syngenta foundation for sustainable agriculture

MICHIGAN STATE UNIVERSITY

Strengthening Regional Agricultural Integration in West Africa:

Key Findings & Policy Implications

Moving from barriers to greater cooperation across West Africa

Editors:
John M. Staatz
Boubacar Diallo
Nathalie M. Me-Nsope

syngenta foundation for sustainable agriculture

MICHIGAN STATE UNIVERSITY

Strengthening Regional Agricultural Integration in West Africa:

Key Findings & Policy Implications

Edited by:

John M. Staatz

Boubacar Diallo

Nathalie M. Me-Nsope

A joint e-publication by the
Syngenta Foundation for Sustainable Agriculture
and Michigan State University

June 2017

Photo credits

Front Cover

Left: Abdramane Traoré

Right: Ryan Vroegindewey

Back Cover:

Ryan Vroegindewey

Part I (p. 1):

Left: USAID West Africa Trade Hub/Carena Corporation

Right: Ryan Vroegindewey

Part II (p. 48):

Left: Boubacar Diallo

Right: John Staatz

Part III (p. 136)

Left: Ryan Vroegindewey

Right: John Staatz

Part IV (p. 197)

Ryan Vroegindewey

Part V (p. 240)

Left: Ryan Vroegindewey

Right: Ryan Vroegindewey

Basel, Switzerland and East Lansing, Michigan, USA.

LIST OF AUTHORS

Ramziath T. Adjao, *The World Bank*

Nango Dembélé, *Minister of Agriculture, Republic of Mali*

Boubacar Diallo, *Michigan State University*

Steven Haggblade, *Michigan State University*

Nathalie M. Me-Nsope, *Michigan State University*

Soulé Bio Goura, *Hub Rural, Dakar*

John M. Staatz, *Michigan State University*

Ryan Vroegindewey, *Michigan State University*

Yuan Zhou, *Syngenta Foundation for Sustainable Agriculture*

ACKNOWLEDGMENTS

This publication and the research that it summarizes were come about only through the contributions of many people and organizations. Thanks go first and foremost to the Syngenta Foundation for Sustainable Agriculture for its ongoing support of the Strengthening Regional Agricultural Integration (SRAI) program and its dedication to building a better life for small farmers around the globe. Particular thanks are go to the Foundation's Executive Director, Marco Ferroni, its Head of Research and Policy Analysis, Yuan Zhou, and the Foundation's West African Delegate, Oumar Niangado, who have provided unwavering support and intellectual guidance to the program throughout its seven-and-a-half-year life. Robert Berlin and Ian Barker have also provided very helpful scientific input, Paul Castle has facilitated the program's outreach activities in various venues, and Marisa de Faveri handled administrative issues with efficiency and good humor.

The SRAI program was coordinated in West Africa by Michigan State University's research and outreach team based in Bamako. Warm thanks go to our colleagues Nango Dembélé, Bino Temé, Abdramane Traoré, Maimouna Traoré, Ladji Diarra, Hawa Coulibaly Traoré, Hamsatou Diallo, Sidibé Thiam, Mamoutou Traoré, and Hamidoun Guindo for their invaluable contributions to the design, implementation, and administrative support of the program over the years. A U.S.-based team of researchers and administrative support-staff partnered with the Bamako team to implement the program. We extend our gratitude to Valerie Kelly, Veronique Theriault, Steven Haggblade, Steven Longabaugh, Ramziath Adjao Ryan Vroegindewey, Abdrahmane Berthé, and Obafemi Elegbede for their invaluable contributions to the program's research and outreach efforts. We also thank Kay Barber, Xiao-Zhen Li, Catherine Snider, Thomas Kalogeropoulos, and Scott Frump for their strong administrative support.

In Mali, the SRAI project office received administrative support and its official administrative "home" from the Assemblée Permanente des Chambres d'Agriculture du Mali (APCAM), which greatly facilitated our work and to whom we extend our warm thanks.

The SRAI research and outreach programs were implemented jointly with West African colleagues from a wide range of national and regional organizations involved in research, policy analysis, statistical systems, higher education, and market information. Colleagues who contributed from national organizations include, by country, the following:

- *Benin:* Patrice Y. Adegbola, Saturnin Akoha, and Aline Aloukoutou;
- *Burkina Faso:* Moussa Kaboré, Mathieu Ouédraogo, Souleymane Ouédraogo, Eric Pale, Savadogo Abdourahyme, Songré Oumarou, and Clément P. Yelemou;
- *Côte d'Ivoire:* Amani Michel, Enoh Moïse Georges, Falle Diabagaté, Kouablé Noël, Kouame Gabriel, Kouamé, N'da Foto Mathias, Tapé Christian, and Yoboua Malan Mathieu;
- *Ghana:* Samuel Asuming-Brempong, Alfred Asuming Boakye, John K. M. Kuwornu, and Patrick Kojo Ofori;
- *Guinea:* Sékou Diawara, IRAG Aly Condé, SNSA, and Yacouba Diakité;

- *Mali :* Ibrahim Ag Abdoulaye Ag Sid Ahmad, Abdoulaye Arby, Jacob Coulibaly, Lamissa Diakité, Aly Diallo, Salifou B. Diarra, Tidiane Diarisso, Bréma Moussa Koné, Balla Keïta Bourema Koné, Ibrahim Zana Jean-Luc Sanogo, Assitan Traoré, and Pierre Traore;
- *Niger:* Sani Laouali Addoh, Bilyamini Ekadé, Harouna Ibrahima, and Salifou Sanda Ousmane;
- *Nigeria:* Chukwuka Onyekwena;
- *Senegal:* Mekha Babou, Mohamadou Lamine Dia, Alioune Dieng, Fara Dione, Mouhamadou Ndiaye, Moussa Niang, Mamadou Sagna, and Momar Ballé Sylla; and
- *Togo:* Amewuame Mawuli and Hevi K. Dodzi.

Colleagues from regional organizations include:

- *AfricaRice:* Simon Codjo, Jeanne Coulibaly Aliou Diagne, Rose Edwge Fiamohe, and Ali Touré;
- *CILSS:* Moussa Cissé;
- *Laboratoire d'analyse régionale et d'expertise sociale (LARES):* Bio Goura Soule and Sanni Gansari; and
- *ReSAKSS/West Africa:* Maurice Taondyandé and Mbaye Yade.

To all these colleagues, and through them to their respective organizations, we express our deep thanks.

A strong editorial group played an invaluable role in putting this publication into final form. Patricia Johannes handled the editing and formatting of the document with remarkable efficiency, skill, patience, and grace. Three chapters were originally drafted in French, and Brandie Brunner skillfully translated those drafts into English. Julie Porter quickly and efficiently produced the French translations of the chapter abstracts and the executive summary.

Finally, none of this work would have been possible without the cooperation and goodwill of the scores of farmers, agro-entrepreneurs, government and regional officials, and development-partner personnel who generously and patiently helped the SRAI team define its research questions, responded to our questions, provided invaluable feedback on our results, and participated actively in the program's outreach activities. To them, we owe our deepest thanks and express the hope that these results will help them in their future endeavors.

John M. Staatz, Boubacar Diallo, and Nathalie M. Me-Nsope May 2017

TABLE OF CONTENTS

LIST OF ACRONYMS

ADBI	Asian Development Bank and its Institute
AE	Adult equivalents
AFD	Agence Française de Développement
AfDB	African Development Bank
AGRHYMET	Centre Regional de Formation et d'Application en Agrométéorologie et Hydrologie Opérationnelle
AIDS	Almost Ideal Demand Systems
ASCo	Ayensu Starch Company (Ghana)
AU	African Union
BAU	Business as Usual
CAADP	Comprehensive Africa Agriculture Development Programme
CC	Cumulative change rate
CET	Common External Tariff
CFA franc (CFAF)	Franc of the Communauté Financière d'Afrique (common currency of the WAEMU countries)
CILSS	Comité Permanent Inter-Etats de Lutte contre la Sécheresse au le Sahel [Permanent Interstate Committee for Drought Control in the Sahel]
CIRAD	Centre de Coopération Internationale de Recherche Agronomique pour le Dévelopment/Agricultural Research Centre for International Development
CMA/WCA	Council of Ministers of Agriculture of West and Central Africa
CNRA	Centre national de recherche agricole (Côte d'Ivoire)
CRD	Coût des Ressources Domestiques (Domestic Resource Cost)
CSA	Commissariat à la Sécurité Alimentaire (Senegal)
CV	Compensating Variation
DADTCO	Dutch Agricultural Development and Tradiing Company
DCS	Daily Calorie Supply
DPSAA	Direction de la Prospective et des Statistiques Agricoles et Alimentaires (Burkina Faso)
DRC	Domestic Resource Cost
ECOWAP	Economic Community of West African States' Agricultural Policy
ECOWAS	Economic Community of West African States
ELIM	Enquête Légère Intégrée auprès des Ménages
ENDA-Tiers Monde	Environnement et Développement au Tiers Monde (Dakar-based NGO)
EPA	Enquêtes Permanentes Agricoles
F&V	Fruits and Vegetables
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	FAO's Statistical Database
FARM	Fondation pour l'agriculture et la ruralité dans le monde
FBS	Food Balance Sheet
FDI	Foreign Direct Investment
FEWSNET	Famine Early Warning Systems Network

FIDA	Fonds International pour le Développement Agricole (IFAD in English)
FIGIS	FAO's seafood database
FOB	Free on Board
GADCO	Global Agricultural Development Company
GDP	Gross Domestic Product
GOANA	Grande offensive agricole pour la nourriture et l'abondance (Senegal)
HBS	Household-level budget-consumption survey
HC	High-case development
HLPE	High-Level Panel of Experts
HVF	High value Foods
IDRC	International Disaster and Risk Conference
IFAD	International Fund for Agricultural Development
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
IMPACT	International Model for Policy Analysis of Agricultural Commodities and Trade
INRAD	Institut National des Recherches Agricoles du Bénin
INSAE	Institut National de la Statistique et de l'Analyse Economique (Benin)
IRAM	Institut de Recherches et d'Applications des Méthodes de développement
kg	kilograms
LARES	Laboratoire d'Analyse Régional et d'Expertise Social
LC	Low-case development
LSMS	Living Standards Measurement Survey
M&E	Monitoring and Evaluation
MAP	Matrice d'Analyse des Politiques (PAM in English)
MCMPMS	Mawuwoe Cooperative Rice Processing and Marketing Society Ltd. (Ghana)
MIS	Market Information Systems
MISTOWA	Market Information System and Trade Organisations in West Africa
MPC	Parginal Propensity to Consume
MSU	Michigan State University
mt	metric tons
NAIP	National Agricultural Investment Plan
NARS	National Agricultural Research Systems
NEPAD	New Partnership for Africa's Development
NERICA	New Rice for Africa
NGO	Non-governmental organizations
ODA	Official Development Assistance
OECD	Organisation for Economic Co-operation and Development
OMA	Observatoire du Marché Agricole (Mali)
OSS	Other starchy staples
PAM	Policy Analysis Matrix
PAPA	Programme d´Analyse des Politiques Alimentaires (Benin)
PAU	Politique Agricole de l'UEMOA
PPP	Purchasing power parity

PPPs	Public-private partnerships
QUAIDS	Quadratic Almost Ideal Demand System
R	Rural
R&T	Roots and Tubers
RAIP	Regional Agricultural Investment Plan
RECs	Regional Economic Communities
ReSAKSS	Regional Strategic Analysis and Knowledge Support System
RN	Rural nonpoor
ROPPA	Réseau des Organisations Paysannes et de Producteurs Agricoles de l'Afrique de l'Ouest
RP	Rural Poor
R-RDTA	Regional-Research and Development Technical Assistance
SADAOC	Fondation Sécurité alimentaire durable en Afrique de l'Ouest Centrale
SAED	Société Nationale d'Aménagement et d'Exploitation des Terres du Delta du fleuve Sénégal
SCS International	Société Commercial Sylvain International (Mali)
SFSA	Syngenta Foundation for Sustainable Agriculture
SM	Sorghum /Millet
SRAI	Strengthening Regional Agricultural Integration
SSR	Self-Sufficiency Rate
SWAC	Sahel and West Africa Club
TCE	Transaction-cost economics
U	Urban
UEMOA	Union Economique et Monétaire Ouest Africaine
UMOA	Union Monétaire Ouest Africaine
UNDESA	United Nations Department of Economic and Social Affairs
UNEP	United Nations Environmental Programme
US$	United States Dollar
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WA	West Africa
WAEMU	West African Economic and Monetary Union (UEMOA in French)
WFP	World Food Program
WHO	World Health Organization
WIENCO	Ghanaian-Dutch agricultural company
WTO	World Trade Organization

EXECUTIVE SUMMARY

This publication presents key results from the Strengthening Regional Agricultural Integration (SRAI) program. SRAI was a major agricultural policy analysis and outreach initiative in West Africa between 2009 and 2017, supported by the Syngenta Foundation for Sustainable Agriculture (SFSA) and implemented by Michigan State University (MSU) and its West African partners. The program began in the aftermath of the 2007-2008 world food crisis. World rice prices had nearly tripled, the prices of other basic staples had spiked sharply, and several Asian grain exporters had imposed export restrictions in an attempt to hold down domestic prices. West African governments implemented policy measures that limited the full transmission of these international price spikes to their markets. Nonetheless, food prices in the region still shot up sharply and food riots broke out in many cities. The experience severely shook the confidence of many West African leaders in the reliability of international and regional markets as sources of food for their growing populations.

In the wake of the 2007-2008 crisis, a process of *globalization in reverse* began to unfold in the region, with governments increasingly calling for greater national food self-sufficiency and moving away from efforts to expand regional agricultural integration that had been underway since the 1990s. In the traditional grain-exporting countries of West Africa, these calls led to periodic export bans, aimed at tempering upsurges in domestic food prices. The message that seemed to be sent to farmers in these countries was that they were free to sell into regional food markets, but only so long as prices were low. Such a message, and the resulting market risks that it implied, depressed farmers' and traders' incentives to invest in new technologies, equipment, and practices that could boost productivity.

It was in this context that SFSA approached MSU about jointly designing a research and outreach program to provide West African policy makers with empirical information concerning the costs of moving away from regional agricultural integration and about the alternatives available for dealing with food crises like those of 2007-2008. An equally important goal was to carry out such work collaboratively with West African partners, thereby strengthening local capacity to carry out such analyses in the future.

The resulting SRAI program developed a research and outreach program that evolved over its seven-and-a-half year life. It initially focused primarily on the impact of the 2007-2008 crisis on West African grain markets and the policy responses to it, but the focus gradually broadened to cover several topics that are central to policies affecting regional agricultural integration. Major research themes included:

- The degree to which international price spikes for food were transmitted to West African markets;
- How production and trade flows responded to those shocks;
- The evolution of food consumption patterns in West Africa and its implications for the focus of future food policies, the strategies of agribusinesses, and the design of social safety-net programs;
- The competitiveness of West African cereal value chains (particularly rice) vis à vis imports; and

- The design of alternative models of value-chain organization to link smallholders more effectively to the rapidly expanding markets for value-added agricultural products.

The resulting analyses fed into national and regional policy discussions that gained strong momentum following the crisis. Chief among these was the African Union's Comprehensive Africa Agriculture Development Programme (CAADP), which in West Africa was integrally linked to the ECOWAS Regional Agricultural Policy (ECOWAP). In part because of such outreach, many of the shortcomings of national and regional policies noted in the findings below are beginning to be addressed in the new 2016-2025 phase of the ECOWAP/CAADP program.

Key findings from the study and their policy implications included the following:

West African governments were able to reduce the transmission of global price shocks to their markets, but at high cost. Among the countries analyzed (all in the CFA franc zone), about one-third of the percentage changes in world rice prices (denominated in US$) was transmitted to domestic markets over the period 2000-2008. A somewhat higher share (averaging around 40%) of global maize price changes was transmitted to those markets. Part of this muting of international price shocks was an artifact of the declining value of the US dollar relative to the CFA franc over this period (a situation that has reversed since 2010), but much of it was due to policies implemented by West African governments to protect consumers. These policies included, among others, cuts in import taxes, export restrictions from traditionally grain-surplus countries, and subsidized sales to consumers. While partially successful in reducing pressure on consumers, the policies had high opportunity costs in terms of foregone government revenues that could have supported programs to expand domestic production and in terms of reduced price incentives to domestic farmers.

West African agrifood system actors are responding to new opportunities, but face high transaction costs. West African farmers, input providers, merchants, agroprocessors, exporters, and retailers have responded innovatively to the many of the changes in domestic and international demand, availability of new technologies and physical environment that they face. Evidence includes rapid expansion in the production of rice, maize, and cassava in recent years; growth of peri-urban horticultural and dairy production; expansion of regional trade; and the emergence of new trade corridors in response to regional patterns of demand, such as the growing demand for feedgrains in Nigeria. As economic policies and agricultural prices in the region have become more favorable, domestic and international firms have expanded their investments in agricultural production and agroprocessing and are experimenting with new models of contracting with small farmers. In undertaking all these actions, however, private-sector actors have faced substantial transaction costs. Some of these stem from increased physical insecurity in West Africa in recent years, but many result from policies that change frequently, are sometimes inconsistent across countries and are often opaque in their application. This is particularly the case with rules governing trade in both agricultural products and inputs among different countries within the region. Regional integration policies, such as those of ECOWAS and the West African Economic and Monetary Union (WAEMU), are attempting to reduce these transaction costs, but as noted below, policy implementation remains a major challenge.

Food consumption patterns in West Africa are changing profoundly, affecting where future food polices should focus their attention. Among the chief driving forces changing the environment facing West Africa's agrifood system is the changing pattern of food consumption in the region. Between 1980 and 2009, per capita availability of calories, protein, and fat increased, in some cases dramatically, in almost all of the 15 member states of ECOWAS. Diets diversified, both among the starchy staples consumed and because of greater per capita availability of fruits, vegetables, and animal products. The largest changes occurred in countries experiencing the most robust economic growth, such as Cape Verde and Ghana. Budget-consumption studies reveal that urbanization and per capita income growth are pushing demand strongly towards perishables and products that are more convenient to prepare and consume. The projected percentage rate of growth of demand through 2040 for animal-based products, fruits and vegetables and vegetable oil all exceed that for cereals, with the bulk of the increase in demand coming from urban areas. Improvements in grain processing have increased the willingness of consumers to substitute milled coarse grains, such as maize, millet, and sorghum, for rice during periods of sharp price increases for rice. The evolving pattern of food consumption implies that a firm understanding of the nature and dynamics of consumption is critical to designing demand-driven policies. In particular, SRAI's findings imply that while the production and competitiveness of basic staples will remain important, the focus of food policy needs to broaden to give greater attention to perishables such as animal-based products, fruits and vegetables, for which demand is growing exponentially. It is also necessary to focus more on the post-harvest segments of the agrifood system that are critical in the marketing and processing of the more perishable and convenient types of foods that West African consumers increasingly demand. These post-harvest segments tend to be labor-intensive, offering the potential for substantial job creation for the burgeoning labor force.

West African agriculture can be competitive, but only if the entire value chain is addressed. Analyses of the financial and economic profitability of value chains for key products such as rice and maize indicate that selected West African production systems can be competitive with imports from overseas. That competitiveness, however, will increasingly depend on the efficiency of post-harvest operations, such as milling, marketing, and quality control. Unfortunately, until recently, most agricultural policies and investment plans, such as those developed under the first phase of ECOWAP/CAADP, concentrated most of their attention at the farm level. Future programs will need to give more attention to improving the post-harvest segments of the value chain–segments that will increasingly determine the competitiveness of West African agriculture in the future. A key element of such a focus will be on improving vertical coordination, including the design of contracting models to link smallholders more effectively to the growing markets. SRAI case studies of such models demonstrate that there is no one-size-fits-all approach, but provide insights into design elements that need to be taken into account for different types of products in various environments.

Greater regional integration is crucial to addressing many of the challenges facing West African agriculture. Greater regional agricultural integration has the potential to spur growth and food security through at least three major pathways:

- Broadening markets for farmers, traders, and agroprocessors through establishment of transparent rules for regional trade and mutually recognized grades and standards across countries. Such broadening would not only offer farmers more outlets for their fresh

products but also increase the scope for processors to source raw products regionally rather than just nationally. Regional sourcing would reduce processors' incentives to turn towards imports, which they now frequently view as a more reliable and less costly source of raw materials.

- Capturing economies of scale in production and marketing of fertilizers, improved seeds and crop protectants; agricultural research, extension, and higher education; and output processing. Without greater regional integration, there is no way for West Africa to capture such scale economies, which fuel the competitiveness of global agricultural powerhouses such as China, India, Brazil, and Indonesia.
- Promoting consumers' ability to substitute across commodities. West African agroprocessors have developed more convenient forms of traditional staples, such as processed sorghum and maize products, and consumers increasingly appear willing to substitute them for imported rice when rice prices spike. Yet simulation analysis demonstrates that without more fluid regional trade of the traditional staples during periods of drought or world price spikes, the ability of consumers, particularly the poor, to afford such substitutes quickly evaporates.

One concrete and immediate action that could help to foster such integration would be to revitalize and extend the border conferences that took place in 2009 between Mali and Guinea and in 2011 between Mali and Senegal. These conferences brought together traders, farmer groups, truckers, border control agents, and other public officials to discuss the rights and responsibilities of those involved in regional trade and to develop concreate steps to improve it.

The regional trade policy agenda needs to go hand-in-hand with a social-protection and risk-mitigation policy agenda. In West Africa, the political motivation to impose food export bans during periods of high prices is to protect domestic consumers, including the poor and politically vocal urban groups. Most policy makers understand that imposing export bans hurts long-term agricultural growth by depressing the incentives of farmers and traders to invest in boosting production. However, policy makers and politicians live in the short term and need to have reliable tools to protect vulnerable populations from spiking prices. As a result, the regional trade agenda needs to go hand-in-hand with the social protection and risk-mitigation agenda. Instead of relying on general trade policy to try to protect vulnerable groups from spiking prices, there is a need to develop targeted and economically sustainable social safety nets and risk-mitigation programs to protect the most vulnerable from the higher food prices that result during crises. Without such programs, the dream of more open trade is likely to remain unattainable. Many of the ECOWAP national investment plans and the regional plan have recognized this need to link the regional integration and social-protection agendas by including components aimed at experimenting with more cost-effective and targeted social safety-net and risk-mitigation programs.

Policy implementation is a greater challenge than policy design. While tough policy design challenges remain, bigger challenges lie in implementation. Improving implementation will require much better and more detailed data, particularly on the post-harvest segments of the food system, and on reinforced human capacity for policy design, implementation, and monitoring and evaluation. Such strengthening needs to include not only governmental and intergovernmental organizations at all levels, from supranational (e.g., ECOWAS) to local

(e.g., *commune* or township), but also private-sector stakeholders, including farmer groups, who are increasingly called upon to implement and monitor policies and programs jointly with government. Such capacity strengthening needs to draw more on the under-used policy analysis capacity of West Africa's universities and policy research institutes. Drawing personnel from these organizations to help with the on-the-ground challenges faced in policy design and implementation could be one component of a much larger effort to transform West Africa's educational system to produce the skills needed for a 21st Century agrifood system.

In addition to these findings, the SRAI program also revealed some broader lessons about the agricultural policy process itself. Chief among these were the following:

- Restricting regional trade generates economic rents that can be captured by those who are in a position to limit such trade. Good governance efforts therefore need to aim at reducing those rents and the capacity and incentives of those in a position to restrict trade from capturing them.
- Strengthening local policy analysis capacity is critical to sustained policy improvement. Local capacity strengthens local ownership and buy-in of policy recommendations and follow-up regarding policy implementation.
- Policy outreach activities need to be an on-going activity rather than a one-shot affair. The policy environment is constantly evolving, and key policy makers frequently change jobs. As a result, there is a need to revisit previous policy recommendations periodically to reassess their relevance and to communicate key messages to new policy makers.
- It is unrealistic to expect economic policies to be devoid of political considerations. Rather than decry such political motivations, a more realistic approach may be to try to design policies so that short-term programs, motivated in part by political considerations, help address long-term structural constraints to growth.

RÉSUMÉ ANALYTIQUE

La présente publication présente les principaux résultats du programme intitulé *Le renforcement de l'intégration agricole régionale* (SRAI). Le programme SRAI était une grande initiative d'analyse des politiques agricoles et de sensibilisation en Afrique de l'Ouest entre 2009 et 2017, financée par la Fondation Syngenta pour l'Agriculture durable (SFSA) et mise en œuvre par l'Université d'État du Michigan (MSU) et ses partenaires d'Afrique de l'Ouest. Ce programme a démarré après la crise alimentaire mondiale de 2007-2008. Les cours mondiaux du riz avaient quasiment triplé, les prix des autres denrées alimentaires courantes étaient montés en flèche et plusieurs exportateurs asiatiques de céréales avaient imposé des restrictions d'exportation pour tenter d'empêcher une hausse des prix intérieurs. Les gouvernements ouest-africains ont pris des mesures qui ont limité l'entière répercussion des hausses des cours mondiaux sur leurs marchés. Néanmoins, les prix des denrées alimentaires se sont tout de même envolés et des émeutes ont éclaté dans de nombreuses villes. Cette expérience a gravement sapé la confiance de nombreux dirigeants ouest-africains quant à la fiabilité des marchés mondiaux et régionaux comme source d'alimentation de leur population de plus en plus nombreuse.

Après la crise de 2007-2008, un processus de *mondialisation à l'envers* a commencé à se produire dans la région, les pouvoirs publics appelant de plus en plus à l'autosuffisance alimentaire nationale et s'éloignant des initiatives de développement de l'intégration agricole régionale, entamée dans les années 1990. Dans ces pays d'Afrique de l'Ouest, traditionnellement exportateurs de céréales, ces appels ont débouché sur des interdictions d'exportation périodiques destinées à tempérer les hausses des prix intérieurs des denrées alimentaires. Dans ces pays, le message qui semblait être communiqué aux agriculteurs était qu'ils étaient libres de vendre sur les marchés régionaux de denrées alimentaires, tant que les prix étaient bas. Un tel message, et les risques qu'il impliquait, ont limité les incitations des agriculteurs et des commerçants à investir dans les technologies, les pratiques novatrices et l'acquisition de nouveaux matériels susceptibles d'améliorer la productivité.

C'est dans ce contexte que SFSA a contacté MSU, proposant de concevoir ensemble un programme de recherche et de sensibilisation offrant aux décideurs ouest-africains des informations empiriques sur les coûts que pourrait engendrer une remise en cause des bienfaits de l'intégration agricole régionale et sur les alternatives possibles face aux crises alimentaires telles que celles de 2007-2008. Un autre objectif tout aussi important était de mener ce travail en collaboration avec des partenaires ouest-africains et donc de renforcer les capacités locales de réaliser de telles analyses dans l'avenir.

L'initiative SRAI a donc mis sur pied un programme de recherche et de sensibilisation qui a évolué pendant ses sept années et demi d'existence. Il s'est tout d'abord intéressé à l'impact de la crise de 2007-2008 sur les marchés céréaliers ouest-africains et aux politiques publiques qui ont suivi, mais ensuite s'est graduellement étendu sur d'autres thèmes au cœur des politiques affectant l'intégration agricole régionale. Les principaux thèmes de recherche étaient les suivants:

- L'ampleur de la flambée des cours mondiaux des denrées alimentaires et sa transmission sur les marchés africains.
- La réponse de la production et la dynamique des flux commerciaux face à ces chocs.
- L'évolution des tendances de la consommation alimentaire en Afrique de l'Ouest et ses implications sur les futures politiques alimentaires, les stratégies de développement du secteur agroalimentaire et la conception de programmes sociaux de protection et de bien-être.
- La compétitivité des chaines de valeur céréalières ouest-africaines (particulièrement le riz) par rapport aux importations, et
- La conception de modèles alternatifs d'organisation de chaines de valeurs reliant plus efficacement les petits agriculteurs aux marchés de produits agricoles à valeur ajoutée, en pleine expansion.

Les analyses ont ensuite alimenté les débats politiques nationaux et régionaux qui ont pris de l'importance après la crise. Parmi ceux-ci, l'important Programme détaillé de développement de l'agriculture africaine (PDDAA-) de l'Union africaine qui, en Afrique de l'Ouest, était intégré à la Politique agricole de la Communauté économique des États de l'Afrique de l'Ouest (ECOWAP). En contrepartie de cette sensibilisation, un bon nombre de lacunes constatées dans les politiques nationales et régionales telles que relatées dans les conclusions ci-dessous, commencent désormais à trouver des solutions dans la nouvelle phase 2016-2025 du programme ECOWAP/PDDAA.

Les principales conclusions de l'étude et leurs implications politiques sont les suivantes:

Les gouvernements africains ont réussi à réduire les répercussions des chocs des cours mondiaux sur leurs marchés, mais à un coût élevé. Parmi les pays analysés (tous dans la zone du franc CFA), environ un tiers des fluctuations des cours mondiaux du riz (libellés en US$) a été transmis sur les marchés intérieurs entre 2000 et 2008. Une proportion légèrement plus élevée (environ 40% en moyenne) des fluctuations des cours mondiaux du maïs a été transmise sur ces marchés. Cette atténuation des chocs des cours mondiaux était due en partie, à la baisse du dollar US par rapport au franc CFA pendant la période (situation qui s'est inversée à partir de 2010), mais cela était dû en grande partie aux politiques mises en œuvre par les gouvernements ouest-africains pour protéger les consommateurs. Ces politiques comprenaient, entre autres, des réductions de taxes d'importation, des restrictions d'exportations pour les pays céréaliers traditionnellement excédentaires et des subventions sur les prix de vente aux consommateurs. Bien qu'elles aient partiellement réussi à alléger la pression subie par les consommateurs, ces politiques ont eu des coûts d'opportunité élevés en termes de pertes de recettes au profit de l'Etat qui auraient pu financer des programmes d'expansion de la production intérieure et en termes de réduction des incitations sur les prix aux producteurs.

Les acteurs du système agroalimentaire ouest-africains saisissent les nouvelles opportunités mais sont confrontés à des coûts de transaction élevés. Les agriculteurs ouest-africains, les fournisseurs d'intrants, les commerçants, les industriels de l'agroalimentaire, les exportateurs et les détaillants ont fait preuve d'innovation face aux nombreuses fluctuations de la demande intérieure et internationale, par rapport à l'existence de nouvelles technologies et le contexte dans lequel ils évoluent. La rapide expansion de la production de riz, de maïs et de manioc ces dernières années, la croissance de l'horticulture périurbaine et de la production laitière,

l'expansion du commerce régional et l'émergence de nouveaux couloirs commerciaux en réponse aux tendances régionales de la demande telles que par exemple la demande grandissante de céréales fourragères au Nigeria, en sont des évidences palpables. Au fur et à mesure que les politiques économiques et les prix agricoles sont devenus plus favorables dans la région, les entreprises nationales et internationales ont accru leurs investissements dans la production agricole et l'industrie agroalimentaire et se sont engagées dans de nouveaux modèles de contractualisation avec les petits agriculteurs. Cependant, les acteurs du secteur privé ont fait face à des coûts de transaction élevés. Certains de ces coûts s'expliquent par l'aggravation de la situation sécuritaire en Afrique de l'Ouest durant ces dernières années, mais beaucoup proviennent des politiques publiques qui changent souvent, manquent parfois de cohérence entre les pays et sont souvent opaques dans leur application. C'est le cas, en particulier, des règles qui régissant le commerce des produits agricoles et des intrants dans divers pays de la région. Les politiques d'intégration régionale, telles que celles de la CEDEAO et de l'Union économique et monétaire de l'Afrique de l'Ouest (UEMOA), tentent de réduire ces coûts de transaction mais comme on le verra ci-dessous, l'application des politiques reste un défi de taille.

Les tendances de la consommation alimentaire en Afrique de l'Ouest changent profondément, et les politiques alimentaires futures devraient en tenir compte. Parmi les grandes forces qui agissent sur le système agroalimentaire oust-africain, on peut noter la transformation des tendances de la consommation alimentaire dans la région. De 1980 à 2009, la disponibilité de calories, de protéines et de lipides par habitant a progressé, parfois considérablement, dans presque tous les 15 pays membres de la CEDEAO. Les régimes alimentaires se sont diversifiés, à la fois dans la consommation de féculents mais aussi en raison d'une plus grande disponibilité de fruits, de légumes et de produits animaux. Les transformations les plus significatives se sont produites dans les pays dont l'essor économique était plus important, comme au Cap Vert et au Ghana. Les études budgets-consommation révèlent que l'urbanisation et la hausse des revenus par habitant poussent fortement la demande vers les produits périssables et les produits plus pratiques à préparer et à consommer. Les taux de progression (en pourcentage) de la demande projetés à l'horizon 2040 pour les produits animaux, les fruits et les légumes et les huiles végétales dépassent tous ceux des céréales. L'augmentation de cette demande vient essentiellement des zones urbaines. Des améliorations dans l'usinage et la transformation des céréales ont renforcé le désir des consommateurs de substituer des céréales secondaires usinées, telles que le maïs, le mil et le sorgho, au riz lors des périodes de forte hausse des prix du riz. Les tendances changeantes de la consommation alimentaire signifient qu'une bonne compréhension de la nature et de la dynamique de la consommation est essentielle pour concevoir des politiques dictées par la demande. En effet, les conclusions de SRAI rapportent que bien que la production et la compétitivité des denrées alimentaires de base restent importantes, les politiques alimentaires se doivent d'élargir leurs horizons et porter une attention particulière aux denrées périssables telles que les produits animaux, les fruits et les légumes, pour lesquels la demande progresse de façon exponentielle. Il faut aussi s'intéresser de plus près aux segments du système agroalimentaire post- récolte qui sont essentiels pour la commercialisation et l'usinage d'aliments périssables et plus pratiques à préparer dont se nourrissent de plus en plus les consommateurs ouest africains. Ces segments post-récolte à haute intensité de main d'œuvre, représentent un potentiel de fortes créations d'emplois pour une main d'œuvre en plein essor.

L'agriculture ouest-africaine peut être compétitive, mais seulement si l'ensemble de la chaine de valeur est considéré. Les analyses de rentabilité financière et économique des chaines de valeur tels que celles du riz et du maïs indiquent que ces systèmes de production ouest-africains ciblés peuvent être compétitifs par rapport aux importations d'outre-mer. Toutefois, cette compétitivité dépendra de plus en plus de l'efficacité des opérations post-récolte, telles que l'usinage, la commercialisation, et le contrôle de qualité. Malheureusement jusqu'à récemment, la plupart des politiques agricoles et des plans d'investissement, comme ceux élaborés pendant la première phase de ECOWAP/PDDAA, se sont surtout concentrés au niveau de l'exploitation. Les futurs programmes devront s'attacher à améliorer les segments post-récoltes de la chaine de valeur – segments qui détermineront de plus en plus la compétitivité de l'agriculture ouest-africaine dans le futur. Un élément important de cet enjeu consistera à améliorer la coordination verticale, notamment la conception de modèles de contractualisation reliant plus efficacement les petits agriculteurs aux marchés en pleine expansion. L'analyse de ces modèles réalisée dans le cadre du programme SRAI montre qu'il n'y a pas une approche standard dans le choix des éléments de conception à prendre en compte pour la réussite d'un partenariat. Cette analyse offre plutôt des idées sur pour diverses catégories de produits et dans des contextes variés.

Une plus grande intégration régionale est essentielle pour relever les nombreux défis auxquels est confrontée l'agriculture ouest-africaine, car elle a le potentiel de stimuler la croissance et la sécurité alimentaire en empruntant au moins trois grandes voies :

- Élargir les opportunités de marchés pour les agriculteurs, les négociants et les industriels agroalimentaires par l'établissement de règles transparentes applicables au commerce régional et de normes et standards mutuellement reconnues par les pays. Un tel élargissement offrirait des débouchés supplémentaires aux agriculteurs pour leurs produits frais et augmenterait la possibilité pour les industriels de s'approvisionner en matières premières dans un espace régional et pas uniquement national. Un approvisionnement régional réduirait les incitations des industriels à se tourner vers les importations, qu'ils considèrent actuellement comme une source plus fiable et moins coûteuse de matières premières.
- Réaliser des économies d'échelle dans la production et la commercialisation des engrais, des semences améliorées, de pesticides et produits phytosanitaires, dans la recherche agricole, la vulgarisation agricole et l'éducation supérieure, l'usinage et la transformation des productions. En l'absence d'une intégration régionale, l'Afrique de l'Ouest ne pourra pas réaliser ces économies d'échelle qui représente l'élément moteur de la compétitivité des puissances agricoles mondiales comme la Chine, l'Inde, le Brésil et l'Indonésie.
- Promouvoir l'aptitude des consommateurs à effectuer des substitutions de denrées alimentaires. Les industriels de l'agroalimentaire ont développé des formes pratiques d'aliments traditionnels, comme les produits usinés, dérivés du maïs et du sorgho que les consommateurs sont de plus en plus désireux de substituer au riz quand les prix de ce dernier s'envolent. Toutefois, l'analyse de simulation montre que sans un commerce régional plus fluide de ces denrées traditionnelles pendant les périodes de sécheresse ou de flambée des prix, la capacité des consommateurs, notamment celle des pauvres, d'effectuer ces substitutions s'amenuiseront rapidement.

Une action concrète et immédiate susceptible de promouvoir une telle intégration consisterait à relancer et à multiplier les conférences des frontalières comme celles organisées en 2009 entre le Mali et la Guinée et en 2011 entre le Mali et le Sénégal. Ces conférences périodiques ont permis de mettre sur la même table des commerçants , des associations de producteurs, des transporteurs, des agents publics et forces paramilitaires aux frontières, et autres responsables pour discuter des droits, devoirs et responsabilités des différents acteurs participant au commerce régional. Ces conférences permettent d'élaborer des mesures concrètes et consensuelles pour améliorer la fluidité du commerce.

La politique commerciale régionale doit aller de pair avec un programme politique de protection sociale et d'atténuation des risques. En Afrique de l'Ouest, les mesures politiques consistant à interdire l'exportation de produits alimentaires pendant les périodes de prix élevés ont pour but de protéger les consommateurs dans le pays, notamment les pauvres et les groupes urbains syndicalisés qui se font entendre. La plupart des décideurs politiques comprennent qu'imposer des interdictions d'exporter est nuisible à long terme pour la croissance agricole car cela décourage les agriculteurs et les commerçants d'investir pour stimuler la production. Toutefois, ces décideurs et politiciens ont une vision à court terme et doivent disposer d'instruments fiables pour protéger les populations vulnérables des effets de la forte hausse des prix. De ce fait, les programmes régionaux en matière de commerce doit aller de pair avec les programmes de protection sociale et d'atténuation des risques. Au lieu de s'appuyer sur des politiques commerciales générales pour tenter de protéger les groupes vulnérables des flambées de prix, il faut développer des programmes de protection sociale et d'atténuation des risques pour protéger les plus vulnérables pendant les crises. En l'absence de tels programmes, la réalisation d'un commerce plus ouvert sera probablement impossible. La plupart des plans nationaux et régionaux d'investissement de l'ECOWAP ont reconnu qu'il fallait lier l'intégration régionale à des programmes de protection sociale en intégrant des volets de protection sociale et d'atténuation des risques plus rentables et mieux ciblés.

Il est plus difficile de mettre en œuvre des politiques publiques que de les concevoir. Bien qu'il existe beaucoup de contraintes dans la conception des politiques, les plus grandes difficultés demeurent dans la mise en œuvre. Améliorer la mise en œuvre exige des données bien plus fiables et détaillées, particulièrement au niveau des segments post-récolte du système alimentaire. Elle exige également un renforcement des capacités humaines dans la conception, la mise en œuvre et le suivi-évaluation des politiques. Un tel renforcement doit s'adresser, pas seulement aux organisations gouvernementales et intergouvernementales à tous les niveaux, du supranational (CEDEAO) au local (*commune*), mais aussi au secteur privé, notamment les associations de producteurs qui doivent de plus en plus s'impliquer dans la mise en œuvre et faire le suivi des politiques et des programmes conjointement avec les pouvoirs publics. Un tel renforcement des capacités doit aussi utiliser les compétences sous-utilisées des universités et des instituts de recherche d'Afrique de l'Ouest e matière d'analyse des politiques. Faire appel au personnel de ces organisations pour aider à relever les défis de conception et de mise en œuvre des politiques sur le terrain pourrait constituer l'un des volets d'une plus grande initiative de transformation du système éducatif ouest-africain afin de produire les compétences requises pour un système agroalimentaire du 21è siècle.

Outre ces conclusions, le programme SRAI a aussi dégagé quelques enseignements plus généraux sur le processus politique agricole lui-même. Parmi ceux-ci, citons certains:

- La restriction du commerce régional engendre des rentes économiques qui peuvent être saisies par ceux qui sont en situation de ralentir un tel commerce. Les initiatives de bonne gouvernance doivent donc tendre à réduire ces rentes ainsi que les capacités et incitations de ceux qui se trouvent en position de restreindre ces échanges.
- Le renforcement des capacités locales en matière d'analyse des politiques est essentiel pour une amélioration durable des politiques publiques. Le renforcement des capacités locales facilite l'appropriation et l'adhésion locale dans la prise en charge des recommandations politiques, leur suivi et leur mise en œuvre.
- Les activités de sensibilisation dans le domaine des politiques doivent être une activité continuelle et non ponctuelle. L'environnement des politiques évolue constamment et les responsables politiques-clés changent souvent de poste. Il est de ce fait nécessaire de revoir périodiquement les recommandations politiques antérieures, réévaluer leur pertinence et communiquer les messages importants aux nouveaux décideurs.
- Il est irréaliste de s'attendre à ce que les politiques économiques soient dénuées de considérations politiques. Au lieu de décrier de tels motifs politiques, une approche plus réaliste pourrait tenter de concevoir des politiques de telle façon que des programmes à court terme, en partie motivés par ces considérations politiques, contribuent à remédier aux contraintes structurelles à long terme qui entravent la croissance.

Part I: Context

SRAI began in response to the 2007-2008 world food crisis. Cereal prices had soared, and many West African countries erected trade barriers, threatening regional integration, food security and agricultural growth.

CHAPTER 1

Introduction

John M. Staatz and Boubacar Diallo

Abstract

This chapter explains why this publication was developed and how it is organized. It presents the context surrounding efforts to strengthen regional agricultural integration in West Africa and discusses how those efforts have evolved over the past 30 years, with particular emphasis on changes brought about by the 2007-2008 world food crisis. In response to that crisis, the Syngenta Foundation for Sustainable Agriculture, in collaboration with Michigan State University and its West African partners, launched the Strengthening Regional Agricultural Integration (SRAI) program, which carried out applied research, capacity building and policy outreach on the opportunities and constraints to greater regional agricultural integration in West Africa. The chapter describes the phases of the SRAI program and discusses the major topics analyzed. It concludes with a readers' guide to the publication, outlining the structure and content of the following chapters.

Résumé

Ce chapitre explique le bien-fondé de cette publication et la manière dont elle a été organisée. Il présente le contexte qui a animé les efforts d'intégration des marchés agricoles en Afrique de l'Ouest et discute de son évolution durant les 30 dernières années, avec un accent particulier sur les changements observés depuis la crise alimentaire de 2007-2008. En réponse à cette crise, la Fondation Syngenta pour une Agriculture Durable, en collaboration avec l'Université d'Etat du Michigan et ses partenaires Ouest Africains, ont lancé le Programme de Renforcement de l'Intégration Agricole Régionale en Afrique de l'Ouest (SRAI). Ce programme s'est consacré à la recherche appliquée, le renforcement des capacités et la dissémination des résultats sur les opportunités et contraintes en vue d'une plus grande intégration régionale en Afrique de l'Ouest. Le chapitre décrit les différentes phases du programme SRAI et discute les différents thèmes qui ont été abordés. Il termine avec un guide d'orientation du lecteur qui présente la structure et le contenu des chapitres qui suivent.

1.1. Motivation and Context

This publication synthesizes key findings from the *Strengthening Regional Agricultural Integration (SRAI*) program in West Africa over the period 2009-2017. SRAI was a major agricultural policy analysis initiative, supported by the Syngenta Foundation for Sustainable

Agriculture (SFSA) and implemented by Michigan State University (MSU) and its research partners throughout West Africa. The program included applied policy research, outreach, and capacity strengthening of local research and policy organizations. The aim was to provide a stronger empirical basis for agricultural policy makers in the Economic Community of West African States (ECOWAS) region, particularly concerning efforts to broaden agricultural markets beyond the limits of individual country borders and to improve the access of small farmers to the most dynamic of these markets.[1]

The program grew out of the world food crisis of 2007-2008, when world prices for major staples, particularly rice, skyrocketed and many grain-surplus countries limited exports. Between April 2007 and April 2008, for example, the free on board (FOB) price of the benchmark Thai 25% broken rice nearly tripled, reaching over US$900/mt (World Bank 2016). India imposed an export ban, and other major exporters, such as Thailand and Vietnam, limited exports to protect domestic consumers. West Africa, as a major importer of Asian rice as well as of commodities such as wheat, oilseeds, and fuel, saw the prices of basic necessities soar. Consumers from Dakar to Niamey protested, sometimes violently, against the rapidly increasing cost of living. Some of the inland countries that traditionally export cereals to the coast, such as Mali and Burkina Faso, imposed their own export bans in an attempt to hold down domestic prices. At the same time, countries across the ECOWAS region launched crash food production programs, especially for rice, aimed at increasing their food self-sufficiency. Most countries in the region also cut import taxes on imported rice in order to slow the rise in consumer prices, a policy that seemed at odds with efforts to boost domestic production.

West African countries thus found themselves, after a period of over 20 years of increasingly open trade following the structural adjustment programs of the 1980s and early 1990s, in a process of *globalization in reverse* (see Chapter 2). Policy makers and the public increasingly viewed international and regional trade as an unreliable means of ensuring a country's access to food. Under the banner of *food sovereignty*, governments implemented policies ranging from fertilizer and seed subsidies to export restrictions, aimed at boosting national food supplies. Initially, individual countries implemented their policies unilaterally, with little coordination with their neighbors. The lack of coordination meant that policy inconsistencies across countries (for example, widely differing rates of subsidy on fertilizer) created incentives for cross-border trade simply to capture the rents arising from the inconsistencies. Furthermore, the export bans, combined with cuts in import taxes on imported rice, seemed to signal to farmers that they were free to produce for the market, but only when prices were low.

All of this took place in the backdrop of ongoing efforts to promote greater regional economic integration and avoid the types of trade restrictions that some West African countries imposed in 2008. Beginning in the early 2000s, the two major economic blocs in West Africa, ECOWAS and the West African Economic and Monetary Union (WAEMU), had launched programs to try to bring about a set of common agricultural policies in their member states.[2] In 2001, WAEMU began developing its regional agricultural policy, known as the PAU–*Politique*

[1] ECOWAS is a 15-member inter-state organization dedicated to promoting economic and political integration of West Africa. Its member states include Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

[2] WAEMU is also known by its French acronym, UEMOA (Union Economique et Monétaire Ouest Africaine). Its member states are the eight countries in the region that share the CFA franc as their common currency (Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo). All WAEMU countries are also members of ECOWAS, and the two organizations often work together on regional economic integration issues.

Agricole de l'UEMOA. In 2002, ECOWAS launched the development of the ECOWAS Agricultural Policy, known as the Economic Community of West African States' Agricultural Policy (ECOWAP), which aimed to be complementary to the PAU. When the African Union launched its Comprehensive Africa Agriculture Development Programme (CAADP) in 2003, ECOWAS incorporated ECOWAP into the process, becoming the West African component of CAADP.[3] Under ECOWAP/CAADP, the regional organization led a process in which each of its member states worked with stakeholders (government ministries, producer organizations, development partners, private-sector representatives, and other civil-society organizations) to develop a mutually endorsed agricultural investment plan. Although ECOWAP was officially endorsed by African Heads of State in 2005, the actual development of country-level and regional CAADP plans only began in earnest in 2008, given a sense of urgency by the soaring food prices. At the same time that the countries were developing their national CAADP plans, ECOWAS developed a regional investment plan and associated policies. These promoted regional integration and trade and addressed trans-border issues, such as management of water and pasture resources that transcended national boundaries. The regional plan also advocated for regional investments in activities such as agricultural research and management of food reserves, where scale economies made it more economical to undertake efforts on a regional rather than just on a national level. Reflecting the impact of the 2007-2008 crisis, most national and regional programs that emerged had a strong import-substitution focus, with a heavy emphasis on staple-food production, particularly rice. While many of the plans saw a role for large-scale agricultural agribusinesses, all the plans also placed a strong emphasis on family farming and the need for inclusive growth.

In this environment of rising prices and a rapidly evolving policy environment, public and private decision makers needed solid empirical information and analysis to help guide the design of the investments and policy programs. These needs included information on the short-term impacts of the crisis on the incentives facing different actors (farmers, input suppliers, traders, and food processors) to invest in building a more productive and robust West African agrifood system. However, they also included the need for analysis of longer-term forces, such as changing consumer demand, that were shaping the evolution of the system. The SRAI program of research and outreach aimed to provide such information and to analyze alternative approaches to addressing the challenges facing West Africa's agrifood system.

It is not surprising that the Syngenta Foundation for Sustainable Agriculture (SFSA) was the initiator of such a program. The foundation had been active for over 30 in West Africa (particularly in Mali) in promoting smallholder-led agricultural development. Its mission is "to create value for resource-poor small farmers in developing countries through innovation in sustainable agriculture and the activation of value chains" via a strategy that focuses on smallholders, productivity and markets (SFSA 2016). The issues of sustainability, value chains, smallholders, productivity and markets were at the heart of the CAADP discussions as well as

[3] The African Union launched CAADP in 2003 as an Africa-wide effort to boost agricultural growth on the continent. Its implementation in the different areas of Africa is led by regional economic communities (RECs), such as ECOWAS in West Africa. CAADP calls for each country to work with stakeholders to develop a sector-wide approach to agricultural development, in contrast to past project-led approaches. The stakeholders then endorse the plan, via signature of a CAADP Compact, and pledge to align their individual actions with the common plan. At the same time, the relevant REC develops a regional program to deal with spillovers across countries and promote regional integration. As part of the CAADP process, most African Union member states pledged to devote eventually a minimum of 10% of their government budgets to agricultural development. For more details, see ECOWAS (2015) and Hollinger and Staatz (2015).

the debates about how best to manage the consequences of the 2007-2008 food crisis. In 2008, SFSA approached Michigan State University (MSU), which had built, since 1985, an ongoing program of applied food security research, outreach, and capacity building in West Africa from a base in Mali. SFSA and MSU jointly designed a program directly focused on analyzing policy options for addressing both the current food crisis and the longer-term development challenges facing ECOWAP/CAADP. The Foundation was particularly concerned about developing alternatives to trade restrictions, which undermined farmers' production incentives, to deal with the soaring prices facing West African countries. SFSA and MSU launched the SRAI program on January 1, 2009.

1.2. SRAI Themes

The SRAI program evolved in two phases. The first phase, known as SRAI 1, ran from 2009 through 2011, and focused on analyzing the impacts of the spike in global food prices on West Africa and on how actors in the food system were reacting to it. During this period, there was strong speculation by the Food and Agriculture Organization (FAO), World Bank, International Food Policy Research Institute (IFPRI) and others that the world had left the previous 40-year era of long-term declines in the real price of food and had entered a period of higher and more volatile prices. The SRAI 1 research and outreach program examined how West Africa's agriculture was reacting to this possible change in the global environment.

SRAI 1 Structured its Research and Outreach around Four Themes

Price Transmission: This theme focused on the degree to which fluctuations in international prices were transmitted to domestic markets in West Africa. Not all staple foods consumed in West Africa are widely traded internationally, and hence prices of goods such as cassava and millet would be affected by the higher global prices only to the extent that consumers substituted away from internationally traded commodities, such as rice, towards these goods. Furthermore, West African governments took a number of actions, such as exempting grain imports from import duties, aimed at buffering domestic markets from the price spikes in global markets. This theme examined the effectiveness of such efforts, the impact of the price shocks on non-traded commodities, and their implications for food price and trade policies.

Supply Response and Trade Flows: This theme examined the extent to which domestic supplies and trade patterns within West Africa shifted in response to the higher prices, as well as to other forces that had affected trade over the previous 20 years. Research activities included the preparation of a report synthesizing shifts in regional trade flows from 1990 to 2010 and support to CILSS for a study to test a new method of measuring cross-border trade flows.[4]

Competitiveness and the Revolution of Comparative Advantage: The higher world prices and the policy emphasis on import substitution raised the question of how competitive West African staple food production was compared to imports and how West Africa's comparative advantage was shifting over time. To address these issues, SRAI partnered with researchers from

[4] CILSS is the *Comité permanent inter-État de lutte contre la sécheresse au Sahel* [Permanent Interstate Committee for Drought Control in the Sahel], an inter-state organization that includes 11 of the 15 ECOWAS member states, plus Chad and Mauritania. Since the 1980s, it has undertaken efforts to facilitate regional trade and promote food security in West Africa, and it currently coordinates those efforts closely with those of ECOWAS.

AfricaRice and the national agricultural research systems of Burkina Faso, Côte d'Ivoire, Guinea, Mali, Niger, and Senegal to carry out a number of studies to analyze these issues.

Evolution of Food Consumption Patterns and Their Implications for the Design of Social Safety Nets: West Africa's food system was being affected not only by shifts in food supply, as exemplified by the change in the international trade environment and the evolution of comparative advantage, but also by shifts in consumers' food consumption habits. Furthermore, these shifts affected the ability of consumers to adapt to changing relative prices for different foods (for example, their willingness to substitute maize for rice in their diet) and the feasibility of designing social safety-net programs that effectively reached the poor and were financially sustainable. Teaming up with researchers from the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) in West Africa and national researchers from eight countries in the region, the SRAI team undertook studies based on national budget consumption studies and food balance sheets to document the changes in food demand in the region and their implications for policy.[5]

Outreach efforts under SRAI 1 cut across all four themes. The involvement of several SRAI team members (Nango Dembélé, Boubacar Diallo, John Staatz, and Abdramane Traoré) in supporting the design of CAADP investment plans, both in Mali and for the ECOWAS region as a whole, led to many of the SRAI findings feeding directly into those processes. SRAI also organized specific outreach efforts such as a major conference co-sponsored with CILSS in Ouagadougou in 2011. This conference brought together representatives of the offices of the Prime Minister and Ministries of Agriculture, Finance, and Trade to discuss the policy implications of the studies on the transmission of international price shocks to West African economies. The findings also fed into two international conferences organized in 2011 by the Organisation for Economic Co-operation and Development's (OECD's) Sahel and West Africa Club (SWAC) on Agricultural and Food Price Volatility and The Impact of Settlement and Market Trends on Food Security, to which SRAI researchers were invited. Based in part on SRAI's analysis of price shocks in West Africa, MSU/SRAI researcher Nango Dembélé was invited to be one of four co-authors of a study by the United Nations High Level Panel of Experts on Food Security and Nutrition on the impact of price volatility on food security (HLPE 2011). The SRAI team was also invited by the Malian Ministry of Agriculture to develop a plan to reform cereals marketing policies in the country, many of whose proposals were subsequently adopted. These various outreach efforts were complemented by numerous articles in the popular press and policy syntheses highlighting key findings.

Phase 2 of SRAI (SRAI 2) Began in 2012 and Continued through Early 2017

By 2012, the immediate effects of the 2008-09 price spike had passed, but price and policy volatility in the markets remained. Policy debates focused on how to mobilize the investments called for in the CAADP programs and how to ensure that smallholders benefitted from the resulting growth. The second phase of SRAI, building on the findings of SRAI 1, therefore focused on the implications of the changes in West Africa's food economy for agribusiness

[5] ReSAKSS are research and analysis teams, established under CAADP and based at international agricultural research centers in Africa. They support "efforts to promote evidence and outcome-based policy planning and implementation as part of the CAADP agenda" (http://www.resakss.org/). The West African ReSAKSS team is based at the International Institute of Tropical Agriculture in Ibadan, Nigeria.

investment in the region and for inclusion of smallholders in the growth process. SRAI 2 had three themes.

Evolution of Food Demand in West Africa and its Implications for Development of Agro-processing: This theme built on the budget-consumption and food-balance-sheet studies of SRAI 1 to identify and quantify the growing demand in the region for foods that are more convenient to prepare and eat and for higher quality products. These demand changes have major implications for both large- and small-scale agro-processors in the region, particularly concerning their ability to source reliable and timely supplies of raw products from West African farmers and traders. Research under this theme identified those challenges and analyzed alternative approaches to resolving them.

Evolution of the Asian Rice Market and Its Policy Implications for Rice Development Efforts in West Africa: The national and regional CAADP investment plans that emerged over the period 2009-11strongly emphasized public infrastructure investments and input subsidies to promote rice production. At the same time, major rice importing firms began exploring the possibility of producing rice within West Africa, taking advantage of the new policy environment and the high global prices, which made local production more attractive. Yet the long-term competitiveness of rice production in West Africa depends not only on conditions in the region but also on those in Asia, the main exporter of rice to West Africa. This theme therefore analyzed the recent and likely future trends in the Asian rice economy in order to identify the principal dimensions of performance that West Africans would need to address in order for their rice value chains to remain competitive with Asian imports.

Alternative Models of Value-Chain Organization That Link Smallholders More Effectively to Markets: Theme 1 of SRAI 2's research agenda documented the increasing demand for processed and higher-value food products by West African consumers. Over the past 20 years, demand in the export market has also been growing for higher-value products, such as premium fresh fruits. As large-scale agro-processors and exporters attempt to respond to these growing demands, they often face high transaction costs in sourcing agricultural products from smallholder farmers. Given these costs, there is a temptation either to focus on buying mainly from large-scale farmers or, for agro-processors, to turn to imports for their raw materials. If buyers follow either of these options, smallholders find themselves excluded from some of most rapidly growing and lucrative markets for agricultural products. Under this theme, SRAI researchers and their West African partners carried out a series of case studies in eight countries, covering a range of crops and policy environments, where processors and exporters contracted with smallholders to produce for these higher-value markets. Some of these efforts failed, while others appear to be succeeding but still face challenges. By comparing across the different studies, the researchers were able to draw lessons about best practices for successfully linking smallholders to higher-value markets.

As with SRAI 1, outreach efforts under SRAI 2 cut across all three research themes. The findings continued to be fed into the ECOWAP/CAADP processes, including efforts to design the next 10-year phase of the program, to be implemented over the period 2016-2025. SRAI 2 results, particularly on food consumption trends, also served as an important input into a major FAO/African Development Bank/ECOWAS study on West African agricultural growth (Hollinger and Staatz 2015), which the organizations are using to help plan future investments. Further outreach included presentations at the OECD/SWAC, the World Bank, SFSA, and

various professional organizations such as the African Association of Agricultural Economics, as well as through various policy syntheses and journal publications.

1.3. Readers' Guide to This Publication

This publication synthesizes key results from the two phases of the SRAI research program.[6] The publication contains five parts. Part I describes the policy context in which the program evolved. After this introductory chapter, Chapter 2 analyzes how agricultural policies initially reacted to the 2008 crisis, both at the national and the regional levels, leading to a process of globalization in reverse. Chapter 3 then outlines the historical patterns of agricultural integration and trade in West Africa. It identifies principal West African staple-food production and trade zones, discusses how they have changed over the past 20 years, and analyzes the impact of the 2008 crisis on agricultural integration in the region.

Parts II and III then analyze major shifts in both demand and supply that are shaping the evolution of West Africa's agrifood system. Part II focuses on the nature and implications for agricultural policies and investment of changing food consumption patterns in the region. Chapter 4 reviews changes in per capita food availability in the 15 ECOWAS countries over a 30-year period (from 1980 through 2009), based on analysis of food balance sheets. Chapter 5 complements this analysis with investigation, based on data from budget-consumption studies, of how food consumption patterns vary based on changes in income, urban vs. rural residence, and household characteristics. Chapter 6 then uses results from budget-consumption analyses to model how consumers in a typical Sahelian country would change their consumption patterns based on changing relative prices of different staples, access to food processing technologies, and varying trade policies. Chapter 7 uses demand parameters estimated from the budget-consumption studies to project changes in the demand for different foods in the ECOWAS region over the period 2010-2040. This analysis highlights the likely rapid growth in demand for high-value products and draws implications for needed agrifood system investments and policies over the coming 25 years.

Part III contains four chapters that analyze factors affecting the competitiveness of West African agriculture in the context of the changing demand and ongoing transformations in the physical, technological, economic and policy environments. Chapter 8 examines the degree to which the international price shocks of 2008 were transmitted to West African economies and how shifts in trade policies dampened or amplified those shocks. The period following 2007 was marked not only by higher international food prices but also by heightened concerns about price volatility. Chapter 9 examines the impact of this price volatility on West African producers and consumers and discusses policy options for managing it more effectively. Chapter 10 examines the implications of changes in the Asian rice economy for the future competiveness of West African irrigated rice production vis à vis Asian imports. Chapter 11 then analyzes the competiveness of West African rainfed rice and maize production vis a vis imports in the period immediately following 2008.

[6] Reports on all the research results are available on the websites of SRAI 1. (http://fsg.afre.msu.edu/srai/index.htm) and SRAI 2 (http://fsg.afre.msu.edu/srai2/index.htm).

Part IV focuses on policies to promote inclusive agrifood system growth in the coming decade. Chapter 12 analyzes how policies are responding in the post-2008 environment to the evolving challenges facing West Africa, with a particular emphasis on the ECOWAP/CAADP process, and identifies further policy challenges and options. Chapter 13 then examines lessons learned from the case studies of alternative models of linking smallholders to higher value-added markets in the food system.

Part V, consisting of Chapter 14, draws crosscutting conclusions and lessons learned from the various SRAI studies synthesized in this publication and discusses their policy implications.

In order to facilitate comparisons throughout this volume, all the chapters except those presenting introductory material (Chapters 1 and 2) and discussion of the evolution of policy and major conclusions (Chapters 13 and 14) follow the same format. Section 1 of each of these remaining chapters introduces the question to be analyzed, while Section 2 reviews the relevant literature and identifies the knowledge gap that the analysis will help fill. Section 3 follows with a presentation of methods and data. Section 4 presents key results, and Section 5 ends the chapter with the main conclusions and policy implications.

References

ECOWAS. 2015. *Agriculture and Food in West Africa: Trends, Performances and Agricultural Policies.* Abuja, Nigeria: ECOWAS.

Hollinger, F. and J. M. Staatz. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers.* Rome: African Development Bank and FAO.

HLPE. 2011. *Price Volatility And Food Security: A Report By the High Level Panel o Experts on Food Security and Nutrition of the Committee on World Food Security*. HLPE Report No. 1. Rome: UN Committee on World Food Security.

SFSA. 2016. https://www.syngentafoundation.org/our-approach.

World Bank. 2016. Global Economic Monitor (GEM) Commodities website. Accessed on 15 September, 2016 at http://databank.worldbank.org/data/reports.aspx?source=global-economic-monitor-(gem)-commodities.

CHAPTER 2

Agricultural Globalization in Reverse: The Impact of the Food Crisis in West Africa as Seen in 2008

La mondialisation agricole à l'envers : l'impact de la crise alimentaire en Afrique de l'Ouest tel qu'il a été constaté en 2008

John M. Staatz, Nango Dembélé, Valerie Kelly, Ramziath Adjao, and Boubacar Diallo

Abstract

The initial response of most West African countries to the 2007-2008 world food price crisis was to draw back from a reliance on regional and international trade as a key element of their food security strategies and to put increasing emphasis on national food self-sufficiency. This retreat from relying on trade as a key element of food policy—a sort of *agricultural globalization in reverse*—was striking given the over 20 year history of regional organizations such as ECOWAS, WAEMU, and CILSS in promoting greater regional integration and trade. This chapter highlights the factors leading to this initial policy reaction by West African governments, the problems such a reaction created for the region's countries, and policy options for moving forward. The chapter also outlines key questions where empirical analysis was needed in 2008 in order to design and implement more effective food policies for the region. These research questions helped shape the research agenda of the Strengthening Regional Agricultural Integration (SRAI) program, results of which form the subject of subsequent chapters in this volume.

Résumé

Face à la crise des prix des denrées alimentaires de 2007-2008, la réaction initiale de la plupart des pays d'Afrique de l'Ouest a été de réduire leur dépendance sur le commerce régional et international. Ces pays ont mis l'accent sur l'autosuffisance alimentaire comme étant l'élément essentiel de leur stratégie de sécurité alimentaire. Ce recul par rapport au commerce régional et international a été l'élément-clé de leur politique alimentaire—une sorte de *mondialisation agricole à l'envers*—réaction étonnante étant donné que les organisations régionales telles que la CEDEAO, l'UEMOA et le CILSS ont fait la promotion pendant plus de vingt ans d'une intégration et d'un commerce plus intense à l'échelle régionale. Ce chapitre présente les facteurs qui ont suscité cette réaction initiale des gouvernements ouest-africains, les problèmes qu'elle a engendrés pour les pays de la région et les solutions politiques pour l'avenir. Il met aussi en lumière les questions essentielles qu'il aurait fallu analyser de façon empirique en 2008 en vue de concevoir et de mettre en œuvre des politiques alimentaires plus efficaces pour la région. Ces thèmes de recherche ont contribué à alimenter le programme de recherche sur le

renforcement de l'intégration agricole régionale en Afrique de l'Ouest (SRAI), dont les résultats sont présentés dans les chapitres suivants du présent volume.

Preface

This chapter is a slightly modified version of a background paper written in September, 2008, by a team of MSU researchers for the Geneva Trade and Development Forum (Staatz et al. 2008). The Forum brought together policy makers and researchers from around the world to debate issues linked to the then on-going Doha round of World Trade Organization (WTO) negotiations and related reforms of international trade rules. This contribution to the conference analyzed how West African countries were reacting to the 2007-2008 food price crisis and raised a series of research questions that needed to be addressed to inform future food and trade policy decisions in the region. The paper and discussion of it at the Forum set the initial research agenda for the SRAI program, which was launched three months later, in January, 2009. This chapter is included here to set in historical context the development of the SRAI program and the research questions highlighted in the succeeding chapters of this publication.

2.1. Background and Objectives

Trade bans and high international food prices are pushing many West African countries away from their historical reliance on regional and international trade as a key component of their food security strategies. No longer confident that international and regional markets are reliable sources of basic staples, many countries are pushing for greater food self-sufficiency —a sort of agricultural globalization in reverse. This paper examines West Africa's globalization in reverse and raises a number of questions about what role regional and international trade should play in the region's future quest for food security. The objective is to stimulate discussion about the different strategies available to West African governments for ensuring food security in the current environment of high world market prices for staple foods. The paper also lays out a research agenda highlighting areas where new information is needed to help inform the design of such strategies. These strategies should take into account not only the need to provide safety nets for vulnerable groups who cannot afford the higher food costs but also the need to stimulate production in response to growing regional and world demand.

2.2. Evolution of Food Security Policies in West Africa

West Africa has historically relied on international and regional trade to help assure its food security. Although some governments in the sub-region promoted national food self-sufficiency in the 1980s, by the early 1990s, most West African countries had adopted a broader notion of food security that built upon historical regional and international trade patterns based on comparative advantage. Countries in the sub-region fall into four categories regarding the role of trade in their food-security strategies:

- Countries such as Mauritania, Senegal and Sierra Leone that have historically based their food strategies on large imports of Asian rice combined with imports of coarse grains (millet, maize and sorghum) from neighboring countries, while exporting cash crops and mineral resources;

- Those that were food exporters in the 1960s (most notably Nigeria), but have become major importers of rice, wheat, and some coarse grains, as their economies and population have grown faster than domestic agricultural output;
- Those that have historically been largely self-sufficient or exporters of staples in normal years (e.g., Mali, Burkina Faso, and Chad); and
- Those (e.g., Côte d'Ivoire, Ghana and Guinea) that import significant quantities of rice from overseas and millet from northern neighbors, but that seasonally export significant quantities of maize (and in Guinea's case, fonio) to their northern neighbors.[1]

In reality, most countries, even significant exporters and importers, are involved in some two-way regional trade in staples. For example, Nigeria exports significant quantities of coarse grains to Niger in exchange for cowpeas, while Mali and Burkina Faso import some rice from Asia while exporting coarse grains to their neighbors.

Since the mid-1970s, the countries of West Africa have been linked through a number of trade and monetary organizations, the most important being:

- The Economic Community of West African States (ECOWAS), formed in 1975 and comprising 15 countries,[2] with a mission to promote economic integration in all fields of economic activity, particularly industry, transport, telecommunications, energy, agriculture, natural resources, commerce, monetary and financial questions, and social and cultural matters. The ECOWAS treaty authorizes free movement of goods and people among the member states.
- The West African Economic and Monetary Union (WAEMU), which includes eight countries (Benin, Burkina Faso, Côte d'Ivoire, Guinea Bissau, Mali, Niger, Senegal, and Togo) that share a common currency, the CFA franc. WAEMU, formed in 1994 by enlarging the scope of activities of the previous West African Monetary Union, has as its mission to strengthen the competitiveness of economic and financial activities of member states within the framework of open and competitive markets and to create a common market based on the free circulation of people, goods, services, and capital, as well as on common exterior tariffs and commercial policies.

In addition, two regional organizations play a particularly important role in the coordination of agricultural policies and trade in West Africa. The Council of Ministers of Agriculture of West and Central Africa (CMA/WCA), created in 1991 and including 20 countries,[3] has as its objectives the promotion of regional agricultural trade, the improvement of West and Central Africa's competitiveness in international agricultural markets, and the promotion of sustainable agricultural development through the harmonization of agricultural policies in the region. The Permanent Interstate Committee to Combat Drought in the Sahel (CILSS), which includes nine

[1] Just because a country exports staples to its neighbors does not imply that it is food secure in the sense of guaranteeing everyone in the country access to a reliable source of food. Indeed, as discussed below, it is the desire to protect the poor's access to food that has led some governments in the region to restrict exports.

[2] Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

[3] Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, Gambia, Ghana, Guinea, Guinea Bissau, Mali, Mauritania, Niger, Nigeria, Senegal, and Togo in West Africa and Cameroon, the Central African Republic, Chad, Congo, Equatorial Guinea, and Gabon in Central Africa.

countries,[4] was created in 1973 as a regional effort to promote food security and combat drought and desertification through promoting regional scientific cooperation, policy coordination, and capacity building. Since the 1970s, CILSS has provided both empirical research and forums for policy discussion to promote regional agricultural trade throughout West Africa and has recently been mandated by ECOWAS to help lead the effort for the entire ECOWAS community.

Thus, over 35 years, West Africa has built up an institutional framework that promotes regional agricultural trade and cooperation as central components of national food security strategies. This long history of institutional cooperation makes the current shift away from trade in response to the current food crisis—*agricultural globalization in reverse*—all the more striking.

The current food crisis has shifted the West African trade-based food-security strategy into reverse for several reasons. Soaring prices (e.g., rice selling for over US $1,000/ton) and export bans from some Asian countries such as India not only threatened the availability of rice imports, but led many West African governments to conclude that the risks were very high in depending on the international market for staples. At the same time, some West African exporters of coarse grains (millet, sorghum, and maize)—most notably Burkina Faso, Mali, Niger, and Nigeria—restricted exports in an attempt to protect domestic consumers from the soaring prices. This in turn has driven up costs in neighboring countries, while depressing prices paid to their own farmers, and having only mixed effects on reducing consumer prices (for details, see Kelly, Dembélé, and Staatz 2008; and Diarra and Dembélé 2008).

2.3. The Recent Staple Food Price Situation in West Africa

Cereal supply in West Africa for 2007-2008 was about 5% below the excellent 2006-2007 harvest.[5] Sahelian countries did better than coastal ones, with aggregate 2007-2008 production in the Sahelian countries 1% below the previous year but 17% above average levels for 2002-2006. Nevertheless, there were important pockets of poor production in a number of Sahelian countries (e.g., in Senegal, Mauritania, Burkina Faso, and Niger). Among coastal countries, four experienced production declines from the previous year (Ghana, Benin, Côte d'Ivoire, and Nigeria) ranging from 7% in Nigeria—by far the largest grain producer in West Africa—to 13% in Ghana, while production in Togo and Sierra Leone increased by 3% and 21%, respectively. Various reconnaissance missions and market information reports confirm that initial responses to these various production shortfalls by the private sector were positive, with new trade routes being developed and the relative importance of existing routes changing in response to the emerging demand.[6] Most analysts agree that this relatively small decline in aggregate regional production and the demonstrated ability of the private sector to respond would not, under historical circumstances, have resulted in the cereal price hikes that have been

[4] Burkina Faso, Cape Verde, Chad, Gambia, Guinea-Bissau, Mali, Mauritania, Niger, and Senegal. [By 2017, the membership of CILSS had grown to 13 members, having added Côte d'Ivoire, Guinea, and Togo.]

[5] All production data come from presentations made by CILSS at the CILSS Market and Trade Opportunity Conference, Cotonou, April 2008. More details are available in Kelly, Dembélé, and Staatz (2008).

[6] See, for example, the discussion in SIMA 2008 and Diarra and Dembélé 2008 about the emergence since 1999 of the new *Kantchari (Burkina Faso) trade corridor* linking producers in Mali and Burkina Faso with growing markets in Niger, northern Nigeria, and northern Benin.

experienced during 2007 and 2008. Thus, it was the combination of slightly lower production in West Africa, higher regional demand, and much higher world prices that resulted in the current high-price situation in West Africa.[7]

Demand for cereals is growing in the region not only as a result of population growth and urbanization but also because as incomes rise, consumers demand more products that require cereals as intermediate inputs (e.g., dairy products, meat, poultry, and alcoholic beverages). Nigeria, for example, had a significant increase in demand for maize in 2007-2008 as its poultry industry recovered from a downturn associated with avian flu. There is evidence that demand for poultry and livestock feed is also growing in Mali, although at a slower rate than in Nigeria. It is not clear that government estimates of cereal needs using traditional "cereals balance" methods are fully accounting for the growth in such intermediate demand.

Generalized inflation is an additional factor contributing to political unrest surrounding rising food prices and concerns about food security. For WAEMU countries, overall prices were 7% higher in May 2008 than a year earlier. This is in contrast to historical patterns of moderate inflation (less than 4%/year) since the late 1990s. Outside the CFA franc zone, inflation in Nigeria and Ghana was higher (5% and 11%, respectively) in 2007, but lower than 1999-2006 rates, which went as high as 19% (Nigeria) and 33% (Ghana) during peak years. The range of products whose price increases have raised consumer concerns is very broad. For example, higher energy prices translate into higher transport costs for food and costs of getting to and from work, school, and markets; transport price hikes can cut into profit margins, reducing the net incomes of artisans, traders, and transporters. Lodging costs and prices of basic household goods are also rising, leaving less money for food.

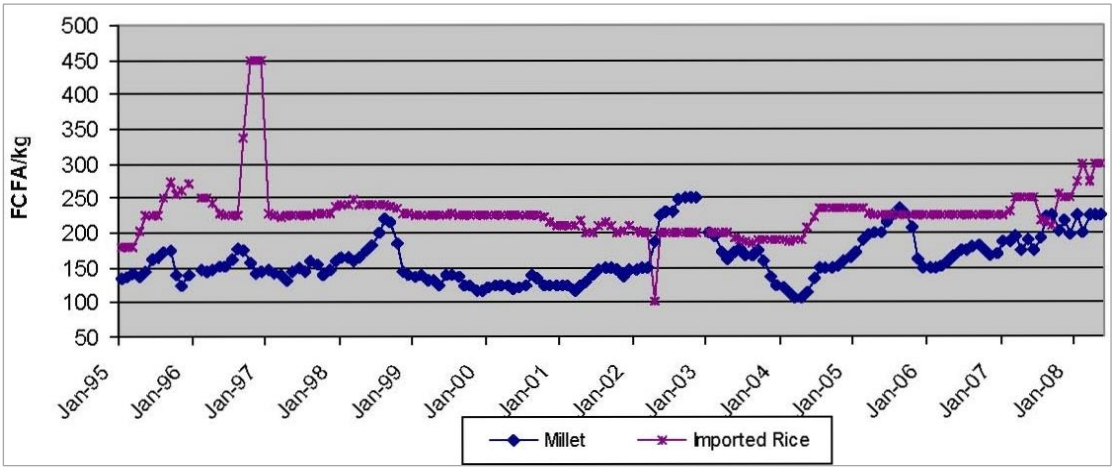
Food price inflation, of course, is an important component of generalized inflation; for WAEMU countries, food prices increased 14.2% from May 2007 to May 2008. Products such as milk, meat, fish, and cooking oil are frequently cited as major culprits. The degree to which staple food prices are rising varies by country, by product, and by source (regional or world markets). Yet it is important to note that for most countries, cereal prices, even in nominal terms, are not at historical highs, particularly for coarse grains. Prices for coarse grains were higher during the crisis year of 2004-2005, when droughts and locust attacks created a supply shortfall, although rice prices are now at or above the 2004-2005 levels.

Figures 2.1 and 2.2 illustrate the long-term price patterns for Dakar and Bamako. As recently as July 2008, FEWSNET reported that millet and sorghum prices in northern Nigeria were still slightly below their 2004-2005 levels, although they were substantially above prices following the good 2006-2007 harvest.[8] Thus, it is not high food prices alone, but rather the combination of higher food prices in conjunction with broader generalized inflation, that is leading to consumer unrest.

[7] For a discussion of the many factors contributing to the high world prices, see the websites on this topic developed by the International Monetary Fund (IMF) : (https://www.imf.org/external/pubs/ft/survey/so/2008/NEW042808A.htm#top and Michigan State University (http://www.aec.msu.edu/fs2/responses/index.htm).

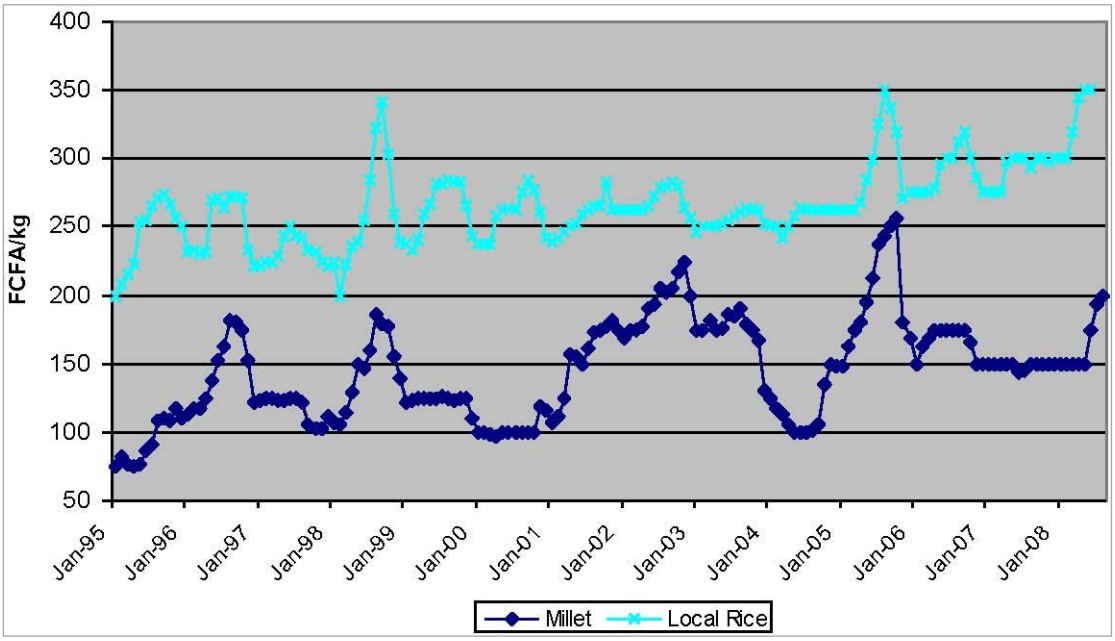
[8] For more details on coarse grain prices see Kelly, Dembélé, and Staatz (2008).

Figure 2.1. Retail Prices of Millet and Imported Rice in Dakar, 1995-2008



Source: Authors, based on data from SIM/Senegal and Afrique Verte.

Figure 2.2. Retail Prices of Millet and Local Rice in Bamako, 1995-2008



Source: Authors, based on data from the Observatoire du Marché Agricole and Afrique Verte.

Figures 2.1 and 2.2 also illustrate that while rice prices have climbed significantly, locally produced coarse grain prices have not, until very recently, shown a similar price increase. In West Africa, it is important to distinguish between staples such as rice and wheat, which are internationally traded, and those that are not as widely traded internationally but are important in regional markets (often referred to as semi-tradables).[9] The latter include millet, sorghum, fonio, cassava, and yams. Maize is an intermediate case. Historically, relatively little maize has

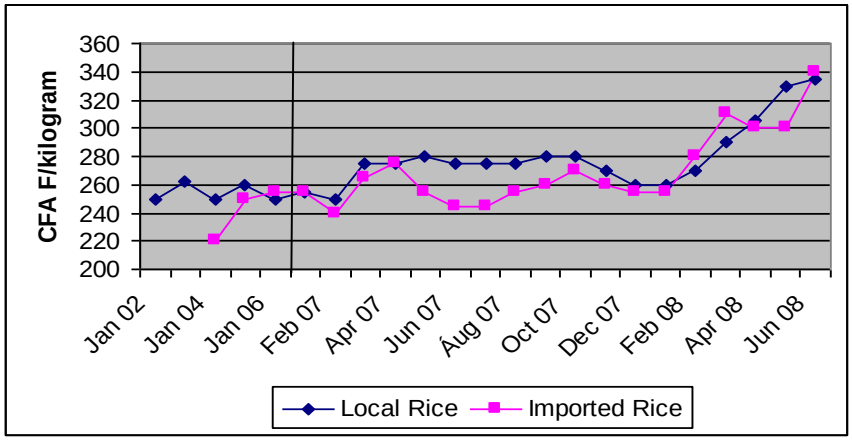
[9] See Delgado et al. 1994 for more discussion of the importance of these semi-tradables in agricultural development in West Africa.

been traded in or out of West Africa, although this situation is beginning to change, particularly with the increasing demand for feed grains for the growing poultry industry.

Over the past 40 years, West African consumers, particularly in urban areas, have shifted their consumption increasingly towards rice and wheat products, in part because they are easier to prepare and consume in time-constrained urban settings. The current high international prices of rice and wheat have been quickly transmitted to West African consumers, as illustrated by Figure 2.3, which shows how prices of domestically produced rice closely track those of imported rice in Mali.

A key empirical question is the degree to which the higher prices of wheat and rice will spill over onto the semi-tradables, driving up their prices as consumers shift consumption to these cheaper locally produced staples. Beginning in April-June, coarse grain prices in Mali, Senegal, Burkina Faso, and Niger, which had been relatively stable earlier in the year, began to rise, suggesting that consumers had begun to overcome their historical reluctance to substitute coarse grains for the easier-to-prepare rice and wheat products (Figures 2.1 and 2.2).[10]

Figure 2.3. Imported and Domestic Rice Price Trends: Mali



Source: Authors, based on data from Afrique Verte. The vertical line indicates that monthly, as opposed to annual data, are graphed starting in January 2007.

Imported rice, and to a lesser extent wheat used in bread, are the biggest problems for import-dependent countries such as Senegal; but imported rice prices are also rising in countries such as Burkina Faso and Mali, which are less reliant on imports. Maize is a problem for countries with production shortfalls (e.g., Nigeria and Ghana) and their neighbors (Niger, Burkina Faso, and Mali), whose markets are being used to help fill the shortfalls (Figure 2.4).

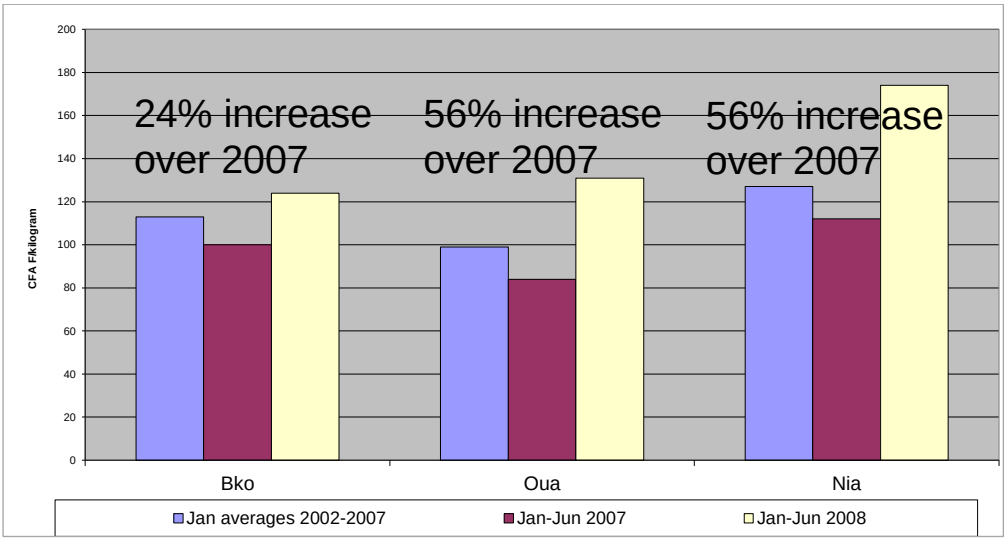
2.4. Short-Run Policy Responses and Emerging Picture of Impacts

Table 2.1, adapted from a paper by the World Bank (2008), presents a set of policy options for dealing with rising food prices. Four options fall into the category of safety-net programs, and six can reduce food prices in general. The table evaluates each policy option in terms of how

[10] See Camara (2004) and Reardon et al. (1998) for past evidence on substitution of cereals by West African consumers. See also Part II in this volume.

well it targets vulnerable groups and preserves incentives for beneficiaries to work or produce more staples as well as in terms of costs and ease of implementation and management.

Figure 2.4. Maize Price Trends in Bamako, Ouagadougou, and Niamey



Source: Authors, based on data from Afrique Verte.

Table 2.1. Effectiveness of Policies for Mitigating High Food Prices

Price Reducing Tools*	Safety-net Tools*
• Reducing Tariffs/VAT (2, 3, 4, 5) • Subsidies/rations – Generalized (3, 4) – Targeted (1, 2, 3) • Release stocks (2, 4) • Export restrictions (4) • Producer price controls (0)	• Targeted cash transfers (1, 2, 3, 5) • Food for work (1, 2, 3) • Food aid (1, 3, 4) • Feeding/nutrition program (2, 3)

Source: World Bank (2008).
* Numbers following each tool refer to the following *effectiveness criteria*: 1. Targets vulnerable, 2. Preserves incentives, 3. Costs contained, 4. Easy to implement, and 5. Limited management and governance concerns.

As the focus of this paper is the relationship between trade policies and rising prices, the policy tools of most interest are those in the price reducing column, such as tariff adjustments and export bans, although subsidies and stock releases implemented at the national level will also influence both domestic and regional trade decisions made by private-sector actors. The World Bank judged that reducing tariffs and taxes can be more effective (four of five effectiveness criteria are applicable) than export restrictions (only one applicable effectiveness criterion), with subsidies and stock releases falling in the middle (2-3 relevant criteria).

Policy instruments used by West African countries to deal with the high food prices fall primarily in the category of those that are *easy to implement*, although perhaps difficult to enforce (a criterion not listed in the table). Those relating to regional trade include tariff relief policies implemented by Niger, Burkina Faso, Mali, Senegal, Cameroon, and Nigeria and

export restrictions imposed by Mali, Burkina Faso, and Niger—all countries whose production this year has matched historical norms.[11]

Tariff Relief

A disadvantage of reducing tariffs on imported staples is that unless the reduction is implemented well in advance of a crisis situation, it is unlikely to have the desired impact because traders are usually unwilling to reduce prices of currently held stocks for which the taxes have already been paid. Response also tends to be slow when import markets are dominated by a few large players who face few competitive pressures to pass on cost savings to consumers—a situation that is common in many countries in the region. Furthermore, when implemented in the context of rapidly rising prices, even if wholesalers do pass on the cost savings, consumers may not perceive lower prices because the importers' purchase price may have risen by more than the tax reduction. Or if the importers agree to a fixed selling price in exchange for a tax holiday, they may not be able to honor the agreement if the world prices (and hence the prices they pay) rise rapidly after the agreement with the government is signed. A recent news item (IRIN 2008) reported that prices of rice, flour, and fish were still at their previous levels or higher almost two months after the government of Cameroon lifted import taxes. The government received agreement from wholesalers that they would pass on the five percent reduction in price to buyers, but the impact had not yet filtered down through retailers. A second drawback of the tax holiday on imports is that it reduces government revenues that could be used to support measures to expand domestic production.[12] For example, Cameroon is currently considering reinstating its import tax on staples and using the revenues to subsidize local production. In Mali, where the government has just announced a major new rice production program, funding is constrained by limited resources because of the reduced cereal and fuel import tax revenues.

Export Restrictions

While there is some evidence that immediately following the introduction of export restrictions regional trade was reduced, recent reconnaissance missions in Mali and Niger (Diarra and Dembélé 2008; SIMA 2008) suggest that trade picked up again and that the main impact of the export bans has been increased transactions costs associated with moving supplies from surplus to deficit zones—costs that are ultimately borne by the consumers in the importing countries and by farmers in the exporting countries, reducing the latter's incentives to invest in agriculture and expand production.

In essence, export bans in West Africa act like very badly designed and poorly implemented export taxes. Like export taxes, they depress producer incentives in low-cost, more efficient producing countries (e.g., Mali and Burkina Faso) and raise producer prices in higher-cost importing countries. They therefore encourage staple food production in areas where such production is more costly while discouraging it in areas that currently have a comparative advantage. This shift in incentives leads to resource misallocation within the region, raising the costs of achieving regional food security. Unlike a fixed export tax, however, the level of illicit

[11] See the appendix to this article for a list of measures undertaken by five of the countries in the region in the years immediately following the 2007-2008 crisis [Editor].

[12] Loans available to government through the IMF's Exogenous Shock Facility may help them to continue to make these key investments in spite of the budgetary shortfalls brought about by the tax reductions.

payments needed to evade an export ban can vary widely, increasing the risk that traders face and reducing their ability to plan. Furthermore, the revenues generated by these illicit taxes flow into the pockets of private individuals who control access to the border crossings (customs and police officers, etc.), rather than into government coffers, where they could be used to invest in increasing agricultural productivity.

The reconnaissance missions confirmed that cereal flows from Mali to Mauritania continued briefly after Mali's export ban was announced (local authorities permitted traders to export existing stocks) but then stopped due both to stricter enforcement and the implementation of import subsidies in Mauritania that made imported wheat products and rice less expensive than Malian coarse grains. The Niono/Nara to Mauritania trading axis had an overall decline in millet exports of 38% from 2007 to 2008. A similar decline in millet exports was observed between Sikasso (Mali) and Côte d'Ivoire (27%). The situation was reversed, however, for millet moving from Sikasso to Niger (174% increase) and for maize along several other market axes, in spite of the export ban. The volume of maize shipped from the Sikasso region to Senegal increased from 1,880 tons (January to July 2007) to 6,047 tons during the same period in 2008.[13] Along the Kantchari-Niamey axis between Burkina Faso[14] and Niger, maize exports grew from 8,384 tons in 2007 (January–July) to 10,870 tons in 2008, in spite of Burkina's and Mali's export bans. Much of this increased trade seems to have been destined ultimately for northern Nigeria and northern Benin, which in normal years export coarse grains to Niger. This year, because of poor harvests, they are importing, drawing grain from as far away as Mali.

For maize, the Malian trade restrictions, officially introduced in February 2008, were followed by rising, rather than falling, wholesale and retail prices in Koutiala, the heart of Mali's maize production zone, in response to the increased export demand (Table 2.2). Interviews with traders also revealed a significant increase in transaction costs for exports from Mali to Senegal and Niger (estimates ranging from 250,000 to 440,000 CFA francs per truck load of 60 to 80 tons of cereal—an eight-fold increase in illicit payments relative to the period prior to the export bans). An analysis of the differences between wholesale maize prices in Koutiala and destination markets in Senegal and Niger in late August, 2008 however, revealed a large increase in the price differential between these markets, suggesting that the trade restrictions, while not stopping trade, had reduced the degree of market in the region (see Figure 2.5).[15] Dakar prices were 95 CFA francs higher per kilogram and Niamey prices 86 CFA francs higher than in Koutiala. Estimated transport and transaction costs (excluding those associated with circumventing the export restrictions) range from 26 to 28 CFA francs/kg, leaving about 60 CFA francs/kg in Niger and 67 in Senegal to cover importer and retailer margins plus *circumvention* costs. So long as the price differences between markets are high, trade restrictions are unlikely to stop cereal flows from surplus to deficit markets. In this example, it is Malian producers and Senegalese and Nigerien consumers who are being penalized by the

[13] Improvements in the road infrastructure between Mali and Senegal in 2007 and 2008 undoubtedly accounted for some of the increase, but it is striking to see such a rise in exports at a time when the Malian government was trying to restrict them.

[14] The Burkina market is fed by supplies from Mali, Côte d'Ivoire, Ghana, and Togo, depending on production patterns in a given year.

[15] The price differentials shown in Figure 2.5 are smaller than the differentials mentioned in the text. The figures cited in the text refer to a slightly later period (late August 2008) and to differences in wholesale rather than retail prices. Nonetheless, the story from Figure 2.5 is clear: spatial price differentials have widened sharply since the imposition of the trade restrictions.

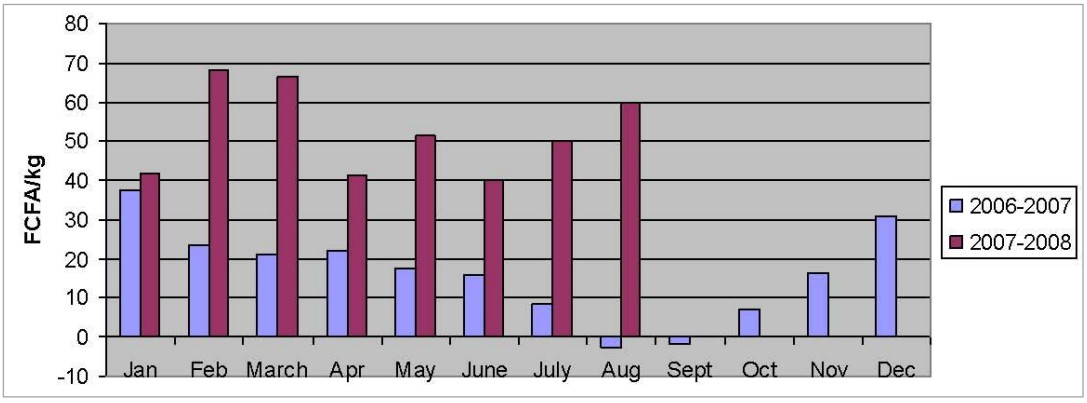
trade bans while those collecting the illicit taxes are benefiting. The result is lower incentives in the system for stimulating production to reduce ongoing food insecurity.

Table 2.2. Evolution of Wholesale and Retail Prices of Maize in Koutiala, Mali: 2007 and 2008

Month	2006/07		2007/08		% Variation 2007 to 2008	
	Wholesale	Retail	Wholesale	Retail	Wholesale	Retail
January	70	75	98	103	40	37
February	75	80	97	105	29	31
March	75	80	101	106	35	33
April	75	80	106	112	41	40
May	76	81	118	124	55	55
June	78	83	137	143	76	72

Source: Diarra and Dembélé (2008).

Figure 2.5. Spatial Retail Price Differentials for Maize: Sikasso (Mali)–Niamey (Niger), 2006 - 2008



Source: Authors, based on data from the Observatoire du Marché Agricole and Afrique Verte.

2.5. Four Emerging Strategies

Four major strategies have emerged or have been advocated as means of dealing with the food crisis in the short run while stimulating agricultural growth in the long run. Below, we briefly discuss the main advantages and disadvantages of each approach.

An Emphasis on National Self-sufficiency

During the mid to late 1980s, most West African countries, especially the francophone countries, shifted from a policy advocating national food self-sufficiency to one of food

security, based on a combination of national production and trade, particularly regional trade that takes account of the complementarity of resources within the subregion. This move away from an autarkic approach to food security was initially strongly pushed by external donors as part of structural adjustment packages, but later was adopted as a central element of the strategies advocated by regional organizations such as ECOWAS, WAEMU, CMA/WCA, and CILSS.

The current crisis, with its trade bans both in West Africa and from Asian rice exporters, has raised the risks of such a trade-based approach and led some countries to aim for greater national self-sufficiency in basic staples. The most striking example is Senegal's Grand Agricultural Offensive for Food and Abundance (GOANA—*Grande offensive agricole pour la nourriture et l'abondance*), which seeks to move Senegal from 20% rice self-sufficiency to 100% by 2015.

A key advantage of a national self-sufficiency strategy, if it succeeds, is that it makes the country less dependent on the vagaries of other countries' export policies for politically important basic staples. Such a strategy also focuses attention on the agricultural sector and may reverse the historical underinvestment in agricultural production in most African countries. In addition, if agriculture is the main provider of employment and source of income for the majority of people, then such policies can promote overall development if they spur increased productive investment in agriculture that allows the country to achieve lower unit costs of production. This is more likely to be achieved if the country focuses on long-term investment in the key drivers of agricultural development rather than just short-term production subsidies.

The costs of such a strategy depend critically upon:

- The degree to which domestic production can be increased through increased *productivity* (driving down the unit cost of production) vs. expanding production through the increasingly costly application of more inputs using the same low-productivity technologies. For example, if production is expanded through the use of subsidized inputs, will those subsidies lead to adoption of new technologies (e.g., more fertilizer-responsive varieties) that eventually drive down unit costs of production? Or will the subsidies have to continue (and be financed) indefinitely as farmers apply the subsidized inputs in their current production systems?
- How stable domestic production will be relative to world market supplies. A traditional justification for trade is that it acts to stabilize domestic supplies, as global or regional production is likely to be more stable than the production in a single country.

The traditional arguments against an autarkic staple food policy are twofold. First, if the country's unit cost of production is significantly higher than the price at which staples can be imported, then either consumers (through higher prices) or taxpayers (through taxes that pay for production subsidies) will bear the higher-cost local production. Those resources, the argument goes, could yield higher returns to the country if they were invested in other sectors of the economy and the revenues thus generated were used to import food. If the production is expanded by subsidies (e.g., for fertilizer), the critical issue is the opportunity cost of the resources going into the subsidy. They likely could have created greater wealth for the economy in other uses; otherwise, they would have flowed into staple food production without government action. Second, as mentioned above, trade can be used as a stabilizer of domestic

markets because global production is generally more stable than production in an individual country. However, to use trade in this way, there must be some trade infrastructure in place and links with reliable trading partners, neither of which are likely to emerge if a country pursues an autarkic food policy. Furthermore, if the country has a surplus, without ongoing trade relations with its neighbors, it may find it harder to find customers for its surplus, leading to more volatile domestic prices.

Yet the recent export bans by countries such as India, Vietnam, Mali, and Burkina Faso bring both of these arguments against autarky into question. Even though the import bans have not really completely cut any country off from foreign supplies, the importing countries have reason to question whether a trade-based food security policy is too risky. If export bans result in staples not being available at any price, then the advantages of a trade-based policy disappear.

Regional Trade Zone with Protection against Outside Imports

ECOWAS is premised on the notion of the free movement of goods and people within member states, while offering some degree of protection from outside imports. In this sense, it has followed, in principle, the model of most free-trade areas, with the well-known effects of trade creation (expanding trade within the community) and trade diversion (reducing trade from lower-cost exporters that are not part of the community). As noted above, in practice the ECOWAS zone suffers from numerous internal trade barriers, ranging from officially imposed trade bans to bribes extracted along major trade routes. While both ECOWAS and WAEMU practice some degree of taxation of agricultural exports from outside the zone, the levels have historically been modest. For example, the ECOWAS's *prelevement communautaire* (ad velorem tax) on rice imports from outside the zone stood at 0.5% in 2007, while the equivalent WAEMU tax stood at 1%.[16]

More recently, there have been calls for greater regional protection within the community to stimulate West African staple food production. These calls are often framed in terms of promoting *food sovereignty* (Berthelot 2006; Blein 2006) and are reminiscent of the calls in the 1980s for a *regional protected zone* for staples in West Africa. The basic argument is that some period of protection from outside competition is needed to spur investment in West African agriculture, presumably leading to cost-reducing technical change that will ultimately drive down food prices. The regional protected zone proposal was widely debated in regional forums in the 1980s, led by CILSS and the Club du Sahel, and was ultimately abandoned for three reasons: (a) concern about how higher staple food prices, at least in the short-run, would affect the large number of low-income consumers in the region; (b) lack of convincing evidence that higher prices in short run would lead to rapid adoption of cost-reducing technical change in agriculture given all the other constraints facing the agricultural sector (weak infrastructure, macro-economic constraints such as highly overvalued exchange rates, and weak agricultural research and extension systems); and (c) a lack of common interests from potential food exporting countries, such as Mali and Burkina Faso (which had interest in high food prices), and major food importers, such as Senegal (which had interest in low food prices).

[16] This situation changed in 2016, with the adoption by ECOWAS member states of the ECOWAS Common External Tariff regime. See chapters 9 and 13 in this volume for details [Editor].

Many of these same constraints still exist. Furthermore, the democratization and increased urbanization that have occurred in most West African countries over the past 20 years have given poor urban consumers even greater voice in policy debates, making a heavily protected regional production zone less likely. However, with high transportation costs and rising world food prices, the region may become competitive vis-à-vis imports from the world market even without a high protective tariff. Thus, the scope may be much greater now for creating a regional agricultural market that links production basins (some of which may span more than one country) to the region's growing consumption centers.[17] Examining the potential for such a market and the investments and policies needed to bring it about is an area that merits further research.

A WTO-style Approach, Based on Open Trade

This approach, while often advocated as an ideal that allows countries to achieve food security at least cost by exploiting comparative advantage, has never been fully embraced by West African policy makers. Now with the collapse of the Doha round, a purely liberal approach to food security seems less likely than ever. The main complaint against this approach is well-known: a belief that the OECD countries stacked the rules of trade in their favor, with the result that the high-income countries flooded West Africa with cheap agricultural goods (subsidized rice, powdered milk, etc.) and subsidized OECD producers (e.g., of cotton) competed with African producers in third countries. While the current high world prices of agricultural commodities have reduced agricultural subsidies for the time being, policy makers remain wary of a completely open policy, especially in light of the recent restrictions on grain exports from major grain exporters such as India and Vietnam.

Nonetheless, if physical availability of basic staples on international markets and reductions in OECD agricultural subsidies could be guaranteed, the advantages of a trade-based food security strategy remain attractive. By focusing its resources in activities where they are most productive, a country and a region can obtain their basic food needs at lowest cost, rather than forcing poor consumers to pay high prices to support inefficient local production. Yet given all the constraints of moving to an equitable and reliable open international trading system, the immediate challenge is to discover paths that allow the West African countries to develop reliable food security strategies that do not require a strong shift back towards autarky. As the example of North Korea shows, autarky is a very costly and seldom effective way to achieve food security.

Bilateral Trade Agreements within the Context of Regional Economic Communities

Export bans, both by countries within ECOWAS and from Asian exporters, have undermined confidence in regional and international trade agreements. Within ECOWAS, it is apparent that the need for national political leaders to protect consumers (many of them poor) trumps regional obligations to *free movement of goods and people*, particularly in a low-income country such as Mali that fears that its neighbors can outbid it for its staple food supplies. Thus, in the context of the trade bans, countries are increasingly looking to bilateral agreements to assure access to at least some food from the exporting countries. These bilateral agreements often involve a quid pro quo on the part of the importer. For example, Mali is offering its

[17] See Chapter 3 in this volume.

neighbors the opportunity to invest in its major irrigated rice area, the Office du Niger, which would presumably permit the investor countries (such as Senegal) the right to export the resulting production. The political advantage of such bilateral agreements is that they provide some political recompense to the exporting country in terms of being able to argue to its own consumers that food is not being exported without a compensating increase in national production.

In addition, some West African countries are exploring bilateral trade agreements with food exporters from outside of West Africa. For example, Senegal recently signed a five-year agreement with India guaranteeing access to Indian rice exports. It is not apparent how such agreements will interact with regional agreements, such as the common agricultural policies of WAEMU and ECOWAS, which call for common external tariffs for imports from outside the communities. Will the rice imported from India be subject to these tariffs? Once in Senegal, in principle, there would be no restrictions to its re-exportation to any country within the community. Thus, has India really just signed an agreement with all of ECOWAS rather than with just Senegal?

2.6. Which Path(s) Forward, and Why?

In the current high-price, post-Doha environment, what are the food-security options for West Africa? One approach that may hold promise is that of a regional trade zone, with modest protection against import surges due to major exchange-rate fluctuations or export subsidies. Such an approach would have the following advantages:

- Wider regional markets will eliminate the small size of national markets (thin markets) that make them so volatile. Regional integration will provide more price stability to both producers and consumers, and thus increase incentives for private investment in agriculture. It will also allow scale economies in marketing and processing.
- A regional trade zone will permit the exploitation of ecological complementarities and comparative advantages among countries, e.g., between the inland Sahel and coastal countries (Badiane and Resnick 2005).
- The region provides the opportunity to pool research resources and achieve scale economies in technology generation around different production basins, which often span national borders.
- The region can also allow the creation or strengthening of existing regional agricultural training centers.

In principle, the regional approach described above sounds very much like the vision embraced by ECOWAS under the New Partnership for Africa's Development's (NEPAD's) Comprehensive African Agricultural Development Program (CAADP). However, the history of regional trade agreements in West Africa has shown that moving from vision to reality is not easy. In particular, overcoming the political pressures that restrict trade (both through trade bans and the persistence of non-tariff barriers) will require addressing the following questions:

- Can trade policy alone protect the poor's access to food without undermining incentives and resources to invest in agricultural productivity growth? If so, how?
- What mix of national and regional trade, investment, and subsidy policies are politically feasible, financially sustainable, and most likely to lead to more food security in the

West African context of porous borders and diverse national production, resource, consumption, and income patterns?

- What policy changes are needed to transform the current high-price environment into an opportunity to attract private investment including foreign direct investment (FDI) into agriculture? Should West Africa adopt national or regional approaches to attract FDI into agricultural production (e.g., regional production basins)?
- Is it possible to move to more predictable, rule-based food policy decision making at the national and regional levels? If so, how? Does West African experience (particularly with WAEMU) in making central bank actions politically independent, transparent, and rule-based provide a relevant model for food security decision making?
- What are the appropriate domestic, regional, and international policy responses to the risks and uncertainty created in the global food markets by export bans?

2.7. What We Do Not Know: Implications for Further Research

Responding to the above questions will depend not only on good political judgment but also on answers to key empirical questions that will help determine what is feasible and what would be the tradeoffs involved in different policy options. The following empirical issues need to be addressed both at the regional level and in terms of variations by country and production basin:

- What is the degree of substitution between imported and regionally produced food products (wheat and rice versus local semi-tradables like millet, sorghum, and cassava)?
- To what degree have the higher prices been transmitted back to farmers as opposed to being captured by other actors in the value chains? Can we do better?
- If world prices stay higher for the coming 10 years as projected by the Food and Agriculture Organization, how is comparative advantage in producing different commodities going to be distributed among countries in West Africa? How competitive will be the regionally produced commodities vis-à-vis imported food items?
- What are the major producing basins for staple crops in the region and what are the likely supply responses in those basins given the enduring high-price environment? What are likely to be the major constraints to supply response?
- Which among the technologies now available on the shelf are most likely to increase regional food supplies quickly?
- What are the food assistance programs to the poor that are most compatible with improved production incentives?

Appendix

Summary of Measures Taken in Individual Countries and Their Impacts: 2008-11*

Country	Principal Measures Taken*	Impacts	Results
Burkina Faso	3,6,7,8,11	Strong price increases despite the measures	Limited effects on production and prices
Côte d'Ivoire	5,6,7	Strong price increases despite the measures	Under-performance of the emergency rice program
Mali	3,4,7,8,9,10	Prices trending higher in spite of the export bans Production stimulated by the input subsidies, but less than anticipated	Exonerations on import taxes benefitted the poor very little. High cost to the public coffers
Niger	1,3,4,5,6,8,10,11,12	Vulnerable groups not protected much Prices trending higher in spite of the measures	High cost of the social safety nets Limited impact on production and prices
Senegal	2,3,5,6,8,11.12	Strong increase in prices in spite of the measures to revive production (GOANA)	Suspension of import taxes insufficient to stem the price increases High cost to the public coffers Good cereal production

Source: SRAI (2011).

* This table covers a period longer than that discussed in the chapter, which was originally written in 2008, but includes many measures initiated in 2008.

* Numbers following each tool refer to the following principal measures taken:

1. Authorization to import rice and other foods
2. Price controls and combatting speculation
3. Negotiation with traders in an attempt to reduce margins and prices
4. Strengthening the monitoring of food security indicators
5. Subsidies on the price of petroleum products and other sources of energy
6. Suspension of the value added tax and other indirect taxes
7. Agricultural production support
8. Suspension of import taxes
9. Export bans on cereals and other products
10. Sale of inventories from cereal banks
11. Subsidized sales of cereals from public reserves
12. Free food distribution.

References

Afrique Verte. Various Market Bulletins. http://www.afriqueverte.org/index.cfm?srub=59.

Badiane, O. and D. Resnick. 2005. Regional Trade Liberalization and Domestic Food Market Stabilization in African Countries. Paper presented at World Bank/DFID Workshop on Managing Food Price Risks and Instability in Low Income Countries, February 28-March 1. Washington, DC.

Berthelot, J. 2006. Food Sovereignty, Agricultural Prices, and World Markets. Paper presented at the Réseau des Organisations Paysannes et de Producteurs Agricoles de l'Afrique de l'Ouest (ROPPA) Forum on Food Sovereignty, 7-10 November. Niamey, Niger.

Blein, R. 2006. La négociation de l'accord de partenariat économique entre l'Afrique de l'Ouest et l'Union européenne: Processus et enjeux pour l'agriculture régionale. Paper presented at the ROPPA Forum on Food Sovereignty, 7-10 November. Niamey, Niger.

Camara, O. 2004. The Impact of Seasonal Changes in Real Incomes and Relative Prices on Households' Consumption Patterns in Bamako, Mali. Ph.D. dissertation. Michigan State University.

Delgado, C., P. Hazel, J. Hopkins, and V. Kelly. 1994. Promoting Intersectoral Growth Linkages in Rural Africa through Agricultural Technology and Policy Reform. *American Journal of Agricultural Economics* 76.5: 1166-71.

Diarra, S.B. and N.N. Dembélé. 2008. Reconnaissance rapide sur l'impact des restrictions à l'exportation des céréales en 2008 au Mali. Special report. Bamako: PROMISAM.

IRIN. 2008. "Cameroon: Lifting of Import Taxes Fails to Reduce Food Prices." IRIN news.org on-line news story, 29 April, 2008. http://www.irinnews.org/report/77971/cameroon-lifting-import-taxes-fails-reduce-food-prices

Kelly, V., N. Dembélé, and J. Staatz. 2008. Potential Food Security Impacts of Rising Commodity Prices in the Sahel: 2008-2009. A special report by the Famine Early Warning Systems Network. Washington, DC: FEWSNET.

Observatoire du Marché Agricole (Mali). Various Issues. *Le Reflet.* Monthly Market Information Bulletin. Bamako.

Reardon, T., B. Diagana, F. Akindès, K. Savadogo, J. Staatz, and Y. Camara. 1998. Sécurité alimentaire et filières agricoles en Afrique de l'ouest en jeux et perspectives quatre ans après la dévaluation du franc CFA: Consommation. Bamako: Institut du Sahel.

SIMA (République du Niger, Ministère du Commerce et de l'Industrie, Système d'Information sur le Marché Agricole). 2008. Impact de la hausse des prix sur les échanges de la sous-région. August. Niamey: SIMA.

SIM-Senegal (Système d'Information sur les Marchés). Various Issues. Bulletin Mensuel d'Information sur les Marchés Agricoles. Dakar: Commissariat à la Sécurité Alimentaire, Cellule Etudes et Information.

SRAI. 2011. Session plénière 1 : Réponses des pays de la sous-région face à la flambée des prix alimentaires mondiaux en 2007-08. Brief No. 1 prepared for the Conférence Régionale sur la transmission de la hausse des prix alimentaires mondiaux en Afrique de l'Ouest, 4-6 April. Ouagadougou, Burkina Faso. http://fsg.afre.msu.edu/srai/1_R%C3%A9ponses_des_pays_suite_%C3%A0_la_flamb%C3%A9e.pdf

Staatz, J.M., N.N. Dembélé, V. Kelly, and R. Adjao. 2008. Agricultural Globalization in Reverse: The Impact of the Food Crisis in West Africa. Background paper for the Geneva Trade and Development Forum, September 17-20. Crans-Montana, Switzerland. http://fsg.afre.msu.edu/srai/Agricultural_Globalization_in_Reverse_MSU_Crans-Montana_paper_final.pdf

World Bank. 2008. Rising Food Prices: Policy Options and World Bank Response. Washington, DC: World Bank. http://siteresources.worldbank.org/NEWS/Resources/risingfoodprices_backgroundnote_apr08.pdf

CHAPTER 3

Historical Patterns of Agricultural Integration and Trade: The Case of Cereals in West Africa

Tendances historiques de l'intégration agricole et commerciale : Le cas des céréales en Afrique de l'Ouest

Boubacar Diallo, Bio Goura Soulé, and John M. Staatz

Abstract

This chapter provides the context for much of the rest of the publication by describing the patterns of production and intraregional trade of cereals in West Africa and how they have evolved since the 1980s. As much as three-fourths of intraregional agricultural trade goes unrecorded in official statistics, and the analysis examines the factors that push those involved in such trade to remain in the informal sector. The chapter identifies the major production and consumption basins for cereals in the region and the trade corridors that link them. It then analyzes the forces that have driven production, consumption, and trade dynamics since the 1980s. The world food crisis of 2007-2008, when global cereal prices spiked to record levels, strongly influenced food policies in the region, including efforts of ECOWAS and WAEMU to promote regional agricultural integration and trade. The high prices stimulated efforts to boost local food production, and the rising value of the US dollar relative to West African currencies since 2008 has further boosted the incentives of West African consumers to *buy local* rather than resort to imports. On the other hand, transaction costs of intraregional trade have increased since 2008 due to rising insecurity in several parts of the region (e.g., due to Boko Haram in Nigeria and jihadist activity in Mali), raising the price of regionally traded goods. Political leaders have also been reluctant to try to boost farm prices further in order to expand local production (favoring instead input subsidies), as they face a *food price dilemma*, in which they have to balance consumer and farmer interests regarding the price of food.

Résumé

Ce chapitre dresse la toile de fonds du reste de la publication en décrivant les tendances de la production et du commerce intrarégional des céréales en Afrique de l'Ouest et leur évolution depuis les années 1980. Jusqu'à trois quarts des échanges agricoles intrarégionaux ne sont pas enregistrés dans les statistiques officielles et l'analyse examine les facteurs qui poussent ces commerçants à rester dans le secteur informel. Ce chapitre répertorie les grands bassins de production et de consommation de céréales de la région et les couloirs commerciaux qui les relient. Il analyse ensuite les forces qui agissent sur la production, la consommation et les dynamiques commerciales depuis les années 1980. La crise alimentaire de 2007-2008, au

moment où les prix des céréales ont atteint des niveaux record, a fortement influencé les politiques alimentaires de la région, notamment les initiatives de la CEDEAO et de l'UEMOA visant à promouvoir l'intégration et le commerce agricole régional. Les prix élevés ont stimulé les initiatives de renforcement de la production de denrées alimentaires locales et la hausse du dollar des États-Unis depuis 2008 par rapport aux monnaies d'Afrique de l'Ouest a davantage incité les consommateurs de l'Afrique de l'Ouest à *acheter des produits locaux* au lieu de recourir aux importations. En outre, les coûts de transaction des échanges intra régionaux ont augmenté durant la même période en raison de la montée de l'insécurité dans plusieurs parties de la région (par exemple, Boko Haram au Nigeria, Niger, Tchad, Cameroun et l'activité djihadiste au Mali). Cela a engendré une hausse des prix des produits échangés dans la région. Les responsables politiques ont aussi hésité à relever les prix à la ferme pour stimuler la production locale (préférant plutôt subventionner les intrants). La région a ainsi été confrontée à un *véritable dilemme sur les prix alimentaires* car ils doivent dorénavant trouver un équilibre entre l'intérêt des consommateurs et celui des agriculteurs face à la hausse des prix alimentaires.

3.1. Introduction

In West Africa, the poor quality, high cost, and elevated time/distance ratio of road and rail networks play an important role in determining the spatial configuration of markets and agricultural production. In addition to problems related to these networks, poor infrastructure in areas not directly linked to transport (marketing, processing, electricity, telecommunications, etc.), delays at borders, administrative barriers and the corresponding transaction costs are serious obstacles to the development of trade within the region (OECD 2013). Administrative hassles are one of the factors that cause operators to avoid checkpoints and remain in the informal sector (Hollinger and Staatz 2015). According to major sources, the volume of officially recorded intraregional trade in West Africa is lower than that of informal trade, for which few precise statistics exist. Data from the ECOWAS Commission indicates that in 2014 the total value of intraregional trade was US$42.2 billion for exports and imports combined, or around 17% of all foreign trade by Community member countries (Blein et al. 2016). In addition to the factors cited above, analysts also attribute the relatively low level of intraregional trade to other factors, such as the similarity of the countries' output mix, diverse monetary systems, and fragmented trade and tax policies across the region. Nevertheless, despite these obstacles, recorded intraregional trade of agrifood products in West Africa has grown significantly over the past 20 years (Soulé and Gansari 2010).

This expansion is mostly due to rapid population growth and urbanization, and the corresponding increased demand for food, changes in eating habits, and, most importantly, efforts to harmonize trade policies (Hollinger and Staatz 2015). In particular, since 1990 there has been a dramatic increase in intra-Community commercial transactions involving live animals and off-season vegetables (potatoes, tomatoes, and onions). There are also significant flows of cereals and cowpeas from Nigeria to Niger and Benin and vice versa, while the coastal countries sell large amounts of roots and tubers (yams and cassava) to the Sahelian countries. The area around Nigeria unquestionably comprises the biggest trading area for cereal products in West Africa (Soulé and Gansari 2010; Hollinger and Staatz 2015).

Today, the volume of agricultural trade flows between the countries of West Africa is an important indicator of economic integration. Therefore, information about the type of products traded, trends in flows, and the quantities imported or exported by destination is indispensable to defining and implementing food policies. The many changes caused by the global rise in food prices in 2007-2008 transformed the configuration of the agricultural production and consumption basins within the region. For example, the West African rice sector was revitalized to some extent because the surge in world prices gave it a degree of protection from imports. The proactive policies implemented by West African governments revived production for a number of other products as well. This was particularly true for cereals, which benefited from several initiatives, such as the Great Offensive for Agriculture, Food, and Abundance (GOANA) in Senegal. GOANA set extremely ambitious, and at times unrealistic, production targets for 2008: 2 million tons for maize (12.6 times more than in 2007), 500,000 tons for rice (2.6 times more than in 2007), and 2 million tons for rainfed cereals (1.6 times more than in 2007). While the targets were not reached, production did increase significantly due to the heavy input subsidies and other government expenditures that accompanied the program. Another example was the Rice Initiative in Mali, through which the government planned to produce 1 million tons of commercial rice (i.e., 1.5 times more than in 2007) by making inputs (fertilizers, seeds, and agricultural equipment) available at subsidized prices.[1] In Burkina Faso, during the 2009-2010 crop year, about 100,000 ha of rice were sown for an estimated production of 300,000 tons, or a 20% increase over the previous year (Diallo, Dembélé, and Staatz 2012).

This chapter outlines the evolution of trade patterns for cereal crops in West Africa over the past 30 years, including the changes brought about by the 2007-2008 surge in global grain prices. It is based primarily on the results of an in-depth study, *La dynamique des échanges régionaux des céréales en Afrique de l'Ouest*, conducted by LARES (Soulé and Gansari 2010) at the request of Michigan State University and with financial support from the Syngenta Foundation for Sustainable Agriculture. The study drew on existing literature on intraregional cereals trade to analyze changes in production zones and consumption centers and the direction and size of trade flows in the region. The overall objective of this chapter is to reassess the dynamics of the reconfiguration of these zones by updating information about production, consumption, and trade and factoring in the effects on these dynamics of the increase in world food prices in 2007-2008.

3.2. Literature Review and Knowledge Gap

The trade of food products in West Africa has received a lot of attention, especially from ECOWAS, WAEMU, and their partners, who have made market integration one of their top priorities. However, little research has quantified the actual volume of inter-regional trade, and the bulk of the literature has expressed the size of the regional market in monetary rather than tonnage values. FAO statistics identify low trade volumes; these, however, stand in stark contrast to field observations, which report much more activity (Josserand 2013; OECD 2013). The vast disparities observed can mainly be ascribed to the exclusion of informal transactions in official statistics, but also to the limited ability of the national planning and statistics units

[1] The fertilizer subsidy rate in Mali is 50%, with the fertilizer sold to farmers on credit. The subsidy for NERICA (New Rice for Africa) rice seed is 60% of the retail price.

for rural development (the FAO's main source of data) to produce adequate statistics for the sector. According to Hollinger and Staatz (2015), the elimination of export taxes within the WAEMU and ECOWAS to encourage integration also played a role in the reduced recording of flows by customs agencies.

Estimates from various sources illustrate the uncertainty about the volume of intraregional trade. The African Development Bank estimated total intra-African exports within ECOWAS at US$8.6 billion in 2008, while ECOWAS itself put the figure at US$7 billion (OECD 2013). With respect to regional agricultural trade, the MISTOWA project assessment report estimated its value at US$305 million in 2005 and US$635 million in 2007 (Soulé and Gansari 2010). A study by the foundation FARM postulated that inter-regional trade is underestimated by about 200% to 300% of total traded volume (OECD 2013). This underestimate was confirmed by CILSS, which, between 2009 and 2013, ran a project to track the cross-border trade of livestock, cereals, and vegetable products at 50 observation points across West Africa. The CILSS study provided information about trade volumes between certain production basins, but did not characterize the overall dynamic in the region. Overall, the results demonstrated that there was much more trade volume than previously assumed (Josserand 2013; Hollinger and Staatz 2015). For example, Josserand (2013), drawing on the CILSS data, estimated that official livestock export statistics from Burkina Faso and Mali capture only about one-fourth of those countries' total intraregional livestock trade. He reached similar conclusions for several other agricultural products.

Some of the literature also focuses on the factors that influence the trade of agricultural products in West Africa. According to the OECD (2013), the growth in trade of food products and the directions of flows are driven by agroecological complementarities, policies, and, above all, settlement dynamics. This literature sees the demand from urban areas as the main factor driving the spatial organization of intra-regional flows and the transformation of agricultural production systems. Urbanization is creating opportunities that are changing the rural economy, while the demand expressed by large cities is strongly influencing agricultural production and trade flows. This view is the basis for the approach used by the OECD (2013) to estimate the direction and relative importance of intra-regional flows. The approach is founded on the principle of estimating the quantities placed on the market, then superimposing consumption and settlement data on these estimates to identify the interdependencies between production and consumption basins. This approach of linking information on the spatial distribution of urban and rural populations with data on agricultural surpluses was also used by Haggblade et al. (2012), who mapped the markets and corridors linking cereal production and deficit zones in West Africa. By combining data on population, production, grain consumption (for millet, sorghum, maize and rice), and prices, the methodology helped to identify the direction of flows connecting production basins to consumption centers.

Finally, some authors have focused on the influence of trade agreements on intra-regional trade, particularly on structural differences influencing aggregate trade volumes within the WAEMU countries compared with those within the ECOWAS countries.[2] Both regional organizations are, in principle, free-trade zones. Diarra and Ndong (2015) used a gravity model to analyze bilateral trade between countries within the two zones. They showed that trade among

[2] All eight WAEMU countries, which are also ECOWAS members, share a common currency, the CFA franc, which is not used by the other seven member states of ECOWAS.

WAEMU countries is more dynamic than ECOWAS intra-regional trade. These results suggest that membership in a single currency zone (as is the case for the WAEMU countries), influences the intensity of intra-regional trade.[3] However, as numerous other studies have shown, measures beyond common currencies and declarations of free-trade zones are needed to promote greater regional trade: harmonization of structural reforms, rules, and procedures; coordination of macroeconomic policies; and the search for economic complementarities (see Hollinger and Staatz 2015, chapters 11 and 12, for details).

3.3. Methods and Data

In order to identify and attempt to quantify volumes of intraregional trade in cereals, Soulé and Gansari (2010), upon which this chapter draws heavily, analyzed data and information up to 2008 that focused on the work of IRAM in the east (Nigeria and its neighbors), of SADAOC in the central region (Côte d'Ivoire, Ghana, Togo, Burkina Faso, and Mali), and of ENDA-Tiers Monde in the Senegambia region, as well as the efforts of Nigerian universities and the previously-mentioned CILSS program on market access.[4] Since the time of the Soulé and Gansari study, trade dynamics have evolved with the advent of new phenomena such as conflicts with armed groups and residual insecurity in the region, the drop in oil prices, and the relative appreciation of the U.S. dollar against other international currencies, including the Euro. The additional analysis set forth in this chapter updates the Soulé and Gansari finding, drawing mainly upon recent information (2008-2015) collected through the work of FEWSNET, the OECD, FAO, and CILSS relating to cereal balance sheets, price trends, and cross-border flows (Bauer et al. 2010; OECD 2013; CILSS – AGRHMET 2015; FEWSNET and CILSS 2015; FAOSTAT 2016).

The trade of cereal products in West Africa is well documented. The methodological approach consisted of reviewing the literature on intra-regional trade to determine the composition, volume, and direction of cereal trade flows in the region. Analysis was difficult because of the instability of flow directions and prices from one year to the next and because of policy measures taken by national governments, which encouraged operators to stay in the informal sector to avoid the measures. These factors weakened the reliability of the statistical data.

Historical benchmarks in the literature made it possible (when data were available) to cull information from the 1980s to the present day to: (i) analyze production dynamics for the main cereals (millet, sorghum, maize, and rice) and cowpeas, as well as the direction of flows, their magnitude, and changes observed; (ii) analyze consumption centers relative to demographic and settlement dynamics; and (iii) map trade patterns that clearly depict flows amongst Sahelian countries and flows between Sahelian and coastal countries.

[3] This conclusion needs to be nuanced, however, as Côte d'Ivoire, a WAEMU country, trades more with Nigeria (a non-WAEMU country) than with any other country in WAEMU. It should be noted, however, that Côte d'Ivoire and Nigeria have the two largest economies in West Africa, so it is not surprising that they have strong trade relations with each other.

[4] See Soulé and Gansari (2010) for details.

3.4. Results

Overall Dynamic of Consumption Centers

West African demand for cereals has changed over the past 30 years in response to three main factors (Hollinger and Staatz 2015):

- a very swift increase in population (2.6% per year for the ECOWAS zone, with spikes of 3% in some countries) accompanied by profound changes in settlement patterns and eating habits;
- the booming demand from the agri-food industry, which is expanding rapidly despite the high-price crisis; and
- the demand for animal feed.

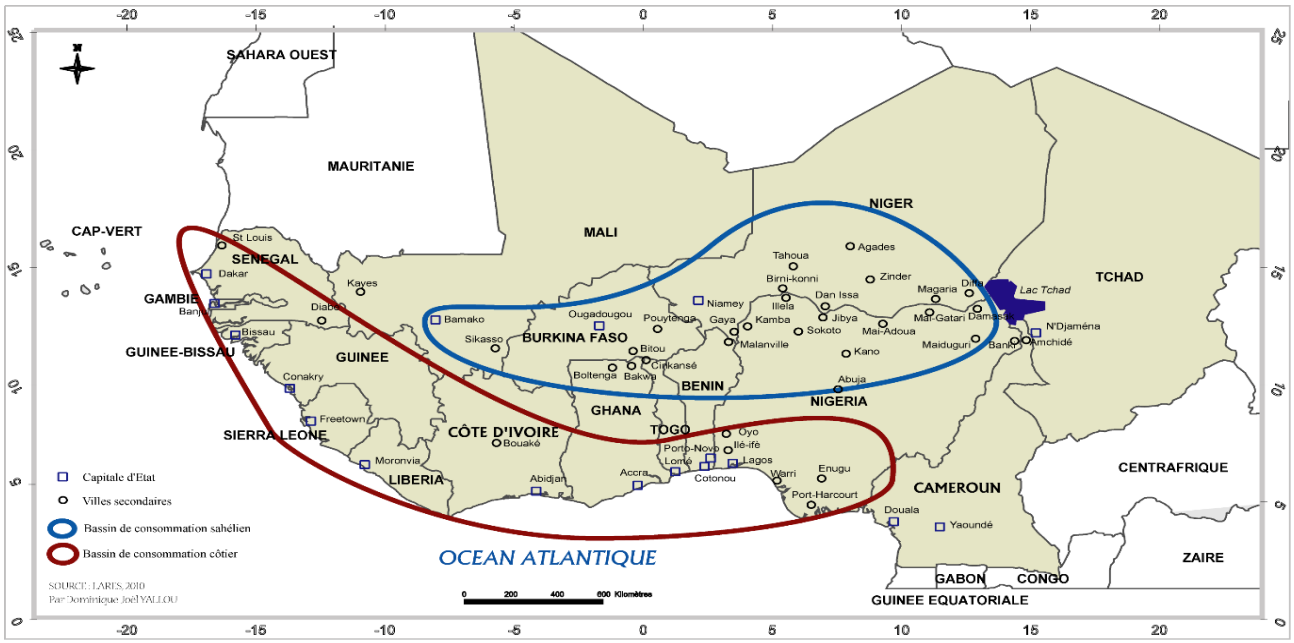
According to the OECD (2013), the population of West Africa, which was estimated at 77.6 million in 1960, rose to 132.3 million inhabitants in 2000, and reached approximately 300 million in 2010. Analysts project that West Africa will be home to 353 million residents in 2025 and 455 million in 2030. This dynamic, combined with urbanization, the growing purchasing power of a significant portion of the population, and the effects of food aid, has caused a profound, long-term transformation in eating habits. These phenomena have expanded consumption of many foods, such as rice and wheat products, for which the region is a large net importer.[5] The changes, however, have not been uniform across all of West Africa. Dietary patterns, while slowly converging across the region, remain segmented geographically, with the coexistence of two main consumption zones having quite distinct characteristics, as illustrated in Figure 3.1.

The *Sahelian basin* encompasses the large urban areas that range from northern Nigeria to Niger, Burkina Faso, and Mali. This basin is characterized by the prevalence of a consumption model that is strongly dominated by local cereals, including millet, sorghum, and rice, which have been supplemented in recent years by maize. The average cereal consumption per capita in this region is 220 kg. The share of local cereals in the total volume of cereals consumed often exceeds 60% and can range as high as 70% to 80% in certain countries, such as Niger and Mali.

The *coastal basin* corresponds to a region that stretches from southern Nigeria to Senegal. It is the most urbanized area of West Africa and includes the vast conurbation that extends from Abba in southeast Nigeria to Abidjan in Côte d'Ivoire. This basin has seen a marked change in the eating habits of its inhabitants, who are gradually replacing tubers and roots (yams, sweet potatoes, and cassava) with cereals, most of which are imported from the international market. The demand for cereals for other uses (agrifood industry and animal consumption) has also risen in this zone. This demand, which is essentially for maize, is quite substantial in countries such as Nigeria, Côte d'Ivoire, Ghana, and Senegal.

[5] See Part II of this volume.

Figure 3.1 Main Consumption Centers



Source: Soulé and Gansari (2010).

The dramatic rise in food prices on the international market in 2007-2008 was transmitted to the food markets in West Africa, with increases in the prices of both imported and locally produced staples, though to a lesser extent for the latter (Diallo, Dembélé, and Staatz 2010).[6] The region is generally self-sufficient in local cereals (millet, sorghum, maize), roots and tubers (cassava, yams, sweet potatoes, etc.), and fruits and vegetables.

Measures taken to stimulate food crop production in response to the crisis, along with the good rainfall recorded in 2008, led to a 28% increase in the region's maize production in 2008 over average production levels from 2000 to 2007. Despite increases in rice production in 2008 (up 35% compared to 2000-2007) and 2009 (up 14% over 2008), the region still has a rice deficit. This structural deficit persists despite the region's production potential. With the exception of Mali, which produces about 75% of its consumption on average, the rate of rice self-sufficiency ranged from 15% in Niger to 41% in Togo over the period 2001 to 2009 (Taondyande and Songré 2011).

Overall Dynamics of Cereal Production Basins

The response of the domestic cereal supply to demand in West Africa has been relatively strong, but not enough to meet fully the growing demand for cereals. Thus cereal imports rose from 39% of food imports in 1990 to 41% in 2010 (Hollinger and Staatz 2015). Since the 2008 crisis, however, growth of production of some staples has accelerated. Between 2009 and 2013, the annual growth rate in the production of rice, maize, and cassava averaged 7.3% within the ECOWAS region (Table 3.1), driven in part by heavy input subsidies. Production trends for various staples, however, varied strongly by type of staple and country (Table 3.2). To continue robust growth in a financially sustainable way (i.e., not just dependent on subsidies), West African countries must boost agricultural productivity, develop infrastructure, and improve the business climate to attract investments in technological innovations and food processing

[6] See Chapter 8 in this volume.

systems. The objectives of the ECOWAS agricultural policy (ECOWAP) align with this strategy, but West Africa has still made only partial progress with regard to adopting the strategies and political commitments necessary to implement it (Hollinger and Staatz 2015).

In addition to the productivity gains achieved for rice and maize, the expansion of their production zones since the increase in food prices in 2007-2008 is also noteworthy. The traditional surplus cereal production zones continued their dominance (Middle Belt and northern Nigeria, Mali, and Burkina Faso).

Table 3.1. Annual Growth Rates in Production, ECOWAS Region: 2009-13

Commodity	ECOWAS	Nigeria	ECOWAS excluding Nigeria
Rice	7.9%	7.9%	7.9%
Cassava	7.6%	9.5%	4.4%
Maize	6.6%	8.5%	4.6%

Source: Authors' calculations based on FAOSTAT (2016) data.

Table 3.2. Annual Growth Rates in Production, by Country: 2009-2014

Commodity	Millet	Sorghum	Maize	Paddy rice
Benin	-	-	+25%	-
Burkina Faso	0%	+12%	+59%	+63%
Ghana	-	-	+9%	-
Mali	+23%		+18%	+11%
Nigeria	-72%	+28%	+23%	+90%
Niger	+25%	+93%	-	-

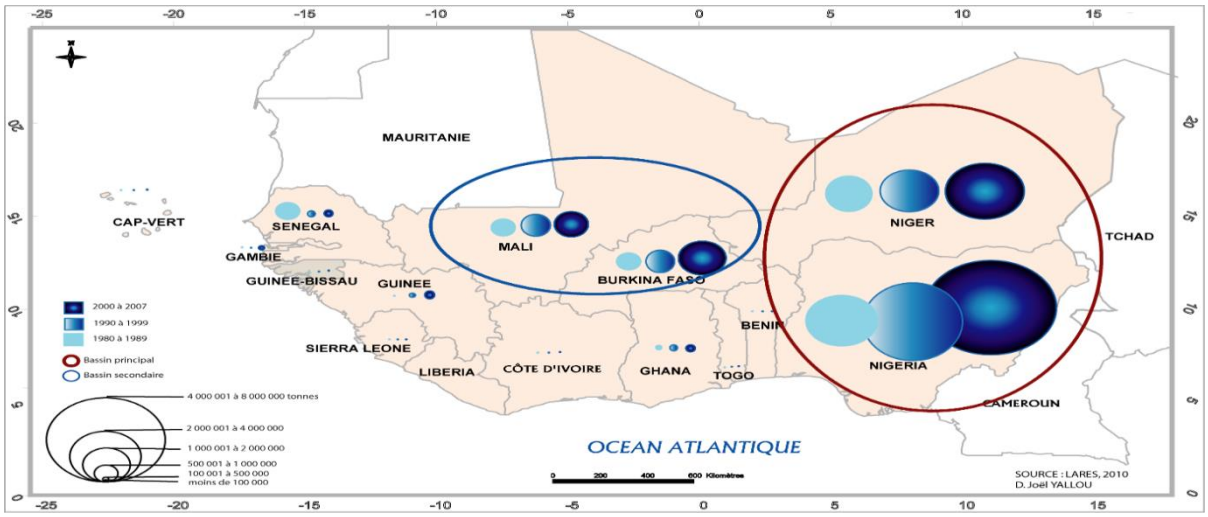
Source: Authors' calculations based on FAOSTAT (2016) data.

Nigeria is by far the largest overall cereals producer; in a normal year, it grows about 40% of all West African cereal output (FEWSNET and CILSS 2015).

Millet production remained concentrated in the Sahelian countries, especially in northern Nigeria, Niger, Burkina Faso, and Mali (Figure 3.2). This basin's share in total regional output edged up from 69% in 1980-1990 to 73% in 1990-2000 and 74.5% between 2000 and 2006. Millet and sorghum production is highly variable and strongly correlated with rainfall.

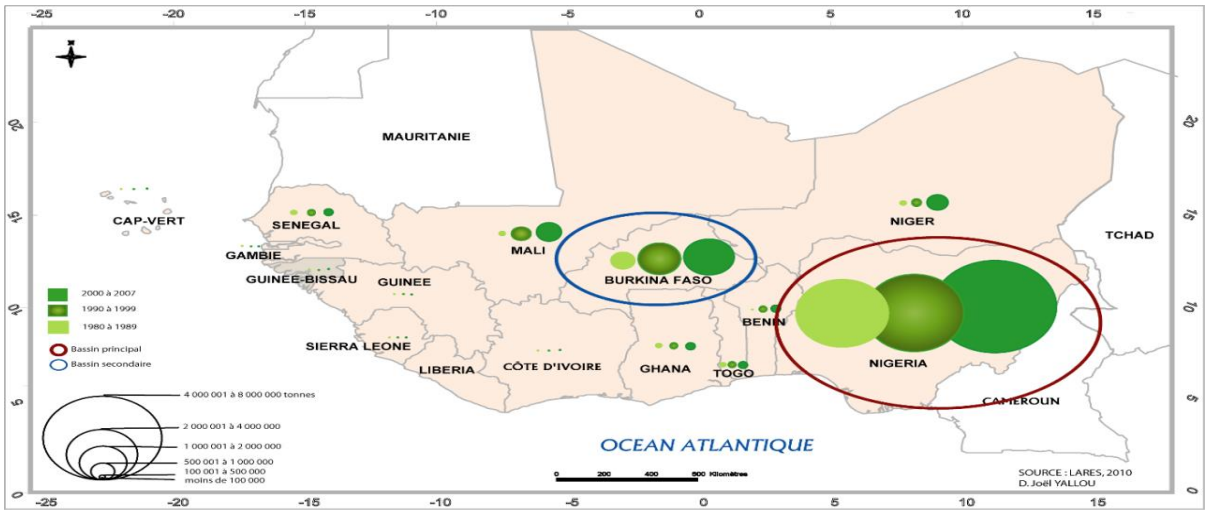
The *sorghum production basin* is less homogeneous than the millet production area (Figure 3.3). Two countries, Nigeria and Burkina Faso, are the main producers and have contributed in virtually the same proportions for 30 years; they are trailed by Mali and Niger. Niger saw a slight improvement in its output between 1980 and 2006.

Figure 3.1. Dynamics of Millet Production Basins in West Africa (1980-2007)



Source: Soulé and Gansari (2010).

Figure 3.2. Dynamics of Sorghum Production Basins, 1980-2007



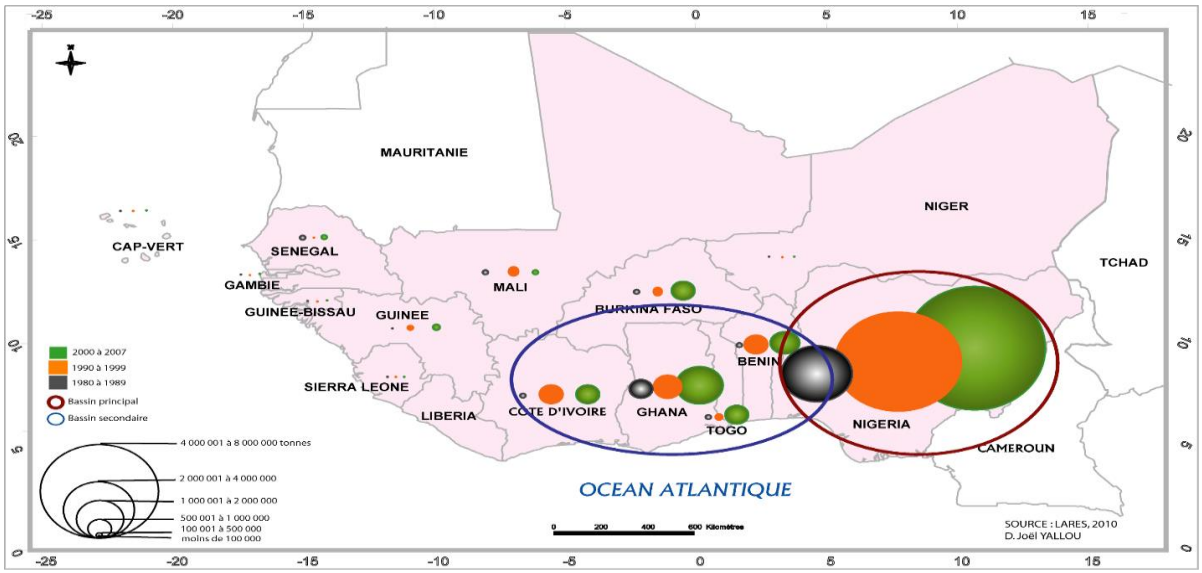
Source: Soulé and Gansari (2010).

Maize production. Under the influence of cotton production programs, which also support (directly or indirectly) maize growing, the maize production basin (Figure 3.4) has expanded into inland production regions in the last few years, including areas that traditionally grew millet and sorghum. Nevertheless, maize production is still concentrated mainly in the coastal countries, i.e., Nigeria, Benin, Togo, Côte d'Ivoire, and Ghana, which supply between 83% and 90% of the region's maize output. Southern Mali and southwest Burkina Faso also saw relative growth in their production since 2009.

Rice production (Figure 3.5) is less concentrated than the production of other cereals, although there are three well-defined basins. The leading basin is indisputably Nigeria, which supplies over 40% of regional production. The second basin is composed of Guinea and Mali, which currently produce about 30% of regional supply. The third, less significant, basin comprises Côte d'Ivoire and Liberia. Before the 2007-2008 rice crisis, these basins all had a rather weak dynamic, due essentially to: (i) the slow transformation of production systems, which were mostly dominated by small family farms; (ii) the low rate of use of inputs (underuse of

fertilizers and improved seed); and (iii) limited mechanization. Since 2008, these basins have been targeted with significant investments, leading to major advances in yield improvement (Diagne 2011; Hollinger and Staatz 2015).

Figure 3.3. Dynamics of Maize Production Basins, 1980-2007



Source: Soulé and Gansari (2010).

Cowpea production occurs primarily in three countries: Nigeria, Niger, and Burkina Faso, which account for over 70% of worldwide production of the legume. Production of cowpeas, perceived as the food of the poor, has been booming in some countries, especially in Niger, over the last ten years. Cowpea production tripled thanks to government incentives.[7] Indeed, Niger's domestic supply surged from an average output of between 250,000 tons and 300,000 tons per year through the late 1990s to more than one million tons in 2008 and 2009.

Table 3.3 in the Appendix gives more details about the basins by country. In general, yields for all four of the major cereals (maize, sorghum, rice, and millet) produced in the region are still very low at about 1,179 kg per hectare compared to 6 tons to over 12 tons in Asia and Europe for wheat, maize, and rice.

Dynamics of All Regional Trade in Cereals and Cowpeas

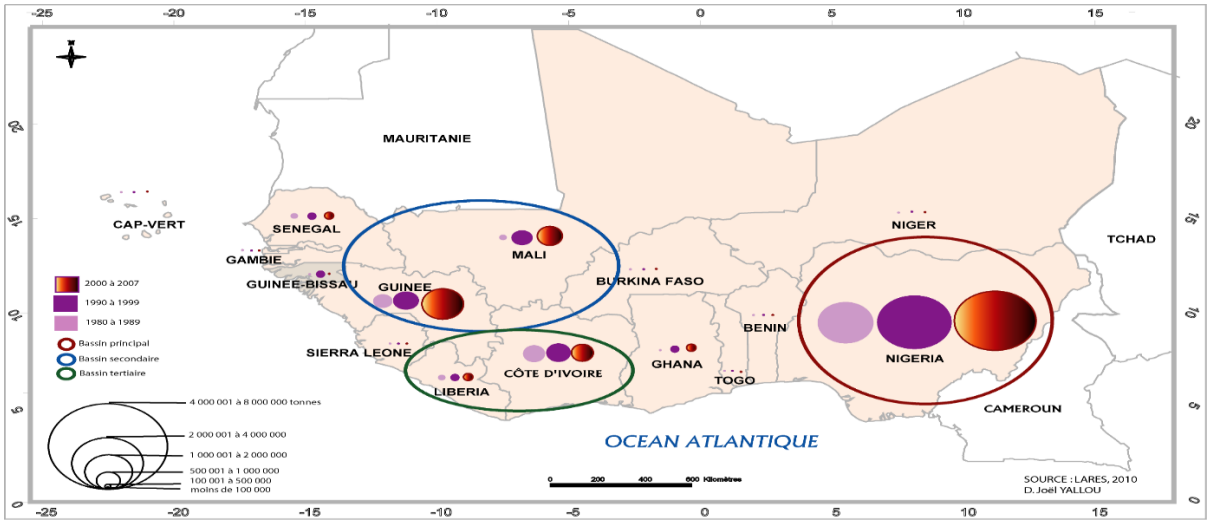
The West African road and railway network suffers from dilapidated infrastructure. Due to the long distances and the poor state of roads, it is mostly nearby countries that trade with one another through five trade areas, which are shown in Figure 3.6.[8]

- The Western Basin (Mauritania, Senegal, Guinea-Bissau, Gambia, Guinea, Sierra Leone, and Liberia) is marked by flows of local rice, plus millet and sorghum.

[7]In 2007, the government of Niger decided to encourage cowpea production by buying at an incentive price of 25,000 CFAF per 100-kg bag compared to the 12,000 CFAF to 15,000 CFAF offered by traders in periodic markets.

[8] See also FEWSNET and CILSS (2015).

Figure 3.4. Dynamics of Paddy Rice Production Basins, 1980-2007



Source: Soulé and Gansari (2010).

- The Eastern Basin (Chad, Niger, Nigeria, and Benin) sees major flows of millet, sorghum, maize, cowpeas, and re-exported rice. More than 60% of local cereal transaction flows for all of West Africa occur in this space.
- The Nigeria-Benin-Togo-Ghana conurbation zone has low maize flows and between 300,000 tons and 500,000 tons of re-exported rice from Benin to Nigeria.

  The Sahel Belt is characterized by millet/sorghum flows between Mali, Mauritania, Burkina Faso, Nigeria, and Niger.

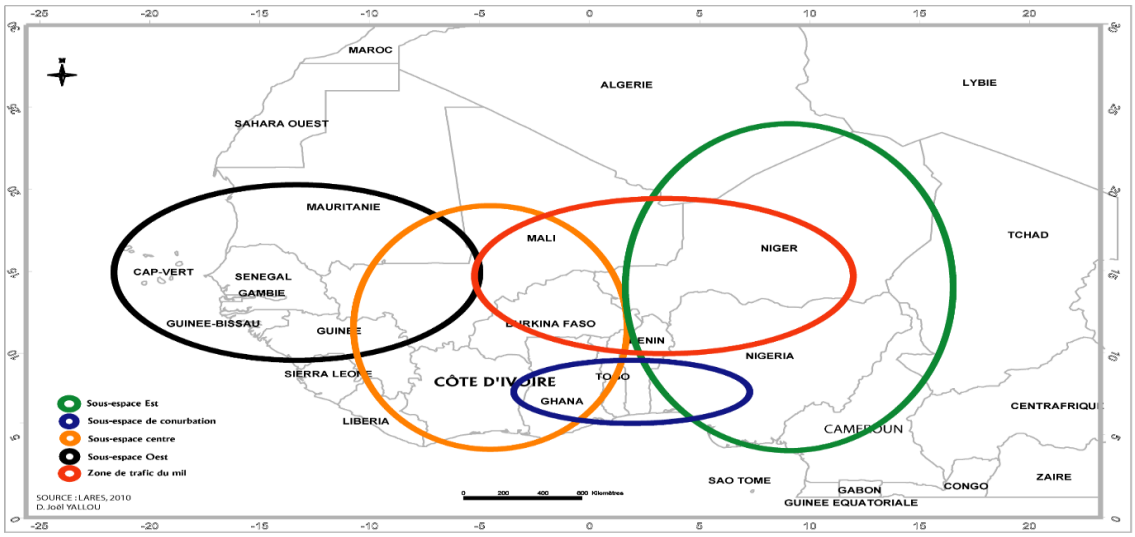
Regional trade in cereal products has intensified since the 1970s because of the famine crises that rocked the Sahelian region, changes in eating habits and increased output. Regional trade flows are supplied by both regional products and those imported from the international market.

The dynamics behind these transactions reveal:

- Strong growth in infra-territorial flows arising from the increasingly extensive connections between production basins and the consumption centers created by rampant urbanization and by industrial and animal feed demand. [9]
- Accentuation of spatial and structural segmentation of the market, which manifests itself in two ways: pronounced differences in the types of flows occurring in different areas and the increasingly marked presence of imported rice in urban cereal transactions.
- Interruption in the long period of relative stability in food product prices in general and in cereal prices in particular, linked to the overall trends in the international market. Indeed, the traditional inter-seasonal and annual fluctuations in local cereal prices were exacerbated by the brutal spike in import prices beginning in late 2007 and early 2008.

[9]Infra-territorial trade refers to trade within an area smaller than the entire West Africa region, such as trade within a greater urban area, within a rural area, or within a subnational unit, such as a Department.

Figure 3.5. Cereals Trade Areas in West Africa



Source: Soulé and Gansari (2010).

Locally produced rice moves very little within the region because of two constraints: the supply shortage and the mediocre quality of rice milled by West African facilities. While the precise volume of regional trade is unknown because so few flows are recorded, official statistics since the crisis—from all sources combined—point to a significant increase in rice, wheat, and wheat flour imports. For example, according to FAOSTAT (2016), total cereal imports in West Africa rose from 10.8 million tons in 2008 to 16.1 million tons in 2013 despite strong growth in regional output. In part, the increase in imports was stimulated by a dramatic decline in world grain prices since 2008. For example, from its peak in April, 2008, the FOB price of the benchmark Thai 25% broken rice fell from US$904/ metric ton (mt) to US$354/mt in November, 2016 (World Bank 2016; FAO 2016).[10]

Estimates made by various teams show a relative uptick in Nigerian and Beninese cereal exports to Niger. According to Bauer et al. (2010), "The Sudanian zone ships about 10,000 tons of rainfed cereal to the eastern Sahel each week, a flow that alleviates the region's cereal deficits. Of the 10,000 tons, between 1,500 and 2,000 tons are supplied by Benin, the rest comes from northern Nigeria." That country is still the largest exporter of cereals in the region.

Rice is the leading imported cereal in West Africa. According to FAOSTAT (2016), between 1980 and 1990, rice imports rose from approximately 1.6 million tons to 1.8 million tons, or an increase of 16%. In 2000, they grew to 2.9 million tons, or a 54% increase over 1990. In 2007, they reached 5.5 million tons, or a 92% increase over 2000. In 2008, they slipped to 5.4 million tons, for a decrease of 1.5% compared to 2007, due largely to the increase in import prices. After 2008, imports continued to rise. In 2013, they grew to 8.4 million tons, or a 54% increase over 2008.

Imports of wheat and wheat flour were considerably lower than those of rice, although their pattern of increase was similar to that of rice through 2005. According to FAO statistics, wheat and wheat flour imports grew by 290% between 1980 and 2005 before declining by about 25% between 2005 and 2007. Over the period 2004 to 2006, imports of cereals and derivatives,

[10] As noted below, the appreciation of the U.S. dollar relative to major West African currencies between 2008 and 2016 made this price decline less dramatic in terms of West African local currencies.

including wheat flour, accounted for about 18% of the gross total supply of cereal products in the region. This proportion reached approximately 20% in 2008 because of the rise in tax-free rice imports to resolve the food crisis caused by soaring commodities prices. The re-exports that originated in the 1980s from disparities in trade and tax policies and involved about 10 countries, are increasingly restricted to the eastern sub-region. The amount of rice re-exported by Benin to Nigeria ranges from 150,000 tons to 400,000 tons per year and Niger re-exports between 100,000 tons and 150,000 tons of rice and wheat flour to Nigeria (Soulé and Gansari 2010).

Impact of Recent Changes: Dollar Appreciation and Growing Insecurity

Since 2008, the strong appreciation of the U.S. dollar relative to West African currencies and the growing insecurity in the region due to jihadist and terrorist actions have both affected regional trade and food prices in the region.

Recent changes in exchange rates. Between April, 2008 (the period of peak world cereal prices) and November 2016 the U.S. dollar appreciated by 31% relative to the CFA franc and 140% compared to the Niara. This appreciation to some extent offset, in local currency terms, falling world cereal prices over this period, which are typically denominated in U.S. dollars. Thus, while in U.S. dollar terms the FOB price of 25% Thai broken rice in November 2016 was only 39% of its peak price of April, 2008, it was 56% of that level when measured in CFA francs and virtually the same level (101%) when measured in terms of Naira.[11] The fall in the value of local currencies relative to the dollar therefore offered some protection for local cereal producers from competing imports. The CFA franc has a fixed parity with the Euro, so its exchange rate with the U.S. dollar is completely out of the hands of the eight West African countries that use this currency. The Niara's value is strongly influenced by the price of petroleum, which is also largely outside of Nigeria's control. Thus, should the U.S. dollar depreciate in the future relative to the Euro/CFA franc or the Niara, these countries would face the full brunt of future declines in world cereal prices. This observation emphasizes the importance of these countries taking actions over the variables they can control (such as improving yields and reducing marketing costs) to ensure their future competitive position relative to cereal imports.

Growing insecurity. The security crises (e.g., Boko Haram in Nigeria, the Malian crisis) and the political tensions and their repercussions in the region have significant effects on economic activities and West African intra-regional trade. In the conflict areas, many farms are abandoned and thefts of livestock and the recurrence of conflicts between crop farmers and herders have increased. The effects of this situation are reflected in the food prices and the cost of transport. According to Fan (2016), "The price of food products and the intensity of civil conflict are linked: the number of consecutive months during which the price of food products were abnormally high from 2000 to 2013 is highly correlated with both the number of situations of violent civil conflict and the number of deaths due to these events." The displacement of people has led to the reduction of food products coming from these production areas and an increase in the demand for food in urban areas in the conflict zones, which are relatively more secure. According to the FAO and WFP, "About 6.7 million people are affected by food and

[11] FOB rice prices are taken from World Bank (2016) and FAO (2016). Exchange rates are taken from www.oanda.com/currency/converter/.

nutritional insecurity, of which 4.2 million are displaced persons in the Sahel and in West Africa because of civil insecurity that is striking the Lake Chad Basin, northern Mali, Libya, the Central African Republic, and Sudan." Price increases stem in part from the shortage of products coming from northern Nigeria and the impossibility of certain countries (Niger, Chad, and Cameroun) to export their products there, affecting the balance of trade in this area (FAO and WFP 2016).

Institutional Dynamics of the Regional Cereal Market

The existing literature on the West African market focuses on the roles of stakeholders, on flows, and on overall price trends, all of which paint a clearer picture of how trade works. Analyses rarely address the institutional framework, which, while certainly disparate across different countries, is evolving markedly. Indeed, the institutional and regulatory framework underlying cross-border transactions in agrifood products in general and cereal products in particular, has changed dramatically over the past 30 years. There have been significant changes in the regional market, in both national and regional regulations and regarding where and how stakeholders organize and intervene (Soulé and Gansari 2010).

Changes in the regulatory framework. Liberalization in the 1990s pushed governments to remove themselves from marketing operations and resulted in the elimination of import monopolies and price controls. At the regional level, ECOWAS and WAEMU, the two institutions in charge of the regional integration process, implemented market liberalization schemes that, in the case of the WAEMU, culminated in a customs union that has been up and running since 2000. However, although the market liberalization process within ECOWAS began in 1993 and concluded in 2000, there are still challenges to the customs-free movement of agrifood products (Soulé and Gansari 2010; Hollinger and Staatz 2015).

In the West African cereals market networks, the ways and levels at which market actors intervene evolved considerably in response to: (i) the growing regionalization of markets; (ii) steadily rising imports; and (iii) the development of road infrastructure connecting cities in different countries.

Traditional networks. Traditional networks have emerged as essential players in the cross-border cereals trade. The most prominent one is the Hausa network, which extends to Nigeria, Niger, northern Benin, Cameroon, Togo, and Ghana. Participants in these networks have developed a strong capacity for market regulation (early cereal collection, storage), which sometimes causes government authorities to liken them to *disreputable speculators*, or even *famine brokers*, during food crises.

There are usually three to four *cereal importers* who dominate each national market; these merchants are generally affiliated with major international corporations, for which they serve as the local outposts. These merchants have close ties to the government, strong financial backing and extensive storage and transportation infrastructure, all of which enables them to exert influence over the functioning of the local market. Analysts have pointed to these importers as the major beneficiaries of the tax exemption status granted to imports by public authorities during the 2008 crisis. These cereals merchants acted with little transparency and passed on only a small share of the tax-exemption measures to consumers, instead preferring to boost their profit margins (Soulé and Gansari 2010).

Producers are often organized into marketing structures, such as cereal banks, warehouse receipt systems, and mini-commodity exchanges, to ensure better market access for their output. The scope of these structures rarely exceeds the production basin in which they exist, but they are likely to play an important role in activating the market regulation instruments planned as part of the implementation of ECOWAP, especially when it comes to supplying cereals to *regional storage operators* and the planned regional commodities exchange (ECOWAS Commission 2012).

Public grain boards and aid agencies, such as the World Food Program, make purchases either from public production agencies, from national grain merchants or from producers, who may or may not be organized into associations, under the management or supervision of said agencies. The overall volumes purchased are still modest, but they play an important educational role in promoting market performance.[12] Purchases are made in conformity with technical specifications that define, in addition to quantity, the quality standards and deadlines to be met.

3.5. Conclusions and Policy Implications

The West African cereals market has undergone significant changes over the past 30 years. The overall structure of the supply of cereal products has experienced major changes in quantity and quality. In addition to the remarkable rise in domestic production, which tripled, imports from outside Africa also increased by approximately 500% over the same period. Over the period 1980 to 1982, foreign cereal volumes accounted for about 18% of the region's total supply, whereas they comprised 21.5% of available cereals from 2006 to 2008. In this regard, the region's food dependence rose despite efforts made to bolster regional production.

However, the structure of demand is still not thoroughly understood. For example, cereal-based animal feed for livestock and poultry farms has contributed to the growth in cereal consumption. The demand for cereals has become very complex because of intense segmentation and changes in the eating habits of an increasingly large swathe of the population.[13] Indeed, little is known about substitutions between local cereals and imported cereals, which are more and more common on local markets.

Infra-territorial flows significantly exceed regional flows, which are related to the rise in urban demand (40% of the region's population), the use of cereal for other purposes, improvements in geographic access, and proactive policies implemented by government authorities. The slow growth in regional trade compared to infra-territorial flows can also be attributed to the many shortcomings of the regional market and to the obstacles that still hinder the movement of products. Very few political leaders in the region believe in the ability of the regional market to play a meaningful role in resolving the cyclical food insecurity problems that face their countries.

[12] See Chapter 12 in this volume for more details.
[13] See Part II of this volume.

One question, however, is on everyone's mind: In the medium- and long-term, how can the lack of an assured market for West African producers (e.g., weak tariff protection and tax-exempt imports) be reconciled with the stated strategy of fostering a lasting recovery in regional cereal production? It seems that government authorities must address two concerns that are occasionally at odds with one another: meeting the immediate needs of urban consumers and raising the income of smallholders by boosting output and promoting the regional market. The only long-term solution to this food price dilemma is to increase productivity throughout the agrifood system, which can permit farm incomes to grow while still keeping food affordable for consumers.

Appendix

Table 3.3. Main Cereal Production Basins in West Africa

Country	Main Cereal Production Basins*	Comments
Benin	Borgou department 1, 2, 3; Alibori department 1, 2, 3; South Benin 3: Ilara, Sakété-Pobè, Ketou area); Ouémé Valley 4 (Bonou, Adjohoun, etc.); Malanville area 4: Niger and Sota valleys; Koussin Lélé area 4; Covè and Zagnanado	Abundant maize production but output for other cereals is low. Rice production in the areas developed as part of agricultural promotion projects
Burkina Faso	Tapoa Province 1, 2, 3; Boucle du Mouhoun 1, 2, 3; Hauts-Bassins 3, 1, 2; Cascades 3 (on border with Côte d'Ivoire)	Abundant millet and sorghum production
Cape Verde	ND	Maize monoculture
Côte d'Ivoire	Northern Côte d'Ivoire 3	Abundant maize and rice production
Gambia	Senegambia basin 1, 4, 2, 3	High maize production, low for other cereals
Ghana	ND	Significant production of maize and rice
Guinea-Bissau	Senegambia basin 4, 1, 2, 3	Significant maize production and low production for other cereals
Guinea-Conakry	Fouta Djalon area 4	Very abundant rice and maize production, but low output for other cereals
Mali	Southern Mali (cotton zone) 2, 3; Sikasso Region 3; Ségou Region 1; Koutiala area 2; Kayes Region 2; Niono area 4	Abundant production of millet, sorghum, and rice
Mauritania	Rosso-Mauritania area 4	Relatively abundant rice production concentrated in the rice-growing areas
Niger	Lake Chad basin 4; North-Central Maradi 1; North-Central Zinder 1; Along the Niger River 4; Diffa Region 3	Abundant production of millet, sorghum, and cowpeas (alternative crop to millet and sorghum)
Nigeria	Niger Plateau states 2, 3: Lake Chad basin 3; Sokoto State 3; Kano State 3; Adamawa State 3; Borno State 1, 4; - Kebbi State 1, 4	Nigeria is the largest producer in West Africa of all studied cereals
Senegal	Senegal River area 4; Boundoun and Debi areas (in the Delta) 4; Mbagaam and Waalo areas 4; Rosso area 4; Nioro du Rip 1; Kaolack region 1 (groundnut and millet basin)	Abundant rice production concentrated in the rice-growing areas of the Société d'Aménagement et d'Exploitation du Delta (SAED)
Togo	Centrale region 3, 2; Kara Region 3, 2; Savane Region 3, 2, 1; Maritime Region 4	Significant maize production and relatively low production for other cereals

Source: Soulé and Gansari (2010). * Cereals key: 1 = millet, 2 = sorghum, 3 = maize, 4 = local rice (paddy).

References

Bauer, J.M., M. Foye, I. Laouali, Y. Tahirou, B. Zoungrana, S.A. Aziz, T. Ramatu, and N.G. Ngague. 2010. *Marchés et Sécurité Alimentaire dans le Bassin Est: Bénin, Niger, Nigéria, Tchad.* Report prepared jointly by CILSS, FAO, FEWSNET, and WFP. n.p. http://www.fao.org/fileadmin/user_upload/emergencies/docs/1_wa_Rapport_mission_bassin_est_2010.pdf.

Blein, R., C. Tidiane, and B.G. Soulé. 2016. *Le commerce régional et international de l'Afrique de l'Ouest: Marchés et sécurité alimentaire.* Study conducted for ENDA CACID. Abuja: CILSS-AGRHYMET 2015. CILSS Country Cereal Reports from 2008 to 2015. http://www.agrhymet.ne/bilancerealier.html.

Diagne, A. 2011. Quelles perspectives pour le marché régional du riz? Vers une politque commerciale régionale conforme aux objectifs de développement et de sécurité alimentairre. Presentation made at the conference 30 ans de partenariat Mali-Fondation Syngenta: Quels impacts pour l'agriculture malienne? 5-7 October, 2011. Bamako, Mali. https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwiWxZLO6NjSAhVB7YMKHYSNCwYQFggaMAA&url=https%3A%2F%2Fwww.syngentafoundation.org%2Ffile%2F2656%2Fdownload%3Ftoken%3DWjBLnAQI&usg=AFQjCNGGDED075ZUBe32ayVXfsQ6WU_T9Q&bvm=bv.149397726,d.amc.

Diallo, B., N. Dembélé, and J. Staatz. 2010. *La dynamique des échanges régionaux des céréales en Afrique de l'Ouest*. MSU/PRESAO/SRAI Project, *Résultats de Recherche* no. 2010-03. September. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/presao_recherche_resultat_3.pdf.

Diallo, B., N. Dembele, and J. Staatz. PRESAO-SRAI1. 2012. *Arbitrage entre protection et ouverture des marchés du riz en Afrique de l'Ouest.* MSU/PRESAO/SRAI Project, *Résultats de Recherche* no. 2012-01. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/presao_rr_2012_01.pdf.

Diarra, M.S. and B. Ndong. 2015. *Accords commerciaux et flux de commerce dans la CEDEAO: le partage d'une monnaie unique est il déterminant?* UNECA. http://www.uneca.org/sites/default/files/uploaded-documents/AEC/2013/accords_commerciaux_et_flux_de_commerce_dans_la_cedeao.pdf.

ECOWAS Commission. 2012. *Regional Programme to Support the Regulation of West African Markets*. Abuja, Nigeria: ECOWAS Department of Agriculture, Environment, and Water Resources.

Fan, Shenggen. 2016. "Q&R: L'état des lieux de la sécurité alimentaire en Afrique." On-line interview with Director General of IFPRI. Scidev.net. Accessed December 20, 2016 at http://www.scidev.net/afrique-sub-saharienne/securite-alimentaire/actualites/q-r-situation-securite-alimentaire-afrique.html.

FAO. 2016. FAO Rice Price Update. Accessed 28 November, 2016 at http://www.fao.org/economic/est/publications/rice-publications/the-fao-rice-price-update/en/.

FAO and WFP. 2016. *Sécurité Alimentaire et Implications Humanitaires en Afrique de l'Ouest et au Sahel*. L'Essentiel, no. 74 (May). Accessed December 20, 2016 at http://reliefweb.int/sites/reliefweb.int/files/resources/1_Note%20Conjointe_Mai_2016_FAO_WFP_fr_VF.PDF.

FAOSTAT. 2016. FAOSTAT Statistics Database. Accessed 28 November, 2016 at http://faostat3.fao.org/.

FEWSNET and CILSS. 2015. *Regional Supply and Market Outlook; West Africa*. (December). Accessed on 5 February, 2017 at http://www.fews.net/sites/default/files/documents/reports/WestMarketSupplyOutlook2015_20151215_v3_0.pdf.

Haggblade, S., S. Longabaugh, D. Boughton, N. Dembelé, B. Diallo, J. Staatz, and D. Tschirley. 2012. *Staple Food Market Sheds in West Africa.* MSU International Development Working Paper No. 121. East Lansing: Michigan State University. http://fsg.afre.msu.edu/papers/idwp121.pdf.

Hollinger, F. and J.M. Staatz. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers.* Rome: AFDB, FAO. http://www.fao.org/3/a-i4337e.pdf.

Josserand, H. 2013. Assessment of Volumes and Values of Regionally Traded Staple Commodities: Current and Prospective Analysis. Paper prepared for the Food Across Borders Conference, 29-31 January. Accra: USAID/West Africa. http://www.inter-reseaux.org/IMG/pdf/Josserand_-_Assessment_of_ATP_E-ATP_Trade_Data.pdf.

OECD. 2013. *Peuplement, marché et sécurité alimentaire*. Paris: OECD Publishing. http://dx.doi.org/10.1787/9789264187412-8-fr.

Soulé, B.G. and S. Gansari. 2010. *La dynamique des échanges régionaux des céréales en Afrique de l'Ouest*. Rapport final. Michigan State University-Syngenta Foundation for Sustainable Agriculture SRAI Project. Bamako and East Lansing: Michigan State University, Syngenta Foundation for Sustainable Agriculture SRAI Project. http://fsg.afre.msu.edu/srai/Dynamique_des_echanges_revue.pdf.

Taondyande, M., M. Sylla, and O. Songré. 2011. *Dynamique de la consommation alimentaire dans la sous-région Ouest-Africaine: principales tendances*. MSU/PRESAO/SRAI Project, Résumé no. 1-2011-08. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/Etude_consommation_rapport_regional_revue_diallo.pdf.

World Bank. 2016. Global Economic Monitor Commodities website. Accessed on 10 November, 2016 at http://databank.worldbank.org/data/reports.aspx?source=global-economic-monitor-(gem)-commodities.

Part II: Changing Food Consumption Patterns: Implications for Policy

West Africans are diversifying their diets rapidly. They want more convenient foods and a broader range of products, including more perishables. Food policies need to adapt to reflect these changes.

CHAPTER 4

Changing Patterns of Food Consumption in West Africa: Food Balance Sheet Analysis

Évolution des tendances de consommation alimentaire en Afrique de l'Ouest : Analyse du bilan alimentaire

Nathalie M. Me-Nsope and John M. Staatz

Abstract

Food balance sheets calculate the average per capita availability for human consumption of various foods in a country and the resulting per capita availability of different nutrients. Analysis of annual food-balance-sheet data for each of the 15 Economic Community of West African States (ECOWAS) countries over a 30-year period reveals striking changes in per capita food availability between 1980 and 2009. Per capita calorie and protein availability increased in all but two countries—Liberia and Côte d'Ivoire, which both suffered civil conflicts during the period—with the increases particularly striking in Ghana, Nigeria and the landlocked Sahelian countries. The data indicate that average diets also diversified strongly over the period, both among the range of starchy staples consumed and with respect to per capita availabilities of fruits, vegetables, animal-based products and pulses. Red meats, milk and pulses are the main sources of animal protein in the landlocked Sahelian countries, while fish remains the dominant source in the coastal countries. In recent years, however, poultry supplies, much of it from imports, have also increased sharply along the coast. The improvements in diet quality were most striking in the countries that experienced the most robust economic growth, such as Ghana and Cape Verde. Despite these changes, the proportion of total calories in the diets derived from carbohydrates is still high relative to the World Health Organization's recommended dietary standards, while the proportion of calories derived from proteins remains close to the lower bound.

Résumé

Les bilans alimentaires calculent la disponibilité moyenne par habitant de divers aliments destinés à la consommation humaine dans un pays et la disponibilité par habitant de divers nutriments. L'analyse des données du bilan alimentaire annuel de chacun des 15 pays de la CEDEAO sur une période de 30 ans révèle des modifications frappantes de la disponibilité de nourriture par habitant entre 1980 et 2009. La disponibilité des calories et des protéines par habitant s'est accrue dans tous les pays sauf deux—le Liberia et la Côte d'Ivoire qui ont tous deux connu des conflits civils pendant cette période—les augmentations ont été

particulièrement remarquables au Ghana, au Nigeria et dans les pays enclavés du Sahel. Les données indiquent que les régimes alimentaires moyens se sont aussi beaucoup diversifiés pendant cette période, à la fois par rapport à la gamme des féculents consommés et à la disponibilité par habitant de fruits, de légumes, de produits animaux et de légumineuses. La viande rouge, le lait et les légumineuses constituent la principale source de protéines dans les pays enclavés du Sahel, tandis que le poisson reste la source dominante de protéine dans les pays côtiers. Toutefois, ces dernières années, les approvisionnements de poulet (pour la plupart importé) ont aussi beaucoup augmenté le long de la côte. La qualité accrue du régime alimentaire a été remarquable dans les pays qui ont connu un essor économique plus fort, tels que le Ghana et le Cap Vert. En dépit de cette évolution, la proportion de calories dérivées des glucides est encore relativement élevée comparé aux normes diététiques recommandées par l'Organisation mondiale de la santé, tandis que la proportion de calories dérivées des protéines reste proche de la limite inférieure.

4.1. Introduction

Changes in food consumption patterns have important implications for food security. They can indicate, for example, whether a country's food production is diverging, in composition and quantity, from what consumers are demanding. As a result, policies to deal with issues of food security require knowledge about these consumption changes and the factors influencing them. Changing food consumption patterns also have implications for agricultural market development, for example, what sorts of marketing infrastructure will be needed in the future. Given West Africa's rapid urbanization and its growing urban middle class, understanding how these consumption patterns have changed will help identify opportunities and challenges for the development of agricultural value chains to meet the growing effective demand.

Rapid changes in the social and economic environment in West Africa (WA) are resulting in shifts in food consumption patterns.[1] These changes include growing total and urban population, increases in per capita incomes, demographic transition towards smaller family sizes in a few countries, migration within the zone towards the coastal states, and the adoption of more western lifestyles (Lopriore and Muehlhof 2003; Hollinger and Staatz 2015). During the period 1980-2010, the population of most ECOWAS nations grew rapidly. The regional average annual population growth rate was about 3%, with an overwhelming importance of the coastal countries (Nigeria alone accounting for three-fifths of the region's total population). The size of the consumer population obviously has an effect on aggregate food demand.

Not only is the population of WA growing rapidly, but it is also becoming more urban. The urban population is projected to continue to grow at a rate of 3.8% per year between 2015 and 2030 (UNDESA 2014). West Africa is the most urbanized part of Sub-Saharan Africa. Figures for 2005-2010 reveal urban population shares of over 40% for nine out of the 15 ECOWAS countries, and 3 of the 9 countries had a share above 50%. Urban population shares are generally higher in the coastal countries than in the inland countries. In the future, it is likely that the WA population will be more concentrated along the coast due to substantial out-

[1] In this chapter, West Africa refers to the 15 member countries of the Economic Community of West African States (ECOWAS), categorized into three groups: i) the Inland Sahel – Mali, Burkina Faso and Niger; ii) the Coastal Sahel – Cape Verde, Gambia, Guinea Bissau, Senegal; and iii) the Coastal Non-Sahel – Benin, Côte d'Ivoire, Ghana, Guinea, Liberia, Nigeria, Sierra Leone, and Togo.

migration from the inland countries of the Sudano-Sahelian belt (e.g., Burkina Faso and Mali) to the coastal countries (UNEP 2002).

Real per capita gross domestic product (GDP), an indicator of purchasing power, also grew sharply over the period 1980-2010. Increases in average annual real per capita GDP growth rates were particularly large in the 2000s. With the exception of a few countries (Côte d'Ivoire, Guinea Bissau, Liberia, Guinea and Togo), per capita GDP has been growing since 2000, and the growth rates have been largest for Cape Verde, Ghana, Nigeria, Burkina Faso, Mali and Sierra Leone. Figure 4.1 shows trends in the total population growth rate, urban population shares and growth of per capita incomes in selected ECOWAS nations for the period 1980-2010.

Rapid urbanization, when accompanied by growth in per capita incomes, has important consequences for how consumption patterns evolve. Regmi and Dyck (2001) note that the specific effects of urbanization on consumption differ depending on the economic conditions—when accompanied by increases in per capita income, urbanization may result in an overall increase in per capita consumption, improvement in diet quality (such as an increase in animal protein consumption), and increases in the demand for processed or easy-to-prepare food. In West Africa, Diagana et al. (1999) observed growth in the demand for easy-to-prepare foods such as rice and bread (wheat), starting in the 1970s, which they argued was favored by the rising demand for convenience in urban areas.

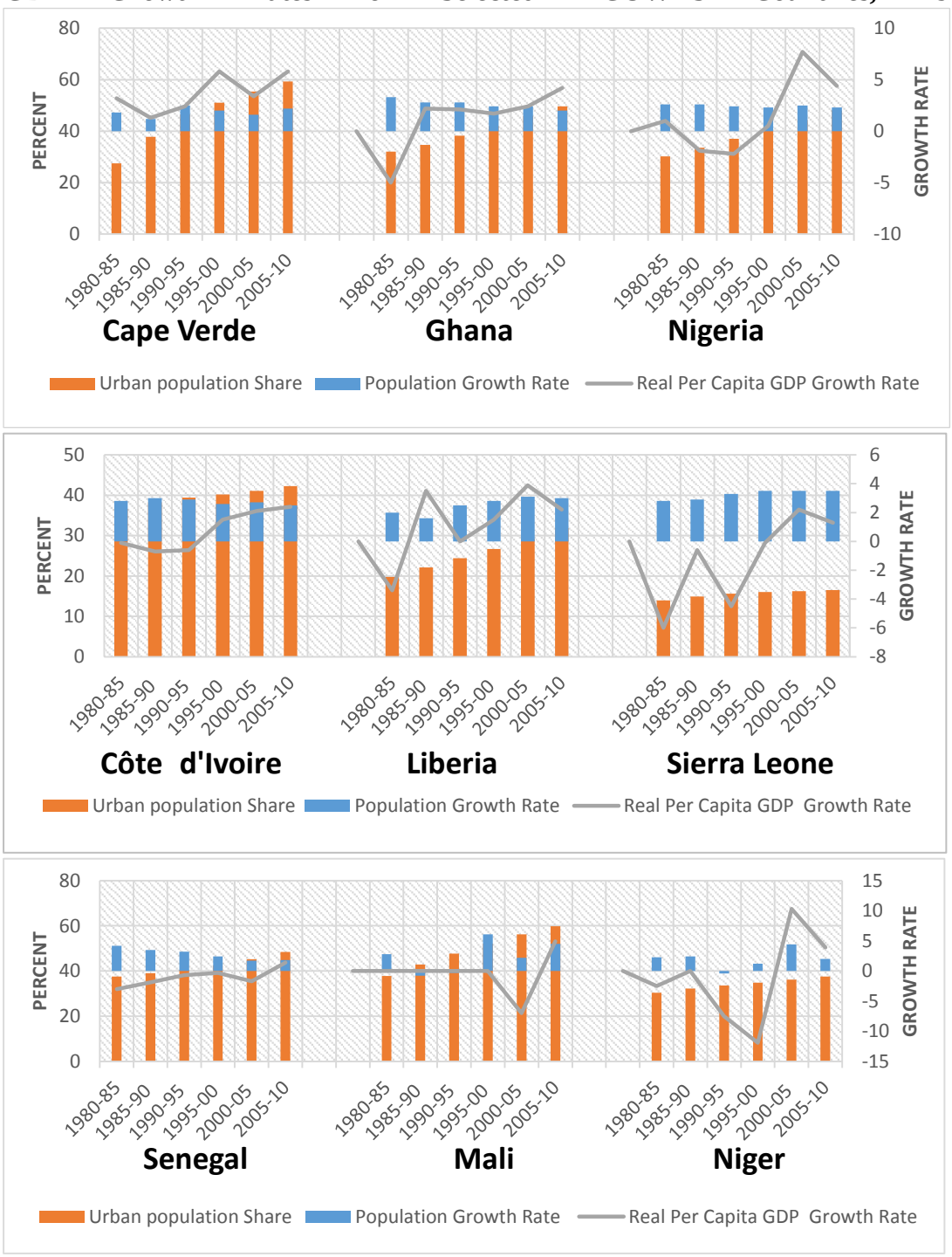
In addition to the structural changes that are influencing food consumption patterns in the region, West Africa has also experienced a series of policy shifts that have constituted major changes in the conditions that determine demand. Examples include the Structural Adjustment Programs of the 1990s, the 1994 CFA franc devaluation, and the 2008 global spike in food prices, all of which led to changes in relative prices, which in turn induced consumers to modify their diets.

The remainder of this chapter explores these issues, based on analysis of food-balance-sheet (FBS) data for each of the 15 ECOWAS countries over the period 1980-2009.

4.2. Literature Review and Knowledge Gap

Previous analyses of aggregate-level trends in food consumption in West Africa have been narrow, often focusing on specific commodities or commodity groups or on a specific country. Most previous analyses are also more than a decade old. Very few have examined aggregate-level trends in food availability with a focus on what is happening in each country, across food commodity groups, and in the context of specific sub-regions in West Africa. Lopriore and Muehlhoff (2003), for example, analyzed trends in dietary energy supply and in diet quality and diversity for the region of WA using national-level data from the Food and Agriculture Organization of the United Nation's (FAO's) FBS. Their analysis, however, extends only to 2001. Me-Nsope and Staatz (2013) and Me-Nsope (2014) expand and update evidence of aggregate-level trends in food availability for the region by providing a more comprehensive picture of the trends in per capita food availability in WA.

Figure 4.1. Population Growth Rates, Urban Population Shares, and Real Per Capita GDP Growth Rates for Selected ECOWAS Countries, 1980-2010



Sources: Population growth rates up to 2005 were calculated from Food and Agriculture Organization's (FAO) Population Statistics, while the growth rates for 2005-2010 were taken from the United Nation's population statistics. Urban population shares were compiled using World Bank, 2013 data. Average annual real per capita GDP growth rates were computed using per capita GDP (constant prices), in national currencies, from the International Monetary Fund, World Economic Outlook Database, April 2008.

Specifically, these latter two studies use national official statistics (as reported through FAO's FBS) to analyze aggregate (national) trends in per capita food availability over the period 1980-2009 for each of the 15 ECOWAS countries, in the context of the social, economic and political changes that have occurred in the region. The studies analyzed aggregate food availability data to identify the commodities that make major contributions to the national food supply as well as new food groups emerging as important contributors to the diet.

More specifically, these studies use aggregate-level food supply data to examine the following questions: i) Have rising per capita incomes in the region been accompanied by increases in the level of per capita calorie availability in the past 30 years? ii) Has the composition of the food supply diversified, with new food groups (e.g., roots and tubers in the inland Sahelian West African countries and maize in the landlocked countries) emerging as important contributors to the daily caloric supply? iii) Has the contribution of animal protein to total daily protein supply increased over time as per capita incomes have increased? and iv) Has the per capita food supply become more balanced in terms of its macronutrient composition?

In this chapter, we summarize the results of Me-Nsope and Staatz (2013) and Me-Nsope (2014) to highlight important regional trends in per capita food availability, as well as show what is happening in the big movers in the region, such as Nigeria, Ghana, and Côte d'Ivoire, which account for a large proportion of the region's population and GDP. These findings can help inform policy dialogue at the regional and national levels on key policy issues concerning the evolution of agrifood systems.[2]

4.3. Methods and Data

National-level official food availability data for the period 1980-2009 for each country in the region obtained from FAO's Statistical Database **(**FAOSTAT) food balance sheets (FBS) serve as the basis for the following analysis. The FBS calculate the domestic food supply as equal to domestic production plus imports, minus imports, plus stocks. Not all domestic supply is available as food for human consumption due to other uses—feed, seeds, processing and other modes of utilization. The FBS therefore deducts these quantities from the total food supply and converts the remaining supply (dubbed *supply for food use*) into estimated per capita availability by dividing it by the country's estimated population. The FBS then expresses the physical amounts of food available per person in terms of per capita availability of calories, protein, and fat, based on a food composition table.

Farnsworth (1961) was among the first to question the reliability of the FBS as a source of national food supply estimates. She noted the statistical shortcomings in the construction of food balances and argued that the FBS figures on per capita availability depend on the accuracy of the production, stocks, and population figures (major elements of the food balance equation), all of which are subject to varying degrees of error across countries. According to Farnsworth, these inaccuracies in food production estimates may stem from difficulties and the heavy costs of obtaining data on minor crops, minor producing areas, and/or home gardens; and incomplete coverage of the production of certain crops and livestock. Farnsworth further observed that

[2] For example, the findings summarized here were a major input into a 2015 FAO-African Development Bank-ECOWAS study on agricultural development challenges and opportunities in West Africa (Hollinger and Staatz (2015)).

stocks data are either nonexistent or limited to government holdings of a few export products, while population estimates frequently have a margin of error of 10%, sometimes much more. She noted further that agricultural production appears to be more frequently underestimated rather than overestimated in official statistics, and the underestimation could be from incomplete coverage of crop areas or crops—a characteristic of the agricultural statistics of practically all countries.

Although agricultural statistical systems around the world have improved substantially in the 55 years since Farnsworth wrote her seminal article, many of her caveats still are valid, particularly when comparing FBS data over a long period of time. For example, the recording of production data for non-cereal crops such as cassava, fruits, and vegetables has improved over the past half-century, so one needs to be cautious regarding apparent diet diversification over time as revealed by the FBS. The figures may just reflect an improvement in the ability of national agricultural statistics to capture previously under-recorded production rather than a real diversification of the diet.

On the consumption side, FBS data provide information the average quantity of food per person reaching the consumer in a given country. The figures do not represent the amount of food actually consumed, and if interpreted as actual food intake, they will almost invariably result in an overestimation in food consumption compared with results from dietary surveys at the individual level (Serra-Majem et al. 2003). Furthermore, national average food availability figures reported in FBS represent a composite of what may be distinctly different types of diets consumed by various subgroups of the total population.

Even with these limitations, however, Farnsworth acknowledged that the FBS figures do not obscure the broad pattern of total food supplies in a country—the estimates indicate important calorie contributors to the diet. Petrovici, Ritson, and Ness (2005) argue that the FBS data represent a valuable database for the aim of classifying countries according to the structure of their nutrient intake. Similarly, Timmer, Falcon, and Pearson (1983) argue that the analysis of FBS data is still the starting point for most food policy analysis at the country level.

FAO compiles food balance sheets annually for most countries around the world, including all 15 ECOWAS member states, and makes them available on the FAOSTAT website.[3] The analysis described in this chapter used data from FBS for each of the ECOWAS countries for every year over the 30-year period from 1980 through 2009 (a total of 450 FBS).[4] The analysis calculates trends in apparent food consumption patterns for each country.[5] The FBS show per capita quantities of food available for human consumption for almost all food commodities and all countries. They also show data on per capita food energy availability, as well as the availability of individual macronutrient groups (proteins and fats) in grams per capita/day. The analysis also classifies macronutrient availability by source (animal and plant). The analysis of protein availability by source provides some insight into diet quality. The analysis of fat availability also helps to understand important changes in the diets, as most West African diets, at least in the Sahelian countries, have historically been deficient in essential fatty acids. Using

[3] http://faostat3.fao.org/download/FB/FBS/E

[4] 15 countries x 30 FBS per country = 450 FBS.

[5] In this chapter, the term apparent per capita consumption is used synonymously with the per capita food or nutrient availability at the retail level as measured by the FBS.

information on per capita availability of individual macronutrients, the analysis calculates the energy contribution of proteins, fats, and carbohydrates.

In order to focus on longer-term trends rather than year-to-year fluctuations, the analysis calculates three-year averages for each key variable. The country results are grouped below by three sub-zones of West Africa, as diet composition and trends vary significantly across these groupings: Coastal Sahel, Inland Sahel, and Coastal Non-Sahel. Section 4.4 presents four major categories of results: 1) evolution of daily calorie supply per person; 2) diet diversification, which includes changes over time in the composition of food by major food group, as well as by major starchy staple types; 3) diet quality, which includes analysis of the contribution of proteins to daily food supply, a breakdown of protein supply by source (vegetal, animal, and pulses), and a breakdown of animal protein by source; and 4) trends in the share of macronutrients (carbohydrates, proteins, and fats) in daily food supply per capita.

4.4. Results

Evolution in Daily Calorie Availability per Person

The data reveal growing daily calorie supply (DCS) per capita over the period 1980-2009 for most ECOWAS countries. For many of these countries, the rate of growth in DCS per capita appears to have been strongly associated with the rate of economic growth and political stability. For example, countries experiencing rapid economic growth (e.g., Ghana and Cape Verde) have shown a pronounced and consistent growth in DCS per capita, while countries that have suffered civil strife (Côte d'Ivoire, Liberia, and Sierra Leone) showed disruptions in that growth (Figures 4.2A, 4.2B, and 4.2C). As a national average, DCS is an imperfect indicator of the state of individual food security. However, empirical evidence suggests a strong correlation between DCS per capita and more individual-based indicators of food security. For example, Smith and Haddad (2000) show that national caloric availability was responsible for more than a quarter of the reductions in child malnutrition in developing countries over the period 1970-95. Thus, the observed trend in DCS per capita in this study strongly suggests that there have been improvements in West Africa's state of food security over the last three decades.

Diet Diversification

Trend in Availability by Major Food Group: The FBS data point to a diversification in the composition of the food supply over the period 1980-2009 (Table 4.1). The relative importance of starchy roots and tubers (R&T) in total food availability, particularly in the Sahel region, has grown over time.

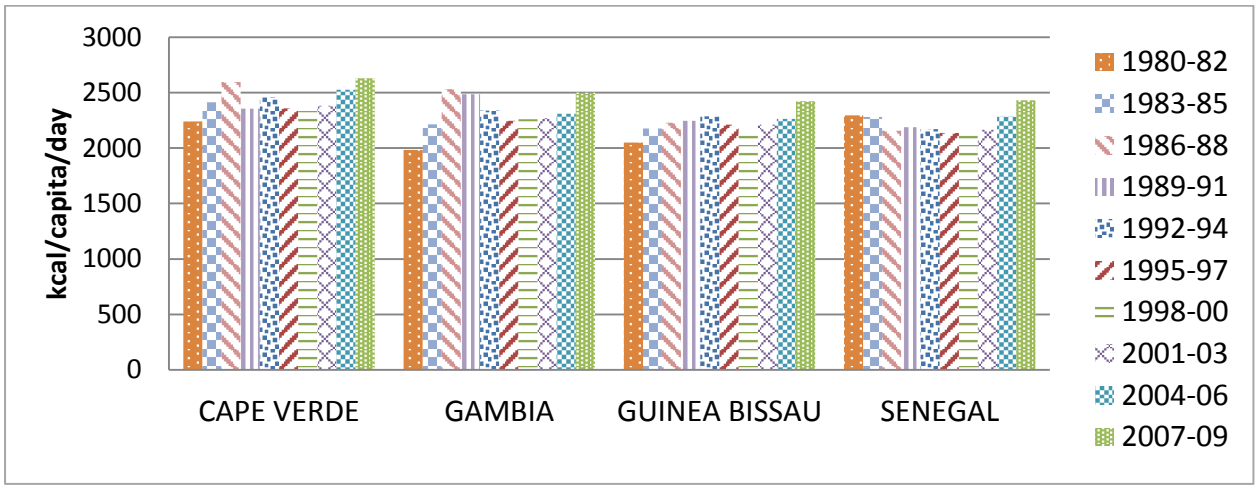
Historically, cereals have represented a large share of total household consumption in the Sahel. While cereals continue to remain the dominant starchy staples in the Sahel, the analysis shows an increase in the supply of starchy R&T, particularly in Mali, Senegal, and Cape Verde. In Mali, for example, R&T availability increased from 4 kg/capita/year in 1980-82 to 32 kg/capita/year in 2007-09 period. The specific composition of this trend is discussed below.

The FBS data also indicate that most countries in the region have experienced important increases in per capita supplies of fruits and vegetables (F&V). In the Inland Sahel, fruit and

vegetable supplies per capita grew the most for Niger, with absolute increases of 30 kg/year for fruit and 8 kg/year for vegetables. In the Coastal Non-Sahel, Ghana experienced the largest growth in per capita availability of F&V, with an absolute increase of 14 kg/year for vegetables and 79 kg/year for fruit over the period 1980-2009. Nigeria, by far the largest country in the region, experienced an absolute increase in vegetable supply per capita of 21 kg/year in the study period. In the Coastal Sahel, absolute increases in fruit and vegetable supplies per capita in the study period were 43 kg/year and 56 kg/year, respectively, in Cape Verde; and 5 kg/year and 47 kg/year, respectively, in Senegal. While some of this apparent growth in per capita F&V supplies may reflect improvement in statistical coverage of these crops over time, the changes are so large (and consistent with data from budget-consumption studies discussed in Hollinger and Staatz 2015) as to suggest an important diversification in West African diets over the 30-year period.

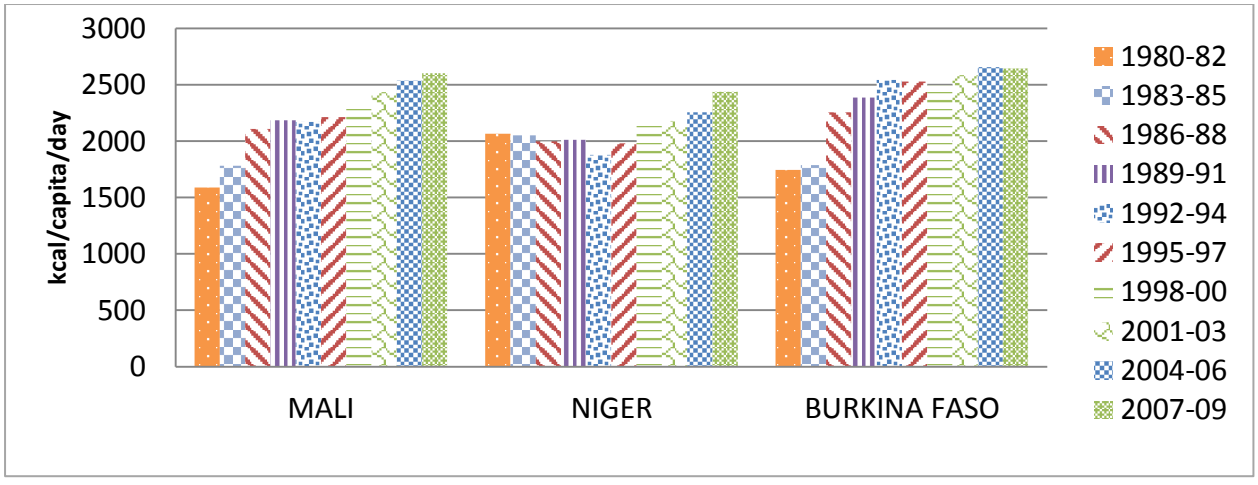
*Changing Mix of Starchy Staples***:** Me-Nsope and Staatz (2013) and Me-Nsope (2014) further examined the contribution of individual starchy staple types to the diet (Figure 4.3). Data show increases in per capita rice availability for most countries over the period 1980-2009.

Figure 4.2A. Trends in Daily Calorie Supply per Capita, 1980-2009, in Coastal Sahel



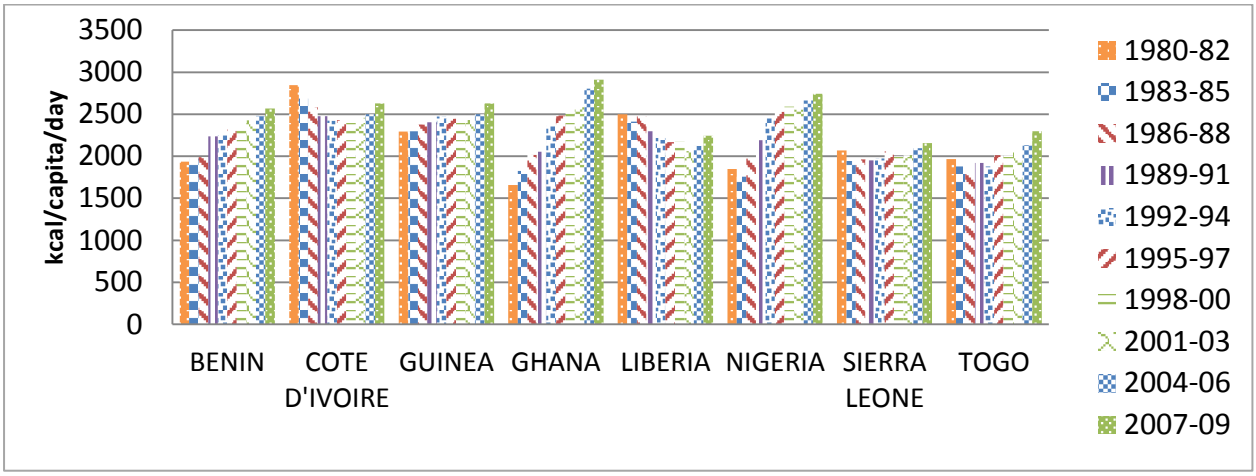
Source: Me-Nsope and Staatz (2013).

Figure 4.2B. Trends in Daily Calorie Supply per Capita, 1980-2009, in Inland Sahel



Source: Me-Nsope and Staatz (2013).

Figure 4.2C. Trends in Daily Calorie Supply per Capita, 1980-2009, in Coastal Non-Sahel



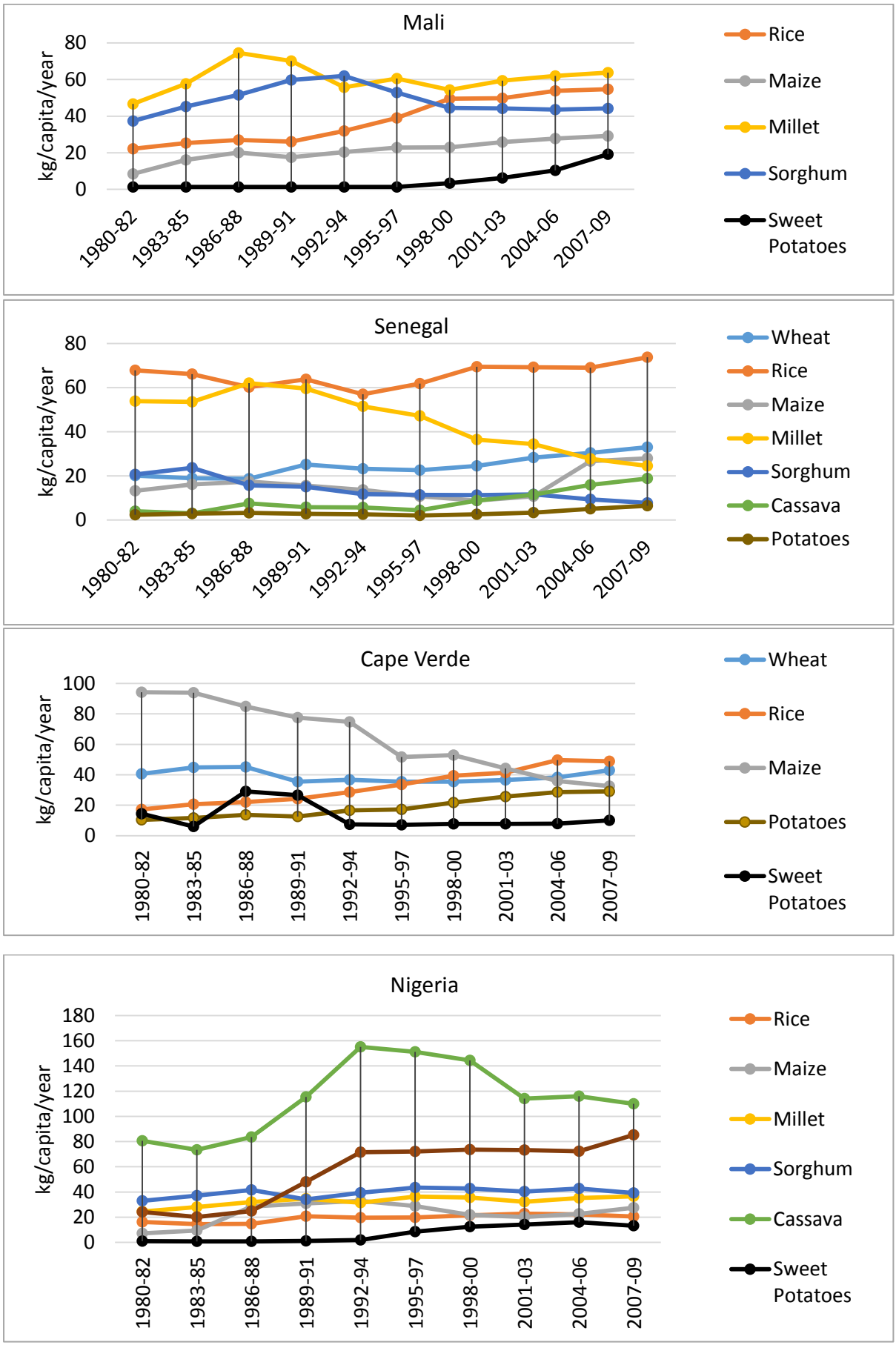
Source: Me-Nsope and Staatz (2013).

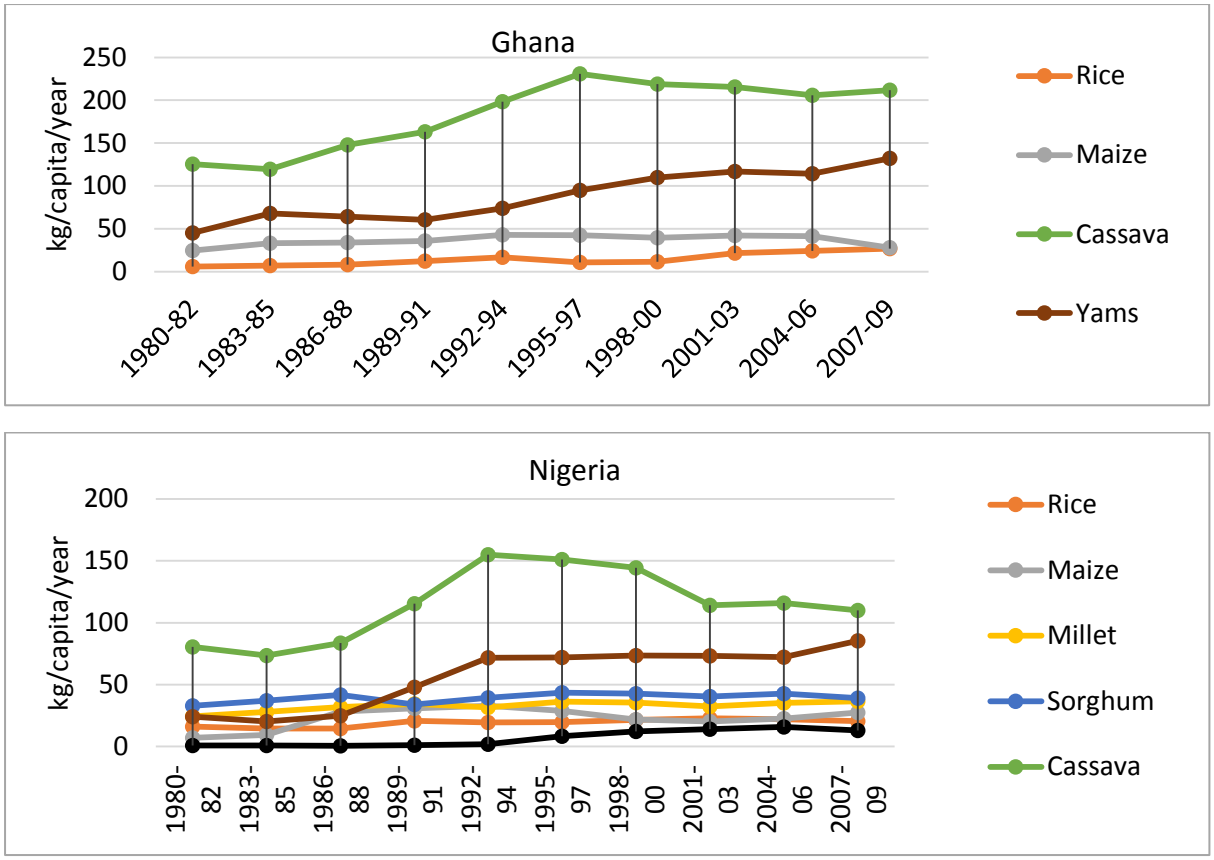
Table 4.4. Percentage Change in Food Availability by Major Food Group in the Period 1980-85 Compared to 2004-09, Selected Countries

Food Group	Inland Sahel		Coastal Sahel		Coastal Non-Sahel		
	Niger	Mali	Cape Verde	Senegal	Ghana	Nigeria	Côte d'Ivoire
Cereals Excl. Beer	3%	44%	-20%	-8%	57%	43%	-15%
Starchy R&T	-57%	729%	69%	247%	72%	117%	-2%
Sugar and Sweeteners	18%	213%	66%	-7%	425%	5%	-5%
Pulses	44%	113%	-27%	-39%	-33%	138%	-11%
Vegetable Oils	50%	45%	-56%	30%	55%	78%	15%
Fruits - Excl. Wine	93%	71%	21%	29%	72%	50%	-24%
Vegetables	170%	4%	106%	264%	79%	-2%	-9%
Meat and offal	12%	23%	777%	23%	22%	55%	-26%
Eggs	-100%	-100%	332%	100%	100%	-12%	0%
Fish and Seafood	218%	13%	300%	-24%	129%	34%	-62%
Milk Excl. Butter	-1%	0%	69%	16%	36%	-34%	-21%
Alcoholic Beverages	-67%	9%	-59%	-22%	26%	-10%	7%

Source: Me-Nsope and Staatz (2013). These figures were computed by comparing actual availability in kg/capita/year between the two periods and expressing the difference as a percentage of the base level. See Me-Nsope and Staatz (2013) and Me-Nsope (2014) for absolute quantities available (kg/cap/day).

Figure 4.3. Trends in Starchy Staples Availability, 1980-2009. Selected Countries





Source: Me-Nsope and Staatz (2013).

In Cape Verde, for example, there has been a replacement of maize with rice as the dominant type of cereal. Annual rice supply per capita increased by 60 kg over the period 1980-85 to 2004-09. In spite of the increase in rice availability, however, in key coastal countries (Nigeria, Ghana, and Sierra Leone), starchy R&T remain dominant. The increase in the availability of starchy R&T since the early 1980s has been due in part to the cassava revolution (Nweke, Spencer, and Lynam 2002). The growth in per capita availability of cassava (e.g., Senegal) and sweet potatoes (e.g., Mali) most likely reflects the lower-income population shifting towards cheaper calorie sources. Yam availability per capita also showed huge increases in some Coastal Non-Sahelian countries (e.g., Ghana and Nigeria) during the study period, although part of this increase may be due to better reporting over time on R&T production. Data also reveal positive growth in the supply of Irish potatoes in some countries (e.g., Cape Verde and Senegal). This growth likely reflects a westernization of diets among some segments of the population (increased consumption of potato chips/French fries). The FBS data also indicate a striking growth in per capita availability of maize in the Sahel (Burkina Faso, Mali, and Senegal).

Although food availability is only one dimension of food security, rising starchy staple availability has likely had a positive impact for food security in the region. Overall, the data from the FBS reveal that shifts in apparent consumption among starchy staples in WA have been much more diverse than simply rice and wheat substituting for traditional staples, as policy debates would often lead one to believe. The *rice and wheat* story is really a rice, wheat, cassava, yams, and maize story, with important variations among countries.

Trend in Dietary Quality

The quality of a diet is measured by its nutrient composition. Me-Nsope and Staatz (2013) and Me-Nsope (2014) analyzed the macronutrient (fat and protein) composition of the diet to determine if there had been any improvements in the quality of the diet during the study period. They found that in addition to the increases in F&V availability discussed above, total daily fat and protein supplies per capita have been increasing for most countries since the early 2000s.

Figure 4.4 shows a breakdown of protein supply per capita, by source (animal, pulses, and other vegetal/plant), for selected countries in West Africa. Protein quality is measured by the balance of essential amino acids within the protein. Proteins from animal sources often have a better balance of these essential amino acids than do proteins from plant sources. There are, however, several exceptions to this generalization. Grain legumes, for instance, not only contain at least three times as much protein per gram as maize (the most commonly consumed staple in Sub-Saharan Africa), but unlike maize, they also contain most of the essential amino acids (de Jager 2013).

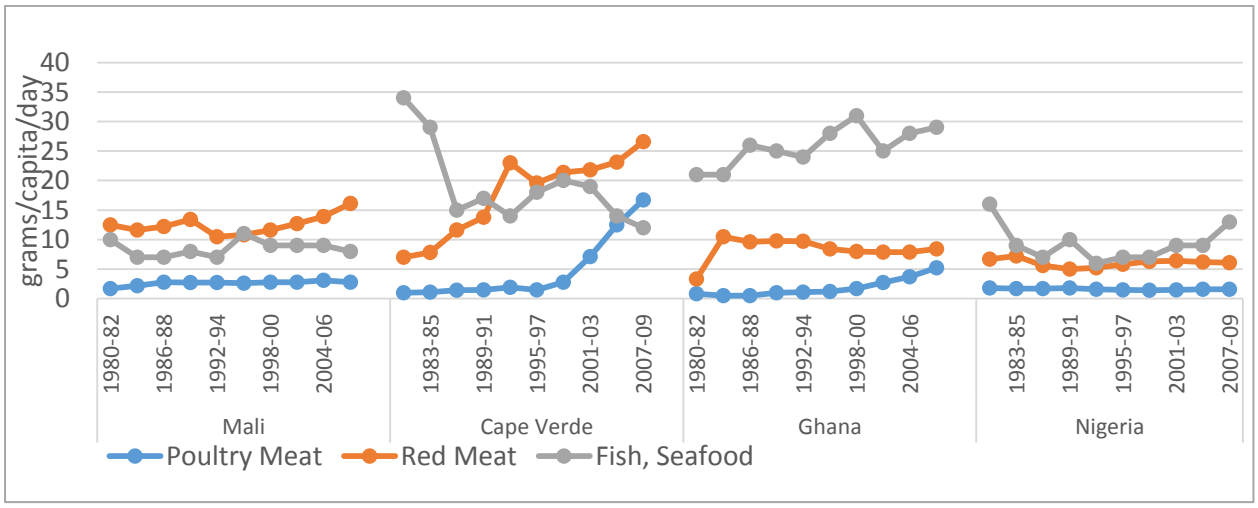
Figure 4.4. Trends in Per Capita Supplies of Protein from Various Sources (GM/Capita/Day)

Source: Me-Nsope and Staatz (2013)

Protein from plant sources clearly dominates the total protein supply in the entire region. Some countries in the region (e.g., Niger, Sierra Leone, Nigeria, and Cape Verde) derive an important share of vegetable protein from pulses, a source of high-quality protein. Nonetheless, the animal protein supply increased for most countries between 1980 and 2009. The growth in the supply of animal protein was particularly striking in countries that experienced rapid economic growth, such as Ghana and Cape Verde. Countries with modest economic growth, such as Mali, showed modest changes in the supply of animal protein over time. Countries that have been through civil disruption, such as Liberia and Sierra Leone, showed significant declines in total protein and animal protein supply during periods of war.

The distribution of animal protein by source in selected countries in WA (Figure 4.5) shows that red meat remains an important source for the inland Sahelian countries, such as Mali. Red meat has also become increasingly important in Cape Verde, which experienced rapid economic growth over the 1980-2009 period and seen a substitution of red meat for fish in the diet. Fish and seafood remain the dominant source of animal protein for most of the other coastal countries. The rate of growth in poultry supply per capita was also quite large for most countries in the region—from 45% in Togo to 1246% in Cape Verde, between 1980-85 and 2004-09. Most of the increase in poultry meat supply came from imports.

Figure 4.5. Composition of Animal Protein by Source in Selected ECOWAS Countries



Source: Me-Nsope and Staatz (2013).

Trend in the Macronutrient Composition

According to FAO (2000), the healthy range of macronutrient intake (a balanced diet), expressed as a percent of total energy, can be broad: 55-75% from carbohydrates, 15-35% from fats, and 10-15% from proteins. The FBS data reveal that the share of carbohydrates, fats, and proteins in total DCS did not change much for almost all the countries over the period 1980-85 to 2004-09.

While most countries meet and even exceed the World Health Organization (WHO) and FAO recommended daily allowance (measured as shares) for carbohydrates, the share of protein in daily energy continues to remain close to the lower bound of the recommended daily value.

This does not imply, however, that dietary quality has stagnated over time, as some countries have experienced both growth in the supply of protein in absolute terms and greater availability of animal protein and pulses.

4.5. Conclusions and Policy Implications

Food balance sheet data indicate growth and diversification of per capita availability of foods consistent with what one would expect as a result of the region's growing economies and rapid urbanization. These patterns include greater per capita daily availability of calories and of starchy staples, a diversification in starchy staples availability, and improvements in the quality of the diet in terms of animal protein, pulses, fruits, and vegetables over time.

Policies to develop agricultural markets should take into account the diversification in the composition of food consumption rather than focus, as they often have in the past, mainly on cereals and other starchy staples. Many of the products concerned—livestock products, fish, fruits, and vegetables—are perishable and therefore require more sophisticated and tightly coordinated marketing systems and key investments such as cold chains to link West African producers effectively to these growing demands. The good news is that if such systems can be developed, the production, processing and marketing of these products is much more labor-intensive than cereal production, offering the opportunity to create new job opportunities for West Africa's burgeoning labor force.

These trends need to be interpreted cautiously, as some of the apparent changes in per capita food availability (particularly for non-cereals) reflected in the FBS may be an artifact of improved coverage over time of national agricultural statistical systems that generate the production figures used in the FBS. Bearing this caveat in mind, the findings described above document a dramatic evolution in the levels and composition of per capita food availability that have accompanied changes in structural factors such as urbanization, increases in per capita incomes and civil strife.

It is important to note, however, that FAO's FBS data only report national average figures of per capita food availability. These national averages do not capture differences in consumption that are due to income inequalities or regional or location-specific differences in food availability. Chapter 5 of this publication analyzes household-level demand for cereals in Mali. Specifically, the chapter presents estimations of household-level cereals demand parameters by per capita income groups (low, middle and high) and by rural and urban residence. The results illuminate the importance of taking into consideration such differences in understanding food consumption behavior.

References

Diagana, B., F. Akindès, K. Savadogo, T. Reardon, and J.M. Staatz, 1999. Effects of the CFA Franc Devaluation on Urban Food Consumption in West Africa: Overview and Cross-Country Comparisons. *Food Policy* 24:5: 465-478.

De Jager, I. 2013. "Literature Study: Nutritional Benefits of Legume Consumption at Household Level in Rural Areas of Sub-Saharan Africa." *N2Africa.* On line publication accessed in 2016 at http://www.n2africa.org/sites/n2africa.org/files/images/images/N2Africa_Nutritional%20benefits%20of%20legume%20consumption%20at%20household%20level%20in%20rural%20areas%20of%20sub-Saharan%20Africa.pdf.

FAOSTAT. 2015. Food Balance Sheets. http://faostat3.fao.org/download/FB/FBS/E.

FAO. 2000. The State of Food Insecurity in the World 2000. Rome: FAO. http://www.fao.org/FOCUS/E/SOFI00/img/sofirep-e.pdf

Farnsworth, C. Helen. 1961. Defects, Uses, and Abuses of National Consumption Data. *Food Research Institute Studies* II.3: 179-201.

Hollinger, F. and J.M. Staatz. 2015. Agricultural Growth in West Africa: Market and Policy Drivers. Rome: FAO and the African Development Bank. http://www.fao.org/3/a-i4337e.pdf.

Lopriore, C. and E. Muehlhoff. 2003. Food Security and Nutrition Trends in West Africa - Challenges and the Way Forward. Paper prepared for the 2nd International Workshop on Food-Based Approaches for A Healthy Nutrition. 23-28 November, 2003. Ouagadougou, Burkina Faso.

Me-Nsope, N.M. 2014. Trends and Determinants of Food Consumption Patterns in West Africa. Chapter 2. Ph.D. Dissertation, Michigan State University.

Me-Nsope, N.M. and Staatz, J.M. 2013. *Trends and Determinants of Food Consumption Patterns in West Africa*. Michigan State University International Development Working Paper No 130. E. Lansing, MI: Michigan State University.

Nweke, F.I., D.S.C. Spencer, and J.K. Lynam. 2002. *The Cassava Transformation: Africa's Best Kept Secret.* East Lansing: Michigan State University Press.

Petrovici, D.A., C. Ritson, and M. Ness. 2005. Exploring Disparities and Similarities in European Food Consumption Patterns. *Cahiers d'économie et sociologie rurales* 75. http://www.inra.fr/esr/publications/cahiers/pdf/petrovic.pdf.

Regmi, A. and J. Dyck. 2001. Effects of Urbanization on Global Food Demand. In *Changing Structures of Global Food Consumption and Trade*, ed. A. Regmi. Washington, DC: USDA, ERS. https://www.webharvest.gov/peth04/20041030184909/http://www.ers.usda.gov/publications/wrs011/wrs011e.pdf.

Serra-Majem, L., D. MacLean, L. Ribas, D. Brulé, W. Sekula. R. Prattala, R. Garcia-Closas, A. Yngve, M. Lalonde, and A. Petrasovits. 2003. Comparative Analysis of Nutrition Data from National, Household, and Individual Levels: Results from a WHO-CINDI Collaborative Project in Canada, Finland, Poland, and Spain. *Journal of Epidemiology and Community Health* 57: 74–80 (doi:10.1136/jech.57.1.74).

Smith, L.C. and L. Haddad. 2000. *Explaining Child Malnutrition in Developing Countries: A Cross-Country Analysis*. International Food Policy Research Institute Research Report No. 111. Washington, DC: IFPRI.

Timmer, C.P., W.D. Falcon, and S.R. Pearson. 1983. *Food Policy Analysis*. Baltimore: Johns Hopkins University Press for the World Bank.

UNDESA (United Nations, Department of Economic and Social Affairs, Population Division). 2014. World Urbanization Prospects: The 2014 Revision, CD-ROM Edition.World Urbanization Prospects: The 2014 Revision, CD-ROM Edition. http://esa.un.org/unpd/wup/CD-ROM/.

UNEP (United Nations Environmental Programme). 2002. Western Africa. Chapter 5. In *Africa Environment Outlook: Past, Present and Future Perspectives*, ed. Geoffrey Bird, Jacquie Chenje, and Sarah Medina. Nairobi, Kenya: UNEP.

CHAPTER 5

Changing Food Consumption Patterns: Household Budget-Consumption Study Analysis

Évolution des habitudes de consommation alimentaire : Analyse des études budgets-consommation des ménages

Nathalie M. Me-Nsope and John M. Staatz

Abstract

This chapter summarizes evidence of changing food consumption patterns in West Africa from the perspective of household budget surveys (HBS). It presents results from two budget-consumption studies. The first was carried out jointly by the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) and Michigan State University (MSU). This study used data from HBS conducted in eight West African countries to describe how food consumption patterns changed between the late 1980s/early 1990s and the 2000s as per capita incomes and the urban populations grew. The second study was an econometric analysis of demand in Mali for rice, millet, sorghum, and maize in rural and urban areas and by income groups, based on Mali's 2006 HBS. This study also measured the effects on consumers' welfare of the cereals price shocks of the late 2000s. The ReSAKSS/MSU analysis revealed a diversification of diets over time, whereby non-traditional staples are emerging as important contributors to the diet—e.g., growth in the consumption of roots and tubers in the Sahelian countries (where, nonetheless, cereals remain the dominant calorie source) and an increase in the share of the food budget allocated to animal products. Roots and tubers still account for major shares of the food budget in the coastal countries. The econometric analysis revealed some substitution between rice and coarse grains in both rural and urban areas and across income groups, suggesting a scope to encourage ongoing diversification of staple food sources to give consumers more opportunity for substitution and choice. Price transmission across cereals suggests a need for a cereals policy rather than just, for example, a rice policy. The results suggest strong future growth in demand for food products and a need to focus on driving down unit costs throughout the food system. The analysis of the effect on consumer welfare of the food price shocks of the late 2000s revealed that in both rural and urban areas, the relative income loss from observed price changes was greater for poorer than richer households, but the absolute income loss was greater for the higher income groups.

Résumé

Ce chapitre résume les changements sur l'évolution des habitudes alimentaires en Afrique de l'Ouest obtenus à partir de sondages sur les budgets des ménages. Il présente les résultats de deux études budget-consommation. La première a été menée par le Système régional d'analyse stratégique et de gestion des connaissances [Regional Strategic Analysis and Knowledge Support System, ReSAKSS] et l'Université d'État du Michigan [Michigan State University, MSU]. Cette étude a utilisé les données des sondages sur les budgets des ménages réalisés dans huit pays d'Afrique de l'Ouest pour décrire l'évolution des modèles de consommation alimentaire entre la fin des années 1980/début des années1990 et les années 2000 parallèlement à la progression du revenu par habitant et de la population urbaine. La seconde étude est une analyse économétrique de la demande de riz, de mil, de sorgho et de maïs au Mali, en zone rurale et urbaine et par catégorie de revenus, basée sur des sondages sur les budgets des ménages au Mali en 2006. Cette étude a mesuré aussi l'effet des chocs des prix céréaliers sur le bien-être des consommateurs à la fin des années 2000. L'analyse ReSAKSS/MSU a révélé une diversification des régimes alimentaires au fil du temps avec des produits alimentaires non traditionnels qui émergent comme importants contributeurs au régime alimentaire—par exemple, l'augmentation de la consommation de racines et de tubercules dans les pays du Sahel (où les céréales restent néanmoins la principale source de calories) et la hausse de la part du budget alimentaire allouée aux produits animaux. Les racines et les tubercules représentent encore des parts importantes du budget alimentaire dans les pays côtiers. L'analyse économétrique a constaté une substitution partielle du riz par des céréales secondaires dans les zones rurales et urbaines et pour toutes les catégories de revenus, ce qui semble indiquer une tendance à la promotion en cours de la diversification des sources de denrées alimentaires afin d'offrir aux consommateurs une plus grande facilité de substitution et de choix. Une transmission des variations de prix sur les céréales suggère le besoin d'une politique sur l'ensemble des céréales plutôt, par exemple, d'une politique spécifiquement sur le riz. Les résultats semblent indiquer une forte croissance de la demande de denrées alimentaires dans les années à venir et le besoin de se focaliser sur la baisse des coûts unitaires dans l'ensemble de la chaine alimentaire. L'analyse de l'effet des chocs alimentaires de la fin des années 2000 sur le bien-être des consommateurs a démontré qu'en zone rurale comme urbaine, la perte relative de revenu due à la fluctuation des prix constatée était plus grande dans les ménages défavorisés que dans les ménages plus aisés. Cependant, la perte de revenu en termes absolus était plus forte dans les catégories de revenus les plus élevées.

5.1. Introduction

Analyses of food balance sheets (FBS), such as those presented in Chapter 4, are often a good starting point for understanding shifts and major drivers of food consumption patterns, but they are based solely on changes in the average national per capita availability of different foods. The FBS data fail to disaggregate food supply by income class, nor do they provide information on the distribution of food availability geographically within a country. For a full understanding of food consumption shifts, and the factors driving such shifts, aggregate-level FBS analyses need to be complemented with an analysis of food demand using household-level data.

Food demand analysis using household-level data allows for the inclusion of household-level economic and socio-demographic characteristics that influence food demand. Further, the

interest of this type of analysis lies in the estimation of income and price elasticities of demand. These *demand parameters* measure how differences in the distribution of income across households, price changes resulting from variations in food supply, and differences in taste and preferences across regions influence food demand. Knowledge of these elasticities, combined with information about different households' current levels of food availability, enables identification of those households that are most vulnerable to sharp drops in their food intake because of price spikes or reductions in their incomes (e.g., due to a drought or other economic crisis). Such information is needed for a much precise understanding of food security problems, in designing programs that target food assistance efficiently, and in evaluating the effect of various trade and food policies and other targeted programs to alleviate food insecurity.

In spite of these advantages of household-level demand analysis, data limitations and the paucity of household-level estimates of food demand parameters (income- and price-elasticities of demand) in West Africa (WA) have severely limited understanding of consumer responses to changes in the conditions that determine food demand in the region. The need for good estimates of household-level food demand parameters was highlighted by the 2007-2008 global food crisis. The main symptom of the crisis was an upsurge in international prices for staple foods such as maize, wheat, and rice. The spike in the prices of these cereals caused great concern in WA, where historically cereals have represented a large share of total household consumption in the Sahelian countries. Furthermore, approximately 20% of the domestic cereal supply in the region originates from imports, making changes in international grain prices major considerations in food security strategies (Hollinger and Staatz 2015). A key preoccupation for policy makers in times of crisis such as in 2007-2008 is to understand how different consumer groups are responding to price and income shocks. Reliable estimates of food demand parameters differentiated by consumer groups therefore become critical in designing policies and programs to reduce the effects of the shocks on consumer welfare.

5.2. Literature Review and Knowledge Gap

Economic theory predicts that the demand for goods will respond to changes in factors that are popularly referred to as *demand shifters*. At the household-level, common food demand shifters include relative prices, income, and taste and preferences. In addition to these factors, household demographic characteristics (such as household size and its age and sex composition) and place of residence may also influence food demand.

Households of different income levels typically devote different shares of their income to food. A widely observed phenomenon, which economists refer to as Engel's Law, is that the proportion of income spent on food declines as incomes increase, even if absolute expenditures on food rise. The demand for food also typically responds differently to changes in income depending on the household's level of income; it is widely, if not universally, acknowledged that richer households are likely to spend proportionally less of any increment to income on food than are poorer households (Alderman 1986). Thus, designing effective food policy requires demand parameters differentiated by income groups.

A household's demand for a particular food item also typically responds to changes in the price of the item. Over the years, West Africa has been through a series of policy shifts such as the Structural Adjustment Programs of the 1980s and 1990s, the 1994 CFA franc devaluation, and

policy reactions to the 2008 global spike in food prices. Associated with all these policy shifts have been changes in relative prices, which in turn have resulted in concerns about how consumers' demand for different foods is affected by the changes.

Specifically, the 1980s and early 1990s were characterized by rapidly increasing imports to meet household food grain needs, a phenomenon that was often attributed to the declining competitiveness of WA food production relative to other producers in the world. A leading research agenda during this period focused on understanding whether rapid growth in the consumption of imported rice and wheat in the region resulted from low world rice and wheat prices relative to those of locally produced millet and sorghum. A key finding was that the rising consumption of imported grains was not driven primarily by changes in relative cereal prices but rather by the greater convenience in the preparation and consumption of the imported goods (Reardon, Thiombiano, and Delgado 1988; Delgado 1989; and Rogers and Lowdermilk 1991).

In 1994 came the devaluation of the CFA franc, the common currency of eight West African countries. An intended consequence of the devaluation was to raise the costs of imports relative to domestic goods and reverse the trend in cereal demand from imported to locally produced grains. Consumption studies conducted following the devaluation, therefore, sought to examine whether, as intended, the resulting higher price of imported rice relative to traditional coarse grains stimulated substitution away from the former. Evidence from studies conducted in urban Mali, Burkina Faso, Senegal, and Cote d'Ivoire suggested low rates of substitution of local coarse grains for imported rice and instead a reduction in total cereal intake (Diagana et al. 1999). The lack of such a shift was attributed to the lackluster supply response of the coarse grain sectors and the resilience of rice demand based on its convenience of processing and preparation for the urban consumer.

The 2007-2008 global food crisis brought renewed attention to food consumption patterns. Again, policy makers sought to understand the extent to which the grain price hikes in the international markets were transmitted to local markets (see Chapter 8 in this volume), the corresponding effect on food demand, and the food security status of West African households. A prompt analysis of the effect of the global price hikes on the food security status of West African households was initially limited by the lack of availability of consistent estimates of food demand parameters in the region. A few attempts (e.g., Joseph and Wodon 2008) were made to understand the effects of the price hikes, but the approaches employed were severely circumscribed by data availability.

To fill this knowledge information gap, in 2011, the Syngenta Foundation funded a joint study conducted by the West African Regional Strategic Analysis and Knowledge Support System (ReSAKSS) and Michigan State University (MSU). The main objective of this study was to use existing budget-consumption data for eight countries in West Africa to understand how food consumption patterns had changed over time with increased per capita incomes and the growth in urban population. Using two budget surveys for each of the countries (Mali, Senegal, Burkina Faso, Niger, Ghana, Togo, Ivory Coast, and Benin), one collected in the late 1980s or the early 1990s and the other in the 2000s, the study examined the following for each country: (i) the evolution in the share of food in total expenditure; (ii) the evolution in food expenditure share by product type, income, and place of residence; and (iii) how food demand prospects were likely to change as a result of changes in per capita income and by place of residence—

the marginal propensity to consume (MPC) in response to a marginal increase in per capita income. The findings from the Regional Strategic Analysis and Knowledge Support System/Michigan State University (ReSAKSS/MSU) study are reported in Taondyandé and Yade (2011, 2012).

Coming a decade after the Diagana et al. (1999) study, the ReSAKSS/MSU study was very useful in providing up-to-date evidence of changing food consumption patterns for several West African countries. Nevertheless, the ReSAKSS/MSU study was limited in the sense that the study did not control for price variation across the sample, and hence, failed to examine the impact of food prices on food demand, information that is essential in times of crisis.

Thus, to build on the ReSAKSS/MSU study, a multivariate econometric analysis of cereals demand in Mali was conducted with funding from the Syngenta Foundation to investigate the combined effects of prices, income and household characteristics on food demand in that country. The parameters of the multivariate food demand analysis (own- and cross-price elasticities and income elasticities of demand) were expected to be useful for characterizing the nature of the demand for different food items, computing the effects on consumers' welfare of price shocks, classifying households per their level of vulnerability to food price shocks, and making enlightened suggestions for food security policy. The findings from the multivariate analysis are reported in detail in Me-Nsope (2014) and Me-Nsope and Staatz (2016).

The choice of Mali for the multivariate analysis was first motivated by the paucity of a complete set of food demand parameters for Mali. Prior to the ReSAKSS/MSU study, only two other studies provided statistical evidence of food demand parameters in Mali based on household-level data. Rogers and Lowdermilk (1991), using household-level data from the 1980s and a single equation model, investigated food consumption patterns of different income classes in urban areas of Mali. Camara (2004) used an Almost Ideal Demand Systems (AIDS) model to investigate the impact of seasonal changes in real incomes and relative prices on households' consumption patterns in Bamako. She found that Bamako households' consumption patterns were responsive to changes in real incomes and relative prices in any given season and that there were seasonal changes in income- and price-responsiveness for all commodities.

The second factor that motivated the choice of Mali for the multivariate econometric analysis was the availability of good quality price data for the basic food commodities identified in the household-level budget consumption survey (HBS) data. The HBS data were collected in 2006 through a survey known as the *Enquête Légère Intégrée auprès des Ménages (ELIM)-2006*. While the ELIM-2006 dataset by itself does not contain information on the prices paid by individual households for most goods, price data for cereals for the regions surveyed by the ELIM-2006 were available from Mali's *Observatoire du Marche Agricole* (OMA), the office responsible for collecting agricultural price data. Cereals prices from OMA were therefore integrated into the ELIM-2006 database.

The demand parameters estimated from the ELIM-2006 data served as the basis for calculating the impacts on consumers' welfare of food price changes. In West Africa, the approaches used in measuring the effects on consumer welfare of food price shocks in the past have been circumscribed by the availability of good demand parameters. In Mali, for example, Joseph and Wodon (2008), using food consumption expenditures data for Mali (ELIM-2006), assessed the short-term impact on poverty of the increase in the price of cereals. To overcome the

limitations in data and the availability of good demand estimates, they made the following assumptions: i) an increase in the price of a food translates into an equivalent reduction of its consumption in real terms, meaning that they do not take into account the own-price or cross-price elasticities of demand that may lead to substitution effects; ii) relative prices remain constant and there is low substitution of millet, sorghum, and maize for rice and wheat on the grounds that these products are important in the Malian diet, and, therefore, their prices will increase in parallel at least in the medium term; and iii) changes in prices do not affect households when food is home-produced and consumed. Nouve and Wodon (2008) extended the work done by Joseph and Wodon (2008) and in a dynamic general equilibrium framework estimated the medium-term impact of higher rice prices in Mali on poverty. They compared a base scenario to six different scenarios that combine rice price changes and policy responses (import tax cuts on rice and measures to increase productivity of domestic rice production). They found that considering either an 80% or a 110% increase in international rice prices from the level in 2006, a 15% increase in productivity of domestic rice production would have a larger impact than a 100% reduction in rice import taxes.

Me-Nsope (2014) and Me-Nsope and Staatz (2016) made three important contributions to the existing evidence of food demand in Mali. First, the studies used a large nationwide dataset to provide first-time estimates of price and income elasticities of demand for cereals for rural Malian households in addition to urban estimates. Previous estimates of food demand parameters in Mali covered only the urban areas (Rogers and Lowdermilk 1991; Camara 2004). Second, the studies specified a Quadratic Almost Ideal Demand System (QUAIDS) model for cereals in Mali. The choice of a QUAIDS model was prompted by the results of a test for model specification. Unlike its popular predecessor, the AIDS model, the QUAIDS model allows for non-linearity in household expenditure shares (Banks, Blundell, and Lewbel 1997). Third, using the demand elasticities estimated from the QUAIDS model, the authors measured the welfare effects of cereals price changes observed in the period 2008-2011 by means of an indicator, the proportional compensating variation (CV)—defined in section 5.3 below—that allows for second-order demand responses (direct and substitution effects).

This chapter summarizes household-level evidence of changing food demand patterns in the region of WA, drawing on the results of the joint ReSAKSS-MSU study (Taondyandé and Yade (2011, 2012) and the econometric analysis carried out by Me-Nsope (2014) and Me-Nsope and Staatz (2016).

5.3. Data and Methods

Data

The ReSAKSS/MSU study used a descriptive approach and data from two household budget surveys (HBS) each for Mali, Senegal, Burkina Faso, Niger, Ghana, and Côte d'Ivoire–one collected in the 1980/90s and the other in the 2000s–and one each for Benin and Togo.[1] Each HBS reported expenditure for major household consumption items and categories. The study examined for each country: (i) the share of food in total expenditure; (ii) the evolution in food

[1] The dates of the HBS were as follows: Benin (2007), Togo (2006), Burkina Faso (1994, 2009), Côte d'Ivoire (1993, 2008), Ghana (1992 and 2006), Mali (1989, 2006), Niger (2005, 2008), and Senegal (1994, 2002).

expenditure share by product type, income and place of residence; and (iii) how food demand prospects would likely change as a result of changes in per capita income and place of residence (rural vs urban). Specifically, the study estimated, for both rural and urban residents, the additional demand for food (MPC) created by a small increase in per capita income.

Me-Nsope (2014) and Me-Nsope and Staatz (2016) used one of the two HBS datasets for Mali that was also used in the ReSAKSS/MSU study, the ELIM-2006. The ELIM-2006 data covered a total of 4,494 Malian households (of which 1,566 were urban and 2,888 were rural) in all nine regions of the country (Koulikoro, Segou, Sikasso, Gao, Kayes, Kidal, Mopti, Tombouctou, and the district of Bamako). ELIM-2006 collected data on household socio-demographic characteristics and food and non-food expenditures. The study measured total consumption expenditure on each food type as the sum of the value of consumption from own-production, purchases, and net gifts received. Total household expenditure on all items was used as a proxy for household income. The ELIM-2006 survey did not collect data on commodity prices. Me-Nsope (2014) therefore imported price data from an external source (OMA) to allow for the estimation of price elasticities of demand.[2]

Table 5.1 presents summary statistics of the data used in this econometric analysis. Average total consumption expenditures were higher for the urban than for the rural sub-sample. Irrespective of the place of residence, the data reveal a declining share of total expenditures going to food as one moves from the low-income to the high-income group (Engel's law). The share of cereals in the food budget also decreased from the low- to the high-income group within each place of residence. This suggests that the lower-income groups were more focused on ensuring adequate calorie intake from these carbohydrate sources, while higher-income groups, which likely had sufficient calorie intake, focused more on diet diversification. An examination of shares by cereal types, by income group and place of residence reveals that in both rural and urban areas, the share of the cereal expenditures going to rice increased with income level while that going to millet and sorghum fell.

Empirical Formulation and Estimation of the Cereals Demand Model

To simplify the modeling of consumption decisions, Me-Nsope and Staatz (2016) made the following assumptions in the specification of the cereals demand model. First, they assumed weak separability of consumer preferences, whereby the consumer's decision-making process is viewed as involving three stages. In Stage I, households allocate their total budget between food and non-food items. Conditional on the first stage allocations, in Stage II, households allocate food expenditure between cereals and non-cereal items. In Stage III, conditional on the second stage allocations, households allocate cereal expenditures to rice, maize, millet, and sorghum. Only the results of the third stage estimation are presented in this chapter.

[2] A question that often emerges in the analyses of household food demand using cross-sectional survey data is whether cross-sectional variations in prices can be used to derive a complete system of own- and cross- price elasticities. For a discussion of this issue and the justification for approached used here, see Me-Nsope (2014) and Me-Nsope and Staatz (2016).

Table 5.5. Summary Statistics of the ELIM-2006 Data

Variable	Urban			Rural		
	Income Tercile#			Income Tercile#		
	Low	Middle	High	Low	Middle	High
Annual Average Total Consumption Expenditure CFAF						
Per household	1,375,659 (41,759)	2,624,424 (72,556)	5,119,698 (160,300)	803,385 (16,050)	1,235,347 (23,403)	1,948,274 (53,820)
Per Adult Equivalent	197,931 (66,633)	423,478 (91,306)	1,089,084 (647,004)	99,421 (28,915)	177,400 (28,529)	362,015 (235,838)
Average Annual Expenditure Per Household CFAF						
Food	723,552	1,039,077	1,218,093	480,024	729,176	906,493
Non food	652,107	1,585,347	3,901,605	323,361	506,172	1,041,782
Food shares	0.53	0.41	0.26	0.60	0.59	0.47
Average Annual Expenditure CFAF Per Household						
Cereals	286,519	368,221	306,188	221,952	341,857	377,647
Non-cereals	437,032	670,856	911,905	258,073	387,319	528,845
Average Annual Expenditure CFAF Per Adult Equivalent##						
Cereals	42,209	59,842	63,021	27,997	49,809	70,574
Non-cereals	64,643	113,756	192,009	32,455	58,405	101,147
Cereals share	0.4	0.35	0.25	0.47	0.48	0.43
Average Annual* Expenditures CFAF Per Adult Equivalent (AE)						
Rice	24,491	39,866	42,734	7,890	18,134	32,166
Millet	10,255	11,858	12,705	11,557	17,321	20,580
Sorghum	4,325	4,778	4,202	5,523	8,751	10,958
Maize	3,137	3,339	3,380	3,027	5,603	6,870
Shares in Cereal Budget						
Rice	0.57	0.64	0.65	0.27	0.36	0.46
Millet	0.24	0.19	0.19	0.43	0.35	0.29
Sorghum	0.11	0.1	0.08	0.18	0.17	0.16
Maize	0.09	0.07	0.08	0.11	0.12	0.1
Average Household size	8.2			9.6		
Average HH AE	6.2			7.0		
Household Head						
Percent Male-	88.8			95.5		
Percent Female	11.2			4.5		

Source: Me-Nsope and Staatz (2016).

Notes: # Income terciles are calculated based on total per capita expenditures and are calculated separately for urban and rural areas. Exchange rate: 540.5 CFAF = US$1.00; ## Adult equivalents (AE) were calculated using the following scale: male > 14 years = 1.0; female > 14 = 0.8; children = 0.5 (Boughton 1994).

* includes the value of consumption from own-production; and figures in parenthesis are the standard errors of the mean.

Second, given data limitations, it was not possible to classify households as net buyers or net sellers of specific cereals, only of all cereals as an aggregate. It was therefore impossible to measure the impact on rural households of increases in their purchasing power arising from price increases of specific cereals, such as rice, which could offset the impact of such higher prices on the household's cereal consumption. The impact of this omission is likely small, as most rural households in the sample were net buyers of cereals.

Third, the analysis also assumes that a household's consumption of a specific cereal from its own-production is responsive to changes in market prices. While cereals are major staples in Mali, it is not uncommon for a cereal-producing household to sell one type of cereal, e.g., rice, and buy back a cheaper cereal, such as maize, in the event of a price hike.

Fourth, unlike most existing models of food demand in Mali, which assume linearity in the expenditure function and therefore specify the food demand function using the AIDS model, Me-Nsope (2014) conducted a formal test for model specification to determine the appropriate shape of the Engel Curve.3 Using the parametric quadratic expenditure specification test developed by Bopape (2006), she found evidence supporting the use of the QUAIDS model proposed by Banks, Blundell, and Lewbel (1997).4 As a complete demand system, the QUAIDS specification allows for non-linearity in the budget shares, thereby permitting an estimation that consistently accounts for the interdependence in the choices made by households among different cereals. In addition, this specification allows more flexibility—expenditure elasticities differ with expenditure levels, which could be a significant advantage in welfare analysis (Bopape 2006).

Fifth, to obtain unbiased and efficient price elasticities, the final QUAIDS model was specified to handle two most common econometric issues that arise when cross-sectional data are used to estimate elasticities–expenditure endogeneity and zero-expenditure.[5]

In order to measure the welfare effects on households of changes in cereal prices, Me-Nsope and Staatz (2016) computed a measured called the proportional compensating variation, or CV. The CV is adapted from de Janvry and Sadoulet (2008). The idea is that using a set of reference prices, one can compute how better-off or worse-off households are as a result of the price changes, moving from their initial utility level to a new utility level in response to the changes in cereals prices. The CV is the difference between the minimum expenditure required to achieve the original utility level at the new prices and the expenditure made at the old (initial) price level–i.e., the amount of money the household would need to be given at the new set of (higher) prices in order to maintain its original level of utility. Initial values for prices, expenditures, and budget shares were derived from the survey data collected in 2006 (the ELIM-2006).[6]

[3] The Engel curve measures how food expenditures change as income changes. The AIDS model assumes a linear Engel curve–i.e., that rate of change of demand for different foods is a fixed proportion of the rate of change of income across all income groups. This is unlikely to be true in reality; the QUAIDS model used here allows the demand for different foods to vary as incomes grow–i.e., for the Engel curve to be nonlinear.

[4] For detailed results of the tests, see Me-Nsope 2014.

[5] For details, see Me-Nsope 2014.

[6] See Me-Nsope and Staatz 2016 for details on the calculation of this welfare measure.

5.4. Results

We begin this section by presenting the major findings from the ReSAKSS/MSU study of the evolution in food consumption patterns between the late 1980s and the 2000s as presented in Taondyandé and Yade (2011, 2012). This is followed by a summary of the results from the econometric analysis of cereals demand in Mali presented in Me-Nsope (2014) and Me-Nsope and Staatz (2016).

Descriptive Analysis of Household Expenditure Patterns in West Africa

The analysis of the share of total household expenditures going to food reveals that food expenditures continue to represent an important share of the total consumption budget across all countries included in the analysis and across time. Based on HBS data collected in the late 1980s and early 1990s, the share of food in total household consumption expenditure ranged from 42% (in Côte d'Ivoire) to 50% (in Mali and Burkina Faso). HBS data collected in the 2000s from these same countries revealed that the food share in total consumption expenditures ranged from 39% in Côte d'Ivoire (2008) to 62% in Benin (2007). Still based on HBS collected in the 2000s, in five of the eight countries studied, the share of food in total household budget was greater than 50%. Comparing food budget shares from HBS collected in the late 1980s and early 1990s to those collected in the 2000s, the study found that the share of food in the total consumption budget had increased in some countries (Burkina Faso and Senegal) but decreased in others (Côte d'Ivoire and Mali). The changes in food share observed in some of these countries may be due to changes in the methods of the surveys over time and the timing of the particular surveys. Niger, Togo, and Benin each only had HBS available for the 2000s; the share of food in total household consumption was 60% for the poorest country in the sample, Niger (in 2005), 52% for Togo in 2006, and 62% for Benin in 2007. The high proportion, on average, of households' budgets going to food across all these countries means that increases in food prices hit West Africans' pocketbooks very hard. Consequently, the issue of food prices is politically sensitive across the entire region.

The analysis of the share of total household expenditures going to food by place of residence revealed that rural households devote a larger share of their total budgets to food than do their urban counterparts. Data from the late 1980s and early 1990s showed that rural food shares ranged from 53% in Mali to 63% in Senegal, while urban food shares ranged from 32% in Côte d'Ivoire to 45% in Mali. The difference reflects, in part, lower average incomes in rural areas than in urban areas and higher lodging costs in urban areas than in rural areas. The study, however, found that the gap in food shares between the rural and urban areas declined over the two decades in most countries. For example, in Côte d'Ivoire the gap dropped from 27 percentage points in 1993 to 12 percentage points in the 2008; in Senegal, the gap dropped from 27 percentage points in 1994 to 11 percentage points in 2002. In Mali, however, the gap in the share of total budgets devoted to food between the rural and the urban area increased by 10 percentage points between 1989 and 2006; while in Burkina Faso, the gap in food share was stable between 1994 and 2009. The finding for Mali suggests that income growth in that country during the 1990s and early 2000s may have been more concentrated in urban areas than was the case in the other countries in the region. The finding that rural households across the region devote a larger share of their total budget to food indicates that rural households are more vulnerable to food price shocks than are urban households.

The analysis of food shares by income level using HBS collected in the 2000s supports Engel's law—the share of food in total expenditures decreased from the low-income to high-income quintiles (Table 5.2). The results reveal high levels of vulnerability for Burkina Faso and Niger households; the data indicate that 80% of households in each of these countries devoted at least 60% of total household consumption expenditures to food. In Burkina Faso, households in the poorest two quintiles (Q1 and Q2) devoted almost 70% of total household consumption expenditures to food in 2009. In Togo, 60% of the population in 2006 allocated at least 60% of total consumption expenditures to food. Households in this group are therefore very vulnerable to food price shocks.

Table 5.6. Food Share (%) in Total Consumption Expenditure by Income Quintile

Country (Year HBS was collected)	Income Quintile (Q1 = poorest; Q5 = richest)					National Share
	Q1	Q2	Q3	Q4	Q5	All
Benin (2007)						62
Burkina Faso (2009)	70	68	65	60	42	54
Côte d'Ivoire (2008)	51	50	47	43	30	39
Ghana (2009)	61	59	57	54	45	51
Mali (2006)	58	59	58	52	31	43
Niger (2005)	61	63	65	64	56	60
Senegal (2002)	55	53	53	53	47	45
Togo (2006)	66	64	61	55	44	52

Source: Taondyandé and Yade (2012).

A decomposition of the food budget by major food groups, using HBS data collected in the 2000s revealed that starchy staples (cereals plus roots and tubers) constitute the largest share in the food budget in all eight countries. The composition of these shares by specific staple types are shown in Table 5.3, with cereals dominating in the inland countries and roots and tubers, especially yams and cassava, being very important in Côte d'Ivoire and Ghana. With respect to non-starchy staple food groups, animal products (meat, fish, and dairy products) take up an important share of the food budget, with shares ranging from 12% in Niger to 30% in Benin. In Benin and Ghana, animal products and fish dominate in food shares, 30% and 29% respectively.

The high share of animal protein in the food budget reflects the expensive nature of these products relative to other food items. A breakdown by place of residence revealed higher shares of animal products in the food budget in the urban areas compared to rural areas. Fruits and vegetables come in third place in terms of shares in the food budget, with shares greater than 10% in all five of the coastal countries. The shares are lower in the inland Sahelian countries (Mali, Burkina Faso, and Niger). Other important food groups in terms of expenditure shares are vegetable oils and oilseeds.

Table 5.7. Shares (%) in Food Budget by Major Food Groups in HBS Collected in the 2000s

Food Group	Benin	Burkina	Côte d'Ivoire	Ghana	Mali	Niger	Senegal	Togo
	2007	2009	2008	2006	2006	2005	2002	2006
Cereals	23	55	26	23	45	61	31	21
Roots, Tubers and Plantains	10	1	17	15	2	1	2	8
Grain Legumes	4	4			2	2	1	3
Oilseeds and Vegetable Oils	9	5	7	5	7	3	13	6
Fruits and Vegetables	12	6	16	14	10	5	13	15
Animal Products and Fish	30	10	23	29	22	12	26	18
Alcoholic Beverages and Stimulants	7	8	2	7	7	4		6
Other Food Products	7	12	10	7	6	12	14	23

Source: Taondyandé and Yade (2012).

The analysis of shares of the food budget by specific food types, based on HBS collected in the 2000s (Table 5.3), revealed some differences between the Sahelian and the coastal countries. The share of staple foods in the food budget is 64% for Niger (2005), 49% for Mali (2006), 60% for Burkina Faso (2009), 43% for Côte d'Ivoire (2008), 32% for Togo (2006) and 34% for Senegal (2002)[7]. Millet and sorghum contribute the most to the total staple food share in Burkina Faso (27% of the total food budget) and Niger (43%)[8]. In Mali and Senegal, rice is the leading starchy staple in terms of share of total food expenditures, accounting for 19% of the total food budget for Mali (in 2006) and 17% for Senegal (in 2002). The second most important starchy staple for these countries, in terms of food budget share, are millet and sorghum for Mali (18%) and wheat products for Senegal (9%). In the coastal non-Sahelian countries like Côte d'Ivoire, Ghana, and Togo, in addition to cereals, roots and tubers are also important staple foods. Rice is the dominant starchy staple item in terms of share in the food budget in Côte d'Ivoire (19% in 2008) and Ghana (11% in 2006). The second starchy staple in terms of shares in the food budget is cassava, with a share of 7% in both Ghana and Côte d'Ivoire. In Togo, the share of the food budget allocated to maize and rice are 11% and 7% respectively, while cassava and yams each represent 5% of the food budget.

The analysis on the evolution in expenditure shares between 1980/90s and 2000s (Table 5.4) showed that the combined share of starchy staples (cereals, roots and tubers and grain legumes) in the food budget increased in Burkina Faso (by +8 points) and Mali (by +3 points), remained

[7] Staple foods include cereals (maize, rice, millet and sorghum, wheat products) roots and tubers, plantains and grain legumes (e.g., cowpeas/beans).
[8] Millet alone is about 36% of the food budget in Niger.

the same for Ghana, and declined in Senegal (-6%) and Côte d'Ivoire (-13%). The diversity of results across countries likely was the result, in part, of the differing years in which the various surveys took place and the price levels prevailing in those years. For example, the second survey in Senegal took place in 2002, when staple food prices were fairly low, while that in Burkina Faso occurred in 2009, when the effects of the spike in world food prices were still being felt. Similarly, the two HBS in Mali spanned the period 1989, when cereal prices were relatively low, and 2006, when they were relatively high. The increases in staple food shares in Burkina Faso and Mali were mostly driven by the increases in the share of the cereals food group in the food budget—the share of cereals alone in the food budget increased in Burkina Faso by 9% and in Mali by 3%. The increase in the share of cereals in the food budget in Burkina Faso was driven by increases in expenditures on rice (+3%) and maize (+6%). A breakdown by urban/rural residence reveals that most of the growth in maize shares in the food budget in Burkina Faso was from the urban areas, suggesting that urbanites may have been substituting processed maize for rice to cope with the soaring rice prices. At the same time, the share of food expenditures on animal products in Burkina fell by 2%, as consumers likely cut back on those products to defend their consumption of the now more costly starchy staples. Meanwhile in Mali, shares in the food budget increased by 7% for rice between 1989 and 2006, 3% for wheat products and 1% grain legumes.

Table 5.8. Evolution in Food Budget Shares Based on Data from Two Household Budget Surveys

Product and Product Groups	Burkina Faso		Côte d'Ivoire		Ghana		Mali		Senegal	
	1994	2009	1993	2008	1992	2006	1989	2006	1994	2002
Cereals	46	55	34	26	20	23	42	45	38	31
Rice	10	13	14	19	7	11	12	19	19	17
Maize	6	12	5	4	7	6	4	4	1	1
Millet and sorghum	28	27	1	0	1	1	25	18	10	4
Wheat products	2	2	15	3	4	5	1	4	8	9
Other cereals	0	1	0	0	0	0	1	0	0	0
Roots, Tubers, Plantains	1	1	21	17	18	15	1	2	2	2
Cassava and derivatives			7	7	9	7				
Yams and derivatives			8	6	5	5				
Other roots and tubers			1	1	1	0				
Banana plantains			5	3	3	3				
Grain Legumes	4	4					1	2	1	1
Oils and Oilseeds	7	5	6	7	7	5	10	7	14	13
Fruits and Vegetables	6	6	10	16	10	14	14	10	12	13
Animal Products and Fish	12	10	12	23	30	29	20	22	24	26
Meat/poultry	7	4	8	7	8	7	11	12	10	9
Dairy products	2	2	2	1	2	2	4	4	5	6
Eggs and products from eggs			1	1	1	1			1	0
Fish and Seafood	4	4	2	14	20	19	6	6	9	11
Beverages and stimulants	13	8	4	2	8	7	7	7		
Other Food Products	11	12	12	10	8	7	4	6	10	14

Source: Taondyandé and Yade (2012).

Animal products (meat, fish and dairy products) increased in share in food budget by 2% in Mali, 11% in Côte d'Ivoire (in 2008, the year of record food prices), 2% in Senegal (in 2002, a year of moderate prices), but decreased by 1% in Ghana. The evidence in this chapter, just like the analysis of food balance sheet data seen in Chapter 4, suggests some diversification in food consumption, whereby new products or non-traditional staples are emerging as important contributors to the diet (e.g., maize in Burkina Faso and wheat in Mali). However, to the extent that prices have also changed over time, these increases in budget consumption shares are likely partially due to changes in prices and not just increases in the actual quantities consumed.

The analysis of staple food expenditures by place of residence reveals that staple food shares are higher in the rural areas than in the urban areas for most countries in the sub-region; rural staple food shares in the food budget exceeded 50% in all countries except Ghana, Senegal, and Togo. This high share of the total food budget devoted to starchy staples explains why these products, particularly cereals, have been at the center of food policy debates in West Africa.[9] Rice is the dominant staple in food shares in urban areas across all the countries, with an average expenditure share of about 15%; country-level shares range from 7% in Togo to 20% in Mali. In urban areas of coastal countries such as Côte d'Ivoire and Senegal, wheat products are also important in the food share (4% and 9% respectively). Millet retains an important share in the urban food budget in Burkina Faso, Niger, and Mali; although the share is lower than in the rural areas. In Cote d'Ivoire and Togo, cassava and yams occupy second and third place, respectively in the urban food budget share. Traditional staples occupy an important share in the food budget in rural Burkina Faso, Mali and Togo.[10] In Burkina and Mali, millet and sorghum had 37% and 24% respectively of the food budget in the rural areas. In rural Togo, maize, and roots and tubers had a share of 14% and 12%, respectively, in food expenditures. Meanwhile in rural areas, rice had a 19% share of the food budget in Côte d'Ivoire, 17% in Mali, and 20% in Senegal. Unlike the other countries in the sub-region, wheat expenditures were important among rural households in Senegal; rural households allocated at least 5% of their food budget to wheat related products (mostly bread). The importance of rice and wheat in the Senegalese food budget allocation and the country's heavy reliance on imports for these cereals highlight the country's vulnerability to price shocks in the global food market (Table 5.5).

The analysis of expenditure by income level reveals that the poorest 40% of the population in Niger spend 56% of their food budget on millet and sorghum, while the corresponding figures are 43% for Burkina Faso and 26% for Mali. The high share of millet and sorghum in the food budget of poorer households suggests greater vulnerability amongst these households to millet and sorghum price shocks, such as those that emanate from droughts.[11] The finding also suggests that millet and sorghum are potential candidates for the design of food safety nets targeting the poor in times of crisis. In Côte d'Ivoire, the food budget of the poorest 40% of households is dominated by rice (22%), cassava (9%), and yams (9%); meanwhile in Senegal, rice and wheat products dominate the food budget of the poorest 40%. Maize represents 17% of the staple food budget for the poorest 40% of households in Togo.

[9] Demand, however, is changing in the region as incomes increase, implying a need to broaden food policy beyond just starchy staples. See Chapter 7 in this volume.
[10] Traditional staples include coarse grains and roots and tubers.
[11] See Chapter 6 in this volume.

By income quintile in the urban areas, the analysis reveals that animal products occupy an important share in the budget of the richest 20% of urban households across all countries (with the exception of Burkina Faso), with shares ranging from 19% in Niger to 37% in Mali (Table 5.6).

Table 5.9. Shares (%) in Food Budgets by Place of Residence Based on Household Budget Survey Data Collected in the 2000s

Product	Burkina Faso (2003)		Côte d'Ivoire (2008)		Ghana (2006)		Mali (2006)		Niger (2005)		Senegal (2002)		Togo (2006)	
	R	U	R	U	R	U	R	U	R	U	R	U	R	U
Banana Plantain	-	-	3	3	3	3	-	-			-	-		
Beans/Cowpeas	-	-	-	-	-	-	-	-	2	2	-	-	5	2
Yams	-	-	10	3	4	6	-	-	-	-	-	-	6	4
Legume	-	-	-	-	-	-	4	8	-	-	-	-	-	-
Maize	6	10	5	2	6	5	5	3	5	11	-	-	14	7
Cassava	-	-	10	7	8	7	-	-	-	-	-	-	6	4
Millet	-	-	-	-	-	-	16	7	41	15	5	1	2	0
Millet /Sorghum	37	7	0	0	1	0	-	-	-	-	-	-	-	-
Wheat Products	1	3	2	4	4	6	0	0	1	4	5	9	1	3
Roots and Tubers	0	1	19	10	-	-	1	3	1	1	2	3	-	-
Rice	7	14	19	18	11	12	17	20	7	19	22	13	7	7
Sorghum	-	-	-	-	-	-	8	3	9	2	2	1	3	0
Total Staple Food Share	51	34	49	37	37	39	51	45	66	53	32	24	43	27

Source: Compiled from Taondyandé and Yade (2011, 2012).

R=Rural and U=urban.

The share of animal products in the food budget also increased from the poorest to the richest 20% of the urban population across all countries. Fruits and vegetables also occupy an important share in the food budget for these richest 20% of urban households in the coastal countries (Ghana, Senegal, Togo, and Côte d'Ivoire), with shares ranging from 13% in Ghana to 17% in Côte d'Ivoire. The share of fruits and vegetables in these coastal countries is greater than the share of rice, the most important starchy staple in terms of shares across all urban income groups and across all eight countries. The exception is Niger, where millet and sorghum dominate the food budget of the poorest 40% of urban households, with an average share of 25%. In Burkina Faso, rice has the largest share in the budget of the top 20% of urban households, followed by maize, with a share in food budget of 17%. The analysis shows the importance of rice in the food budget of all urban income groups across countries and, therefore, highlights the vulnerability of these households to hikes in the world market price of rice, given that most of these countries rely on imports for a significant portion of their rice consumption needs. The results also illustrate a shift away from starchy staples to better quality foods like animal proteins and fruits and vegetables as urban households get richer.

Table 5.10. Food Shares by Income Quintile in Urban Areas

Country	Quintile	Rice	Maize	Millet/ Sorghum	Wheat	Roots and Tubers	Fruits and Vegetables	Animal Products
Burkina Faso (2009)	U1	16	17	15	2	1	9	7
	U2	19	18	15	2	0	8	8
	U3	22	16	9	4	1	9	9
	U4	22	15	6	4	1	9	12
	U5	25	17	3	5	1	8	16
Côte d'Ivoire (2008)	U1	25	6	0	2	12	16	18
	U2	24	4	1	3	11	17	21
	U3	21	2	0	4	10	17	24
	U4	17	2	0	4	10	17	26
	U5	14	1	0	5	8	17	30
Ghana (2006)	U1	14	8	1	5	13	15	26
	U2	13	7	0	6	14	14	27
	U3	12	6	0	6	12	14	28
	U4	12	5	0	6	13	14	29
	U5	11	4	0	6	13	13	27
Mali (2006)	U1	21	6	15	4	1	11	16
	U2	25	3	14	5	1	11	18
	U3	23	3	12	4	2	12	21
	U4	22	2	8	5	3	12	22
	U5	14	2	6	5	4	12	37
Niger (2005)	U1	19	11	30	1	1	7	8
	U2	21	11	22	2	1	7	10
	U3	20	12	19	2	1	8	13
	U4	19	11	15	4	1	8	14
	U5	16	10	10	6	2	10	19
Senegal (2002)	U1	19	0	3	11	2	12	9
	U2	15	0	3	13	3	13	13
	U3	14	0	2	13	3	13	16
	U4	11	0	2	12	3	14	20
	U5	13	0	1	9	3	15	28
Togo (2006)	U1	8	11	1	1	9	16	13
	U2	8	9	1	3	8	16	16
	U3	7	7	1	3	9	16	18
	U4	7	6	0	4	8	16	19
	U5	6	4	0	4	8	16	22

Source: Taondyandé and Yade (2012).

U1 to U5 are the urban income quintiles, with U1 being the lowest-income and U5 the highest.

Table 5.11. Food Shares by Income Quintile in Rural Areas

Country	Quintile	Rice	Maize	Millet/ Sorghum	Wheat	Roots and Tubers	Fruits and Vegetables	Animal Products
Burkina Faso (2009)	R1	5	7	35	1	0	7	7
	R2	6	9	39	1	0	7	7
	R3	7	11	36	1	1	6	7
	R4	9	10	34	2	1	5	9
	R5	10	10	36	2	1	4	10
Cote d'Ivoire (2008)	R1	22	10	1	1	17	14	15
	R2	21	7	1	1	22	13	16
	R3	20	5	0	1	20	15	17
	R4	20	5	0	2	21	15	19
	R5	17	4	0	2	16	14	22
Ghana (2006)	R1	9	9	6	3	5	16	25
	R2	10	8	2	4	8	15	32
	R3	12	7	1	4	10	14	33
	R4	11	6	1	4	12	15	31
	R5	11	5	1	5	13	13	31
Mali (2006)	R1	11	6	29	2	1	9	13
	R2	14	5	28	2	1	8	15
	R3	18	5	25	2	1	8	15
	R4	17	6	24	2	1	7	17
	R5	20	4	17	3	1	8	23
Niger (2005)	R1	4	4	58	0	1	3	10
	R2	5	4	57	1	1	3	10
	R3	6	4	54	1	1	3	11
	R4	7	4	50	1	1	4	11
	R5	9	6	44	2	1	5	12
Senegal (2002)	R1	26	1	10	5	1	10	4
	R2	22	1	9	7	2	11	5
	R3	22	1	8	8	2	11	5
	R4	21	1	8	7	2	11	6
	R5	23	1	6	8	2	10	8
Togo (2006)	R1	7	11	2	1	5	11	13
	R2	7	8	1	1	7	12	13
	R3	8	8	1	1	7	14	15
	R4	8	8	1	2	8	13	15
	R5	8	6	1	2	8	14	19

Source: Taondyandé and Yade (2012).

R1 to R5 are the rural income quintiles, with R1 being the lowest-income and R5 the highest.

Disaggregating across rural income groups, the analysis reveals that across all rural income groups (with the exception of Ghana, which has the highest per capita income of all of the sample countries), starchy staples represent the largest shares of the food budgets (Table 5.7). Millet and sorghum take up the largest share in the food budget in Sahelian countries across all income groups, except in Mali, where the share of rice in the food budget exceeds that of millet and sorghum for the richest 20% of rural households. Rural households in Senegal have the largest share of wheat products in the food budget of all the countries, and the wheat share increases with increases in income. In Ghana, in rural areas, just like in the urban areas, animal products, fruits, and vegetables take up the most important share of the food budget.

Food Demand Prospects—Marginal Propensity to Consume (MPC)

Estimates of the MPC of different food products indicate that demand for most foods will grow rapidly as per capita incomes rise in West Africa. Results suggest that a 100 CFAF increase in per capita income will result in additional spending on food amongst urban households ranging from 23 CFAF in Mali to 47 CFAF in Togo. For rural households, this amount will range from 42 CFAF in Côte d'Ivoire to 67 CFAF in Niger.

A decomposition of this additional demand shows a clear preference for rice, fruit and vegetables and animal products in the urban areas. Rice is expected to take up about 15% of this additional total spending in Burkina Faso, Niger, and Mali, about 8% in Senegal and Côte d'Ivoire, and about 5% in Togo. About 10% of the additional spending would be devoted to fruits and vegetables in Burkina Faso and Niger, 15% in Côte d'Ivoire and Togo, and 13% in Senegal. The share of increased spending devoted to meat ranges from 8% in Togo to 25% in Senegal. For fish, the additional expenditure lies between 5% in Mali and 11% in Senegal. The share of increased spending going towards dairy products ranges from 2% in Burkina Faso to 7% in Mali.

Millet and sorghum not only dominate the cereal basket of rural households in Burkina Faso and Niger, but also increments to spending in these areas. The MPC analysis indicates that 24% of increments to income of rural residents of Burkina Faso, at the margin, would go to these cereals, while in rural Niger the corresponding figure is 42%. Only 10% of the increment in per capita income will be spent on rice in the rural areas of these countries.

This finding suggest that (a) demand in the rural areas will likely remain robust in the short to medium term and (b) consumers in the rural areas are probably still calorie-short since they are spending such a high percentage of increments to income on basic, low-cost staples. In Mali, Senegal, and Côte d'Ivoire, rice is the most preferred in rural areas, with MPCs of 24%, 16% and 15%, respectively. While Mali is nearly self-sufficient in rice, Senegal and Côte d'Ivoire rely heavily on rice imports. This heavy reliance on imports exposes these countries to shocks in world rice prices, thereby increasing their vulnerability to food insecurity. This finding therefore suggests a need to explore ways to expand domestic rice production at lower per-unit costs.

Econometric Analysis of Cereals Demand in Mali

While MPCs indicate the proportion of an increment to income that would go to expenditure on a given product (all other things held equal), price and income elasticities of demand address somewhat different questions. Income elasticities of demand measure the percentage change in the expenditure on a given item (e.g., rice), given a 1% change in the consumer's income. This elasticity thus measures whether demand will grow faster or slower than the growth of per capita income. Own-price elasticities of demand measure the percentage change in the expenditure for a good given a 1% change in its price, while cross-price elasticities measure the percentage change in expenditure for the good given a 1% change in the price of a related good (a substitute or a complement). Collectively, these various elasticities, which measure how sensitive the demand for a product is to changes in income and prices, are referred to as demand parameters. Me-Nsope (2014) estimates a complete set of cereals demand parameters for urban and rural Mali and by income group within each place of residence. In the sections that follow, we present key results from those estimations.

Expenditure Elasticities of Cereals Demand. All estimated expenditure elasticities were found to be positive and statistically significant at the 1% level (Table 5.8).[12] Rice and sorghum expenditure elasticities were higher in the urban areas than in the rural areas, meaning that the demand for rice and sorghum in the urban area is more responsive to changes in income than the demand for rice and sorghum in the rural areas.

Millet and maize expenditure elasticities were higher in the rural areas than in the urban areas. The estimated expenditure elasticities in the urban areas suggest an increasing preference for rice, sorghum, and maize at higher per capita income levels, while the preference for millet tends to decrease as incomes rise in the urban areas. The high average expenditure elasticities of sorghum and millet in the urban area and the increase in sorghum expenditure elasticity as income increases are intriguing findings because past studies argued that coarse grains are generally less preferred than rice in the urban areas for reasons such as the high opportunity cost of the time required for their processing and preparation. One possible reason for the present findings is that the ELIM 2006 data did not distinguish between expenditures on processed and unprocessed millet and sorghum, and the demand for processed products, which are becoming more widely available in urban areas, is likely to be much stronger among high-income groups. If the higher-income groups buy more of these processed products (as well as eat more of these cereals in prepared meals away from home), these findings would likely result. This suggests a need for future budget-consumption studies to differentiate expenditures for processed versus unprocessed forms of these cereals and by place of consumption (for example, home and away from home).

[12] Except for millet in the low-income urban households, which is only significant at a 10% level.

Table 5.12. Cereals Expenditure Elasticities by Place of Residence and Income Group[a]

	Rice	Millet	Maize	Sorghum
		URBAN		
All	0.964*	1.038*	0.668*	1.502*
By Income Group				
Low	1.248*	0.758***	0.702*	0.673*
Middle	0.880*	1.079*	1.070*	1.454*
High	1.239*	0.415*	1.032*	1.247*
		RURAL		
All	0.728*	1.200*	1.099*	1.109*
By Income Group				
Low	0.654*	1.248*	1.030*	1.054*
Middle	1.006*	0.980*	0.867*	1.069*
High	1.001*	1.025*	1.014*	0.974*

Source: Me-Nsope and Staatz (2016).
Notes: [a] The per-capita consumption expenditure terciles for both rural and urban areas are referred to, for simplicity of exposition, as low-income, middle-income, and high-income. These appellations refer to the relative incomes of the three groups and not to any standards for low-, middle- or high-income status used by international agencies such as the World Bank.
* means significant at a 1% level and ** means significant at 5% and *** means significant at 10%.

In rural areas, rice continues to be the most preferred cereal as per capita income increases. The expenditure elasticities for millet, sorghum, and to a lesser extent maize tend to decline with increases in income in the rural areas. In the urban areas, a similar pattern was observed only for millet.

Price Elasticities of Cereals Demand: Own-Price Elasticities of Cereals Demand. Aggregating across income groups, all estimated uncompensated and compensated own-price elasticities were not only negative as expected for normal goods, but were also statistically significant at a 5% level (Table 5.9).[13,14]

Economic theory predicts that poorer households are generally more sensitive to price changes than are richer households. In the urban sub-sample, this expectation proved true only for maize and sorghum. Rice demand response to changes in its own price in the urban areas turns out to be higher for high-income households than low-income households. This finding reinforces the

[13] A change in the price of a good affects the demand for it in two ways. First, there is a *substitution effect*, whereby consumers shift their consumption pattern in reaction to the good becoming more or less expensive relative to other goods. For example, if it becomes more expensive, consumers typically substitute consumption of something else for at least part of their consumption of the original good. Second, there is an *income effect*, as the change in price of the good also changes the consumer's real income. For example, if the price of the good increases and the consumer continues to buy the same amount of the product, s/he has less income left over to spend on other goods. An *uncompensated elasticity* captures both the substitution effect and the income effect, while a *compensated elasticity* measures only the substitution effect (by measuring how consumption would change if the consumer were compensated for the income effect of the price change).
[14] Economists refer to goods whose demand fall as their prices increase as *normal goods.*

argument made by Diagana et al. (1999) that rice has become a key fast food eaten at noon by low-income urban laborers who have few alternatives to substitute other staples for a quick

Table 5.13. Own-Price Elasticities of Cereal Demand–Urban and Rural Mali

	Rice	Millet	Maize	Sorghum
		URBAN		
Uncompensated				
All	-0.955*	-0.904*	-1.046*	-1.156*
Low	-0.997*	-0.243	-0.996*	-1.014*
Middle	-0.915*	-1.035*	-1.026*	-0.948*
High	-1.065*	-0.514*	-0.946*	-0.658*
Compensated				
All	-0.341*	-0.714*	-0.986*	-1.021*
Low	-0.277*	-0.089	-0.914*	-0.944*
Middle	-0.318*	-0.860*	-0.945*	-0.828
High	-0.241*	-0.439*	-0.870*	-0.557**
		RURAL		
Uncompensated				
All	-0.938*	-1.135*	-1.024*	-0.994*
Low	-0.781*	-1.010*	-1.041*	-0.894*
Middle	-0.973*	-0.963*	-0.940*	-0.945
High	-0.991*	-0.993*	-0.996*	-0.988*
Compensated				
All	-0.660*	-0.723*	-0.896*	-0.819*
Low	-0.585*	-0.513*	-0.907*	-0.713*
Middle	-0.607*	-0.622*	-0.834*	-0.768*
High	-0.516*	-0.696*	-0.897*	-0.853*

Source: Me-Nsope (2014); Me-Nsope and Staatz (2016).
Note: * = significant at 1%, ** = significant at 5% and *** = significant at 10%.

lunch. Among the rural households, rice is the least sensitive of all cereals included in the analysis to changes in its own price. The uncompensated own-price elasticities show that low-income rural households are more sensitive to millet and maize price changes than are high-income households, but these findings appear to be driven by the income-effects of the price change, as the compensated elasticities are not uniformly higher in magnitude for the bottom income tercile than for the top one.

Price Elasticities of Cereals Demand: Cross-Price Elasticities of Cereals Demand. Positive cross-price elasticities indicate that two goods are substitutes, while negative cross-price elasticities indicate that the goods are complements. With one exception, all the estimated urban cross-elasticities among cereals that are statistically significant are also positive, suggesting some substitution between these starchy staples (Table 5.10). Rice is a substitute for millet and sorghum across all urban income groups. Millet is a substitute for rice across all urban income groups, while sorghum is a substitute for rice only in the low- and middle-income urban groups. Rice is a complement for maize in the high-income urban group. Maize is a

substitute for rice across all urban income groups. The substitution between these major starchy staple types suggests some flexibility in consumer demand choices and signals that a potential option for reducing the effect on consumer welfare (particularly the poor) of a food price shock will be to expand the scope of substitution between the different starchy staples.[15]

In the rural sample, with one exception, all compensated cross-price elasticities are statistically significant and positive (Table 5.11). The sensitivity of rice demand to changes in the price of millet, maize, and sorghum increases from the low- to the middle-income rural group but drops from the middle- to the high-income rural group. Also noticeable is the increase in the sensitivity of millet, maize, and sorghum demand to changes in the price of rice as per capita income increases.

This means that richer rural households are more likely to substitute coarse grains for rice when the price of rice increases. With agriculture being the mainstay of rural Malian households, one would expect that richer households would own larger farms than poorer households and produce more food than poorer households. This finding suggests that richer households have more options than poorer households, such that an increase in the price of one type of cereals (for example rice) would cause these households to substitute coarse grains from their own production for rice to satisfy household food needs.

Table 5.14. Compensated Cross-Price Elasticities of Cereal Demand–Urban Mali

Demand For:	Elasticity with Respect to Changes in the Price of: Rice	Millet	Maize	Sorghum
		Low-Income		
Rice	-0.277*	0.129**	0.098*	0.130*
Millet	0.192	-0.089	0.124***	-0.077
Maize	0.567*	0.145	-0.914*	0.215**
Sorghum	0.460*	-0.304	0.300*	-0.944*
		Middle-Income		
Rice	-0.318*	0.146*	0.096*	0.067*
Millet	0.674*	-0.860*	0.063*	0.128*
Maize	0.580*	0.191*	-0.945*	0.111*
Sorghum	0.437*	0.356*	0.000*	-0.828*
		High-Income		
Rice	-0.241*	0.128*	-0.097**	0.089*
Millet	0.305	-0.439*	0.651*	-0.034
Maize	1.299*	0.570***	-0.870*	0.245
Sorghum	0.167	0.089	-0.005	-0.557**

Source: Me-Nsope and Staatz (2016).
Note: * = significant at a 1%; ** = significant at 5%, and *** = significant at 10%.

[15] See Chapter 6 for an analysis of the role of staple food substitution in softening the effects of price shocks on consumers.

Table 5.15. Compensated Cross-Price Elasticities of Cereal Demand–Rural Mali

Demand For:	Elasticity with Respect to Changes in the Price of:			
	Rice	Millet	Maize	Sorghum
		Low-Income		
Rice	-0.585*	0.291*	0.058*	0.148*
Millet	0.215*	-0.513*	0.202*	0.176*
Maize	0.326*	0.469*	-0.907*	0.117*
Sorghum	0.369*	0.298*	0.103*	-0.713*
		Middle-Income		
Rice	-0.607*	0.335*	0.119*	0.167*
Millet	0.347*	-0.622*	0.122*	0.171*
Maize	0.338*	0.363*	-0.834*	0.048
Sorghum	0.369*	0.367*	0.064	-0.768*
		High-Income		
Rice	-0.516*	0.286*	0.096*	0.141*
Millet	0.457*	-0.696*	0.104*	0.136*
Maize	0.451*	0.308*	-0.897*	0.136*
Sorghum	0.495*	0.266*	0.092*	-0.853*

Source: Me-Nsope and Staatz (2016).
Note: * = significant at a 1%; ** = significant at 5%, and *** = significant at 10%.

The compensated cross-price elasticities computed by income group suggest that across all urban income groups, households were more likely to replace millet with rice than they were to replace sorghum with rice, and the magnitude of the substitution of rice for sorghum declines from the low to the high-income urban groups. This finding suggests some preference for sorghum in urban Mali. Conversely, the cross-price elasticities did not reflect a uniform pattern in the substitution of millet and sorghum for rice across income groups in both urban and rural areas. The results also suggest that substitution of maize for rice increases as incomes increase in urban areas. In rural areas, maize substitution for rice is lower than in urban areas. A possible reason for the higher tendency to substitute maize for rice in urban areas is that the larger number of milling facilities in urban areas increases the availability of processed maize products, which are attractive to time-poor urban consumers because these products require shorter time to prepare and are more easily substituted for rice. The substitution between rice and coarse grains across income groups in both the rural and the urban groups implies some scope for dealing with price spikes for one cereal by increasing the availability of substitutes—a possibility that the earlier findings of low cross-elasticities seemed to discount.[16]

Welfare Effects of Cereals Price Changes

Me-Nsope (2014) and Me-Nsope and Staatz (2016) used the estimated demand elasticities to compute the welfare effects associated with the price changes observed at the district level in each of the years 2008, 2009, 2010 and 2011 compared to the 2006 baseline.[17] Specifically, a CV was computed jointly for rice, millet, sorghum, and maize. A summary of average price changes for all locations covered by ELIM-2006 is presented in Table 5.12.

[16] See Chapter 6 for more analysis of this point.
[17] Price data at the administrative unit level for 2006 to 2011 were obtained from the OMA.

The analysis isolates the first-order effect of the price change on households' welfare, which implicitly assumes that households are unable to change their consumption patterns when prices change, from the second-order effect, which includes substitution effects through cross-price elasticities, but no income effects through production or other linkages (e.g., wages).

Table 5.16. Average Consumer Price Changes Compared to 2006 (%)

Period	Rice	Millet	Maize	Sorghum	Average
2008	21	9	17	10	14
2009	21	21	28	21	23
2010	16	15	20	14	16
2011	23	19	30	23	24

Source: Me-Nsope (2014).

Friedman and Levinsohn (2002) have argued that ignoring substitution effects in consumption in the computation of welfare measures may lead to significant biases and inappropriate inferences.

The results obtained suggest that the first-order estimates capture almost all the impact of the price changes on welfare in both urban and rural areas (Tables 5.13 and 5.14). This finding reflects the fact that during the 2008-2011 period all cereals prices were rising sharply, thus limiting the scope for substitution to cheaper cereals.

Table 5.17. Magnitude of Welfare Losses Implied by the Cereals Price Changes over the Period 2008-2011, by Urban Per Capita Income Group

Year	CV (Full impact) in %	Value of compensation based on 2006 average cereals expenditure (CFAF)	Percent of average total household consumption expenditure in 2006
		Low-Income	
2008	17.8	51,000 (95)	3.7%
2009	22.6	64,753 (120)	4.7%
2010	16.2	46,416 (86)	3.4%
2011	22.7	65,040 (121)	4.7%
		Middle- Income	
2008	18.0	66,280 (123)	2.5%
2009	21.9	80,640 (150)	3.1%
2010	16.7	61,493 (114)	2.3%
2011	22.8	83,954 (156)	3.2%
		High-Income	
2008	17.5	53,583 (99)	1.0%
2009	21.8	66,749 (124)	1.3%
2010	17.0	52,052 (97)	1.0%
2011	23.1	70,729 (125)	1.4%

Source: Me-Nsope and Staatz (2016). Note: The figures in parenthesis are U.S. dollar equivalents.

Across all the years, the first-order impact was larger than the full impact by less than 1%. Thus, consistent with a priori expectations, the first-order effect overstates, but only marginally, the welfare losses for urban and rural households. In this chapter, we present the results from the full or second-order effect only. Interested readers should see Me-Nsope and Staatz (2016) for the first-order values.

Although the CVs of cereals price changes do not show much difference across per capita income groups when measured in terms of percentage of total cereals expenditures in 2006, in absolute terms, the impacts differ widely. The actual magnitude of the welfare losses from cereals price changes were substantial and differed by place of residence and income groups (Tables 5.13 and 5.14). In 2008, for instance, on average low-income urban households would have had to be compensated by 17.8% of their cereal budget in 2006, equivalent to 51,000 CFAF = US$95, to be as well off after the price increases as they were before them (Table 5.13). For low-income rural households, the corresponding figure was 15.0% of their total cereals expenditures in 2006, equivalent to 33,293 CFAF = US$62 (Table 5.14).

This is equivalent to saying that the observed price changes in 2008 would have required a compensation of low-income urban households of about 3.7% of their 2006 total household consumption expenditures (proxy for income) to avoid a fall in their welfare. For low-income rural households, the figure was 4.1%.

Table 5.18. Magnitude of Welfare Losses Implied by the Cereals Price Changes over the Period 2008-2011, by Rural Per Capita Income Group

Year	CV (Full impact) in %	Value of compensation based on 2006 average cereals expenditure (CFAF)	Percent of average total household consumption expenditure in 2006
		Low-Income	
2008	15.0	33,293 (62)	4.1%
2009	23.4	51,937 (96)	6.5%
2010	16.7	37,066 (69)	4.6%
2011	23.3	51,715 (96)	6.4%
		Middle- Income	
2008	15.4	52,646 (98)	4.3%
2009	22.7	77,602 (144)	6.3%
2010	16.3	55,723 (103)	4.5%
2011	23.6	80,678 (150)	6.5%
		High-Income	
2008	16.2	61,179 (114)	3.1%
2009	21.7	81,949 (152)	4.2%
2010	15.6	58,913 (109)	3.0%
2011	23.3	87,992 (163)	4.5%

Source: Me-Nsope and Staatz (2016). Note: The figures in parenthesis are U.S. dollar equivalents.

The adverse effect of the higher prices on the Malian population as shown in Tables 5.13 and 5.14 supports the view that essentially every group experienced an income reduction because of the higher cereals prices. However, the percentage reduction in total household consumption declined from the low- to the high-income groups in both the urban and the rural sub-samples. This means that in both locations, the welfare loss from observed price changes in the period 2008 to 2011, as a proportion of total household consumption expenditures, was greater for poorer households than for richer households. Furthermore, the percentage reduction in total household expenditures was higher for rural groups than for urban ones. These findings are consistent with findings presented in Chapter 6 on the results of bidding wars for staple foods that break out between low-income and high-income groups in times of price spikes.

Me-Nsope (2014) also showed that rice accounted for a substantial part of the overall welfare effect implied by the higher cereals prices. Across all income groups, the full welfare effects of the increase in rice prices were higher in the urban area than in the rural area across all years. This result was not surprising given that the share of rice in cereals budget was much larger in urban areas than in rural areas.

5.5. Conclusions and Policy Implications

The analysis in this chapter points to five major conclusions and related policy implications. First, the descriptive analysis conducted by ReSAKSS/MSU suggests that cereals continue to take up an important share of the food budget in the Sahel region of West Africa, and roots and tubers continue to account for an important share of the food budget in coastal West African countries like Côte d'Ivoire and Togo. The study finds evidence of a diversification in the diet characterized by a growing demand for maize and to some extent roots and tubers in the Sahelian countries. These findings imply that changes in staple food prices have a strong effect on consumers' budgets and hence are likely to be politically very sensitive.

Second, the estimated marginal propensities to consume various food products imply that food demand will grow strongly in West Africa as per capita incomes increase, including demand for basic starchy staples. The results from the econometric analysis of cereals demand in Mali also found high expenditure elasticities for cereals in both urban and rural areas of Mali, reinforcing the message that demand for these staples will be robust if per capita incomes continue to grow. This implies that prices are likely to rise if supply is not increased substantially. Therefore, there is a need to expand production while driving down unit costs throughout the food system.

Third, the compensated cross-price elasticities derived from the estimation of cereals demand in Mali point to a relationship of substitution among the different cereals in both the urban and rural sub-samples. This finding suggests not only a scope for dealing with price spikes for one cereal by increasing the availability of substitutes—a possibility that the earlier findings of low cross-price elasticities seemed to discount—but also a scope for price transmission across cereals. Efforts geared towards expanding production and driving down the unit cost of production could encourage consumption of these grains, and private sector involvement in the processing of coarse grains to reduce preparation time would give consumers more opportunity for substitution and choice. Overall, this finding points to a need for a cereals policy rather than just, for example, a rice policy.

Fourth, the findings further suggest that demand patterns for cereals may be changing over time. For example, while past findings suggested that coarse grains were generally less preferred in the urban areas for various reasons such as the high opportunity cost of the time required for their preparation, Me-Nsope and Staatz (2016) found a high expenditure elasticity for sorghum in the urban sub-sample. This finding could be explained by the greater availability of mechanical processing of coarse grains in urban areas, which reduces preparation time and makes the grains more attractive for consumption to urban dwellers.

Fifth, the welfare analysis of cereals price shocks in Mali over the period 2008-2011, considering the first order (direct) and the second-order (substitution) responses, revealed a very limited substitution effect during this period because all the prices of all cereals rose together. If supply of some of the cereals could have been increased, e.g., through greater regional trade, the scope for substitution would have been greater. Estimates of the full impact revealed that all households were adversely affected by cereals price changes and the adverse effect of the higher cereals prices on Malian population ranged from a 1% to 7% income reduction, without considering the possibility of producer supply response. The findings suggest that, as expected, in both the urban and rural population, low-income households are hardest hit by cereals price increases–i.e., the percentage increase in total household expenditure required to compensate for the higher prices was lowest for the high-income group and largest for the low-income group. The willingness to substitute one cereal type for another implies that expanding the availability of these cereals could help reduce some of the welfare losses from cereals price shocks, especially those emanating from the world market for rice. Overall, the estimated welfare losses from the recent price hikes suggest a need to address supply (including marketing, international, and regional trade, and processing) issues in order to improve consumers' welfare and food security.

References

Alderman, H. 1986. *The Effect of Food Price and Income Changes on the Acquisition of Food by Low-Income Households.* Washington, DC: IFPRI.

Banks, J., R. Blundell, and A. Lewbel. 1997. Quadratic Engel Curves and Consumer Demand. *Review of Economics and Statistics* 79.4: 527-539.

Bopape, L.E. 2006. The Influence of Demand Model Selection on Household Welfare Estimates: An Application to South African Food Expenditures. Ph.D. Dissertation, Michigan State University.

Boughton, D.H. 1994. A Commodity Subsector Approach to the Design of Agricultural Research: The Case of Maize in Mali. Ph.D. Dissertation, Michigan State University.

Camara, O. 2004. The Impact of Seasonal Changes in Real Incomes and Relative Prices on Households' Consumption Patterns in Bamako, Mali. Ph.D. Dissertation. Michigan State University.

de Janvry, A. and E. Sadoulet. 2008. Methodological Note: Estimating the Effects of the Food Price Surge on the Welfare of the Poor. Assessed on March 23, 2016 at http://are.berkeley.edu/~esadoulet/papers/FoodPriceMethodologyDec08.pdf.

Delgado, C. 1989. Why Is Rice and Wheat Consumption Increasing in West Africa? Paper Presented to the European Seminar of Agricultural Economists, May 29-June 2. Montpellier, France.

Diagana, B., F. Akindès, K. Savadogo, T. Reardon, and J.M. Staatz. 1999. Effects of the CFA Franc Devaluation on Urban Food Consumption in West Africa: Overview and Cross-Country Comparisons. *Food Policy* 24.5: 465-478.

ELIM-2006. 2006. Enquête Légère Intégrée auprès des Ménages. http://www.instat-mali.org/nada/index.php/catalog/4.

Friedman, J. and J.A. Levinsohn. 2002. The Distributional Impact of Indonesia's Financial Crisis on Household Welfare: A 'Rapid Response' Methodology. *World Bank Economic Review* 16.3: 397-423.

Hollinger, F. and J.M. Staatz. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers*. Rome: FAO and African Development Bank.

Joseph, G. and Q. Wodon. 2008. *Assessing the Potential Impact on Poverty of Rising Cereals Prices: The Case of Mali*. World Bank Policy Research Working Paper Series No. 4744. Washington, DC: The World Bank. Assessed March 23, 2016 at SSRN: http://ssrn.com/abstract=1277063.

Me-Nsope, N. M. 2014. Trends and Determinants of Food Consumption Patterns in West Africa. Ph.D. dissertation, Michigan State University. http://web2.msue.msu.edu/afreTheses/fulltext/Me_Nsope_Dissertation_Final.pdf

Me-Nsope, N. M. and J.M. Staatz. 2016. *Household-Level Evidence of Cereals Demand and the Welfare Implications of Cereals Price Shocks in Rural and Urban Mali.* PRESAO/SRAI 2 Component Working Paper No. 2016.01. East Lansing and Bamako: Michigan State University. . http://fsg.afre.msu.edu/srai2/WP2016_01_MeNsope_Staatz_Household_paper_AAAE_RESUBMISSION.pdf

Nouve, K. and Q. Wodon. 2008. Impact of Rising Rice Prices and Policy Response in Mali: Simulations with Dynamic CGE Model. Washington, DC: World Bank. Mimeo.

Reardon, T., T. Thiombiano, and C. Delgado. 1988. La substitution des céréales locales par les céréales importées : la consommation alimentaire des ménages à Ougadougou, Burkina Faso. Paper presented at the CEDRES/IFPRI Colloque sur la Consommation Alimentaire au Burkina Faso, 6-7 June, 1988, in Ouagadougou, Burkina Faso. Washington: International Food Policy Research Institute.

Rogers, B.L. and M. Lowdermilk. 1991. Price Policy and Food Consumption in Urban Mali. *Food Policy* 16.6: 461-473.

Taondyandé, M. and M. Yade. 2011. Etude sur la Consommation Alimentaire en Afrique de l'Ouest: Rapport de synthèse. Draft Report. Ibadan, Nigeria: ReSAKSS West Africa.

Taondyandé, M. and M. Yade. 2012. Etude sur la Consommation Alimentaire en Afrique de l'Ouest. AGWA Background Paper. Ibadan, Nigeria: ReSAKSS West Africa.

CHAPTER 6

The Role of Staple Food Substitution and Trade in Moderating Major Food Shocks in Sahelian West Africa

Le rôle de la substitution des denrées de base et du commerce dans l'atténuation des chocs alimentaires dans le Sahel en Afrique de l'Ouest

Steven Haggblade, Nathalie M. Me-Nsope, and John M. Staatz

Abstract

This chapter reports results from a multi-market simulation model to evaluate the impact of common production and world-price shocks on food consumption of vulnerable groups in Sahelian West Africa. The analysis confirms that poor households bear the brunt of such consumption risks, particularly in closed markets, where trade barriers restrict imports and the poor find themselves in a bidding war with richer consumers for limited food supplies. In the absence of expanded trade, a drought that reduces domestic rainfed cereal production by 20% would compress already low calorie consumption of the rural poor by as much as 15%, four times as much as other household groups. Conversely, a 50% spike in world rice prices would hit the urban poor hardest, reducing their calorie consumption by up to 8%.

Policy responses need to focus on two basic mechanisms that can help to moderate this pressure—trade and consumer substitution among staple foods. Immediately south of the Sahel, coastal West African countries enjoy higher rainfall, dual rainy seasons, more stable staple food production based on root crops (cassava and yams) as well as frequent double cropping of maize. The model simulation results indicate that regional trade in maize, yams, and cassava-based prepared foods like gari and attieké could fill over one-third of the consumption shortfall resulting from a major drought in the Sahel. Increasing substitutability across starchy staples, for example through expansion of maize, cassava, and sorghum-based convenience foods, would further moderate consumption pressure by expanding the array of food alternatives and hence supply responses available during periods of stress.

Résumé

Ce chapitre délivre les résultats d'un modèle de simulation multi-marchés visant à évaluer l'impact de la production courante et des chocs des cours mondiaux sur la consommation de denrées alimentaires au niveau des groupes vulnérables des pays sahéliens en Afrique de l'Ouest. L'analyse confirme que les ménages les plus pauvres font les frais de tels risques de consommation, notamment dans les marchés fermés où les barrières commerciales réduisent

les importations et où les pauvres se trouvent dans une guerre de surenchère avec les consommateurs les plus riches dans un contexte d'approvisionnements limités de denrées alimentaires. En l'absence d'un commerce intense, un épisode de sécheresse qui diminuerait la production pluviale de céréales de 20%, réduirait de 15 % la consommation déjà faible en calories des pauvres des zones rurales, soit quatre fois plus que les autres catégories de ménages. Inversement, une hausse de 50% du cours mondial du riz affecterait les populations urbaines les plus défavorisées, réduisant ainsi leur consommation en calorie d'un pourcentage pouvant atteindre jusqu'à 8%.

Les réponses politiques doivent se focaliser sur deux mécanismes de base susceptibles de contribuer à modérer cette pression—le commerce et la substitution des denrées de base au niveau du consommateur. Situé immédiatement au Sud du Sahel, les pays côtiers d'Afrique de l'Ouest ont une pluviosité plus importante, deux saisons des pluies, une production plus stable de denrées à base de racines (manioc et ignames) ainsi que de grandes possibilités de doubles récoltes de maïs. Les résultats de ce modèle de simulation indiquent que le commerce régional de maïs, d'ignames et d'aliments préparés à base de manioc (comme le gari et l'attiéké) pourrait combler pour plus d'un tiers les baisses de consommation résultant d'une forte sécheresse au Sahel. Les importantes possibilités de substitution parmi les féculents, par exemple à travers une augmentation d'aliments à base de maïs, de manioc ou de sorgho prêts à consommer, réduirait significativement les conséquences de la baisse de consommation en élargissant la gamme de choix alimentaires et de ce fait les réponses de l'offre pendant les périodes de stress.

6.1. Introduction

Increasingly erratic weather patterns, together with recent world food crises in 2008 and 2011, have convinced West African policy makers of the growing need to understand the effects of major food shocks on the food security of poor households. In particular, two common shocks impose significant pressure on vulnerable households in the Sahel region of West Africa: (a) production shocks—commonly caused by droughts that result in reduction of the region's supply of rain-fed staples (sorghum, millet, and maize); and (b) world price shocks, especially for imported staple food in the region, such as rice. These production and price shocks limit the poor's access to food and trigger concerns among policymakers about how to reduce the effects of the shocks on poor, vulnerable households.

Developing adequate policy responses to these shocks requires a better understanding of the pathways through which they affect the food consumption of different groups in the population. In order to provide such an understanding, researchers under the SRAI 2 program developed a simulation model to estimate the effects of such shocks on the calorie consumption levels of four different population groups in a typical Sahelian economy: the rural poor, the rural nonpoor, the urban poor, and the urban nonpoor. The full structure of the model and its results are available in Haggblade, Me-Nsope, and Staatz (2016). This chapter summarizes the main findings from the analysis, highlighting the effects on the food consumption levels of the different population groups of: (a) their willingness to substitute between different staple food groups depending on relative prices and (b) regional and international commodity trade in softening the deterioration in food consumption that results from major supply shocks. By highlighting critical factors influencing consumption outcomes, the results help draw

implications for food and trade policies, including efforts to develop new technologies and markets for processed products that can help to broaden the ability of poor families to deal with major supply shocks.

6.2. Methods and Data

The study developed a multi-market simulation model, following the tradition of Braverman and Hammer (1986), to evaluate the impact of common production and world-price shocks on food consumption of vulnerable groups in the West African Sahel. The model simulates staple food consumption responses to price and income shocks of differing household groups using available estimates of key consumption parameters. To account for differences in consumption patterns, income sources and therefore vulnerability to key shocks, the model distinguishes between two categories of food-insecure households (the rural poor and the urban poor) as well as two nonpoor groups, urban and rural. The model includes five commodity groups─three staple foods (sorghum and millet, rice, and other starchy staples), high-value foods, and non-foods. Other starchy staples (OSS) for the Sahelian countries include maize, wheat, sweet potatoes, Irish potatoes, fonio, and small amounts of yams and cassava. High-value foods (HVF) include fresh fruits and vegetables, fats and oils, dairy products, poultry, fish, red meat and high-protein legumes such as cowpeas and groundnuts. Nonfood goods and services account for the remainder of household consumption expenditures.

More specifically:

- The model constructs as its baseline an archetype Sahelian food economy using detailed consumption, price, production, and trade data from 2010. A baseline household population, consumption, and expenditure profile is constructed for each of the four household groups using 2010 consumption survey data from Mali along with official poverty line estimates from 2010.[1] Table 6.1 summarizes the baseline population data as well as per capita food consumption and total expenditure for the four household groups.
- Initial consumption data reveal that within the staples, sorghum and millet provide the largest source of calories in most Sahelian countries (Table 6.1 and Me-Nsope 2014). Rice is the region's second most important single source of calories. Other starchy staples for the Sahelian countries contribute calories per capita roughly comparable to rice.
- Rural nonpoor (RN) households produce more food than they consume, making them large net sellers of food. In contrast, the rural poor (RP) and urban households remain net buyers of staple foods.
- While poor rural households rely on sorghum and millet for over 40% of total calorie intake, urban households rely more heavily on rice, consuming three times as much rice per capita as the rural poor, 66 kg per capita annually compared to 19 kg (Table 6.1). Because of these differences in consumption patterns, specific shocks affect these two

[1] The consumption data are drawn from the 2010 Enquête Legère Intégrée auprès des Ménages (ELIM) study in Mali (République du Mali 2011), while the Malian national poverty line from 2010 is used to define poor and nonpoor household groups (Republic of Mali 2011).

groups very differently. To capture these differences in consumption patterns, the initial consumption basket for each household group was obtained from ELIM 2010, République du Mali (2011) and Bricas, Tchamda, and Thirion (2013). In aggregate, the baseline food consumption quantities respect the per capita calorie availability of 2,833 kcal/person/day as well as the commodity composition of those calories as outlined in the Mali food balance sheet for 2010 (FAOSTAT 2016).

- Differences in consumption patterns affect the vulnerability of the urban and rural poor to various types of price shocks. An examination of detailed consumption data revealed significant differences in the composition of OSS and HVF consumed by different household groups. Within OSS, urban and nonpoor groups consume more wheat products and Irish potatoes than do rural and poor groups, while maize and sweet potatoes claim a larger share of OSS consumption among the rural groups. Even more striking differences emerge in the high-value foods, where wealthy and urban groups typically consume more beef, dairy products, fish, horticultural, and processed foods than do the rural and nonpoor households. In contrast, the rural households and urban poor consume a greater proportion of HVF in the form of oils and legumes (particularly cowpeas and groundnuts). As a result, the calorie density of HVF and OSS differs markedly across household groups. Among HVF, poor households purchase foods with a calorie density more than double that of HVF consumed by nonpoor groups (see Table 6.1).
- Aggregate food supply data were generated from FAO food balance sheets (FAOSTAT 2016). Because Mali's large irrigated rice infrastructure makes it far more rice self-sufficient than its neighbors, the baseline import shares adopt the Sahel-wide average of 40% domestic production and 60% rice imports (Table 6.2).

Price formation and supply responses differ across these five commodity groups. Given a single annual cropping season for most agricultural commodities, the model sets the short-run supply elasticity of domestic production at zero for all commodities. Weather-induced shocks to domestic production shift domestic supplies, leading to endogenous price determination for sorghum and millet (SM), other starchy staples (OSS) and high-value foods (HVF). Because imports account for over half of Sahelian West Africa's rice supplies, the model fixes the nominal rice price at import parity. Nonfoods similarly take prices as fixed, with imports balancing supply and demand. Other starchy staples (OSS) include a mix of internationally traded wheat products and regionally traded staple food substitutes, most notably maize, roots, and tubers, which traders bring north into the Sahel from coastal production zones. Given two rainy seasons across most of coastal West Africa, maize farmers in particular can respond rapidly to price hikes in regional markets, enabling higher imports during drought years. For this reason, the model includes an upward-sloping supply of OSS imports. In sum, endogenous prices equilibrate sorghum/millet, OSS and high-value food markets, while imports balance supply and demand for the model's two fixed-price commodities, rice, and nonfoods.

Table 6.3 summarizes these alternative supply responses and price formations embodied in this stylized model of Sahelian West Africa.

- Income for each household group varies in response to production and price shocks, which alter the quantity and value of the group's output. The model takes baseline

production shares for each household group as fixed and allocates production shocks proportionally across producing groups.

- Consumption likewise varies in response to price changes and shifting nominal income of each household group. For the four food commodities, the model estimates consumption responses using a log-linear demand function with constant elasticities of demand with respect to total expenditure, own price and cross prices. Demand for nonfoods becomes a residual, computed as total expenditure minus expenditure on foods, with changes in total expenditure set equal to changes in nominal income.

Table 6.1. Household Consumption and Expenditure Baseline

	Household groups				Total
	Rural		Urban		
	Poor	Nonpoor	Poor	Nonpoor	
Population share (%)	37%	25%	8%	30%	100%
Total expenditure ($/capita/year)	207	558	384	1,449	683
Consumption (kg/capita/year)					
sorghum/millet	125	158	55	61	109
rice	19	42	66	117	58
other starchy staples	56	103	45	110	83
high-value foods	39	102	138	278	134
nonfoods*	83	310	133	958	406
Net sales (production minus consumption: kg/capita/year)					
sorghum/millet	-28	133	-55	-61	0
rice	-1	24	-66	-117	-35
other starchy staples	-12	116	-45	-110	-12
high-value foods	89	153	54	-278	-8
Calorie density (kcal/kg)					
sorghum/millet	2,893	2,893	2,893	2,893	2,893
rice	3,618	3,618	3,618	3,618	3,618
other starchy staples	2,725	2,699	2,697	2,560	2,752
high-value foods	6,247	2,482	2,233	1,308	3,224
Caloric intake (kcal/person/day)					
sorghum/millet	990	1,252	436	483	860
rice	189	418	657	1,155	571
other starchy staples	420	764	334	774	510
high-value foods	671	691	843	994	892
total calories	2,270	3,125	2,270	3,406	2,833

Source: Haggblade, Me-Nsope, and Staatz (2016), compiled from République du Mali (2011); FAOSTAT (2016); Observatoire du Marché Agricole (2015); and Bricas, Tchamda, and Thirion (2013).
*Nonfoods valued in 2010 US$.

Table 6.2. Commodity Supplies Baseline Data

	Sorghum/ Millet SM	Rice R	Other Starchy OSS	High-Value Foods HVF	Nonfoods NF
Production (kg/capita)*	109	23	71	126	414
Exports (kg/capita)*	0	0	0	5	108
Import share of domestic consumption	0%	60%	15%	10%	25%
Price ($/kg)	0.30	0.56	0.45	1.29	1.00
Value added/value of gross output	0.90	0.75	0.90	0.75	0.80
GDP share	0.06	0.02	0.06	0.22	0.63

Source: Haggblade, Me-Nsope, and Staatz (2016) compiled from République du Mali (2011); Observatoire du Marché Agricole (2015); Miller, Adjao, and Staatz (2011); and World Bank (2016).
*Nonfoods valued in 2010 US$.

The model simulates the impacts of two different types of shocks:

- A production shock caused by a serious drought that reduces domestic production of sorghum, millet, and other starchy staples by 20%.
- A price shock in the world rice market resulting in a 50% increase in the world rice price, which in turn affects domestic rice prices.

Table 6.3. Price Determination in the Multi-Market Model

	Supply responsiveness		
Commodity	Domestic Production (Q)	Imports (M)	Price Determination
1. Sorghum/millet	Fixed	Fixed at zero	Endogenous (S=D)
2. Rice	fixed	Perfectly elastic	Exogenous world price sets domestic price
3. Other starchy staples	Fixed	Imperfectly elastic	Endogenous (S=D)
4. High-value foods	Fixed	Fixed	Endogenous (S=D)
5. Nonfoods	Fixed	Perfectly elastic	Fixed at base level; imports balance supply and demand

Source: Haggblade, Me-Nsope, and Staatz (2016).

In order to evaluate the impact of these shocks on the calorie consumption of the four different population groups, the analysis involved a series of simulations, using the General Algebraic Modeling System (GAMS). The first simulation provided a baseline projection that included no substitutions in consumption (all cross-price elasticities of demand set to zero) and only the rice supply (via imports) responsive to changes in prices and incomes. A second set of simulations introduced consumption substitution across staple food groups using cross-price elasticities of demand along with varying assumptions about the degree to which regional imports of other starchy staples (maize, roots, and tubers) respond to changes in demand. Further sensitivity analysis explored the impact of varying degrees of consumer substitution among staple food products and making income exogenous (as opposed to endogenous). See Haggblade, Me-Nsope, and Staatz (2016) for a full set of model equations used in simulating the impact of these shocks on income, prices and food consumption of vulnerable groups.

Critical to the results are the values of the parameters (income- , price- and cross-price elasticities of demand) included in the model. These were chosen following a thorough compilation of existing estimates for the Sahel region of West Africa (see Haggblade, Me-Nsope, and Staatz 2016, Annex B for details). Few of the existing estimates are disaggregated by place of residence (urban/rural) or by income group. In one welcome exception, Camara (2004) examined the effects of seasonality on the cross-price elasticities of different starchy staples in Bamako, Mali. Specifically, Camara's study reports substitution effects among different starchy staples across four different seasons—lean, harvest, post-harvest and planting seasons. Camara's findings reveal that: (a) substitution among different starchy staples was strongest during the lean season; and (b) pooling data across seasons dampens the annual average estimated substitution among the different starchy staples. The present study derived its cross-price elasticities from Camara's uncompensated lean-season parameters, based on their recognition that the lean-season parameters better reflect the behavior of poor households during periods of duress. Table 6.4 presents a summary of empirical estimates of demand parameters in the Sahel region used in this analysis.

6.3. Results

This section summarizes key results from the analysis of the two shocks simulated by the model: the drought-induced production shock that reduces domestic production of sorghum, millet, and other starchy staples by 20%; and the world market rice price shock that raises world rice prices by 50%.

Impact of a Major Drought

Table 6.5 summarizes the impacts of a major drought, defined as a 20% fall in the domestic production of sorghum and millet (SM) and other starchy staples (OSS), on the calorie consumption of the different population groups under various scenarios. The scenarios differ by the assumptions they make about: (a) the degree of substitution in demand between the different food groups and (b) the responsiveness of regional imports of other starchy staples during a major drought. Under all scenarios, the rural poor (RP) faced the greatest consumption pressure of all household groups. For example, under scenarios that allow rice imports but no increase in regional trade in OSS (Simulations a and b in Table 6.5), the RP faced severe compression in caloric intake, with per capita caloric intake falling by 15%, two to four times more than other household groups. The severity of the impact on rural poor households reflects the group's high initial level of sorghum/millet consumption and their sensitivity to changes in the sorghum/millet price (own-price elasticity of demand of -0.8, as shown in Table 6.4). The results further indicate that in the absence of any increase in regional imports of OSS (Simulations a and b in Table 6.5), increases in the prices of sorghum and millet and of other starchy staples will result in falling real incomes for the rural poor and both urban household groups, who are net buyers of products.

Allowing a moderate increase in regional trade in OSS, however, causes a significant reduction in the consumption pressure. Specifically, the results indicate that under the scenario with moderate regional imports of other starchy staples (Table 6.5, Simulation c), regionally sourced

imports of 164,000 tons from unaffected coastal countries moderate the domestic OSS price, as well as other foods prices.[2]

Table 6.4. Demand Parameters

Elasticity of Demand	With Respect to Commodity i			
	Sorghum/ Millet SM	Rice R	Starchy Staples OSS	High-Value Foods HVF
Expenditure elasticity of demand				
Rural poor (RP)	0.90	1.40	0.70	1.50
Rural nonpoor (RN)	0.40	0.90	0.50	1.20
Urban poor (UP)	0.80	0.90	0.60	1.00
Urban nonpoor (UN)	-0.20	0.50	0.40	0.80
Price elasticity of demand, Rural Poor				
sorghum/millet (SM)	-0.8	0.1	0.15	
rice '(R)	0.1	-0.4	0.05	
other starchy staples (OSS)	0.2	0.05	-0.9	
high-value foods (HVF)				-0.6
Price elasticity of demand, Rural Nonpoor				
sorghum/millet (SM)	-0.6	0.05	0.15	
rice '(R)	0.2	-0.2	0.1	
other starchy staples (OSS)	0.1	0.05	-0.6	
high-value foods (HVF)				-0.4
Price elasticity of demand, Urban Poor				
sorghum/millet (SM)	-0.4	0.1	0.1	
rice '(R)	0.1	-0.8	0.15	
other starchy staples (OSS)	0.15	0.15	-0.8	
high-value foods (HVF)				-0.9
Price elasticity of demand, Urban Nonpoor				
sorghum/millet (SM)	-0.2	0.05	0.1	
rice '(R)	0.05	-0.4	0.2	
other starchy staples (OSS)	0.1	0.2	-0.5	
high-value foods (HVF)				-0.7

Source: Haggblade, Me-Nsope, and Staatz (2016), Annex B.

[2] The figure for imports of 164,000 tons under the drought scenario with moderate OSS trade (Simulation c) is calculated as the difference between the change in the OSS supply in Simulation b relative to the non-drought situation (-189,000 mt) and that under Simulation c (-25,000 mt). Equivalently, it is equal to the sum of the net change in imports shown in Table 6.5 under Simulation c (98,700 mt) plus the original level of imports in normal years (65,300 mt, or 15% of normal supplies).

Table 6.5. Impact of a Major Drought*

				Simulations					
				a	b	**c****	d	e	f
			Demand substitution	None	Moderate	**Moderate**	Moderate	High	Hi-urban
			Import responsiveness						
			Rice	Infinite	Infinite	**Infinite**	Infinite	Infinite	Infinite
			Other Starchy Staples	Zero	Zero	**Medium**	Infinite	Medium	Medium
Simulation Results									
% Δ	Q	Domestic Production							
		SM		-20	-20	**-20**	0	-20	-20
		Rice							
		OSS		-20	-20	**-20**	0	-20	-20
		HVF							
% Δ	P	Price							
		SM		49.4	67.1	**53**	0	60.9	54.5
		Rice							
		OSS		37.1	53.2	**14.7**	0	18.3	15.9
		HVF		3.5	4.9	**2.6**	0	3	2.7
% Δ	M	Imports							
		SM							
		Rice		2.9	24.5	**12.5**	0.0	27.7	19.7
		OSS				**98.7**	0.0	131.7	108.8
		HVF							
Δ	S	Total Supply Change ('000 tons) =							
Δ	D	Change in Demand ('000 tons)							
		SM		-289	-289	**-289**	0	-289	-289
		Rice		13	113	**58**	0	127	91
		OSS		-189	-189	**-25**	0	30	-8
		HVF							
% Δ	Cal/cap/day								
		RP	rural poor	-15.4	-15.0	**-11.3**	0	-9.4	-11.5
		RN	rural nonpoor	-8.1	-4.4	**-4.3**	0	-0.7	-4.4
		UP	urban poor	-6.7	-3.6	**-2.0**	0	1.4	1.2
		UN	urban nonpoor	-5.1	-1.2	**-0.4**	0	2.9	2.6

Source: Haggblade, Me-Nsope, and Staatz (2016).
* Shock = 20% reduction in domestic production of sorghum, millet (SM) and other starchy staples (OSS).
** Best-guess baseline scenario.

Compared to a 53% increase when no increase in regional trade is allowed (Simulation b), the OSS price rises only 15% in Simulation c. This smaller price increase relative to the no-increase-in-trade scenario in turn triggers substitution between different foods, thereby driving calorie improvements among all household groups. For rural poor households, calorie compression drops from -15% when there is no increase in regional trade to -11% with moderate regional imports of OSS. The urban poor also benefit from the increased regional imports in OSS, with their calorie shortfalls dipping from -3.6% to -2.0%. Further increases in trade responsiveness (Simulation d) raise the total supply of OSS from imports even more, further moderating the OSS price increase, and consequently reducing calorie compression among all household groups.

The moderate regional trade scenario (simulation c) is more realistic than the other scenarios given likely aggregate supply constraints in the coastal countries, and hence is dubbed the best-guess baseline scenario in Tables 6.5 and 6.6.

In addition to regional trade, substitution among food staples also helps to moderate consumption pressure, though primarily among urban households and the rural nonpoor. To observe the effect of substitution in demand on consumption when there is a major drought, compare Simulations a (zero cross-price elasticities) to simulation b (non-zero, positive cross-price elasticities). The results indicate that allowing for substitutions leads to increased consumer demand for rice in response to sharply increased SM and OSS prices, an increase in demand that is met by increased rice imports, which benefit all rice consumers.

The results indicate, however, that urban nonpoor households benefit the most from the increased rice imports when substitution is allowed. This result is due to this group's greater initial consumption of rice and their stronger purchasing power than other groups. The effect on calorie consumption of the substitution in demand during a major drought is marginal for rural poor households (calorie compression dropped from -15.4% to -15.0%). The modest benefit to the rural poor is because food substitution in the absence of trade pushes up prices for local foods, and given the rural poor's weak purchasing power, these households get outbid for those foods by the nonpoor households (see more in section 6.4 below).

Impact of a World Rice Price Hike of 50%

Table 6.6 illustrates the impacts of a 50% spike in world rice prices. The findings indicate that urban households, particularly the urban poor, are hardest hit by higher rice prices. Under the most realistic conditions (moderate demand substitution and moderate trade in OSS – Simulation i), per capita calorie consumption would fall by 7.0% among the urban poor and by 3.2% for the urban nonpoor when rice prices rise by 50%. The results indicate that rural households face smaller losses due to their lower initial levels of rice consumption. The rural nonpoor would actually benefit slightly, with calorie consumption increasing by 0.2% when there is a spike in the price of rice of 50%. This result is due to the rural nonpoor being large net sellers of rice; hence, their incomes rise with the large increase in rice prices. This income effect more than offsets the impact of the higher price of the rice that they consume.

Allowing for moderate substitution between foods in the absence of an increase in regional trade in OSS (Table 6.6, Simulation h) increases the demand for substitute staple foods to make up for the reduced consumption of rice caused by the rice price spike, thus pushing up the prices of SM (+8.8%) and OSS (10.4%). Under this scenario, all household groups except the rural nonpoor see their consumption levels fall considerably. Meanwhile, the rural nonpoor, as net sellers of food, benefit from the increase in the prices of substitute staple foods (OSS and SM), allowing them to increase their calorie consumption.

As in the case of a major drought, regional trade in OSS helps to moderate the consumption pressure originating from the spike in the world rice price. Moderate responsiveness of regional OSS imports (Simulation i) increases the total supply of OSS by 38,000 tons relative to the pre-price-spike situation, an increase which fills about a third of the total supply gap created by the 101,000-ton reduction in rice imports.

This growth in the OSS supply enables greater substitution towards these starchy staples, thereby softening the impact of the rice price hike on per capita calorie consumption for all

household groups.[3] The results show that the rural poor benefit the most from a moderate increase in trade in OSS, as their calorie loss per capita declines from -2.0% with no expansion of OSS trade to -1.1% with a moderate OSS trade increase.

Table 6.6. Impact of a 50% Increase in World Rice Price

				Simulations					
				g	h	**i***	j	k	l
			Demand substitution	None	Moderate	**Moderate**	Moderate	High	Hi-urban
			Import responsiveness						
			Rice	Infinite	Infinite	**Infinite**	Infinite	Infinite	Infinite
			Other Starchy Staples	Zero	Zero	**Medium**	Infinite	Medium	Medium
Simulation Results									
% Δ	Q	Domestic Production							
		SM							
		Rice							
		OSS							
		HVF							
% Δ	P	Price							
		SM		0.6	8.8	**7.0**	5.8	16.6	9.1
		Rice		50	50.0	**50.0**	50.0	50	50
		OSS		0.5	10.4	**4.2**	0	9.5	7.2
		HVF		0.6	1.4	**1.0**	0.8	1.6	1.2
% Δ	M	Imports							
		SM							
		Rice		-24.1	-20.2	**-22.1**	-23.3	-15.1	-19.2
		OSS				**22.8**	39.4	57.2	41.3
		HVF							
Δ	S	Total Supply Change ('000 tons) =							
Δ	D	Change in Demand ('000 tons)							
		SM							
		Rice		-111	-93	**-101**	-107	-70	-88
		OSS				**38**	65	95	69
		HVF							
% Δ	Cal/cap/day								
		RP	Rural Poor	-1.3	-2.0	**-1.1**	-0.5	-0.6	-1.9
		RN	Rural Nonpoor	-0.3	0.0	**0.2**	0.4	1.8	-0.1

Source: Haggblade, Me-Nsope, and Staatz (2016).
* Best-guess baseline scenario.

Sensitivity Analysis

Increasing the degree of substitution among staple foods: Tables 6.5 and 6.6 also analyze the impact of variations in the willingness of consumers to substitute among different food staples, as measured by cross-price elasticities of demand. The next-to-last column of each table shows how outcomes would differ if all cross-price elasticities of demand shown in Table 6.4 were doubled—for example, if expansion in the availability of processed forms of millet, sorghum and other starchy staples made them closer substitutes for each other and for rice. The last column in each table shows the impacts of doubling only the cross-price elasticities in the urban

[3] The increase in OSS price fell from 10.4% with no expansion of OSS trade to an increase of only 4.2% with a moderate increase in OSS trade.

areas—for example, if newly available processed products remain concentrated only in the cities.

In the case of a major drought, higher food substitution among all household groups (Table 6.5, Simulation e) leads to a major increase in rice imports (compared to the base Simulation c) and to a slight increase in OSS and SM prices, which, in turn, trigger increased OSS imports. In this scenario, the responsiveness of rice imports increases from 58,000 tons in the base scenario (Table 6.5, Simulation c) to 127,000 tons under higher food substitutability (Table 6.5, Simulation e). All income groups benefit. However, when higher substitutability occurs only in urban areas, only the urban households gain. While the urban poor see calorie consumption improve, from a 2% decline with a drought under moderate substitutability (Simulation c) to a 1.2% improvement under urban-only higher substitution (Simulation f), both rural household groups see exacerbated calorie losses.

A similar result occurs in the face of a world rice price spike (Table 6.6). All households benefit from increased substitutability when cross-price elasticities increase for all household groups (Simulation k). In response to higher substitutability, SM and OSS prices increase, triggering increases in OSS imports. These imports increase from 38,000 tons in the base scenario (Simulation i) to 95,000 tons under high substitution (Simulation k). As a result, all household groups see improved calorie consumption. However, when only urban households have access to higher substitutability foods (Simulation l), urban households improve calorie consumption at the expense of rural households. This outcome suggests that the geographic availability of more substitutable processed foods, which may trigger these changes in substitutability in the first place, will become an important determinant of differential consumption outcomes in rural and urban areas.

Endogenizing farm income: The simulations presented in Tables 6.5 and 6.6 all consider farm income to be endogenous—that is, they assume that as prices rise, incomes increase for those groups that are net sellers of the goods (the rural non-poor for major food staples). Income gains from these net sales help to moderate the consumption shock resulting from increases in staple food prices. In contrast, if income is held exogenous (unaffected by the staple food price increases), calorie losses accruing to the rural nonpoor (large net sellers of millet and sorghum) nearly double in the drought scenario to -7.6% compared to -4.3% under the assumption of endogenized farm income in the base scenario (simulation c in Table 6.5). A similar result occurs in the event of a 50% hike in world rice price; calorie consumption for the rural nonpoor would fall from roughly neutral (0.2% increase) in the base scenario (Simulation i in Table 6.6) to -1.1% without the income effect (see Haggblade, Me-Nsope, and Staatz 2016 for details).

6.4. Discussion

Bidding Wars

Any supply shock will trigger a bidding war among different groups in the population for the resulting reduced supply of staples. In the case of a major drought affecting the supply of SM, these bidding wars determine which groups will absorb the reduction in sorghum and millet supplies and which ones will capture the increase in OSS supplies resulting from the induced increase in regional imports. Table 6.7 illustrates the bidding war in the aftermath of a major

drought. The results indicate that the rural poor would absorb a disproportionate share of the total reduction in SM and OSS compared to their share of total consumption of those goods in the baseline (pre-drought) situation. Although the rural poor account for 43% of baseline SM consumption, they absorb 57% of the total reduction in supplies. In contrast, the urban nonpoor account for 17% of total initial SM consumption, but absorb less than 6% of the reduction, as they bid supplies away from the rural poor. Although the reduction in total OSS supply amounts to only 2.2% due to increased regional OSS imports, the rural poor and all urban households lose the bidding war for OSS supplies to the rural nonpoor, who absorb only 14% of the reduced supply compared to their 31% baseline consumption share. As large net sellers of cereals, the rural nonpoor see their real income increase with rising commodity prices, enabling them to bid away food supplies from all other household groups. For the same reason, rice supplies, which increase by 7.5% due to imports, also go disproportionately to rural nonpoor households, a group that accounts for only 18% of the initial share of national rice consumption but absorbs 40% of the increased rice supplies.

Table 6.7. Bidding Wars Following a Major Drought

	SM - supply falls by 20%		OSS- Supply falls by 2.2%		Rice- Supply increases by 7.5%	
Household group	Initial share of total consumption	Share of reduction absorbed	Initial share of total consumption	Share of reduction absorbed	Initial share of total consumption	Share of increase absorbed
Rural poor	43%	57%	25%	32%	12%	12%
Rural nonpoor	36%	34%	31%	14%	18%	40%
Urban poor	4%	3%	4%	8%	9%	8%
Urban nonpoor	17%	6%	40%	46%	61%	40%
total	100%	100%	100%	100%	100%	100%

Legend: Losers, Winners

Source: Compiled from Table 6.5, Simulation c.

Table 6.8 illustrates the outcome of these bidding wars following a rice price hike in the world market. In this case, the bidding wars revolve around which groups will absorb the reduction in rice supplies and which ones will capture the increase in OSS supplies resulting from the induced increase in regional imports. The results indicate that in the scramble for diminishing rice supplies, the rural nonpoor clearly win, as they account for 18% of initial rice consumption, but they absorb only 6% of the total reduction in supplies. In contrast, the urban poor emerge as the clear loser, accounting for only 9% of initial rice consumption but absorbing 17% of the shrinkage. The results also indicate that in the bidding war for increased OSS supplies, the rural poor lose out—they account for 25% of initial OSS consumption, but they capture only 1% of increased OSS supplies. In contrast, the urban nonpoor capture over 80% of increased OSS supplies.

Table 6.8. Bidding Wars Following a World Rice Price Hike

	SM - supply stable		OSS- Supply increase by 3.4%		Rice- Supply falls by 13.2%	
Household group	Initial share of total consumption	Share of final consumption	Initial share of total consumption	Share of increase absorbed	Initial share of total consumption	Share of decrease absorbed
Rural poor	43.2%	43.1%	25%	1%	12%	13%
Rural nonpoor	36.1%	35.9%	31%	13%	18%	6%
Urban poor	3.8%	3.9%	4%	5%	9%	17%
Urban nonpoor	16.9%	17.1%	40%	81%	61%	64%
total	100%	100%	100%	100%	100%	100%

Legend: Losers, Winners

Source: Compiled from Table 6.6, Simulation i.

Trade

Trade serves as a potentially critical shock absorber in times of food insecurity. In particular, the simulations highlight the importance of rice imports during drought years and of OSS imports from coastal countries during times of drought in the Sahel as well in periods of world price spikes. Specifically, in the case of a major drought, regional imports of 164,000 tons of maize, cassava and other starchy staples (OSS) from unaffected coastal countries plus 58,000 tons of rice imports from Asia fill nearly 40% of the gap resulting from a 20% decline in domestic SM and OSS production (Table 6.5, Simulation c). Similarly, in the case of a world rice price hike, regional imports of OSS (especially maize) fill over 35% of the gap resulting from price-induced reductions in rice imports (Table 6.6, Simulation i). The findings in Tables 6.5 and 6.6 clearly show that increases in the supply responsiveness of regional OSS imports can help to moderate consumption pressure in the Sahel.

These findings reinforce the importance of repeated efforts by the Economic Community of West African States, West Africa Economic and Monetary Union, Comité Permanent Inter-Etats de Lutte contre la Sécheresse au le Sahel (ECOWAS, WAEMU, CILSS) , and other regional organizations to maintain open borders (see Chapter 13 in this volume). Such efforts will prove critical in building resilient regional food systems capable of coping with what would otherwise be extreme consumption compression by vulnerable groups during food crises.

Consumer Substitution

Substitution among staple foods serves to moderate supply-induced consumption shortfalls. The basic mechanism at work involves bidding up prices of unaffected substitute foods, which in turn helps to elicit a supply response. In Eastern and Southern Africa, multi-year storage of in-ground cassava stocks serves as a regional food buffer stock in drought years, when maize supplies fall (Haggblade et al. 2012). In West Africa, in contrast, maize supplies from the coastal countries, which are generally less affected by drought than their northern Sahelian neighbors and which have two rainy seasons (and hence the possibility of two maize crops per year), play a similar buffering role. In addition, yams and cassava-based convenience foods like gari and attieké are increasingly traded between the coastal states and the Sahel. The model simulation results highlight the importance of consumer substitution among food staples. In

scenarios without short-term supply response through regional trade in OSS, consumer substitution benefits primarily nonpoor households, who have the purchasing power to outbid vulnerable groups for limited available food supplies.

6.5. Conclusions and Policy Implications

Four major policy implications emerge from the preceding analysis:

First, fluid trade benefits vulnerable groups. The results highlight the critical importance of trade in staple foods, both regionally and internationally. Tradeability of staple foods provides a vital shock absorber that protects both the urban and rural poor populations from shocks resulting from reductions in domestic staple food production and spikes in world prices. In the case of a major drought, policy makers have long recognized the importance of rice imports in helping protect the urban poor and nonpoor populations. Less widely recognized is how regional tradability of other starchy staples, coupled with the willingness of consumers to substitute these other starchy staples for rice to some degree, can mitigate the pain caused by a major drought or a spike in world rice prices. For example, compare a major drought scenario where only rice imports can increase and there is no inter-staple substitution by consumers to a scenario of moderate tradability of OSS and a degree of substitution consistent with our best estimates of cross-price elasticities of demand. In the latter scenario, the reduction in per capita calorie consumption among the urban poor falls by more than two-thirds compared to the former scenario and virtually disappears for the urban nonpoor. Among the rural poor, who absorb the hardest hits during a major drought, compression in per capita calorie consumption falls 27% relative to the no-increase-in-OSS-trade, no-substitution scenario.

Therefore, efforts by ECOWAS and other regional organizations to build a truly regional market for foodstuffs in West Africa will prove vital to the food security of the Sahelian countries. The challenge remains to convince policy makers that more open borders can only function effectively as a two-way street. The Sahelian countries cannot expect to be able to close their own borders to exports in periods of high prices (to protect domestic consumers) and simultaneously expect their neighbors to export to them during periods of stress. Yet, the need to protect low-income domestic consumers during periods of high prices remains a stark political reality. The Sahelian countries therefore need to find instruments other than trade barriers to offer that consumer protection. This leads directly to the second policy implication.

Second, the poor require special support. The urban and rural poor typically suffer the most acute calorie compression during food crises, particularly when policy makers place restrictions on regional trade. During rice price crises, the urban poor face the largest consumption pressure, while in drought years the rural poor emerge as most vulnerable. Therefore, in addition to improving trade flows, policy makers need to offer increased purchasing power through temporary, targeted income transfers to vulnerable groups. These could take various forms, from public works employment to direct cash transfers to in-kind distribution of food.

These efforts need to target the rural poor and not just the urban poor. The income impacts of higher food prices help to temper the adverse impacts on the rural nonpoor, but have little positive impact on the rural poor. Because the rural nonpoor are net sellers of starchy staples

and high value foods, higher food prices increase their incomes, which helps offset the negative effects of higher prices on their consumption. The differential income effect on the rural nonpoor and the rural poor underlines the need in policy analysis to distinguish between rural net sellers and rural net buyers of staple foods rather than assuming that all farmers benefit from higher food prices.

Third, there is a need to increase substitutability through improved processing of traditional staple foods. The sensitivity analysis presented above demonstrates that increasing the degree of substitutability of sorghum/millet and other starchy staples for rice (e.g., through processing) could help reduce the adverse impacts of a world price shock on consumers, particularly when coupled with more open regional trade in these products. For many years, CILSS and other regional organizations have promoted the development of processed maize, millet, sorghum, and other local food products to substitute for imported rice (Ilboudou and Kambou 2009). The analysis suggests that these product-development efforts can significantly help the poor, but only when coupled with efforts to ensure the regional tradability of locally produced starchy staples. The analysis further suggests that increasing cross-product substitutability only in urban areas—for example, through making such processed products more available only in the cities—can actually make the rural population worse-off by exacerbating the bidding wars between rural and urban groups for available food supplies. This finding implies that policy makers need to include rural areas in their efforts to improve the availability of processed local staple foods.

Fourth, policy makers need to support efforts to get better information on cross-product substitution. Developing improved food policies requires solid information on how consumers will respond to changes in the relative prices of different foods. The results of the sensitivity analysis demonstrate the sensitivity of outcomes to the demand parameters used in the model. Despite their importance, available estimates of cross-price elasticities for different staple foods in the Sahel remain scarce (see Chapter 5 in this volume). Furthermore, those that exist from econometric studies vary considerably in terms of commodity disaggregation, times, location, and methods. There is therefore a need to support further research on consumer behavior, including use of non-econometric approaches (e.g., contingent valuation studies with consumers) to obtain more reliable and disaggregated estimates of expected consumer responses during periods of stress.

References

Braverman, A. and J.S. Hammer. 1986. Multimarket Analysis of Agricultural Pricing Policies in Senegal. In *Agricultural Household Models: Extensions, Applications, and Policy*, ed. Inderjit Singh, Lyn Squire, and John Strauss. Baltimore: Johns Hopkins University Press for the World Bank.

Bricas, N., C. Tchamda, and M.C. Thirion. 2013. Consommation alimentaire en Afrique de l'ouest et centrale : les productions locales tirées par la demande urbaine, mais les villes restent dépendantes des importations de riz et de blé. Déméter 2014. *économie et stratégies agricoles* 20: 125-42.

Camara, O. 2004. The Impact of Seasonal Changes in Real Incomes and Relative Prices on Households' Consumption Patterns in Bamako, Mali. Ph.D. dissertation. Michigan State University.

FAOSTAT. 2016. http://faostat3.fao.org/home/E.

Haggblade, S., A.A. Djurfeldt, D.B. Nyirenda, et. al. 2012. Cassava Commercialization in Southeastern Africa. 2012. *Journal of Agribusiness in Developing and Emerging Economies* 2.1: 4-40. doi: 10.1108/20440831211219219.

Haggblade, S., N.M. Me-Nsope, and J.M. Staatz. 2016. *Food Security Implications of Staple Food Substitution in Sahelian West Africa*. PRESAO/SRAI 2 Working Paper No. 2016-02. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai2/WP2016_02_Full_length_Article_Food%20Security_Implications_13Oct_reformatted.pdf.

Ilboudou, S. and D. Kambou. 2009. Elaboration d'une stratégie opérationnelle de dévloppement de l'agro-industrie au Sahel et en Afrique de l'Ouest: rapport provisoire. Ouagadougou: CILSS Sécretariat, Exécutif Programme Régional d'Appui/Accès aux Marchés.

Me-Nsope, N.M. 2014. Trends and Determinants of Food Consumption Patterns in West Africa. Ph.D. dissertation, Michigan State University. https://etd.lib.msu.edu/islandora/object/etd%3A2830.

Miller, S., R. Adjao, and J. Staatz. 2011. Excel Spreadsheet Decision Support Tool to Assess the Impact of FTF Investments on Income Growth and Food Security. Report to USAID/Mali. East Lansing, MI: Michigan State University. http://fsg.afre.msu.edu/promisam_2/FTFMatrix_2011.xls.

Observatoire du Marché Agricole (Mali). 2015. Le Reflet, various issues. http://www.oma.gov.ml/.

Republic of Mali, Ministry of Economy and Finance, General Secretariat. 2011. Presentation of the Report on the 2010 Review of the Strategy Framework for Growth and Poverty Reduction. Bamako. https://www.imf.org/external/pubs/ft/scr/2011/cr11372.pdf.

République du Mali, Ministère de l'Economie et des Finances, Institut National de la Statistique (INSTAT). 2011. Résultats préliminaires du volet ELIM. Bamako: République du Mali. http://www.maliapd.org/IMG/file/pdf/ACTUALITE/Rapport_ELIM_draft_06_06_11.pdf.

World Bank. 2016. Global Economic Monitor (GEM) Commodities website. http://databank.worldbank.org/data/reports.aspx?source=global-economic-monitor-(gem)-commodities.

CHAPTER 7

Projected Demand and Supply for Various Foods in West Africa: Implications for Investments and Food Policy[1,2]

Projections de la demande et de l'offre pour diverses denrées alimentaires en Afrique de l'Ouest : implications pour les investissements et la politique alimentaire

Yuan Zhou and John M. Staatz

Abstract

This chapter uses expenditure-elasticity estimates derived from budget-consumption studies in West Africa and hypotheses about alternative income growth trajectories to develop scenarios about the evolution of demand for various foods in the region over the period 2010–2040. It then compares the projected demand growth with projection of production growth in key commodities to identify potential or increasing demand–supply gaps. From this comparison, it derives implications for needed investments and policies regarding different commodities and components of the West African agrifood system. The analysis shows that in absolute terms, production shortfalls relative to demand for starchy staples, particularly rice and wheat, will continue to pose a major challenge for the Economic Community of West African States (ECOWAS) countries. In relative terms, however, imbalances between domestic production and demand will increase more quickly for foods with high income-elasticities of demand, such as meat, dairy products, seafood, fruits and vegetables and vegetable oils. Urban demand will grow two to four times faster than rural demand, depending on the commodity, putting increased pressure on already stressed urban food marketing systems. Substantial variations in supply–demand gaps across countries suggest that more fluid regional trade could help individual countries cope with these challenges. The findings also suggest that the focus of food policies in West Africa, historically on starchy staples, particularly cereals, needs to broaden to include a range of higher-value products for which demand is likely to increase very rapidly in the near future.

Résumé

Ce chapitre se base sur des estimations de l'élasticité des dépenses dérivées d'études budgets-consommation en Afrique de l'Ouest et sur des hypothèses se rapportant à divers scénarios d'augmentation des revenus pour élaborer les grandes tendances d'évolution de la demande de divers aliments dans la région sur la période 2010–2040. La projection de l'augmentation de la demande est ensuite comparée à la projection de l'augmentation de la production des produits de

[1] A longer version of this chapter originally appeared in *Food Policy* 61 (2016) 198–212. Reprinted by permission.
[2] In this chapter, the term *West Africa* refers to the 15 countries that are members of the Economic Community of West African States (ECOWAS): Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo.

base-clés pour repérer les potentiels écarts ou disparités croissantes entre la demande et l'offre. Partant de cette comparaison, il a été déduit des besoins d'investissements et de politiques concernant divers produits de base et composantes du système agroalimentaire ouest-africain. L'analyse démontre qu'en termes absolus, le déficit de production par rapport à la demande de féculents, particulièrement le riz et le blé, continuera de poser un grave problème aux pays de la CEDEAO. En termes relatifs, toutefois, le déséquilibre entre la production intérieure et la demande augmentera plus rapidement pour les aliments à forte élasticité de la demande par rapport aux revenus, tels que la viande, les produits laitiers, les fruits de mer, les fruits et légumes frais et les huiles végétales. La demande urbaine progressera deux à quatre fois plus rapidement que la demande rurale, en fonction du produit de base, ce qui exercera une pression accrue sur des systèmes de commercialisation alimentaire urbaine déjà tendus. Ces fluctuations importantes de l'écart entre l'offre et la demande dans les pays laissent à penser que des échanges régionaux plus intenses pourraient aider les pays à relever individuellement ces défis. Ces conclusions semblent aussi indiquer que les politiques d'Afrique de l'Ouest, centrées dans le passé sur les féculents, particulièrement les céréales, doivent être élargies pour intégrer un éventail de produits de plus grande valeur marchande pour lesquels la demande devrait progresser très rapidement dans un avenir proche.

7.1. Introduction

As discussed in Chapters 4 and 5, food demand has been growing rapidly and changing in its composition over the past 30 years in West Africa. In addition to population and income growth, changes in lifestyles associated with globalization and the region's rapid urbanization appear to be major drivers of changing food demand in West Africa (Hollinger and Staatz 2015). West Africa is the most urbanized part of Sub-Saharan Africa, with 45% of the population living in cities in 2015, and one of the most rapidly urbanizing areas of the world (UNDESA 2014). A growing urban middle class (which the African Development Bank (2011) defines as those families living on more than US$2 per capita per day), combined with increasing time pressures on all urban consumers due to congestion and increased labor-force participation of women outside the home, are boosting the demand for more convenient, processed and prepared foods that are easy to prepare and consume. There is also increasing demand, especially among the middle class, for product attributes such as consistent quality, healthiness, and food safety (Bricas and Seck 2004; Hollinger and Staatz 2015).

The governments of all 15 ECOWAS member states and ECOWAS as a regional organization have increased their policy emphasis on agricultural growth since the food price spikes of 2008. All are in the process of adopting new investment programs and policy changes aimed at stimulating agricultural growth and food system transformation. In addition, starting in 2015 ECOWAS countries began instituting a common external tariff (CET), which aims at providing a uniform schedule across member countries of taxation of imported food products. The rapid evolution of food demand in West Africa, however, raises serious questions about how well West African agrifood systems will respond to the changing demand, quantitatively and qualitatively, over the coming 25 years, even with the new ECOWAS CET. If they cannot, the region will become increasingly dependent on food imports and/or face higher domestic food prices. In crafting improved policies and investments for the agrifood sector, it is therefore critical to have a

better understanding of how demand is likely to evolve and compare this with likely trends in domestic supply.

This chapter provides such information. It compares projected rates of growth in expenditures for major food items, in rural and urban areas, with projected rates of growth in the supply of those items. These projections are made for the ECOWAS region as a whole and for individual West African countries over the period 2015-2040, relative to a baseline of 2010. The comparison is done in five-year increments from 2010 through 2040. This comparison allows identification of: (a) the shifting relative importance of rural and urban areas in total food demand and (b) food items where significant production shortfalls relative to demand may lead to burgeoning imports and/or increases in real prices. Such information will suggest possible areas where current food system development efforts will need to be modified.

7.2. Literature Review and Knowledge Gap

Economists have long noted that rising per capita incomes and urbanization typically lead to striking changes in dietary patterns (e.g., Bennett 1954). West Africa is no exception. Since the 1980s, policy makers in the region have been concerned about how urbanization and rising incomes were leading to substitution of rice and wheat—largely imported—for locally produced starchy staples, particularly cereals such as millet and sorghum (CILSS and OECD 1989). This substitution led to worries that the region's import-dependence for basic staples could reach financially unsustainable levels, and to proposals in the mid-1980s to increase import barriers in order to create a *regional cereals protected zone* (Gabas, Giri, and Mettetal et al. 1987).

The policy concerns stimulated analyses in the 1980s and early 1990s of the factors driving these shifts (e.g., Delgado and Miller 1985; Reardon, Thiombiano, and Delgado 1988; Delgado 1989; Rogers and Lowdermilk 1991). A major conclusion from these analyses was that while declining relative prices for the imports relative to locally produced staples played some role in stimulating the substitution (particularly in the CFA franc countries, where the currency was becoming increasingly overvalued during the 1980s and early 1990s, making imports cheaper for domestic consumers), much of the shift was prompted by urban consumers' desire for convenience. Wheat products (bread, pasta, etc.) are practically ready-to-eat, and rice is much quicker to prepare than traditional West African starchy staples (e.g., millet, sorghum, yams, and cassava). Time-pressed urban consumers increasingly shifted their consumption towards these *convenience foods*. Although processed forms of the traditional staples (e.g., packaged millet and sorghum flours and *instant* processed yams) have appeared in West African markets in recent years to try to capture some of this demand, their market share remains small relative to rice and wheat products (Hollinger and Staatz 2015).

During the 1990s and early 2000s, analysts' attention broadened beyond starchy staples to examine other forms of dietary diversification, including increased consumption of fruits, vegetables, animal products, and processed foods, particularly in urban areas, and increased attention to product quality (e.g., Cour and Snrech 1998; Bricas and Seck 2004). The OECD/Sahel and West Africa Club was particularly active in sponsoring studies examining the possible impacts of urbanization on the structure of West African agriculture and its likely capacity to compete with imports (e.g., OECD 2014). While some recent studies (OECD 2014; Bricas, Tchamda, and Thirion 2013; Hollinger and Staatz 2015) have drawn insights from budget-consumption studies

to discuss changing patterns of rural and urban food consumption, none have used estimates of income-elasticities from such studies to make quantitative projections of future demand for different food products in West Africa or assess their implications for agricultural policies.[3]

In contrast, Tschirley et al. (2013, 2015) have conducted such analyses for East and Southern Africa. Their studies show very rapid likely growth in the demand for high-value products such as meats, seafood, dairy products, fruits and vegetables and a wide range of processed products, in response to rising incomes and urbanization. One implication of their results is that the level of investment in infrastructure and human capital in the post-farm parts of the food system (e.g., food processing and marketing), especially of perishables, will need to increase dramatically in the coming years if demand for these high-value products is to be met through local production rather than imports. This chapter provides a similar analysis for the West Africa region, drawing implications for needed policies and investments.

7.3. Methods and Data

Four steps are involved in carrying out the comparison of the rates of growth of food expenditures with those of the supply of different food items: (1) projecting the increases in per capita expenditures on total food as well as individual food items due to income growth, in both urban and rural areas, for each country for which data are available, under different income-growth scenarios; (2) converting estimates of rural and urban per capita expenditures in a given year into total expenditures by multiplying the per capita figures by the projected rural and urban populations for that year; (3) aggregating expenditure figures across countries to come up with a regional expenditure estimate for the ECOWAS zone; and (4) making projections of the growth in supply for each of the future years to compare with the projected expenditures. Each of these steps is explained in more detail in the following paragraphs.

Projection of Per Capita Expenditures

Expenditure projections: obtaining initial elasticity estimates. For expenditure projections, we used expenditure elasticity estimates for both rural and urban areas calculated from budget-expenditure study data in eight ECOWAS countries: Burkina Faso, Côte d'Ivoire, Ghana, Mali, Niger, Nigeria, Senegal, and Togo. For seven of the countries, we used expenditure elasticities estimated by the Regional Strategic Analysis and Knowledge Support System (ReSAKSS) in collaboration with national research teams (Tayondyandé and Yade 2012 as reported in Hollinger and Staatz 2015).[4] As estimates for Nigeria were not available from ReSAKSS, we developed such estimates using based on a Tobit model using 2013 Nigerian Living Standards Measurement Study (LSMS) data. The eight countries account for 89% of the total population in West Africa. Table 7.1 summarizes the expenditure elasticity estimates for 18 food groups in both urban and rural areas. A major advantage of using these elasticity estimates as opposed to those available from

[3] Income elasticities of demand are a measure of how quickly demand for a product increases as incomes rise. If demand grows at the same rate as income growth, the elasticity has a value of 1.0; product demands that grow more than proportionally with higher incomes have an elasticity greater than one, and those that grow less quickly than income have a value below one.

[4] Although the elasticities estimated by ReSAKSS are reported in Hollinger and Staatz (2015) as income-elasticities of demand, the underlying studies upon which they were based used total household expenditures as a proxy for income; thus, in reality, these estimates are expenditure elasticities of demand.

United States Department of Agriculture (USDA) (Mohammad et al. 2011) is that the latter are not disaggregated by rural and urban areas. The shifting geographic location of food consumption has major policy implications for West Africa.

All expenditure data are in real per capita U.S. dollars in purchasing power parity (PPP) terms, using constant 2010 international dollars. When the latest data for a given country were before or after 2010, total expenditure values were brought to 2010 levels using the average Gross Domestic Product (GDP) growth rate between the survey year and 2010.

Adjusting expenditure elasticity estimates to take account of future income growth. One challenge in using expenditure elasticity estimates to project consumption patterns more than a few years into the future is that the expenditure elasticities of demand for food generally decline as total expenditures rise. In other words, as a household's income rises, it typically spends less of each additional dollar on food and more on non-food items, a relationship known as Engel's Law. Since we are making demand projections over the period 2010-2040, it is very important to estimate how much average expenditure elasticities will decline over this 30-year period, when per capita incomes are expected to rise substantially under all the growth scenarios (see the next section).

Zhou and Staatz (2016) provide details on how the elasticity estimates were adjusted as projected future per capita income levels increased. The adjustments were made based on observed patterns of declining elasticities among higher-income consumers in Nigeria (for all countries except Nigeria and Ghana, where projected future income levels were highest) and South Africa (for Ghana and Nigeria). After these adjustments were made, the projected change in per capita expenditure for a given item in a given year was calculated relative to 2010 levels by multiplying the estimated expenditure elasticity for the item in that year by the estimated change in per capita income relative to 2010, under six different growth scenarios, as explained below.

Growth scenarios: Two key sources of predictive uncertainty regarding the future demand for different food items are the rate of growth in real per capita expenditure and the distribution of that growth (Tschirley, Haggblade, and Reardon 2013). We developed three scenarios of the rate of per capita income growth: business as usual (BAU), low-case development (LC), and high-case development (HC). LC refers to an outcome resulting from an unfavorable environment while HC indicates a favorable economic climate. Under BAU, the average per capita income growth rates were determined as follows: for the period 2010-15, we took an average of the rates reported in the World Bank's World Development Indicators for 2010-13 and the projections for 2014 and 2015 from the International Monetary Fund (IMF). The average growth rate projections for the period 2016-2040 were based on various IMF country reports (IMF 2014).

All these reports have GDP growth rate projections for 2024 and 2034, which we took as the average growth rate for 2020-30 and 2030-40 respectively. For the LC scenario, we assumed that the annual rate of per capita income growth was 1% less than BAU across countries. For HC, the assumption was that the growth rate was 1% higher than BAU.

Table 7.19. Expenditure Elasticities of Demand for Food Products, by Country and Place of Residence

	Burkina Faso		Côte d'Ivoire		Ghana		Mali		Niger		Nigeria*		Senegal		Togo	
Product	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**	**Urban**	**Rural**
Rice	0.9	1.4	0.4	0.7	1.25	1.17	0.5	1.2	0.8	1.4	0.77	0.92	0.6	0.9	0.8	1.2
Wheat products	1.5	1.7	1	1.2	1.11	1.24	1.3	0.8	1.7	1.5	0.97	1.28	0.7	1.1	1.2	2
Maize	0.4	0.7	0	0.5	0.74	0.81	0.4	0.5	0.8	1.3	0.68	0.58			0.2	0.7
Millet and sorghum*	-0.2	0.6				0.19	0.2	0.5	0.5	0.9	0.84	0.44	0.5	0.9	0.5	0.6
Cassava			0.5	0.7	0.98	1.65					0.49	0.85			0.7	1.1
Yam			0.6	0.5	1.27	2.19					0.79	1.22			1	1.4
Banana-plantains			0.6	0.7	0.37	1.31										
Beans/cowpeas									0.6	1.1	#	#			0.5	1
Pulses							0.7	1.1			0.76	0.87				
Fruits and vegetables	0.9	1	0.8	0.9	0.94	1.31	0.7	0.7	1	1.3	0.78	0.87	1	1.4	1	1.1
Oils and oilseeds	0.9	1.1	0.6	0.7	0.51	0.88	0.7	0.9	1.1	1.2	0.67	0.71	0.6	1	0.8	1
Meat	1.4	1.5	1	1.2	1.16	1.46	1	1.3	1.3	1.3	1.48	1.62	1.3	2.4	1.3	1.6
Fish and seafood	0.9	1.2	0.7	0.8	0.99	0.89	0.6	0.9	0.9	1	0.66	1.08	1	0.9	1	1.2
Dairy products	1.5	1.3	1.3	1.4	1.34	0.51	1.1	1.3	1.2	0.9	1.41	1.42	1.1	2.1	1.7	2.1
Sugar							0.6	0.8			0.94	0.89	0.6	1		
Beverages and stimulants	1	1.1	1.3	1.3	1.81	1.61			1.1	1.4	1.34	1.78			1.3	1.1
Outside dining			3.2	4.3							1.10	1.18			1.6	1.3
Other food products	0.7	1	1.2	1.5	1.67	1.37	0.8	0.9	1	1.1			1	0.9	0.9	0.9

* For Nigeria, expenditure elasticities of demand were estimated in more disaggregated form for the following products. Figures shown in this table are weighted averages means of the individual ite (with the weights corresponding to individual items' budget shares), but in expenditure projections reported later in paper, individual disaggregated elasticities were used and resulting amounts for each individual item were aggregated to get total amounts of these "aggregated" commodities:

- Millet and sorghum--each estimated separtely
- Cassava: gari and "other cassava" estimated separately
- Meat: spearate estimates for beef, mutton and goat, poultry and other meat.

Source: Tayondyandé and Yade 2012 as reported in Hollinger and Staatz 2015, for countries other than Nigeria. Authors' estimates for Nigeria based on 2012/13 LSMS data.

To address the issue of income distribution, we created two sub-scenarios of distribution of growth across rural and urban areas for all the scenarios. *Urban bias* implies that the rate of growth in per capita income in urban areas will grow 20% faster than the national average, while *equitable growth* assumes that the growth rates for urban and rural areas will be the same. These result in six scenarios in total: BAU1 (urban bias), BAU2 (equitable growth), LC1 (urban bias), LC2 (equitable growth), HC1 (urban bias) and HC2 (equitable growth).

For reasons of brevity, we present below results for only three scenarios, which illustrate the range of possibilities: BAU1 (growth in per capita incomes at the levels projected by the IMF, with the current patterns of urban bias continued into the future); LC1 (the national average per capita growth rate 1% lower than the IMF forecast but with urban incomes continuing to grow faster than rural incomes); and HC2 (growth of per capita incomes 1% higher than the IMF forecast, with urban and rural incomes growing at the same rate).

Projection of Total Expenditures by Country

For each of the projection years, we multiplied the projected rural and urban per capita expenditures for different food items times the forecast mid-year rural and urban populations as developed by the UN Department of Economic and Social Affairs (UNDESA 2014). This procedure yielded the projected total daily expenditures for rural and urban areas for the respective years. Adding up the rural and urban figures gives a projection of total daily expenditures for the country.

Projection of Regional Expenditures

We provide projections of expenditure growth for the entire 15-country ECOWAS zone as well as for selected individual countries. The motivation to provide projections for the zone as a whole arises because, as described in Parts I and IV of this volume, ECOWAS is a key player in the design and implementation of agricultural investments and policies in West Africa.

Nigeria is by far the largest economy in ECOWAS, accounting for 53% of the total population and 64% of the GDP in 2009/10 (UNDESA 2014; World Bank 2011). Therefore, in projecting regional totals, we first calculate the expenditures for Nigeria, based on the elasticities and income growth projections for that country, and then add these to the projected expenditures for the rest of the zone. The non-Nigeria ECOWAS expenditure projections are calculated by taking the sum of total expenditures for the seven remaining countries for which we have budget-consumption data and inflating them in a given year by those countries' share of the total projected non-Nigerian population of ECOWAS. That share varies between 76% and 79% over the period 2015 and 2040. The inflated figures thus assume that expenditures in the smaller non-Nigerian countries for which we have no budget-consumption data will grow at the same rate as those of the seven countries for which data are available. Adding this estimate for all the non-Nigerian countries to the corresponding projected expenditure for Nigeria yields the estimated ECOWAS regional total.

In the analysis that follows, the levels of food expenditures in the projection years (2015 to 2040), both in per capita and total terms, are expressed as ratios, showing their level relative to the corresponding expenditures in 2010.

Projections of Supply Growth Rates

Supply projections are based on production and trade data from FAOSTAT for crop and livestock products and from FAO's FIGIS database for seafood. FAO provides historical data on both volume and value of production and trade of different commodities, with values estimated based on farm-level prices. In making projections of the rate of growth of supply based on these data, one needs to decide: (a) whether to base the projections on volume or value figures; (b) the baseline period used for the projection; and (c) whether to project past rates of growth or develop a more sophisticated supply model to estimate future supply. With respect to (a), we opted, with one exception, to use volume rather than value estimates, as projecting value estimates based on past data would implicitly assume that the patterns of change in prices of the products in baseline period would continue into the future. Since we had no evidence to support this assumption (particularly with respect to the rapid increase in prices starting in 2008), we opted to project growth rates in volume terms. This approach is the equivalent of projecting the rate of growth of the value of production under the assumption that that the real prices of the different commodities will remain unchanged from those prevailing in the baseline year of 2010. Further implications of this assumption are discussed below. The one exception to the use of volume estimates was the supply projections for fruits and vegetables, for which FAOSTAT only provides trade data in value terms (presumably because of concerns that the highly heterogeneous nature of this food group would make tonnage estimates not meaningful). For this food category, we used FAOSTAT data on value of production and trade.

With respect to the choice of a baseline period, we observe that agricultural growth rates in West Africa vary widely from year to year (Hollinger and Staatz 2015, ch. 2), in part because production is largely rainfed.[5] Projection of future growth rates based on short periods is subject to considerable variation depending on the period chosen. We therefore opted to calculate growth rates by commodity over a 10-year period (2004-13) rather than a shorter period.[6] We estimated the annual growth rate by following the World Bank methodology of regressing the natural logs of the production data against time (http://data.worldbank.org/about/data-overview/methodologies). This approach is less sensitive to the choice of beginning and end dates than are alternative measures, such as the average annual or cumulative annual growth rates. For this analysis, we opted for simply projecting past rates of growth forward, with sensitivity analysis of some of the more extreme growth rates to test the robustness of the results. Constructing a full supply model, including incorporating possible impacts of climate change on the production of the various commodities involved, would have been well beyond the scope of the data and time at our disposal.[7]

[5] Only 10% of total cropland in the ECOWAS zone is irrigated (Hollinger and Staatz 2015).

[6] For comparison, we also calculated growth rates for the more recent period, 2009-13, to see if the rates had changed markedly in the period since 2008, when most West African countries began designing and implementing their Comprehensive Africa Agriculture Development Programme (CAADP) investment programs. The results show for the ECOWAS zone as a whole, there was very little difference in the annual rate of growth for rice production (the crop that received the largest attention from West African governments) between the 2004-13 period (7.8%) and the more recent 2009-13 period (7.9%). In the more recent period, the rates of growth of meat and milk production were negative as opposed to positive in the 2004-13 period, perhaps reflecting short-term effects of drought in 2011 in much of the area, but slightly less negative for millet and sorghum production.

[7] IFPRI's IMPACT model (Rosegrant et al. 2012) is a computable general equilibrium model that makes such projections on both the supply and demand side for global and regional markets. Its estimates are based on a different set of elasticity estimates than we use (those of Mohammad et al. 2011), which do not take into consideration differences between rural and urban demand patterns. Using the IMPACT model for these

A country's supply of a given product in a given year equals the sum of domestic production and net trade, assuming no net changes in stocks. Therefore, in order to calculate the projected growth in total supply due to the growth in domestic production, we multiplied the projected growth rate in domestic production by the country's self-sufficiency rate (SSR) for that commodity, where the SSR is defined as the domestic production divided by the sum of domestic production plus imports minus exports.[8] Thus, for example, if the estimated annual rate of growth of domestic production of commodity X was 6% and the SSR was 50%, the estimated growth rate of total supply due to the growth in domestic production would be 3%.

This figure represents the growth rate of total supply *assuming* that net imports of the good are frozen at 2010 (baseline) levels. The assumption that net imports remain frozen is simply a heuristic device used to calculate the amount by which domestic supply would have to increase beyond its historical growth rate to completely meet the projected increase in demand. As discussed below, in reality the greater the calculated demand-supply gap, the more imports would likely increase and the more domestic prices would increase to close the resulting gap.

Comparing Projections of Growth of Expenditures and Supply

Following the methods described above yielded projections of the rate of growth of total expenditures for different food items, expressed as an index relative to 2010 expenditures, and projections of the supply of those items, also expressed as an index relative to 2010 levels, under the initial assumption that all changes in supply are due solely to changes in domestic production. In 2010, each index is equal to 1.0, and expenditures are assumed to equal total supply (domestic production plus net trade). At any point of in the future, if the index for expenditures exceeds that of projected supply, the difference between the two indices represents the degree to which expenditures would exceed supply, assuming no growth in imports and no change in real prices from those prevailing in 2010. This index is expressed as a proportion of the 2010 expenditure on that item. For example, suppose that in 2030 in country X, the projected total expenditures for meat are 1.55 times the amount spent in 2010 while supply is 1.20. This implies a shortfall in supply equal to 0.35 times the 2010 level of meat expenditures. This deficit represents the amount by which imports would have to increase to avoid a real price increase in meat. If imports did not increase by this amount, real prices would increase, which would close the deficit by reducing per capita expenditures (demand response) and increasing domestic supply (likely with a lag). If the index for the supply exceeds that for expenditure, the opposite situation prevails. Comparing the magnitudes of the projected deficits and surpluses across commodities and countries gives a relative picture of the degree to which various food items are likely to face supply-demand imbalances and hence some combination of changing levels of imports and real prices.

In comparing the indices for the growth in expenditures and supply, however, several caveats must be borne in mind. First, the demand projections, being based on budget-consumption studies, reflect only the projected future expenditures for direct human consumption of these

projections would therefore involve forgoing analysis of the shifting nature of demand between rural and urban areas, which is a central focus of this chapter.

[8] For our analysis, we calculate the SSRs based on the average production and trade data over the period 2006-2010. SSRs vary over time (long-term trends) but show less year-to-year variation than do production figures; therefore, we opted for a shorter, more recent period for the SSRs (to capture ongoing trends) than the longer 2004-2013 period used for calculating our annual production growth rates.

items. To the extent that demand for other uses of the commodities, such as animal feed or industrial uses increases, these expenditure projections are likely to underestimate the total growth in demand. The animal feed demand is likely to be strongest for maize, which we have excluded from the tables below to focus our analysis on the rising demand for direct human consumption. Second, the *demand* projection is in terms of expenditures while, with the exception of fruits and vegetables, the supply projection implicitly implies no change in the real prices of various food items compared with those that prevailed in 2010. However, as consumers' incomes increase, they typically buy higher quality products (e.g., moving from broken rice to whole-grain rice); therefore, one would expect expenditures to increase more quickly than the physical quantities purchased. Therefore, some degree of *apparent deficit* (perhaps 20 to 30%) could be accounted for by this quality upgrading, and thus, not represent a physical deficit.

Third, we acknowledge that projecting annual growth rates calculated for the 2004-13 decade unchanged through 2040 is fraught with risks. While yields in West Africa have increased in recent years, the bulk of the growth in production in the region since 1980 has been due to area expansion rather than yield increases, a process that is unlikely to continue over the next 25 years without causing serious environmental costs. In addition, for a few commodities, percentage annual growth rates of production over the 2004-13 decade have been exceptionally high (e.g., for rice), in part because of the small initial production base, and it is unlikely that these high percentage growth rates can be sustained. On the other hand, for a few commodities (notably millet and sorghum in Nigeria), production has fallen, and projecting the decreases onward for 25 years would imply a near end to production of those goods by 2040. In these cases, we use sensitivity analysis of the supply growth rates to examine what are likely more reasonable long-term assumptions on future supply-demand balances. Fourth, our projections of supply-demand balance are based on the assumption of constant real prices. In reality, if significant deficits or surpluses emerged, domestic prices would likely change (assuming that imports are not perfectly price-elastic); inducing responses on both the supply and demand side that would tend to bring supply and demand back into equilibrium.

The bottom line is that our analysis is not intended to provide precise estimates of future levels of food expenditures and supply. Rather, it is a *what if* analysis that uses elasticity estimates to compare the order of magnitude of supply and demand imbalances that would emerge in if present trends continued. The results therefore suggest areas where changes in current agricultural investments and policies may be needed and, where, absent those, significant changes in food imports and prices will occur.

7.4. Results

Growth in Per Capita Expenditures on All Foods

Table 7.2 shows the projection results of per capita per day food expenditure under three growth scenarios. For brevity, the results are shown in 10-year increments rather than 5-year increments. For BAU1, the level of food expenditure by 2020 would grow by 40% in Nigeria and by 86% in Ghana compared to the base year of 2010; by 2040, total expenditures would be over three times higher in those countries than in 2010.[9] The incremental growth in Mali and Niger is the lowest, reflecting the modest rates of income growth projected for those countries. Under the LC1 scenario (slower growth, urban-biased), the growth levels are relatively modest, with only Ghana growing more than three times the initial level. In contrast, under the HC2 scenario (higher growth, more equal rural-urban income distribution), the growth ratio between 2010 and 2040 is about 5.8 for Ghana and 4.0 for Nigeria. The average per capita per day food expenditure in Ghana increases from US$2.02 in 2010 to US$11.75 in 2040, which is the highest amongst all the selected countries**.**

Table 7.20. Per Capita per Day Food Expenditure Projections for Selected Countries in West Africa (US$ in Purchasing Power Parity (PPP) Terms, Constant 2010)

	Burkina Faso	Côte d'Ivoire	Ghana	Mali	Niger	Nigeria	Senegal	Togo
Scenario 1: BAU1								
2010	$1.17	$1.04	$2.02	$1.09	$1.00	$1.83	$1.02	$1.25
2020	$1.53	$1.43	$3.75	$1.22	$1.28	$2.56	$1.18	$1.72
2030	$2.05	$1.82	$5.44	$1.41	$1.43	$3.75	$1.56	$2.10
2040	$2.71	$2.33	$8.80	$1.63	$1.62	$5.76	$2.12	$2.63
Growth ratio 2010-40	2.32	2.23	4.37	1.50	1.62	3.14	2.08	2.11
Scenario 2: LC1								
2010	$1.17	$1.04	$2.02	$1.09	$1.00	$1.83	$1.02	$1.25
2020	$1.48	$1.38	$3.54	$1.18	$1.23	$2.45	$1.13	$1.64
2030	$1.84	$1.63	$4.58	$1.28	$1.27	$3.26	$1.36	$1.83
2040	$2.28	$1.94	$6.61	$1.38	$1.33	$4.54	$1.71	$2.09
Growth ratio 2010-40	1.95	1.86	3.28	1.27	1.33	2.48	1.68	1.67
Scenario 3: HC2								
2010	$1.17	$1.04	$2.02	$1.09	$1.00	$1.83	$1.02	$1.25
2020	$1.59	$1.49	$3.96	$1.26	$1.33	$2.69	$1.23	$1.79
2030	$2.28	$2.03	$6.44	$1.56	$1.60	$4.32	$1.77	$2.41
2040	$3.22	$2.80	$11.75	$1.91	$1.97	$7.33	$2.60	$3.29
Growth ratio 2010-40	2.75	2.69	5.83	1.75	1.96	4.00	2.56	2.64

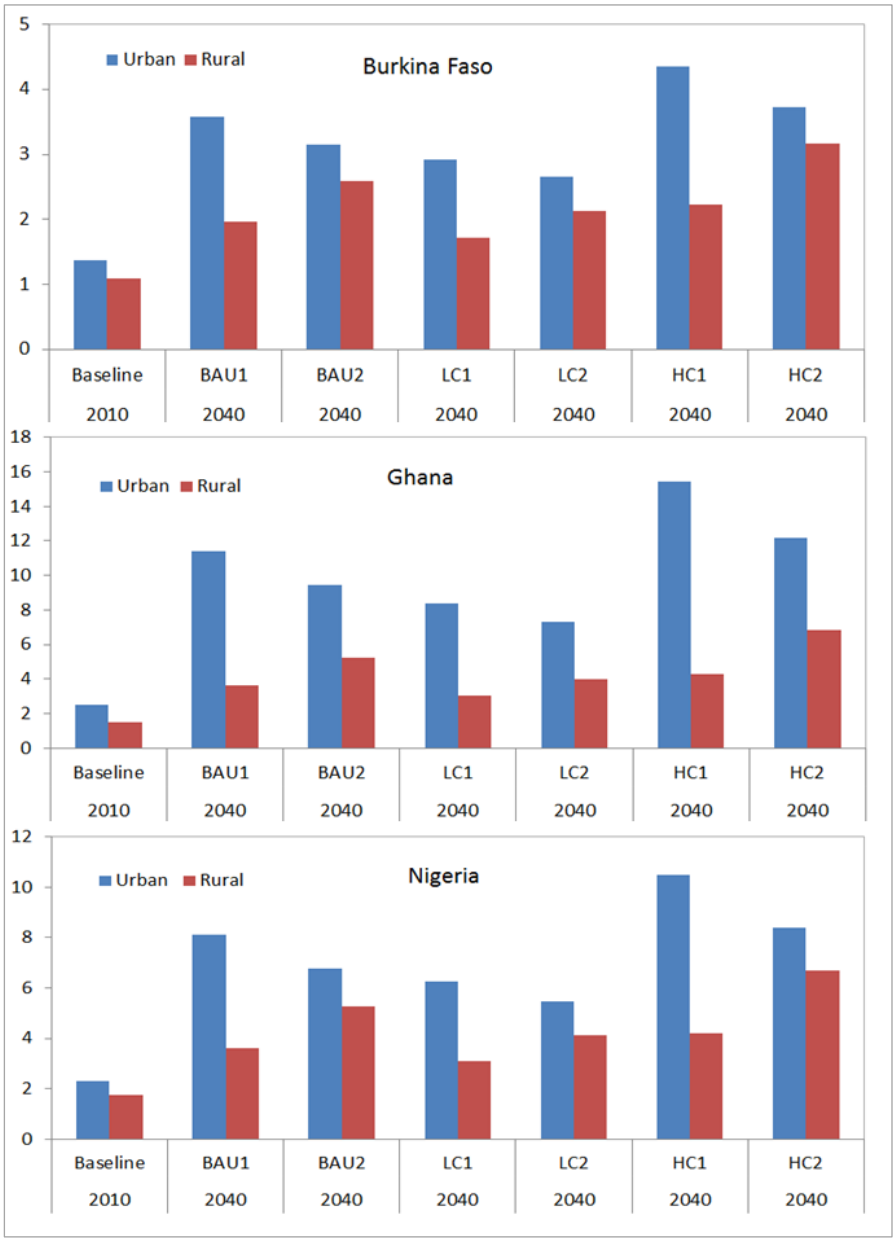
Source for this and following tables, unless otherwise noted: authors based on model results.

[9] This growth includes the value of home-produced as well as marketed food. As more and more people will be relying on the market for food over time, the growth in demand for marketing services will grow even faster than these figures imply. For comparison, in the United States over the 11-year period from 2013/14 through 2024/25, domestic demand for wheat is projected to grow by less than 3%, and demand for chicken, one of the food products with the fastest growing consumption, is projected to grow at 23% (calculated from data in U.S. Department of Agriculture 2015).

The results exhibit clear differences across the six scenarios. Figure 7.1 illustrates the changes in three countries, selected to show a range of outcomes. In all the countries, the baseline situation is that the food expenditure is higher in urban areas than rural areas.

The projection shows that this will continue to be the case through 2040 across all the six scenarios. However, given the priority that hungry people give to allocating income to acquire food, the disparities in per capita food expenditures between urban and rural areas under the *equitable growth* setting are considerably reduced compared to those under the urban bias income growth scenarios.

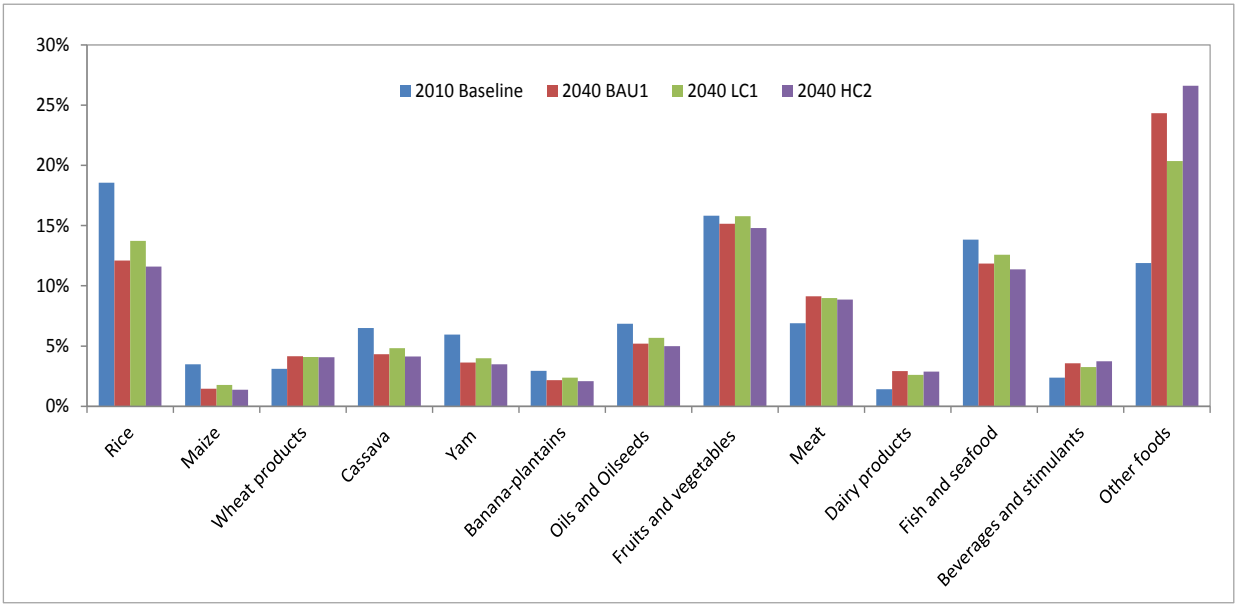
Figure 7.1. Urban vs. Rural Food Expenditure Growth Trajectory under Six Scenarios (US$, PPP)



Source: Model results.

As the total food expenditure grows over the years, the composition of spending across food groups keeps changing. With additional income, households spend more on starchy staples (cereals, roots, and tubers) until such expenditures reach a plateau. Take Côte d'Ivoire as an example (Figure 7.2). Its food budget shares are changing from 2010 to 2040, and there are clear differences across the three main scenarios. The budget shares for most staple crops come down while the shares for meat, dairy, beverages and other foods go up.

Figure 7.2. Food Budget Shares in Côte d'Ivoire by Detailed Food Groups in 2010 and in 2040 under Three Scenarios



Source: Model results.

Growth in Total Expenditures on All Foods

The projected total annual food expenditures for the eight countries (Table 7.3) reflect the combined effects of higher incomes, population growth, and increased urbanization. Under the BAU1 scenario, total food expenditure is projected to increase more than five times over the period of 2010-40 for Burkina Faso, Ghana, Niger, and Nigeria. Notably, total food expenditures in Nigeria and Ghana would increase seven-fold. Even in countries where per capita food expenditure grows relatively slowly, such as in Mali and Togo, the overall food demand expansion is remarkable, due to rapid population growth. For example, by 2040 the food demand would be 3.7 times larger in Mali and 4 times bigger in Togo than it was in 2010.

Under the HC2 scenario, the situation is more dramatic. The total food demand would grow over eight-fold for Nigeria and Ghana by 2040, driven by their high income growth and shift in consumption towards higher-value products. Burkina Faso and Niger would expect food demand over six times bigger by 2040. These would be remarkable changes. To meet the surge in demand, the region's food and agricultural sector needs a major boost in investment.

Table 7.21. Total Annual Food Expenditure Projections for Selected Countries (in Billions PPP US$, Constant 2010)

	Burkina Faso	Côte d'Ivoire	Ghana	Mali	Niger	Nigeria	Senegal	Togo
Scenario 1: BAU1								
2010	$6.64	$7.23	$17.85	$5.56	$5.83	$109.49	$4.80	$2.88
2020	$11.47	$12.44	$45.17	$8.45	$10.95	$200.85	$7.36	$5.06
2030	$19.86	$19.37	$69.98	$13.42	$17.95	$385.41	$12.41	$7.69
2040	$33.17	$30.14	$130.82	$20.73	$29.48	$768.23	$21.01	$11.71
Growth ratio (2010-40)	5.00	4.17	7.33	3.73	5.06	7.02	4.38	4.07
Scenario 2: LC1								
2010	$6.64	$7.23	$17.85	$5.56	$5.83	$109.49	$4.80	$2.88
2020	$11.07	$11.98	$42.66	$8.18	$10.54	$192.12	$7.04	$4.83
2030	$17.83	$17.34	$58.99	$12.15	$16.00	$336.48	$10.87	$6.70
2040	$27.82	$25.09	$98.16	$17.57	$24.23	$610.04	$16.95	$9.31
Growth ratio (2010-40)	4.19	3.47	5.50	3.16	4.16	5.57	3.53	3.24
Scenario 3: HC2								
2010	$6.64	$7.23	$17.85	$5.56	$5.83	$109.49	$4.80	$2.88
2020	$12.28	$12.92	$47.06	$8.82	$12.00	$211.77	$7.79	$5.34
2030	$23.42	$21.29	$78.89	$15.01	$21.86	$439.44	$14.50	$8.84
2040	$41.88	$34.65	$154.67	$24.55	$39.35	$927.38	$26.60	$14.43
Growth ratio (2010-40)	6.31	4.79	8.66	4.42	6.75	8.47	5.54	5.02

Growth in Total Expenditures on Selected Food Items, by Region and Selected Countries, Compared with Projected Supply

Table 7.4 presents the projected growth of expenditures by food category for ECOWAS as a whole, through 2040, expressed as a ratio of the 2010 expenditures in the three scenarios. It also compares the growth of expenditures with the projected growth of domestic supply (as explained above, using parameters shown in Table 7.5) and calculates the deficit or surplus in 2040, expressed as a proportion of the 2010 level of expenditures.

Several points emerge from Table 7.4. First, for the region as a whole, projected demand (expenditures) outstrips projected supply for all commodities examined, but the relative gap between the two is greatest for meat, dairy products, vegetable oil, and fruits and vegetables. For example, Table 7.4 projects that under BAU1, expenditures on dairy products will increase by 2040 to 9.92 times the level of 2010 dairy expenditures, yet domestic supply (holding imports constant) would increase only 1.98 times, leaving a gap equivalent to nearly 8 times the 2010 level of total expenditures on dairy products in the zone. This gap would need to be closed by increased imports and/or higher prices. In contrast, the relative size of the projected deficit in rice is only 2.07 times the 2010 expenditure levels on that commodity. In absolute terms, however, because estimated 2010 expenditures on rice are so much higher than those on dairy products (US$ 21.5 billion vs. US$ 3.8 billion [PPP]), the value of absolute deficit in rice in 2040 would still be 45% larger than that of dairy products (US$44.5 billion vs. US$30.5 billion (PPP), respectively).

Table 7.22. Indices of Projected Total Expenditures on and Supply of Selected Commodities in ECOWAS Region, 2020-2040 (2010 = 1.00)

Commodity	Year	Domestic supply index	Indices of Projected Total Expenditures under Different Growth Scenarios								
			BAU 1**			LC1**			HC2**		
			Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Rice	2020	1.43	1.84	2.23	1.41	1.77	2.14	1.36	1.93	2.25	1.58
	2030	2.13	3.09	4.14	1.93	2.77	3.67	1.77	3.48	4.25	2.62
	2040	3.16	5.23	7.51	2.70	4.43	6.30	2.35	6.14	7.76	4.34
	*2040 deficit/ surplus**		-2.07			-1.26			-2.98		
Millet & Sorghum	2020	0.72	1.45	1.98	1.36	1.42	1.91	1.33	1.54	1.99	1.46
	2030	0.50	2.08	3.79	1.79	1.95	3.44	1.69	2.36	3.86	2.10
	2040	0.35	3.01	6.98	2.33	2.71	6.00	2.14	3.55	7.16	2.93
	*2040 deficit/ surplus**		-2.66			-2.36			-3.20		
Cassava	2020	1.36	1.75	1.75	1.75	1.69	2.01	1.37	1.84	2.09	1.59
	2030	1.91	2.68	3.46	1.90	2.46	3.17	1.75	3.08	3.52	2.63
	2040	2.68	4.15	5.62	2.67	3.67	5.00	2.33	5.11	5.73	4.49
	*2040 deficit/ surplus**		-1.47			-0.99			-2.43		
Meat	2020	1.25	2.20	2.71	1.59	2.06	2.51	1.52	2.37	2.74	1.92
	2030	1.59	4.86	6.79	2.56	3.93	5.37	2.22	5.88	7.10	4.43
	2040	2.03	12.14	18.66	4.39	8.35	12.47	3.45	16.02	19.84	11.48
	*2040 deficit/ surplus**		-10.12			-6.32			-14.00		
Fish & Seafood	2020	1.33	1.82	2.21	1.40	1.76	2.12	1.36	1.91	2.22	1.58
	2030	1.83	2.92	3.84	1.90	2.63	3.44	1.74	3.30	3.94	2.61
	2040	2.52	4.74	6.63	2.65	4.07	5.66	2.31	5.66	6.83	4.38
	*2040 deficit/ surplus**		-2.21			-1.55			-3.14		

Table 7.4 (cont'd.). Indices of Projected Total Expenditures on and Supply of Selected Commodities in the ECOWAS Region, 2010-2040

Commodity	Year	Domestic supply index	Indices of Projected Total Expenditures under Different Growth Scenarios								
			BAU1			LC1			HC2		
			Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Dairy Products (milk equiv.)	2020	1.24	2.20	2.71	1.52	2.07	2.52	1.46	2.32	2.75	1.76
	2030	1.56	4.54	6.23	2.28	3.75	5.03	2.03	5.20	6.52	3.44
	2040	1.98	9.92	14.69	3.52	7.29	10.55	2.91	11.88	15.58	6.91
	*2040 deficit/ surplus**		-7.94			-5.31			-9.90		
Vegetable Oil	2020	0.92	1.65	2.01	1.34	1.60	1.94	1.31	1.72	2.02	1.47
	2030	0.85	2.59	3.57	1.77	2.38	3.24	1.65	2.88	3.64	2.25
	2040	0.77	4.05	6.06	2.36	3.57	5.30	2.12	4.67	6.21	3.38
	*2040 deficit/surplus***		-3.27			-2.80			-3.90		
Fruits & Vegetables	2020	1.18	1.85	2.22	1.41	1.77	2.12	1.37	1.94	2.24	1.59
	2030	1.41	3.05	4.03	1.91	2.73	3.56	1.75	3.43	4.15	2.59
	2040	1.69	5.14	7.28	2.64	4.32	6.06	2.30	6.03	7.55	4.25
	*2040 deficit/ surplus**		-3.44			-2.63			-4.33		

*Deficit/Surplus expressed as a proportion of 2010 expenditures on the item

Table 7.23. Supply Parameters Used in ECOWAS Supply Projections

Domestic Supply Parameters	Domestic production annual growth rate	SSR	Annual growth rate of total supply
Rice	7.82%	51.8%	4.05%
Millet & Sorghum	-3.52%	101.6%	-3.58%
Cassava	3.46%	113.4%	3.93%
Meat	2.66%	120.5%	3.21%
Fish & Seafood	3.40%	112.2%	3.82%
Dairy products	4.09%	58.2%	2.38%
Veg. Oil	-1.10%	79.9%	-0.88%
Fruits & Vegetables	1.81%	101.1%	1.83%

Source: Calculated from FAO's FAOSTAT 2016 and FIGIS 2016 databases.

Third, the pace and distribution of income growth have a strong impact on the evolution of expenditures, particularly for foods that have a high income elasticity of demand. This is most evident for animal-based foods, where the projected deficits for meat, dairy products, and fish under scenario HC2 are roughly double those under LC1.

Fourth, for all commodities, the rate of growth in demand is more rapid in urban areas than in rural areas, in some cases strikingly so. For example, the rate of increase of expenditures on meat products relative to 2010 levels under scenario BAU1 is over four times as rapid in urban areas as in rural areas. Even under HC2, where rural incomes increase more rapidly, the rate of growth of urban demand is double that of rural demand. For a starchy staple like cassava, the pattern is less extreme, but even there, projected urban expenditures under BAU1 grow twice as fast as rural expenditures.

The size of the deficit in 2040 for a particular commodity is a function of four variables: the income elasticity of demand for the good, the projected rate of income growth and its distribution, the rate of growth of domestic production and the initial level of the self-sufficiency rate for the good. For millet and sorghum, demand growth is very modest, but because the 2004-13 growth rate of production for the region is negative (due to a sharp fall in Nigeria), a substantial deficit appears for 2040—the equivalent of 2.66 times the 2010 level of expenditures. However, if the annual growth rate in production increased from the baseline level of -3.5% to +3.8%, then the deficit would disappear. For vegetable oil, an annual growth rate of +6.1% would eliminate the deficit, while an increase in the rate for fruits and vegetables from +1.8% to +5.1% would do the same for those commodities. In contrast, the demand for meat and dairy products is projected to grow so fast, and the import dependence for dairy products is so high, that even increasing domestic growth rates of production of each of those commodities to 8%/year would still leave deficits equivalent to 4.2 times the 2010 level of expenditures for meat and 6.2 times for dairy products. The projected deficits for fish would be substantially lower than those for meat; this strongly suggests that in reality the price of fish (currently the most widely consumed form of animal protein in the coastal states of West Africa) would increase relative to meat as consumers shifted even more from meat to fish consumption.

Because Nigeria is the giant in ECOWAS, it is useful to disaggregate the regional results between Nigeria and the rest of the region (Tables 7.6 and 7.7). Outside Nigeria (Table 7.6), the baseline growth rates for production are generally higher except for fish. As a result, the projected deficits are smaller, and in the case of cassava, there is even a small surplus under the LC1 scenario.[10] Nonetheless, the general patterns noted above for the overall region hold, with larger relative deficits for meats, dairy products, vegetable oils, and fruits and vegetables than for starchy staples. As with the regional figures, projected growth in expenditures is more rapid in urban than in rural areas and the overall rate and pattern of income growth across the different scenarios have a strong effect on the projected supply-demand balances.

For Nigeria (Table 7.7), some of the large projected deficits are due to negative growth rates in the 2004-13 baseline periods. For millet and sorghum, projecting the -8.38% growth rate through 2040 results in the near elimination of national production, a clearly unrealistic development. If the growth rate for these commodities could be raised to 4% per annum, the 2040 deficit would be eliminated. Similarly, the baseline growth rate for vegetable oils in Nigeria is also negative (-3.75%/year). This rate would need to increase to +6.7%/year to eliminate the 2040 deficit. In 2011, the Nigerian government announced an ambitious new Agricultural Transformation Agenda. This aimed at, among other things, reversing the declines in sorghum and oil palm production and accelerating growth in other subsectors, such as livestock and cassava (Nigeria Federal Ministry of Agriculture and Rural Development 2011). To the extent that these plans succeed, the deficits shown in Table 7.7 should be smaller. The one bright spot in the current projections is for fish, which shows a surplus for 2040 under BAU1 and LC1, but which drops to near zero in the case of more rapid and less urban-biased growth (HC2). As with the previous examples, growth in expenditures is much more rapid in urban areas than in rural areas under all scenarios.

Space does not permit us to illustrate the full range of variation of demand patterns across all eight countries for which we have done projections. The impact of income growth on the growth of demand, however, is well illustrated by Ghana (Table 7.8). This country has had very robust economic growth in recent years, including in certain agricultural subsectors such as rice, cassava, and export horticulture. Despite the rapid growth in domestic rice production over the baseline period of 2004-13 (over 11%), the high income-elasticity of demand, rapid income growth and low initial rate of rice self-sufficiency result in substantial projected shortfalls by 2040. In contrast, despite tepid growth in domestic production, the lower income-elasticity of demand for millet and sorghum results in a near balance of projected expenditures and supply under all scenarios. The rapid growth of cassava production relative to expenditures for direct human consumption leads to large projected surpluses in 2040, although these could be reduced by increasing demand for cassava for animal feed and industrial products (e.g., starch, flour, and beer). Ghana's strong production performance in horticultural products results in a continuing exportable surplus of fruits and vegetables in 2040, although the actual volumes depend on the pace and pattern of economic growth (cf. LC1 and HC2). Like the other cases examined above, rapid income growth, high income-elasticities of demand, and slow growth of domestic production result in very large projected deficits for meat and dairy products, as well as for vegetable oil.

[10] Although if industrial demand for cassava increases, as seems to be occurring in recent years, this surplus could quickly turn into a deficit.

Table 7.24. Indices of Projected Total Expenditures on and Supply of Selected Commodities in ECOWAS outside Nigeria in 2040 (2010 = 1.00)

Commodity	Domestic supply index*	Indices of Projected Total Expenditures under Different Growth Scenarios								
		BAU 1			LC1			HC2		
		Total	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural
Rice	4.02	5.13	7.13	2.73	4.25	5.86	2.32	6.12	7.49	4.46
*2040 surplus***		-1.11			-0.23			-2.10		
Millet and Sorghum	2.56	3.00	4.47	2.79	2.73	4.25	2.51	3.75	4.58	3.64
*2040 surplus***		-0.44			-0.17			-1.19		
Cassava	4.68	4.67	6.05	2.92	3.91	5.09	2.41	6.05	6.29	5.75
*2040 surplus***		0.00			0.77			-1.37		
Meat	2.18	6.65	8.55	3.37	5.13	6.52	2.74	8.26	9.30	6.45
*2040 surplus***		-4.47			-2.96			-6.08		
Fish & Seafood	1.54	4.46	6.45	2.17	3.75	5.33	1.92	5.08	6.76	3.15
*2040 surplus***		-2.92			-2.21			-3.54		
Dairy Products (milk equivalent)	2.33	7.30	10.24	3.13	5.51	7.53	2.63	8.76	11.19	5.31
*2040 surplus***		-4.97			-3.18			-6.43		
Vegetable Oil	2.17	3.60	4.82	2.48	3.16	4.24	2.17	4.33	5.02	3.68
*2040 surplus***		-1.43			-1.00			-2.16		
Fruits & Vegetables	2.74	4.84	6.34	2.71	4.03	5.24	2.31	5.79	6.69	4.50
*2040 surplus***		-2.10			-1.29			-3.05		
***Domestic Supply Parameters:**			Rice	Millet &	Cassava	Meat	Fish &	Dairy	Veg. Oil	Fruits &
Production annual growth rate			9.88%	3.20%	5.47%	3.12%	1.52%	4.18%	3.29%	3.29%
SSR			49.8%	102.8%	99.9%	87.4%	98.2%	70.7%	82.1%	107.7%
Annual growth rate of total supply			4.92%	3.30%	5.47%	2.72%	1.49%	2.96%	2.70%	3.54%

**Surplus expressed as a proportion of 2010 expenditures on the item. Negative values indicate a deficit.

Table 7.25. Indices of Projected Total Expenditures on and Supply of Selected Commodities in Nigeria in 2040 (2010 = 1.00)

		BAU 1			LC1			HC2		
		Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
Rice	2.13	5.41	7.97	2.73	4.64	6.77	2.41	6.29	8.13	4.36
*2040 surplus***		-3.28			-2.51			-4.16		
Millet and Sorghum	0.08	3.11	9.06	1.92	2.77	7.47	1.82	3.45	9.28	2.28
*2040 surplus***		-3.04			-2.69			-3.38		
Cassava	2.03	4.00	1.73	1.82	3.62	1.73	1.82	4.81	1.73	1.82
*2040 surplus***		-1.97			-1.60			-2.79		
Meat	1.62	15.10	25.53	4.82	10.09	16.53	3.75	20.18	27.01	13.45
*2040 surplus***		-13.47			-8.47			-18.56		
Fish & Seafood	6.39	5.05	6.92	3.06	4.40	6.05	2.64	6.22	7.03	5.35
*2040 surplus***		1.33			1.99			0.17		
Dairy Products (milk equivalent)	1.35	12.61	19.43	3.94	9.14	13.79	3.23	15.09	20.29	8.47
*2040 surplus***		-11.26			-7.79			-13.73		
Vegetable Oil	0.42	4.39	6.98	2.33	1.67	1.92	1.48	2.25	2.23	2.27
*2040 surplus***		-3.97			-1.25			-1.83		
Fruits & Vegetables	1.25	5.50	8.38	2.65	4.66	7.00	2.35	6.36	8.57	4.17
*2040 surplus***		-4.25			-3.42			-5.12		

***Domestic Supply Parameters:**	Rice	Millet & Sorghum	Cassava	Meat	Fish & Seafood	Dairy products	Veg. Oil	Fruits & Vegetables
Production annual growth rate	4.68%	-8.38%	2.47%	1.70%	7.33%	3.54%	-3.75%	0.78%
SSR	56.4%	100.9%	100.0%	98.9%	90.1%	29.6%	78.7%	98.3%
Annual growth rate of total supply	2.64%	-8.45%	2.47%	1.68%	6.60%	1.05%	-2.95%	0.76%

**Surplus expressed as a proportion of 2010 expenditures on the item. Negative values indicate a deficit.

Table 7.26. Indices of Projected Total Expenditures on and Supply of Selected Commodities in Ghana in 2040 (2010 = 1.00)

		BAU1			LC1			HC2		
		Total	**Urban**	**Rural**	**Total**	**Urban**	**Rural**	**Total**	**Urban**	**Rural**
Rice	2.51	7.36	9.94	2.52	5.71	7.60	2.16	8.34	10.52	4.23
*2040 surplus***		-4.84			-3.19			-5.82		
Millet and Sorghum	1.26	1.35	1.72	1.22	1.39	1.90	1.21	1.30	10.52	4.23
*2040 surplus***		-0.09			-0.13			-0.04		
Cassava	8.36	5.55	6.87	3.56	4.54	5.66	2.84	7.40	7.15	7.78
2040 surplus**		2.81			3.82			0.96		
Meat	1.36	7.02	8.79	3.11	5.54	6.89	2.55	8.28	9.26	6.12
*2040 surplus***		-5.66			-4.18			-6.92		
Fish & Seafood	0.78	4.67	6.96	2.05	3.91	5.73	1.83	5.25	7.25	2.95
*2040 surplus***		-3.89			-3.13			-4.46		
Dairy Products (milk equivalent)	1.09	9.07	11.23	1.55	6.83	8.37	1.47	9.70	11.96	1.79
*2040 surplus***		-7.98			-5.74			-8.60		
Vegetable Oil	1.02	2.93	3.57	2.03	2.73	3.37	1.82	3.32	3.60	2.91
*2040 surplus***		-1.91			-1.71			-2.29		
Fruits & Vegetables	6.90	5.10	6.50	2.79	4.26	5.42	2.34	6.11	6.75	5.06
*2040 surplus***		1.80			2.64			0.78		

***Domestic Supply Parameters:**	Rice	Millet & Sorghum	Cassava	Meat	Fish & Seafood	Dairy products	Veg. Oil	Fruits & Vegetables
Production annual growth rate	11.26%	0.79%	7.59%	1.62%	-0.87%	1.62%	0.13%	6.69%
SSR	28.7%	100.8%	100.1%	66.5%	96.6%	19.0%	67.7%	102.9%
Annual growth rate of total supply	3.23%	0.80%	7.60%	1.08%	-0.84%	0.31%	0.08%	6.89%

**Surplus expressed as a proportion of 2010 expenditures on the item. Negative values indicate a deficit.

In Ghana, the rapid growth in demand for animal protein is also manifested by a 2040 deficit for fish and seafood equal to between 3.1 and 4.5 times the 2010 level of expenditures (depending on the growth scenario). As with the other cases examined thus far, the growth in expenditures is much faster in urban areas than rural areas due to rapid urbanization and urban income growth.

Analysis of the other countries (not shown here due to space constraints) shows broadly similar patterns, with increasing relative deficits for animal protein products, fruits and vegetables, and vegetable oils almost everywhere. However, there is substantial variation between countries for individual products, depending on initial production levels, projected rates of income growth, and levels of initial self-sufficiency. Mali, for example, is projected to have a modest exportable surplus of meat products in 2040 unless scenario HC2 prevails (more rapid, less urban-biased growth). Such variations between countries point to the important potential role of regional trade in helping countries cope with shortfalls.

A few words are also warranted about the growing demand for processed and prepared products, for which no supply projections are presented here. Wheat products (e.g., breads and noodles) are a major example. They represent a type of *fast food*, which urban (and increasingly rural) consumers pressed for time are increasingly substituting for other staples. Consumption of products derived from wheat (almost all of which is imported) has increased sharply in West Africa since the 1980 (Me-Nsope and Staatz 2013). The estimated expenditure elasticities of demand for such products (Table 7.1) exceed unity for many of the sample countries, indicating that demand will continue to rise rapidly as long as per capita incomes continue to increase in the region. Similarly, while expenditure-elasticities of demand for prepared food eaten outside of the home are available for only three of the eight sample countries (Table 7.1), these elasticities are uniformly high, suggesting a potentially explosive growth in the demand for such products as urbanization and income growth continue. These findings suggest a very strong future demand for post-harvest processing and marketing services in West Africa, a finding consistent with that found for Eastern and Southern Africa by Tschirley et al. (2013, 2015).

7.5. Conclusions and Policy Implications

Any long-term projections, including those in this study, involve a degree of uncertainty. The demand and supply projections presented here must be used with caution and can be interpreted as indicating orders of magnitude of relative changes in supply-demand balances rather than point estimates. The projected food deficits shown above may be larger than are likely to occur, because of two reasons. First, some of the increased expenditures will go for increased quality of products rather than quantities. Second, the projected shortfalls would likely induce higher prices, which would in turn temper demand and induce increased domestic production.

Nonetheless, the relative patterns are strongly suggestive of how supply-demand balances are likely to evolve in the coming years and hence pressures on real prices. Bridging the gap between demand and supply for certain starchy staples (notably rice and wheat) will continue to be a challenge in absolute terms. However, in relative terms, the demand for other food groups—most notably meats, dairy products, fish, vegetable oils, and fruits and vegetables—will increase even faster relative to supply if current trends continue. This suggests that food

policy in West Africa, which has historically focused primarily on starchy staples (especially cereals) needs to give greater emphasis in the future to a broader range of commodities and post-harvest services for which demand will be rising rapidly. While cereals demand (particularly for maize as an input into animal feed) will continue to increase, so will the demand for a much larger array of products. Many of these—livestock products, fish, fruits and vegetables—are perishable. They therefore require more sophisticated and tightly coordinated marketing systems and key investments such as cold chains to link West African producers effectively to these growing demands. The good news is that if such systems can be developed, the production, processing and marketing of these products is much more labor-intensive than cereal production, offering new employment opportunities for West Africa's burgeoning labor force. Similar comments apply for the growing demand for processed agricultural products and prepared foods (Hollinger and Staatz 2015).[11]

Fortunately, as part of a 2015 review of the ECOWAS agricultural policy's past performance and plans for its next 10 years, the regional organization and its stakeholders have recognized the importance of broadening the scope of its initiatives to put greater emphasis on perishables such as animal products and fruits and vegetables, for which demand is increasing rapidly (ECOWAS 2015).[12] One implication of this reorientation is that greater investment is needed in agricultural research in a range of both staple and non-staple foods. Such research is necessary in order to help reduce unit costs of production, so that production can be expanded without sharp increases in consumer prices, and to adapt production to changing environmental conditions in the region.

Our analysis also shows that demand will be rising much more rapidly (from two to over four times more quickly) in urban areas than in rural areas, due to a combination of rapid urbanization and more rapid urban income growth. This implies enormous pressure on already stressed urban food marketing infrastructure, such as public markets, wholesaling systems and retail shops. While national and regional agricultural investment plans do include components to strengthen food-marketing systems, the bulk of the emphasis is at the farmer/first handler level. Improving urban marketing systems—and especially the critical role of improved wholesaling systems to link agro-processors to reliable local supplies of agricultural raw materials—is relatively neglected (Hollinger and Staatz 2015). This analysis strongly suggests the need for much greater policy attention to these urban marketing components, including investments in marketing infrastructure, cold stores, and reliable electricity supplies, which are crucial for the handling and processing of perishable products. In addition, promotion of a business climate that facilitates contracting arrangements between farmer organizations, wholesalers, agro-processors, and modern retailers that allow the downstream sellers more reliable supplies of raw agricultural materials is essential if the growing demand for more consumer-ready products is to be met by local production rather than imports (Ibid.).

Some of the projected shortfalls, particularly for vegetable oil, reflect falling domestic production of commodities for which West Africa historically had comparative advantage. For example, in the 1960s, Nigeria was the world's largest exporter of palm oil, and Senegal was a

[11] As Tschirley et al. (2013, 2015) point out for East and Southern Africa, exploiting such employment opportunities will require substantially increased investments in labor-force skills for the post-harvest components of the agrifood system, as well as greater investments in marketing infrastructure.
[12] See also Chapter 13 in this volume.

major exporter of groundnut oil. The analysis suggests that if production can be revived in these commodities, there will be a strong local market for the output.

As the comparison across the three growth scenarios shows, the magnitude of the demand increases, particularly for the products with high demand elasticities, is very sensitive to the pace and distribution of future income growth. To the extent that ECOWAS countries are successful in stimulating more rapid, inclusive growth, they will face rapidly growing supply-demand imbalances for animal-based foods, fruits and vegetables, vegetable oils and processed and prepared foods.

Finally, as noted above, the variation in supply-demand balances across countries in West Africa emphasizes the important role that regional trade can play in helping ECOWAS countries face these coming challenges. Given widespread projected shortfalls across countries, food imports from outside the region are likely to grow; policy measures aimed at making ECOWAS's official policy of free trade of agricultural products within West Africa a reality could also be an important component in helping its member states deal with the rapid increases in demand for food they will face in the coming 25 years.

References

African Development Bank (AfDB). 2011. *The Middle of the Pyramid: Dynamics of the Middle Class in Africa*. Market Brief, April 20. Abidjan, Côte d'Ivoire: AfDB.

Bennett, M.K. 1954. *The World's Food*. New York: Harper and Brothers.

Bricas, N. and P.A. Seck. 2004. L'alimentation des villes du Sud: les raisons de craindre et d'espérer. *Cahiers Agricultures* 13.1: 10-14.

Bricas, N., C. Tchamda, and M.C. Thirion. 2013. Consommation alimentaire en Afrique de l'ouest et centrale : les productions locales tirées par la demande urbaine, mais les villes restent dépendantes des importations de riz et de blé. Déméter 2014 : économie et stratégies agricoles. Paris : Club Déméter, p. 125-142.

CILSS and OECD. Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel and Organisation for Economic Co-operation and Development). 1989. Club du Sahel. Espaces Céréaliers en Afrique de l'Ouest/Regional Cereals Markets in West Africa. Documents presented at the Regional Markets Seminar, 6-11 November. Lomé, Togo.

Cour, Jean-Marie and Serge Snrech, eds. 1998. *Preparing for the Future: A Vision of West Africa in the Year 2020─West Africa Long-Term Perspective Study*. Paris; OECD/Club du Sahel.

Delgado, C. 1989. Why Is Rice and Wheat Consumption Increasing in West Africa? Paper Presented to the European Seminar of Agricultural Economists, May 29-June 2. Montpellier, France.

Delgado, C.L. and C.P.J Miller. 1985. Changing Food Patterns in West Africa: Implications for Policy Research. *Food Policy* 10.1: 55–62.

ECOWAS, Department of Agriculture, the Environment and Water Resources. 2015. Outlook, Orientations and Adjustments for ECOWAP for 2025. Paper presented at the International Conference on Agriculture in West Africa, ECOWAP+10 Appraisal and Outlook for 2025 Global Forum, 17-19 November. Dakar, Senegal.

FAOSTAT (FAO's Statistical Database). 2016. Accessed 2 January, 2016 at http://www.fao.org/faostat/en/#home.

FIGIS (Fisheries Global Information System, Food and Agriculture Organization of the UN). 2016. Accessed 2 January, 2016 at http://www.fao.org/fishery/statistics/global-production/query/en.

Gabas, Jean-Jacques, Jacques Giri, and Gilles Mettetal. 1987. *A Protected Regional Cereals Market: An Initial Exploration of a New Idea*. Paris: OECD/Cub du Sahel.

Hollinger, Frank and John M. Staatz, eds. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers.* Rome: FAO and African Development Bank.

IMF. 2014. IMF Country Report 14/215 (Burkina Faso), IMF Country Report No. 14/358 (Côte D'Ivoire), IMF Country Report No. 14/129 (Ghana), IMF Country Report No. 14/337 (Mali), IMF Country Report No. 15/63 (Niger), IMF Country Report No. 14/103 (Nigeria), IMF Country Report No. 14/177 (Senegal), IMF Country Report No. 14/38 (Togo). Washington, DC: IMF.

Me-Nsope, Nathalie M. and John M. Staatz. 2013. *Trends in Per Capita Food Availability in West Africa, 1980-2009*. MSU International Development Working Paper No. 130. East Lansing, Michigan: Michigan State University.

Mohammad, Andrew, James L. Seale, Jr., Birgit Meade, and Anita Regmi. 2011. *International Evidence on Food Consumption Patterns: An Update Using 2005 International Comparison Program Data*. U.S. Department of Agriculture, Economic Research Service, Technical Bulletin No. 1929. Washington, DC: USDA.

Nigeria Federal Ministry of Agriculture and Rural Development. 2011. Agricultural Transformation Agenda: We Will Grow Nigeria's Agricultural Sector. Abuja, Nigeria: Federal Ministry of Agriculture and Rural Development.

OECD, Secrétariat Club du Sahel et de l'Afrique de l'Ouest. 2014. *Peuplement, marché et sécurité alimentaire*. Paris: OECD.

Reardon, T., T. Thiombiano, and C. Delgado. 1988. La substitution des céréales locales par les céréales importées : la consommation alimentaire des ménages à Ougadougou, Burkina Faso. Paper presented at the CEDRES/IFPRI Colloque sur la Consommation Alimentaire au Burkina Faso, 6-7 June, 1988, in Ouagadougou, Burkina Faso. Washington, DC: International Food Policy Research Institute.

Rogers, B.L. and M. Lowdermilk. 1991. Price Policy and Food Consumption in Urban Mali. *Food Policy* 16.6: 461-473.

Rosegrant, M.W. and The IMPACT Development Team. 2012. *International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT): Model Description.* Washington, DC: International Food Policy Research Institute.

Taondyandé, M. and M. Yade. 2012. Etude sur la Consommation Alimentaire en Afrique de l'Ouest. AGWA Background Paper. Ibadan, Nigeria: ReSAKSS West Africa.

Tschirley, D., S. Haggblade, and T. Reardon. 2013. Africa's Emerging Food System Transformation. Global Center for Food Systems Innovation, White Paper Series. East Lansing, Michigan: Michigan State University.

Tschirley, D., J. Snyder, M. Dolislager, T. Reardon, S. Haggblade, J. Goeb, L. Traub, F. Ejobi, and F. Meyer. 2015. Africa's Unfolding Diet Transformation: Implications for Agrifood System Employment. *Journal of Agribusiness in Developing and Emerging Economies* 5.1: 102-136.

UNDESA (United Nations, Department of Economic and Social Affairs), Population Division. 2014. World Urbanization Prospects: The 2014 Revision, CD-ROM Edition. http://esa.un.org/unpd/wup/CD-ROM/

U.S. Department of Agriculture, Office of the Chief Economist, World Agricultural Outlook Board. 2015. *USDA Agricultural Projections to 2024***.** Long-term Projections Report OCE-2015-1, Washington, DC: USDA.

World Bank. 2011. *World Development Indicators.* Washington, DC: World Bank.

Zhou, Y. and J. Staatz. 2016. Projected Demand and Supply for Various Foods in West Africa: Implications for Investments and Food Policy. *Food Policy* 61.C: 198-212.

Part III: Forces Driving the Competitiveness of West African Agriculture

Thanks to better technologies, infrastructure and policies, much of West African agriculture can compete with imports. But only if entire value chains are improved.

CHAPTER 8

Price Transmission and Trade Policy

Transmission des prix et politique commerciale

Boubacar Diallo and John M. Staatz

Abstract

Throughout the period 2000-2008, and especially in 2007-2008 when world grain prices were rising precipitously, West African governments implemented several trade and non-trade measures to limit the degree to which the international price increases were transmitted to their domestic economies, in an attempt to stabilize consumer prices. This chapter analyzes the degree to which such measures were successful and the degree to which the changes in domestic consumer prices that did occur were transmitted back to farmers, influencing their production incentives. The analysis covers two coastal countries that were heavily dependent on grain imports from overseas (Côte d'Ivoire and Senegal) and two landlocked countries (Mali and Niger) that were had lower import-dependence.

Over the period 2000-2008, on average only about one-third of the percentage changes in the world price of rice was transmitted to the domestic price of imported rice in the four countries, with the rate of transmission higher in the two coastal countries than in the two landlocked countries. For maize, the rates of transmission were higher, ranging from 22% in Senegal to over 59% in Niger. These rates of transmission increased in the period 2007-2008, particularly for maize. The depreciation of the U.S. dollar relative to the CFA franc during 2000-2008 accounted for about a third of the reduction in transmission from international to domestic prices because as the dollar depreciated, international prices for these cereals, denominated in dollars, became cheaper in CFA francs. Other measures, such as reductions in import tariffs and subsidized sales to consumers, accounted for the rest of the reduction. Of the increases the domestic consumer prices of rice that did occur, a high share was transmitted back to farmers (ranging from 81% in Mali to over 100% in Niger), increasing production incentives. The ability of governments to buffer domestic consumers from future global price spikes to the degree that they did in 2007-2008, while still increasing production incentives is problematic, in part because of the recent appreciation of the U.S. dollar and in part because cuts in import taxes on imported cereals reduce government revenues that could otherwise be used to support expanded domestic production.

Résumé

Pendant la période allant de 2000 à 2008 et particulièrement de 2007 à 2008, lorsque les prix des céréales sont montés en flèche, les gouvernements ouest-africains ont appliqué plusieurs mesures commerciales et non commerciales afin de limiter le degré de répercussion des cours mondiaux sur les économies intérieures, dans tentative de stabilisation des prix à la consommation. Ce chapitre analyse le degré de réussite de ces initiatives et dans quelle mesure les fluctuations de prix à la consommation intérieure une ont été répercutées à leur tour sur les exploitants agricoles, affectant ainsi leurs incitations à produire. L'analyse couvre deux pays côtiers qui étaient fortement dépendants des importations céréalières d'outre-mer (Côte d'Ivoire et Sénégal) et deux pays enclavés (Mali et Niger), moins dépendants des importations.

Pendant la période de 2000 à 2008, en moyenne, seul un tiers des fluctuations en pourcentage du cours mondial du riz a été répercuté sur le prix du riz importé dans les quatre pays, le taux de transmission étant plus élevé dans les deux pays côtiers que dans les deux pays enclavés. Pour le maïs, les taux de transmission étaient plus élevés, allant de 22% au Sénégal à plus de 59% au Niger. Ces taux de transmission ont progressé pendant la période 2007-2008, particulièrement pour le maïs. La dépréciation du dollar des États-Unis par rapport au franc CFA pendant la période 2000-2008 a représenté environ un tiers de la réduction de la transmission des cours internationaux sur les prix intérieurs car, le dollar se dépréciant, les cours mondiaux de ces céréales, libellés en dollars, ont baissé en termes de francs CFA. D'autres mesures, telles que la réduction des tarifs sur les importations et les ventes subventionnées aux consommateurs, ont représenté le reste de la réduction. En ce qui concerne l'augmentation des prix à la consommation intérieure du riz, une grande partie a été répercutée en retour aux agriculteurs (allant de 81% au Mali à plus de 100% au Niger), ce qui a accru leurs incitations à la production. La volonté des gouvernements à protéger les consommateurs domestiques des futures hausses des cours mondiaux tout en continuant à augmenter les incitations à produire comme cela a été le cas de 2007 à 2008, est problématique, partiellement en raison de la récente appréciation du dollar, mais aussi parce que les réductions de taxes sur les importations de céréales contribueront à diminuer les recettes de l'État qui pourraient éventuellement servir à accroitre la production intérieure.

8.1. Introduction

The sharp increase in international food prices from late 2006 to late 2008 raised major concerns within West Africa. The consequences of this spike in international prices on West African food security were a function of the region's degree of dependence on imports from the international market and to the extent to which this rise was transmitted to domestic consumer and producer prices. Most of the countries in the region used trade and non-trade price stabilization measures to protect consumers and smallholders who are net buyers of food products. These measures involved, among other things, lower taxes, import subsidies, and duties and restrictions on exports. The non-trade measures consisted, above all, of social welfare, child nutrition, and food assistance programs. Meanwhile, food production stimulus programs focused on subsidies for fertilizer, seeds, agricultural equipment, and irrigation investments, as well as on strengthening extension services.

The biggest controversy brought to the forefront by the crisis was the doubt cast on the prevailing idea that expanding international trade and opening markets would make the food supply cheaper and more reliable, therefore creating a boon to importing countries, especially poor ones. Regrettably, the consequences of the crisis struck these poor countries head-on after the enactment of export restriction measures by some of the main rice-producing countries in Asia and the rest of the world. The West African countries quickly realized the need to reorient and bolster their investments in agricultural production (including rice) to lower their dependency on imports and increase food self-sufficiency, but also to take advantage of the promising prospects on the market. In doing so, most of the countries had to contend with the food price dilemma. On the one hand, they had to stimulate local production with incentive pricing. On the other hand, they had to forestall the risk of a disproportionate price increase that would upset consumers and lead to social unrest.

This chapter is based on the results of an in-depth study, *La transmission de la hausse des prix mondiaux sur les marchés agricoles ouest africains et l'analyse des prix de parité* (Transmission of Global Price Increases on West African Agricultural Markets and Analysis of Parity Prices) carried out in 2009 by a Michigan State University (MSU) team and its partners in West African research institutions and agricultural market information systems.[1] This study used the method of calculating cumulative price changes developed by the Food and Agriculture Organization of the United Nations (FAO) to test the hypothesis that international price increases were transmitted to Asian markets. The FAO analyzed price transmission and its implications in seven Asian countries (Dawe 2008). This chapter analyzes the impact of the rise in international prices on West African domestic prices for certain staples such as rice, maize, millet, and plantains in Côte d'Ivoire, Mali, Niger, and Senegal.

8.2. Literature Review and Knowledge Gap

The increase in food prices from 2007 to 2008 threatened food security around the world in general and in Sub-Saharan Africa in particular (HLPE 2011). Maize, wheat, and rice prices rose the most at the global level. According to FAOSTAT (2016), the price of wheat surged 130% in world markets between March 2007 and March 2008, while the price of rice rose 90% and that of maize by nearly one-third. The FAO Food Price Index, which had moved up 8% from 2005 to 2006, increased 24% in 2007. Between January and March 2008, these prices had gone up 53% compared to the same period of the previous year. In 2008, maize and rice prices in Côte d'Ivoire, Guinea, Mali, and Niger reached levels that had not been observed in the previous 10 years (Diallo et al. 2009).

The increase in food prices affected urban consumers and the survival of many individuals who live in the grips of poverty and who struggle each day to get enough food. Because it is domestic prices that affect food consumption, the bulk of the literature on the worldwide increase focused on the effects on consumers, especially urban consumers. In West Africa, urban consumers and net buyers of cereals in rural areas are the ones who were hardest hit by the food crisis. Because the cost of food usually gobbles up half or more of their income, many city dwellers and the poorest farming families had no choice but to consume cheaper foods or even skip meals. In some countries, consumers turned more to locally grown foods like cassava.

[1] A full set of the reports produced under this study are available at http://fsg.afre.msu.edu/srai/index.htm#rp.

Even these, however, became more expensive, in part because of rises in the price of the fuel needed to transport and process them (Dembélé, Cissé, and Blein 2008).

Still, few studies have looked at the output and income of rural producers who may have turned a profit as a result of the higher prices. The price increase appears to have been beneficial for rice farmers in many countries. Cotton-growing areas even saw renewed interest in rice farming. In Burkina Faso, for example, there was a trend among farmers to give up cotton in favor of rice production. In the rice-growing plains of Bagré and Sourou, rice purchase prices improved, helping farmers who now sold their output at over 175 CFA Francs (CFAF)/kg versus the previous rate of 90 CFAF/kg (Coulibaly 2009). In Mali, the average producer price of rice in real terms was 291 CFAF/kg in 2008 versus 195 CFAF/kg in 2003 (Diallo et al. 2009). The local price of rice in Senegal also benefited from the price increase on the international market. Between March 2006 and March 2008, the price of rice gained 38%, while the price of imported broken rice rose 27% (FARM and CIRAD 2008).

The FAO was amongst the first to highlight the degree to which international price fluctuations were transmitted to the consumer and producer levels between 2003 and 2007. Its interpretation of the results focused on the trade and non-trade policies adopted by various Asian countries and found that one-third of the increase in world food prices during this period was transmitted to domestic prices in real terms (Dawe 2008).

From 2009 to 2010, there were other analyses of the causes of the increase in world food prices, responses by private and institutional players, and policy implications (e.g., von Braun et al. 2008; FARM and CIRAD 2008; Dembélé, Cissé, and Blein 2008; Kelly, Dembélé, and Staatz 2008; Mousseau 2010). The Farm Foundation studied the rise in international prices in six African countries (Cameroon, Guinea, Madagascar, Mali, Niger, and Senegal). The results showed that the consumer prices of products imported to the respective capitals were more stable than international prices, whereas the prices of local rainfed cereals such as millet and maize were more variable and disconnected from international prices. The main factors that explain the supply-demand disequilibrium that, in the long term, resulted in an upward trend in prices were the following: the growth of the middle class in emerging markets, the scarcity of land owing to demographic pressure, and climate change. However, the short-term explanations for the surge in prices from 2007 to 2008 were, most significantly, the jump in oil prices and their impact on the cost of inputs and transportation, the downward trend in global cereals inventories, speculation by traders, limits on exports (because of the dip in supply), and financial speculation on commodities in the wake of the depreciation of the U.S. dollar (US$) (FARM and CIRAD 2008).

There has also been a lot of interest in the public sector's responses to the increase. Most government actions combined trade facilitation policies (e.g., lowering customs duties and negotiating with importers) with market regulations or restrictions (export bans, use of government grain stocks, price controls, and anti-speculative measures). In West Africa, certain countries—some more than others—managed to reduce the transmission of this inflation to their domestic markets thanks to the measures adopted, which are summarized in Table 8.1 (Diallo, Dembélé, and Staatz 2010).

Finally, according to Mousseau (2010), the 2007-2008 increase in food prices merely revealed and aggravated a food crisis that had already existed in many parts of the world. Overall, the

number of people affected by chronic under-nutrition grew from 850 million in 2007 to over one billion in 2009. However, prior to 2007 many West African countries that were both poor and dependent on food imports were already affected by the instability of agricultural product prices. This suggests that high domestic price volatility is one of the main problems that must be tackled by correcting structural constraints in the market (poor transportation and storage infrastructure, an inadequate financing system, road harassment, information asymmetry, etc.).

Table 8.27. Measures Taken by Certain Countries and Their Impact

Country	Measures taken*	Impact	Results
Côte d'Ivoire	(5) (6) (7)	• Steep rise in prices despite measures	• Underperformance of emergency rice program
Mali	(3) (4) (7) (8) (9) (10)	• Upward price trend despite export bans • Production stimulated by input subsidies, but less than expected	• Import tax exemptions were of little benefit to the poorest • High cost in public spending
Niger	(1) (3) (4) (5) (6) (8) (10) (11) (12)	• Little protection for vulnerable groups • Upward price trend despite the measures	• High cost of safety nets • Limited effects on output and prices
Senegal	(2) (3) (5) (6) (8) (11) (12)	• Steep rise in prices despite production stimulus measures	• Suspension of customs duties not enough to curb the increase • High cost in public spending • Good cereal production

Source: Diallo, Dembélé, and Staatz (2010).
*Note: (1) Authorization to import rice and other food products; 2) Anti-speculation efforts and price controls; (3) Negotiations to reduce margins and prices; 4) Improved monitoring of food security indicators; 5) Price subsidies for fossil fuel and other energy sources; 6) Suspension of VAT and other indirect taxes; 7) Production support; 8) Suspension of customs duties on imports; 9) Suspension of exports of cereals and other products; 10) Sale of inventory from grain banks; 11) Subsidized sales of government inventory; 12) Free food distribution.

8.3. Methods and Data

The data used pertain to four West African countries: Côte d'Ivoire, Mali, Niger, and Senegal. The countries were chosen based on the size of the region's main production areas (northern Côte d'Ivoire, southern Mali for maize, Mali/Senegal/Niger for rice), on the role of cereal

imports in these areas, and on the geographic aspects (coastal or landlocked) needed to get a firm grasp on the dynamics of the regional markets.

The choice of products considered the consumption profiles of urban areas, which are increasingly concentrated on rice, maize, and wheat and less on locally produced starchy staples such as millet, sorghum, and tubers. Amongst the data used are the Thailand rice Free on Board (FOB) and U.S. Gulf maize FOB international prices as proxies for the prevailing global market prices. They were extracted from the statistics database of the International Monetary Fund (IMF).[2]

At the regional level, the analysis used monthly data on consumer and producer prices taken from agricultural market information systems in the countries studied, as well as consumer price indices and exchange rate data.[3] The length of the price series varies by country. Most range from 1998 to 2009 for consumer prices and FOB prices, which makes it possible to analyze the transmission of the increase in food prices that began in 2003, with a peak period from 2007 to 2009. However, the producer price series are limited and difficult to use because of discontinuities. Therefore, an emphasis was placed on domestic urban prices, which are key interfaces for substitutions between imported and local products (Table 8.2).

Table 8.2. Summary of Price Series Used in the Study*

Country	PcPl [a]	PpPl [b]	PcPi [c]	Available Series
Côte d'Ivoire	Millet, maize, local rice, plantain[d]	None	Imported rice[e]	Jan. 2000-June 2009
Niger	Millet, maize, local rice	None	Imported rice	Jan. 1998-Dec 2008
Mali	Rice, millet	Rice	Imported rice	Jan. 1998-April 2009
Senegal	(Millet, maize)[f], local rice	None	Imported rice	Jan 2000 - July 2008

Source for this and the following tables: Diallo, Dembélé, and Staatz (2010).
* Unless otherwise noted, prices are for the capital cities of the countries indicated.
Note: [a] PcPl: Consumer price of local product; [b] PpPl: Producer price of local product; [c] PcPi: Consumer price of imported product; [d] In Daloa, Abengourou; [e] In Daloa, Abengourou; [f] In Dagana, Fatick, Kaolack, M'Pal, Passy, Porokhane, St. Louis, St. Maur, Tambacounda, Thiaroye.

Two of the countries studied are landlocked (Mali and Niger) and two are coastal (Côte d'Ivoire and Senegal). Although all four countries are supplied with extra-regional rice imports, it is mainly the coastal countries (Côte d'Ivoire and Senegal) that take in extra-regional maize imports. Similarly, two of the countries (Côte d'Ivoire and Mali) together produce more than

[2] http://www.imfstatistics.org/IMF/ImfBrowser.aspx
[3] Obtained from http://www.afristat.org/.

half the total maize output of the four countries combined and, along with Guinea, comprise the region's main maize production zone.[4]

This analysis mostly focused on the relationship between the international FOB prices for rice and maize and the import prices of these products and of local consumer substitutes in some markets.

The key measure of price change used in the study is the rate of cumulative change calculated as a percentage. This measure is defined as the sum of percentage changes in the monthly price compared to the previous price of a product or group of products in a given period. The analysis method used the international and domestic nominal prices and real prices adjusted for inflation and for the change in the US$-CFAF exchange rate to assess the transmission of fluctuations in rice and maize prices to the region's markets. It should be noted that during the analysis period, the U.S. dollar lost considerable value against the Euro and, consequently, against the CFA Franc, which is pegged to the Euro.

The transmission of the increase in international prices was assessed for the following periods and interfaces:

- Between the international price and the consumer price of imported rice and maize in nominal terms for the four countries (Niger, Mali, Côte d'Ivoire, and Senegal) over the periods January 2000 to July 2008 and January 2007 to July 2008.
- Between the consumer price of imported rice and the consumer price of local rice in nominal terms for three countries (Niger, Mali, and Côte d'Ivoire) over the periods January 2000 to July 2008 and January 2007 to July 2008.
- Between the consumer price of local rice and producer price in nominal terms for Mali over the periods January 2000 to July 2008 and January 2007 to July 2008.[5]
- Between the consumer price of local rice and the price of another locally produced starchy staple in nominal terms for three countries (millet for Niger and Mali and plantains for Côte d'Ivoire) over the periods January 2000 to July 2008 and January 2007 to July 2008.

8.4. Results

The results presented below examine two phenomena: (1) Changes in international prices over since 2000 and the transmission of their fluctuations to certain markets in the region. The analysis pays special attention to the period January 2007 to December 2008, when there was a sharp rise in global food prices; and (2) The degree of transmission between consumer and producer prices in the domestic market for various commodities (rice, maize, millet, and plantains produced and consumed locally). The results are presented as follows: analysis of the changes in rice and maize prices and their variability; followed by analysis of the transmission of international prices to domestic markets at different market interfaces.

[4] Excluding Nigeria and Ghana, which were not included in this study due to data limitations.
[5] Because Mali is the only country that provided producer rice prices, as seen in Table 8.2.

Price Changes and Variability

During the period 2000 to 2008, the low value of the coefficient of variation (CV) for international prices (CV = 6.0% for rice and 2.3% for maize) indicates that international prices were relatively stable (Table 8.3).[6] The FOB price for rice (Thailand 25% broken) of US$194 per ton in June 2000 held steady through January 2004, when it was US$197. Between 2004 and 2007, the price of rice followed a small upward trend, reaching US$317 per ton in December 2007. On the international maize market, prices moved much more slowly: prices held steady from US$92 per ton in January 2000 until September 2006, with a slight upward trend. Beginning in 2006, prices rose gradually to hit US$287 per ton in June 2008.

The consumer prices of local and imported products and producer prices of local products fluctuated significantly compared to the international prices for both rice and maize across all four of the countries studied (Table 8.3). The variability of producer prices was higher than the variability of consumer prices for local and imported products. This is normal given the relative stability of marketing margins between the producer and consumer levels and given that demand at the producer level is determined by the consumer price. In Mali, the coefficient of variation was 14.3% for the producer price of rice, 11.0% for the consumer price of local rice, and 11.7% for the consumer price of imported rice.

The trends were almost identical for maize. The variability of rice and maize prices was in general more pronounced in the coastal countries than in the landlocked ones, despite expectations to the contrary because of the larger margin between the export parity price and the import parity price in the landlocked countries. However, the variability of consumer prices for imported rice was high in Niger compared to other countries.

Table 8.3. Coefficients of Variation in Nominal Prices of Rice and Maize (2000-2008) Expressed as a Percentage

Country	CV P.int*		CV PcPi*		CV PcPl*		CV PpPl*	
	Rice	Maize	Rice	Maize	Rice	Maize	Rice	Maize
Mali	6.3	2.3	11.7	-	11.0	11.1	14.3	20.3
Senegal	6.3	2.3	14.9	8.8	-	12.7	-	-
Niger	6.3	2.3	10.6	21.1	16.2	-	-	-
Côte d'Ivoire	6.3	2.3	14.7	15.1	20.6	-	-	-

*Note: P.int: International price in US$ (Thailand FOB [rice] and U.S.-Gulf FOB [maize]); PcPi: Consumer price of imported product in CFAF; PcPl: Consumer price of local product in CFAF; PpPl: Producer price of local product in CFAF.

Table 8.4 shows, for the period 2007 to 2008, a marked increase in the variability of the international price of rice (CV = 14%) and a slight increase in that of maize (CV = 2.5%)

[6] The coefficient of variation (CV) is defined as the ratio of standard deviation to the mean price in a given period, expressed as a percentage.

compared to the 2000-2008 period. Domestic consumer prices of imported rice also showed a sharp increase in their variability during this period (CV for imported rice = 15.2% for Mali, 28.2% for Senegal, 14.1% for Niger, and 21.5% for Côte d'Ivoire). Price volatility was also higher in the coastal countries than in the landlocked countries.

Table 8.4. Coefficients of Variation (CV) in Nominal Prices of Rice and Maize (2007-2008) Expressed as a Percentage

Country	CV P.int*		CV PcPi*		CV PcPl*		CV PpPl*	
	Rice	Maize	Rice	Maize	Rice	Maize	Rice	Maize
Mali	14.0	2.5	15.2	-	11.9	11.1	16.6	11.1
Senegal	14.0	2.5	28.2	5.6	-	7.0	-	-
Niger	14.0	2.5	14.1	23.6	19.0	-	-	-
Côte d'Ivoire	14.0	2.5	21.5	12.6	18.1	-	-	-

*Note: P.int: International price in US$ (Thailand FOB [rice] and U.S.-Gulf FOB [maize]); PcPi: Consumer price of imported product in CFAF; PcPl: Consumer price of local product in CFAF; PpPl: Producer price of local product in CFAF.

In the period 2000 to 2008, the consumer prices of the two imported cereals were relatively stable compared to the consumer prices of locally grown products. The situation was reversed during the period of soaring prices in Mali and Côte d'Ivoire, when the price of domestically produced rice was more stable than that of the imported product.

Overall, for the period 2000 to 2008 and for all four countries, the coefficients of variation given in Table 8.3 show relative stability in prices, except for the consumer price of local rice in Côte d'Ivoire and the price of imported maize in Niger. During the period 2007 to 2008, there was a clear uptick in the coefficients of variation for all four countries. It is important to note that, in reality, the period 2000 to 2008 can be divided into three distinct sub-periods:

(1) The sub-period prior to 2003, which saw prices fall in the international market. At the same time, there was a somewhat weaker decline in domestic prices, and markets were fairly stable;.

(2) The sub-period 2003 to 2007, which was characterized by a modest, but meaningful increase in international prices and during which prices for local and imported products rose significantly; and

(3) The sub-period 2007 to 2008, when international and domestic priced climbed to nearly unprecedented levels.

The Transmission of International Prices to Domestic Markets: January 2000 - December 2008 and January 2007-December 2008

Interface: International Prices and Consumer Prices of Imported Goods. A comparison of columns (1) and (2) in Table 8.5 shows that as the U.S. dollar depreciated against the CFA Franc, international prices expressed in CFA Francs did not rise as much as they did in dollar terms. For the two periods under consideration (see Tables 8.3 and 8.4), the rates of cumulative

change in the international US$ FOB price of rice were 134.8% for the period 2000 to 2008 and 106.4% for the period 2007 to 2008, compared to the equivalent increases in CFA Francs of 96.8% and 88.5%. The same trend was observed for maize: the cumulative change rates were 110.3% and 41.5% for the US$ FOB price versus 75.4% and 25.7% for the equivalent international price in CFA Francs. Thus, the depreciation of the U.S. dollar muted, to a certain extent, the impact of the increase in food prices, which would have had even serious consequences (in terms of diminished buying power) for consumers and perhaps been even more favorable (in terms of incentives) to farmers if the full increase in US$ terms actually had been transmitted.

Table 8.5. Rate of Cumulative Change in Rice and Maize Prices (January 2000-December 2008) Expressed as a Percentage

Country	(1) P.int N-$*		(2) P.int N*		(3) PcNPi*		(4) PcRPl *		T (3)/(1)*	
	Rice	Maize	Rice	Maize	Rice	Maize	Rice	Maize	Rice	Maize
Mali	134.8	110.3	96.8	75.4	31.6	33.8	16.0	26.5	23.4	30.7
Senegal	134.7	110.2	96.7	75.4	43.7	24.3	68.6	1.7	32.4	22.0
Niger	134.7	110.2	96.7	75.4	30.4	64.9	22.5	94.6	22.5	58.9
Côte d'Ivoire	134.7	110.2	96.7	75.4	53.5	45.9	33.4	119.3	39.7	41.6

*Note: P.int N-$: Nominal international price in US$-FOB; P.int N: Nominal international price in CFAF; Pc NPi: Nominal consumer price of imported product in CFAF; Pc RPl: Real consumer price of local product in CFAF; T: Degree of transmission.

For the period 2000 to 2008 across the four countries, the cumulative change rate shows, for both rice and maize, a greater increase in international prices than in the consumer prices of imported products (Table 8.5). This increase was 134.8% in Senegal for the FOB international rice price versus 43.7% for the consumer price of imported rice. The cumulative increase for the consumer price of imported rice was greater in Côte d'Ivoire (53.5%) and Senegal (43.7%) than in Mali (31.6%) and Niger (30.4%). During the same period, only 23.4% of the changes in the international price of rice in dollar terms were passed through to the consumer price of imported rice in Bamako. In Senegal, 32.5% of the changes in the international price of rice in dollars were transmitted to the consumer price of imported rice in Dakar. Analysis in real terms reveals much lower cumulative changes, which suggests that the transmissions were weaker than suspected. This situation is more obvious during the period 2007 to 2008, which corresponds to the widespread surge in prices, during which the prices of non-food goods (e.g., energy) often rose as quickly as food prices. Thus, the price of these foods relative to other prices (this is the relationship captured by real prices) did not really change during the crisis. However, this does not signify that West African consumers did not see food prices rise relative to their purchasing power.

Furthermore, the transmissions for maize were larger than for rice across three of the four countries, the exception being Senegal (Table 8.5). The rate of transmission reached 59% in

Niger between 2000 and 2008. Niger imports three-fourths of the maize it consumes, a good portion of which is imported from Benin, Nigeria, and Burkina Faso.

During the period 2007 to 2008, the rate of price transmission from international prices to the consumer price of imported products increased in all four countries except for rice in Niger and Côte d'Ivoire (Table 8.6). The cumulative increase of the variations in the international rice price in a single year (2007-2008) accounted for approximately 79% of the cumulative increase observed over nine years (2000-2009). The cumulative increase for the consumer price of imported rice was also greater in Côte d'Ivoire (36.8%) and Senegal (39.8%) than in Mali (27.4%) and Niger (19.9%). During the same period, transmission in nominal terms of the changes between rice on the international market and the consumer price of imported rice ranged from 19% to 26% for Mali and Niger versus 35% to 38% for Côte d'Ivoire and Senegal. Over the same period, these transmissions in nominal terms across the four countries were stronger for imported maize than for imported rice, except for in Senegal.

Table 8.6. Rate of Cumulative Change in Rice and Maize Prices (January 2007-December 2008) Expressed as a Percentage

Country	(1) P.int N-$*		(2) P.int N*		(3) PcNPi*		(4) PcRPl *		T (3)/(1)*	
	Rice	Maize	Rice	Maize	Rice	Maize	Rice	Maize	Rice	Maize
Mali	106.3	41.4	88.4	25.7	27.4	22.3	-8.2	23.5	25.8	53.9
Senegal	106.3	41.4	88.4	25.7	39.8	10.3	79.0	-3.0	37.4	24.9
Niger	106.3	41.4	88.4	25.7	19.9	49.2	17.9	54.7	18.7	118.6
Côte d'Ivoire	106.3	41.4	88.4	25.7	36.8	22.7	36.6	51.6	34.6	54.9

*Note: P.int N-$: Nominal international price (US$-FOB); P.int N: Nominal international price converted to CFAF; Pc NPi: Nominal consumer price of imported product; Pc RPl: Real consumer price of local product; T: Degree of transmission.

Overall, the extent of transmission to the consumer price of imported rice was greater in the coastal countries than in the landlocked countries. Similarly, rice price volatility was more pronounced in the coastal countries, whereas the situation was reversed for maize.

Interface: Consumer Prices of Imported Rice and Local Rice. During the period 2000 to 2008, the consumer prices of imported rice and local rice were on the rise. The rate of cumulative change was higher in nominal terms for imported rice than for the consumer price of local price in Mali and Côte d'Ivoire (Table 8.7).

Table 8.7. Rate of Cumulative Change in Rice Prices (January 2000-December 2008) Expressed as a Percentage

Country	(1) Pc NPi*	(2) Pc RPl *	(3) Pp NPl *	(4) Pc RPl*	T (3)/(1)*
Mali	31.5	15.9	26.2	37.6	83.2
Niger	30.4	22.2	45.2	47.3	148.7
Côte d'Ivoire	53.5	61.0	32.8	48.6	61.4

*Note: Pc NPi: Nominal consumer price of imported product in CFAF; Pc RPl: Real consumer price of imported product in CFAF; Pp NPl: Nominal producer price of local product in CFAF; Pc RPl: Real producer price of local product in CFAF; T: Degree of transmission.

During the period 2007 to 2008, the trend stayed the same for the three countries, but transmission was much more pronounced compared to the period 2000 to 2008. Similarly, in 2007-2008, the cumulative changes in the consumer price of imported rice were higher than those in the consumer price of local rice in Mali and Côte d'Ivoire (Table 8.8). This was in part attributable to the successful 2007-2008 crop year in Mali and Côte d'Ivoire, which saw Côte d'Ivoire's rice production rise by 12% relative to the previous year and Mali's increase by 50% (FAOSTAT 2016).

Interface: Consumer Price and Producer Price of Local Rice: During the period 2000 to 2009, the cumulative price changes in nominal terms were roughly equivalent between consumer prices and producer prices in Mali. Producer prices, however, rose a bit more. Table 8.9 shows 109.9% transmission from the consumer price to the producer price. The period 2007 to 2008 saw a 30.6% increase in the producer price of local rice compared to 22.5% for imported rice, or a transmission rate of approximately 134%.

Overall, these results indicate that the increase in consumer prices was transmitted to Malian farmers. The price of local rice in Bamako, which was 285 FCFA in September 2000, remained stable at about the same price until May 2005. Starting in 2007, the price of local rice rose from 300 FCFA/kilogram (kg) in May to 405 FCFA in September 2008, i.e., an increase of 105 FCFA/kg. During the same period, the producer price in Niono climbed from 237 FCFA to 363 FCFA/kg, i.e., an increase of 126 FCFA/kg. This implies a drop in the marketing margin per kilogram between Niono and Bamako during the period.

Interface: Consumer Prices of Local Rice and Millet/Plantains: The analysis also examined the relationship between changes in the consumer price of imported rice and those of locally produced nontraded staples—millet in Mali and Niger and plantains in Côte d'Ivoire. During the period 2000 to 2008, the cumulative changes were greater for the consumer price of millet than the consumer rice price in Mali (Table 8.10).

The trend was reversed in Niger (where the millet price rose 16.1% versus 45.2% for rice) and for plantains in Côte d'Ivoire (14.3% for plantains versus 32.9% for rice). However, during the period 2007 to 2008, the cumulative price changes for rice were much higher than for the nontraded staples, reflecting the surge in international rice prices (Table 8.11). In this latter period, there appears to have been significant transmission of the rice price increases to the domestic prices for millet in Mali and Niger (58.6% and 22.9% respectively). This transmission likely was the result of consumers switching some of their consumption from higher-priced

rice to lower-priced millet, thereby, bidding up the price of millet. In Côte d'Ivoire, in contrast, there was practically no change in plantain prices in 2007-08, suggesting that the upswing in rice prices had little impact on plantain prices. Either consumers were not substituting plantains for more expensive rice during this period or there was an increase in the plantain supply that was large enough to offset any increased demand resulting from such substitution.[7]

Table 8.8. Rate of Cumulative Change in Rice Prices (January 2007-December 2008) Expressed as a Percentage

Country	(1) Pc NPi	(2) Pc RPl	(3) Pp NPl	(4) Pc RPl	T (3)/(1)
Mali	27.4	23.6	23.6	30.2	86.1
Niger	19.9	17.9	32.4	36.6	162.7
Côte d'Ivoire	36.8	36.6	29.7	33.3	80.8

Note: Pc NPi: Nominal consumer price of imported product in CFAF; Pc RPl: Real consumer price of imported product in CFAF; Pp NPl: Nominal producer price of local product in CFAF; Pc RPl: Real producer price of local product in CFAF; T: Degree of transmission.

Table 8.9. Rate of Cumulative Change in Rice Prices in Mali Expressed as a Percentage

Period	(1) Pc NPi*	(2) Pc RPl*	(3) Pp NPl*	(4) Pc RPl*	T (3)/(1)*
2000-2008	34.3	26.2	37.6	45.4	109.9
Jan. 2007-Dec. 2008	22.5	23.6	30.6	32.6	134.3

*Note: Pc NPi: Nominal consumer price of imported product in CFAF; Pc RPl: Real consumer price of imported product in CFAF; Pp NPl: Nominal producer price of local product in CFAF;
Pc RPl: Real producer price of local product in CFAF; T: Degree of transmission.

[7] FAOSTAT (2016) data indicate that between 2007 and 2008 plantain production in Côte d'Ivoire increased by 11%.

Table 8.10. Rate of Cumulative Change in Rice Prices and Local Starches Expressed as a Percentage (January 2000 - December 2008)

Country	(1) Pc NPi* Rice	(2) Pc RPl* Rice	(3) Pc NPl* Millet/plantain **	(4) Pc RPl* Millet/plantain **	T (3)/(1)
Mali	34.3	26.2	52.0	62.6	151.6
Niger	45.2	47.3	16.1	30.5	35.4
Côte d'Ivoire	32.8	48.6	14.3	40.6	43.4

*Note: Pc NPi: Nominal consumer price of imported product in CFAF; Pc RPl: Real consumer price of imported product in CFAF; Pc NPl: Nominal consumer price of local product in CFAF; Pc RPl: Real consumer price of local product in CFAF; T: Degree of transmission; **Millet in Mali and Niger, plantains in Côte d'Ivoire.

Table 8.11. Rate of Cumulative Change in Rice and Millet Prices (January 2007-December 2008) Expressed as a Percentage

Country	(1) Pc NPi* Rice	(2) Pc RPl* Rice	(3) Pp NPl* Millet/plantain	(4) Pc RPl* Millet/plantain	T (3)/(1)*
Mali	22.5	23.6	13.1	15.8	58.5
Niger	32.4	36.6	7.4	21.8	22.8
Côte d'Ivoire	29.2	33.3	-0.9	-18.0	-3.0

*Note: Pc NPi: Nominal consumer price of imported product in CFAF; Pc RPl: Real consumer price of imported product in CFAF; Pp NPl: Nominal consumer price of local product in CFAF; Pc RPl: Real consumer price of local product in CFAF; T: Degree of transmission.

8.5. Conclusions and Policy Implications

This chapter measured the transmission of the international increase in prices over the period 2007 to 2008 to prices in certain markets in four countries (Côte d'Ivoire, Mali, Niger, and Senegal). The results of this analysis show that this increase was indeed transmitted to markets in the West African region, but not entirely. In percentages, the transmission was more significant in coastal countries than in landlocked countries. Factors such as transportation, freight, and the cost of delivering products to distant points of consumption all tended to dampen the transmission, in percentage terms, of the international price increases to the landlocked countries. For all countries, the U.S. dollar's depreciation against the CFA Franc also reduced transmission of the international price increases to their domestic markets.

If the rise in international prices continues over the long term, coastal countries will likely need to turn increasingly to the region's main production areas for their rice and maize supplies. The lingering question will be the extent to which farmers and decision makers respond to meet this potential demand. Many landlocked, as well as coastal, countries (notably Senegal and Côte

d'Ivoire) are already implementing investment programs to boost the amount of cropped land and the yields of import-substitution products such as rice and maize to meet the ever-growing regional demand. While production will likely continue to increase in these coastal countries, intra-regional trade will also need to grow more to meet the growing demand in both the inland and coastal countries, including Nigeria.

The outlook for the international food market is still uncertain, given the unsure impact of climate change and the variability of worldwide reserves. As incomes rise, Asians are diversifying their diets and increasing their consumption of animal products, which may reduce the area devoted to rice production in Asia and drive up the demand for feed grains like maize.[8] In recent years, India and China have experienced drastic fluctuations in their agricultural output and in their trade with the rest of the world. Policies in Africa must be deftly positioned with respect to these new challenges.

Overall, our analysis shows that only about one-third of the fluctuations in international prices for rice and maize (expressed in U.S. dollars) during the crisis from 2007 to 2008 were passed through to West African consumers. The U.S. dollar's depreciation against the CFA Franc and a series of emergency actions (exemptions from import duties, consumer subsidies, etc.) cushioned the impact of the crisis on consumers, but at a rather high opportunity cost for the countries in terms of resources, which were subsequently unavailable for investments elsewhere. Another increase in international prices could have similar short-term costs for these West African countries. That said, the analysis also showed that in Mali (the only country where the necessary data were available), as soon as the consumer rice price edged up, that increase was transmitted at a rate of over 100% to farmers, thus encouraging them to increase their production. This transmission of price increases from the consumer to the producer level is a potential positive factor for agricultural development in West Africa in the medium and long term, but will only take place if governments allow at least some of the increases in international prices to be transmitted to the domestic consumer level. In deciding how much of that transmission to allow, governments have to evaluate the net impact of the higher prices on food security in the region, which depends on the balance between the negative short-term effects on the consumer and the more positive medium- and long-term incentives for food producers.

The implications of the transmission of rising international prices to domestic prices are felt at several levels:

- For consumers, the effects will vary between urban and rural consumers. Among rural consumers, the impact is different depending on whether they are net sellers or net buyers of the goods involved. Urban consumers and net buyers in rural areas will experience a drop in their real income, at least in the short-run.[9] Their purchasing power will erode for consumption of both local rice and substitution products, such as millet and sorghum in the Sahel and roots, tubers and plantains in coastal countries, whose prices may edge up. The degree of consumer substitution between tradable and non-

[8] See Chapter 10 of this publication.

[9] In the medium and long run, they could gain if the growth in agricultural production generates new income-earning opportunities for them elsewhere in the economy through its growth linkages.

tradable products will depend on relative price increases in these two product categories.[10]

- If, as in the case of Mali rice markets, increases in consumer prices are transmitted back to farmers, farmers will face improved production incentives. For the higher global prices to induce greater production, however, two conditions must prevail. First, at least some of the rise in international prices need to be allowed to be transmitted to domestic consumer prices. Second, the food system as a whole needs the capacity to respond, in terms of technology, infrastructure, and farmer support services. If the production increase is to be environmentally sustainable, moreover, it must come primarily from increased yields and not simply extending the areas under cultivation.
- In the coastal countries, which will be the first to be exposed to surges in international prices, transmission of these international prices to domestic markets will force these countries to look to landlocked countries to help meet their supply needs, unless they make huge investments in infrastructure to stimulate their domestic production. It is clear that the rainfed rice production systems in these areas will not be enough to meet the challenge.

Finally, this analysis suggests that preventing price volatility at the local level is one of West Africa's first lines of defense against soaring world prices. There are still numerous, persistent imperfections in the domestic markets, such as inadequate transportation and storage infrastructure, a weak financing system, road harassment, and information asymmetry. These are all factors in the regional and local agricultural markets that must be tackled moving forward.

References

Coulibaly, S.N. "Production agricole au Burkina Faso. La bataille du riz continue." *Sidwaya*, October 10, 2009. Accessed November 1, 2016. http://www.journaldufaso.com/article.php?aid=10.

Dawe, D. 2008. *Have Recent Increases in International Cereal Prices Been Transmitted to Domestic Economies? The Experience in Seven Large Asian Countries*. ESA Working Paper No 08-03. Rome: FAO-ESA. http://econpapers.repec.org/paper/faowpaper/0803.htm.

Dembélé, N.N., M. Cissé, and R. Blein. 2008. La transmission des prix internationaux sur les prix des céréales au Sahel. *Grain de sel* 43 (June-Aug.): 14-16. http://www.inter-reseaux.org/IMG/pdf/GdS43.pdf..

Diallo B., N. Dembélé, and J. Staatz. 2010. Effets des mesures commerciales tarifaires et non tarifaires en Afrique de l'Ouest suite à la hausse des prix alimentaires mondiaux. MSU Résultats de recherche N° 2010-04. Strengthening Regional Agricultural Integration

[10] See Chapter 6 of this publication.

(SRAI) Project. East Lansing: MSU. http://fsg.afre.msu.edu/srai/presao_recherche_resultat_4.pdf.

Diallo, B., N. Dembélé, J. Staatz, R. Adjao, and M. Cissé. 2009. Transmission des Hausses des Prix Internationaux des Produits Alimentaires en Afrique de l'Ouest : Leçons de la crise de 2007-2008 pour l'expansion de la production des biocarburants. Paper presented at the Conference Internationale sur les Biocarburants in Afrique: Les biocarburants, facteur d'insécurité ou moteur de développement, 10-12 Novembre. Ouagadougou, Burkina Faso. http://fsg.afre.msu.edu/srai/communication_transmission_prix_msu.pdf.

FARM and CIRAD. (Fondation pour l'agriculture et la ruralité dans le monde and Centre de Coopération Internationale de Recherche Agronomique pour le Dévelopment/Agricultural Research Centre for International Development). 2008. *Les mécanismes de transmission de la hausse des prix internationaux des produits agricoles dans les pays africains.* Research Brief. Paris: FARM. http://www.fondation-farm.org/zoe/doc/confprix_etudeinracirad_resume.pdf

FAOSTAT. 2016. http://faostat3.fao.org/home/E.

HLPE (High-Level Panel of Experts). 2011. *Price Volatility and Food Security: A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security*. HLPE Report No. 1. Rome: UN Committee on World Food Security. http://www.fao.org/fileadmin/user_upload/hlpe/hlpe_documents/HLPE-price-volatility-and-food-security-report-July-2011.pdf.

Kelly, V.A, N.N. Dembélé, and J.M. Staatz. 2008. Potential Food Security Impacts of Rising Commodity Prices in the Sahel: 2008-09. Famine Early Warning Systems Network Special Report. Washington, DC: FEWSNET. http://fsg.afre.msu.edu/responses/FEWS_NET_WA_Rising_Prices_Food_Security.pdf

Mousseau, F. 2010. Le défi de la hausse des prix alimentaires, Une Revue des Réponses à la Crise de 2008. Oakland, California: The Oakland Institute. http://www.carefrance.org/ressources/themas/1/1009,high_food_prices_FRENCH_02.pdf.

von Braun, Joachim, Akhter U. Ahmed, Kwadwo Asenso-Okyere, Shenggen Fan, Ashok Gulati, John F. Hoddinott, Rajul Pandya-Lorch, Mark W. Rosegrant, Marie T. Ruel, Maximo Torero, Teunis van Rheenen, and Klaus von Grebmer. 2008. *Hausse des prix alimentaires et actions stratégiques proposées: que faire, par qui et comment ?* International Food Policy Research Institute Policy Brief 1A. Washington, DC: IFPRI. http://ebrary.ifpri.org/cdm/ref/collection/p15738coll2/id/10400.

CHAPTER 9

Options for Limiting and Managing Price Volatility

Limiter et gérer la volatilité des prix : Alternatives possibles

John M. Staatz and Nango Dembélé

Abstract

Price volatility refers to unanticipated price changes, either upward or downward, that are so large that agrifood system participants have difficulty managing the consequences. Since 2007-2008, unexpectedly higher food prices have been the main type of price volatility facing West Africans. Historically, however, downward price volatility, often the result of surges in the imports of cheap imported goods, have frequently created serious problems for West African farmers and agribusinesses. Price volatility has two sources. Imported volatility results from volatile international prices and exchange rates, while endogenous volatility occurs as a result of shocks in local domestic production and/or demand, compounded by structural problems such as thin markets and high transaction costs of trade. This chapter analyzes the relative importance of these two sources of volatility in West African agrifood markets, discusses their impacts, and analyzes policy measures to reduce each type of volatility. Not all price volatility can be eliminated, however, so the chapter concludes by reviewing tools to reduce and manage its impact. These range from weather-based crop insurance to financial reserves and expanded international lending facilities that could help countries cope with sudden increases in foreign-exchange demands for imports during periods of soaring prices and depressed export earnings during periods of deeply depressed prices.

Résumé

La volatilité des prix se réfère à des fluctuations de prix non anticipées, soit à la hausse ou à la baisse, suffisamment élevées de telles sortes que les acteurs du système agroalimentaire ont du mal à en gérer les conséquences. Depuis 2007-2008, c'est ce genre de volatilité inattendue des prix de denrées alimentaires à laquelle sont confrontés les agriculteurs ouest africains. Dans le passé, toutefois, la volatilité des prix à la baisse, souvent le résultat d'un afflux d'importations bon marché, a souvent créé de sérieux problèmes aux agriculteurs et aux entreprises agroalimentaires en Afrique de l'Ouest. Deux causes sont à l'origine de la volatilité des prix. *La volatilité importée* est le résultat de fluctuations de cours internationaux et de taux de change, tandis que *la volatilité endogène* se produit suite à des chocs dans la production et/ou la demande intérieure locale, auxquels s'ajoutent des problèmes structurels tels que l'étroitesse des marchés et les coûts élevés des transactions commerciales. Ce chapitre analyse l'importance relative de ces deux causes de volatilité sur le marché de l'agroalimentaire ouest-africain, explique leur impact et analyse les mesures visant à réduire chacune d'elles.

Cependant, puisqu'il n'est pas possible d'éliminer toute les formes de volatilité des prix, ce chapitre examine les outils d'atténuation et de gestion de son impact. Ces derniers passent des assurances agricoles basées sur la météorologie, aux réserves financières et facilités de prêts internationaux susceptibles d'aider les pays à faire face à des hausses soudaines de demande de devises pour les importations pendant des périodes d'envolée des prix et à l'occasion des chutes de recettes d'exportation pendant les périodes d'effondrement des prix.

9.1. Introduction

The 2007-2008 spike in world food prices raised concerns around the world about the harm that highly volatile food prices inflicted on poor consumers, farmers and the pace of economic growth. The Food and Agricultural Organization of the United Nations (FAO) (cited in HLPE 2011) estimated, for example, that the price spike increased the number of malnourished in the world by 173 million between 2007 and 2009. In West Africa, much of the debate about price volatility tended to equate price volatility with higher prices. In reality, price volatility refers to large, *unanticipated* price changes, which can be either upward or downward. Downward price volatility (collapsing farm prices) have historically been at least as frequent a problem in West Africa as soaring prices, often prompting charges by farm leaders that the low prices resulted from Organisation for Economic Co-operation and Development (OECD) countries dumping surplus agricultural products onto West African markets.

In order to develop effective policies to reduce and manage price volatility, decision-makers need a clear understanding of what price volatility is, what its impacts are, and what are its major causes. To help provide that understanding, beginning in 2009, the SRAI program began synthesizing information on price volatility in order to help inform policy debates about how best to address the problem in the context of the then-current high-price crisis. The syntheses fed into planning for the Economic Community of West African States (ECOWAS) regional agricultural policy (Economic Community of West African States' Agricultural Policy - ECOWAP), major publications by the UN's High Level Panel of Experts on price volatility and food security (HLPE 2011) and the FAO and African Development Bank (Hollinger and Staatz 2015), and discussions at the 2012 International Disaster and Risk Conference (IDRC 2012). This chapter summarizes key messages from the SRAI analysis, with an emphasis on policy options to reduce and manage the impacts of agricultural price volatility in West Africa.

9.2. Literature Review and Knowledge Gap

There is a long literature on the causes and impacts of agricultural price instability (see Demeke, Pangrazio, and Maetz 2011; Dawe and Timmer 2012; Anderson 2012; Galtier 2013; Hollinger and Staatz 2015 (Focus Section A) for reviews). The literature has stressed that participants in agricultural markets expect prices to vary, seasonally and year-to-year, for a variety of reasons. Some degree of price variation in response to shifts in supply and demand is essential to create incentives for spatial and temporal arbitrage and hence the efficient allocation of resources over time and space. Price variation becomes a concern only when its magnitude becomes so large and it occurs so unexpectedly that consumers and producers face serious problems in coping with the changes (Hollinger and Staatz 2015). Large and unpredictable price changes are referred to as price volatility. Previous literature has identified

the major causes and types of price volatility, its impacts on various actors in the economy, and how government policies affect its magnitude.

Causes and Types of Price Volatility

In the simplest sense, price changes result from *expected* or *perceived* shifts in supply and demand. These price changes will be most severe and erratic when: (a) the shock to demand or supply is large; (b) there is little scope in the short-run of adjusting to the shocks through augmenting supply by drawing on or adding to carryover stocks, increasing production, or adjusting trade (inelastic supply); (c) little scope exists for adjusting consumption of the good (inelastic demand)—e.g., through shifting to substitutes; and (d) uncertainty prevails with respect to magnitude of the shocks, the size of carryover stocks and how government is likely to react.

The shocks to supply and demand can emanate from two sources. *Imported volatility* refers to volatility that occurs in international commodity and currency markets and is transmitted to domestic markets through trade. Imported volatility is generally more important in countries that trade heavily internationally, depend extensively on food imports, and adopt policies that allow fluctuations in world market prices to be transmitted into domestic markets (Hollinger and Staatz 2015). As agricultural markets have become more tightly integrated with markets for other commodities, particularly energy with the rise of modern biofuels, fluctuations in these related international markets can also redound onto global food markets, creating another source of imported food price volatility. Indeed, much of the debate about food price volatility in the late 2000s focused on the degree to which speculation in these non-food markets, particularly the energy market, helped to spur the price spikes of 2007/08 (HLPE 2011).

Price volatility can also be *endogenous* to a country or region, resulting from shocks to supply and demand in domestic markets. In West Africa, these shocks historically have been associated with major droughts on the supply side and civil disruption on the demand side. Endogenous volatility tends to be greater when markets are *thin*—i.e. when a relatively small proportion of total production enters the market, with the remainder being consumed on the farm. In these conditions, a relatively small variation in total production can result in a high variation in the amounts entering the market, thereby generating large price fluctuations. Thin markets are more typical in poor economies and in certain international markets, such as for rice, where a relatively small proportion of global production is traded internationally. *Endogenous* volatility also tends to be greater in landlocked countries, where high transport and transaction costs result in the band between import and export parity prices being large. This large band results in domestic prices varying widely before actors face an incentive either to import additional product (in the case of high prices) or export it (in the case of depressed prices) in order to stabilize prices through trade.

Impacts of Price Volatility

The literature identifies both short-run and long-run impacts of price volatility. In the short run, soaring prices (*upside volatility*) hurt consumers, particularly the poor, who devote a high proportion of their income to food (see Part II in this volume). Collapsing prices (*downside volatility*) hurt both farmers (particularly those who are large net sellers of agricultural products) and farm workers, as demand for hired agricultural labor often collapses along with

farm prices. These collapses can redound into other parts of the economy, as demand for farm inputs and consumer goods sold in the rural areas also declines. Both upside and downside volatility also hurt other actors in the agrifood system (traders, input providers, agro-processors and retailers) by increasing their risks and disrupting their routine procedures. They also create problems for banks that are considering providing short- and medium-term credit to agriculture by increasing risks of repayment and the difficulty of valuing inventories of agricultural products pledged as collateral. This is one of the reasons why it is difficult to rely uniquely on private banks to finance agricultural mechanization.

The short-run impacts of price volatility can turn into long-run impacts as consumers, farmers and other agrifood-system actors attempt to cope with its effects. Consumers may be forced to cut back on their calorie consumption, reduce the quality of their diet, and shrink expenditures on child health and education, all of which can have long-run effects on the family's human capital and long-term earning capacity (Camara 2004). Similarly, farmers facing collapsing prices may have to sell off assets, which can trigger a downward spiral, leading families to fall into a poverty trap (Carter and Barrett 2006).

Agricultural price volatility can also slow economic growth over the long term because in a price-volatile environment, actors in the economy, knowing that prices can move erratically, tend to hold assets in more liquid forms rather than in forms that can have a larger impact on spurring productivity growth (Dawe and Timmer 2012). Farmers, for example, may hold higher levels of reserves in the form of grain stocks rather than selling more of the grain and investing in improved seeds and irrigation. Bankers, seeing how volatility affects the riskiness of agricultural investment, may invest in government bonds and other "safe assets" rather than lending to farmers and agribusinesses wanting to expand their operations. In addition, because governments and development partners are often the "insurers of last resort", they end up devoting more of their resources to relief efforts rather than to investment to spur economic growth.

There are also political-economy dimensions of how price volatility affects the pace and pattern of economic growth. As the food riots that swept several West African cities in 2008 testify, unexpected price spikes can lead to civil disruption that destroys infrastructure and discourages long-term investment. Similarly, farm protests during periods of abnormally low prices may lead to strongly protectionist policies that slow economic growth.

Price volatility can skew the path as well as the pace of economic growth, affecting who captures most of its benefits. Generally, the rich are better able to bear the risks that price volatility entails, allowing them to invest in higher return but riskier activities from which the poor are excluded (Hollinger and Staatz 2015). To the extent that domestic markets for agricultural products are more volatile (both in prices and in marketed volumes) than international ones, agro-processors are induced to turn towards imports for their raw materials rather than relying on local supplies, thus excluding local producers from West Africa's growing demand for processed food products (ibid.).

Impacts of Government Actions on Price Volatility

The literature on the impacts of government policies on volatility flows directly from the basic analytics of supply and demand. Actions that reduce the size of sudden shocks to supply and

demand for agricultural products will reduce price volatility, as will actions that allow supply and demand to adjust to those shocks (increases in the price elasticities of supply and demand). Efforts to *drought-proof* domestic production through increased use of irrigation and increased use of carryover or reserve stocks have been widely promoted as means to stabilize supply, particularly in the Sahel, but the opportunity cost of the resources devoted to those options remain question marks given other options, such as more reliance on regional and international trade. The 2008 world food crisis demonstrated, however, that when regional and international trade are disrupted, many governments feel forced to promote policies to promote greater self-sufficiency, given the high political costs of supply shortages that result in lower consumption and concomitant nutritional stress. The literature on buffer stock operations (e.g., Gilbert 2012) stresses that while in principle such buy-sell operations by government agencies can reduce price volatility, such actions require large financial reserves, particularly when the price band that the government tries to defend is narrow. They can also crowd out private storage, shifting more of the financial burden of storage onto government budgets. In the absence of sufficient financial resources to effectively defend the price band, buffer-stock operations can actually be destabilizing rather than stabilizing (Minot 2012; Hollinger and Staatz 2015: 123).

Although the literature (e.g., Anderson and Masters 2009) generally argues that trade helps to stabilize supply, concerns about how reliance on trade can lead to high levels of imported price volatility from international markets were at the center of policy debates in West Africa in the late 2000s. The degree to which price volatility on international markets redounds onto domestic markets depends on government trade, tax and subsidy policies that affect the degree of price transmission from international to domestic markets (see Chapter 8 in this volume). Food-exporting countries often attempt to protect domestic consumers during periods of international price surges by restricting exports and to protect farmers during periods of low prices by subsidizing exports. Simultaneously, importing countries often try to limit domestic price volatility during global price surges by cutting import taxes or subsidizing imports, and protect domestic producers during periods of global price slumps by raising import barriers. Anderson (2012) has shown that these opposite actions of exporters and importers tend to be self-cancelling and actually increase global price volatility.

On the demand side, increasing the range of substitutes for goods subject to supply shocks lowers price volatility by allowing consumers to modify their consumption patterns more easily in response to shocks to the supply of a particular good.[1] Efforts to encourage more substitution between rice and coarse grains through promoting processed forms of the latter are an example of this phenomenon.[2]

Finally, the literature notes that transparency in government policy interventions is critical to reducing price volatility. In the absence of clear information about the conditions under which governments will intervene in markets, private actors may engage in either hoarding or panic selling, thus augmenting price volatility (Timmer, Falcon, and Pearson 1983). Similarly, in a regional context, clarity and coordination of policy actions across countries that are linked by trade is also critical to stabilizing rather than augmenting such volatility (Anderson 2012).

[1] In economic jargon, such actions increase the price elasticity of demand of the good, making its price less responsive to shifts in demand.
[2] See Chapter 6 in this volume.

Knowledge Gap

The main knowledge contribution of the SRAI effort on price volatility was to illustrate how concepts from the literature on volatility applied in West Africa, particularly in the context of the 2007-2008 crisis. This contribution involved analyzing the main factors driving the price volatility in the West African context and how national and regional policies and programs were likely to affect it.

9.3. Methods and Data

The approach taken by the SRAI team was to synthesize existing data (including drawing on efforts that the FAO, World Bank, IFPRI, FEWSNET and other international agencies launched to monitor and analyze the high-price crisis as it unfolded) and to contextualize that information in terms of the situation in West Africa. This contextualization involved complementing the information from the literature and other ongoing monitoring efforts with data from West African market information systems and direct observation of policy processes and decisions made by key public- and private-sector actors in West Africa during the period following 2008.

9.4. Results

Key results from the analysis focused on: (a) the magnitude of price changes experienced in West Africa during the 2007-2012 period, placed in an historical perspective; (b) the relative magnitudes of imported and endogenous volatility in the region in the late 2000s; and (c) the driving forces behind both the imported and endogenous price volatility.

Magnitude of Price Changes in Historical Perspective

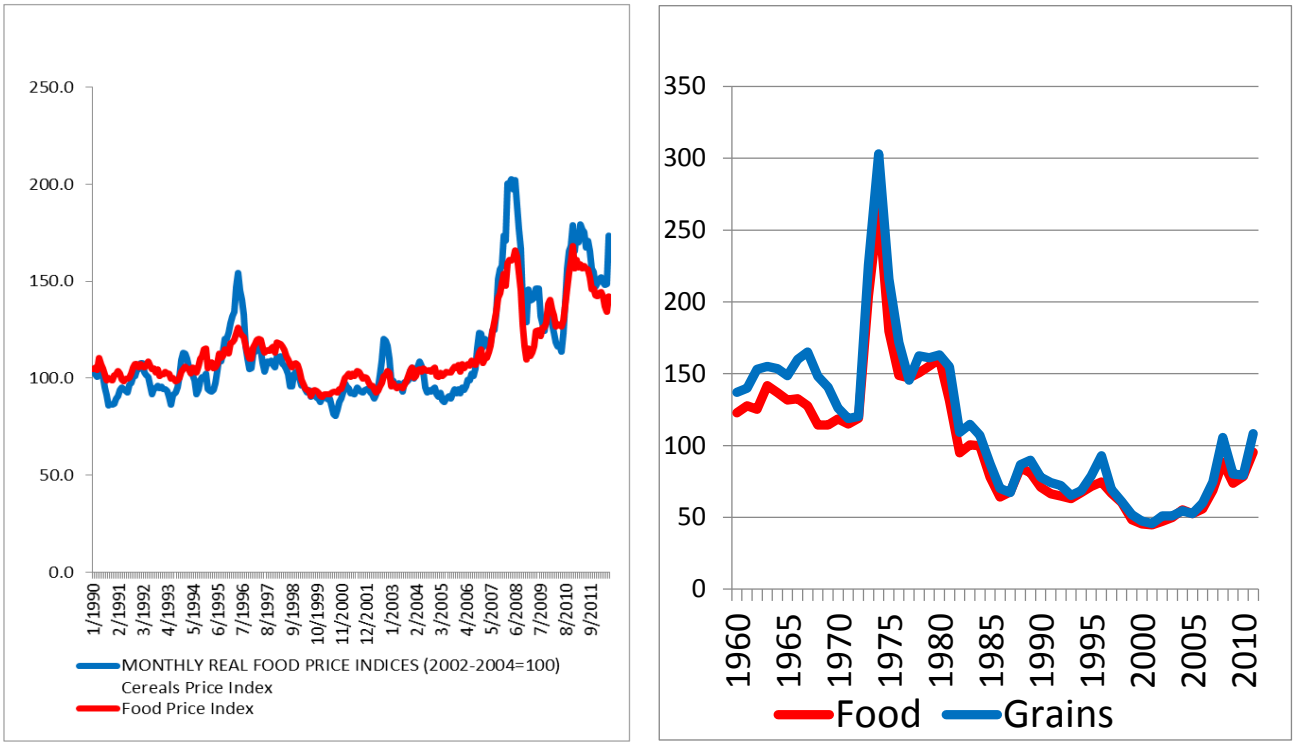
Data from FAO and the World Bank indicate that while real world food prices, and cereal prices, in the period 2008-2012 were the highest they had been since 1990, they were still markedly below the peaks attained during the world food crisis of 1975 (Figure 9.1, panels a and b). Indeed, from the peak in global grain prices in 1975, real world food prices had declined sharply through 2002. What was worrying was the indication that since 2002, real prices appeared to be trending upward, suggesting that the world was entering a new era of higher, and perhaps more volatile prices.

In West Africa, cereal prices, particularly for rice, reached levels in 2008 that had not been seen in the previous 10 years. For example, between July 2007 and July 2008, rice prices rose by 43% in Mali, 50% in Niger, 64% in Burkina Faso and 112% in Senegal (Demeke, Pangrazio, and Maetz 2011.) Yet government efforts to ease import restrictions and provide subsidized sales to consumers kept these price fluctuations below levels experienced in international markets (see Chapter 8 for details).[3]

[3] Minot (2012) showed that while world prices of internationally traded cereals became more volatile in the period 2007-10 compared to 2003-06, in 11 African countries for which time-series data were available, prices for these goods generally did not become more volatile, although they did increase in absolute magnitude. Minot measured volatility as the standard deviation of the proportional change in food prices from one month to the next.

Figure 9.6. International Food and Cereal Price Indexes

(a) 1990-2012 **(b) 1960-2012**



Source: FAOSTAT (2012); World Bank (2012).

While the late 2000s were characterized by soaring food prices in West Africa, historically the opposite has often been the case. Periods of low international prices for poultry (between 1995 and 2003), dairy products (1999-2003) and rice (1983-2003) led to import surges that undermined prices for West African producers and led to calls from them for higher import barriers.[4] FAO studies of these surges indicated that while policies of the exporting countries, such as export subsidies, in some cases were important causes of the large increases in imports, domestic causes such as low productivity, trade and market reform policies, and weak institutions also contributed to the surges (Hollinger and Staatz 2015, Focus Section A).

The Relative Magnitudes of Imported and Endogenous Price Volatility

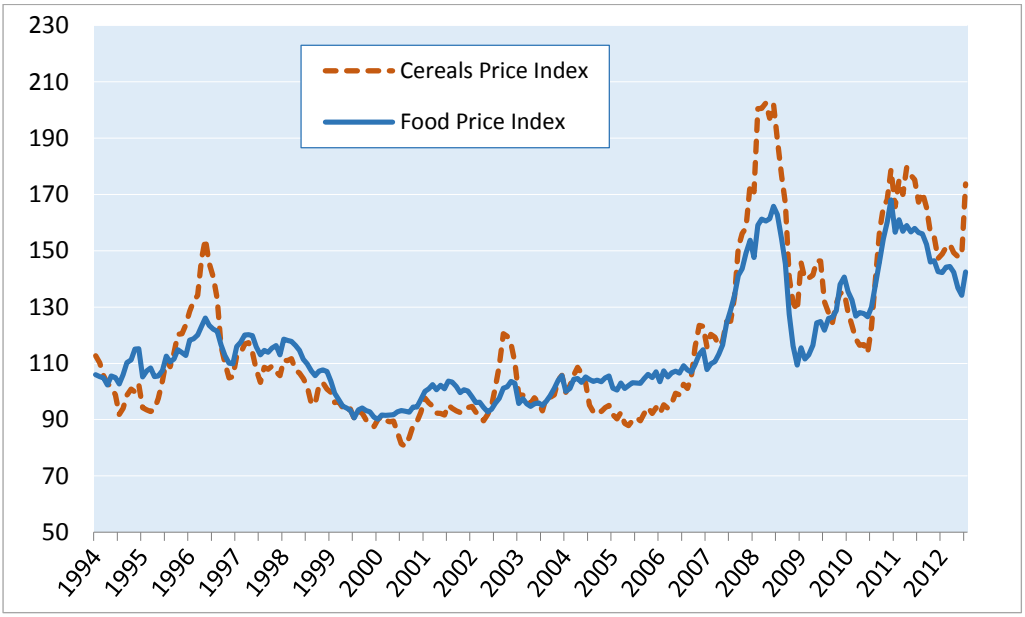
Figure 9.2 illustrates the magnitude of the endogenous and potential imported price volatility that West Africans faced over the period 1994 through 2012. Panel (a) shows the volatility of international food prices as measured by the FAO food and cereal price indices, while panel (b) illustrates the volatility of farm- and retail-level maize prices in Mali over the same period. While international prices varied by a factor of two, farm-level prices in Mali varied by a factor of up to five, and consumer prices varied by nearly a factor of four, suggesting that endogenous factors are at least as important as imported factors in influencing the price volatility facing Malian farmers and consumers. As discussed below, a combination of structural factors in West African cereal markets contributed to the endogenous price volatility, which is particularly a problem for landlocked countries like Niger, Mali, and Burkina Faso, where there is less scope to use international trade to help stabilize local production shortfalls. At the same time, West

[4] There is no universally accepted definition of import surges in the literature; they are generally described as sudden and often relatively short-lived increases in imports (Rakotoarisoa et al. 2011).

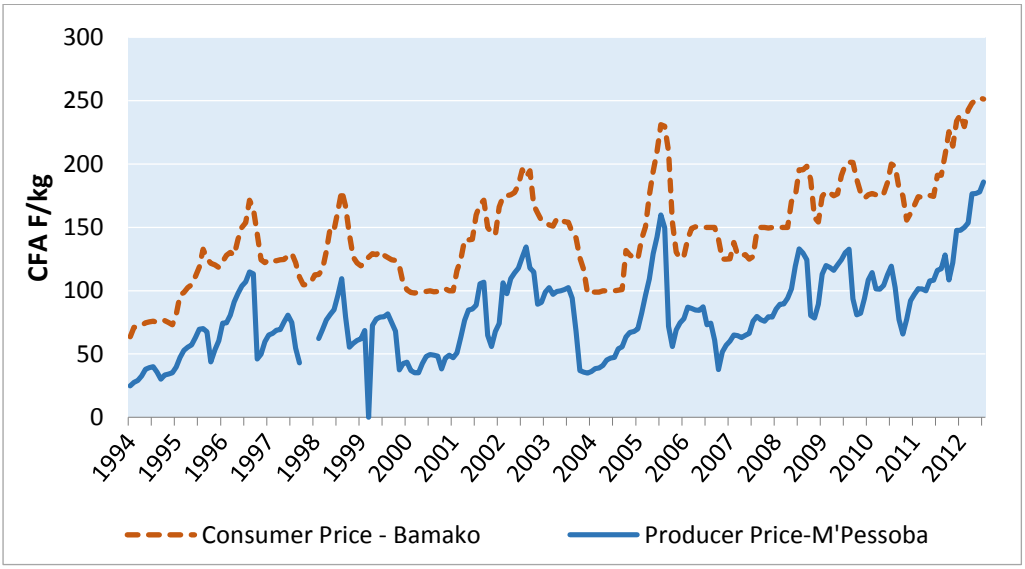
African governments implemented policies that limited the transmission of the imported price volatility to domestic markets, albeit at substantial financial cost to these countries (see Chapter 8 in this volume).

Figure 9.2. Relative Sizes of Endogenous and Potential Imported Price Volatility Facing West Africans, 1994-2012

(a) Global Food and Cereal Price Indices, 1994-2012[a]



(b) Producer and Consumer Retail Maize Prices in Mali



Sources: (a) FAOSTAT (2017); (b) Observatoire du Marché Agricole 2014.
[a] 2002-2004 = 100.

The Sources of Imported and Endogenous Price Volatility

Imported Volatility. Numerous studies examined the causes of the price spikes and higher variability of international staple food prices during the late 2000s and concluded that an

unusual confluence of factors contributed to these phenomena (e.g., Kelly, Dembele, and Staatz 2008; Demeke, Pangrazio, and Maetz 2011; HLPE 2011; Anderson 2012; Konandreas 2012; Minot 2012; Hollinger and Staatz 2015). Among the key contributory factors identified by these studies were the following:

- Increasing price-inelasticity of demand for staple foods resulting from growing per capita incomes in much of the world and strong biofuel mandates from several OECD countries. The latter require a certain percentage of fuels come from non-traditional sources (such as maize-based ethanol) regardless of the staple-food prices. As demand becomes less sensitive (more inelastic) to changes in price, supply shocks—e.g., the shortfall in 2007/08 in Australian wheat production due to drought—generate larger price fluctuations, as it takes a large change in price to get consumers to adjust their consumption to the changed level of supply.
- The thinness of international rice markets, with only about 7% of world rice production entering international trade. Thus, a relatively small change in global rice production can result in a large change in the volume traded internationally, and hence, world prices.
- Changes in agricultural support policies in the OECD countries that led to a reduction in year-to-year carryover stocks of major grains, meaning that it became more difficulty to offset fluctuations in production by drawing on reserve stocks.
- A slow-down in investment in agriculture worldwide during the 1990s and early 2000s, leading to a tightening of global food supplies.
- Growing integration of agricultural markets with other commodity markets, particularly energy markets, with the result that speculative bubbles in those other markets—as occurred in the energy markets in 2007-08—spilled over into agricultural markets.
- Growing currency fluctuations. Since most international cereal transactions are priced in U.S. dollars, fluctuations in the value of the dollar relative to other currencies led to variations in cereal prices.
- Increasingly *defensive* measures by both grain-exporting and grain-importing countries to try to protect consumers in the face of rising prices. These measures included export-restrictions by food-surplus countries and subsidies and tax-exemptions to cheapen food imports by food-deficit countries. Collectively, these actions tended to encourage panic buying and hoarding and increase volatility in global markets (Anderson 2012).

*Endogenous volatility***.** The causes of endogenous agricultural price volatility in West Africa are related to structural constraints in local and regional markets, government policies, and poor information available to various actors in the market.

Structural issues include:

- The thinness of markets for locally produced cereals, particularly millet and sorghum. Typically less than half of West African production of these crops enters markets (the rest being consumed on the farm), and the crops are not widely traded internationally. Thus, relatively small changes in production can have large impacts on their prices.
- The heavy dependence of the region on rainfed agriculture, coupled with erratic rainfall. Only 10% of arable land in West Africa, and just 2% in the Sahel, is irrigated, compared with nearly a third of such area in Southeast Asia (FAOSTAT 2017).

- The poor transport infrastructure and high transaction costs of operating in West African markets. These costs, which can fluctuate widely due to disruptions in transport infrastructure (such as the deterioration of rural roads during the rainy season) and civil disruption, contribute to the volatility of prices faced by all agrifood system actors.
- The limited access of consumers to processed staple foods, which in turn constrains substitution among staples (e.g., substitution of maize grits for rice), thereby making the demand for the different staples more price-inelastic (see Chapter 6 in this volume).

Highly variable government policies (termed "policy volatility" by Hollinger and Staatz 2015) include:

- Ad hoc changes in government trade policies, such as export restrictions imposed by countries such as Burkina Faso and Mali during periods of high international prices and import bans imposed by Nigeria;
- Changing rules regarding import and export licensing; and
- Impromptu purchases and releases of grain from national reserve stocks.

The impact of these previously mentioned factors is compounded by frequently poor information by both public and private actors about evolving market conditions, particularly the levels of inventories held by private actors and planned government actions. In the absence of reliable information about the level of private stocks of grains, governments often fear that too much grain is being shipped out of the country and impose export restrictions. Uncertainty about planned government actions can provoke speculative buying and selling, including both panic buying by consumers and panic selling by traders, adding to increased market volatility.

9.5. Conclusions and Policy Implications

Policy measures and investments to deal with price volatility need to be of two sorts: those that aim to reduce volatility and those that give actors improved tools to manage its effects. For each type, it is important to distinguish whether the source of the volatility is imported or endogenous. When designing policies to deal with price volatility, it is also important to recall that it can involve abnormally low prices as well as abnormally high ones.

Measures to Reduce Imported Price Volatility[5]

Both during the food price spike of 2007/08 and during earlier periods of abnormally low prices, each West African country attempted to moderate and manage imported price volatility largely by itself. The measures deployed typically included trade policies (for example, exoneration of import taxes during periods of high prices, and increased tariffs and other trade barriers during low prices) and targeted sales of subsidized foods to vulnerable populations during periods of price spikes. Because neighboring countries frequently did not coordinate their actions with each other, such measures sometimes induced unintended trade flows within West Africa such as the re-export of subsidized goods to neighboring countries, thereby weakening the impact of the measures. Since 2015, however, trade of the ECOWAS countries with the outside world is, in principle, regulated within the context of the ECOWAS Common External Tariff (CET) and associated safeguard measures (Hollinger and Staatz 2015, ch. 12).

[5] The following sections draw heavily on Hollinger and Staatz (2015).

As a result, measures to reduce imported price volatility will increasingly fall under the mandate of ECOWAS, both in the application of the CET-associated safeguard measures and in the role of ECOWAS as an advocate for West Africa in international forums such as the World Trade Organization (WTO) negotiations.[6]

*Trade safeguard measures***.** The CET regime includes several trade safeguard measures – rules that trigger tariff increases in the presence of large import surges, tariff reductions in the presence of precipitous drops in imports, and compensatory taxes if imports are shown to be the result of large subsidies from the exporting country. These measures have, in principle, two advantages over the previous measures that were implemented by individual West African governments. First, the safeguard measures are designed to be triggered by specific formulas (taking into account changes in import volumes and prices) and hence, in principle, are a welcome shift from the ad hoc and often unpredictable implementation of previous trade measures. Second, they are meant to apply across the entire ECOWAS zone, thereby eliminating the incentive to re-export imported goods to neighboring countries in response to differences in external tariffs. Implementation of the safeguard measures, however, face at least two major difficulties: (i) how to implement the triggering mechanisms that depend on prices in an economic community that does not have a single currency (and hence, where price fluctuations that trigger the measures could vary from country to country depending on the exchange rate); and (ii) deciding on the level at which to set the triggers. For example, as originally designed, the trigger for the compensatory taxes were set so low that the taxes would be invoked almost constantly, essentially converting this safeguard measure into an additional ad valorem tax. Such an additional tax would provide added protection to domestic producers, but it would do nothing to reduce price volatility, as it would simply raise the level of domestic prices while not reducing their variability (Hollinger and Staatz 2015). Thus, while the concept of safeguard measures is very important in dealing with imported price volatility (both soaring prices and collapsing prices), ECOWAS needs to focus on how to implement those measures effectively. It also needs to put pressure on its member states to abide by the CET regime and not add additional ad hoc measures on top of the common tax schedule.

Lobbying for strengthened WTO disciplines on export restrictions. Current WTO rules have very strong rules limiting the degree to which a WTO member country can erect import trade barriers, but very weak restrictions on export restrictions. The 2007-2008 crisis illustrated how damaging export barriers by major food exporters (such as Thailand, Vietnam, and India) can be to international markets. ECOWAS has a role to play in encouraging its member states to argue for stricter rules limiting these types of export restrictions. However, to be credible in these arguments, the ECOWAS member states themselves need to pledge to limit such barriers among themselves, as export bans within West Africa were a major contributor to the region's endogenous price volatility during the 2007-2008 period.

Lobbying for more flexible biofuel standards. A number of OECD countries have passed legislation mandating that an increasing proportion of their domestic fuels come from renewable bio-sources. In the first phase of these programs, particularly in the United States, the feedstock for many of these fuels has been maize (for ethanol) and soybeans (for bio-diesel).

[6] ECOWAS only has observer status at the WTO, while its individual member states are WTO members. In its current status, therefore, ECOWAS can serve mainly as a tool to help its member states develop common positions on issues of critical importance to West Africa in the WTO negotiations and voting, as it cannot vote on those issues itself.

These mandates generally set required volumes of biofuels to be produced, but make no provision for the volumes to vary depending on the price of the feedstock. In other words, the mandates add a totally price-inelastic demand to the market, serving to drive prices even higher during periods of production shortfalls. Another lobbying role for ECOWAS, therefore, is to argue in various international forums for more flexibility in these mandates, allowing the mandated volumes to fall when prices of the underlying feedstocks rise precipitously.

Measures to Reduce Endogenous Price Volatility

Reducing endogenous price volatility requires addressing the structural issues discussed above that help generate it. Measures that would help reduce this volatility include:

- Efforts to reduce fluctuations in production of basic staples through more weather-proofing of production systems through increased irrigation, better soil and water management, and varietal improvement.
- Improving the fluidity of regional and international trade to allow trade flows to help offset fluctuations in local supplies. Needed actions include, for example, improving roads and other transport infrastructure, reducing transaction costs of trade through diminution of West Africa's numerous roadblocks, and reforming trucking regulations to promote greater competition in the transport industry.
- Improving the collection and diffusion of information about market conditions to both public and private actors. This information needs to include monitoring of international trade volumes, production, and inventories held at both the farm and trader level. Such information is critical not only for private decision making but also to provide early warning of problems that could require special actions, such as the triggering of the CET safeguard mechanisms, and to prevent panicked imposition of intraregional trade barriers by governments fearing excessive outflow of food staples from their countries.
- Promoting expanded private stock holding, for example, through subsidizing construction of private storage facilities, coupled with improved reporting on inventory levels held in these facilities. The proposed establishment, under the ECOWAS Regional Agricultural Investment Plan (RAIP), of certified regional warehouses, where traders could store grain and be free to export it to any country in the region, is a move in this direction.
- Mutualizing some proportion of national grain reserve stocks into a regional reserve, as proposed under the ECOWAS RAIP, which would lead to greater flexibility in the management of such reserves and potential economies of scale. The RAIP plan also calls for holding two-thirds of the regional reserve in monetary form rather than physical stocks, which should reduce costs of managing the reserve, assuming that the financial reserves are well managed.

Measures to Manage the Effects of Price Volatility

Not all price volatility can be eliminated, so measures are needed to help various actors in the agrifood system deal with the volatility that remains. Key among the potential tools to achieve better management are:

- weather-based insurance for farmers and grain aggregators (much less developed in West Africa than East and Southern Africa)[7];
- financial reserves and expanded international lending facilities that would help countries cope with sudden increases in foreign-exchange demands for imports during periods of soaring prices and depressed export earnings during periods of deeply depressed prices[8]; and
- more targeted, market-compatible social safety nets to help consumers deal with the consequences of high food prices.

Governments throughout the region have implemented some targeted social safety nets, such as school feeding and food-for-work programs, in addition to less targeted programs, such as free food-aid distribution and subsidized food sales within geographic areas judged to be food insecure (e.g., because of drought). During the 2000s, lower-income grain-exporting countries within West Africa also imposed export bans in an attempt to hold down domestic staple-food prices in order to protect their consumers. Government leaders in these countries feared, with some justification, that their richer neighboring countries would bid away food supplies from the exporting countries' poor.[9] As discussed above, however, in aggregate such actions, taken together with countervailing actions by the importing countries, tend to increase rather than decrease regional and international price volatility and discourage long-term agricultural growth by depressing farmer incentives. Discussions by SRAI researchers with high-level government decision makers during the 2007-2008 crisis revealed that most of them understood many of the negative long-term consequences of such trade bans. They felt, however, that lacking any other proven and financially affordable ways of protecting consumers from spiraling food prices, they had no alternative but to rely on the trade bans. The ECOWAS regional food policy (ECOWAP) calls for experimentation on innovative models of social protection in the face of high food prices. Such an initiative is welcome, as the 2007-2008 experience showed graphically that West African governments are unlikely to move towards fluid regional trade without a simultaneous solution to protecting vulnerable populations from soaring prices.

Conclusions

Policies used in recent past to deal with volatility in West Africa, such as trade restrictions, increasing government physical stocks, and consumer subsidies (e.g., via tax exemptions on imported food) have had mixed effects and are likely to be financially unsustainable. Given ecological complementarities in West Africa, regional trade appears as a less costly price volatility mitigation and management tool. However, to be effective, such a trade-based approach requires strong regional leadership of ECOWAS to impose consequences on member-states that violate provisions of the ECOWAS Treaty calling for the free movement of goods and people throughout the region. It will likely also require some regional support of social safety nets in the inland countries that have the lowest per capita incomes (such as Burkina Faso, Mali, and Niger) in order to avoid political pressures in those countries for export bans during periods of high food prices. Thus, policies to reduce regional price volatility and

[7] For information on such insurance, see, for example, https://www.syngentafoundation.org/agricultural-insurance-east-africa

[8] For a discussion of international funding facilities to deal with price volatility, see Hollinger and Staatz (2015).

[9] See the discussion of bidding wars between poor and rich consumers in Chapter 6 in this volume.

promote agricultural growth through more fluid regional trade cannot be designed independently of a strategy to develop sustainable social safety nets.

Better information on production, trade, and inventory levels, as well as more transparent, predictable rules under which governments will undertake actions (such as release of grain reserves) are also critically important in reducing hoarding and panic selling, which aggravate endogenous price volatility. Allowing grain traders from neighboring West African countries to bid for contracts to help supply national grain reserves would also help drive down costs of such reserves (since neighboring countries may have greater marketable surpluses) and help expand and stabilize regional grain markets. In addition, efforts to promote weather-based crop insurance, better water control, and development of resilient crop/livestock varieties to reduce the risk of investment at the farm level will also play a key role in helping actors manage the remaining price volatility that the earlier-mentioned actions cannot entirely eliminate.

References

Anderson, K. 2012. Government Trade Restrictions and International Price Volatility. *Global Food Security* 1.2: 157–166.

Anderson, K. and W.A. Masters. 2009. *Distortions to Agricultural Incentives in Africa*. Agricultural Distortions Working Paper No. 56. Washington, DC: The World Bank.

Camara, O. 2004. The Impact of Seasonal Changes in Real Incomes and Relative Prices on Households' Consumption Patterns in Bamako, Mali. Ph.D. Dissertation, Michigan State University.

Carter, M.R. and C.B. Barrett. 2006. The Economics of Poverty Traps and Persistent Poverty: An Asset-Based Approach. *Journal of Development Studies* 42.2: 178–199.

Dawe, D. and C.P. Timmer. 2012. Why Stable Food Prices Are a Good Thing: Lessons from Stabilizing Rice Prices in Asia. *Global Food Security* 1.2: 127–133.

Demeke, M., G. Pangrazio, and M. Maetz. 2011. Country Responses to Turmoil in Global Food Markets: The Nature and Preliminary Implications of the Policies Pursued in the 2006-08 Episode. In *Extreme Volatility in Agricultural Markets: Causes, Consequences, and Policy Options*, ed. A. Prakash. Rome: FAO.

FAOSTAT (FAO's Statistical Database). 2017. Accessed 29 January, 2017 at http://www.fao.org/faostat/en/#data/RL.

Galtier, F. 2013. Managing Food Price Instability: Critical Assessment of the Dominant Doctrine. *Global Food Security*. 2.2: 72–81.

Gilbert, C.L. 2012. International Agreements to Manage Food Price Volatility. *Global Food Security* 1.2: 134–142.

HLPE. 2011. Price Volatility and Food Security. A Report by the High Level Panel of Experts on Food Security and Nutrition of the Committee on World Food Security. Rome: UN Committee on World Food Security.

Hollinger, F. and J.M. Staatz. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers*. Rome: FAO and African Development Bank.

IDRC. 2012. http://idrc.info/about/former-conferences/idrc-davos-2012/plenary-sessions/plenary-9/

Kelly, V., N.N. Dembele, and J. Staatz. 2008. Potential Food Security Impacts of Rising Commodity Prices in the Sahel: 2008-2009. A special report by the Famine Early Warning Systems Network. Washington, DC: FEWSNET.

Konandreas, P. 2012. Food Price Volatility in West Africa: Effects on Consumers and Producers and Policy Options at National, Regional and International Levels. AGWA Background Paper. Rome: FAO.

Minot, N. 2012. *Price Volatility in Africa: Has it Really Increased*? IFPRI Discussion Paper No. 01239. Washington, DC: International Food Policy Research Institute.

Rakotoarisoa, M.A., R.P. Sharma, and D. Hallam, eds. 2011. Agricultural Import Surges in Developing Countries: Analytical Framework and Insights from Case Studies. Rome: FAO.

Timmer, C.P., W.P. Falcon, and S.R. Pearson. 1983. *Food Policy Analysis.* Baltimore, MD: Published for the World Bank by The Johns Hopkins University Press.

CHAPTER 10

Implications of Asia's Changing Rice Economy for the Development of Rice Value Chains in West Africa

Implications de l'évolution de l'économie rizicole en Asie pour le développement des chaines de valeur du riz en Afrique de l'Ouest

Ramziath T. Adjao and John M. Staatz

Abstract

Following the 2007-2008 world food crisis, efforts to expand West Africa's rice production intensified in an attempt to reduce the region's dependence on imports, most of which come from Asia. The heaviest investments were in irrigated systems with full water control, where yields are highest and least variable. Using production budget data and domestic resource cost analysis, this chapter compares the financial and economic profitability of rice production in such systems in Côte d'Ivoire, Mali and Senegal with those of three major Asian rice exporters (India, Thailand and Vietnam) in 2011. Using data from three long-term rice market outlook studies, the chapter then conducts scenario analysis to identify the major factors that will influence the relative profitability of the West African and Asian systems through 2022. The financial profitability of the three West African value chains exceeded that in the three Asian countries. In all the scenarios analyzed, the financial and economic profitability of rice production was highest in Mali of the three West African countries analyzed.Sensitivity analysis reveals that the future profitability of the West African systems relative to their Asian counterparts is most sensitive to changes in world rice prices, the U.S. dollar/French Franc (US$/CFAF) exchange rate, increases in milling efficiency, and costs of irrigation infrastructure investments. Improving the quality of locally milled rice will also be an important factor in improving the profitability of local rice compared with imports.

Résumé

Suite à la crise alimentaire mondiale de 2007-2008, les initiatives d'expansion de la production rizicole en Afrique de l'Ouest se sont intensifiées pour tenter de réduire la dépendance de la région à l'égard des importations, pour la plupart provenant d'Asie. Les investissements les plus importants ont porté sur les systèmes irrigués avec maitrise totale de l'eau, dont les rendements sont plus élevés et moins variables. À l'aide de données sur les budgets de production et la méthode d'analyse du coût des ressources intérieures, ce chapitre compare la rentabilité financière et économique de la production rizicole des systèmes de riz en Côte d'Ivoire, au Mali et au Sénégal, avec ceux de trois grands pays exportateurs de riz (Inde,

Thaïlande et Vietnam) en 2011. À partir des données provenant de trois études sur les perspectives à long terme du marché mondial du riz, ce chapitre analyse ensuite des scénarios en vue de dégager les facteurs-clés qui affecteront la rentabilité relative des systèmes ouest-africains et asiatiques jusqu'à 2022. La rentabilité financière des trois chaines de valeur ouest-africaines est supérieure à celle des trois pays asiatiques. Lorsque l'analyse est réalisée sur la base des prix économiques et non des prix financiers, les systèmes malien et sénégalais restent rentables, mais le système ivoirien ne l'est que marginalement et demeure très sensible aux faibles fluctuations de prix des intrants et de la production. Dans l'ensemble des scénarios analysés et au niveau des trois pays ouest-africains étudiés, c'est au Mali que la rentabilité financière et économique de la production de riz était la plus élevée. L'analyse de sensibilité révèle que la rentabilité future des systèmes ouest-africains par rapport à celle de leurs homologues asiatiques est plus sensible aux fluctuations des cours mondiaux du riz, au cours du change dollar US/FCFA, à l'efficacité accrue des systèmes d'usinage et aux coûts des investissements dans les infrastructures d'irrigation. L'amélioration de la qualité du riz usiné localement sera aussi un facteur important de renforcement de la rentabilité du riz local face au riz importé.

10.1. Introduction

Rice is at the center of food policy debates in West Africa (WA).[1] Driven by its convenience in preparation and consumption and higher consumer incomes, per capita consumption grew from just under 15 kg/year in 1970 to 40 kg/year in 2011 while population tripled during the same period. As a result, imports have soared, from 464,000 metric tons (mt) in 1970 to 6.4 million mt, 44% of West Africa's total rice supplies, in 2011. The bulk of these imports comes from Asia, which accounts for about 90% of the world rice production and consumption and is the home of many of the world's top rice exporters and importers.

In 2007-2008, world rice prices spiked, with the free on board (FOB) price of the benchmark Thai 25% broken rice nearly tripling in one year and several key Asian exporters imposing export bans. This crisis laid bare West Africa's vulnerability to outside supply disruptions and stimulated massive actions by individual countries and the region as a whole, through regional organizations such as Economic Community of West African States (ECOWAS) and West African Economic and Monetary Union (WAEMU), to expand rice production in order to reduce import dependence and create new markets for West African farmers. These production initiatives expanded rice production in the ECOWAS zone from 6.9 million mt in 2008 to 11 million mt in 2013, but have relied heavily on input subsidies as well as investment in new irrigation infrastructure.

Over the long term, such production will only be economically sustainable if it can deliver local rice to West African consumers in the qualities and quantities desired and at a price that is competitive with Asian imports. Previous analyses by the authors (Adjao and Staatz 2015; Adjao 2016) have identified several factors that are likely to affect the relative competitiveness of West African and Asian rice systems. This chapter draws on those findings to estimate the

[1] In this chapter, West Africa (WA) refers to the 15 member countries of the Economic Community of West African States (ECOWAS): Benin, Burkina Faso, Cape Verde, Côte d'Ivoire, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Mali, Niger, Nigeria, Senegal, Sierra Leone, and Togo. Unless otherwise noted, all production, trade and consumption figures cited in this chapter are from FAOSTAT (2016).

relative competitiveness of the Asian and West African systems under various scenarios. The analysis highlights critical factors that West Africans must address to ensure that their efforts to substitute local production for imported rice remains economically sustainable in the future.

10.2. Literature Review and Knowledge Gap

This chapter draws together two disparate streams of literature on the competitiveness of Asian and West African rice value chains. On the one hand, the Food and Agriculture Organization of the United Nations (FAO) production and trade data (FAOSTAT 2016) and a number of recent studies (e.g., Hazell 2008; Pandey et al. 2010; Reardon et al. 2014; Chen et al. 2013) highlight the dominance of Asia in the global rice economy and key structural characteristics of the Asian and world rice markets. On the other hand, since the 1980s many studies have assessed the comparative advantage of rice value chains in West Africa (Pearson, Stryker, and Humphreys 1981; Barry 1994; Lançon and Erenstein 2002; USAID 2009; Seck et al. 2010; Diallo, Dembélé, and Staatz 2012; Diagne et al. 2013). Previous studies of comparative advantage in West Africa have compared (i) rice production with other commodities, (ii) different rice production systems within a given country, and (iii) similar rice production systems across West African countries. Very few studies, however, have explicitly compared profitability of rice production West Africa with that other regions of the world. A rare exception is a study carried out by the World Bank (Byerlee et al. (2013), which compared rice value chains in Thailand, Senegal, and Ghana.

None of the studies, moreover, have examined how future changes in Asia, the dominant region in the world rice economy, are likely to affect the future competitiveness of West African rice value chains. These changes include: (i) increased diversification of the Asian diet as a result of changing age structures and rapid economic growth; (ii) modifications in production patterns across Asia, as land moves out of rice and into more high-value products; and (iii) evolving costs of production in response to higher energy and water costs, technological change, changing marketing strategies of rice producers, and climate change (Reardon et al. 2014; Adjao and Staatz 2015; Adjao 2016). This chapter draws on world rice market outlook studies and other analyses of these changes to develop scenarios aimed at analyzing how these changes are likely to affect the future competitiveness of irrigated rice production in key West African countries.

10.3. Methods and Data

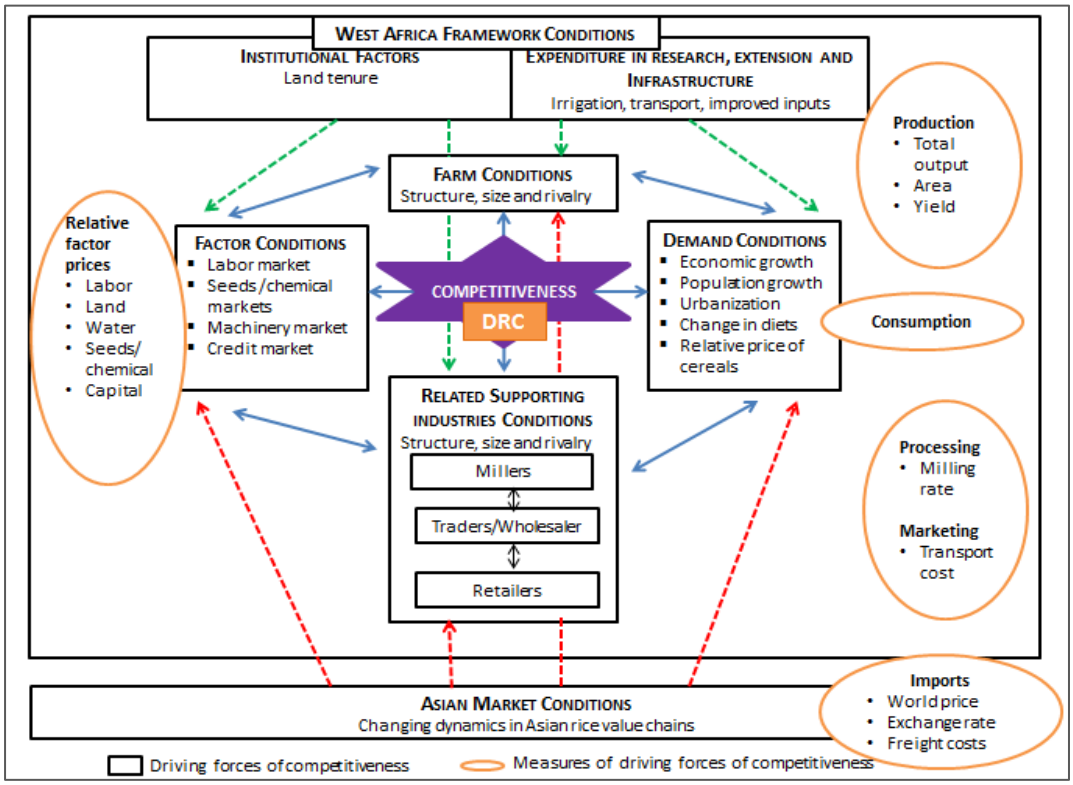
The analysis combines three elements: the development of an analytic framework to identify parameters that drive rice value-chain competitiveness, a review of major rice market outlook studies to identify likely ranges of values for those parameters in the coming 5 to 10 years; and the incorporation of those parameter values into the calculation of domestic resource cost ratios to measure future competitiveness of major rice value chains in selected West African countries.

Development of an Analytic Framework

In this chapter, competitiveness is be defined as "the ability to face competition and to be successful when facing competition, i.e., the ability to sell products that meet the requirements (price, quantity, quality) and, at the same time, ensure profits over time that enable the firm to thrive (…) within domestic or international markets" (Latruffe 2010). Thus, an increase in competitiveness or financial profitability occurs when a firm or country is able to lower its costs relative to those incurred by its rivals.

Building on the work of Porter (1998) and Reardon and Timmer (2014), Figure 10.1 presents a conceptual framework that identifies the main driving forces of competitiveness of West African and Asian rice systems and explains the changing structures of these systems as their economies evolve. The framework models changes in competitiveness as the outcome of changes in four interlinked factors, including (1) demand conditions; (2) farm-level conditions; (3) the conditions of related supporting industries; and (4) specialized factor markets, including for labor and capital, resulting from substantial, sustained investments in technology and know-how. These interlinked factors are complemented by both national framework conditions and global framework conditions of international markets, especially Asian markets, which influence the development of local value chains in WA. Each of these factors is linked by transactions (within firms or across markets), and the analysis of the coordination of these transactions is central to the model. The conceptual framework identifies key factors that are likely to drive competitiveness of West African irrigated rice er systems in the future. Sensitivity analysis on these factors, in Section 10.4 below, identifies which of them will be most influential in shaping WA's rice competitiveness in the future.

Figure 10.1. The Determinants of West African Rice Competitiveness



Source: Adjao (2016).

Summary of Key Outlook Studies

While Figure 10.1 presents the conceptual framework guiding the analysis, a review of major rice outlook studies provided likely parameter values for major driving factors identified in the framework. Three major organizations have developed outlook reports on probable trends over the coming decade in world rice markets, which are mainly driven by the major Asian rice economies: the USDA (Westcott and Trostle 2013)─covering the period 2011-2022; the University of Arkansas (Wailes and Chavez 2012)─covering 2010-2021; and the OECD-FAO (2013)─covering 2013-2022. These projections were developed assuming that no major domestic or external shocks would affect global agricultural markets in the next decade (e.g., normal weather with, in general, continuation of current trends in crop yields). The projections also assume: (i) an overall increase in economic growth in developing countries at around 3.8-4.2% per year, with strongest growth expected in Asia and Africa; (ii) population growth at around 1% per year, with the fastest growth occurring in Africa, while rates decline in the major Asian rice-exporting countries; (iii) subdued inflation in most parts of the world, at around 2%, with higher rates in the range of 4-8% for high-growth emerging countries; (iv) continued depreciation of the U.S. dollar, which would further decrease rice import prices (quoted in U.S. dollars) to countries whose currencies are not linked to the U.S. dollar; (v) further increases in crude oil prices, which were expected to increase faster than the general inflation rate; and (vi) continuation of domestic agricultural and trade policies, including long-term economic and trade reforms in many developing countries.

Based on these assumptions, the three studies all project global rice consumption to grow at an average rate of 1% annually, with higher rates in Africa and in the Middle East. For instance, Wailes and Chavez (2012) estimate total rice consumption in Africa to rise particularly fast (about 3% per year over the next decade) while the opposite is expected in China (0.3% per year). Moreover, all three studies project global rice production to increase by about 1% annually, mainly as a result of improvements in yields, although new investments in the sector in Africa are expected to contribute significantly to area expansion. Most of the expected growth in production is likely to come from India and Asian Least Developing Countries, including Cambodia and Myanmar, but also African countries, especially Nigeria, Mali, Sierra Leone and Ghana. However, China, currently the world's largest producer, is projected to cut output significantly in response to declining per capita domestic consumption and strong competition for land. As a result, Wailes and Chavez (2012) expect Asia's share of world production to decline slightly from 89.9% to 89.3% over 2010-2021 while Africa's share will increase from 3.4% to 4.2% over the same period.

Moreover, world prices, on average, are projected to remain on a high plateau compared to the previous decade in both nominal and real terms, although they are likely to be lower than the 2007-2008 levels. In fact, the Organisation for Economic Co-operation and Development (OECD)-FAO projections foresee the world rice/coarse-grain price ratio falling from 2.5 in recent years to 1.9 by 2022 and the rice/wheat price ratio falling from 1.8 to 1.7 (OECD-FAO 2013), suggesting some shift in consumption away from rice toward coarse grain and wheat-based products, such as noodles, especially among lower income consumers in WA.

The three studies also expect international trade in rice to continue to grow within a range of 2.0–2.5% per year, likely fueled by increased import demand by countries in West Africa, especially Nigeria and Côte d'Ivoire, and in the Middle East, especially Iran and Iraq, as well as traditional rice-deficit Southeast Asian countries, such as the Philippines and Bangladesh. However, new trade patterns are expected to emerge. While China and India are projected to remain the largest rice economies, still accounting for nearly half of global rice production and consumption in the next decade, China will significantly reduce its rice exports while India's exports will increase. Although Thailand, Vietnam, India, Pakistan, and the U.S are projected to remain the top five rice exporters, accounting for over fourth-fifths of global net trade, Vietnam may surpass Thailand as the leading exporter by 2020 depending on whether Thailand continues to pursue its high producer price policies, which have eroded its competitive edge in recent years. Myanmar and Cambodia are also expected to increase exports by about 10% per year to 2020.

Financial and Economic Analysis

In order to assess the current competitiveness of West African irrigated rice systems compared with those of major Asian rice exporters, the analysis examined a wide range of production and marketing data for rice produced in full water-control irrigation systems in Mali, Côte d'Ivoire and Senegal. Mali is the second-largest rice producer in West Africa (after Nigeria), and Côte d'Ivoire and Senegal are the region's second and third-largest rice importers (after Nigeria). Lack of comparable farm-level budget data precluded including Nigeria in the analysis. The analysis focused on full water-control irrigation systems because these systems account for the bulk of the marketed surplus of rice in West Africa and they are the systems that have received most public investment to date.

The analysis was conducted in terms of market and production conditions existing in 2011. It compared the competitiveness of rice produced from these systems with imports of Asian rice from two different perspectives. The first perspective is financial analysis, which calculates the cost of production and net value added using prevailing market prices, including any taxes paid and subsidies received by value-chain actors. The financial analysis thus measures the profitability to private actors of rice production and marketing under existing market conditions. The second perspective is economic analysis, which nets out the value of any taxes and subsidies, including the effects of over- or under-valued exchange rates. The economic analysis thus measures the profitability to the economy as a whole of the activity, i.e., whether the country has a comparative advantage in rice production and marketing.[2]

The indicator used here to assess economic profitability is the Domestic Resource Cost (DRC) ratio. This ratio measures the cost to the country, in terms of the domestic resources it uses, of producing a kilogram (kg) of rice and delivering it to consumers, in a given location, compared to importing it. It does so as follows. The numerator of the ratio is the value (expressed in terms of foreign exchange) of domestic (nontradeable) resources (land, labor, capital) used in the production and delivery of a given amount of rice to the country's capital city. The denominator is the net value of foreign exchange that would be needed to replace the same amount of rice

[2] Economic analysis takes the prevailing world prices as given and does not take into account any taxes paid or subsidies received by actors in the exporting country. The justification is that the importing country cannot affect these taxes and subsidies, and therefore, the world price represents the opportunity cost to the importing country of producing the good rather than importing it.

with imports. If this ratio is less than one, it indicates that it is cheaper to produce and deliver the rice using domestic resources than to import it, and hence the country has a comparative advantage in providing the good. If the ratio is above one, the opposite is true (Adjao 2016). The lower the value of the DRC ratio (the closer it is to zero), the higher is the comparative advantage of the country in rice production.

Data

The data used for this analysis were compiled based on recent rice value chains studies conducted by the Asian Development Bank and the Regional-Research and Development Technical Assistance (R-RDTA) for several Asian countries, including India, and Vietnam (Chen et al. 2013); the Asian Development Bank and its Institute (ADBI) in Vietnam (Reardon et al. 2014); the World Bank in Thailand and Senegal (Byerlee et al. 2013); USAID/Mali in Mali (Stryker and Coulibaly 2011), and AfricaRice and its national partners (NARS) in collaboration with Michigan State University (MSU) for several countries in WA, including Côte d'Ivoire, Mali, and Senegal (Diagne et al. 2013; Diallo, Dembélé, and Staatz 2012; Dieng et al. 2011; Ouattara 2011). The year 2011 is taken as the base year of this analysis. Where necessary, the data, especially per-unit costs figures and average producer and consumer prices for WA, were updated to 2011 using data obtained from national Market Information Systems (MIS) and Famine Early Warning Systems (FEWSNET). The cost data are mostly representative of those facing small- to medium-scale paddy producers and processors. World prices and exchange rates were obtained from international statistical databases, including the World Bank and FAOSTAT. However, it is important to note that rice is not a homogeneous product and quality differences are not always accurately reflected in the data, making some of the cross-country comparisons subject to error. Therefore, cost numbers need to be interpreted with caution.

10.4. Results

Financial Analysis

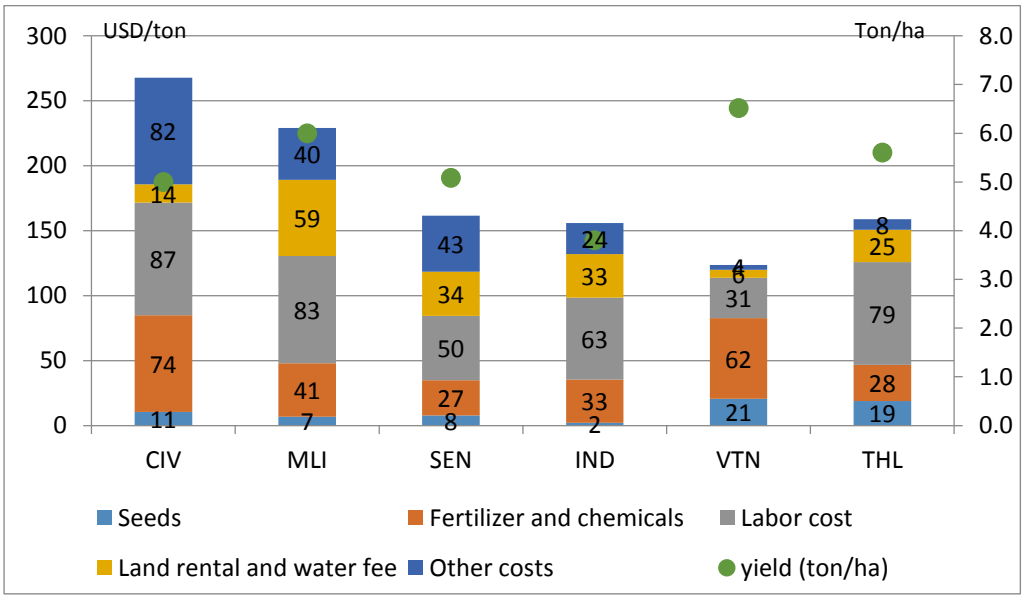
Figure 10.2 compares financial costs of production, at the farm level, of paddy rice in Côte d'Ivoire, Mali, Senegal, India, Vietnam, and Thailand. Senegal's cost, at slightly over US$150/metric ton, is comparable to that of India and Thailand, but above that of Vietnam. The financial costs for Côte d'Ivoire and Mali exceed those India and Thailand by between 50% and 80%, and by an even higher amount for Vietnam.

Because consumer rice prices are higher in West Africa than in the Asian exporting countries, however, the financial profitability of the entire value chain, as measured by the cumulative net margin (value added) by all actors involved in producing and delivering rice to each country's respective capital city, is positive in West Africa and even higher than that of the three Asian countries (Table 10.1). The high financial profitability in the three West African countries is consistent with the rapid expansion of rice production in these countries since the rice crisis of 2008.

Figure 10.3 presents a comparison of the price structure along the retail (or export) value chains in the selected countries, highlighting the principal activities in the chain that capture the

highest share of the final retail price. The price structure in WA contrasts strongly with the structure in Asia. Overall, the performance of downstream segments of Asian rice value chains (i.e., traders, millers, and wholesalers) has become nearly as important as the farm segment, with about 40% of the total value added of the rice value chain (reflected in the final retail price) deriving from the downstream segments and the remaining 60% from the farm segment. However, in WA the share of the off-farm components in the final retail price is only half of those estimated for Asia, except in Senegal.

Figure 10.2. Level and Distribution of Production Costs for Irrigated Rice in Côte d'Ivoire, Mali and Senegal Compared to India, Vietnam and Thailand (US$/ton paddy)



Source: Adjao (2016).
Note: Other costs include machine rental, equipment maintenance and depreciation, interest on capital, gas and fuel, sacks; depreciation of irrigated infrastructure is excluded.

Table 10.1. Net Financial Value Added in Irrigated Rice Value Chains, 2011 (US$ per Metric Ton of Milled Rice)

Country	Net Value Added
Côte d'Ivoire	263
Mali	250
Senegal	258
India	201
Vietnam	189
Thailand	148

Source: Adjao (2016).

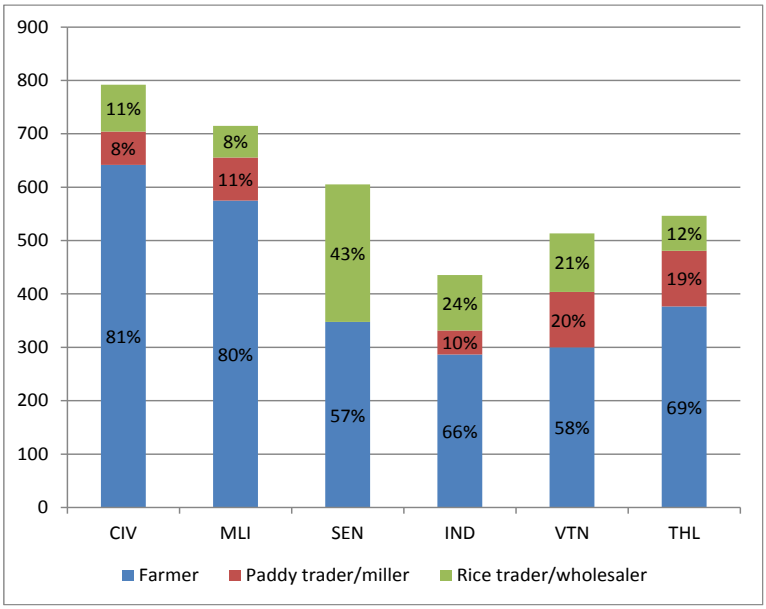
Economic Analysis

When competitiveness is measured using economic analysis, a slightly different picture emerges. The DRC ratios for Mali (0.68) and Senegal (0.78) are both below 1.0, indicating that under conditions prevailing in 2011 these countries had a comparative advantage in rice

production. In Côte d'Ivoire, however, the DRC was 1.0, indicating that, from an economic standpoint, irrigated rice production in that country was just at a break-even point, and hence was highly vulnerable to shocks that could make it unprofitable from the perspective of the country as a whole. The divergence between Côte d'Ivoire's break-even position in economic terms and the financial profitability shown in Table 10.1 implies that the financial profitability in Côte d'Ivoire was driven by explicit and implicit subsidies to the rice sector.

It is not surprising that Mali has the strongest the comparative advantage in producing and marketing rice to its capital city, as Mali's landlocked position offers the country some natural protection from imports. In contrast, the major rice-consuming cities of Senegal and Côte d'Ivoire are close to ports, making access to imports cheaper.

Figure 10.3. Price Structures of the Rice Value Chain in RCI, Mali, and Senegal Benchmarked to India, Vietnam, and Thailand (% of Wholesale or FOB Price)*



Source: Adjao (2016).
*Note: In the Delta region in Senegal, paddy is processed either by the farmer or the wholesaler. In the above scenario, paddy is processed by the wholesaler who pays for custom milling and transportation fees from farm to wholesale markets.

These DRC results differ from those of a 2013 study by AfricaRice (Diagne et al. 2013), which found that Côte d'Ivoire had a comparative advantage in rice production (DRC = 0.57). That study, however, assumed that the major irrigation infrastructure was already paid for and thus did not have to be included in the analysis. The AfricaRice approach is only appropriate if one is analyzing the economics of expanding production within an existing irrigation facility that requires no new major infrastructure. Since most rice production initiatives in West Africa involve bringing new areas under irrigation, it is preferable to include the investment costs of the new infrastructure in the analysis. The fact that excluding such costs makes a marginally unprofitable activity look highly profitable probably explains why many private promotors of expanded large-scale irrigation in Côte d'Ivoire (and elsewhere) have sought to have the infrastructure costs covered by government within a public-private partnership framework.

Sensitivity Analysis: Key Factors Influencing Future Competitiveness

Figure 10.1 illustrates the driving forces affecting future competitiveness of West African rice systems vis à vis their Asian counterparts. These range from institutional issues, such as land-tenure conditions, to exchange rates, access to new technologies, conditions in factor markets, and costs of both ocean and inland freight. This section presents sensitivity analysis of the DRC calculations presented above with respect to several of these driving forces (shown as the circled items in Figure 10.1). They include the world rice price, the CFAF/US$ exchange rate, ocean and inland transport costs, rice yields, costs of chemical inputs, milling rates, irrigation costs, capital costs, land costs and the cost of labor. The level of changes in these key variables relative to the base period (2011) were taken from the outlook studies discussed earlier for the medium run (i.e., the period 2011-2016) and the long run (i.e., 2011-2021).

Table 10.2 summarizes the results for changes in the individual levels of these major drivers of competitiveness. Key results for the most important drivers were the following (for details, see Adjao 2016):

Changes in World Rice Prices and Exchange Rates: Competitiveness was most sensitive to projected declines in the world prices (a function of production costs in Asia) and a depreciation of the U.S. dollar relative to the Euro (and hence the CFAF).[3] For example, a 12% decline in world prices from 2011 levels would increase the DRC to 1.49 in Côte d'Ivoire and 1.07 in Senegal, making rice production in those countries economically unprofitable, and reduce Mali's competitiveness (DRC increasing to 0.87). In reality, world prices in dollar terms for Thai 25% broken rice fell by 27% between 2011 and 2015 (FAO 2016), but this was largely offset by a 20% appreciation of the US$ relative to the CFAF, resulting in a net decline in world prices, in CFAF terms, of 7%. The net effects of these actual price and exchange rate changes were to increase Senegal's DRC to 0.94 (still marginally profitable in economic terms) but to turn Côte d'Ivoire's production unprofitable (DRC = 1.27). Mali's competitiveness declined but remained economically profitable (DRC = 0.79). Both the world price and the exchange rate are entirely outside the control of these three West African countries, so in order to strengthen their competitiveness, they need to concentrate on factors that are within their control, such as investment costs in irrigation infrastructure and operational efficiency throughout the value chain.

Increases in Milling Efficiency and Farm-Level Yields: Increases in milling rates (rates of conversion of paddy into milled rice) and paddy yields were strong factors in increasing competitiveness, with increases in milling rates having a somewhat stronger impact than growth in farm-level yields. For example, a 5% increase in milling rates would decrease the DRC in Senegal from 0.78 to 0.73, while a 5% yield increase would reduce the figure to 0.75. This finding underlines the importance of looking to improve efficiency throughout the entire value chain and not just at the farm level.

[3] The CFA franc (CFAF) has a fixed parity with the Euro (1 Euro = 656 CFAF). All three West African countries analyzed here share the CFAF as a common currency.

Table 10.2. Impact of Changes in Key Variables on Competitiveness

	CÔTE D'IVOIRE			
Scenario	% change		DRC (1.00)*	
	MR	LR	MR	LR
1 World rice price	-5%	-12%	1.09	1.24
2 Dollar exchange rate	-5%	-10%	1.09	1.18
3 Ocean freight costs	10%	20%	0.97	0.95
4 Inland transport costs	10%	20%	1.01	1.02
5 Yield	-6%	3%	1.11	0.96
6 Chemical costs	10%	20%	1.03	1.06
7 Milling rate	5%	8%	0.93	0.89
8 Irrigation costs	-20%	-50%	0.91	0.77
9 Capital costs	-5%	-10%	0.97	0.95
10 Land costs	50%	100%	1.03	1.06
11 Labor costs	20%	50%	1.07	1.17
	MALI			
Scenario	% change		DRC (0.68)*	
	MR	LR	MR	LR
1 World rice price	-5%	-12%	0.72	0.78
2 Dollar exchange rate	-5%	-10%	0.72	0.76
3 Ocean freight costs	10%	20%	0.67	0.65
4 Inland transport costs	10%	20%	0.68	0.69
5 Yield	11%	22%	0.61	0.55
6 Chemical costs	10%	20%	0.69	0.7
7 Milling rate	5%	8%	0.64	0.62
8 Irrigation costs	-20%	-50%	0.63	0.56
9 Capital costs	-5%	-10%	0.67	0.65
10 Land costs	10%	20%	0.69	0.7
11 Labor costs	20%	50%	0.72	0.78
	SENEGAL			
Scenario	% change		DRC (0.78)*	
	MR	LR	MR	LR
1 World rice price	-5%	-12%	0.83	0.93
2 Dollar exchange rate	-5%	-10%	0.83	0.89
3 Ocean freight costs	10%	20%	0.76	0.74
4 Inland transport costs	10%	20%	0.78	0.78
5 Yield	3%	5%	0.75	0.74
6 Chemical costs	10%	20%	0.79	0.8
7 Milling rate	5%	8%	0.73	0.7
8 Irrigation costs	-20%	-50%	0.72	0.62
9 Capital costs	-5%	-10%	0.76	0.74
10 Land costs	50%	100%	0.79	0.8
11 Labor costs	20%	50%	0.81	0.86
Notes: * Base scenario, MR = medium-run; LR = long-run				

Source: Adjao (2016).

Changes in Energy Prices: The impact of changes in energy prices is ambiguous on the competitiveness of West African rice production. On the one hand, higher energy costs raise the cost of ocean transport, thereby raising the cost of imports and improving West African competitiveness. On the other hand, costs of inland transport and energy-intensive inputs like fertilizer also rise, hurting local competitiveness.

Rising Agricultural Labor Costs: Higher agricultural labor costs in West Africa reduce competitiveness, with the effect strongest in Côte d'Ivoire, where a 20% increase in labor costs per mt of output would raise the DRC from 1.0 to 1.07, making rice production uncompetitive with imports. This finding underlines the importance of promoting labor-saving technologies (such as herbicides and selective mechanization) in countries like Côte d'Ivoire and Ghana, where wage rates are rising due to robust economic growth.

Cost of Irrigation Infrastructure: The cost of developing irrigation infrastructure is a major determinant of competitiveness. If these costs per ha could be reduced by 20%, production in Côte d'Ivoire would become competitive (DRC = 0.91) and that in Senegal and Mali would be even more so (DRCs falling from 0.78 to 0.72 in Senegal and from 0.68 to 0.63 in Mali).

Relative Competitiveness across Countries: The sensitivity analysis shown in Table 10.2 indicates that Malian rice production for the domestic market would remain competitive under a wide range of scenarios. In contrast, the competitiveness of Ivorian production is very sensitive to the factors shown in the table. Senegal occupies an intermediate position, often remaining competitive, but with some combinations of factors, such as declines in the world price coupled with rising transport costs, eroding the sector's competitiveness.

10.5. Conclusions and Policy Implications

Recent changes in the Asian rice economy suggest a favorable environment for expansion of West African rice production, as area is shifting out of rice in Asia, productivity growth is slowing and labor costs are increasing. In West Africa, large-scale irrigated production was financially profitable in 2011 in Senegal, Mali and Côte d'Ivoire, but only economically profitable the former two. This suggests that net subsidies to the rice sector since the 2008 world food price crisis have been an important contributor to expansion of production, at least in Côte d'Ivoire. The fact that production is economically profitable in Senegal and Mali suggests that current levels of subsidies are not needed for the full-water-control component of the rice value chain to be competitive. Given its relatively high comparative advantage in producing and marketing rice to its capital city, Mali may even be in a position itself as a substantial exporter of rice to regional markets.

However, the future competitiveness of West African rice value chains will depend on factors both outside the countries' control, such as world prices and exchange rates, and those they can influence, such as efficiency in production, processing and transport. World rice prices in dollars have declined since 2011, potentially weakening the competitiveness of West Africa's rice sector vis à vis Asian imports. Within the CFAF zone, however, this effect has been largely offset by a weakening of the Euro, and hence the CFAF, relative to the dollar. Should economic conditions in the European Union strengthen or conditions in the US weaken, the Euro (and hence the CFAF) could strengthen relative to the dollar, putting West African rice systems

under greater competitive pressure. Therefore, focusing on improving the efficiency of these systems is critical.

Increases in farm-level yields and milling rates, reductions in per ha investments in irrigation infrastructure, and reduced financing costs are among the most powerful factors that could offset the negative impacts of unfavorable changes in world prices and exchange rates. The ability to achieve these increases in system-wide efficiency requires adequate investment in agrifood system research and extension. This raises the question of whether shifting public resources to such efforts from the current heavy expenditures on input subsidies might have a larger and more sustainable impact on West Africa's rice competitiveness than current policies. Another action that could improve competitiveness is the reduction of inland transport costs through efforts to increase competition in the trucking industry and reduce non-tariff barriers such as roadblocks, which increase the already high marketing costs of local rice.

Quality improvement can also strengthen the competitiveness of West African rice. In most countries of the region, consumers perceive local rice to be of lower quality than imports, frequently with higher levels of impurities such as stones and chaff. Demand for higher quality food products is increasing throughout West Africa, particularly among the growing middle class (Hollinger and Staatz 2015). Therefore, increasing marketable volume of milled rice without addressing the quality issue may no longer be sufficient if West African rice value chains are to claim a bigger share of the booming West African rice market. Strengthening systems of contracting among farmers, their organizations, millers and marketers will be an important element in achieving such quality improvement.[4]

References

Adjao, R.T. and J.M. Staatz. 2015. Asian Rice Economy Changes and Implications for Sub-Saharan Africa. *Global Food Security* 5.June: 50-55.

Adjao, Ramziath T. 2016. Competitiveness and Protection: A Comparative and Prospective Study of the West African and Asian Rice Subsector. Ph.D. dissertation, Michigan State University.

Barry, A.W. 1994. Comparative Advantage, Trade Flows and Prospects for Regional Agricultural Market Integration in West Africa: The Case of Cote d'Ivoire and Mali. Ph.D. Dissertation, Michigan State University.

Byerlee, Derek, Andres F. Garcia, Asa Giertz, and Vincent Palmade. 2013. *Growing Africa: Unlocking the Potential of Agribusiness: Main Report.* World Bank Working Paper No. 75663. Washington, DC: World Bank.

Chen, K.Z., T. Reardon, J. Wang, L. Wong, and A.T. Dao. 2013. Rice Value Chains in China, India, Lao PDR, and Viet Nam: 2012 Survey Results, Interpretations, and Implications for Policy and Investment. Report to the Regional - Research and Development Technical

[4] See Chapter 12 in this volume.

Assistance (R-RDTA) of the Asian Development Bank (ADB). International Food Policy Research Institute (IFPRI). Beijing, China: ADB, IFPRI.

Diagne, A., E. Amovin-Assagba, K. Futakuchi, M.C.S. Wopereis. 2013. Developing Competitive Rice Value Chains. In: *Realizing Africa's Rice Promise*, ed. M.C.S. Wopereis, D.E. Johnson, N. Ahmadi, E. Tollens, and A. Jalloh. Wallingford, UK: CAB International.

Diallo, B., N. Dembélé, and J. Staatz. 2012. *Compétitivité du riz local en Afrique de l'Ouest depuis la hausse des prix alimentaires mondiaux*. PRESAO/SRAI résultats de recherche no. 1. East Lansing, MI: Michigan State University.

Dieng, A., M. Sagna, M. Babou, and F. Dione. 2011. *Analyse de la compétitivité de la filière rizicole dans la Vallée du Fleuve et dans le Bassin de l'Anambé au Sénégal.* PRESAO/SRAI rapport no. 1. East Lansing, MI: Michigan State University.

FAO. 2016. FAO Rice Price Update. http://www.fao.org/economic/est/publications/rice-publications/the-fao-rice-price-update/en/.

FAOSTAT. 2016. http://faostat3.fao.org/home/E.

Hazell, P.B.R. 2008. An Assessment of the Impact of Agricultural Research in South Asia since the Green Revolution. Rome: CGIAR Science Council Secretariat.

Hollinger, Frank and John M. Staatz, eds. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers.* Rome: FAO and AfDB.

Lançon, F. and O. Erenstein. 2002. Potential and Prospects for Rice Production in West Africa. Paper presented at sub-regional workshop on Harmonization of Policies and Co-ordination of Programmes on Rice in the ECOWAS Sub-Region, 25-28 February. Accra, Ghana.

Latruffe, L. 2010. *Competitiveness, Productivity and Efficiency in the Agricultural and Agri-Food Sectors*. OECD Food, Agriculture and Fisheries Working Papers No. 30. Paris, France: OECD Publishing.

OECD-FAO. 2013. *OECD-FAO Agricultural Outlook 2013.* Rome: OECD, FAO. http://www.oecd-ilibrary.org/agriculture-and-food/oecd-fao-agricultural-outlook-2013_agr_outlook-2013-en.

Ouattara, Z.F. 2011. *Impact du TEC de l'UEMOA sur la compétitivité du riz irrigué en Côte d'Ivoire*. PRESAO/SRAI rapport no. 3. East Lansing, MI: Michigan State University.

Pandey, S., D. Byerlee, D. Dawe, A. Dobermann, S. Mohanty, S. Rozelle, and B. Hardy. 2010. *Rice in the Global Economy: Strategic Research and Policy Issues for Food Security*. Los Baños, Philippines: International Rice Research Institute.

Pearson, S.R., J.D. Stryker, and C.P. Humphreys. 1981. *Rice in West Africa: Policy and Economics*. Stanford, CA: Stanford University Press.

Porter, M.E. 1998. *The Competitive Advantage of Nations*. 2nd ed. New York: Free Press.

Reardon, Thomas, Kevin Z. Chen, Bart Minten, Lourdes Adriano, The Anh Dao, Jianying Wang, and Sunipa Das Gupta. 2014. The Quiet Revolution in Asia's Rice Value Chains. *Annals of the New York Academy of Sciences* 1331: 106-118.

Reardon, T. and P.C. Timmer. 2014. Five Inter-linked Transformations in the Asian Agrifood Economy: Food Security Implications. *Global Food Security* 3.2: 108-117. (10.1016/j.gfs.2014.02.001).

Seck, P.A., E. Tollens, M.X.A. Wopereis, A. Diagne, and I. Bamba. 2010. Rising Trends and Variability of Rice Prices: Threats and Opportunities for Sub-Saharan Africa. *Food Policy* 35.5: 403–411. (10.1016/j.foodpol.2010.05.003).

Stryker, J.D. and M. Coulibaly. 2011. Republic of Mali National Plan for Priority Investment in the Agricultural Sector: Domestic Resource Cost Analysis and CAADP Country Strategy Plan Costing Services for the Accelerated Economic Growth Strategic Objective Program. Bamako, Mali: USAID/Mali.

USAID. (United States Agency for International Development) 2009. *Global Food Security Response: West Africa Rice Value Chain Analysis.* USAID Micro Report No. 161. Washington, DC: United States Agency for International Development.

Wailes, E.J. and E. Chavez. 2012. World Rice Outlook: International Rice Deterministic and Stochastic Baseline Projections, 2012-2021. In *B.R. Wells Rice Research Studies 2011,* ed. R.J. Norman and K.A.K. Moldenhauer, pp. 379-95. Fayetteville: University of Arkansas System Division of Agriculture, Arkansas Agricultural Experiment Station, Research Series 600 (August). http://arkansasagnews.uark.edu/600.pdf.

Westcott, P. and R. Trostle. 2013. *USDA Agricultural Projections to 2022*. Outlook No. (OCE-131). Washington, DC: United States Department of Agriculture.

CHAPTER 11

Competitiveness of Rainfed Rice and Maize Production in West Africa

Boubacar Diallo[1]

Abstract

This chapter analyzes the financial and economic profitability of rainfed rice and maize production systems in Benin, Burkina Faso, Côte d'Ivoire, and Senegal under prices prevailing in 2011. These systems have shown remarkable dynamism in West Africa since 2007-2008, when world grain prices increased sharply and NERICA rice varieties began to be introduced to the region. Using the Policy Analysis Matrix (PAM) and Domestic Resource Cost Analysis (DRC), the chapter shows that all six rainfed rice production systems and six of the eight rainfed maize systems analyzed were financially and economically profitable at the farm level and competitive with imported cereals. Government policies in the countries generally provided net subsidies to farmers, with the exception in Burkina Faso and for maize producers in Côte d'Ivoire, where policies implicitly taxed them. Given the strong competitiveness of these rainfed systems and their rapid expansion in recent years, they merit strong attention in future food policies for the region.

Résumé

Ce chapitre analyse la rentabilité financière et économique du riz et du maïs pluvial au Bénin, Burkina Faso, Côte d'Ivoire et au Sénégal. Ces systèmes ont connu un certain dynamisme en Afrique de l'Ouest depuis 2007/08, lorsque les prix alimentaires mondiaux se sont envolés et au moment où les variétés de riz NERICA ont commencé à être introduites dans la sous-région. Utilisant la Matrice d'Analyse des Politiques (MAP) et l'Analyse de Coût des Ressources Domestiques (CRD), ce chapitre montre que tous les six systèmes de production de riz pluvial et six des huit systèmes de production de maïs pluvial analysés sont financièrement et économiquement rentables au niveau de la ferme et compétitives par rapport aux céréales importées. Les politiques gouvernementales dans ces pays ont généralement alloué des subventions aux producteurs qui ont été protégés à l'exception de ceux au Burkina Faso et ceux du maïs en Côte d'Ivoire qui ont été plutôt taxés. Compte tenu de la forte compétitivité de ces systèmes pluviaux et leur rapide expansion durant ces dernières années, ceux-ci méritent dorénavant une attention particulière dans la sous-région.

[1] This chapter was written by Boubacar Diallo of Michigan State University, who assumes entire responsibility for all the statements herein. The underlying research, upon which the chapter is based, however, could not have taken place without the strong collaboration of researchers from AfricaRice (especially Ali Touré, Rose Edwge Fiamohe, Simon Codjo, and Jeanne Coulibaly) who supervised collection of data and analysis of the competitiveness of rainfed rice and maize by teams from national agricultural research systems (NARS) in West Africa. The author expresses his profound gratitude to the AfricaRice colleagues and the members of the NARS teams.

11.1. Introduction

Chapter 10 analyzed the profitability and competitiveness of irrigated rice production under full water control in West Africa compared to similar systems in Asia. This chapter complements that analysis by examining the private and social profitability of two types of rainfed cereals that have shown remarkable dynamism in West Africa in recent years: rainfed rice, whose production has been spurred since 2008 with the introduction of NERICA varieties, and rainfed maize, whose production expanded more than nine-fold between 1980 and 2014.[2] Specifically, the chapter explores the whether it is more profitable for small farmers in the region to produce rainfed rice and maize for their own families to consume (and sell in local markets) rather than procuring those cereals from imports. The chapter explores the profitability and competitiveness of these crops based on evidence from field surveys and includes recent developments in these sectors, including changes observed since 2008.

In West Africa, rice and maize are important staples for food security. They also play a significant role in supplying regional markets, increasing the income of farmers and creating jobs in rural areas. As described in Chapter 3, rice production in West Africa is mostly concentrated in the basins of Nigeria (40%), Guinea and Mali (30%), and Côte d'Ivoire and Liberia (10%-15%). Maize is a critical crop for the region because it serves as both human food (predominantly white maize) and animal feed (predominantly yellow maize). Maize production is concentrated in the basins formed by Nigeria, Benin, Togo, Côte d'Ivoire, and Ghana. Since the increase in world food prices that began in 2007-2008, these areas have been joined by an emerging basin comprising Burkina Faso, Mali, and Guinea (see Chapter 3). The rates of rice self-sufficiency for the three largest rice producers in West Africa were 96% for Mali, 80% for Guinea, and 56% for Nigeria during the period 2006 to 2010 (Hollinger and Staatz 2015). Over the same period, nearly all West African countries were self-sufficient in maize, or close to it. In more recent years, maize imports have grown in some countries, such as Ghana and Senegal, as demand for poultry feed has burgeoned (FAOSTAT 2017).

Over the last 20 years, West African agriculture has relied primarily on two types of production systems. The first type includes traditional systems, which range from rainfed to uncontrolled flooding, mainly for rice, sorghum, and maize. The second type relies on hydro-agricultural improvements, such as controlled flooding and full water control, for irrigated crops (African Development Bank 2016). The area sown to rice in West Africa rose from three million hectares (ha) in the 1980s to more than six million ha in 2013. The average yield of irrigated rice in Senegal and Mali is three tons per ha. The average yield per ha for the entire region of West Africa for all rice production systems combined has stagnated at around 1.6 tons. This low average yield is attributable in large part to the limited yields of rainfed rice farming (Boutsen and Aertsen 2013). Meanwhile, the land area sown to maize surged from 2.2 million ha in 1980 to 5.9 million in 2000, then to 11.1 million ha in 2014. Maize production has undergone a spectacular boom from 2.1 million tons in 1980 to 19.5 million tons in 2014 (FAOSTAT 2017).

[2] NERICA, or the New Rice for Africa, is a series of rice lines that resulted when AfricaRice researchers crossed the African species *Oryza glaberriama*, which withstands harsh environments, with the high-yield Asian species *Oryza sativa*. NERICA varieties have made remarkable inroads in upland ecological zones, but have made less of an impact on irrigated and seasonally flooded bottomland ecological zones.

Rainfed rice production is associated with traditional farms that require intensive family labor, especially that of women, and use very little capital. Yields from the traditional methods are low at around 0.5 to 1.5 tons (t)/ha. NERICA varieties have been adopted relatively quickly since 2008, enabling many farmers to boost their production in both upland rice and bottomland (*bas-fonds*) rice systems. The NERICA varieties, which by 2010 had been disseminated to over more than 300,000 ha, have shown that there is tremendous potential for upland rice production (Diagne 2010). These varieties have been particularly beneficial to women, whose rice production is concentrated in upland and bottomland areas. Fertilizers and pesticides are generally not used much in rainfed rice production systems and when they are, the technical guidelines are not closely followed. Rainfed rice is most often produced in combination with other crops (maize, tubers, etc.) and is subject to certain constraints, such as the variability of rainfall, erosion, extensive soil depletion, disease, and pest attacks. The harvests are intended mainly for home consumption, but sometimes a portion is sold on local markets.

Maize farming systems in West Africa are very heterogeneous. In most countries, maize production is rainfed, and the development of irrigated maize is recent. The maize farming areas cover land ranging from the semi-arid Sudano-Sahelian climate to the sub-humid, tropical climates of southern West Africa. Maize is usually very responsive to improvements in its growing conditions (water, fertilizer, sunlight, etc.). Experience in cotton-producing countries (Benin, Burkina Faso, Côte d'Ivoire, Mali, and Chad) has demonstrated that when inputs are used for cotton, they also benefit maize. For example, fertilizer applied to cotton has residual benefits for maize grown in rotation, and animal traction equipment financed through cotton production also benefits maize production. Cotton and maize grown in rotation in the region has brought many agronomic benefits and improved soil fertility (AFD, CIRAD, and FIDA 2011).

To respond to the 2007-2008 increase in food prices, West African governments focused much of their attention on rehabilitating and deploying new agricultural irrigation facilities—especially for rice—and providing subsidies to farmers for fertilizer and improved seed (see Chapter 13). However, the response to the crisis was also driven by farmers, who increased the area planted in dryland systems as well as in seasonally flooded bottomlands and upland areas where rainfed rice is produced. Rainfed rice now accounts for about 40% of the rice-growing farmland in West Africa and employs approximately 70% of rice farmers (Diagne et al. 2010; Grain 2009). Similarly, the area under rainfed maize expanded rapidly. This expansion raises the question of whether the growth in production of these rainfed cereals was driven primarily by subsidies or by more fundamental economic profitability. The analysis in this chapter addresses this question.

11.2. Literature Review and Knowledge Gap

Over the last two decades, profitability and competitiveness analyses in West Africa have focused on local rice production systems (irrigated, seasonally flooded bottomland and rainfed) because of the important role that rice plays in the domestic food basket and because of rice's strategic and economic importance in the policy agenda of decision makers, particularly since the 2007-2008 food crisis. These decision makers have come to understand that local rice may be able to compete with imported rice in terms of production potential, quality, and price. Most of these studies have used the Policy Analysis Matrix (PAM) and Domestic Resource Cost

(DRC) analyses to assess whether the use of domestic resources to produce rice locally is less costly than importing the cereal. As explained in section 11.3 below, the PAM is a tool that systematically compares private (financial) and social (economic) costs of producing and selling a good and measures the income transfers that occur among private actors and society as a whole as a result of the prevailing system of pricing, taxes, and subsidies.[3] DRC analysis uses the same concepts incorporated in the PAM to measure whether it is economically more efficient to produce a good locally or to import it. As explained in Chapter 10, a DRC ratio of less than 1.0 indicates that it is economically more efficient to produce the good domestically in order to supply a specified market than to import it, while a DRC ratio of above 1.0 indicates that the country does not have a comparative advantage in producing the good and would be economically better off importing the good and using its own domestic resources to produce something else.

AfricaRice, a pioneer in the field of PAM and DRC analysis, conducted a general review of issues relating to rice policy in West Africa and maintains a databank of West African rice-growing statistics (AfricaRice 2011). In this review, AfricaRice also examined the efficiency of the rice market and carried out an in-depth study on the competitiveness of the rice sector in select countries like Benin, Côte d'Ivoire, Guinea, Nigeria, and Senegal. The study concluded that the continent's rice production potential exceeds consumption levels and that local rice can be competitive. (See also Chapter 10). The AfricaRice (2011) study showed that although aggregate rice yields in Africa are lower than in Asia, a more precise analysis suggests that rice yields in Africa, when controlled for by ecological zone and season, are at least as high as those in Asia. That study, which looked at irrigated rice production as well as rainfed systems, assumed that most of the major infrastructure supporting the region's irrigated systems was built right after the countries gained their independence and, thus, could be considered a sunk cost. Consequently, AfricaRice did not take these infrastructure costs into account when carrying out its DRC analysis. This assumption explains why the DRC ratios in that study for irrigated rice are almost all less than 1.0 and why AfricaRice concluded that irrigated rice was competitive in most of the countries of West Africa.[4]

In contrast, a study by Stryker and Coulibaly (2011) estimated that when the cost of infrastructure is taken into account, the DRC ratio of local rice in Mali, in both irrigated and rainfed systems, is always greater than or equal to 1.0. This was true for systems with partial water control, such as in the Office du Riz Segou and the Office du Riz Mopti (DRC = 1.44), the small village irrigation projects (PIVs) in Timbuktu (DRC = 1.07), and the seasonally flooded bottomlands of Sikasso (DRC = 1.0). Thus, the question of whether irrigated rice under full water control is competitive with imports depends on whether one is analyzing its expanded production under existing infrastructure or whether it involves the creation of new irrigation

[3] In the following analysis, the terms *financial* or *private* costs, prices, and returns refer to the costs, prices, and returns that accrue to or are faced by private actors in the economy given the prevailing taxes, subsidies, and pricing structures that exist in the economy. For example, financial prices represent the prices that actors, such as farmers, actually face in the market. *Economic* or *social* costs, prices, and returns refer to those same items once all taxes, subsidies, and monopoly charges have been removed. Economic prices and costs thus represent the opportunity costs to society as a whole of undertaking a given activity.

[4] As explained in Chapter 10, the assumption that irrigation infrastructure costs are sunk costs means that AfricaRice's analysis pertains to expanding rice production on the existing irrigation systems, assuming no further investment or infrastructure rehabilitation costs are needed. In contrast, if one assumes that future expansion of irrigated rice production will require investment in new irrigation systems or rehabilitation of older ones, then those costs need to be taken into account in the analysis.

facilities and/or rehabilitated facilities, requiring additional new investments (see Chapter 10 in this volume). Given these results drawing into the question the economic efficiency of irrigated rice production, it seems prudent to examine the competitiveness of rainfed rice production as at least a complement to expanded irrigated production.

Barbier et al. (2011) attempted to provide an overview of the existing technical options across the range of rice production systems in the Sahel (rainfed, flood recession, improved bottomland, uncontrolled and controlled flooding, full water control, with or without pumping, large and small irrigation perimeters) using a typology developed by experts from five Sahel countries. The results show that the effectiveness of these systems varies widely and is constantly changing: large perimeters are seeing new developments with the rise in agribusiness; small private perimeters are expanding rapidly; partial water control irrigation is stagnating or regressing; and bottomland crops are growing at a quick rate, especially in savanna areas, both in the rainy season for flooded rice farming and in the dry season for market gardening (Barbier et al. 2011).

In contrast to rice systems, little attention has been given in the literature to the competitiveness of local production of rainfed cereals such as millet, sorghum, and maize, even though these crops also compete with food imports such as rice, maize, and wheat. A few authors have addressed this topic recently. Stryker and Coulibaly (2011) estimated the economic and financial profitability of a large range of agricultural value chains in Mali (millet, sorghum, maize, rice, beef, milk, poultry, and fish farming). The results show that investing in the intensification of maize and rice production in the Office du Niger is profitable, whereas the intensification of millet and sorghum production in their current state is premature unless better technologies are found for these crops.

Given the mixed results from previous studies, and the substantial work already done on the profitability of irrigated rice under full water control (see Chapter 10), the major knowledge gap addressed by the present research concerns the profitability of rainfed production of the two crops that appear to have the greatest production potential: rice and maize.

11.3. Methods and Data

This analysis is based on the results of studies conducted by Michigan State University (MSU) through the SRAI project and AfricaRice on the profitability and competitiveness of rice and maize. These were analyzed on the basis of data collected by teams from national agricultural research systems (NARS) in several West African countries in 2011 as part of a joint project conducted by AfricaRice and the NARS entitled the "Project to Reinforce the Availability of and Access to Rice-Growing Statistics in Sub-Saharan Africa".[5] The project identified 22 countries in Africa and collected data on crop budgets for different rice and maize production systems (irrigated, seasonally flooded bottomland, and rainfed). The MSU/SRAI project collaborated with the AfricaRice/NARS project in carrying out analyses on six countries in West Africa (Benin, Burkina Faso, Côte d'Ivoire, Guinea, Mali, and Senegal) to assess the

[5] The rice data system for Sub-Saharan Africa is supported by the Japan-AfricaRice Emergency Rice Initiative, which is funded by the government of Japan. The project was coordinated at the regional level by Africa Rice Center (AfricaRice).

profitability and competitiveness of rice and maize production systems.[6] This chapter focuses on the results concerning the profitability and competitiveness of rainfed rice and maize systems in the upland ecological zone (in Benin, Burkina Faso, and Senegal for rice; and in Benin, Burkina Faso, and Côte d'Ivoire for maize). The chapter also reviews the current production context for these crops, taking into account recent developments in West African and international markets.

The policy analysis matrix (PAM) method employed by the NARS drew on data from the different production systems and developed budgets for rice and maize farmers using both financial (private) prices and at economic (social) prices. The financial prices were the prices prevailing in the markets for the outputs and inputs updated to 2011. The economic prices for outputs (rice and maize) were import parity prices calculated at the farm level, taking into account the costs of transport along the supply chain to the port. The economic prices for tradeable inputs (fertilizer, seed, and pesticides) were the international prices for these inputs minus customs duties and adjusted for the costs of storage and transport to the area of use. To determine the economic prices for domestic inputs (land, labor, and capital), these resources were valued at their opportunity costs. Using the economic prices, DRCs were calculated for the rainfed rice and maize production systems.

Table 11.1 summarizes the main steps of the PAM model. For rainfed rice, the research conducted by the NARS focused on three countries in the region—Benin, Burkina Faso, and Côte d'Ivoire—as shown in Table 11.2. For maize, the research also focused on three countries—Benin, Burkina Faso, and Côte d'Ivoire (Table 11.3).

11.4. Results

Characterization of Rainfed Maize and Rice Production Areas

The 2007-2008 surge in world prices resulted in a renewed emphasis throughout West Africa on food self-sufficiency, and all production systems (irrigated, seasonally flooded bottomland, and rainfed) were seen as important means to boosting agricultural production (Barbier et al. 2011).

Table 11.28. Presentation of the Policy Analysis Matrix

	Revenues	Costs of factors		Profit
		Tradeable goods	Non-tradeable goods	
Private	A	B	C	D
Social	E	F	G	H
Divergences	I	J	K	L

Source: Monke and Pearson (1989).

D = A-B-C = Financial profit
H = E-F-G = Economic profit
I = A-E = Output transfers
J = B-F = Tradeable input transfers
K = C-G = Domestic input ransfers
L = D-H = Net transfers

[6] Data on all the rice and maize production systems by ecological zone were not available for all countries. Therefore, the results presented here cover only four countries (Benin, Burkina Faso, Côte d'Ivoire, and Senegal).

Table 11.29. Data Sources by Ecological Zone for Rainfed Rice Production

	Data source	Sample size	Ecological zone
Benin	• INSAE	1,255 rice farmers in 244 villages	Rainfed system in the North (Atakora, Borgou, Alibori, Donga) and Center (Collines, Zou)
Burkina	• Ongoing surveys (EPA) by the DPSAA	n.a.	Rainfed system in Center-East (Bagré), Hauts Bassins (Bobo) and Boucle du Mouhoun (Degougou and Sourou)
Senegal	• CSA surveys. SAED and AfricaRice databases in St. Louis.	n.a.	Rainfed system in the Middle Valley of the Senegal River

Source: Adegbola and Akoha (2011); Dieng et al. (2011); Ouédraogo, Ouédraogo, and Yelemou (2011b).

INSAE : I*nstitut National de la Statistique et de l'Analyse Economique* (National Institute of Statistics and Economic Analysis).
EPA: *Enquêtes Permanentes Agricoles* (Continuous agricultural surveys).
DPSAA: *Direction de la Prospective et des Statistiques Agricoles et Alimentaires* (Directorate for Agricultural and Food Statistics and Forecasting).
CSA: *Commissariat à la Sécurité Alimentaire* (Food Security Commission).
SAED: *Société Nationale d'Aménagement et d'Exploitation des Terres du Delta du fleuve Sénégal* (National Authority for Land Reclamation & Development in the Senegal River Basin).
n.a. = not available.

Table 11.30. Data Sources by Ecological Zone for Rainfed Maize Production

	Data source	Sample size	Ecological zone
Benin	• Primary data collected as part of the PAPA project in 2011	Random sample of 182 producers	• North (Borgou, Alibora, Atakora, Donga) • Center (Zou and Collines)
Burkina Faso	• Ongoing surveys (EPA) by the DPSAA	n/a	Southwest region, East region, Center-North region, Cascades and Sahel regions
Côte d'Ivoire	• Secondary data from government agencies • Primary data from lead farmers • CNRA and ONDR survey in 2009 • Further investigations in 2011	n/a	Savanna and forested areas

Source: Adegbola and Aloukoutou (2011); Ouédraogo, Ouédraogo, and M. Kabore. (2011a); Yeo (2011).

PAPA: *Programme d´Analyse des Politiques Alimentaires* (Food Policy Analysis Program) of the *Institut National des Recherches Agricoles du Bénin* (INRAB).
EPA: *Enquêtes Permanentes Agricoles* (Continuous agricultural surveys).
DPSAA: *Direction de la Prospective et des Statistiques Agricoles et Alimentaires* (Directorate for Agricultural and Food Statistics and Forecasting).
CNRA: *Centre national de recherche agricole* (National Agricultural Research Center).

In West Africa and in the Sahel in particular, the rainfed system is a significant contributor to rice and maize production. According to AfricaRice (2011), rainfed rice accounts for about 40% of total rice farmland in West Africa, while more than 80% of maize in the region is rainfed.

Characterizing these systems in their various forms (diversity of practices, costs, and performance) is an important step in any profitability analysis. The rainfed rice and maize production systems and areas are characterized in Table 11.4.

Table 11.31. Characterization of Rainfed Rice and Maize Production in Four Countries

Country	Area	System Characteristics
Benin	• North • Center	• Rice: Rainfed system that employs NERICA, little fertilizer, and manual and animal fieldwork. Yield is about 1.5 t/ha without fertilizer, 3.5 t/ha with fertilizer. • Maize: Rainfed system that employs improved seeds and manual fieldwork. Yield is about 1.5 t/ha.
Burkina Faso	• Southwest region • Center-East region • Center-North region • Cascades region • Hauts-Bassins region	• Rice: Rainfed system that employs improved seed (NERICA), little fertilizer, and manual and animal fieldwork. Yield is about 1.3 t/ha without fertilizer, 3 t/ha with fertilizer. • Maize: Rainfed system that employs improved seed and manual fieldwork. Yield is about 1.5 t/ha.
Côte d'Ivoire	• Forested area • Savanna area	• Rice: Rainfed system that employs improved seed (NERICA), little fertilizer, and manual and animal fieldwork. Accounts for approximately 90% of rice farmland and 80% of rice production. Yield (NERICA) is about 2 t/ha without fertilizer and 3 t/ha with fertilizer. • Maize: Rainfed system that employs improved seed, fertilizer and animal or manual fieldwork. Practiced in all regions. Yield is about 2 to 5 t/ha.
Senegal	• Middle Valley of the Senegal River	• Rice: Rainfed system that employs improved seed (NERICA), little fertilizer, and manual and animal fieldwork. Yield is about 1.5 t/ha without fertilizer and 2.5 t/ha with fertilizer.

Source: Adegbola and Akoha (2011); Adegbola and Aloukoutou (2011); Dieng et al. (2011); Ouédraogo, Ouédraogo, and M. Kabore (2011a); Ouédraogo, Ouédraogo, and C.P. Yelemou (2011b); Yeo (2011).

Profitability and Competitiveness of Rainfed Rice (Farm Level)

As shown in Table 11.5, the production of rainfed rice for local consumption in the three countries is financially and economically profitable in these upland ecological zones, as evidenced by the positive profit figures. The DRC ratios, which are all under 1.0, indicate that production systems, aimed at meeting local farm-level consumption needs, are economically profitable and can survive without government subsidies. Mechanized production using tractors in Burkina Faso appears to be more efficient economically (lower DRC ratio) than production based on manual production or use of animal traction.

The value added measured in financial prices in Benin and Senegal is higher than that measured in economic prices, which indicates that rainfed rice producers are supported and protected at the farm level by the input subsidies that were applied to all production systems, as well as by other government policies. In contrast, in Burkina Faso, the economic value added exceeds the financial value added, indicating that farmers in that country are implicitly taxed by a range of government policies.[7] Given the low levels of the DRC ratios, particularly for north and central

[7]One of those policies is monetary policy. The researchers from the Burkina NARS who conducted the DRC analysis estimated that the CFA franc was overvalued by 10% in Burkina Faso, which had the effect of making imports appear artificially cheap in local currency term.

Benin and the Middle Valley of Senegal, such production is likely to be competitive vis à vis imported rice in the rural markets surrounding the production zones.

Table 11.32. Results of the PAM Analysis, at the Farm Level, for Rainfed Rice in Three Countries (CFAF/kg)

Country	Systems	Value Added per kg in Financial Prices	Value Added per kg in Economic Prices	Net Transfers	DRC
Benin	N7	235	120	115	0.47
	N10	245	132	113	0.41
Burkina Faso	PT	88	104	-16	0.79
	PA	82	101	-19	0.84
	PM	105	125	-20	0.61
Senegal	SMV	106	95	11	0.50

Source: Calculated from data in Adegbola and Akoha (2011); Ouedraogo, Ouédraogo, and C.P. Yelemou (2011b); Dieng et al. (2011).

N7: Improved rainfed system in the North with use of fertilizer–Benin
N10: Improved rainfed system in the North without use of fertilizer–Benin
PT: Rainfed system with manual cultivation
PA: Rainfed system with animal traction
PM: Rainfed system using tractors
SMV: Rainfed system in the Senegal River Middle Valley

In contrast to the figures shown in Table 11.5, Easypol (2009), a project supported by the FAO, estimated that in 2005 the DRC ratio for rainfed rice production in Burkina Faso using animal traction equipment was 1.0, indicating that such production was only borderline efficient. The figures in Table 11.5 showing that the DRC ratio for this system had fallen to 0.84 by 2011 suggest that the higher prices that have occurred both globally and in West Africa since 2007-2008 have made rainfed rice production more economically competitive, at least in Burkina Faso.

Profitability and Competitiveness of Rainfed Maize (Farm Level)

In Benin, the maize production systems are classified into areas (North, Central, and South) located in Ouémé/Plateau, Borgou, Atlantique, Couffo, Zou, and Donga Departments, which together make up over 85% of national production. Depending on the system, farmers may use improved maize varieties, local yellow or local white cultivars; work the soil with tractors, animal traction equipment or hand hoes; and may or may not use fertilizer and pesticides. The specific systems for which our analysis applies are described in Table 11.6. Yields have improved markedly, from 600 kg/ha on average in 1970 to 1.4 t/ha in 2009. The national production volume reached 1,346,000 tons in 2013 (FAOSTAT 2017).

In Côte d'Ivoire, maize is cultivated in three main regions that combine to yield 68% of the country's total maize production: Savanes (50% of output), Haut Sassandra (9%), and Denguélé (9%). From 2000 to 2009, the average volume produced was 604,031 tons from an average land area of 291,852 ha, for a yield of about 2.3 t/ha (Yeo 2011). In these areas, manual maize farming is still far more widespread than use of animal traction. The latter, however, has been a marked success in northern Côte d'Ivoire, especially in the large cotton-growing basins. There are also two versions of motorized farming. The first form is intermediate motorization, which includes rotary tillers and small, low-power tractors (Yeo 2011). The other version is considered conventional and involves medium- to high-power tractors.

Table 11.33. Results of the PAM Analysis, at the Farm Level, for Rainfed Maize in Three Countries (CFAF/kg)

Country	Systems	Value Added per kg in Financial Prices	Value Added per kg in Economic Prices	Net transfers	DRC
Benin	N1	153	-229	382	3.00
	N2	130	-153	283	2.27
	C1	162	101	61	0.44
Burkina Faso	PT	93	105	-12	0.50
	PA	89	100	-11	0.50
	PM	81	92	-11	0.67
Côte d'Ivoire	ZF	56.6	67.9	-11.3	0.65
	ZS	50.6	62.6	-11.9	0.59

Source: Adegbola and Aloukoutou (2011); Ouédraogo, Ouédraogo, and M. Kabore (2011a); Yeo (2011).

N1: System used in North with improved varieties, fertilizer and animal traction tilling–Benin
N2: System used in North with local varieties, fertilizer and tractor tilling–Benin
C1: System used in Center with local varieties, no fertilizer and animal traction tilling–Benin
PT: Rainfed system with manual cultivation
PA: Rainfed system with animal traction
PM: Rainfed system using tractors
ZF: Forested area system with improved varieties and animal traction tilling in Côte d'Ivoire
ZS: Savanna system in Côte d'Ivoire with local varieties and animal traction tilling in Côte d'Ivoire

* In Burkina Faso, financial and economic profits are expressed in million CFAF per year for the entire rainfed maize sector.

In Burkina Faso, most maize is grown under rainfed systems, but irrigated maize production has recently emerged. Its share of total production, however, remains very small, and hence the profitability of the irrigated system is not analyzed here. The primary areas with high production in the rainy season are: (i) the Southwest, where the share of rainfed maize production in regional production is 93.3%; (ii) East (91.7%); Center-North (89.2%); and Cascades (89.2%) (Ouédraogo, Ouédraogo, and M. Kabore 2011a). There are three subsystems within the rainfed production systems: traditional rainfed, rainfed with animal traction, and motorized rainfed.

Maize yields from rainfed systems are fairly uniform in Burkina Faso, ranging from 1.1 t/ha to 1.5 t/ha. The yields are tripled in the irrigated system (Kaminski, Elbehri, and Zoma 2013).

Table 11.6 indicates that in Côte d'Ivoire rainfed maize production at the farm level is financially and economically profitable and competitive for local demand compared to imported maize, which comes mainly from Argentina. Financial value added is less than economic value added for farmers in the savanna and forested areas, indicating that these farmers are implicitly taxed by a combination of government policies.

In Burkina Faso, Table 11.6 indicates that rainfed maize is financially and economically profitable and competitive for domestic demand compared to imported maize for all three systems analyzed. In contrast to rainfed rice production, mechanized production of maize using tractors appears to be less economically efficient (higher DRC ratio) than production using animal traction and manual cultivation. In all three systems analyzed, however, value added measured in economic prices exceeds that measured in financial prices, indicating (as was the case for rainfed rice in the country) that farmers are implicitly taxed by a combination of government policies.

In Benin, the results of the analysis are more mixed. They show that the financial value added in maize growing at the farm level is positive in all three systems analyzed, but that production is not economically profitable in the two systems analyzed from the northern part of the country. The positive net transfers in both the north and the center of the country show that the government's policy measures (input subsidies) have benefited maize farmers and the magnitude of the figures suggest that these transfers are the main reason that maize production persists in the north. The DRC ratios (less than 1 in the Center but greater than 1 in the North) convey the same story: rainfed maize farming is competitive with imports for local consumption in the Center of the country, but not the North.

In summary, the figures in Table 11.6 show that with the relatively high maize prices that prevailed in 2011, rainfed maize farming was financially profitable in all the systems analyzed in the three countries. However, it was not economically profitable in the two systems analyzed for northern Benin. The competitiveness of maize in these northern Benin systems could be compromised by factors relating to agro-ecology and the adoption and use of inputs. The very low level of intensification in these systems affects productivity, as does the inefficient use of tradeable inputs, whose prices also soared in the period following 2007.

11.5. Conclusions and Policy Implications

While the rise in cereals prices that began in 2007-2008 has had a negative impact on consumers by lowering their purchasing power, it has provided positive incentives for rainfed rice and maize producers in the region. When measured at the farm level, the DRC ratios show that in 2011 the production of rainfed rice and maize was economically competitive for local consumption in the four countries studied with the exception of the ecological zones in northern Benin. Thanks to government subsidies, production was financially profitable in the systems analyzed, even though it was not economically profitable in northern Benin. Overall, a combination of government policies increased the profits of rainfed rice and maize farmers in all these systems except in Côte d'Ivoire for maize and in Burkina Faso for both rice and maize, where policies resulted in implicit net taxation of farmers.

It thus appears, at least for the systems analyzed here, that under the higher prices prevailing in the region in 2011, rainfed production of rice and maize holds promise of being an important component of West African countries' food strategies. The net government support provided to farmers, as documented by the MAP analysis, may have been important in inducing adoption of new technologies, particularly the NERICA rice varieties. These varieties for the upland ecological zone have made it possible to boost the production of rainfed rice significantly and improve food consumption for rural populations. They are currently being disseminated on a large scale and should be given special consideration because of the opportunities they afford to increase production and decrease the region's rice dependency. More research is also needed on seed varieties suited to seasonally flooded bottomlands, considering the potential of bottomland ecological zones in the region. In addition, demand for maize in West Africa, for both human consumption and use in animal feed, is growing sharply. This burgeoning demand, combined with the strong economic and financial profitability of production in the rainfed systems analyzed here, suggests that continued promotion of this crop in areas that are ecologically suited to its production is strongly warranted.

References

Adegbola, Patrice Y. and S. Akoha. 2011. *Etude de la compétitivité de la riziculture béninoise.* MSU/PRESAO/SRAI Project Rapport Final No. 2- 2011-11 – Riz. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/Benin-_Rapport_final_competitivite_riz_Benin.pdf

Adegbola, Patrice Y. and A. Aloukoutou. *2011. Compétitivité du maïs au Bénin*. MSU/PRESAO/SRAI Project Rapport Final No.1- 2011-11- Maïs. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/Benin_Rapport_final_competitivite_mais_Benin.pdf

AFD, CIRAD, and FIDA. 2011. *Les cultures vivrières pluviales en Afrique de l'Ouest et du Centre: Eléments d'analyse et propositions pour l'action.* A Savoir No. 6. Paris: Agence Français de Développement. http://www.afd.fr/webdav/site/afd/shared/PUBLICATIONS/RECHERCHE/Scientifiques/A-savoir/06-A-Savoir.pdf.

AfricaRice. 2011. Acquis de la crise rizicole: Politiques pour la Sécurité Alimentaire en Afrique. Cotonou : AfricaRice. http://www.africarice.org/publications/Lessons%20from%20the%20rice%20crisis-fr.pdf.

African Development Bank. 2016. Conférence Régionale sur la Compétitivité en Afrique de l'Ouest Francophone, 23 Mars, 2016. Abidjan, Côte d'Ivoire. http://www3.weforum.org/docs/WEF_2016_ACR_Abidjan_Workshop_Report_FR.pdf

Barbier, B., H. Ouédraogo, Y. Dembele, H. Yacouba, B. Barry, and J.Y. Jamin. 2011. L'agriculture irriguée dans le Sahel ouest-africain: diversité des pratiques et des performances. *Cahiers Agriculture* 20.1-2 (janvier-avril): 24-33. http://revues.cirad.fr/index.php/cahiers-agricultures/article/view/30897/30657

Boutsen, S. and J. Aertsen. 2013. *Peut-on Nourrir l'Afrique de l'Ouest avec du Riz?* Mo Paper No. 74. Brussels: Wereldmediahuis vzw. http://www.alimenterre.org/sites/www.cfsi.asso.fr/files/575_mo-paper74_riz_fr.pdf.

Diagne, A. 2011. Quelles perspectives pour le marché régional du riz ? Vers une politique commerciale régionale conforme aux objectifs de développement et de sécurité alimentaire. Presentation made at the Conference Quels impacts pour l'agriculture malienne ? 30 ans de partenariat Mali-Fondation Syngenta, 5-7 October, 2011. Bamako. https://www.syngentafoundation.org/file/2656/download?token=WjBLnAQI

Diagne, A., S-K.G. Midingoyi, M. Wopereis, and I. Akintayo. 2010. The NERICA Success Story: Development, Achievements and Lessons Learned. Draft Paper. Cotonou: The Africa Rice Center (AfricaRice). http://siteresources.worldbank.org/AFRICAEXT/Resources/258643-1271798012256/NERICA-Success-Story-11-2010.pdf

Dieng A., M. Sagna, M. Babou; and F. Dioné; 2011. *Analyse de la compétitivité de la filière rizicole dans la Vallée du Fleuve et dans le Bassin de l'Anambé au Sénégal.* MSU/PRESAO/SRAI Project. Rapport Final No. 1- 2011-11- Riz. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/Senegal_Rapport_final_competitivite_riz_Senegal.pdf.

Easypol. 2009. Analyse de la compétitivité de la filière riz local au Burkina Faso. Easypol Module 131. Rome: FAO. http://www.fao.org/docs/up/easypol/938/analyse-filiere-riz-local-burkina-faso_131fr.pdf.

FAOSTAT. 2017. http://www.fao.org/faostat/en/#home. Accessed 15 Februray, 2017.

Grain. 2009. "Le riz Nerica – un autre piège pour les petits producteurs Africains." Grain.org. On line report. Accessed on 9 February, 2009 at https://www.grain.org/article/entries/112-le-riz-nerica-un-autre-piege-pour-les-petits-producteurs-africains.

Hollinger, F. and J.M. Staatz, eds. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers*. Rome: African Development Bank and FAO. http://www.fao.org/3/a-i4337e.pdf.

Kaminski. J., A. Elbehri, and J.B. Zoma. 2013. Analyse de la filière du maïs et compétitivité d'intégration des petits producteurs au marché au Burkina Faso. In *Reconstruire le potentiel alimentaire de l'Afrique de l'Ouest*, ed. A. Elbehri. Rome: FAO and FIDA. http://www.fao.org/3/a-i3222f/i3222f14.pdf.

Monke, E.A. and S.R. Pearson. 1989. *The Policy Analysis Matrix for Agricultural Development*. Ithaca, NY: Cornell University Press.

Ouédraogo, M., S. Ouédraogo, and M. Kabore. 2011a. *Analyse de la compétitivité de la filière maïs au Burkina Faso.* MSU/PRESAO/SRAI Project. Rapport Final No. 3- 2011-12- Maïs. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/Burkina_Rapport_final_Maïs.pdf.

Ouédraogo, M., S. Ouédraogo, and C.P. Yelemou. 2011b. *Analyse de la compétitivité de la filière riz au Burkina Faso.* MSU/PRESAO/SRAI Project. Rapport Final No. 5- 2011-12- Riz. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/Burkina_Rapport_final_Riz.pdf.

Stryker, J.D. and M. Coulibaly. 2011. Domestic Resource Cost Analysis and CAADP Country Strategy Plan Costing Services for the Accelerated Economic Growth Strategic Objective Program (Final Report). Bamako: USAID/Mali, AIRD, GREAT.

Yeo, Y.A. 2011. *Analyse de la compétitivité de la filière maïs en Côte d'Ivoire.* MSU/PRESAO/SRAI Project. Rapport Final No. 2- 2011-11- Maïs. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/Benin-_Rapport_final_competitivite_riz_Benin.pdf.

Part IV: Policies to Promote Inclusive Agrifood System Growth

For growth to be inclusive, carefully designed group action, more effective private-public partnerships and increased policy coordination among countries and stakeholders are crucial.

CHAPTER 12

Linking Smallholders to Profitable Markets in West Africa: Case Study Synthesis

Relier les petits exploitants aux marchés rentables en Afrique de l'Ouest : Synthèse des études de cas

John M. Staatz, Ryan Vroegindewey, Boubacar Diallo, and Nathalie M. Me-Nsope[1]

Abstract

This chapter synthesizes results from seven sets of case studies that examined differing arrangements for linking West African small farmers to growing markets for valued-added agricultural products. The studies focused on farmers in eight countries producing cereals, cassava, and mangoes for agro-processing and high-value exports. The arrangements, termed *partnership models*, involved various forms of contracting with farmers, either through farmer organizations or directly with individuals. Using concepts from transaction-cost economics, the analysis identifies factors that contribute to the inclusion of smallholders and economic sustainability of the approaches used. The partnership models studied fell into five broad categories, varying with respect to which group (farmers, large-scale buyers, or service providers) initiated the agreements and the complexity of the contractual arrangements. The attractiveness of the models to farmers depended on the degree to which they helped to fill missing markets for key inputs, such as improved technology (as embodied in modern inputs), credit, and advisory services, and the degree to which they provided price premiums and assured markets (the latter particularly important for more perishable products). The value to buyers lay in the partnership models' potential for ensuring adequate volumes and qualities of raw product to operate their facilities near capacity, driving down per-unit costs. Government policies, such as tax laws, also affect the value of the partnership models to buyers, as illustrated in case studies from Ghana and Senegal. The models varied widely in their ability to provide value to the different parties, thus affecting their success. Key design lessons that emerge include the need to: (a) identify carefully sources of value for the different parties from any proposed partnership model; (b) pay careful attention to factors that can undermine contract success, such as side-selling, and the costs needed to limit them; (c) take advantage of the role that intermediaries, including private individuals, can play as aggregators of raw product from farmers; and (d) avoid designing overly complex partnership models for storable commodities, such as cereals, destined for the mass market. In situations where no single firm dominates an entire value chain, there is also need to go beyond such partnership models to develop value-

[1] The authors gratefully acknowledge the very helpful comments received from Steven Haggblade, Yuan Zhou, and Veronique Theriault on an earlier version of this chapter.

chain-wide organizations that address system-wide constraints limiting the expansion of contracting with smallholders.

Résumé

Ce chapitre fait la synthèse des résultats de sept séries d'études de cas de divers dispositifs reliant les petits exploitants d'Afrique de l'Ouest à des marchés en expansion pour certains produits agricoles à valeur ajoutée. Ces études portent sur des agriculteurs de huit pays producteurs de céréales, de manioc et de mangues pour le secteur agroalimentaire et les exportations à forte valeur ajoutée. Ces dispositifs, désignés sous le terme de *modèles de partenariat*, comprennent divers types de contractualisation avec les agriculteurs, soit via des organisations d'agriculteurs, soit directement avec des particuliers. À partir des concepts de l'économie des coûts de transactions, l'analyse dégage les facteurs qui contribuent à l'inclusion des petits agriculteurs et à la pérennité économique des approches utilisées. Les modèles de partenariat tombent dans cinq grandes catégories, qui varient en fonction du groupe (agriculteurs, acheteurs à grande échelle ou prestataires de service) qui a initié l'accord et de la complexité de l'accord contractuel. L'attractivité des modèles pour les agriculteurs varie selon qu'ils contribuent à combler des marchés manquants pour les intrants-clés, par exemple des technologies améliorées (pour les intrants modernes), des crédits et des services de vulgarisation/conseils ou selon qu'ils offrent des primes sur les prix et des marchés garantis (particulièrement important pour des produits périssables). Pour les acheteurs, l'attractivité réside dans le fait que le modèle de partenariat a le potentiel d'assurer des volumes et des qualités de matières premières suffisantes pour exploiter leurs installations d'usinage à leur quasi pleine capacité, ce qui baissera les coûts à l'unité. Les politiques gouvernementales telles que les taxes fiscales affectent aussi la valeur des modèles de partenariats pour les acheteurs, comme on l'a constaté dans les études de cas du Ghana et du Sénégal. Les modèles varient beaucoup quant à leur aptitude à offrir de la valeur aux différentes parties, ce qui assure donc leur réussite. Les principales leçons qui découlent de la conception des modèles, comprennent le besoin de: (a) repérer avec soin les sources de valeur pour les différentes parties dans le modèle de partenariat proposé; (b) faire très attention aux facteurs qui sont susceptibles d'entacher la réussite du contrat, par exemple les ventes parallèles, et les coûts requis pour les limiter; (c) prendre en compte le rôle que jouent les intermédiaires, y compris les personnes privées, dans l'agrégation et le regroupement des matières premières collectées auprès des agriculteurs; et (d) éviter de concevoir des modèles de partenariat trop complexes pour les produits alimentaires stockables (comme les céréales) destinées aux marchés de masse. Dans les situations où aucune entreprise ne domine une chaine de valeur entière, il est aussi nécessaire de dépasser ces modèles de partenariat et mettre sur pied des organisations de toute la chaine de valeur afin de remédier aux contraintes de l'ensemble du système qui limitent l'expansion de la contractualisation avec les petits agriculteurs.

12.1. Introduction

This chapter synthesizes results from seven sets of case studies carried out in 2014-16 under the SRAI program that examined differing models of linking West African small farmers (hereafter termed *smallholders*) to growing markets for valued-added agricultural products. The studies focused on farmers producing crops for agro-processing and high-value exports.

The models, termed *partnership models* here, involved various forms of contracting arrangements with farmers, either through farmer organizations or directly with private firms. The studies aimed at identifying factors that contribute to the inclusion of smallholders and the economic sustainability of the approaches used.

Contract farming with smallholders has a long history in West Africa. It was a central element of colonial and post-colonial strategies to promote export-crop production, typically through state-run single-channel marketing systems for crops like cotton, groundnuts, cocoa, and palm oil. These systems provided farmers with technical support and inputs on credit, which was recovered through monopsonistic output marketing arrangements. The systems succeeded in providing West African smallholders access to remunerative new markets, most spectacularly for cocoa and cotton. Yet in the post-colonial period, the marketing boards and parastatals that operated these schemes frequently accumulated large financial deficits due to a combination of poor management, expansion beyond the initial low-cost areas of production, sagging world prices, and insufficient incentives for farmers to improve quality (Hollinger and Staatz 2015). Governments sometimes attempted similar approaches for staple food crops. However, the greater complexity of the food system, involving millions of farmers and thousands of markets, compared with export crops, which are channeled through a few export points, resulted in these marketing organizations never succeeding in handling more than a small share of total production (Berg 1975).

The growing deficits of the government-backed marketing organizations and the resulting pressure on government budgets were among the forces that led to structural adjustment programs in the 1980s and 1990s. The initial phases of these programs often revealed that the private sector did not automatically rush in to fill the void left by retreating state enterprises. The structural problems that gave rise to these organizations in the first place, such as weak or missing markets for key inputs and information, often persisted, leaving smallholders to face high marketing costs and weak incentives to expand production. Therefore, since the 1990s farmers and their organizations, West African governments, and development partners have all shown growing interest in developing new arrangements to link smallholders to markets. Rather than purely state-run efforts, these arrangements are often conceptualized as public-private partnerships (PPPs) involving farmer organizations, domestic and international private-sector firms, development partners such as non-governmental organizations (NGOs), and government. The focus has been on both export crops and on food crops for the growing domestic and regional markets.

Since the mid-2000s, two factors have accelerated experimentation with models for linking smallholders to profitable agro-processing and export markets. First, the spike in world food prices (particularly for rice) in 2007-2008 exposed the vulnerability of West African countries—which are major importers of rice and wheat—to disruptions in import markets for basic staples. This, in turn, led governments and the private sector to expand investment in local production, often in various forms of PPPs (see Chapters 2 and 13 in this volume). These partnerships aimed at overcoming weaknesses in infrastructure and in markets for inputs, credit, and information that typically constrain smallholder production.

Second, demand for agricultural products throughout the world has been evolving rapidly from undifferentiated bulk products towards specific attributes sought by consumers, such as ease of preparation, healthfulness, and environmental sustainability. In West Africa, this evolution

has led to the rapid growth in demand for processed food products, cleaner and more healthful foods (particularly by the growing middle class), and traceable, high-quality agricultural exports. Technological change is further boosting demand for large volumes of consistent-quality agricultural products as industrialists develop innovative uses for traditional staples, such as the manufacture of polymers and high-quality starches from cassava (Hollinger and Staatz 2015).

In order to respond to these growing demands, processors and exporters require a reliable, timely supply of agricultural products of consistent quality and quantity. Such supplies are critical for large-scale processors and exporters to operate their facilities near capacity, holding down unit costs of production. Yet the supply of raw materials from smallholders is often dispersed and irregular. The high transaction costs of dealing with numerous scattered smallholders, many of whom lack appropriate technology and management skills to serve the new markets, may create incentives for downstream actors to source their raw material from large farmers, or import markets. If they follow this path, the result is the exclusion of smallholders from lucrative new markets.[2]

12.2. Literature Review, Conceptual Framework, and Knowledge Gap

Effectively linking smallholders to profitable markets is a question of vertical coordination, defined as the process of harmonizing activities across the vertical stages in a value chain, such as farm-level production, assembly, processing, and marketing (Mighell and Jones 1963). Vertical coordination involves creating incentives for actors throughout the value chain to produce the quantities and qualities of products demanded by final consumers at the time they need them. This coordination can take place through an array of exchange arrangements, from spot markets to vertical integration.

Transaction-cost economics (TCE) views all exchange arrangements as involving some type of explicit or implicit contract. Indeed Williamson (1989, p. 136) defines TCE as "a contractual approach to the study of economic organization." This approach posits that different exchange arrangements (dubbed "governance structures" by Williamson), each incorporating different contractual terms, arise and tend to dominate in different types of transactions, depending on the underlying characteristics of the transaction (see below). This study adopts TCE's broad view of contracting, while recognizing that much of the literature on contract farming defines contracting more narrowly. For example, Minot (2011) defines contract farming "as agricultural production carried out according to a prior agreement in which the farmer commits to producing a given product in a given manner and the buyer commits to purchasing it."

The TCE literature (e.g., Williamson 1981, 1985; Joskow 2005; Kirsten et al. 2009), pays particular attention to the influence of four factors in influencing the partnership models that evolve between buyers and sellers. The more these four factors are present in a transaction, the

[2] Economic theory is ambiguous as to whether the higher transaction costs of dealing with small farmers leads inexorably to their exclusion from these new markets. The higher transaction costs may be offset by lower labor costs for small farmers and a lower tendency of small farmers to default on contractual agreements if they have fewer market options than larger farmers. Empirical results also show mixed results (e.g., Reardon et al. 2009; Barrett et al. 2011; DaSilva and Rankin 2013).

more likely the exchange is likely to move away from the spot market towards tighter forms of contractual control. The four factors include:

- The degree to which each party has invested in assets that are specific to the transaction, locking the participant into a trading relationship with a specific supplier or buyer. This asset specificity criterion includes a number of factors highlighted in some of the contract-farming literature (e.g., Tschirley, Minde, and Boughton 2009; Minten, Randrianarison, and Swinnen 2009):
    - The degree of competition among potential buyers of the output. In the TCE literature, asset specificity refers to investments in assets that are specific to a particular *transaction*, not to the production of the good. Thus, the more potential buyers there are for the product, the less the asset is specific to a transaction with a particular buyer.
    - Investment in human capital by the farmer to meet product standards that are specific to the buyer.
    - The perishability of the product, which the TCE literature (e.g., Masten 2000) refers to as *temporal specificity* and which can subject the farmer to hold-up by the buyer (Klein, Crawford, and Alchian 1978).
- The frequency of transaction due, for example, to the perishability of the product and asymmetry between the scale of operations of the farmer and the buyer. Frequency influences whether it is worthwhile to develop more complex, non-spot-market trading arrangements.
- The degree of uncertainty surrounding the transaction (for example, due to unpredictable weather or changes in government policies), which influences the scope for opportunistic behavior by the trading partners.
- The degree to which one trading partner can impose positive or negative externalities on the other (for example, through debasing product quality by careless handling), thereby creating incentives for vertical integration.

The literature on various models of linking smallholders to markets falls into three broad streams: (a) one on collective action by farmers (covering, for example, various models of farmer cooperatives); (b) one on trader networks; and (c) one on contract farming, along the lines defined by Minot (2011). In a TCE sense, all three streams deal with various forms of contracting and the evolution of market structures. For example, farmers' motivations to undertake various forms of collective action can be seen as attempts to contract with each other and others in the agrifood system to mitigate the effects of transaction costs. These costs emerge from imperfect or missing markets for key inputs, outputs, and information; large differences in scale between farm-level production and processing and marketing; and imbalances in market power (Staatz 1987; Sexton 1989; Grosh 1994; Sindi 2013). The TCE approach has been widely adopted and extended by many other authors analyzing contract farming and trader networks, with a particular emphasis on how it attempts to deal with incomplete or missing markets for critical inputs (e.g., fertilizer, technical information, and credit) and with problems of asymmetric information and power (e.g., Grosh 1994; Jaffee and Morton 1995; Reardon et al. 2009; Tschirley, Minde, and Boughton 2009; Minton, Randrianarison, and Swinnen 2009; Minot 2011; Barrett et al. 2011; Bellemare 2012; Prowse 2012; DaSilva and Rankin 2013; Otsuka, Nakano, and Takahashi 2016).

In this literature, analyses of various partnership models have largely focused on four issues. First, they have investigated which farmers are most likely to participate in contract farming (as defined by Minot) and why. Second, they have examined the impact of such participation on farm household welfare, particularly participants' incomes, but also more recently household food security (Bellemare and Novak 2016). Third, they have tried to explain the presence of different partnership models in particular settings, based on factors such as farmers' and processors' ownership of specific assets and the degree of information asymmetry among market participants. Fourth, they have sought to identify organizational characteristics and management practices that contribute to the economic sustainability of farmer organizations involved in such partnership models.

A large body of research has provided important insights on the first and second issues. With respect to inclusivity, the key conclusion seems to be that it depends on the product involved (e.g., its degree of labor intensity), geographic setting (which conditions farmers' alternatives to contracting), access of smallholders to non-land assets (e.g., irrigation, human capital), and the social and political setting. Particularly important in the latter is the degree to which land distribution in the country is unimodal, in which case smallholders are predominant and, thus, tend to be included in partnerships with agro-processors, versus bimodal distribution, in which case they must compete with many large farms (Hazell et al. 2010). With respect to welfare impacts, older sociological literature emphasized the possible exploitative nature of contract farming, particularly when the buyer had monopsonistic powers, as in many of the state-run cash-crop schemes.[3] While concerns about the possible harmful impacts on smallholders of poorly designed contracting systems persist (see United Nations General Assembly 2011), recent literature indicates positive economic impacts on farmers' incomes from participating in such schemes (Barrett et al. 2011; DaSilva and Rankin 2013; Bellemare 2015).

With respect to third and fourth issues, there is a growing consensus in the literature that future research should identify key design features that contribute to positive impacts, both in terms of income and on a broader set of welfare measures, such as inclusiveness and model durability. Consistent with a TCE approach, this includes analysis of factors affecting transaction characteristics, such as product characteristics (e.g., perishability and input requirements), market structure (e.g., the existence of alternative markets), and the broader economic environment (e.g., road conditions, credit systems, and contract enforcement mechanisms). There is also a need for broadening the analysis of contributing factors to take into account aspects such as social networks and the links between contracting and other elements of the local economy (see, for example, Jia and Bijman 2013; and Bellemare 2015).

This chapter addresses these gaps in the literature. It makes three contributions. First, while having its roots in the transaction-cost approach, it broadens the analysis, as suggested by Jia and Bijman (2013), to consider the effects of a broader array of geographic, institutional, and sociological factors (referred to hereafter as *environmental factors*) that affect the degree to which smallholders participate in and benefit from different partnership models. Second, it goes beyond the question of whether various models of linking smallholders to high-value markets have an impact on the farmers' welfare, to ask how and why the models do so, and how the models could be modified to have stronger and sustained positive effects. Third, in contrast to the bulk of the literature, which has focused on Asia, Latin America, and East and

[3]See Grosh 1994, for a summary of this literature.

Southern Africa, the focus of these studies is on West Africa and is carried out across a range of institutional, commodity, and geographical settings to seek cross-cutting lessons.

12.3. Methods and Data

The case studies summarized in this paper took place in eight countries: Benin, Burkina Faso, Côte d'Ivoire, Ghana, Mali, Nigeria, Senegal, and Togo. The focus and unit of analysis was the partnership models that linked smallholders to higher-value product markets rather than local spot markets. Most of the studies examined cereal crops (particularly rice), as developing new marketing and contracting arrangements for these crops in West Africa has been a major policy focus and challenge since the 2007-2008 food price crisis (ECOWAS 2015). The studies also covered semi-perishable and perishable crops (cassava and mangoes) destined for domestic and international markets.[4] In some cases, an agro-processing or exporting firm combined production from its own nucleus estate with that obtained under contract from smallholders.[5]

A criterion sampling approach was used to investigate partnership models that involved smallholders and that covered a range of product types, destination markets, and environmental factors. This purposive sampling procedure allowed us, in the context of multiple-observation case studies, to generate a wide enough set of observations to begin to disentangle the effects of the various factors affecting the structure of partnership models (Teddlie and Yu 2007; Yin 2014). The cases included models that appeared to be succeeding well (e.g., contracting between smallholders and a mango exporter in Mali, described by Coulibaly and Diarisso 2015) and a few that were foundering or had failed after having initially received acclaim in the popular press as innovative and promising (e.g., contracting between Ghanaian cassava smallholders and a Dutch firm that processed high-quality cassava cake for a major brewery in Accra, described by Asuming-Brempong et al. 2016a).

The studies followed a multiple-case design, in which a common theoretical framework (based on the transaction-cost approach) generated similar theoretical propositions and interview protocols, thereby contributing to broader generalizability of results (Yin 2014; Sterns, Schweikhardt, and Peterson 1998). Researchers interviewed actors on both sides of the major transactions and gathered copies of written contracts and other documents, where available, in order to triangulate findings. Case studies are particularly appropriate when the focus of inquiry is not *whether* a particular partnership model has an effect but rather *how and why* it does (Yin 2014). Such an approach also helps to refine and extend theory, particularly where, as in these studies, a broader range of variables is considered than in typical transaction-cost analyses (Sterns, Schweikhardt, and Peterson 1998; Yin 2014). Case studies delve into the details of institutional arrangements in order to understand how they shape the incentives for individuals' and organizations' actions. They are particularly appropriate when the context for the

[4] Key characteristics of the studies are summarized in Table 12.1 in section 12.4 below. Staatz et al. (2016) and the individual study reports themselves (see the citations listed in Table 12.1) provide detailed descriptions of the studies and their samples.

[5] A nucleus estate is a farm operated by an agro-processor or exporter to produce raw product to complement that purchased under contract from surrounding local farmers (*outgrowers*). The nucleus estate's output helps to ensure an adequate volume to operate the processing plant near capacity. Typically nucleus estates are many times larger than the farms of outgrowers, who produce crops under contract on their own land for sale to the agro-processor or exporter.

phenomenon under study is difficult to disentangle from the phenomenon under study (Yin 2014). In the case studies summarized here, the environmental factors and market opportunities (the context) are deeply interwoven with partnership models under study. A case-study approach is also well suited to agribusiness research because stringent case selection criteria or information inaccessibility often limits sample size (Sterns, Schweikhardt, and Peterson 1998).

Because the case studies covered a range of products and environmental conditions, comparing across studies allows identification of the impacts of a broader range of factors influencing the design of partnership models with farmers, as suggested by Jia and Bijman (2013). In addition to the TCE factors described above, these other factors include the institutional environment (including policy and sociological factors), the state of market infrastructure, and issues of territorial development, which take into account the structure of the local economy and agro-climatic factors.

12.4. Results

Categories of Partnerships

Table 12.1 summarizes key characteristics and findings of the case studies. The partnership models examined in the case studies fall into five broad categories, with substantial variation within each category.[6]

1. Farmer-driven partnerships with structured market linkages. In this model, farmer organizations aggregate output produced by their members and sell it to specific buyers through contracts signed in advance of production or in response to opportunities to make bulk sales to major buyers, such as a grain board. Often the buyer requires that the product meet standards that are higher than those prevailing in the spot market, so these partnerships help farmer organizations learn how to serve more demanding markets that offer premiums for quality, as well as for volume sales. Several of the case studies of cereals partnerships in Mali described by Vroegindewey (2014, 2015) as well as the *voluntary sales* model of rice contracting described by Soulé (2016) for Burkina Faso and Mali fit this model. The farmer organization may also arrange bulk purchases of inputs for its members. The main sources of value to farmers of this partnership are the scale economies in input and output marketing, possible quality premiums earned on the outputs, and the gaining of access to improved inputs through the farmer organization. Buyers gain value through the scale economies of purchase and role of the farmer organization in ensuring that quality standards are met.

*2. Service-provider driven partnerships***.** This model involves a provider of services to farmers such as inputs, credit, or training helping to aggregate and sell their products to buyers. Examples of this model occurred in the Malian cereals marketing case studies. The service provider's motivation is to provide farmers with a remunerative income stream so that they can afford to pay the service provider for its services. The sales can either be to the spot market or,

[6] The following classification draws heavily upon and modifies models of *product aggregation* described by Berlin et al. (2016). In this classification system, *structured market linkages* refers to exchange arrangements other than sales in the spot market. In the discussion that follows, the term *buyer* refers to the agro-processor, exporter, large-scale wholesaler or other large entity (such as a national grain board or the World Food Programme) that seeks to purchase large quantities of the output from farmers or their organizations. It does not refer to small-scale intermediaries who may purchase from the farmers to resell to these larger buyers.

more typically, to a specific buyer, as described in model 1 above. The sources of value from this partnership to farmers include the services provided, scale economies in output marketing and possible quality premiums, while buyers benefit from the aggregation of product (typically through a farmers' organization) and some degree of quality control.

3. Buyer-driven partnerships with loosely structured market linkages. In this model, a buyer acquires product at the time he/she needs it from individual farmers. This is typically done through purchases from preferred suppliers who can usually be relied upon to produce the quantities and qualities of product the buyer needs. The buyer often sources additional supplies from the spot market. Typically, in this model, the exchange is limited to the output market, with the buyer not providing the farmer with inputs. This is the least complex of the partnerships, with the main source of value to the farmers being the assurance of a market for their output (possibly with a quality premium paid) and to the buyer being a more dependable source of supply than relying entirely on the spot market. This was the most prevalent model used in the case study of maize supply to the Nigerian poultry-feed industry (Elegbede 2016).

4. Buyer-driven partnerships with tightly structured market linkages. This is the model most typically described in the contract-farming literature, in which a buyer contracts for future delivery of products with either individual farmers or, more typically, farmer organizations. This model was used in all the cases of perishable (mangoes) and semi-perishable (cassava) products studied (Coulibaly and Diarisso 2015; Asuming-Brempong et al. 2016b). Several of the partnerships studied in the rice value chains in Ghana (Asuming-Brempong, et al. 2016a), Nigeria (Onyekwena 2016), Senegal, and Côte-d'Ivoire (Soulé 2016) were variants of this model; all aimed at higher-end segments of the rice market. This type of partnership can involve one of two types of contracts: (a) market specification contracts, in which product quantities, qualities, and delivery times are specified; and (b) resource-providing contracts, which, in addition to market specifications, provide inputs on credit and frequently technical assistance and supervision, recovering the credit at the time that farmers deliver the output (Mighell and Jones 1963). Sources of value to farmers in this partnership are access to better technology through technical assistance and improved inputs from the buyer and a more assured market for the output (particularly important for perishable products). For buyers, the value derives from ensuring a reliable source of supply of raw product that meets their quality standards, thereby allowing them to operate their facilities close to capacity. In cases where a farmer organization is involved, it benefits both farmers and buyers through its ability to act as an intermediary between the two parties.

5. Joint management partnerships. This model resembles relation-based or equity-based alliances (Peterson, Wysocki, and Harsh 2001) in which both parties, typically a farmer organization and a buyer, invest in joint marketing or processing facilities and share management responsibilities. This model also typically includes contracts with farmers through their organizations similar to the model of buyer-driven partnerships with tightly structured market linkages. The *co-managed models* in the rice value chains of Benin and Togo described by Soulé (2016) are examples of this type of partnership.

Table 12.1. Summary of Case Studies

Study Reports and Country(ies)/Regions Covered	Product(s) & Key Actors Involved in Partnerships	Study Focus & Types of Partnerships Examined	Main Strengths of Partnership Models	Constraints to Model Expansion
Soulé, 2016 _____ Benin (south and central), Burkina Faso (southwest), Côte d'Ivoire (nation-wide), Mali (Office du Niger), Senegal (Senegal River Valley), Togo (south and central)	**Rice** Rice farmers, farmer organizations, commerical millers, rice distributors, state agencies, financial institutions	Compares four archtypical contracting systems: (1) Buyer-driven partnership in Senegal with tightly structured market linkages and heavy state role (dubbed "**Integrated model**"); (2) Farmer-driven partnerships with structured market linkages, involving sales to state grain boards in Burkina Faso and Mali, with strong "coaching" from the boards (dubbed "**Voluntary sales model**"); (3) Buyer-driven partnership in Côte d'Ivoire in which the state has granted industrial-scale firms exclusive concessions in different areas of the country (dubbed "**Exclusive model**"); and (4) Joint management partnerships in Benin and Togo (dubbed a "**Co-managed model**")	(1) **Integrated model**: Strong coordination of system through state-supported technical assistance, input provision, finance agencies and trade policies/pricing. (2) **Voluntary sales model:** Provides experience to farmer organizatoins in meeting standards of commercial contracting**.** (3) **Exclusive model**: Strong coordination and provision of services by firms. (4) **Co-managed model:** Strong farmer involvement and ownership of system for producing value-added rice products.	(1) **Integrated model**: Not clear that Senegalese state has resources to extend the model to cover numerous smallholders. (2) **Voluntary sales model:** Only addresses output market access for farmers, not access to productivity-enhancing inputs; purchases by grain boards well below targets and of variable quality. (3) **Exclusive model:** Rice farmers constrained to deal with single large buyer in their area, which dictates production procedures, leading to charges that system undermines family farming. (4) **Co-managed model:** Heavily dependent on external technical assistance, raising questions about its economic sustainability.
Onyekwena, 2016 _____ Nasarawa State, Nigeria	**Rice** Industrial rice processor/marketer, Local Buying Agents (intermediaries), rice farmers in Nasarawa State, Nigeria	Evolution and implementation of a buyer-driven partnership with tightly structured market linkages -- the outgrower model of one of the largest rice processors in Nigeria (OLAM)	OLAM still struggles to attract and hold outgrowers and, consequently, only operates mill at 50% of capacity. Private Local Buying Agents (LBAs) play a key role as intermediaries between firm and farmers.	Farmers' weak access to inputs other than improved seeds limits productivity growth and raises transaction costs to firm, as does geographic dispersion of outgrowers. LBAs play critical role in paddy aggregation for firm but raise costs beyond levels originally anticipated. Farmers' lack of access to mechanization services and poor roads further increase costs, and poor access to credit leads to side-selling. Federal Government's failure to follow through on commitments to supply inputs and technical assistance to farmers is weakening the system.

Table 12.1 (cont'd.). Summary of Case Studies

Study Reports and Country(ies)/Regions Covered	Product(s) & Key Actors Involved in Partnerships	Study Focus & Types of Partnerships Examined	Main Strengths of Partnership Models	Constraints to Model Expansion
Asuming-Brempong et al., 2016b Greater Accra Region and Volta Region, Ghana	**Rice** Rice farmers, farmer cooperative, processor, state irrigation and extension agencies	Comparison of two variants of buyer-driven partnerships with tightly structured market linkages (contract farming initiated by processors), one large-scale (WIENCO/GADCO) and the other small-scale (MCRPMS)	Case study identifies reasons why WIENCO's implementation of the contracting model developed earlier by GADCO seems to be succeeding while GADCO's implementationof it failed. Key elements include strict monitoring of farm-level practices by WIENCO staff and development of PPP with government-run irrigation scheme. MCRPMS's smaller-scale model is based on close personal ties between processor and farmers and ability to offer above-market prices to farmers for their paddy due to firm's value-added activities.	**WIENCO:** Need for strong field supervision to ensure recommended farm practices are followed. Farmers' poor access to credit for farm labor and harvest operations leads to side-selling. Weak farmer access to mechanization services for land preparation and harvesting. **MCRPMS:** Reliance on social networks and personal relations with farmers for contract enforcement limits scope for expansion. Farmers also have weak access to mechanizaiton services.
Vroegindewey, 2014; Vroegindewey, 2015 Sikasso, Koulikoro and Segou Regions, Mali	**Rice, millet, sorghum, maize** Grain farmers, village associations and cooperatives, regional farm organizations, grain processors, institutional buyers, service providers and state agencies	Examines 15 separate partnership models involving all forms (except joint management partnership model) involved in the marketing of cereals, which are categorized into one of three types: farmer-led, processor-led and service-provider led.	**Farmer-led** (predominates): farmer-governed organizaitons can potentially serve many farmers on an ongoing basis; government and donor policies favor this model. **Buyer-driven:** builds flexible and dedicated network of suppliers that meets a buyer's specific needs, while faciliating farmers' access to input and output markets. **Service-provider driven:** Farmers have acess to integrated package of high quality inputs and technical assistance.	**Farmer-driven:** Dependent on substantial and often long-term technical assistance from development partners to build the capacity of the farmer organizations to raise capital and manage contracting for inputs and outputs. **Buyer-driven:** Involved relatively few farmers; limited resources and reliance on social ties for contract enforcement limits expansion. **Service-provider driven:** Often have high costs per farmer served, raising quesions about model's financial sustainabilty.
Elegbede, 2016 Kaduna and Ogun States, Nigeria	**Maize** Small and medium-sized maize farmers in North Middle Belt, Large farmer-dealers, maize wholesalers, feed processors, large-scale poultry farmers	Examines how poultry feed value chain is coordinated, between large egg producers and feed manufacturers in Southwestern Nigeria, and with their primary source of maize farmers 800 km to the north. Predominant model is buyer-driven with unstructured market linkages, with buyers being large grain wholesalers.	No succeses to note, since small maize farmers sell mainly in the spot market and are largely excluded as suppliers to poultry feed value chain. The study documents the role of private grain wholesalers and northern-based large farmers in aggregating maize and delivering it to buyers in the Southwest.	Small farmers' limited access to productivity-enhancing inputs and weak/missing cooperative structures in Kaduna region raise transaction costs of dealing with smallholders. As a result, large-farmers, who serve as main aggregatrors, mostly contract with other medium and large-scale farmers.

Table 12.1 (cont'd.) Summary of Case Studies

Asuming-Brempong et al., 2016a _____ Central Region and Volta Region, Ghana	**Cassava** Cassava farmers, assemblers, processors, and two breweries	Compares three variants of buyer-driven partnerships with tightly structured market linkages established to produce cassava as an input into beer production, linking farmers, cassava processors and two different breweries, Accra Brewery Ltd. (ABL) and Guinness Ghana Brewery Ltd. (GGBL).	**ABL-DADTCO-farmers:** DADTCO's innovative in-field cassava processing technology. **ABL-Caltech-farmers:** Caltech produced a more refined cassava flour that was more suitable to ABL. Caltech has fewer problems with side-selling and following technical advice with block farmers who grow cassava on Caltech's own land than with outgrowers. Caltech and ABL were exploring establishing a fixed contract with one another to stabilize their relationship. **GGBL-ASCo-MAXPO-Farmers:** key role of GGBL in financing value chain.	**ABL-DADTCO-farmers:** ABL abbrogated contract with DADTCO because it judged DADTCO's high-quality cassava cake too fibrous for use in its brewing operation, and because it had access to another supplier (Caltech). This led to DADTCO defaulting on contracts with cassava farmers. **GGBL-ASCo-MAXPO-Farmers:** Weak financial position of ASCo, a state-owned enterprise, forces GGBL to pre-finance many of the operations of ASCo and its aggregator, MAXPO. Frequent plant breakdowns at ASCo limit the ability of GGBL to produce cassava-based beer. **ABL-Caltech-Farmers:** Caltech has some problems with side-selling by outgrowers. Caltech's lack of firm contracts with buyers of cassava flour occasionally leads to disputes with buyers over price.
Coulibaly and Diarrisso, 2015; Diallo et al., 2016; Diakité and Goro, 2016 _____ Areas around Bamako and Sikasso, Mali	**Mangoes for export market** Export firm, European importers, mango farmers, custom harvesters (pisteurs), mango interprofessional organization	Examines a buyer-driven partnership with tightly structured market linkages between one of Mali's largest exporters of fresh mangoes to the European Union, SCS International, and small- to medium scale orchard owners. The study emphasized how the partnership works with farmers to meet stringent product certification standards	Exporting firm invests heavily in training of its contract growers so that they become GlobalGap and Organic certified producers. It is also working to help some of them also become harvesters that contract to pick other growers' fruit. Export firm also works closely with its overseas partners to enforce quality control standards. Firm also makes "social investments" to help build grower loyalty.	System-wide constraints, including low literacy rate among gorwers; capital needs to finance widespread replanting of orchards; no certification of nurseries producing young trees; weak public investment in R&D and in training professional arborists; potential for product debasement by custom harvesters; and poor financial status of export packing facillities. Lack of dynamism in an interprofessional organization that, in principle, could address many of these problems.

Cross-Cutting Observations

From the seven sets of case studies, four cross-cutting observations emerge:

I. Potential partners need to identify carefully the sources of value generated by different partnership models.

Partnership models must create enough value for each party to warrant its investment in the arrangement. This observation seems obvious, but it focuses attention on identifying the sources of value in the partnership for each party relative to the level of resources needed to sustain it. More complex partnerships, such as farmer -, buyer- , and service-driven models with tightly structured market linkages and joint-management partnerships require more resources to sustain, especially if they provide inputs on credit. They are likely to be sustainable only if they involve products earning substantial quality premiums over alternative uses (e.g., export-grade perishables or products having quality standards different from those in the mass market) or if they generate substantial productivity gains for each partner.

Several of the partnerships created value by filling missing markets. Providing access to improved technology (e.g., improved seeds, cassava cuttings, fertilizer, and advisory services) is not only a major inducement to smallholders' participation in contracting, but is also critical to holding down the costs of such partnerships for the buyer. Buyers across the case studies faced a major challenge of increasing the volume of raw product to feed into their agro-processing plants or export enterprises. Two options exist for sourcing increased volumes: increase the number of smallholders with whom the firm contracts or increase the production per smallholder. Holding other factors constant, the first option implies raising transaction costs for the firm, especially when farmers require significant training and monitoring to meet quality standards. This is why firms as diverse as MCMPMS in the rice value chain in Ghana (Asuming-Brempong et al. 2016b) and SCS International in the mango export value chain in Mali (Coulibaly and Diarisso 2015) sought to improve the productivity of their contract growers. Markets for information (e.g., advisory services) and transportation are also often weak, making partnerships that improved access to these (e.g., through buyer-provided extension services and subsidized transport from farmers' fields to buying stations) particularly attractive to smallholders. At the same time, failure to address important missing markets can weaken partnerships. In several instances, (e.g., the cassava and rice case studies in Ghana), lack of credit for hiring labor led some farmers to incur debts with local traders and then engage in side-selling to repay the debts.

The models reviewed in the case studies varied widely in the degree to which they addressed such missing markets in a comprehensive manner. Soulé's (2016) study of various approaches to contracting in rice value chains in different West African countries illustrates this point. Some, such as the purchase agreements of the Malian and Burkinabé grain boards with farmer organizations, focused solely on the output markets, counting on other public and private programs to improve access to key inputs like fertilizers and improved seeds. The *integrated model* of rice contracting being promoted in the Senegal River Valley had the most unified approach to linking financing (for rice distributors and millers as well as farmers), technical assistance, and inputs to the output market contracts, but it is unclear whether the Senegalese government can and will devote the resources needed to scale up this model widely. Overall, the case studies suggest that simply contracting on the output side without addressing other

missing markets is unlikely to boost farmers' incomes significantly and may threaten the durability of the partnership.[7]

Offering flexibility in pricing and delivery obligations creates value for farmers, but to be economically sustainable requires the buyer to earn correspondingly higher margins. Some buyers, such as the Ghanaian rice processor MRCMPS and all the millet and sorghum buyers studied in Mali, consistently paid a premium over market prices to help ensure delivery and quality. Several rice and cassava processors specified that after farmers had delivered enough product to repay in-kind the inputs they had received on credit, they were free to sell to any buyer. Farmers appreciate both clauses, but they are not cost-free to the buyer. They must be offset either through their effect in ensuring the buyer a supply of adequate quantity and quality to operate facilities near capacity (by reducing the farmers' incentive for side-selling) and/or the ability to sell into higher-margin markets. For example, MRCMPS's ability to offer above-market prices for paddy was due in part to the margins it earned in the production of value-added rice-based products like cookies and rice flour. The millet and sorghum buyers who paid premiums in Mali were largely either institutional buyers or a processor serving higher-end segments of the market. In contrast, the firm WIENCO, which contracts with small paddy producers in Ghana and just markets milled rice, rarely adjusts previously agreed-to prices for paddy.

Contract breaches are a major threat to the value created by the partnerships'; limiting them can involve substantial costs. Contract breaches such as farmers' side-selling leading to non-repayment of credit and buyers not honoring advance purchase agreements are common when one party has more specific assets at risk than the other. For example, if a processor with heavy fixed investment in processing equipment contracts with farmers who are producing a storable annual crop that has several potential buyers, the risk of contract breach through side-selling is high. Buyers also occasionally breach contracts, particularly when multiple sources of supply (including imports) are available and the buying price in the contract exceeds the prevailing market price. Such breach is most harmful to farmers when they have invested in meeting the buyer's quality specifications and alternative buyers are either unavailable or unwilling to pay a premium for the product.

Measures exist to limit contract breaching, but these add costs. Common measures include contract clauses such as profit sharing, adjusting prices based on current market conditions, and making contract renewal each season contingent on past performance; reliance on social capital to build loyalty; and strict monitoring of partner performance. In the case studies, some buyers reinforced their social capital with smallholders and their communities by making contributions for schools, health clinics, or to those facing household emergencies. Frequently, these informal investments substituted for more formal contract monitoring. However, reliance on such tools becomes impractical when the number of contracting farmers becomes large, as illustrated by the Malian cereals cooperatives that have developed more formal contracts with their members as the organizations have expanded their membership. The case of the Ghanaian rice processing firm MCRPMS illustrates the limits of reliance on reputation (Asuming-

[7] Exceptions occur when: (a) farmers are facing very few buyers and the presence of contracts increases market competition for the output (which was one of the stated purposes of the buying schemes of the Malian and Burkinabé grain boards), and (b) the contract leads producers to increase the quality of their output, giving them future access to higher-value markets. For this latter condition to occur, however, the contract likely needs to be coupled with technical assistance to farmers on improving product quality.

Brempong et al. 2016a). The proprietor of this firm, after a bad experience with a widespread contract breach when contracting with many farmers, restricted her contracts to seven farmers whom she knows well and with whom she has strong social ties. She operates largely on the basis of verbal agreements and reports no problems with contract breaching, although this approach likely limits future expansion of her firm. Similarly, the large maize producer/aggregator studied by Elegbede (2016) in north-central Nigeria extended credit to a relatively small number of medium-sized farmers and relied on his strong social ties in the community to ensure enforcement of the agreements. In contrast, in Ghana, the rice processing and marketing firm WIENCO/Copa-Connect operates through formal written contracts with hundreds of farmers but expends a large amount of resources to monitor compliance.

II. Tailoring the design of the partnership to local conditions is critical.

The five broad categories of partnership models described above are just that: broad categories. Within each, partnerships require careful tailoring to local conditions**.** The mediocre performance and even failure of some partnerships such as those of Olam-Nigeria and GADCO (in Ghana) for rice and of DADTCO-Ghana for cassava—which had received acclaim in the popular press as "A Holistic Approach to Tackling Low Agricultural Incomes" (Osei 2012),—demonstrate that the design and implementation of such approaches is neither easy nor automatic. There is also evidence that in certain environments, transaction costs and lack of appropriate supporting organizations such as cooperatives may exclude smallholders from growing markets, as in the case of the maize-poultry feed value chain linking southwest and north-central Nigeria (Elegbede 2016). On the other hand, in certain environments, consistent with the theoretical literature, disadvantaged groups may benefit from contracting arrangements given their meager alternatives elsewhere. For example, the Ghanaian firm Caltech produces cassava starch as an input for cassava-based beer. It found that women who received plots of land, improved planting materials and technical support to grow cassava on the firm's large nucleus estate were exceptionally conscientious in meeting their contractual obligations—in part because this was one of the few opportunities for women in the region to gain access to such resources.

One of the critical elements in the tailoring of the design of the partnerships to local conditions is *the buyer's knowledge of the entire value chain*, not just of the level at which it is most immediately present. This was vividly illustrated by the case of DADTCO, a Dutch firm that had a technological solution to a major aggregation problem in the Ghanaian cassava value chain (reducing the bulkiness and perishability of the roots through use of its mobile processing unit). The company had successfully deployed this technology in Mozambique to help cassava farmers market a processed cassava product—high-quality cassava cake—to breweries as a feedstock for making beer. However, DADTCO did not seem to understand that its sole customer in Ghana, the Accra Brewery Limited, employed a different brewing technology than that used in Mozambique. Accra Brewery experienced difficulties handling the cassava cake that DADTCO produced and had an alternative source of high-quality processed cassava product from the company Caltech. This allowed the brewery to impose tighter quality specifications on DADTCO, leading to the collapse of its program. On the positive side, one reason for SCS International's success with fresh mangoes exports from Mali has been its strong understanding of the strict and frequently changing quality standards of its European clients, and its ability to communicate those standards to its growers.

Another critical element of buyers' knowledge of the value chain is their understanding of farmers' output potential and capacity to meet quality standards, input needs, aggregation and transport challenges, and their general aspirations. The Mali cereals case studies (Vroegindewey 2015) provided some examples of how contractors identified and responded to such challenges. These included a rice processor who provided access to irrigated land to many farmers, a food processor who mentored a farmer organization on improving the quality of its cereals, a maize processor who provided access to a threshing machine and transport at the village level, and service providers who moved increasingly into facilitating output marketing.

Design of partnership models also needs to consider *the positive role that intermediary aggregators can play* in promoting success of agreements, particularly when many farmers are involved. Monitoring farmer compliance with contractual agreements is costly in part because of information asymmetry between the buyer and the seller, particularly with respect to farmers' creditworthiness and dependability to follow recommended practices. Buyers' distance from farmers (either geographically or socially) creates a market opportunity for intermediaries who know the farmers better and who may have specialized logistical skills and capacities to act as product aggregators for the agro-processor or exporter. Frequently these aggregators are farmer organizations (as in many of the Mali cereals cases), often supported by development partners to strengthen their capacity to play this role. However, sometimes they are private entities, either engaged directly by the buyer, as occurred in one of the cassava processing cases; or arising on their own to seize a profit opportunity, as did Local Buying Agents who aggregate and sell paddy to Olam in Nigeria. Structuring intermediaries' incentives so that they are consistent with the interests of the other parties is critical, as illustrated by the Malian mango exporter's attempts to move from a system of independent harvesters/aggregators (who sometimes comingled fruit from non-certified growers with that of certified growers) to certified grower-aggregators, who have a strong financial interest in maintaining product quality.

III. The public sector has a critical role in structuring public-private partnerships.

Partnership models are often described by their advocates as PPPs. In the partnership models studied, the roles of the public sector varied widely, involving one or more of the following activities: (a) establishing and enforcing policies that affected the partnerships (e.g., price, tax and sectoral policies, laws of contract, land tenure regulations, and rules governing the establishment and roles of farmer organizations); (b) provision of infrastructure; (c) direct market involvement of state-run agencies (e.g., grain boards and state-owned firms); and (d) provision of services such as credit and extension to value-chain actors. The public sector's role in the case studies varied from helpful to detrimental, the nature of which changed over time.

Policies affecting the partnership models cover a wide range of areas. One of the most fundamental is *land-tenure policy*, which affects the conditions under which agro-processors and exporters can gain access to land for their facilities, including nucleus estates. The question of land tenure in West Africa is politically very sensitive, with farmer and civil-society groups often voicing strong concerns about *land grabs* and the domination of family farms by large agribusinesses.[8] National and local governments can help equilibrate bargaining power

[8] See, for example, Hollinger and Staatz (2015), Focus Section B, pp. 311-14.

between farmers and large processing firms, as occurred in the cases of rice contracting in Senegal studied by Soulé (2016). Alternatively, they can favor one party over the other, as when they grant large firms user rights to great swathes of land without offering compensation to those who previously cultivated it (which appears to have occurred in some of the Ghana cassava case studies). Most of the partnership models involving nucleus estates have used long-term leases from local communities or their customary leaders rather than outright land purchases, but this has not obviated land-tenure concerns because such leases frequently displace farmers who were previously cultivating that land. The Ghanaian firm Caltech's strategy of engaging those farmers not as hired laborers but as block farmers on its nucleus estate, granting them free use of a block of land on the company's estate along with technical support and inputs, is one way of reducing tensions over land acquisitions while at the same time reducing the incentives for shirking that frequently accompany a hired agricultural labor force.

Land tenure policies were closely linked in the case studies *to policies that affect the degree to which farmers are involved in their production decisions and daily operations*. At one extreme was the rice development approach of Côte d'Ivoire described by Soulé (2016), where a single firm directs all irrigated production in its specified zone. While farmers retain use-rights to their land, their options if they want to produce paddy are severely restricted by the dictates of the company. This leads critics to charge that farmers are being converted into a proletariat working for a local monopsonist, even as rice production and farmers' incomes rise. In contrast, the co-managed rice contracting systems in Benin and Togo (Soulé 2016) involve farmer organizations as co-owners of the buyers' business enterprises, yet these models seem to be heavily dependent on external support for their continuity.

The cases also provided examples of how *tax and trade policies* can help foster buyer-led partnership models. Changes in Ghana's tax code to favor firms that increased local content in their manufactured items were critical in inducing two major breweries in Accra to begin producing cassava-based beer and developing contracting links with farmers to supply the feedstock (Asuming-Brempong et al. 2016a). Senegalese policy to make the granting of rice import licenses conditional on a firm's also purchasing locally processed rice has helped to foster buyer-led partnerships in the Senegal River Valley (Soulé 2016). The cases also include instances where the absence of appropriate policies can hinder the development of successful partnership models. Examples include the absence of strong *policies to support farmer cooperatives* in northern Nigeria, which limited small maize farmers' ability to sell into the growing poultry feed market (Elegbede 2016) and the absence of appropriate *sectoral policies* for horticulture in Mali, which presents major obstacles to the success and growth of contracting arrangements with small- and medium-scale mango producers (Coulibaly and Diarisso 2015; Diakité and Goro 2016).

Infrastructure. In the cases involving irrigated rice production (in Ghana, Mali, and Senegal), the most common public-sector contributions were investment in the basic irrigation infrastructure (a very large fixed investment), establishment of a public-sector entity to manage it, and granting the buying firm permission to contract with farmers who had plots within the publicly operated irrigation systems. In some cases (e.g., in Mali and Ghana), the public sector also granted the agro-processor a lease for a nucleus estate. A second critical public-sector investment is road infrastructure, as indicated by farmers' complaints in several of the cases about how the poor state of rural feeder roads made delivering product to contractors' buying

points less attractive than selling locally. A critical issue in all infrastructure investments is coupling these with plans for maintenance and, where appropriate, eventual transfer to private operators. A positive example comes from Ghana, where the large rice agro-processor WIENCO, as part of a PPP, provided advance cash payments to the irrigation management agency to allow it to clean its canals in a timely way. A less positive example comes from Mali, where public investments in export packing facilities played an important role in stimulating mango exports, but the transfer of these facilities to the private sector and their future financial sustainability is proving problematic.

Role of state enterprises. The role of state-owned enterprises can be either positive or negative in fostering PPPs. State-run firms often have a reputation for inefficiency and lack of innovation, which can hinder the development of new markets. This was exemplified by the managerial and financial problems that a government-owned starch-producing company (ASCo) created for the expansion of cassava-based beer production in Ghana, and the apparent reluctance of the government to privatize the firm (Asuming-Brempong et al. 2016a). In other instances, state enterprises can play a more positive role, as illustrated by the case of the Malian grain board that began contracting with farmer organizations to supply rice to a national grain reserve stock. The resulting partnership model served as an apprenticeship program that helped farmer organizations learn the skills needed to aggregate and sell to other large buyers while meeting strict quality standards. The difference between these contrasting examples lies in how the roles of the public-sector entities were conceived. The starch company was originally created to help build a market for cassava farmers, but had no strategy to turn over the operation eventually to the private sector. The result was that the company's operations likely crowded out private investment. In contrast, the grain board saw its mandate, in addition to the public-good role of maintaining an emergency grain reserve, as fostering the growth of the private-sector, including farmer-organizations, by helping train them in how to meet commercial contracting conditions. In doing so, the board likely helped crowd in private investment.

Provision of supporting services. In some cases, state agencies provided supporting services to various value-chain members that were critical to the success of partnerships. These included extension services, credit, and assistance in price setting—e.g., through provision of objective crop budgets to serve as a basis for price negotiation and, in some cases, involvement of public officials in those negotiations. Often, these services were done in partnership with private firms, such as joint sharing of extension responsibilities. In an era of budget austerity, however, the financial capacity of the state to sustain such services may limit their expansion into new areas. For example, in the Senegal rice-contracting cases described by Soulé (2016), public financing agencies played a critical role in extending credit to make the contracting system viable, but the ability to expand and sustain such expenditures remains an open question. In the case study of Olam's outgrower scheme, the failure of government agencies to follow through on previous commitments to ensure input supply to farmers was a major contributor to the mediocre performance of that partnership. Thus, in future efforts to develop effective PPPs, developing sustainable models for providing such supporting services remains a high priority (see, for example, Zhou and Babu 2015).

IV. Collective action among participants is critical but takes time to develop.

The various partnership models all require value-chain participants to work together more closely than they have in the past. For models that involve farmer organizations, this means

building the capacity to develop and implement contracting, quality control and contract compliance arrangements. As the Mali cereals and Benin-Togo rice case studies illustrate, building such capacity is a long-term process, typically longer than the three-to-five-year project cycles of most development partners. It often involves iterative training and capacity building, and assistance accessing both operating capital and capital for long-term investments. However, as the mango export case study illustrated, when a value chain is not dominated by a single firm, there are also frequently system-wide vertical coordination challenges beyond the scope of a single entity to address. In such cases, collective action along the entire value chain becomes essential, for example, through the development of an effective interprofessional organization.[9] Experience has shown that developing such organizations is a long-term process that requires both supportive government policies and the development of a vision and attitude of *co-opetition* among the value chain participants (Brandenburger and Nalebuff 1996)—one in which they may be rivals at a certain level within the value chain but where they can come together and work collectively to address system-wide problems. As with the case of developing effective farmer organizations, developing such value-chain-wide organizations takes considerable time and effort.

12.5. Conclusions and Policy Implications

The types of partnership models with farmers discussed in this chapter will need to replicate over time if these farmers are to be linked effectively to the growing value-added markets for West African agricultural products. However, the case studies reveal that there is no single dominant model that works in all situations. Rather, partnership models need to be tailored closely to the product, its production system, and the environment. Consistent with transaction-cost theory, the case studies examined here revealed that tighter forms of contractual agreements were more predominant where both parties had specific assets at risk (cf. mangoes vs. rainfed cereals). Therefore, they faced fewer buyers or suppliers for their goods, and were, more locked in to a given trading relationship. However, models for the same crop also varied depending on the approaches historically favored by political leadership in different countries. For example, although most countries rely on some form of PPP to develop contracting in their irrigated rice sectors, Senegal's strategy relies on state agencies to play a stronger role in coordinating the value chain than does that of Togo, Benin, and Mali, which is more farmer-led, or that of Côte d'Ivoire, which places a greater reliance on large agribusiness firms to coordinate the system. The degree to which different countries develop processes to deal with sensitive land-tenure issues surrounding the leasing of large areas for nucleus farms or develop arrangements such as Caltech's block-farmer strategy to dampen those tensions will also condition the types of partnerships that evolve.

A key message coming out of the case studies is that to be economically sustainable, a partnership model needs to generate enough value to both buyer and seller to warrant their investment in it. One should not promote complex partnership models where the scope for creating additional value is very limited. A principal first step in designing such partnership

[9] Interprofessional organizations are voluntary organizations, widely promoted in Francophone West Africa, that include representatives from throughout a value chain (farmers, service providers, processors, distributors, exporters, government, etc.). The organizations attempt to improve vertical coordination by addressing value-chain wide challenges that are beyond the capacity of any one actor to resolve. For details, see Duteurtre and Dieye (2008); Shepherd, Cadilhon, and Galvez (2009); and Staatz and Ricks (2010).

models is therefore identifying their possible sources of value for each party. One of the key values for farmers of the partnerships studied was their ability to fill gaps left by weak or missing markets, typically for inputs such as credit, improved technology embodied in improved seeds and fertilizer, mechanization and advisory services and insurance. Improving farmers' productivity is also crucial to buyers' success, as it expands supplies available to the buyer without a proportionate increase in transaction costs. Those designing potential partnerships should, therefore, first carefully analyze: (a) which are the most important missing-market constraints facing farmers and other value chain participants; (b) how these are likely to evolve in the future (e.g., growing demand for mechanization services as local wage-rates rise); (c) which party or parties should take the lead in helping fill those gaps; and (d) the arrangements best suited to deliver the goods and services. For example, a range of options for technology dissemination needs to be considered, including private extension efforts by the buyer, use of nucleus farms as experimental and training centers for farmers as well as sources of additional output for the processing or exporting firm, and joint research and extension efforts by the buying firm with the public sector and/or NGOs.[10]

The case studies also reveal that government policies can either crowd-in private investment in ways that favor contracting with farmers (as in the case of Ghana's modification of its tax laws to favor greater local content in food manufacturing) or crowd it out (as exemplified by the poor performance of the government-managed ASCo, which limited expansion of the market for cassava). One area where farmer groups and some agro-processors have pressured West African governments to modify their policies has been in the area of trade, in which they have argued for protection in the form of import restrictions, especially for rice (Hollinger and Staatz 2015). Senegal has taken some steps in this direction by tying import licenses for rice to distributors' having purchased a certain amount of domestic production. However, the scope for such protection in the future is likely to be very limited for two reasons: (a) growing urban consumers increasingly pressure governments to hold down the prices of basic necessities, and (b) the 2015 adoption by ECOWAS countries of a common external tariff that limits member countries from acting unilaterally on trade (ibid.).[11] Therefore, policies to promote more contracting with smallholders will need to focus on measures other than trade restrictions, such as encouraging private investments that boost system-wide productivity and reduce transaction costs.

The cases also reveal that only a few successful large-scale partnership models involve the buying firm contracting directly with individual farmers. Typically, larger firms rely on some intermediary to act as a contracting interface with farmers. Often these are farmer organizations, but others are private individuals or firms. While many projects have focused on strengthening farmer organizations to improve market linkages, greater attention should be given to the potential contributions of private aggregators, including how to increase their productivity and strengthen their incentives so that they do not conflict with those of the farmers or the contracting firm. However, even when private aggregators are relied upon to accumulate product, strong farmer organizations are needed to facilitate monitoring and information flows and to represent farmers' interests, particularly in situations where, as in the Ivorian irrigated rice system, they are likely to face local monopsonists.

[10] For case studies of different approaches to private and PPP-led extension services, see Zhou and Babu (2015).
[11] See Chapter 13 in this volume.

In situations where no single firm dominates the entire value chain, there is a need to strengthen value-chain-wide organizations, such as interprofessions, to address system-wide constraints that limit expansion of contracting with smallholders. These organizations could help develop and share information on industry structure, the evolving nature of final consumer demand, farmers' alternative market channels, and buyers' alternative sources of supply. Such information would be extremely helpful in communicating to farmers the product attributes, quality levels, and delivery conditions that attract buyers. Building such organizations is likely to require a long-term commitment from governments, development partners, and the private sector, as these organizations require both technical skills and a fundamental change in the vision of many value-chain actors.

Finally, implementation of the partnership models is at least as important as their original design, as illustrated by several cases of partnerships that foundered. Effective implementation requires strong technical knowledge of the value chain and of the social environment in which it is embedded, and a willingness to evolve the partnership as the environment changes over time. Many of the most effective partnership models studied relied on strong social ties (usually built up through a history of exchange and often bolstered by the buyer contributing to the local community or farmers in their times of need) to induce respect of the agreements' terms. Flexibility in adjusting previously negotiated prices to meet local competition and in renegotiating input loans also builds farmer loyalty, but requires large enough margins and cash flow on the part of the buyer to sustain. Thus, such flexibility is most likely in products linked to higher value-added markets that can generate those margins, as compared to bulk commodities like rainfed cereals. However, beyond social ties, enforcement of standards required by the final buyer is critical. In the words of the director of the Malian mango-exporting firm studied, "in this business, there is no room for doing things 'approximately.'"

References

Asuming-Brempong, S., A. Asuming-Boaky, J.K.M. Kuwornu, and P.K. Ofori. 2016a. *Linking Smallholders to Profitable Markets: A Case Study of Selected Cassava Value Chains in Ghana.* East Lansing, MI: Michigan State University, SRAI 2 Project. http://fsg.afre.msu.edu/srai2/Linking%20Smallholders%20to%20Profitable%20Markets%20-%20Cassava%20%20FinalReport%20(12June2016).pdf

Asuming-Brempong, S., A. Asuming-Boaky, J.K.M. Kuwornu, and P.K. Ofori. 2016b. *Linking West African Smallholders to Greater Value-added Activities: A Case Study of Selected Rice Value Chains in Ghana*. East Lansing, MI: Michigan State University, SRAI 2 Project. http://fsg.afre.msu.edu/srai2/Linking_SH_Farmers_to_Markets-Rice_Final_14June2016.pdf

Barrett, C.B., M.E. Bachke, M.F. Bellemare, H.C. Michelson, S. Narayanan, and T.F. Walker. 2011. Smallholder Participation in Contract Farming: Comparative Evidence from Five Countries. *World Development* 40.4: 715-730.

Bellemare, M.F. 2012. As You Sow, So Shall You Reap: The Welfare Impacts of Contract Farming. *World Development* 40.7: 1418-1434.

Bellemare, M.F. 2015. Empirical Research on Contract Farming: Quo Vadis? Presentation at the Agricultural and Applied Economics Association Pre-conference on Rapid Agrifood System Transformation, Globalization, and International Development, July 25, 2015. San Francisco, CA.

Bellemare, M.F. and L. Novak. 2016. Contract Farming and Food Security. *American Journal of Agricultural Economics* 99.2: 357-378. https://doi.org/10.1093/ajae/aaw053.

Berg, E. 1975. *The Recent Economic Evolution of the Sahel.* Occasional Paper. Ann Arbor: University of Michigan Center for Research on Economic Development.

Berlin, R., B. Reddy, F. Zamil, and Y. Zhou. 2016. Linking Smallholders to Markets: Prospects and Challenges, Paper prepared for the Seminar on Linking Farmers to Markets, January 26, 2016. Basel, Switzerland.

Brandenburger, A. and B. Nalebuff. 1996. *Co-opetition.* New York: Doubleday.

Coulibaly, J. and T. Diarisso. 2015. *Accès des petits producteurs aux marchés : Etude de cas du modèle de partenariat entre SCS International et les producteurs de mangues au Mali*. Bamako: IPR/IFRA de Katibougou, Institut d'Economie Rurale and Michigan State University. http://fsg.afre.msu.edu/srai2/Mangue_correction_finale_JC_TD_21012015.pdf

DaSilva, C.A. and M. Rankin, eds. 2013. *Contract Farming for Inclusive Market Access*. Rome: FAO.

Diakité, L. and A.G. Goro. 2016. *Développement de la filière mangue au Mali : analyse des modèles de coordination et de partenariat entre les différents acteurs*. Rapport de l'atelier de restitution de l'étude de cas sur l'exportation de mangues fraîches par SCS International. Bamako: Michigan State University. http://fsg.afre.msu.edu/srai2/Rapport_provisoire_atelier_1%20juin.pdf.

Diallo, B., J. Coulibaly, T. Diarisso, J. Staatz, A. Traoré, and B. Temé. 2016. Développement de la filière mangue au Mali: analyse des modèles de coordination et de partenariat entre les différents acteurs, Atelier de validation de l'étude de cas « Développement de la filière mangue au Mali: analyse des modèles de coordination et de partenariat entre les différents acteurs ». 19 avril. 2016. Bamako: Michigan State University. http://fsg.afre.msu.edu/srai2/Synth%C3%A8se_Etude_mangue_Atelier_19_Avril_2016_final.pdf.

Duteurtre, G. and P.N. Dieye. 2008. *Les organisations interprofessionnelles agricoles au Sénégal: de nouveaux outils de régulation des marchés ?* Dakar: Bureau d'analyses macro-économiques de l'Institut sénégalais de recherches agricoles (ISRA-BAME).

ECOWAS. 2015. *Agriculture and Food in West Africa: Trends, Performances and Agricultural Policies.* Abuja, Nigeria: ECOWAS. http://www.hubrural.org/Nouvelle-publication-L-agriculture.html?lang=en.

Elegbede, O. 2016. *Linking Smallholder Maize Farmers to the Market for Poultry Feed in Nigeria: A Case Study*. East Lansing, MI: Michigan State University, SRAI 2 Project. http://fsg.afre.msu.edu/srai2/Nigeria%20maize_poultry%20feed%20report_Elegbede_Feb%202016.pdf.

Grosh, B. 1994. Contract Fanning in Africa: An Application of the New Institutional Economics. J*ournal of African Economies* 3.2: 231-261.

Hazell, P., C. Poulton, S. Wiggins, and A. Dorward. 2010. The Future of Small Farms: Trajectories and Policy Priorities. *World Development* 38.10: 1349-1361.

Hollinger, F. and J.M. Staatz, eds. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers.* Rome: African Development Bank and FAO.

Jaffee, S. and J. Morton, eds. 1995. *Marketing Africa's High-value Foods: Comparative Experiences of an Emergent Private Sector*. Dubuque, Iowa: Kendall/Hunt Publishing Co.

Jia, X. and J. Bijman. 2013. Contract Farming: Synthetic Themes for Linking Farmers to Demanding Markets. In *Contract Farming for Inclusive Market Access*, ed. C.A. Da Silva and M. Rankin. Rome: FAO.

Joskow, P. 2005. Vertical Integration. In *Handbook of New Institutional Economics*, ed. C. Ménard and M.M. Shirley. Dordrecht: Springer.

Kirsten, J.F., A.R. Dorward, C. Poulton, and N. Vink, eds. 2009. *Institutional Economics Perspectives on African Agricultural Development.* Washington: International Food Policy Research Institute.

Klein, B., R. Crawford, and A. Alchian. 1978. Vertical Integration, Appropriable Rents, and the Competitive Contracting Process. *Journal of Law and Economics* 21:2: 297-326.

Masten, S. 2000. Transaction-cost Economics and the Organization of Agricultural Transactions. In *Industrial Organization*, Vol. 9, ed. M. Baye. New York: Elsevier. http://dx.doi.org/10.1016/S0278-0984(00)09050-7

Mighell, R.L. and L.A. Jones. 1963. Vertical Coordination in Agriculture. *Agricultural Economic Report 19*. Washington, DC: U.S. Department of Agriculture.

Minot, N. 2011. *Contract Farming in Sub-Saharan Africa: Opportunities and Challenges.* Kigali, Rwanda: AAMP.

Minten B., L. Randrianarison, and J.F.M. Swinnen. 2009. Global Retail Chains and Poor Farmers: Evidence from Madagascar. *World Development* 37.11: 1728–41.

Onyekwena, C. 2016. *Case Study of Olam Outgrower Scheme in Rukubi Rice Farming Communities, Nasarawa State, Nigeria.* East Lansing, MI: Michigan State University, SRAI 2 Project. http://fsg.afre.msu.edu/srai2/Revised_OLAM_Report_June_jms2.pdf.

Osei, R.D. 2012. *GADCO: A Holistic Approach to Tackling Low Agricultural Incomes*. Growing Inclusive Markets: Case Study. New York: UNDP. http://www.undp.org/content/dam/undp/library/corporate/Partnerships/Private%20Sector/AFIMcases/UNDP%20GIM%20Case%20Study%20GADCO%20Final.pdf

Otsuka, K., Y. Nakano, and K. Takahashi. 2016. Contract Farming in Developed and Developing Countries. *Annual Review of Resource Economics* 8: 353-376.

Peterson, H.C., A. Wysocki, and S.B. Harsh. 2001. Strategic Choice along the Vertical Coordination Continuum. *The International Food and Agribusiness Management Review* 4.2: 149-166.

Prowse, M. 2012. *Contract Farming in Developing Countries - A Review*. Paris: Agence française de développement.

Reardon, T., C.B. Barrett, J.A. Berdegué, and J.F.M. Swinnen. 2009. Agrifood Industry Transformation and Small Farmers in Developing Countries. *World Development* 37.11: 1717‑1727.

Sexton, R.J. 1989. Imperfect Competition in Agricultural Markets and the Role of Cooperatives: A Spatial Analysis. *American Journal of Agricultural Economics* 72.3: 709-720.

Shepherd, A.W., J.-J. Cadilhon, and E. Galvez. 2009. *Commodity Associations: A Tool for Supply Chain Development?* Agricultural Management, Marketing and Finance Occasional Paper No. 24. Rome: FAO.

Sindi, J.K. 2013. Essays on Market Access through Collective Action: Analyses of Factors Affecting the Formation, Success, and Impact of Farmer Marketing Groups in Kenya. Ph.D. dissertation. Michigan State University.

Soulé, B.G. 2016. *La contractualisation : une opportunité pour la promotion des chaines de valeur du riz local en Afrique de l'Ouest.* East Lansing, MI: Michigan State University, SRAI 2 project. http://fsg.afre.msu.edu/srai2/note_contractualisation_finale.pdf.

Staatz, J. M. 1987. Farmers' Incentives to Take Collective Action via Cooperatives: A Transaction Cost Approach. In *Cooperative Theory: New Approaches*, ed. J.S. Royer. ACS Service Report 18. Washington, DC: USDA, Agricultural Cooperative Service.

Staatz, J.M. and D. Ricks. 2010. Value Chain Participant Councils: A Tool for Improved Market Coordination and Broad-Based Growth. In *Markets, Marketing, and Developing Countries: Where We Stand and Where We are Heading*, ed. H.V. Trijp and P. Ingenbleek. Wageningen: Wageningen Academic Publishers.

Staatz, J.M., B. Diallo, N.M. Me-Nsope, and R. Vroegindewey. 2016. *Linking Smallholders to Profitable Markets in West Africa: Case Study Synthesis.* MSU/PRESAO/SRAI Project Working Paper No. 2016-03. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai2/Case_study_synthesis_report_Draft_16Oct2016_rev2a.pdf

Sterns, J.A., D.B. Schweikhardt, and H.C. Peterson. 1998. Using Case Studies as an Approach for Conducting Agribusiness Research. *The International Food and Agribusiness Management Review* 1.3: 311-327.

Teddlie, C. and F. Yu. 2007. Mixed Methods Sampling: A Typology with Examples. *Journal of Mixed Methods Research* 1.1: 77-100.

Tschirley, D., I. Minde, and D. Boughton. 2009. *Contract Farming in Sub-Saharan Africa: Lessons from Cotton on What Works and under What Conditions.* ReSAKSS Issues Brief No.7. Pretoria, South Africa: ReSAKSS. https://www.ifpri.org/publication/contract-farming-sub-saharan-africa-lessons-cotton-what-works-and-under-what-conditions

United Nations General Assembly. 2011. *The Right to Food: Note by the Secretary-General.* Interim Report of the Special Rapporteur on the Right to Food, Olivier De Schutter, submitted in accordance with General Assembly resolution 65/220. New York. United Nations.

Vroegindewey, R. 2014. *Examining Economic Coordination Models in Malian Agricultural Value Chains.* PRESAO Working Papers, SRAI 2 Component. East Lansing, MI: Michigan State University. http://fsg.afre.msu.edu/srai2/Syngenta_Mali_Trip_Report_Vroegindewey_12.1.14_formatted_pictures_compressed.pdf.

Vroegindewey, R. 2015. A Framework for Analyzing Coordination in Agricultural Value Chains: Evidence from Cereal Markets in Mali. Master's thesis. Michigan State University.

Williamson, O.E. 1981. The Modern Corporation: Origins, Evolution, Attributes. *Journal of Economic Literature* 19.4: 1537-1568.

Williamson, O.E. 1985. *The Economic Institutions of Capitalism*. New York: The Free Press.

Williamson, O.E. 1989. Transaction Cost Economics. In *Handbook of Industrial Organization*, Volume I, ed. R. Schmalensee and R.D. Willig. Amsterdam: Elsevier.

Yin, R.K. 2014. *Case Study Research: Design and Methods*, 5th ed. Thousand Oaks, CA: Sage publications.

Zhou, Y. and S. Babu, eds. 2015. *Knowledge Driven Development: Private Extension and Global Lessons.* Amsterdam: Elsevier.

CHAPTER 13

Policy Responses to West Africa's Agricultural Development Challenges[1]

Réponses politiques aux enjeux de développement agricole en Afrique de l'Ouest

John M. Staatz, Boubacar Diallo, and Nango Dembélé

Abstract

Chapter 2 discussed the initial reactions of West African governments and regional organizations to the high price crisis of 2007-2008. That crisis, however, was part of a longer-term environment that continues to shape agricultural development challenges in the region. Since 2005, the policies of both national governments and regional organizations have evolved substantially to address those challenges, particularly in the context of the ECOWAP/CAADP process. This chapter analyzes the nature of those challenges, the policy responses to them over the period 2005-2016, and remaining issues that West Africans and their development partners need to address to foster inclusive agricultural growth, greater regional agricultural integration, and food security in the coming decades. There is a particularly critical need to: (a) broaden the focus of programs from attention primarily on farm-level production to improving the performance of the entire agrifood system, including input provision and agro-processing; (b) improve incentives for the private sector beyond just small farmers to participate in the programs; (c) increase the attention paid to perishable commodities, such as livestock products, fruits, and vegetables, for which demand is rapidly increasing; and (d) strengthen the capacity at all levels, from local stakeholder groups to regional organizations, for effective program implementation, monitoring, and evaluation.

Résumé

Le chapitre 2 a décrit les réactions initiales des gouvernements ouest-africains et des organisations régionales à la flambée des prix et à la crise de 2007-2008. Cette crise, toutefois, s'inscrivait dans un contexte à plus long terme qui continue à façonner les enjeux du développement agricole de la région. Depuis 2005, les politiques des gouvernements nationaux et des organisations régionales ont fortement évolué pour relever ces défis, particulièrement dans le contexte du processus ECOWAP/PDDAA (Politique régionale agricole de l'Afrique de l'Ouest/Programme détaillé pour le développement de l'agriculture). Le présent chapitre analyse la nature de ces enjeux, les réponses politiques de la période 2005-2016 et le reste des problématiques que les Africains de l'Ouest et les partenaires au développement doivent

[1] This chapter draws heavily on Hollinger and Staatz (2015), Chapters 11 and 12, and ECOWAS (2016).

résoudre pour promouvoir une croissance agricole inclusive, une plus grande intégration agricole régionale et la sécurité alimentaire dans les décennies à venir. Il est particulièrement essentiel: (a) d'élargir la portée des programmes, initialement focalisés sur la production au niveau de l'exploitation, vers le système agroalimentaire dans son ensemble, afin d'améliorer sa performance notamment au niveau de l'offre d'intrants et de la transformation agroalimentaire; (b) d'améliorer les incitations du secteur privé à participer aux programmes, au-delà de celles des simples petits agriculteurs; (c) d'accroitre l'attention portée aux denrées périssables, telles que les produits animaux, les fruits et les légumes, pour lesquels la demande augmente rapidement et (d) de renforcer les capacités à tous les niveaux, allant des acteurs et groupes d'acteurs locaux aux organisations régionales, pour la mise en œuvre, le suivi et l'évaluation efficaces des programmes.

13.1. Introduction

West Africa faces a more conducive environment for rapid agricultural growth than it has in several decades. Demand for the region's agricultural products is growing rapidly, both at home and abroad, and prices for farmers' products are more favorable than they were in the 1990s and early 2000s. New biotechnologies and the information revolution offer the potential for putting powerful tools in the hands of West African farmers and agribusinesses. In addition, after years of relative neglect during the 1980s and 1990s by African governments and their development partners, agricultural has become a high policy priority for most countries in the region.

At the same time, challenges abound. Rapid population growth and urbanization are putting enormous pressure on land resources and the post-harvest parts of the agrifood system, especially as the demand for perishable, more healthful and value-added products grow (see Part II of this volume). The youth bulge in the population is creating a huge demand for new, rewarding jobs, resulting in calls for the agrifood system to create employment opportunities that are more attractive to young people than spending a day under the hot sun with a hand hoe. Insecure land tenure is leading to increasing conflicts (e.g., between crop farmers and herders), and lack of secure access to land by potential agri-investors is discouraging investment in land improvements and agro-processing. New technologies and new markets bring with them new risks for farmers, marketers, and agro-processors, creating demands for more effective tools for risk management.

The policy responses of West African governments, regional organizations, and their development partners to these opportunities and challenges have been more coordinated in recent years than in the project-led development approaches of the past. While independent and at times ad-hoc national initiatives to address specific issues, such as agricultural mechanization, still continue, national policy responses since 2008 have increasingly been designed within the framework of the Comprehensive Africa Agriculture Development Programme (CAADP) of the African Union (AU). The CAADP approach has three distinguishing characteristics:

- A pledge by national governments to move towards devoting at least 10% of national budgets to agricultural development and a pledge by development partners to devote more of their resources to this effort.

- A movement away from project-led development to a sector-wide approach. Under this approach, all major stakeholders (farmer organizations, national governments, civil society organizations, the private sector, and development partners) agree on an overall development strategy and investment plan, sign a pledge (known as a *CAADP Compact*) to support that plan and build their activities around it rather than undertake completely independent projects.
- Recognition of the importance of regional complementarities as critical elements of national agricultural development programs. This recognition was manifested in West Africa in calls by regional organizations, such as ECOWAS, the West African Economic and Monetary Union (WAEMU) and the Permanent Interstate Committee for Drought Control in the Sahel (CILSS), for open agricultural trade within the region. In addition, both ECOWAS and WAEMU have designed regional agricultural policies and investments to complement national programs and policies. The regional programs aim to deal with regional spillovers and scale economies that cannot be addressed adequately by purely national approaches—for example, the management of resources such as river basins and transhumance routes that transcend national boundaries.

In West Africa, the AU's CAADP initiative was merged with ECOWAS's initiative, launched in 2005, to develop a regional agricultural policy covering its15 member states. This initiative is known as the ECOWAS Agricultural Policy, or ECOWAP. Parallel to, and complementary with, the development of ECOWAP, the regional organization continued throughout the period 2005-2015 to negotiate among its member states to create a common external tariff (CET) for imports from outside the region. The CET is part of ECOWAS's ongoing efforts to transform the region in to a functional customs union, with free trade among member countries and common trade regulations for imports coming into the region. The bulk of the debate regarding tariff levels and accompanying safeguard measures concerned agricultural products; hence, the CET discussions were tightly linked to the development of the overall regional ECOWAP/CAADP program.[2]

This chapter describes the evolving policy response in West Africa to the challenges of agricultural growth and regional agricultural integration. The remaining sections of this chapter are organized as follows. Section 13.2 summarizes the main elements of the first phase of the CAADP/ECOWAP process, covering the period 2005-2015. In 2015, ECOWAS launched a year-long review of the program, involving input from a wide range of stakeholders. This led to proposals for modifications for the next 10-year phase of the program, known as ECOWAP + 10, covering the period 2016-2025. Section 13.3 discusses the main proposed modifications in the program and concludes with a discussion of remaining opportunities and challenges in implementing more effective regional agricultural growth and integration policies in West Africa.

13.2. The First Phase of ECOWAP/CAADP: 2005-15

The African Union launched the CAADP initiative in 2003, and ECOWAS began designing its regional agricultural policy in 2005. CAADP is a continent-wide initiative. The intent is that

[2] For details, see Chapter 9 in this volume and Hollinger and Staatz (2015), Chapters 11 and 12.

every member state of the AU design and implement its own CAADP agricultural development program, but that all countries follow similar design and implementation processes. The AU called upon Africa's Regional Economic Communities, such as ECOWAS in West Africa, to help guide their member states in developing the plans, using a common framework, and to develop regional plans that complemented the national ones by addressing issues that transcended national borders. Rather than create a separate initiative, ECOWAS decided to merge the CAADP process with its regional policy initiative, thereby creating ECOWAP/CAADP. Although the CAADP and ECOWAP initiatives existed on paper prior to the 2007-2008 food crisis, that crisis was instrumental in leading to the design, in earnest, of the national and regional CAADP plans beginning in 2008.

The Challenges Addressed

ECOWAP's objective was to address fundamental challenges facing the agricultural sector in West Africa, which policy makers increasingly recognized could not continue on its previous growth path. Although agriculture generates approximately 35% of the region's GDP, 16% of its exports and nearly 60% of its employment, it has increasingly been unable to keep up with growing food demand in the region, resulting in burgeoning imports (ECOWAS 2015d). Production growth in the region has depended primarily on area expansion rather than yield increases, and population pressures and a 25% decline in rainfall over the past 50 years has increasingly made that model of growth environmentally and economically unsustainable. The 2007-2008 world price spike and continued volatility in international markets in subsequent years served as a wake-up call to leaders in the region that West African countries could not continue to rely on what had previously been inexpensive food imports to feed a burgeoning urban population. Rather, policies needed to spur agricultural intensification to increase the region's food sovereignty, but do so primarily on the basis of family farming in order to help generate the badly needed jobs for the rapidly growing labor force (ECOWAS 2016).[3] At the same time, recognizing the widespread poverty and malnutrition in West Africa and the vulnerability of the region to natural and human-made crises, the policies also needed to include a strong social protection and crisis prevention component.

The ECOWAP/CAADP Design Process

ECOWAS provided financial support and the International Food Policy Research Institute (IFPRI) provided technical support for the design of the CAADP National Agricultural Investment Plans (NAIPs), which all followed a similar process. Each country assembled a CAADP design team, drawn primarily from the ministries of agriculture, rural development, and regional integration, and sometimes with participation from representatives of farmer organizations and the private sector. Each team carried out a diagnostic study to analyze the country's previous agricultural development efforts and identify future priorities. This study was complemented by a modeling exercise that aimed to quantify the impacts on agricultural

[3] *Food sovereignty* is a key objective of ECOWAP, although nowhere in the main documents describing the program (e.g., ECOWAS 2015a) is the term explicitly defined. It is generally understood to mean the ability of a region or a country to define its food policies independently of others, while ensuring that a substantial proportion of its food supply comes from national or regional supplies. In practice, debates about achieving food sovereignty revolve around whether and how much a country or region should enter into international trade agreements, which implicitly involve giving up some degree of sovereignty for the benefits of freer trade, and what level of protection the countries should offer local producers against competing imports.

and economic growth rates and on poverty alleviation of different investment options. These background studies fed into the design of the draft CAADP Compact document, which set out the priorities for the country's agricultural development strategy for the coming 5 to 10 years. The draft Compact in each country was reviewed and debated by a wide range of stakeholders, amended, and eventually signed by them. Once signed, the Compacts served as the basis for the design by the national CAADP teams of the draft NAIPs, which underwent a similar review process by national stakeholders as well as ECOWAS review teams.

Parallel to the development of the NAIPs, an ECOWAS-commissioned team developed a draft Regional Compact, Regional Agricultural Investment Plan (RAIP) and associated regional policies. These drew inspiration from an earlier regional agricultural policy developed by WAEMU, which covers the eight ECOWAS member states that share the CFA franc as a common currency.[4] Between July 2009 and January 2011, all 15 ECOWAS countries signed their national compacts, and the regional compact was signed in November, 2009. Over the next few years, the countries and the region developed their investment plans and related policies.

Characteristics of the First Generation of ECOWAP/CAADP Plans

The national and regional plans that emerged from this process were heavily influenced by the food price crisis that began in 2007-2008. On the positive side, the crisis focused the attention of West African policy makers and their development partners on the importance of boosting the region's agricultural growth. Although all had endorsed CAADP's objectives in 2003, the 2007-2008 crisis focused attention on the urgency of putting them into practice. On the negative side, the urgency of the crisis led many governments to launch emergency food production programs in 2008 and 2009, such as Senegal's *Grande offensive agricole pour la nourriture et l'abondance* (GOANA) and Mali's *Initiative Riz.* These programs, launched prior to the design of the NAIPs, aimed to boost domestic production of basic staples— mainly cereals—very rapidly, in part through heavy subsidies on agricultural inputs such as fertilizer and seeds. Because these crash food production programs absorbed a large portion of the governments' rural development budgets, they had to be retrofitted into the overall CAADP investment plans. The CAADP plans, which in principle aimed to address long-run structural constraints to sustainable agricultural growth, often ended up instead having a very ambitious short-term focus.

The short-term focus was in part driven by CAADP's explicit link to the Millennium Development Goal objective of halving the poverty rate between 2000 and 2015. In order to achieve this ambitious goal, modeling suggested that most countries needed to achieve a

[4] The WAEMU countries have a much longer history of regional collaboration than does ECOWAS, as they have been members of a monetary union that has existed since their Independence, with their currency initially tied at a fixed parity to the French franc and subsequently to the Euro. Maintaining a common currency has required tight collaboration on macroeconomic policies. In 1994, following the devaluation of the CFA franc, the monetary union broadened its mandate to include creation of a free-trade zone, leading to the development of WAEMU's regional agricultural policy, PAU (*Politique Agricole de l'UEMOA*). For discussion of the similarities and the differences between the PAU and ECOWAP, see Hollinger and Staatz (2015), pp. 276-86. In developing ECOWAP, ECOWAS coordinated its efforts with other regional organizations, such as WAEMU and CILSS, often delegating to them specific components of the ECOWAP program. As noted below, such coordination in recent years has not been perfect, as the latter organizations have sometimes developed programs independently of ECOWAS (see Oxfam (2015) for details).

sustained annual agricultural growth rate of at least 6% per year, which was substantially above the historical and fluctuating rates achieved in the past.

In addition to the heavy short-run production focus of the plans, the NAIPs often had the following characteristics:[5]

- A strong emphasis on production of staples, particularly rice, for which the region is heavily dependent on imports. Much of the infrastructure investment called for in the NAIPs focused on expanding irrigation facilities for rice production. Most plans allocated a relatively small proportion of their budgets to livestock products and other perishables, such as fruits and vegetables, for which demand is growing rapidly. [6]
- A primary focus on farm-level production as opposed to the off-farm elements of the agrifood system, such as wholesaling, agro-processing, and retailing.
- Although the overall CAADP program had a major stated focus on increasing agricultural productivity, in practice, many of the NAIPs placed more of an emphasis on raising *production*, e.g., through the use of input subsidies, than on increasing *productivity* per se. While production can be raised by increased use of various inputs, this does not necessarily result in lower-cost food if the inputs are costly to society. Productivity increases, on the other hand, involve adopting new technologies, organizational methods and production practices that lower per-unit costs of production, thereby allowing production to expand without prices necessarily having to increase.[7] The *productionist* approach was manifested in the heavy emphasis on input subsidies relative to investments in research, development, and extension that could generate productivity-enhancing innovations.
- A concentration of the investments devoted to institutional capacity building on farmer organizations, with many fewer funds devoted to agricultural higher education and research organizations and to units charged with policy implementation, monitoring, and evaluation.
- A heavy reliance on external funding. The 12 NAIPs for which detailed budget data are available called for an average of 68% of their total costs to be covered by sources other than the national governments (i.e., development partners and the private sector). The figures ranged from 31% for Niger to 90% for The Gambia (Hollinger and Staatz 2015, p. 284). This heavy reliance on external funding was largely due to the very ambitious production targets of the plans, a function, as explained above, of the desire (pushed heavily by the development partners) to meet the Millennium Development Goal of halving the rate of poverty between 2000 and 2015.
- Relatively little emphasis on mobilizing private investments, beyond those of small-scale farmers and their associations, to achieve the goals of the plans. The plans put heavy emphasis on public and donor investments, but paid relatively little attention on how to create incentives for larger domestic and international private-sector actors to invest in both farm-level production and agro-processing.

[5] For details, see Hollinger and Staatz (2015), pp. 280-310.
[6] See Chapter 7 in this volume.
[7] In the jargon of the economist, a productivity increase represents an outward shift in the supply curve, allowing greater output for a given expenditure on inputs. This is contrasted with increasing production by simply moving along a static supply curve, expanding output at increasingly higher marginal costs of production.

- Inclusion of components addressing crisis prevention and social safety nets. Seven of the 12 NAIPs for which detailed budget information is available included programs to improve food crisis prevention and management, improved nutrition, and social safety nets. These NAIPs, thus, recognized that given the climatic and social risks facing the region, such programs need to be part of an agricultural growth agenda.

A few figures from Senegal's NAIP budget for its first five years illustrate these issues. The budget allocated 59% of its resources to improving production at the farm level, compared with 5% allocated to improving market access, 1% to strengthening the capacity of various stakeholders such as farmer groups and inter-professional organizations, and 0.6% each for improving agro-processing and financing agricultural research. Because of the emphasis on increasing farm-level production rapidly, the budget allocated only 31% to investment costs, with the rest going to recurrent costs, of which more than two-thirds went to input subsidies (Staatz and Hollinger 2016).

The regional investment plan and associated policy measures aimed to complement the NAIPs. The first phase of the regional program included three components:

1. Three mobilizing and federating programs.
    - The first focused on investments to promote production, marketing and processing of products deemed to be strategic in improving the region's food sovereignty. These included rice, cassava, maize, livestock, meat, and fish.
    - The second program aimed to help create an environment conducive to regional agricultural development, including more fluid regional trade. Among the key components of this second program was support to ECOWAS's ongoing efforts to ensure mutual recognition across member states of standards for fertilizers, and improved seeds and pesticides. This mutual recognition would allow inputs approved in one member state following regional protocols to be sold in all member states. Such a provision is critical to attracting foreign investment in these input industries, as it frees companies from having to go through separate approval processes in each of the 15 ECOWAS countries.
    - The third program focused on reducing food insecurity and promoting sustainable access to food, including developing a regional food reserve and experimenting with various models of social safety nets.
2. A set of policy measures, including those fostering free trade within the region, aimed at promoting adoption of the mobilizing programs.
3. An institutional implementation framework within ECOWAS, including a regional agricultural development fund, a regional agency for agriculture and food to help steer the implementation of the regional development programs, a consultative group of stakeholders, an interdepartmental Committee for Food and Agriculture within the ECOWAS Commission, and a monitoring and evaluation system.

Unlike the NAIPs, the RAIP did not set explicit production targets, as ECOWAS intended the RAIP to complement the production activities included in the national plans. Like the NAIPs, the regional program was heavily dependent on external financing. The proposed budget for the NAIP was US $900 million over five years, of which ECOWAS pledged to provide US$150 million (17%). As Allen, Heinrigs, and Sibiri (2015) point out, the heavy reliance of both the

national and the regional investment plans on outside funding raises serious questions about whether such programs could really promote food sovereignty. It is difficult to be sovereign if someone else is paying most of the bills.

Parallel to the development of the ECOWAP/CAADP program, negotiations continued among member states over the structure of the Common External Tariff and related trade safeguard measures (Hollinger and Staatz 2015 Chapter 12). In 2006, the ECOWAS Heads of State had authorized the extension to all member states of the CET that had previously been adopted by the eight WAEMU countries. The WAEMU CET included 4 tariff bands, with duties ranging from 0% in the lowest band to 20% in the highest. Within ECOWAS, several countries, including Nigeria, called for the creation of a fifth band with a higher rate (up to 50%) to provide protection to sectors, such as rice, sugar and palm oil, that these countries felt were threatened by imports. Over the period 2006 and 2014, debate continued over the creation of the fifth band, the level of import duty to be associated with it, and which products it would include.

The long and contentious negotiations reflected differing interests among ECOWAS member states with respect to desired levels of import protection. Countries with large urban populations heavily dependent on imported products such as rice opposed high tariff rates on these items, while those with less competitive sectors and stronger farm lobbies favored both a higher rate for the fifth band and a broad range of products to be included in it. When agreement was finally reached, the fifth band rate was set at 35% and was applied to only 2.2% of the total tariff lines (products) in the ECOWAS import schedule. Products falling under the fifth band included mainly animal-based products, selected vegetable products (e.g., potatoes, onions, and shallots), and certain processed products, such as oils, soap, cocoa powder, chocolate products, and fabrics. In addition, safeguard measures were adopted that either raised or lowered import taxes temporarily in response to import surges or shortages (see Chapter 9 in this volume for details). The CET regime entered into force in 2015.

Despite various shortcomings, the ECOWAP/CAADP program demonstrated several strengths relative to previous agricultural development policies in the region. The move towards a sector-wide approach to agricultural development planning represented a more coordinated and potentially less duplicative process than the previous project-led approach. In many of the countries and at the regional level, the setting of objectives and strategies was more participative than previously, although farmer groups expressed the view that it could have been more so (van Seters, Afun-Ogidan, and Rampa 2012; Hollinger and Staatz 2015 Focus Section B). The linking of national strategies to a regional strategy was done in a thoughtful manner, with clear criteria about which activities should be undertaken at each level and with a recognition of regional spillovers, potential scale economies (e.g., in agricultural research and emergency preparedness) and the importance of maintaining fluid regional agricultural trade. The incorporation in many of the NAIPs and in the RAIP of a component focused on social safety nets and food crisis mitigation and management revealed recognition that agricultural development strategies in the region need to address protection of poor consumers from natural and human-made crises if the strategies are to be inclusive and politically acceptable. The development of the NAIPs, under ECOWAS leadership, using a common approach and supported by workshops that brought all the national design teams together, created a process of mutual learning and peer review. And the development of the CET and associated safeguard measures as a complement to the ECOWAP/CAADP agricultural policies offers the prospect

of a more unified trade response across the region to soaring or collapsing international agricultural prices than has happened in the past.

Initial Implementation and Impacts of the Programs

Even though ECOWAP was officially launched in 2005, its design in earnest began in 2008, and most of the NAIPs and the RAIP, which are the instruments that guide the investments, were only validated and approved by stakeholders between 2010 and 2013 (Covic and Hendriks 2016). Therefore, the programs, both at the national and regional levels, have only been officially underway for a few years, making it early to measure their impacts. In particular, between 2010 and 2015 the regional program focused mainly on setting up the new organizations, such as the Regional Agency for Agriculture and Food, which were charged with implementing the program, providing limited support to a regional rice production initiative (which was implemented largely through national programs), and the launching of the regional food reserve (Allen, Heinrigs, and Sibiri 2015; Oxfam 2105; ECOWAS 2016). The national programs initially concentrated most of their efforts on extending the production initiatives that had been launched in the immediate aftermath of the food crisis. In 2008 and 2009, these efforts concentrated heavily on expanding rice production, with a strong emphasis on input subsidies and extension efforts. In more recent years, the efforts have expanded to other crops, such as maize and cassava, and, in some instances, to livestock and fisheries.

Measuring the initial impacts of the programs is difficult because many have been under way only for a short time, and some of the investments, such as in irrigation infrastructure, take time to make their impact felt. In addition, factors other than the ECOWAP/CAADP programs have affected production, ranging from weather conditions to the Ebola epidemic that swept several coastal countries in 2014-2016 and the terrorist attacks that have occurred across the Sahel beginning in 2011. Nonetheless, some early indicators suggest the effects of the region's renewed policy emphasis on agricultural investment and growth.

In terms of public investments, West African governments and their development partners have given greater priority to expenditures on the agricultural sector since 2008. While average annual real government expenditures of the ECOWAS countries on agriculture (measured in 2010 US dollars) remained essentially static between 2003-2008 and 2008-2013 (at US$1.3 billion), the share of total government budgets going to agriculture increased modestly, from 3.8% in 2003-2008 to 4.1% in 2008-2013 (Covic and Hendriks 2016). This regional average was well below the CAADP target of 10%, but there was considerable variation among the 15 ECOWAS countries. Seven countries actually reduced the share of public spending allocated to agriculture, six increased it but failed to reach the 10% threshold, and two (Burkina Faso and Mali) exceeded it (Covic and Hendriks 2016; ECOWAS 2016).[8]

Development partners' commitment, as measured by the percentage of Official Development Assistance (ODA) going to agriculture in the ECOWAS zone, grew more strongly, from an average of 4% in the 2003-2008 period to 7% in 2008-2014, and increasing further to 8.8% in

[8] There is debate over the usefulness of the percentage of the budget allocated to the agricultural sector as an indicator of government support of agricultural and agrifood system development. In an increasingly commercialized agricultural sector, agrifood system development also depends on expenditures on items such as transportation, education, and electricity supply. For a discussion of this issue, see Hollinger and Staatz (2015), pp. 288-89.

2015. Disbursements of agricultural ODA as a percentage of total commitments fell slightly over the period, however (from 73.9% in 2003-2008 to 71.9% in 2008-2014), reflecting perhaps problems in program implementation (Covic and Hendriks 2016). Strong funding gaps persisted in the NAIPs and the RAIP. For example, in late 2015, ECOWAS had succeeded in mobilizing only 10% of its already meager contribution to financing of the RAIP; and in early 2017 the regional farmers' organization ROPPA complained that ECOWAS had not contributed any of its own funds to either the regional food reserve or the various structures established under ECOWAP to help finance the agricultural sector.[9] Although donor funds had flowed into the regional ECOWAP program, most of those were focused on establishing the regional food reserve and building monitoring and evaluation capacity (Staatz and Hollinger 2016; Niang 2017).

In terms of the evolution of agricultural production, the annual growth rate of value added in West African agriculture actually fell from the 2003-2007 period, when it averaged 5.5%, to the 2010-2014 period, when it averaged 4.0%. This downturn in the average rate of growth for the region as a whole masked considerable variation across countries, however, with three countries coming close to or meeting the CAADP 6% annual growth rate target (ECOWAS, 2016). In terms of specific commodities, Table 13.1 compares average annual growth rates of selected products over the period 2009-2013 (which represents the initial five years of the implementation of many of the NAIPs and their predecessor crash production programs) with the preceding five-year period (2004-2008). Because Nigeria accounts for about 50% of the zone's production of many agricultural products and hence strongly influences regional averages, the table shows production growth rates for Nigeria and the rest of the ECOWAS zone separately as well as for the region as a whole.

Table 13.1. Annual Growth Rates of Production, ECOWAS Region: 2004-08 vs. 2009-13

Commodity	ECOWAS		Nigeria		ECOWAS excluding Nigeria	
	2004-2008	2009-2013	2004-2008	2009-2013	2004-2008	2009-2013
Rice	6.1%	7.9%	3.4%	7.9%	8.1%	7.9%
Cassava	3.6%	7.6%	3.2%	9.5%	4.3%	4.4%
Maize	6.0%	6.6%	7.5%	8.5%	4.2%	4.6%
Fruits and vegetables	0.2%	3.2%	-0.9%	2.6%	1.9%	4.1%
Milk	9.1%	-0.6%	0.5%	5.2%	10.6%	-1.5%
Vegetable oils	3.0%	-0.8%	3.9%	-2.6%	1.3%	1.8%
Meat	3.4%	-2.6%	2.4%	-7.3%	4.2%	1.9%

Source: Calculated from FAOSTAT (2016) data.

Bearing in mind all the caveats mentioned above about possible confounding factors that could have affected these growth rates, the table suggests that the initial impact of the ECOWAP/CAADP programs has been modest and mixed. For the three starchy staples (rice,

[9] ROPPA = Réseau des Organisations Paysannes et de Producteurs de l'Afrique de l'Ouest (Network of Peasant Organizations and Producers of West Africa)

cassava, and maize) that were the focus of the regional ECOWAP/CAADP plan as well as many of the NAIPs, growth rates for the region as a whole accelerated and exceeded 6% per year in the 2009-2013 period. However, according to the FAOSTAT data, the increase in the regional growth rate was entirely due to increases in the growth rate for these three commodities in Nigeria. The table suggests that the rapid growth of the three crops in the non-Nigerian portion of ECOWAS began before the implementation of the NAIPs and RAIP.

The table indicates that the rate of growth of fruit and vegetable production increased modestly throughout the region in the 2009-2013 period, even though fruits and vegetables were not the main focus of the first phase of the ECOWAP/CAADP program. This increase may simply represent a private-sector response to the growing demand for fruits and vegetables in the region (see Part II of this volume) as well as in export markets.

In contrast, production of meat, milk and vegetable oils, for which demand is also growing rapidly, showed sharp drops in their rates of growth (with the rates turning negative in some instances), but with substantial variation between Nigeria and the rest of the ECOWAS zone. The declines in the growth rate for meat production may reflect in part disruption in the northern parts of West Africa due to Boko Haram and other jihadist attacks (e.g., in Mali).

With the entering into force of its CET in 2015, ECOWAS gained a major tool for the realization of its plan to create effective common market for West Africa. Creating such a market for the 350 million West Africans is critical to improving access of agro-processors to raw materials from throughout the region and attracting foreign investment in agribusinesses, including the fertilizer and seed industries (Hollinger and Staatz 2015). In reality, however, in spite of the creation of the CET and the establishment years earlier of the ECOWAS Trade Liberalization Scheme, numerous barriers to free trade within the region persist. The security and health crises that have afflicted many countries in the region have in recent years have led to understandable efforts to restrict movements of people and to inspect goods shipments along highways, which have compounded the difficulties of trying to make the ECOWAS vision of a West African common market a reality (ECOWAS 2016).

13.3. Looking to the Future: ECOWAP + 10 and Beyond

The ECOWAP + 10 Process

In 2015, ECOWAS launched a yearlong consultation process with a broad array of stakeholders to evaluate the performance of the first 10 years (2005-2014) years of ECOWAP and to propose modifications for the next 10-year period from 2016 through 2025. This process was known as ECOWAP + 10 and culminated in an international conference of stakeholders in Dakar at which major conclusions from the review were debated and proposals for modifications were presented (ECOWAS 2015a, 2015b).

The review highlighted many of the shortcomings of the program discussed above and called for the following modifications over the coming 10 years (ECOWAS 2015b; ECOWAS 2015c; Staatz and Hollinger 2016; ECOWAS 2016):

- Placing a greater emphasis on the off-farm components of the food system, with a particular focus on improving vertical coordination throughout the system—for

example, through a greater use of contracting among value-chain participants and the creation and strengthening of regional inter-professional organizations.[10]

- Focusing more on value chains dealing with perishable products, particularly fruits, vegetables, milk, meat and fish, for which demand is expanding rapidly.
- More strongly incorporating nutritional and food safety components into the program.
- Mainstreaming gender considerations into the design and implementation of the programs, particularly regarding technology development and extension, and taking account of how increasing commercialization of agriculture affects the division of labor within farm households.
- In light of the large number of young people entering the labor market, promoting job creation throughout the food system. This should be done by focusing on structural problems such as improving training in the skills needed in a modernizing agrifood system, strengthening access to better technologies through research and outreach, and addressing problems of land tenure and access to financing that limit entry into farming and agro-processing.
- Increasing the emphasis on creating incentives for private-sector actors other than small family farmers to participate in the programs and broaden their investment in the agrifood system.
- Reallocating efforts from program design to program implementation, monitoring, and evaluation. In the words of one delegate from Sierra Leone, it is time for ECOWAP "to move from talk, talk, talk to work, work, work."

In addition to the joint review organized by ECOWAS, other organizations such as OECD (Allen, Heinrigs, and Sibiri 2015) and Oxfam (2015) conducted their own assessments of ECOWAP. These highlighted ECOWAS's failure to fund its proportion of the regional program (due in part to its need to divert funds to address pressing security and health crises ―such as the Ebola epidemic―in the period following 2010) and the lack of coordination between several new donor-driven initiatives and the ECOWAP regional program.[11] Oxfam (2015) attributed this lack of coordination to donors' need to respond to the timing schedules of their own funding and project management cycles and to their domestic clienteles, as well as their concerns about the implementation capacity of ECOWAS, particularly the newly created and still understaffed Regional Agency for Agriculture and Food. Increasingly, Oxfam argued, external funders were choosing to work with other regional organizations, such as CILSS and WAEMU, rather than ECOWAS, doubting ECOWAS's implementation capacity. While in principle these other regional organizations worked in concert with ECOWAS, in practice, they sometimes designed the new programs jointly with the donors, and ECOWAP then was obliged to adapt its program to them.

The hope of the organizers of the Dakar conference was to reach enough agreement on the objectives and approaches to be followed in the regional program for the next 10 years to be able to sign a new regional compact covering ECOWAP + 10. Disagreements, especially among some of the technical and financial partners and ECOWAS on modalities for implementation, including monitoring and evaluation, prevented agreement, and discussions

[10] See Chapter 12 in this volume.

[11] Hollinger and Staatz (2015) also had earlier raised concerns about new donor-driven activities, sometimes being initiated outside of, or with little coordination with, the CAADP framework.

continued throughout 2016. Although a revised investment program for the period 2016-2025 was approved by ECOWAS in December, 2016, as of February, 2017, the donors had not yet signed off on either that program or the new regional Compact.

Policy Challenges Moving Forward

West African policy responses to the challenges of agricultural development and agricultural regional integration have definitely improved since the mid-2000s. In almost all countries in the region, agricultural development now enjoys a higher priority in policy discussions and statements than in previous decades. In several countries the budget allocations to agriculture, both by national governments and their development partners, have increased. Thanks to the efforts of WAEMU and ECOWAS, most countries' policies incorporate regional cooperation and trade as components of their agricultural development strategies, even though the experience of the 2007-2008 crisis showed that this element can be fragile when faced with spiking food prices.

Strong challenges remain, both for the individual countries (where most of the investments and reforms need to take place) and for the region as a whole. These include, among others:

- Shifting the level and mix of food production to respond to West Africa's rapidly evolving demand in order to compete effectively with food imports.
- Addressing the potentially explosive issue of providing more secure land tenure in an environment where the demand for good agricultural land is rising sharply because of higher agricultural prices and rising population pressure.
- Creating attractive jobs for the millions of young people entering the labor force over the coming decade.

In addressing these challenges, three policy issues need to be addressed:

The Mix vs. the Level of Funding: While increased funding for agricultural development is important, the mix of funding is at least as equally important. As discussed above, much of the design of the first phase of the ECOWAP/CAADP program, both at the national and the regional levels, appears to have been crisis-driven. It therefore aimed at pouring resources, often in the form of input subsidies, into rapidly boosting production in the short run. This approach resulted in fewer resources being available to address longer-term structural issues, such as support of agricultural research systems and reform of educational systems to provide the personnel needed for a 21st Century agrifood system. The short-term focus is also reflected in crash programs to promote agricultural mechanization in some countries, which have been characterized by distribution of subsidized tractors. While such ad hoc efforts may help deliver a message of political support to the agricultural sector, they are often undertaken with no long-term strategy of targeting equipment to the needs of different classes of farmers.[12] In West Africa's democracies, it is inevitable that important groups of voters, such as farmers, will benefit from certain targeted programs, such as these. The challenge for policy makers is to design such programs so that they can address not only short-run needs but also underlying structural problems. For example, can programs that provide subsidized tractors be designed

[12] For a discussion of this issue in the context of Mali, see Sanogo and Diallo 2017.

in a way that helps young people launch custom tractor hire services, thereby creating jobs for the youth while at the same time providing needed mechanization services to small farmers?

Another key dimension in the mix of funding is the mix between public and private funding. Experiences from many countries around the world suggest that if agricultural programs and more general economic policies create an attractive environment for national, regional and international private investors—for example, through clearer rules on land acquisition for both farm-level production and agro-processing and transparent commercial courts to adjudicate business disputes—private funds and technical expertise will flow into production. This will help free public resources to concentrate on key public goods, such as agricultural education, research, and infrastructure that are critical to catalyzing and ensuring broad benefits from private-sector-led growth.

Policy Coordination: In an increasingly modern agrifood system open to international trade, policy issues frequently transcend the traditional mandates of ministries of agriculture. They include, for example, questions related to health and nutrition, transportation, regional trade, energy, and emergency relief. Addressing these questions requires policy coordination among (i) sectors (agriculture, health, trade, energy, industry, transport); (ii) actors (farmers, consumers, traders, processors); (iii) different levels of government, from supra-national to local levels; and (iv) governments and their development partners. The CAADP/ECOWAP process created procedures that try to foster coordination among many different stakeholders, but as Oxfam's review (2015) suggests, this coordination is far from perfect. To foster intersectoral coordination in the implementation its regional investment program, the ECOWAS Commission created the ECOWAS Inter-departmental Committee on Food and Agriculture, which includes representatives from ECOWAS departments outside of agriculture (such as trade and industry, infrastructure, and energy) that supervise the regional programs critical to the development of the agrifood system. As of the end of 2015, however, the Committee had yet to meet, let alone try to foster and coordinate with similar units in the ECOWAS member states. Similar units exist in a few countries, such as Ghana, but much remains to be done.

Policy Implementation: A principal message that emerges from the review of the first ten years of ECOWAP/CAADP is that its main shortcoming is not its conceptual design but its weak implementation. The program identifies many of the key constraints limiting agrifood system growth and integration in West Africa, but the initial years of the effort have revealed a weak capacity to implement many of the proposed solutions. For example, while progress has been made in harmonizing seed policies across ECOWAS countries, as of early 2017 no member state had yet registered a new variety using the ECOWAS procedure that would allow it to be sold across the region (Barker 2017). In one sense, the very ambitiousness of the ECOWAP/CAADP production goals could be considered a design flaw. While setting ambitious goals may sometimes be helpful in mobilizing support for an effort, there is a danger that the very ambitious ECOWAP/CAADP goals, if not met, may lead governments and their development partners to become disillusioned with agricultural development and turn to a new development fad that ignores the fundamental importance of the agricultural sector.

Strengthening policy implementation will require three things (Hollinger and Staatz 2015, pp. 33-35): strengthened implementation capacity, improved data, and alignment of incentives.

Strengthened Capacity: including monitoring and evaluation capacity will require improved training and information at several levels. At the regional level, both the new Regional Agency for Agriculture and Food and the ECOWAS Monitoring and Evaluation (M&E) unit are understaffed, yet there has been little effort to mobilize the expertise in West African universities and private consulting firms to help reinforce their capacity, or that of national M&E units. At the national level, enforcement of regional free-trade rules is frequently in the hands of customs agents at the border, some of whom lack information on the regional agreements. As many governments within the region pursue policies of decentralization, implementation of important measures concerning issues such as land tenure and agricultural support services are increasingly allocated to local units of governments, farmer organizations, and other civil society groups. Yet the level of training of those charged with such responsibilities and the technical and policy information available to them is often woefully weak. Similarly, the ECOWAP/CAADP program calls for stakeholder groups to be involved not only in their implementation but also in their monitoring and evaluation. This will require strengthening their M&E skills.

It is impossible to implement effective policy if one does not know how situations are evolving on the ground. Lack of *reliable and timely data*, particularly on the off-farm elements of the agrifood system (such as agro-processing, wholesaling and retailing), severely limits the development of empirical food policies. While the World Bank and the Bill and Melinda Gates Foundation have invested considerable resources in recent years to improve the quality of farm-level production data, a similar effort is needed for the post-harvest segments of the agrifood system if food policies in West Africa are to be effective.

Finally, *aligning incentives* among the various actors involved in policy enforcement is critical to its effective implementation. In the ECOWAS region, this involves aligning incentives at two levels: (a) among member states versus the region as a whole and (b) among the individual agents charged with enforcing regional or national policies. In terms of national and regional alignment, this will likely require a *carrot-and-stick* approach. The ECOWAP program proposes, for example, withholding some regional funding from member states that do not respect their commitment to open regional trade. This stick provision may need to be complemented, however, with the carrot of some regional funding for social safety net programs in the poorer countries to help them deal with the potential risk of their richer neighbors bidding away food from them during periods of high prices. The alignment of individual and group incentives linked to policy implementation involves dealing with problems of bureaucratic red tape and rent-seeking by those charged with policy implementation. While improving salaries for government agents such as customs and police officers may help reduce such behavior, so might linking the funding of their agencies to performance on independently monitored indicators of ease of doing business.

Perhaps the best incentive for more effective policy implementation will come from encouraging strong private sector and civil-society organizations and a free press to act as counterweights to inefficient or corrupt policy implementation. The creation of strong stakeholder organizations is critical to maintaining an ongoing policy commitment to agricultural and agrifood system development when political leadership in a country changes. Without pressure from well-organized interest groups to keep a focus on agriculture, there is a risk that new leaders will appeal to other constituents (including the increasingly numerous

urban population) to pursue programs that turn attention away from the need for building a 21st Century agrifood system.

References

Allen, T., P. Heinrigs, and J.Z. Sibiri. 2015. *ECOWAP+10: Mutations de l'économie agro-alimentaire et implications.* Version provisoire. Paris : OECD, Secrétariat du Club du Sahel et de l'Afrique de l'Ouest. Available at https://www.oecd.org/swac/publications/ECOWAP10.pdf.

Barker, Ian (Head of Agricultural Partnerships, Syngenta Foundation for Sustainable Agriculture). 2017. Personal communication.

Covic, N. and S.L. Hendriks (Eds). 2016. *Achieving a Nutrition Revolution for Africa: The Road to Healthier Diets and Optimal Nutrition*. ReSAKSS Annual Trends and Outlook Report 2015. Washington, DC: IFPRI. Available at https://www.ifpri.org/publication/achieving-nutrition-revolution-africa-road-healthier-diets-and-optimal-nutrition.

ECOWAS. 2015a. *Agriculture and Food in West Africa: Trends, Performances and Agricultural Policies.* Abuja, Nigeria: ECOWAS. http://www.hubrural.org/Nouvelle-publication-L-agriculture.html?lang=en.

ECOWAS. 2015b. Assessing 10 Years of ECOWAP Implementation: Review Ecowap + 10. Report presented at the International Conference on Agriculture in West Africa, 17-19 November, 2015. Dakar, Senegal.

ECOWAS. 2015c. Outlook, Orientations and Adjustments for ECOWAP for 2025. Report presented at the International Conference on Agriculture in West Africa, 17-19 November, 2015. Dakar, Senegal.

ECOWAS. 2015d. Regional Agricultural Policy for West Africa: ECOWAP. Abuja, Nigeria: ECOWAS Department of Agriculture, Environment, and Water Resources.

ECOWAS. 2016. ECOWAP/CAADP Process 2025: Strategic Policy Framework 2025. Document adopted by the Ministerial Committee on Agriculture, Environment and Water Resources, 12 December, 2016. Abuja, Nigeria: ECOWAS Department of Agriculture, Environment, and Water Resources.

FAOSTAT. 2016. Online database. Accessed July 15, 2016 at http://www.fao.org/faostat/en/#home.

Hollinger, F. and J.M. Staatz, eds. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers*. Rome: FAO and African Development Bank. http://www.fao.org/3/a-i4337e.pdf.

Niang, N.F. 2017. "Financement de l'agriculture: Le Roppa dénonce le peu d'engagement de la CEDEAO." *Le Quotidien*, 4 February. http://www.lequotidien.sn/financement-de-lagriculture-le-roppa-denonce-le-peu-dengagement-de-la-cedeao/.

Oxfam. 2015. *ECOWAP: A Fragmented Policy.* Oxfam Briefing Paper. Oxford, UK: Oxfam. https://www.oxfam.org/sites/www.oxfam.org/files/file_attachments/bp-ecowap-fragmented-policy-131115-en.pdf.

Sanogo, Z.J-L. and B. Diallo. 2017. Etat des lieux sur la mécanisation agricole et l'accès des producteurs à la technologie au Mali. Paper presented at the Conférence sur la transformation de l'agriculture ouest-africaine par le développement de la mécanisation: quelles politiques publiques ? sponsored by The Syngenta Foundation for Sustainable Agriculture and the Hub Rural, February 2017. Dakar, Senegal. Can be accessed at http://fsg.afre.msu.edu/srai2/ETAT_DES_LIEUX_et_ACCES_A_LA_MECANISATION_PAR_LES_PRODUCTEURS_AU_MALI.pdf.

Staatz, J. and F. Hollinger. 2016. *West African Food Systems and Changing Consumer Demands*. West African Papers No. 04. Paris: OECD Publishing. http://dx.doi.org/10.1787/b165522b-en

van Seters, J., D. Afun-Ogidan, and F. Rampa. 2012. Regional Approaches to Food Security in Africa: The CAADP and Other Relevant Policies and Programmes in ECOWAS. ECDPM Discussion Paper 128d. Maastrich, The Netherlands: European Centre for Development Policy Management. http://ecdpm.org/wp-content/uploads/2013/10/DP-128d-Regional-Approaches-Food-Security-Africa-CAADP-ECOWAS-2012.pdf

Part V: Conclusions & Policy Implications

West Africa’s agricultural growth prospects have never been stronger. Greater regional integration and better policy implementation are critical to realizing these prospects for the region’s next generation.

CHAPTER 14

Conclusions, Policy Implications, and Lessons Learned

Conclusions, implications politiques, et enseignements

John M. Staatz, Boubacar Diallo, and Nathalie M. Me-Nsope

Abstract

This chapter highlights key findings of the SRAI research and policy outreach program, discusses their policy implications and how policy in West Africa is responding to the challenges they represent. The chapter concludes by presenting a few broader lessons that the SRAI team learned about the policy process in West Africa. Key findings include: (a) the high opportunity cost of measures taken to limit the transmission of price shocks in world grain markets to West African domestic economies; (b) the rapidly changing nature of food demand in West Africa; (c) how significant transaction costs are limiting the response of actors in the agrifood system to this changing demand and other challenges facing them; (d) the multiple pathways through which greater regional agricultural integration can help address those challenges; (e) the need to link the regional agricultural trade agenda to social-protection and risk-mitigation agendas; and (f) the need to focus beyond the farm level to entire value chains if West African agriculture is to be competitive even on a regional level. These findings imply that food policies, to be successful, need to take into account how demand patterns are changing (including the rapid growth in the demand for perishable products, such as animal-based foods, and fruits and vegetables) and increasingly link with concerns outside the traditional mandates of ministries of agriculture, such as nutrition and health. Bolstering regional trade will also require attention to *soft infrastructure*, such as harmonizing grades and standards and reforming trucking regulations, in addition to improving *hard infrastructure*, such as roads, ports, and telecommunications. Broader lessons learned include: (a) the critical importance of *good governance* aimed at limiting the rent-seeking behavior of those who are in a position to hinder regional integration; (b) how such integration is dependent on strengthening local policy analysis and outreach capacity; (c) the ongoing nature of policy outreach; and (d) the need to tailor policy interventions that have an overt political aim so that they also address underlying structural constraints to broad-based growth.

Résumé

Ce chapitre met en lumière les principales conclusions du programme de recherche et de sensibilisation politique SRAI, expose leurs implications politiques, explique comment la politique en Afrique de l'Ouest répond aux enjeux qu'elles représentent et esquisse quelques enseignements plus généraux que l'équipe de SRAI a dégagés concernant le processus politique en Afrique de l'Ouest. Les principales conclusions qui en découlent sont les

suivantes: (a) le coût d'opportunité élevé des mesures prises pour limiter la répercussion des chocs des cours mondiaux des céréales sur les économies des pays ouest-africains; (b) le changement rapide de la nature de la demande alimentaire en Afrique de l'Ouest; (c) les coûts de transaction élevés qui limitent les réactions des acteurs du système agroalimentaire face à cette évolution de la demande et aux autres enjeux; (d) l'existence de multiples moyens par lesquels une plus grande intégration agricole régionale peut contribuer à relever ces défis; (e) le besoin de relier le programme régional de commerce agricole avec les programmes de protection sociale et d'atténuation des risques et; (f) le besoin de s'intéresser aux chaines de valeur dans leur ensemble, au-delà du niveau de l'exploitation, si l'on veut que l'agriculture ouest-africaine soit compétitive, même à l'échelle régionale. Ces conclusions impliquent que pour réussir, les politiques alimentaires doivent tenir compte de la transformation des modèles de demande (notamment l'augmentation rapide de la demande de produits périssables, tels que les produits animaux, les fruits et légumes). Ces politiques doivent s'intéresser de plus en plus aux préoccupations traditionnellement hors du champ des missions des ministères de l'agriculture, comme par exemple la nutrition et la santé. Stimuler le commerce régional exigera aussi de faire attention aux *infrastructures* dites *soft ou institutionnelles*, à savoir l'harmonisation des catégories et des normes ainsi que la réforme des réglementations du transport routier, outre l'amélioration des *infrastructures physiques* telles que les routes, les ports et les télécommunications. Les enseignements plus généraux comprennent les éléments suivants : (a) l'importance cruciale de la bonne gouvernance visant à limiter la recherche de rente par ceux qui sont en position de miner l'intégration régionale ; (b) la nécessité de renforcer les capacités locales en analyse des politiques et sensibilisation ; (c) le besoin de mettre en place un programme continue et non ponctuel de sensibilisation dans le domaine des politiques et (d) le besoin d'adapter des programmes à court terme, en partie motivés par les considérations politiques, pour qu'elles remédient aussi aux contraintes structurelles qui minent la croissance.

14.1. Introduction

As discussed in Chapter 1, the Strengthening Regional Agricultural Integration (SRAI) program began in 2009 in the aftermath of the 2007-2008 world food crisis. As a result of that crisis, many West African leaders lost confidence in the reliability of international and regional markets as sources of food for their growing populations and called for increased national food self-sufficiency. Consequently, the region entered into a process of *globalization in reverse*, in which much of the impetus towards greater regional agricultural integration that had built up since the 1990s appeared to be threatened (see Chapter 2). While the SRAI program initially focused primarily on the impact of the 2007-2008 crisis on West African grain markets and the policy responses to it, the program gradually broadened its attention to cover several topics that are central to policies affecting regional agricultural integration. The resulting analyses fed into national and regional policy discussions that gained momentum following the crisis, as discussed in Chapter 13. Chief among these was the African Union's Comprehensive Africa Agriculture Development Programme (CAADP), which in West Africa was integrally linked to the ECOWAS Regional Agricultural Policy (ECOWAP).

The remainder of this chapter summarizes key findings from the SRAI program, discusses their policy implications and highlights lessons learned about the policy process in West Africa.

14.2. Key Findings

Six broad findings emerged from the SRAI program:

West African Governments Were Able to Reduce the Transmission of Global Price Shocks to Their Markets, but at High Cost

Among the countries analyzed (all in the CFA franc zone), about one-third of the magnitude of price changes in world rice prices (denominated in U.S. dollars (US$)) was transmitted to domestic markets over the period 2000-2008. A somewhat higher share (averaging around 40%) of global maize price changes was transmitted to those markets. During the height of the crisis (2007-2008), these shares increased, but never exceeded 40% for rice and averaged around 50% for maize in three of the four countries studied. Part of this muting of international price shocks was an artifact of the declining value of the dollar relative to the CFA franc over this period (a situation that has reversed since 2010), but much of it was due to policies implemented by West African governments to protect consumers. These policies included, among others, cuts in import taxes, export restrictions from traditionally grain-surplus countries, and subsidized sales to consumers. While partially successful in reducing pressure on consumers, the policies had high opportunity costs in terms of foregone government revenues that could have supported programs to expand domestic production and in terms of reduced price incentives to domestic farmers.

Food Consumption Patterns in West Africa Are Changing Profoundly

SRAI aimed to understand how West African countries responded to the 2007-2008 food crisis, but do so in the context of longer-term forces driving change in the region's agrifood system. It became apparent that chief among those driving forces is the changing pattern of food availability and consumption in the region. Per capita supplies of many agricultural products in the region have increased since 1990 as the result of improvements in agricultural technologies and infrastructure, more favorable economic policies, better weather, and expanded trade.[1] The analysis of food balance sheets covering the 30 years from 1980 through 2009 (Chapter 4) showed that per capita calorie, protein and fat availability increased, in some cases dramatically, in almost all of the 15 member states of ECOWAS. Furthermore, diets diversified. Amongst starchy staples, consumption increases were particularly dramatic for rice and wheat (supplied largely through imports), but also for maize, cassava and yams in several countries, while growth in per capita availability of millet and sorghum was much slower. More broadly, per capita availability of fruits, vegetables and animal products increased sharply across the region, with the greatest changes occurring in countries experiencing the most robust economic growth, such as Cape Verde and Ghana.

When demand is analyzed further by income group and place of residence (Chapters 5 and 7), it becomes evident that both urbanization and per capita income growth, including the expansion of West Africa's middle class, are pushing demand strongly towards perishables and products that are more convenient to prepare and consume. The projected percentage rate of growth of demand through 2040 for animal-based products, fruits and vegetables and vegetable oil all exceed that for cereals, with the bulk of the increase in demand coming from urban areas (Chapter 7). The evidence also suggests that improvements in grain processing has increased

[1] For details, see Hollinger and Staatz (2015), Chapters 2 and 11.

the willingness of consumers to substitute milled coarse grains, such as maize, millet and sorghum, for rice during periods of sharp price increases for rice (Chapter 5).

Processed products and perishables incorporate a much higher degree of post-harvest value-added (through processing, packaging and marketing) than do basic staples, offering the potential to create many additional jobs in the non-farm segments of the agrifood system. At the same time, three-quarters of the population of the region continues to subsist on less than US$2 per day and has a primary focus on obtaining basic calories at the lowest price possible. The degree to which West African staple food value chains can be competitive globally (see Chapters 10 and 11) will largely determine whether these consumers will *eat locally* or turn to imports.

West African Agrifood System Actors Are Responding to New Opportunities, but Face High Transaction Costs

West African farmers, input providers, merchants, agro-processors, exporters and retailers are responding innovatively to many of the changes in demand, international market conditions, technologies and physical environment that they face. The rapid expansion in the production of rice, maize and cassava in the region in recent years reflects farmers' response to burgeoning demand and the adoption of new technologies, such as the NERICA rice varieties. Peri-urban horticultural and dairy producers have rapidly grown their operations in response to consumers' diversification and upgrading of their diets. Regional trade in agricultural products within West Africa, although imprecisely measured, appears to have expanded rapidly since the 1990s (see Chapter 3). The emergence of new regional trade corridors reflects adaptation to changing regional patterns of demand, such as the growing demand for feed grains in Nigeria. As economic policies and agricultural prices in the region have become more favorable, domestic and international firms have increasingly invested in agricultural production and agro-processing. As discussed in Chapter 12, they are experimenting with various partnership models to link small and medium-scale farmers into their enterprises. Agro-processors, ranging from large-scale industrial operations to small-scale street-food producers, have developed new forms of convenient fast foods for time-constrained urban consumers.

While actors across the agrifood system have shown remarkable dynamism in responding to changes in their socio-economic and physical environments, they have faced substantial transaction costs in doing so. Some of these stem from increased physical insecurity in West Africa in recent years. Many, however, result from policies that change frequently, are sometimes inconsistent across countries and are often opaque in their application. This is particularly the case with rules governing trade in both agricultural products and inputs among different countries within the region. Because the rules are not always clear to all involved, enforcement tends to be arbitrary, opening the door to corruption and other unofficial fees. Reducing these transaction costs will be an important step in increasing the responsiveness of actors throughout West Africa's agrifood system to the new opportunities facing them.

Regional Agricultural Integration Can Improve Growth and Food Security through Several Different Pathways

SRAI's research initially focused on understanding how disruptions in regional trade, such as ad hoc export bans, depressed local prices, raised market risks, and lessened the gains from

regional comparative advantage and specialization, thereby reducing incentives for farmers, traders and agro-processors to adopt productivity-enhancing technologies. As SRAI's work progressed, however, it soon revealed that regional agricultural integration has the potential to spur growth and food security through at least three major pathways:

Broadening markets for farmers, traders and agro-processors through establishment of transparent rules for regional trade and mutually recognized grades and standards across countries. Following the 2007-2008 crisis, rules changed frequently in an ad hoc manner from one country to another about the conditions under which agricultural goods could be imported or exported. Often these rule changes were poorly communicated to different actors in the value chains, leading to increased uncertainty about the conditions under which regional trade could take place. The resulting policy volatility increased the transaction costs for those engaged in regional trade. To offset the risks, traders offered lower prices to farmers in the exporting countries, charged higher prices to consumers in the importing countries, minimized investments in warehousing and other trade-related infrastructure and reduced the scale of their operations. Agro-processors were largely precluded from sourcing raw materials from neighboring countries and faced volatile domestic prices, in part because national governments did not honor the ECOWAS agreements regarding the free movement of agricultural goods within the region (see Chapter 9). As a consequence, many agro-processors turned towards imports as a more reliable and less costly source of raw materials.

Capturing economies of scale. With the exception of Nigeria, most national economies in West Africa are small by global standards. In 2015, of the 15 ECOWAS countries, 14 had fewer than 30 million inhabitants and 7 had fewer than 10 million (UNDESA 2017). The small national populations combine with low per-capita incomes and country-specific market regulations, grades, and standards to result in economies that are too small to capture the scale economies enjoyed by global agricultural powerhouses such as China, India, Brazil and Indonesia. The lack of scale inhibits competitiveness and efficiency in agricultural research, extension and agricultural higher education, as it is difficult to assemble a critical mass of specialists in all the domains facing agriculture in each country. It also impedes the production of productivity-enhancing inputs such as fertilizer and improved seeds. For example, no ECOWAS country except Nigeria has an annual consumption of urea close to the minimum efficient output of a urea factory (500,000 tons/year), and varying national fertilizer regulations across the zone have hindered the establishment of plants that could market to multiple countries (Hollinger and Staatz 2015). International seed companies have little incentive to invest in producing and selling improved germ plasm in the region if they have to go through separate approval processes in 15 different countries, many of them with very small markets. As discussed in Chapter 13, ECOWAS has made progress on paper in harmonizing many of these input regulations, but to date, implementation on the ground remains very limited. Until the West African market becomes much more integrated for such inputs, access of farmers to critical sources of improved productivity will remain limited.

Promoting consumers' ability to substitute across commodities. Consumers' ability and willingness to shift among different staple foods appears to be increasing in recent years, as diets have diversified, processed forms of maize, millet and sorghum have become more available, and per capita incomes have increased (see Chapters 4 and 5). But as the analysis in Chapter 6 vividly illustrates, the ability of consumers in Sahelian countries to substitute across staple foods during periods of shortfalls in domestic production or spikes in the world price of

rice depends critically on fluid regional trade. Both the poor and the nonpoor suffer from restricted trade during periods of local food shortfalls and higher world prices, with the poor absorbing the worst effects. For example, consider the scenario of a 50% increase in world rice prices and a moderate willingness of consumers to substitute from more expensive rice to cheaper staples such as millet, sorghum and maize as rice prices increase.

The analysis in Chapter 6 indicates that in this situation the urban poor's calorie consumption would fall by 7.5% if no increase in regional trade of the cheaper staples took place, while that of the urban nonpoor would fall by 3.5%. With the possibility of importing these cheaper staples from neighboring countries, the supply of such staples would increase, and the poor's calorie consumption would fall by 4.9% (35% less than under the restricted trade scenario) while the nonpoor's consumption would remain virtually unchanged from its level before the spike in world rice prices. Thus, while efforts to promote the greater availability of processed and easy-to-consume forms of coarse grains such as millet, sorghum and maize do increase the range of consumer choice, their ability to help protect consumers during periods of drought and world price spikes depends critically on maintaining fluid regional trade.

Addressing Regional Trade in the Absence of Social Safety Nets and Risk Mitigation Is a Non-starter

In low-income, grain exporting countries of West Africa, such as Burkina Faso, Niger, and Mali, policy makers are justifiably concerned that in periods of food shortages in neighboring countries, maintaining open borders will bid up domestic food prices, hurting their poor. The bidding wars between poor and nonpoor for food during periods of shortage described in Chapter 6 operate on a regional basis as well as on a national basis. Most of these low-income grain-exporting countries are surrounded by richer neighbors, leading to the risk that the neighboring countries could bid supplies away from poor Sahelian consumers. Maintaining open borders helps the poor in Sahelian countries during periods of local shortages in their own countries when other supplies are available from neighboring countries. The opposite, however, is not likely to be the case when the neighbors are short of food and want to import large quantities from the Sahelian countries. This is particularly true if the shortages are regional or global rather than localized. Most policy makers in the Sahelian countries understand that imposing export bans hurts long-term agricultural growth by depressing the incentives of farmers and traders to invest in boosting production. Many also understand that in the long run, increasing productivity throughout the value chain offers the prospect of holding down the price of food while maintaining the profitability of production and trade. But policy makers and politicians live in the short term and need to have reliable tools to protect vulnerable populations from spiking prices. As a result, the regional trade agenda needs to go hand-in-hand with the social protection agenda. There is a need to develop targeted social safety-net programs to protect the most vulnerable from the higher food prices that will result, at least in the short run, from burgeoning regional demand.

The need to link the trade agenda with an agenda dealing with risk mitigation and safety-net assistance to the vulnerable is reflected in the design of the ECOWAP/CAADP regional agricultural investment plan as well as may of the national plans (see Chapter 13). For example, the ECOWAP regional investment plan includes a component aimed at experimenting with and expanding various types of safety-net and disaster mitigation programs. Yet the design of such programs in a way that is financially sustainable is challenging in a region where three-

quarters of the population subsists on less than US$2 per day. Successful design will require, as an important component, improved understanding of the food consumption behavior of different income and social groups in the population, such as that discussed in Part II of this volume.

West African Agriculture Can Be Competitive, but only if the Entire Value Chain is Addressed

The analyses in Chapters 10 and 11 indicate that for key products such as rice and maize, selected West African production systems can be competitive with imports from overseas. But as stressed in Chapter 10's discussion of the competitiveness of West African irrigated rice systems compared with those of Asian exporters, competitiveness in the future will increasingly depend on the efficiency of post-harvest operations, such as milling, marketing and quality control. This finding is consistent with findings of other SRAI-supported work on determinants of import parity prices (Diallo, Dembélé, and Staatz 2010) as well as other analyses of the competitiveness of African agriculture (e.g., World Bank and FAO 2009; Hollinger and Staatz 2015). Unfortunately, until very recently, most agricultural policies and investment plans, such as those developed under ECOWAP/CAADP, have concentrated most of their attention at the farm level. They have devoted relatively few resources to improving the post-harvest segments of the value chain–segments that will increasingly determine the competitiveness of West African agriculture in the future (see Chapters 7 and 13).

This imbalance in focus has been recognized at the regional level, and plans for the 2016-2025 of the ECOWAP/CAADP program call for a much stronger value-chain approach to spurring agrifood system development (see Chapter 13). Such an approach will need to strengthen vertical coordination along entire value chains, from input provision to sale to the final consumer. Improved models, involving various forms of joint action and contracting, will be needed to link small farmers to the region's growing value-added markets if these farmers are to benefit from the growth of the value chains. Linking such smallholders to the burgeoning demand is also essential for ensuring that the resulting economic growth has a strong impact on reducing food insecurity. The case studies of contract-farming models summarized in Chapter 12 demonstrate that the ability of such models to address the financing and risk-management needs of different actors is critical to their success, but that no single model is optimum in all cases. These models need to be tailored carefully to the commodity in question and the physical and socio-economic environment in which it is produced. The analysis in Chapter 12 provides some guidance regarding which types of partnership models are likely to be most successful in different circumstances, but there is no substitution for careful efforts by the stakeholders involved to work out the particular details suited to a given setting.

14.3. Policy Implications and Policy Response

The preceding sections have already discussed, either implicitly or explicitly, some of the policy implications of SRAI's major findings. Among these is the need to shift the focus of agricultural policy from just farm policy to a broader food policy that takes into account the entire value chain, including its off-farm elements such as agro-processing, wholesaling and retailing. Given the increasingly regional nature of agricultural markets and the growing demand for healthier foods, such policies also need to address the links between agriculture,

trade, nutrition and health. This broader food policy focus thus involves areas beyond the traditional mandate of ministries of agriculture, necessitating much greater inter-ministerial cooperation and programming.

The evolving pattern of food consumption in the region implies that a firm understanding of the nature and dynamics of food consumption patterns is critical to designing demand-driven policies. Without understanding how demand is changing, policies are likely to miss important opportunities to promote growth and food security. In particular, SRAI's findings imply that while production and competitiveness of basic staples will remain important, the focus of food policy needs to broaden in order to give much greater attention to perishables such as animal-based products, fruits and vegetables, for which demand is growing exponentially (see Chapter 7).

Achieving greater regional agricultural integration is critical to addressing many of the challenges facing West Africa's agrifood system. This will require a strong political commitment by individual ECOWAS member states to go beyond the rhetoric of favoring regional integration to actually taking the actions necessary to lift the barriers to cross-border trade. Such actions will need to include more than just investments in hard infrastructure such as improved roads, telecommunications, electricity grids and systems of cold-stores, important as they are. It will also require strong efforts to supply the complementary soft infrastructure, such as regionally compatible grades and standards for agricultural products and inputs, reforms of transportation regulations to foster greater competition in the trucking industry across the ECOWAS region, and joint educational programs, such as *border conferences* that involve both the private sector and government officials such as customs agents in discussions about the rights and responsibilities of those involved in intraregional trade and how to facilitate regional trade.[2]

Policy makers in West Africa are responding to many of these challenges. As discussed in Chapter 13, policies have become much more favorable towards agricultural growth in West Africa since 2000. Despite setbacks experienced in the wake of the 2007-2008 world food crisis, there has also been important progress in fostering regional integration under the leadership of WAEMU and ECOWAS. Most ECOWAS countries explicitly include some degree of regional trade in their agricultural development strategies, despite occasional calls for national self-sufficiency in basic staples. And ECOWAS, in its regional investment plan and related policies, has identified actions to promote regional trade, harmonize grades and standards for products and agricultural inputs, and capture economies of scale in emergency relief through the creation of a regional food reserve. There has also been increasing recognition of the need to address agricultural development from a value-chain perspective, including value chains that transcend national boundaries within the region. Such a perspective, which recognizes the changing nature of demand for agricultural products in West Africa,

[2] MSU has helped facilitate such border conferences between Mali and Guinea in 2009 (see http://fsg.afre.msu.edu/wa_mkt/Synthese_Atelier_Siguiri_Mai_23.pdf and between Mali and Senegal in 2011 (see http://fsg.afre.msu.edu/promisam_2/Rapport-conf%C3%A9rence.pdf). Discussions at these conferences revealed that some of the alleged harassment of traders at border crossings reflected a lack of understanding on their part of the rules governing trade. For example, the security crises in the region in recent years have increased the legitimate need of customs officials to inspect goods, particularly those shipped in mixed lots on trucks, for clandestine arms shipments hidden beneath produce. Many traders seem unaware that they could avoid such inspections (viewed by them as harassment) by shipping entire truckload lots that are inspected upon loading and then sealed during transport.

implies the need for greater coordination of decisions among all stakeholders, from the supranational to the local level, across areas under the mandates of different organizations and ministries (e.g., agriculture, transport, trade, and health) and between public and private actors. Some structures have been created to facilitate such coordination, such as the Interdepartmental Committee for Food and Agriculture within the ECOWAS Commission and similar organs in a few individual countries such as Ghana, but much remains to be done to make them fully functional.

Designing and implementing agricultural policies, however, has become more complex in recent years, as the range of stakeholders and issues involved has broadened dramatically. While in the past, agricultural policy was formulated primarily within national agricultural ministries, it now increasingly involves input from trade and health ministries, local governments, regional organizations, farmer groups, food traders and manufacturers, consumer groups, environmental groups, other civil-society organizations, and development partners. Frequently, the policies that emerge call for public-private partnerships. A big question is how to translate this broad idea into workable arrangements on the ground (see Chapter 12).

In addition, in recent years two political time bombs have come to shape many agricultural policy discussions: how to generate rewarding jobs for the millions of young people who will enter the job market in the coming decade and how to deal with the thorny issue of land tenure. Each of these questions has important technical aspects that affect the pace and pattern of growth in the agrifood system, and each is deeply political, influencing who will benefit from that growth. How well policies grapple with these two issues will strongly influence the pace and shape of agrifood system growth in West Africa over the coming decade.

While tough policy design challenges remain, bigger challenges lie in implementation. As discussed in Chapter 13, improving implementation will require much better and more detailed data, particularly on the post-harvest segments of the food system (including agribusiness, agro-processing, marketing and regional trade) and reinforced human capacity for policy design, implementation, and monitoring and evaluation. Such strengthening needs to include not only governmental and intergovernmental organizations at all levels, from supranational (e.g., ECOWAS) to local (e.g., *commune* or township), but also private-sector stakeholders, including farmer groups, who are increasingly called upon to implement and monitor policies and programs jointly with government. Such capacity strengthening needs to draw more on the under-used policy analysis capacity of West Africa's universities and policy research institutes. Drawing personnel from these organizations to help with the on-the-ground challenges faced in policy design and implementation could be one component of a much larger effort to transform West Africa's educational system to produce the skills needed for a 21st Century agrifood system.

14.4. Lessons Learned about the Policy Process

In addition to its findings about the forces driving agrifood system dynamics in West Africa and the policy challenges to promoting greater regional agricultural integration, the SRAI team also learned key lessons about the policy process itself. Four of these are particularly important.

Good Governance is Essential

Effectively implementing the regional integration policies that all ECOWAS member states have endorsed requires good governance at all levels. But what does good governance mean in this context? Barriers to regional integration create economic rents, which those in charge of maintaining the barriers can appropriate for themselves. For example, maintaining differing standards for selling fertilizer from one country to another protects the income of the companies that currently have the contracts to supply the input in the individual countries. If standards were harmonized, those companies could face greater outside competition. Similarly, a customs official who can delay a truckload of ripe tomatoes at a border crossing because of phytosanitary rules is in a position to extract a hefty under-the-counter payment if he ignores those rules. Thus, any move to implement more fluid regional trade is likely to be opposed by some people, many of them quite powerful. In the context of promoting regional agricultural integration within West Africa, good governance requires that government leaders at all levels work to reduce the opportunities for such rent extraction, punish when it occurs, and work to change the incentives facing those in a position to hinder regional integration. No country in the world has eliminated rent-seeking behavior, but without a firm political commitment to combat it, regional agricultural integration in West Africa will proceed much more slowly than it otherwise could.

Local Capacity is Critical

To the extent that SRAI was influential in helping to shape national and regional policies in West Africa, it was because it worked through national and regional teams, combining research with capacity building. Outside researchers, such as those from a foreign university like MSU, can help with technical analysis and provide an imprimatur of quality control on reports. But correctly identifying the political-economic context of the issue under analysis, as well as how it was addressed in the past, requires local knowledge. In addition, the receptiveness of policy makers to the results is frequently higher if they are "owned" by national researchers and research institutions. Furthermore, the local analysts are in a much better position than outsiders to follow-up in the months (and sometimes years) following the analysis to help ensure that it is incorporated into policy design and implementation.

Policy Analysis and Outreach Are not One-Shot Events

Plant breeding requires maintenance breeding to preserve seed quality over time. Similarly, research and outreach on specific policy issues require ongoing efforts to make sure that they remain relevant and are heard by key policy makers. As noted throughout this volume, West Africa's food system is changing dramatically, as is the global context within which it operates. Analyses of policy issues, such as the advisability of a particular type of input subsidy, need to be revisited periodically to see if they are still germane in the present context. Even if they are, people in key policy positions frequently change jobs, so that outreach to their successors about critical policy issues, even ones that were well discussed with their predecessors, needs to be an ongoing effort. The need for an ongoing program of policy analysis and outreach is another reason why local capacity in these areas is critical. Outsiders are ill equipped to ensure such a long-term program.

Expecting an Apolitical Approach to Policy is Unrealistic

All around the world, and particularly in countries where political leaders need to woo voters, policies are shaped in part by political considerations. In shaping agricultural policies, it is unrealistic to expect West African political leaders to behave any differently from their colleagues in other countries, particularly since the majority of voters in most West African countries live in rural areas. Yet outside observers often bemoan that short-term political considerations influence agricultural policy decisions in the region, arguing that economic efficiency should be the overriding design criterion. A more realistic approach may be to try to design policies so that short-term programs, motivated in part by political considerations, help address long-term structural constraints to growth. For example, in recent years many West African leaders have tried to signal their support for the agricultural sector through expansion of input subsidies. Recently, subsidized sales of tractors have become a feature of agricultural policies in several West African countries. Currently, such programs serve mainly as a subsidy to medium- and large-scale farmers, and sometimes result in smaller farmers going deeply into debt because that they cannot profitably use the equipment after having contracted to buy it. Can such programs instead be designed to channel the machines to young people who are trained through associated vocational programs in the use and management of such equipment, in order to create custom-hire services for small-scale farmers while at the same time creating jobs for previously unemployed youth? There are, of course, limits on the degree to which programs can be redesigned this way, but given the strong interest in the region in promoting pro-agriculture programs, the scope for improvement in such programs and policies is large.

References

Diallo, B., N. Dembélé, and J. Staatz. 2010. *Analyse et estimation des prix de parité du riz en 2009 en Afrique de l'Ouest.* MSU/PRESAO/SRAI Project. Résultats de recherche N° 2010-02. Bamako and East Lansing: Michigan State University. http://fsg.afre.msu.edu/srai/presao_recherche_resultat_2.pdf.

Hollinger, F. and J.M. Staatz, eds. 2015. *Agricultural Growth in West Africa: Market and Policy Drivers*. Rome: FAO and African Development Bank. http://www.fao.org/3/a-i4337e.pdf.

UNDESA (United Nations Department of Economic and Social Affairs), Population Division. 2017. World Population Prospects: The 2015 Revision. Online database, accessed 20 March, 2017. https://esa.un.org/unpd/wpp/.

World Bank and FAO. 2009. *Awakening Africa's Sleeping Giant: Prospects for Commercial Agriculture in the Guinea Savannah Zone and Beyond*. Directions in Development. Washington, DC: FAO and the World Bank.

Between 2009 and 2017, the Syngenta Foundation for Sustainable Agriculture partnered with Michigan State University to design and implement the ***Strengthening Regional Agricultural Integration (SRAI)*** program. SRAI carried out applied research, policy outreach and capacity building aimed at strengthening agricultural cooperation and trade in West Africa. The program emerged in the aftermath of the 2007-2008 world food crisis, when global food prices soared. In response, many West African countries erected trade barriers and reduced their reliance on regional and international trade as central components of their agricultural development and food security strategies. This process of *globalization in reverse* cut off many small farmers from profitable markets, reducing their incomes and slowing agricultural growth.

The SRAI program, through analysis of the forces driving agricultural growth, food demand, and regional trade in West Africa, identified approaches that can help foster greater regional cooperation and agricultural trade in West Africa while at the same time addressing national leaders' legitimate concerns about the risks of relying on regional and international markets. This volume summarizes many of the findings from the SRAI program and their policy implications. Its 14 chapters, written by key participants in the program, are an essential reference for anyone interested improving food policies in West Africa.