



Study on strengthening the rice value chain in Mali

Rice value chain analysis in Mali and recommendations to strengthen it

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Acronyms

ADRS	Agence de Développement Rural de la vallée du fleuve Sénégal
APHLIS	African Post Harvest Losses Information System
ASSEMA	Seed Association of Mali
BCEAO	Central Bank of West African States - Banque Centrale des États de l'Afrique de l'Ouest
BMGF	Bill and Melinda Gates Foundation
CEDEAO	West African States Economic Community - Communauté Économique des États de l'Afrique de l'Ouest
CEMA	Agricultural Mechanization Centre
CIRAD	Centre de coopération internationale en recherche agronomique pour le développement
CNSOV	Comité National de Semences d'Origine Végétale
CPS/SDR	Cellule de Planification et de Statistiques du Secteur de Développement Rural
DNA	National Direction of Agriculture - Direction Nationale de l'Agriculture
DNGR	National Direction of Rural Engineering - Direction Nationale du Génie Rural
DRA	National Direction of Agriculture - Direction Régionale de l'Agriculture
EAC	Enquête Agricole de Conjoncture
EMOP	Enquête Modulaire et Permanente auprès des Ménages
EPIC	Établissement Public à caractère Industriel et Commercial
F CFA	Franc of the African Financial Community
FAO	Food and Agriculture Organization
FARA	Forum for Agricultural Research in Africa
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit – Coopération Allemande
IER	Institut d'Économie Rurale
IFRIZ	Interprofession Riz
INSTAT	Institut National de la Statistique
ITC	International Trade Center
LABOSEM	Seed Laboratory - Laboratoire des Semences
LOA	Agricultural Orientation Law - Loi d'Orientation Agricole
LuxDev	Luxembourg Développement
ODRS	Office de Développement Rural de Sélingué
OHVN	Office de la Haute Vallée du Niger
OMB	Office du Moyen Bani
ON	Office du Niger
OPA	Organisation Professionnelle Agricole
OPAM	Office des Produits Agricoles du Mali
OPIB	Office du Périmètre Irrigué de Baguinéda
ORM	Office Riz de Mopti
ORS	Office Riz de Ségou
PIB	Produit Intérieur Brut
PIV	Périmètre Irrigué Villageois
SFSA	Syngenta Foundation for Sustainable Agriculture
SIE	State Intervention Stock - Stock d'Intervention de l'État
SNS	National Security Stock - Stock National de Sécurité
SRI	System of Rice Intensification
SSN	National Seed Service - Service Semencier National
UE	European Union - Union Européenne
USD	Dollar of the United States

Executive Summary

Rice cultivation has evolved significantly in Mali over the past twenty years. The area devoted to rice has more than doubled, from 352,739 ha in 2000 to 898,060 ha in 2020. This progression and the increase in average yields in the country (from 2.1 t/ha to 3.4 t/ha) have resulted in a spectacular growth in paddy rice production, which has more than quadrupled from 742,808 tons in 2000 to 3,010,027 tons in 2020, or the equivalent of 1,655,515 tons of white rice.

The sharp increase in Malian paddy production has helped to reduce the country's dependence on imports; indeed, national production permitted to achieve a self-sufficiency rate of 92% in 2019, compared to 77% in 2002.

The development of rice production has made Mali one of the largest rice producers in Africa (5th) and the second largest in West Africa after Nigeria.

However, rice imports are still high (263,000 tons in 2019) and cost the country nearly USD 64.1 million, or 0.37% of GDP, not including cross-border imports from Burkina Faso estimated at over 2,000 tons per year.

Population growth (+3.5% per year on average) and changing consumption habits in both urban and rural areas have contributed to an increase in per capita rice consumption from 58 to 76 kg/capita/year between 2010 and 2019 (+3.4% per year) and will result in increased imports in the coming years.

More than 84% of Mali's rice production is concentrated in the four regions of Mopti, Ségou, Sikasso and Timbuktu.

4 agroclimatic cropping systems are practiced in Mali:

- Total water control: intensive cultivation system allowing high yields (6.0 t/ha on average) and in some areas two harvests per year (in-season and off-season harvests).
- Partial water control with 2 subsystems:
 - o Controlled flooding cultivation system (2.3 t/ha on average).
 - o Lowland cropping system (2.2 t/ha on average).
- Rainfed rice: in this cropping system, water supply is entirely dependent on rainfall (1.9 t/ha on average).
- Free flooding rice: an extensive form of cultivation, subject to natural conditions and without security (1.2 t/ha on average).

58% of the country's paddy rice production is produced in fully controlled irrigated areas, which represent only 30% of the country's rice-growing area.

The rice sector in Mali faces several challenges ranging from input supply to marketing.

- **Seeds**

The quality of rice seed used by farmers is generally low. Despite a national rice seed development strategy, the quantities of certified seed produced remain far below the needs. On the other hand, seed companies face challenges in selling their certified seed directly to farmers, as farmers traditionally use self-produced, unselected seed, or receive seed free of charge from national or donor-funded development programs.

This situation makes it difficult for farmers to accept the idea of paying for rice seed.

- **Fertilizers**

Fertilizer use in Mali strongly grew between 2008 and 2020 and contributed to increase rice production. The higher use of nitrogen fertilizers (+142%), phosphate fertilizers (+577%) and potassium fertilizers (+4%) was driven by a government subsidy program where subsidized urea and DAP are sold to farmers at a fixed price of 11,000 CFA francs per 50 kg bag (12,500 CFA francs from 2022). However, fertilizers' international market price has soared over the past two years and their availability has declined sharply. A shortage of fertilizer has been observed in Mali, particularly for subsidized fertilizers, forcing rice farmers to buy fertilizer at market prices (35,000 to 40,000 CFA francs per 50 kg bag) when available.

- **Pesticides**

Imports of plant protection products have also increased rapidly over the last decade, from 3,000 to 14,000 tons per year (+35.5% per year on average).

- **Mechanization**

Malian rice cultivation is essentially based on manual tools, with almost all farms using dabas, hoes and picks. According to the DNGR's 2020 report, of the nearly 1.5 million farms in Mali, only 4.4% have motorized traction. The Malian government pushed to increase the number of tractors in the country that went from 1,890 (2012) to 16,320 (2019). In 2018, a national agricultural mechanization strategy 2019-2025 was designed, with a specific component for rice cultivation where a subsidy of 50% of the cost of equipment acquisition is granted. The strategy contributed to improve the mechanization rate for rice cultivation.

- **Agricultural extension and advisory services**

Technical support and rice extension campaigns are very limited in the country, except in the areas covered by the Offices (public industrial and commercial establishments) where technical agents intervene. However, these are insufficient and are generally limited to the areas of intervention of development projects financed by international donors.

- **Rice farmers**

The profile of rice farmers (male, elderly, uneducated with low financial means) is one of the causes of the low productivity of rice farming in Mali. For these reasons, the cultivation calendar and technological packages are not well applied, resulting in yields below agronomic potential and significant losses during and post-harvest. Their reluctance to change makes the introduction of new technologies more difficult.

Access to finance is difficult and its cost is very high for Malian farmers (the interest rate is 9 to 17% for commercial banks and 12 to 24% for microfinance). Financing institutions are reluctant to finance

agriculture because of the risks associated with it and the lack of collaterals. Financial education of farmers is generally very low.

Security problems in the main production areas (Ségou, Mopti, Timbuktu) hamper efforts to achieve the objectives of the national rice strategy. Production has decreased by 8% in 2022 in the Office du Niger area due to terrorism (fires in rice fields, death threats to farmers, etc.).

- **Processors**

Rice processing is carried out by several types of players in Mali: farmers processing their own rice manually with mortar and pestle for their own consumption, service providers using mobile hullers and offering their services to rice farmers on the field (18,000 small units), artisanal hulling units managed by individuals or cooperatives, women's cooperatives producing parboiled rice, mini-rice mills, and industrial rice mills (5 in the country).

Most of the rice milling (about 80%) is done by mobile and artisanal units.

Performance of hulling and milling equipment is generally poor resulting in lower productivity (50% of white rice instead of 70%) and higher energy consumption. This is particularly true for mobile and artisanal units, which cause heavy losses of up to 15-20% of the country's milled rice. Processors also face problems with the quality of paddy rice purchased from farmers due to high moisture content (>14%), varietal mix and high levels of impurities (straw, clods, stones, etc.).

- **Traders**

Rice marketing is characterised by a complex organization where the roles of the actors are not clearly delimited. For example, farmers may sell their rice to wholesalers, to retailers and to final consumers at the same time, or wholesalers sell their products to semi-wholesalers, to retailers and to final consumers, etc.

The sector has been dominated for several decades by an oligopoly of traditional traders who act as aggregators of local rice, importers, wholesalers and, for some of them, processors. These traders buy and process very large volumes of rice and have a crucial influence on the market due to their financial power. They are the main actors supplying the domestic market and public buyers with imported rice. The dominant position of this oligopoly is reinforced by duty-free policies on imported rice.

Rice prices at the consumer level have risen sharply in recent years due to high input and energy prices. From 2015 to 2022, average local white rice prices increased by 18-26%.

- **Consumers**

Malian consumers are attracted to rice because of its ease of cooking, its availability and because it symbolizes economic and social success. Malians prefer local rice for its taste, although it is more expensive than imported rice. Gambiaka is the most demanded variety, although consumers find it difficult to identify it among all the varieties available in the market.

1. Context and objective of the mission

The Syngenta Foundation for Sustainable Agriculture (SFSA) has been active in Mali since 1981. Following its participation in the launch of the 'Rice Initiative' in 2008, SFSA launched a program in 2010 to support rice intensification in Mali in cooperation with AfricaRice.

The main objective of the program was to improve the income of small-scale rice farmers by increasing the quantity and margin of rice produced using direct and secure marketing channels.

The expected results are as follows: (i) the rice supply chain is more efficient and reliable and allows small-scale farmers to access inputs and equipment at affordable costs; (ii) profitability is enhanced by optimizing production and maximizing quality, the average rice yield is increased by 20% and farmers earn at least a 10% quality premium on the price; (iii) post-harvest losses have been halved thanks to the availability of adapted harvesting equipment, by implementing a model based on Agricultural Mechanization Centers (CEMA) and functional "Farmers' Hubs" which contribute to the achievement of these results.

The program has had very positive results in terms of improving yields from 4 to 6 tons per hectare in the Office du Niger area.

In this context and to contribute to its objectives, SFSA with the support from the Bill and Melinda Gates Foundation (BMGF), has launched a project to strengthen the rice sector in Mali and Nigeria.

The program aims to build on China's experience in developing the rice sector and to adapt and transfer know-how and technology for this purpose.

The agricultural contexts of China and African countries are similar in that they both rely on smallholder farmers. This project aims to improve understanding of the needs of African countries and will explore opportunities for transferring technologies and successful value chain practices from China into approaches that can be adapted by African countries. This should ultimately improve the overall capacity of African agricultural value chains for the ultimate benefit of smallholder farmers. It aims to provide information and recommendations to inform opportunities for modernizing the rice value chains in West Africa, through better products, knowledge and information exchange, financing and networking between farmers and communities. This approach will be tested for the rice value chains in Mali and Nigeria, which will form the basis for a broader intervention to strengthen the rice value chains in both countries.

SFSA and BMGF commissioned STECIA International to identify the causes of the low efficiency of the rice value chain in Mali and to provide strategic guidance to promote the inclusion of smallholder farmers and to strengthen the overall capacity of the rice value chain, particularly on rice productivity, quality improvement, processing, and distribution through the adoption of technology and knowledge, drawing on the experience of China. More specifically, the project has three main outcomes:

- i. A better understanding and appreciation of the gaps, challenges, needs and opportunities across the rice sector in Mali.
- ii. Raised awareness among public and private actors of the problems and solutions in the different segments of the rice value chain and the opportunities for the rice sector to benefit smallholders.
- iii. Agreed rice value chain strategies for public and private institutions to develop technologies, support technology transfer and investment to build a stronger, more

inclusive, and efficient rice value chain for the benefit of smallholder farmers in pilot countries.

2. Methodological approach

This study was carried out in four phases between April 2022 and March 2023:

- i. Document review: during this phase, the consultants collected and studied available reports, documents, and statistics on the rice sector in Mali produced by Malian public institutions, development programs and international organizations involved in the rice sector.
- ii. Field survey: this phase was composed of 3 sub-phases:
 - a. Preparation of several specific questionnaires for each type of stakeholder,
 - b. Identification of stakeholders involved in the rice sector (ministries and public agencies, input suppliers, rice farmers and farmers' organizations, processors, traders, financing institutions, donors, etc.)
 - c. Organization of face-to-face or online interviews in the main rice production areas in Mali, of the different production systems (Ségou, Koulikoro, Sikasso, Timbuktu) and in Bamako for the headquarters of national organizations.
- iii. Analysis of the completed questionnaires and preparation of the rice value chain analysis report.
- iv. Design of interventions for strengthening the Malian rice sector based on the value chain analysis. The proposed interventions were presented and validated by high-level rice sector stakeholders during a workshop held in Bamako on 9th March 2023.

3. Characteristics of Malian agriculture

3.1. The Malian economy

3.1.1. Socioeconomic characteristics of Mali

The Republic of Mali is a landlocked country in West Africa, bordering Mauritania and Algeria to the north, Burkina Faso and Côte d'Ivoire to the south, Senegal and Guinea to the west and Niger to the east.

It has a surface area of 1.241 million km² (7th in Africa) and a population of 20.9 million¹ in 2021, equivalent to a density of 16.8 inhabitants/km².

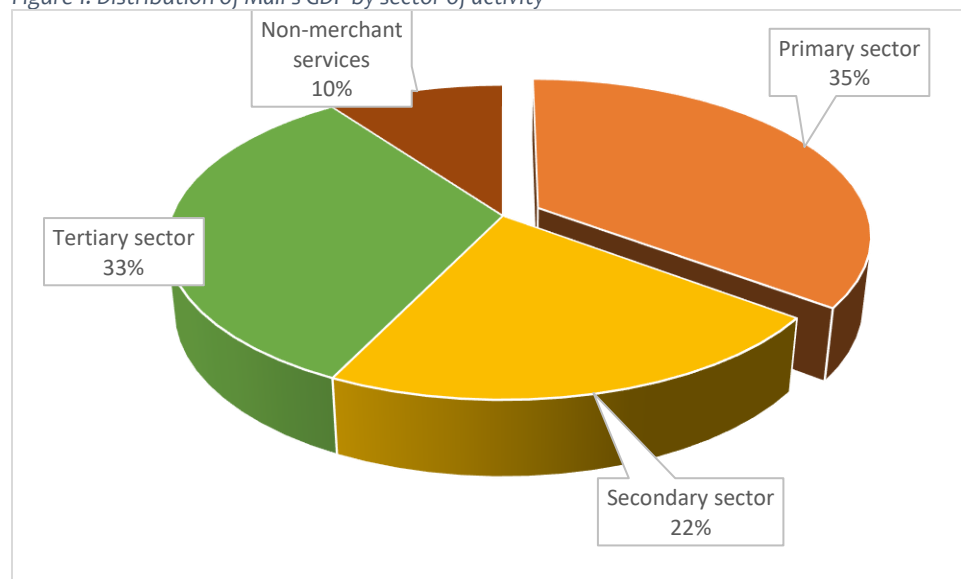
Two thirds of the country is desert (North). The Sahelian region (Centre) is relatively dry but is crossed by the Niger River where the developed areas are cultivated with rice, cotton, millet, sorghum, and groundnuts. The many effluents of the river constitute swamps in this region.

Finally, the Sudanese zone (South) receives significant rainfall (>1,200 mm/year)² with temperatures ranging from 24 to 32°C.

Mali's Gross Domestic Product (GDP) was 9,976 billion CFA francs in 2020³, or 411,800 CFA francs/capita (US\$767/capita).

The primary sector (agriculture, livestock, fishing, and forestry) is very important in the Malian economy as its contribution to GDP was 3,518.9 billion CFA Francs (35.3%).

Figure 1: Distribution of Mali's GDP by sector of activity



Source: Central Bank of West African States (BCEAO), 2021

Mali has been facing recurrent political instability since 2012. The last Coup was conducted on August 18th, 2020, and was the source of diplomatic tensions that led to an embargo by the

¹ World Bank: <https://donnees.banquemondiale.org/indicateur/SP.POP.TOTL?locations=ML>

² www.unccd.int/sites/default/files/country_profile_documents/PLAN%20SECHERESSE%20DU%20MALI%20VERSION%20FINALE.pdf

³ BCEAO, www.bceao.int/sites/default/files/2021-10/Rapport%20annuel%20de%20la%20BCEAO%202020.pdf

countries of the Economic Community of West African States (ECOWAS) on January 9th, 2022, which was lifted in July 2022.

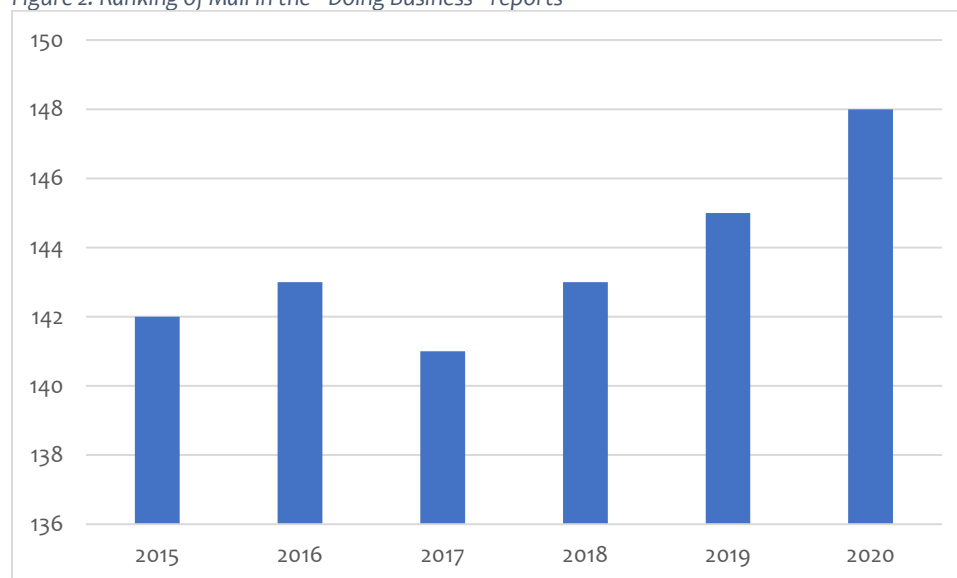
In addition to political instability, the country has also been confronted since 2012 with attacks by separatist and terrorist groups (Al Qaeda in the Islamic Maghreb, Islamic State in the Sahel, etc.) in different regions of the country and even in Bamako.

3.1.2. Business environment

The “Doing Business” report prepared by the World Bank assesses the business environment by measuring regulations that encourage or discourage business activities according to 10 criteria: starting a business, obtaining a building permit, connecting to electricity, transferring property, obtaining loans, protecting minority investors, paying taxes, cross-border trade, enforcing contracts and dealing with insolvency.

Mali is ranked 148th out of 190 countries assessed in the 2020 edition, with a score of 52.9. The business climate in the country has deteriorated over the past five years, losing 7 positions compared to 2017 due to the low number of reforms to promote business activities in the country.

Figure 2: Ranking of Mali in the “Doing Business” reports



Source: “Doing Business” Report, The World Bank

The World Economic Forum’s Global Competitiveness Index analyses the competitiveness of countries according to several criteria: infrastructure, ICT adoption, macroeconomic stability, healthcare, skills, labor market, financial system, market size and business dynamism.

Mali has also lost positions in this ranking in recent years, dropping from the 115th position in 2008 to the 129th in 2019 out of 140 ranked countries.

The World Bank’s “Enabling the business of agriculture” report⁴ measures laws and regulations in agriculture according to eight criteria: seed supply, fertilizer import and registration, securing water, registering farm machinery, maintaining livestock, protecting plant health, trading food, and accessing financing.

⁴ www.eba.worldbank.org/en/eba, 2019

In the 2019 edition, Mali is poorly ranked, 85th out of 98 ranked countries with a score of 33.7. It is ranked lower than the main rice producers in Africa.

Table 1: Ranking of the main African rice producers in the "Enabling the business of agriculture"

Country	Rank	Score
Tanzania	58 th	57,15
Nigeria	66 th	49,17
Egypt	70 th	47,06
Côte d'Ivoire	72 nd	45,87
Senegal	74 th	43,98
Madagascar	81 st	36,26
Mali	85 th	33,70
Guinea	86 th	33,59
DR Congo	90 th	29,81

Source: "Enabling the business of agriculture" Report, World Bank

These results show that much remains to be done to encourage private investment in the agricultural sector in Mali in general and particularly in the rice value chain.

3.2. The Malian agricultural sector

3.2.1. Agricultural policies

Malian agriculture has received special attention from the Government, which has developed policies to support it since independence. This effort has increased over the past twenty years and led to the promulgation of the **Agricultural Orientation Law (LOA)** in 2006, which was designed as a unifying framework. It formulates a long-term vision of a sustainable, modern, and competitive agricultural sector. It places farmers at the center of the approach, to meet the growing needs of the country. It initiated a 'value chain' vision giving a very important place to Professional Agricultural Organizations (PAOs) and the creation of "inter-professions" results from it.

Several strategies and programs have been designed in this regard, including the **National Food and Nutritional Security Strategy**, developed in May 2019, which aims to reduce the effects of climate shocks and stabilize prices within a coherent policy framework in order to ensure food security of the Malian population, improve the nutritional status of the most vulnerable groups and their resilience capacities in the context of the CREDD⁵'s perspective of achieving Mali's Sustainable Development Goals (SDGs) by 2030.

The **National Program for Agricultural Investment and Food Security, 2015-2025 (PNISA)** represents the operational framework for planning and implementing the LOA. It identified priority value chains in terms of production and competitiveness. PNISA is integrated into the Regional Agricultural Investment Program (PRIA) which brings together national priorities within the framework of the Detailed African Agriculture Development Program (CAADP) of the New Partnership for Africa's Development (NEPAD).

Improving access to inputs is also one of the main objectives of the agricultural component of the **Strategic Framework for Growth and Poverty Reduction (CSCR)** and the **Economic and Social Development Program (PDES)**.

⁵ Cadre stratégique pour la Relance économique et le Développement durable – Strategic Framework for the economic recovery and sustainable development

3.2.2. The farming population

Despite these strategies and programs, Malian agriculture still faces several structural challenges that limit its performance. Indeed, agricultural production relies mainly on small-scale farmers, 93% of whom are men, poorly educated and with very limited financial resources.

The 2019 Agricultural Economic Survey (EAC) shows that 68.8% of rural men and 84.4% of rural women aged between 15 and 39 years have no education.

Another characteristic of farmers is the ageing of this population where the average age of the head of the rural household is 51.4 years, which is very high in a country where life expectancy for men is 58.6 years.

Finally, the rural population, 96.3% of which is employed in the agricultural sector in the broad sense (including livestock, fishing, and forestry), has the highest level of poverty (53.1%), compared to 11.2% in Bamako.

Access to credit is very low for farmers:

- 32.7% for input credits
- 6.3% for agricultural equipment loans.

Women's access to finance is even more difficult, as for example 44.6% of male-led farms benefit from input credit, while only 6.6% of female-led farms benefit from it. The same is true for agricultural equipment loans, where 9.2% of men benefit from them compared to 0% of women.

This lack of access to finance is due to the reluctance of financial institutions to grant loans to low-income clients without collaterals in a very high-risk sector.

Finally, interest rates and loan application fees are very high, so there is little incentive for farmers to apply for credit.

3.2.3. The land property situation

In April 2014, the government drew up an Agricultural Land Policy (PFA) for Mali, whose objective is to ensure equitable access for all Malian farmers (men and women) and other users to well-managed and secure agricultural land in an environment of good land governance. The intention is to foster public, community, individual and private investments that would make the various farming systems more efficient and viable and contribute to sustainable food sovereignty.

To this end, the strategy sets out the following specific objectives a) to ensure equitable access of family farms and commercial farms to Mali's land resources by avoiding land speculation that is detrimental to social cohesion and the national economy; b) to promote land tenure security for family farms as a priority and for commercial farms in order to allow current generations to produce sustainably without compromising the future of the coming generations; c) create conditions that foster public investment as a priority, individual private and community investment in family farms as a priority, and commercial farms to ensure food sovereignty and create national wealth; d) create greater synergy of action between agricultural land stakeholders to ensure national consistency in modes of access to and security of land. It is also a question of ensuring the regulation of options for the transferability and transmissibility of land in accordance with the principle of equity between all farmers, particularly marginalized groups.

The implementation of the PFA will rely on an institutional mechanism structured around a multi-stakeholder steering committee; a national observatory on agricultural land with a very clear

characterization of family farms and the identification of reference standards necessary for the development of the observatory; regional land commissions in all regions bringing together all the land tenure stakeholders at the regional level; circle-level land commissions bringing together all the land tenure stakeholders at the circle level; communal land commissions bringing together all the land tenure stakeholders at the commune level; village land commissions bringing together all the land tenure stakeholders in the villages. Implementation will be coordinated by the Permanent Secretariat of the Loi d'Orientation Agricole under the supervision of the Ministry of Agriculture and the steering committee.

There are two legal and regulatory systems for agricultural land in Mali:

- The modern legal system (state law)
- The customary law system.

State law covers all legal texts relating to land ownership, in **particular law n°2017-001/ of 11th April 2017 on agricultural land**, which applies to all land and areas of the national domain used for agriculture. It organizes access to agricultural land, its securing as well as transactions, and recognizes individual and collective customary rights and local land management.

The customary law system encompasses a range of systems according to agroecological zones or ethnic groups, all of which are based on social organization based on blood ties, the pre-eminence of elders over cadets, men over women, and to some extent, indigenous or foreign status.

Prior to the 2017 law, unregistered customary lands were considered state land, allowing the government to take it if necessary. As most agricultural land was occupied based on customary rights, the sustainability of farming was not guaranteed as the possession of the land could be challenged at any time, in particular for the development of new agricultural areas, the allocation of such land to foreign investors for agricultural or mining activities. The 2017 law allowed a major advance in land tenure security through the recognition of customary rights.

On the other hand, this law has not brought any changes to the management of land in the Office du Niger, which is governed by a specific decree and where farmers hold precarious contracts and can easily be evicted from the land they use. This situation of land tenure insecurity continues to act as a brake on investment and the mechanization of agriculture in this area, which is the main rice-growing area of the country.

Finally, the law on agricultural land is still not fully operational due to the weakness of the State's resources and security problems in several areas of the country. In consultation with the agricultural professional organizations, the State has set up a National Observatory of Agricultural Land (ONAF) by Decree n°2018-0334/P-RM of 04 April 2018.

4. Characteristics of rice production in Mali

4.1. The position of the rice sector Mali

Rice is considered a strategic product in Mali because of its importance for food security but also for the country's economic development given its predominant role in production, agricultural employment, and income generation for farmers. Rice cultivation is practiced by almost 190,000 family farms, representing about 12.7% of Malian farms.

Rice production represents 4.7% of the country's GDP and 13.3% of agricultural GDP.

Finally, its strategic importance lies in the fact that its availability at an acceptable price is a guarantee of social peace in the country, given its central place in the diet of Malians, whether in urban or rural areas.

Rice has and will continue to have an important place in Mali's cereal production. According to the projections made by the Food Security Commission and the Ministry of Rural Development in the framework of the three-year consolidated and harmonized agricultural campaign plan for the period 2022 to 2024, rice is currently ranked 2nd in percentage of production with 28.6% behind maize, which accounts for 41.1% of Mali's cereal production.

The estimated cereal production in Mali during this period is presented below:

Table 2: Evolution of cereal production projections in Mali

	2022	2023	2024
Expected cereal production (in tons)	10 500 526	11 080 587	11 645 801
Occupied cereal area (in ha)	6 061 726	6 174 611	6 319 245

Proportion in % of crops in the expected production	
Corn	41,1%
Rice	28,6%
Millet	15,1%
Sorghum	14,3%
Fonio	0,5%
Wheat	0,2%

Source: Commissariat for Food Security, Ministry of Rural Development, 2022

4.2. Strategies for rice development

Several policies and strategies have been put in place to contribute to the development of rice production to achieve self-sufficiency and export to neighboring countries in the sub-region. The most important are:

- The Rice Initiative (2008),
- The National Rice Development Strategies - SNDR I (2009) and II (2016),
- The National Rice Seed Development Strategy (2017),
- The Rice component of the National Agricultural Mechanization Strategy (2019) and
- The National SRI Program⁶.

These strategies have increased the rice cultivated area and made subsidized fertilizers, farm equipment and certified seeds available to rice farmers, which has helped to increase yields and

⁶ The National SRI Program aims to contribute to 10% increase in national rice production envisaged by the SNDR over 10 years. This increase aims to reach a production of 516,593 tons of paddy rice by 2025, with a sown area of 154,268 ha and 244,962 farmers involved. This program was delayed at the start due to the COVID-19 pandemic but should be fully operational in 2023.

production. However, despite the upward trend in production, government targets have not been met.

Indeed, while the 2009 strategy was based on a production of 10 million tons by 2012, this target has been revised downwards in the new SNDR II 2016-2025 strategy, which has set a new production target of 5.5 million tons in 2025, which will also be difficult to achieve.

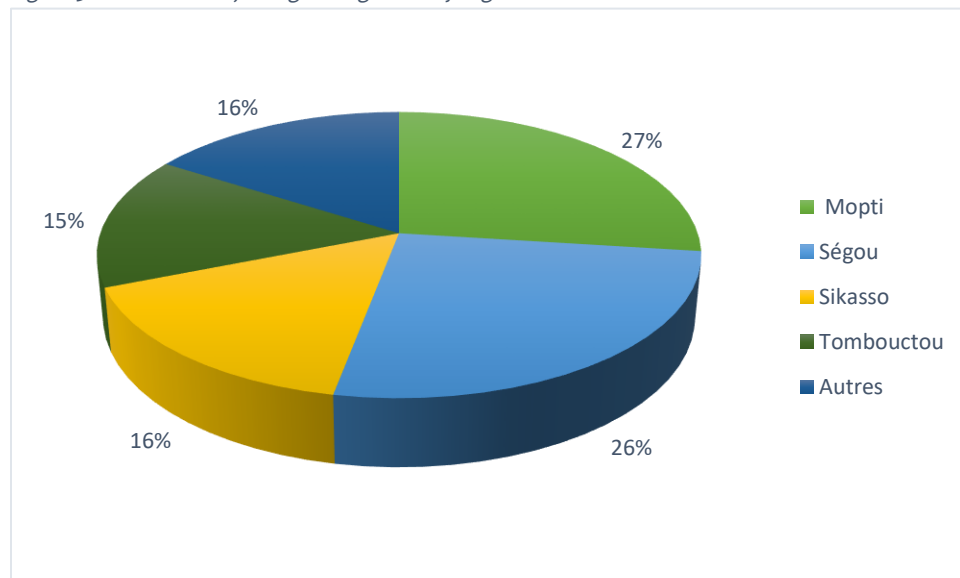
4.3. Rice production basins

The main rice production areas in Mali are concentrated in the following zones:

- Ségou (Office du Niger- ON, Office Riz Ségou-ORS, Office du Moyen Bani-OMB and lowlands),
- Mopti (Office Riz-Mopti-ORM, OMB, Village Irrigated Schemes-PIV and the submersible plains),
- Timbuktu (PIV, lakes, and ponds),
- Sikasso (Zone Office de Développement Rural de Sélingué-ODRS, lowlands),
- Koulikoro (Office du Périmètre Irrigué de Baguinéda-OPIB zone, Manincoura, Office de la Haute Vallée du Niger-OHVN),
- Gao (PIV and plains) and
- Kayes (Zone Agence de Développement Rural de la Vallée du fleuve Sénégal -ADRS, lowlands).

More than 84% of rice production is concentrated in the regions of Mopti, Ségou, Sikasso and Timbuktu, as shown in the following figure:

Figure 3: Distribution of rice-growing areas by region



Source: Ministry of Agriculture

Areas that can be managed for irrigated rice are estimated at nearly **2,200,000 ha**, including many lowlands in the south of the country. Current managed areas are only 560,000 hectares⁷ (about 23% of the irrigable potential).

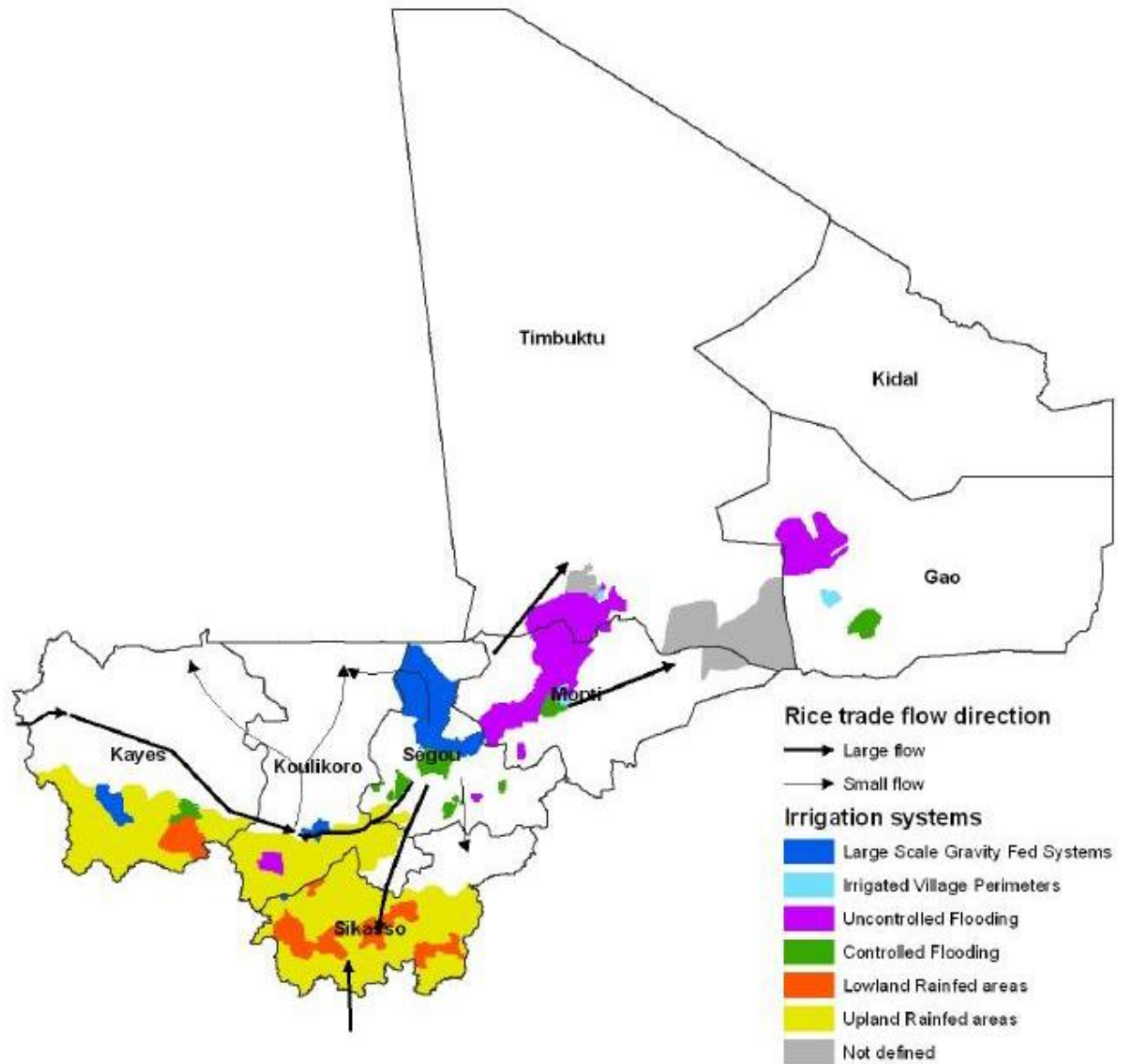
⁷ Consolidated and harmonized three-year crop plan, 2021 Balance sheet, 2022 Forecasts and 2023-2024 projections, Food Security Commission, Ministry of Rural Development

4.4. Rice production systems

There are four rice production systems in Mali. They are distributed over the territory according to geophysical and climatic potential:

- **Full water control:** in large and small irrigated perimeters (Ségou, Mopti, Sikasso, Koulikoro and Timbuktu):
- **Large-scale irrigation schemes:** Water management consists in bringing irrigation water to the plot in a rational quantity and in due time without water loss. The water needs expressed by the farmers are supplied by the water system manager through a system of canals and valves. The water turns are organized in such a way that each farmer receives the water quantity he or she needs according to a precise schedule. In this intensive cultivation system, farmers use selected seeds, mineral and organic fertilizers.
- **Village Irrigated Schemes (PIVs):** in this system water is pumped directly from the river. This intensive cropping system allows for high yields (6.0 tons/hectare in average in 2021) and in some areas it is possible to have two harvests per year: the main season harvest and the off-season harvest.
- **Partial water control:** controlled flooding and lowland rice cultivation (Ségou, Mopti, Sikasso):
- **Controlled flooding system** consists of erecting ring dikes to protect the rice plots from early flooding. The control is partial because in this system it is not possible to admit and drain water according to the plant cycle. Risks associated with irrigation and difficulties of draining water are the reasons for farmers' reluctance to use organic and mineral fertilizers, which results in low yields (2.3 tons/hectare in average in 2021).
- **The lowland cropping system:** in this system, there is usually a water retention infrastructure and a main canal ensuring water enters rice fields. The varieties used are local varieties adapted to the height of the water level. In this system, the use of mineral fertilizers depends on the degree of water control. Yields are generally low (2.2 tons/hectare in average in 2021).
- **Rainfed rice:** in this production system, water supply is entirely dependent on rainfall. It is estimated that rainfall has declined by 20% since the 1970s. Given periodical variations in rainfall from one year to the next, yields are generally low (1.9 tons/hectare in average in 2021).
- **Free flooding rice:** Free flooding or floating rice is the oldest form of rice cultivation. It has been practiced in Mali since 1500 BC. It is an extensive form of cultivation, subject to natural conditions and without security. Rice is grown in flooded depressions for 3 to 6 months along the Niger River in the regions of Mopti, Timbuktu, and Gao. The rice is sown with the first rains, and its growth must follow the rise waters during the flood. With climate change, the irregularity of the rains, especially at the beginning of the season, and the uncertainty of the flooding make this production system rather uncertain. For this reason, hardy varieties that can adapt to natural conditions are used, but these varieties have generally low yields. Given the risks associated with this crop, farmers do not apply organic or mineral fertilization, which contributes to the very low yields obtained for this production system (1.2 tons/hectare in average in 2021). Free flooding irrigated rice fields are also the major source of methane from rice fields.

Figure 4: Map of rice-growing regions by type of production system



Ministry of Agriculture Source: FAO and Ministry of Agriculture

Source: Ministry of Agriculture

The level of rice yields directly depends on the production system and can vary from one to five-fold between total water control and free flooding (river rice farming), as shown in the table below:

Table 3: Contribution to the production of each type of production system

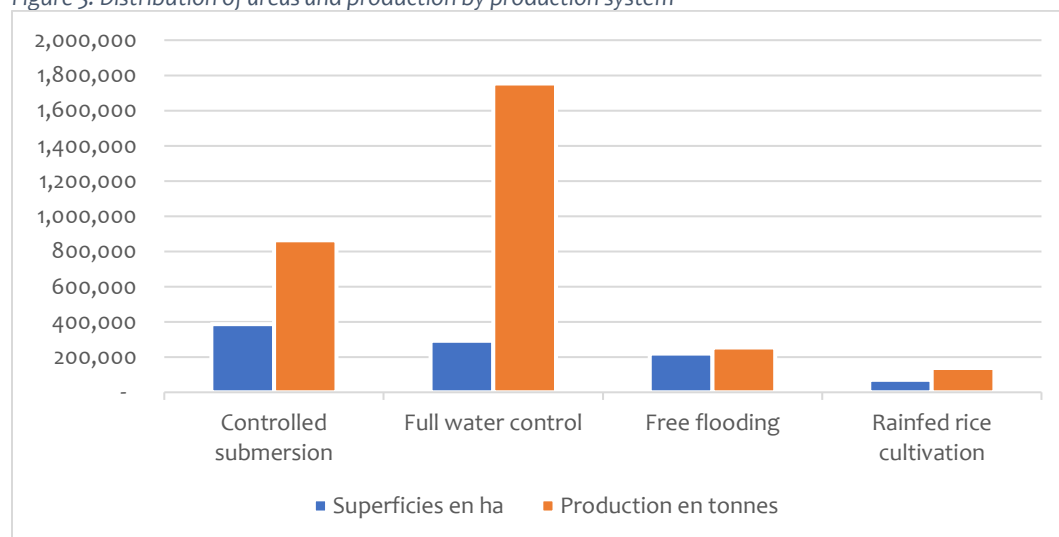
Production system	Yield in kg/ha	Area in hectares	Total production in tons
Full water control	5,978	293,307	1,753,389
Controlled flooding	2,309	152,033	351,044
Lowland rice farming	2,182	235,081	512,947
Rainfed rice	1,933	70,905	137,059
Free flooding	1,158	219,034	253,641

Source: Ministry of Rural Development, 2021

The figure below shows the crucial importance of rice production under full water control for Mali. Indeed, although it only represented 30% of the country's rice-growing area (970,350 hectares in 2021), it contributed 58% of paddy production.

Rice production under partial water control (controlled flooding and lowland rice cultivation) is also very important since it represents 40% of the rice-growing area and 29% of national production.

Figure 5: Distribution of areas and production by production system



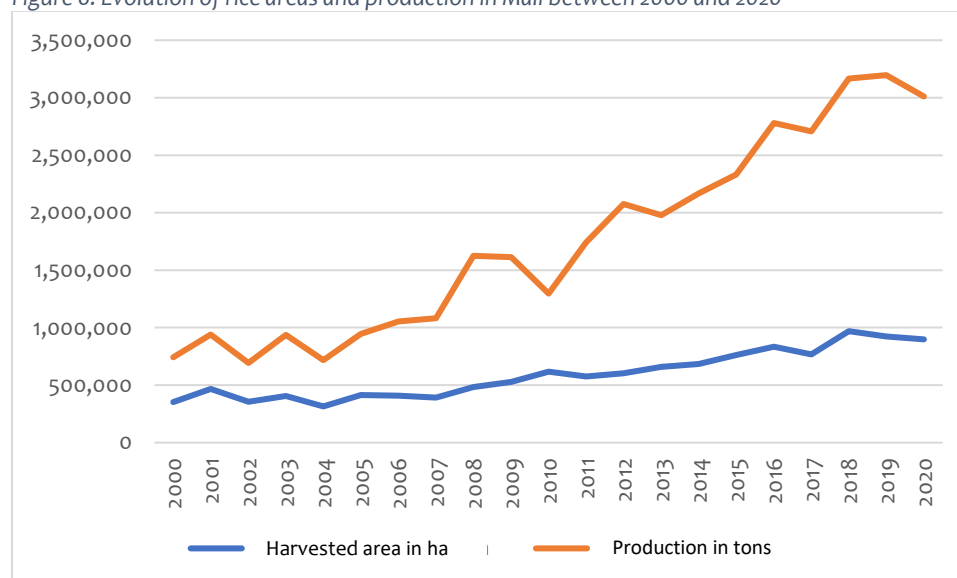
Source: Ministry of Rural Development, 2021

4.5. Production and productivity developments

Rice production has evolved significantly in Mali over the last twenty years, with the area for rice cultivation more than doubling from 352,739 hectares in 2000 to 898,060 hectares in 2020.

Production has more than quadrupled, from 742,808 tons of paddy rice in 2000 to 3,010,027 tons in 2020, equivalent to 1,655,515 tons of white rice. This tremendous increase can be explained by the increase in surface area but also by the increase in average yields in the country, which have risen from 2.1 tons/hectare to 3.4 tons/hectare.

Figure 6: Evolution of rice areas and production in Mali between 2000 and 2020



Source: FAOSTAT

Main season crop accounts for 94% of rice production and off-season crop only 6% of national production.

52.7% of the production is harvested in the DRA areas and 47.3% in the Offices and ADRS areas.

It should be noted that production significantly dropped in 2021 to 2,511,976 tons (-19.8%) due to early flooding of some rice plots before they were put into production, the flooding of some cultivated plots and operating difficulties due to insecurity in the country.

The strong increase in rice production has made Mali one of the main rice producers in Africa (5th) and the second largest in West Africa, just behind Nigeria.

In terms of yield per hectare, Mali is second among the largest producing countries in Africa, although it is still far behind the rice yields in Egypt (8.83 t/ha).

Table 4: The 10 biggest rice producers in Africa in 2020

	Production in tons	Yield in tons/hectare
Nigeria	8,172,000	1.55
Egypt	4,893,507	8.83
Tanzania	4,528,000	2.85
Madagascar	4,232,000	2.53
Mali	3,010,027	3.35
Guinea	2,916,395	1.48
Côte d'Ivoire	1,481,182	2.85
RD Congo	1,379,000	1.05
Senegal	1,349,723	3.34
Sierra Leone	1,049,795	1.74

Source: FAOSTAT

4.6. The environmental impact of rice cultivation

Rice cultivation has a significant environmental impact, particularly the production of methane (greenhouse gas - GHG). This production is even more important when good agricultural practices are not applied.

The IPCC in its 2022 report⁸ on climate change estimates that GHG emissions from rice production account for 1.7% of total global emissions, which is higher than GHG emissions from shipping (1.3%), aviation (1.1%) or oil refining (1.1%).

The same report states that the agricultural sector is one of the sectors with the greatest potential to reduce GHG emissions between 2020 and 2050, and specifically cites improved rice cultivation as an avenue for climate change mitigation.

The carbon footprint of rice in Mali is estimated⁹ at 3.63 tons of CO₂ emitted/ton of paddy or 6.4 tons of CO₂ emitted/hectare of rice.

The total CO₂ emitted by rice production is estimated at 7.042 million tons/year, or more than half¹⁰ of the country's CO₂ emissions.

5. Rice value chain analysis in Mali

5.1. Inputs segment

5.1.1. Seeds

The rice seed value chain is composed of many stakeholders:

- **AfricaRice**, which provides Mali with stem cells. It is one of the 15 CGIAR research centers, a global research partnership for a future without hunger. It is also an intergovernmental association of African member countries. Its mission is to improve the livelihoods of farmers and other stakeholders in the rice sector in Africa by increasing the productivity and profitability of rice-based agri-food systems, while ensuring the sustainability of natural resources.
- **The 'Institut d'Économie Rurale' (IER)**, is responsible for the production of foundation, pre-basic and basic seeds. It is the main agricultural research institution in Mali. It has developed a wide range of varieties in collaboration with its partners including AfricaRice, Alliance for a Green Revolution in Africa (AGRA), Korea-Africa Food and Agriculture Cooperation Initiative (KAFACI) and the International Atomic Energy Agency (IAEA).
- **Producers of foundation seed** under contract with IER.
- **Producers of certified seed** (private companies and seed production cooperatives).
- **The local structures of the National Directorate of Agriculture** (Laboratoire des Semences-LABOSEM, the Regional Seed Laboratories, the Legislation and Control Divisions of the Regional Directorates of Agriculture-DRA and the National Seed Service-SSN) which ensure quality control, certification, and advice to farmers.
- **The National Committee for Seeds of Plant Origin (CNSOV)** is responsible for proposing the principles and general guidelines of seed regulation, for proposing the approval of new varieties and their registration in the catalogue of species and varieties, and for validating the results of the control and certification of seeds produced or imported before commercialization.
- **The Planning and Statistics Unit of the Rural Development Sector (CPS/SDR)** is responsible for monitoring, evaluating, and analyzing statistical data along the seed value chain.

⁸ www.ipcc.ch/report/ar6/wg3/downloads/report/IPCC_AR6_WGIII_TechnicalSummary.pdf

⁹ www.doi.org/10.4060/cb1504fr

¹⁰ www.donnees.banquemondiale.org/indicateur/EN.ATM.CO2E.KT?locations=ML

- **The association of seed growers of Mali¹¹** which brings together all private seed production companies.

National certified rice seed production covers 2,270 hectares and production in 2022 is estimated at 9,235 tons. The quantity produced is insufficient compared to the country's theoretical needs, which are about 78,130 tons (based on 87 kg of seed/hectare). The EAC 2019 showed that only 23% of farms use improved seed.

The main improved varieties used in the different production areas are presented in the table below:

Table 5: Main varieties of rice grown

Irrigated rice cultivation	Controlled submersion rice cultivation	Lowland rice farming	Rainfed rice cultivation
ARICA 9 ARICA 10 NENEKALA SAHEL 134 GAMBIAKA KOKOUM ADNY 11 KOGONI 91-1 SEBERANG YIRIWAMALO/08 FAN 2 SAHEL 108 WASSA IR 32307 HYBRIDE SWARNA 2	KAO-GAEWN DKA 1 DKA – M3 SHWETASSOKE	SIK 350-A150 SIK 350 ARICA 3 BW 348-1 SIK 353-A10	NERICA 4 NERICA 8 NERICA 9 NERICA 12 DKA-P17 DKA-P27 DKA-P 28 DKA-P 29 DKA-P 30

Source: Ministry of Agriculture

During the field survey, seed companies claimed to have difficulties in selling certified rice seed to rice farmers because most of them are used to using self-produced seed. This practice results in yields 30-40% lower than agronomic potential. Some of the farmers we met justify their reluctance to buy certified seed by their lack of confidence in the seriousness of the controls and the seed certification process carried out by the Ministry of Agriculture.

Given the low demand from rice farmers, seed companies market their certified seeds to donor-funded development projects, which provide them free of charge to rice farmers or to institutional partners with whom they collaborate. Some companies export rice seeds to countries in the sub-region (Senegal, Togo, Guinea, Sierra Leone, etc.) on an ad hoc basis as part of tenders for development projects.

However, it is important to note that there are rice farmers who have adopted seed technologies and who are obtaining very good results, as is the case of a farmer with an atypical profile whom we met in Koulikoro (a private investor with a higher education degree). This farmer grows rainfed rice and has been testing two new F1 hybrid rice varieties (Swarna and Ariz Gold) imported from India by Toguna company since last year.

The results obtained by these varieties (grown under SRI) are very encouraging, as the average yields obtained were 6.1 t/ha compared to 4.0 t/ha for the ADNY variety and 3.0 t/ha for the WASSA variety (which were not grown under SRI).

From a financial point of view, the gain for the rice farmer is significant. In fact, if the cost per hectare of F1 hybrid seeds (30,000 F CFA/ha for 10 kg at 3,000 F CFA/kg) is comparable to that of conventional

¹¹ See list of members in Appendix 3

seeds (32,000 F CFA/ha for 80 kg at 400 F CFA/kg), the turnover generated by the hybrid varieties is much higher than that of conventional varieties.

Thus, the turnover by hectare generated by the F1 hybrid varieties is 840,000 F CFA higher than ADNY variety and 1.2 million F CFA higher than WASSA variety. Even if this differential is not entirely attributable to the F1 hybrid varieties, since the type of management was not the same (SRI allows yields to be increased by 25 to 30%), it remains interesting for improving the income of Malian rice farmers.

Awareness raising and promotion of certified seeds and their impact on farmers' incomes should be stepped up to help increase Malian production.

5.1.2. Fertilizers

The fertilizer value chain is composed of the following actors:

- Importers of packaged fertilizers.
- Fertilizer formulation companies made from imported raw materials.
- Wholesalers with their distribution network.
- Agro-dealers.
- Rice farmers, whether individuals or cooperatives.
- Banking institutions.
- Donors and
- The Government, through its various supervisory, research and quality control structures.

The main producers and distributors of fertilizers are presented in the table below:

Table 6: Main producers, importers, and distributors of fertilizers in Mali

Agriplus Mali	Importer and distributor of fertilizers, vegetable seeds and agricultural equipment	Address: Immeuble Tourela, Avenue de l'OUA, Sogoniko, BP E-1391, Bamako Phone: +223 20 20 06 78 info@agriplusmali.com
Doucouré Partenaire Agro-industrie - DPA	NPK fertilizer formulation	Bamako Phone: +223 66 16 80 17 info@dpa-industries.com
Éléphant Vert	Production of fertilizers and organic amendments	Bamako Phone: +223 66 37 49 13
Mali Engrais	Production and distribution of organic and organo-mineral fertilizers	Address: Sébénikoro Dramanebougou à côté de la colline (commune IV), BP 3220, Bamako Phone: +223 76 77 61 77 / 21 73 69 15 / 65 44 78 74 abasse@giemaliengrais.com
ORGAFERT	Production of organic fertilizers	Ségou
PROFEBA	Production of organic fertilizers	Bamako Phone: +223 20 21 00 40
SAD – Société Africaine de Distribution	Fertilizer distribution	Bamako Phone: +223 76 25 60 83 dgsad@orangemali.net
Sangoye SA	Fertilizer importer	Bamako Phone +223 66 75 30 14 moussapind@hotmail.fr

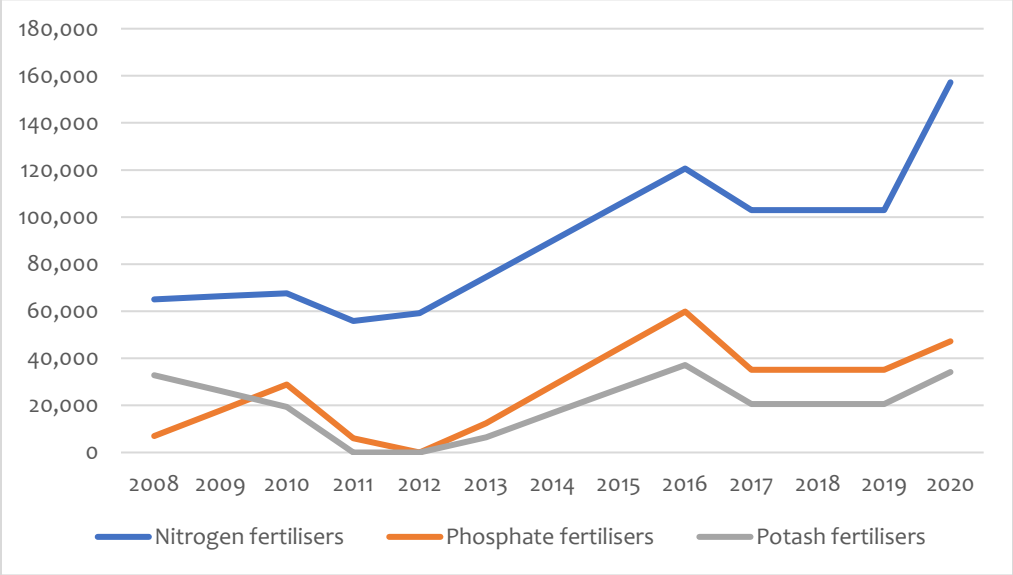
SOFAVIA Mali	Producer of organic fertilizer	Koutiala Phone : +223 72 96 77 20 kalifadiassana849@gmail.com
SOGEFERT	NPK fertilizer formulation	Cite 16 Villas ACI 2000, Hamdallaye Bamako Phone: +223 76 40 31 15 ousmane.sibide@gmail.com
SOMADECO Industry - Malian Equipment and Trade Company		
Toguna Agro-industrie	Production of mineral and organic fertilizers. This company is part of the Toguna Group which is active in the import and distribution of plant protection products, agricultural equipment and in mining. It controls nearly 50% of the Malian fertilizer market.	Address: Senou, P 203 / R 48 Phone: +223 44 97 94 00 toguna@gmail.com

Source: The consultant

Fertilizer use in Mali has grown strongly between 2008 and 2020 and has contributed to the increase in rice production.

Indeed, the use of nitrogen fertilizers increased by 142% during this period, that of phosphate fertilizers increased by 577%, while potassium fertilizers changed little (+4%).

Figure 7: Evolution of the use of fertilizers in Mali



Source: FAOSTAT

The Malian government subsidizes fertilizer for rice production. This subsidy is distributed through a long and complex procedure¹²:

¹² <https://demarchesadministratives.gouv.ml/demarches/afficher/Subvention-des-intrants>

- A form called "technical guarantee" detailing information on the farm and its input requirements is issued by the technical services of the Ministry of Agriculture (rice offices, DNA) to the rice farmer.
- The farmer gives the original technical guarantee to the fertilizer supplier.
- The fertilizer supplier submits the technical guarantee to the DNA for validation.
- DNA sends the validated technical guarantee to the Ministry of Economy and Finance (MEF).
- MEF reimburses the supplier the difference between the market price and the price paid by the farmer (12,500 CFA francs per bag).

Since 2018, an electronic 'technical guarantee' system (e-voucher) has been tested, to ensure better transparency, better targeting of beneficiaries, and a reduction in the risks of fraud that were numerous with the paper system (establishment of false technical guarantees, etc.). This system is based on an electronic platform that links fertilizer suppliers and rice farmers, who receive an SMS indicating the quantity of fertilizer to be collected from a given supplier. However, the use of this system remains very limited due to technical constraints (incomplete databases of rice farmers and fertilizer suppliers, farmers' access to a mobile phone, illiteracy, etc.).

All farmers of the targeted crops (rice, cotton, maize, wheat, millet, and sorghum) are eligible for subsidies, which are proportional to the areas cultivated.

A quota of subsidized fertilizer is allocated at national level and is distributed by region.

However, the administrative processes related to the subsidized fertilizers, cause delays in the distribution and result in lower yields as some cultivation operations cannot be postponed.

The quantities of fertilizer subsidized in 2021 for all crops were as follow:

Table 7: Quantities of subsidized fertilizer distributed in 2021 by region

Structures	NPK (in tons)	Urea (in tons)	DAP (in tons)	Total mineral fertilizer (in tons)	Organic fertilizer (in tons)
Kayes	559	537	455	1,551	101
Koulikoro	3,139	3,471	3,108	9,718	1,681
Sikasso	3,287	3,287	3,287	9,861	2,836
Ségou	6,848	15,274	3,420	25,542	3,708
Mopti	4,100	5,500	3,595	13,195	812
Tombouctou	1,780	2,866	600	5,246	0
Gao	0	60		60	0
Taoudéni	0			0	0
Koutiala	2,581	998	114	3,693	788
Bougouni	3,973	3,357	2,357	9,687	1,505
Dioila	400	473	21	894	759
Nioro				0	0
District of Bamako	100	145	50	295	600
Total fertilizers	26,767	35,968	17,007	79,742	12,790

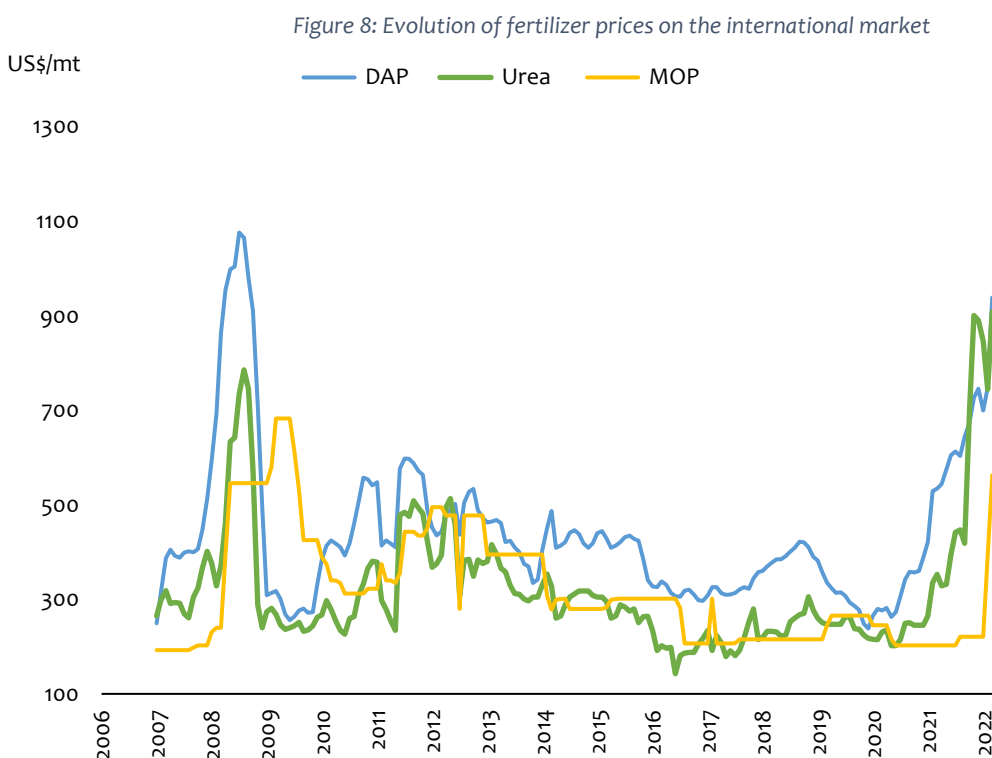
Source: Ministry of Rural Development

498,176 farmers, including 94,872 women (19%), benefited from subsidized fertilizers in 2021 for a total amount of 15.6 billion CFA francs.

The total quantities of subsidized mineral fertilizers distributed for all crop production in 2021 (79,742 tons) are far from sufficient to cover the needs of rice production alone, which has been estimated by the Ministry of Rural Development at 171,097 tons.

By way of comparison, during the launch of the Rice Initiative in 2009, the quantities distributed for rice cultivation alone were 51,779 tons (33,067 tons of urea and 18,733 tons of DAP), whereas at the time, the national requirement for mineral fertilizers was only 92,800 tons.

Mali's nitrogen fertilizer imports, 80% of which is urea, are mainly imported from Russia. Urea prices have more than tripled in one year to around USD 900/ton in December 2021 due to rising gas prices, logistics costs and limited global stocks. This situation has worsened further in 2022, with the start of the war in Ukraine and the continued increase in energy costs. The price reached USD 907/ton in March 2022 (see Figure 8).



Source: Commodity Markets Outlook, World Bank, April 2022

World Bank forecasts¹³ expected fertilizer prices to increase by 70% in 2022 before a decline begins in 2023 with the commissioning of urea plants in Brunei, Nigeria, and India.

This rise in international market prices has had negative consequences in Mali, where it has become very difficult to buy fertilizer even at market prices (35,000-40,000 CFA francs per bag instead of 11,000 CFA francs for subsidized fertilizer). In this context, the government has increased the fertilizer subsidy budget from 15 to 17 billion CFA francs in 2023¹⁴ to encourage the use of local fertilizers, particularly

¹³ www.openknowledge.worldbank.org/bitstream/handle/10986/37223/CMO-April-2022.pdf

¹⁴ [https://www.agenceecofin.com/breves-agro/1905-97822-mali-la-subvention-des-intrants-pour-la-campagne-agricole-2022/2023-coulera-finalement-27-millions#:~:text=\(Agence%20Ecofin\)%20%2D%20Au%20Mali,24%20millions%20%24\)%20opr%C3%A9vue%20initialement](https://www.agenceecofin.com/breves-agro/1905-97822-mali-la-subvention-des-intrants-pour-la-campagne-agricole-2022/2023-coulera-finalement-27-millions#:~:text=(Agence%20Ecofin)%20%2D%20Au%20Mali,24%20millions%20%24)%20opr%C3%A9vue%20initialement)

organic fertilizers, which will be available at a price of 2,500 CFA francs per bag¹⁵. It also increased the purchase price of a subsidized bag of fertilizer from 11,000 to 12,500 CFA francs in 2022, while halving the quantities allocated per hectare (2 bags per hectare instead of 4 bags).

Farmers are therefore forced to use less fertilizer than recommended in the technical packages, especially as there is a shortage even of non-subsidized fertilizer. This situation will certainly have a negative impact on national rice production in 2022 and beyond.

5.1.3. Plant production products

The main players of the crop protection value chain are:

- **The Ministry of Agriculture, Livestock and Fisheries**, which oversees the management of phytosanitary products through:
 - o The “Direction Nationale de l’Agriculture” (DNA) and more specifically its “Division Législation et Contrôle Phytosanitaire des Produits Végétaux”, which is responsible for drafting legislation and standards on plant production, phytosanitary control, and inputs, controlling the quality of inputs and agri-pharmaceutical products and ensuring their approval.
 - o The “Office de la Protection des Végétaux” (OPV) whose mission is to ensure the implementation of the national plant protection policy.
 - o Development offices (ON, ORS, ORM, etc.) involved in information/awareness raising and promotion of alternatives.
 - o The National Committee for Pesticide Management (CNGP), responsible for proposing the principles and general orientations of pesticide regulation in Mali, adopting a list of banned pesticides, and issuing an opinion on import or approval requests.
- **The Ministry of the Environment, Sanitation and Sustainable Development**, and in particular the National Directorate of Sanitation and Control of Pollution and Nuisances, in charge of providing technical advice on all matters relating to pollution and potentially polluting products.
- **The Ministry of Health and Social Affairs**, and specifically the National Health Directorate, which oversees monitoring the impact of pesticides on the health of the population and for preparing the documentation of pesticide-related poisoning cases in Mali.
- **The Ministry of Industry and Trade** through two Directorates in charge of control: the National Directorate of Trade and the National Directorate of Industry.
- **Pesticide manufacturers**: private companies that manufacture pesticides for domestic use (Société Malienne de Produits Chimiques-SMPC and Société de Fabrication de Produits Insecticides-PRODIMAL).
- **Réseau des Opérateurs d’Intrants Agricoles du Mali (ORIAM)**, a network of players in the agricultural inputs sector (seeds, fertilizers, pesticides and agricultural equipment).
- **CropLife Mali**: association of pesticide importers.
- **Rice farmers**.
- **The Sahelian Pesticide Committee**, an organization of the Sahel Institute/CILSS, responsible for evaluating all new pesticides proposed by companies. Its approval authorizes the marketing of the product in CILSS member countries.

The main importers and distributors of plant protection products are shown in the table below:

¹⁵ www.commodafrica.com/14-04-2022-au-mali-le-president-de-la-transition-fixe-les-priorites-agricoles

Table 8: Main importers of plant protection products

AF-CHEM SOFACO Mali	Subsidiary of the Ivorian group Af-Chem Sofaco.	Address: Zone industrielle, Rue 943 Porte 233, BP 2581 Bamako Immeuble BANGA (Face Station Total), Route de SOTUBA infos@afchem-mali.net Phone: +223 20 21 56 65 / 66 71 44 91
AGRICHEM	Subsidiary of the Société Africaine Group is an importer and distributor of agricultural inputs (Tradecorp, Toguna, Cigogne, Bayer SAS, Savana, Syngenta).	Address: Faladié, Avenue des 30 mètres, Immeuble Gamby, BP E 2068 - Bamako Phone: +223 20 20 90 12 / 20 20 92 91
ARC-EN-CIEL	Created in 2006. Importer, distributor of seeds, fertilizers, plant protection products and agricultural equipment/machinery (tractors, tillers, sprayers, atomizers, pumping and irrigation equipment). Runs points of sale in CMDT areas, Office du Niger and Office Riz Ségou.	Address: Boulkassoumbougou - Rue 518 Porte 200, Bamako Phone: +223 - 20 24 50 26
Mali Protection des Cultures (MPC)	Created in 1998. Member of the Indian group UPL. Distributes Arysta Life Science products. Manages a network in 12 communities: Bamako, Bougouni, Sikasso, Koutiala, Selingué, Kita, Fana, Kayes, Ségou, Niono, San and Mopti.	Address: Quinzambougou, Route de SOTUBA, Rue 499, Porte n° 1892, BP 603 Bamako mpc.mali@upl-ltd.com Phone: +223 20 21 33 55
SOGEA	Distributor of Bayer and Syngenta products. Runs a network in 9 communities: Bamako, Kati, Bougouni, Niena, Sikasso, Koutiala, Niono, M'Bewani and Mopti.	Phone: +223 76 13 29 78
SOLEVO Mali SA	Created in 2000 and is a subsidiary of the SOLEVO Group (Louis Dreyfus Commodities). It is one of the main traders-distributors of agricultural and chemical inputs in Africa. Has three branches in Bamako, Ségou and Sikasso.	Address: Rue 128, Sogoniko, BPE 4293, Bamako solevo.mali@solevogroup.com Phone: + 223 20 20 69 09
TOGUNA	Company created in 2000. Importer and distributor of plant protection products (BASF). Is part of the Toguna Group which is active in the production of mineral and organic fertilizers, the import and distribution of agricultural equipment and in mining.	Address: Senou, P 203 / R 48 toguna@gmail.com Phone: +223 44 97 94 00

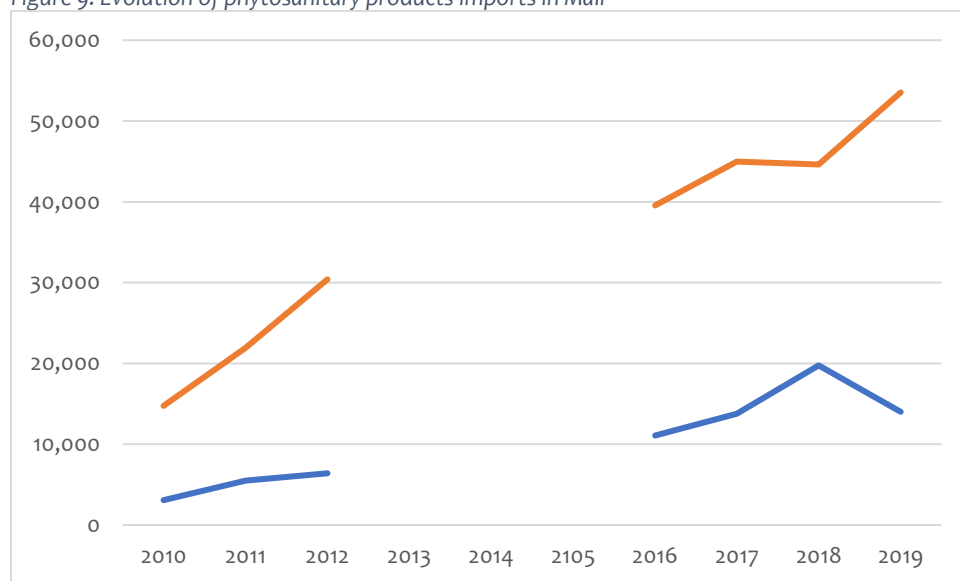
Source: The Consultant

Imports of plant protection products have grown very rapidly over the last decade, from 3,000 to 14,000 tons per year (+35.5% per year on average).

The value of imports increased from USD 14.7 million to USD 53.5 million over the same period (+26.3% per year on average).

Data for the years 2013, 2014 and 2015 are not available.

Figure 9: Evolution of phytosanitary products imports in Mali



Source: FAOSTAT

5.1.4. Mechanization

The main players in the mechanization value chain are:

- **Société Coopérative Artisanale des Forgerons de l'Office du Niger (SOCAFON)**, a cooperative specializing in the manufacture and adaptation of soil preparation equipment (ploughs, graders, etc.) and post-harvest equipment (threshers, bundlers, hullers, sorters, and mini-rice mills). SOCAFON assembles power tillers using engines and components imported from Thailand.
- **Mali Tracteurs SA**, a company born from the partnership between an Indian investor and the Malian government, built a Mahindra tractor assembly plant in 2009 in Samanko, in the Mandé region, less than twenty kilometers from Bamako. The factory has a production capacity of 2,000 tractors per year; however, the company is experiencing difficulties related to the low purchasing power of farmers and the difficulties in accessing to bank credit for most farmers. This situation has not allowed the company to enter its profitability phase and the Indian investor is considering withdrawing from the project. For the 2020/2021 season, the company has sold 372 tractors and accessories¹⁶, as part of the national mechanization program and for some development projects.
- **Importers of agricultural equipment**: they import equipment mainly from India and China. Given the importance of the price factor in the Malian market, imported equipment is often of poor quality, and breaks down very quickly. As many importers do not offer after-sales service, the equipment is abandoned because of the lack of spare parts.
- **Centres d'Exploitation de Machines Agricoles (CEMA)**, developed by the Syngenta Foundation for Sustainable Agriculture, are providers of mechanization services (soil preparation, irrigation, harvesting/threshing/draining, shelling and transport). This service offer matches with the needs of the Malian market, where there are very few large farms with the financial capacity to purchase and depreciate agricultural equipment.
- **The Rural Agricultural Service Centres – “Centres Ruraux de Prestation de services agricoles” (CRP)**, set up by the Malian government and under the guidance and supervision of the “Cellule pour la Promotion de l'Entrepreneuriat Agricole” (CPEA).

¹⁶ Annual Report 2020, DNGR www.dngr.gouv.ml/fileadmin/user_upload/Rapport_Annuel_2020_DNGR.pdf

- **Local manufacturers of agricultural equipment** (Directory of local equipment suppliers available: see SAA Mali, June 2021)

Mechanization of rice remains low in the country, although it is more important than for other crops, for several reasons:

- Small plot size,
- Low financial capacity of farmers,
- Public support and subsidies for mechanization very low compared to the country's needs,
- Lack of know-how in the use and maintenance of agricultural machinery and equipment,
- Unavailability of spare parts for imported equipment,
- Low number of agricultural mechanization service companies.

The mechanization of Malian rice farming is essentially based on manual tools. Almost all farms use dabas, hoes and picks.

According to the DNGR report of 2020, of the nearly 1.5 million farms in Mali, there are:

- 702,357 farms equipped with animal traction (47.4%) and
- 65,649 equipped with motorized traction (4.4%)

Equipment is mainly composed of:

- Ploughs,
- Tillers
- Hoes,
- Seed drills and
- Carts.

The rate of farms with agricultural equipment in Mali is presented in the following table:

Table 9: Percentage of farms equipped

Equipment	Percentage of farms equipped in %
Spray	7,2
Tiller	14,2
Plough	81,6
Donkey hoe	21,8
Seed drill	26,9
Harrow	9,6
Ploughing animals	74,3
Carts	82,3
Straw cutter	9,8
Mowers	10,0

Source: EAC 2019

According to the 2019 General Population and Housing Census, the number of tractors in the country has increased from 1,890 in 2012 to 16,320¹⁷ in 2019.

About 2/3 of tractors are in Sikasso (25.8%), Koulikoro (23.8%) and Bamako (18.2%). More than ¾ of tractors (77.5%) are used in agriculture.

¹⁷ www.instat-mali.org/storage/135/rapport-module-rga-rgph5_rap.pdf

This number is still very low compared to the country's agricultural area.

It is important to emphasize that rice cultivation, where intensification is more important than for other crops, has a higher rate of mechanization than the national average.

To illustrate this, we can highlight the type of ploughing practiced in the production regions. The table below shows that on almost half of the agricultural land (44.8%), farmers use a ploughing system with a tractor to plough the soil. Motorized ploughing is very rare, being practiced on only 3.3% of the agricultural area.

In Segou, which is one of the main intensification zones, 62.7% of the area is ploughed with a hitch and 9.5% by mechanized ploughing.

Table 10: Ploughing method by region in percent

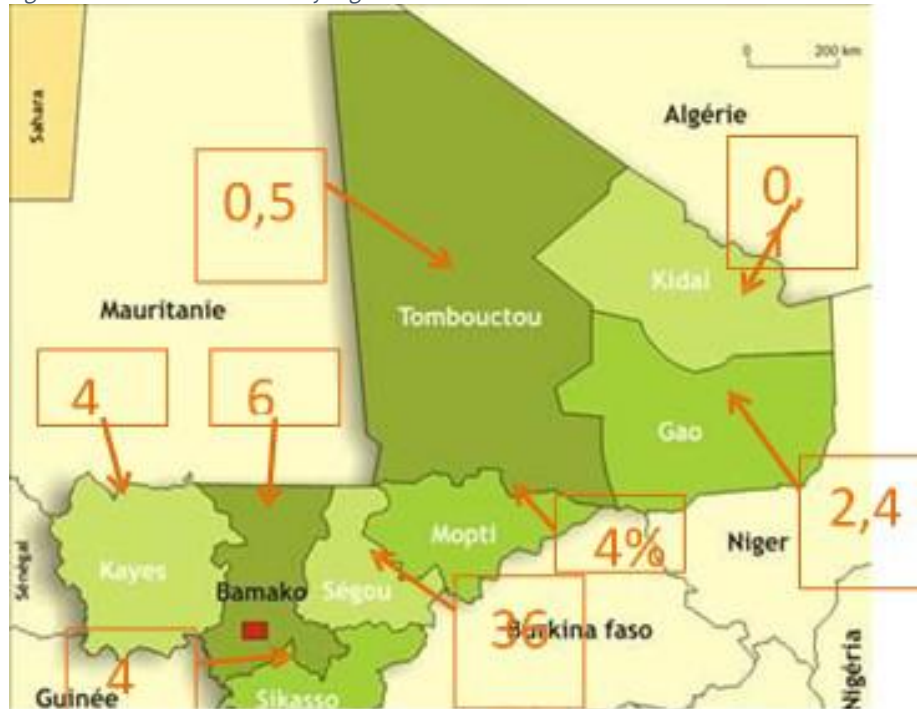
	Kayes	Koulikoro	Sikasso	Ségou	Mopti	Timbuktu	Gao	Bamako	Total
Plots without ploughing	6.84	4.07	2.61	4.44	8.06	2.09	0.00	9.10	4.80
Plots with manual ploughing	42.71	7.53	11.04	3.54	27.97	59.96	19.60	61.20	21.41
Plots with harnessed ploughing	24.14	57.82	70.95	62.74	33.40	5.23	13.43	0.00	44.77
Manual harnessed ploughing	22.54	26.63	9.74	16.50	28.41	4.95	65.00	9.79	21.73
Plots with motorized ploughing	0.17	0.34	5.20	9.52	1.91	0.89	0,00	9.02	3.33
Manual and motorized ploughing	0.53	1.77	0.17	0.53	0.00	0.15	1.15	4.36	0.59
Harnessed & motorized ploughing	1.77	1.06	0.27	1.37	0.00	0.59	0.00	0.00	0.84
Others or does not know	1.29	0.79	0.03	1.37	0.25	26.13	0.83	6.53	2.53

Source: EAC 2019

These elements are also confirmed by the FARA study¹⁸ which shows that Segou is the area with the highest mechanization rate in Mali (36%).

¹⁸ Mechanization and skills development for productivity growth, employment, and value addition: Insights from Mali, FARA, April 2020

Figure 10: Mechanization rate by region in Mali



Source: FARA

Finally, it should be noted that the Malian government has developed a national strategy for agricultural mechanization 2019-2025, which has a specific component for rice cultivation.

Its objectives are to:

- Promote the emergence of a dynamic private sector (manufacturers, mechanics, drivers, service providers) operating in the mechanization sub-sector.
- Promote access to agricultural equipment and machinery through the establishment of 10 service centers in the rice-growing basins and by providing farmers with:
 - 1,500 power tillers and accessories in the full water control areas.
 - 640 tractors and their accessories as well as the renewal of existing hitched equipment in undeveloped areas.
 - 1,000 threshing machines,
 - 1,000 huskers,
 - 4 mini rice mills,
 - 4 rice mills
 - 1,000 modern parboiler kits.
- Promote accompanying measures for the modernization of rice cultivation.

As part of the implementation of this strategy, a subsidy of 50% of the acquisition cost of the equipment is granted by the Ministry of Agriculture.

The equipment subsidized in 2021 were as follows:

Table 11: Subsidized equipment in 2021

Description	Quantities received by DFM ¹⁹	Observations
Power tillers (16 hp) equipped with plough, puddle, long handle trailer	50	
Tractor (50 hp and 60 hp) equipped with plough, sprayer, trailer	215	100 tractors 50 CV 115 tractors 60 CV
Multifunctional animal traction buttress	100	
Seeder - seed spreader with motorized traction (reach)	80	
Threshing machines	100	Multipurpose threshers
Hullers	50	
Motor pump 20-25hp	170	100 units of 5 CV 35 units of 15 CV 35 units of 25 CV
Photovoltaic motor pump	200	
Motorized binding machines	50	

Source: Consolidated three-year crop year plan

A 2013 study shows that compared to the world's main rice producers, which are in Asia²⁰, the mechanization of Malian rice cultivation is still insufficient:

	Japan	Korea	China	India	Mali
Average farm size	2 ha	1.36 ha	0.4 ha	1.33 ha	4.73 ha
% Mechanization					
Soil preparation	99-100%	100%	82%	40.3%	4.8%
Plantation	100%	98%	20.9%	28.9%	N/A
Yield	100%	99%	64.5%	65.0%	N/A

During the field surveys, several people reported that, in recent years, many equipment importers have appeared and then disappeared from the market. These players import low-cost equipment of low quality, depending on the opportunities that arise, and without a medium or long-term development strategy, and as they do not provide after-sales service or spare parts, the first time the equipment breaks down it is abandoned.

There is therefore a very large amount of abandoned non-functional agricultural equipment in Mali.

5.2. Rice farming

Malian rice farmers face many challenges that prevent them from expressing the potential of their crops. In interviews with rice farmers, the following main points were cited:

- The profile of rice farmers (male, elderly, uneducated with little financial means) is one of the main causes of the low productivity of rice cultivation in Mali. Indeed, the cultivation calendar and technical packages are not well applied for these reasons, resulting in yields lower than the agronomic potential

¹⁹ Direction des Finances et du Matériel, Ministry of Agriculture

²⁰ *Mechanization in rice farming: lesson learned from other countries*, Asia Rice Foundation, Annual Rice Forum 2013

and high losses during and after harvest. Their reluctance to change makes the introduction of new technologies more difficult.

- Women and young people have little access to resources (land, fertilizer, finance, etc.), which has a negative impact on their production and income levels.
- The average size of plots is small (4.7 hectares at national level, 1.5 in the Office du Niger area, 0.3-0.5 hectare in the Village Irrigated Schemes). The production of very small plots is mainly for self-consumption and in many cases is not even sufficient to cover annual family needs.
- SRI has been implemented by development projects since 2014. Results have shown that it can increase yields by 30%, while reducing the use of seeds and fertilizers. The National SRI Program with the support of these projects has been able to cover 5,610 ha in Office du Niger (11,900 farmers), 980 ha in ORS (1,960 farmers) and 700 ha in OMB (1,400 farmers) out of a total programmed area of 154,268 ha. The reluctance of farmers to adopt SRI is linked to the additional labor requirements, the lack of necessary equipment, the difficulty of managing water turns and the high cost of transporting organic fertilizers.
- Technical support and extension for rice are very limited in the country, except in the areas of the Offices where there is a presence of technical agents, even if they are in very insufficient numbers, and in the areas of intervention of development projects financed by international donors.
- Irrigation costs are high due to the use of diesel fuel, the price of which has risen sharply in recent years.
- Access to finance is difficult and interest rates are very high for Malian farmers (9 to 17% for bank loans and 12 to 24% for microfinance). Financing institutions are reluctant to finance agriculture due to the risks associated with this activity and the absence of collaterals. The financial education of farmers is generally very low.
- Access to finance has also become more difficult, as financial institutions have withdrawn from rural areas facing insecurity issues (Mopti and Ségou) and moved to urban areas.
- Rice farmers have little awareness of the waste of resources that they cause (water, inputs, energy, production losses, etc.) and even when they are aware, they do little to change things.
- Rice farmers are not very aware of the impact of their activity on the environment (methane emissions, pollution, etc.) and on their health (use of pesticide packaging as water containers for drinking, use of fertilizer bags to store rice, etc.).
- Problems of soil impoverishment are beginning to appear in some areas of Sikasso and are causing yield reductions.
- Impact of climate change is increasing; flooding, irregular rainfall, and the development of pockets of drought (Sikasso).
- Availability of labor is becoming problematic due to migration to urban centers and the displacement of populations threatened by terrorist groups.

On the other hand, interviews with stakeholders in the different production basins confirm the official statistical data presented above.

Table 12: Yields in the main production basins

Production basin	Yields per hectare (in t/ha)	Paddy rice cultivation profit per ha (in F CFA)
Koulikoro (full control)	2.0 – 4.0	740,000 – 1,780,000
Sikasso (rainfed)	1.8 – 2.5	200,000 - 900,000
Sikasso (lowlands)	2.5 – 2.8	100,000 – 350,000
ORS (full control)	4.0 - 6.2	1,100,000 – 1,300,000
ON (full control)	5.7 - 6.1	ND

Source: Data collected by the Consultant

Margins generated by rice production could be improved if post-harvest losses were lower. According to the African Postharvest Losses Information System (APHLIS)²¹, which is the main international initiative for the collection, analysis, and dissemination of data on post-harvest losses of cereal crops in Africa, post-harvest losses and waste of rice in Mali are estimated at 11.4% (2021).

APHLIS' estimate of losses based on a production of **1,602,255 tons** in 2021 (not 3,010,027 tons) shows a loss of **175,351 tons** of paddy rice worth **US\$119.8 million per year**. This loss could have fed 751,161 adults or 1,700,451 children aged 0-3 years in Mali.

The main steps leading to losses are detailed in the following table:

Table 13: Main steps of post-harvest losses of rice in Mali

Step	Loss rate
Harvest-drying on fields	4.4%
Threshing-ginning	3.1%
Winnowing	2.5%
Transportation from the field	1.3%
Household storage	0.1%

Source: APHLIS, 2022

For comparison, post-harvest loss rates in Mali are lower than in the other main African rice-producing countries studied by APHLIS, as shown below:

Table 14: Post-harvest loss rates in major African rice producing countries

Mali	11.4 %
Madagascar	12.0 %
Tanzania	12.3 %
Nigeria	12.3 %
Guinea	12.5 %
Côte d'Ivoire	12.5 %
Sierra Leone	15.3 %
Senegal	15.5 %
DR Congo	16.2 %

Source: APHLIS, 2022

Other studies²² show that post-harvest losses vary greatly depending on the size of the farm, the technologies used, the area of production and the harvest period.

²¹ www.aphlis.net

²² www.mdpi.com/2071-1050/13/17/9627/htm

5.3. Rice processing

5.3.1. The processing steps

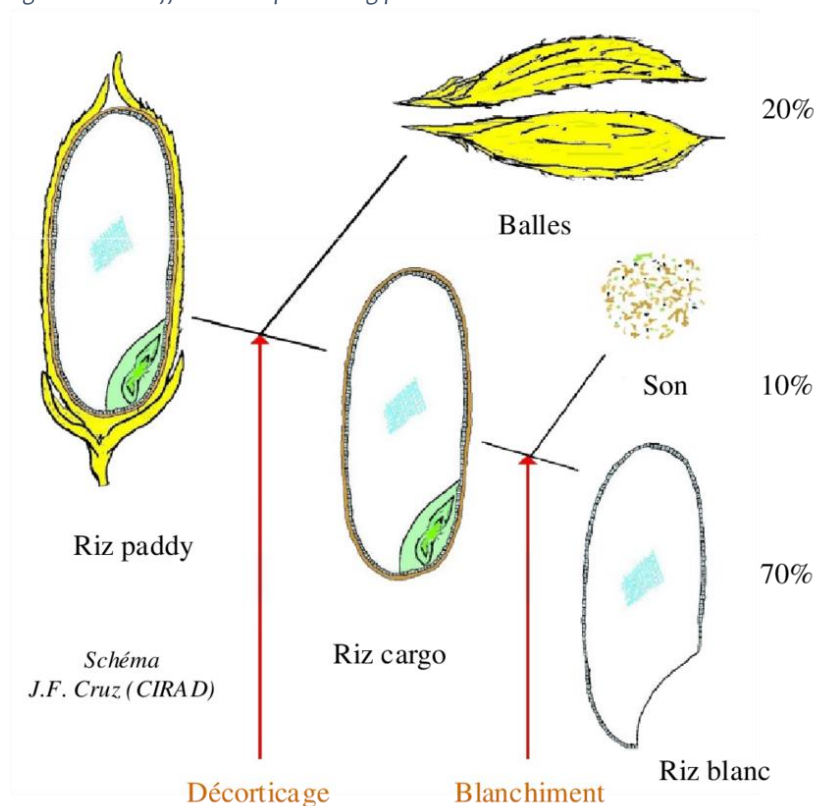
Paddy rice is the product harvested by farmers; its grain retains its husk after threshing.

Rice processing operations consist in husking (removing the outer husk from the paddy rice) to obtain cargo rice, and then whitening it by milling.

The different types of processed rice from paddy rice are:

- **Husked rice** (cargo, or brown rice): paddy rice from which only the husk has been removed. Some loss of pericarp may occur during hulling and handling.
- **Milled rice** (white rice): husked rice that has had all or part of the pericarp and germ removed by milling.
- **Parboiled rice** is husked or milled rice obtained by soaking paddy rice or husked rice in water, then treated by heat that completely gelatinizes the starch and dried.
- **Glutinous rice**, special varieties of rice whose grains are white and opaque. The starch in glutinous rice consists almost entirely of amylopectin. It tends to clump together after cooking.

Figure 11: The different rice processing products

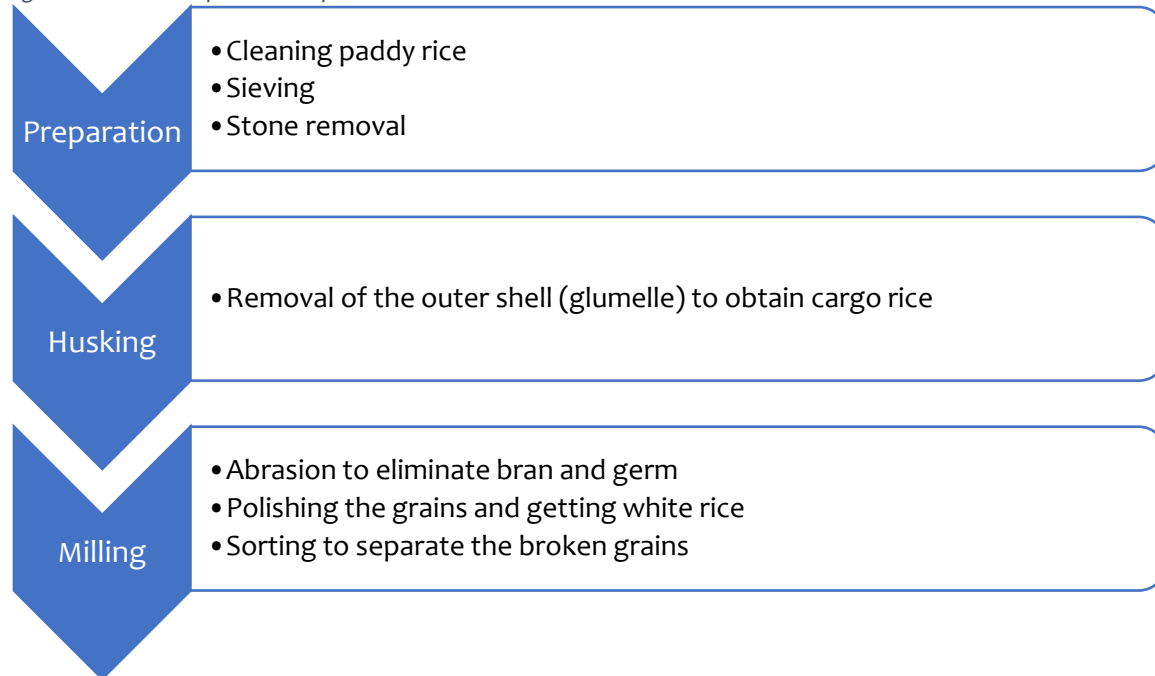


Source: CIRAD

The two main processes of rice processing are shown below:

- White rice

Figure 12: White rice production process



Source: The Consultant

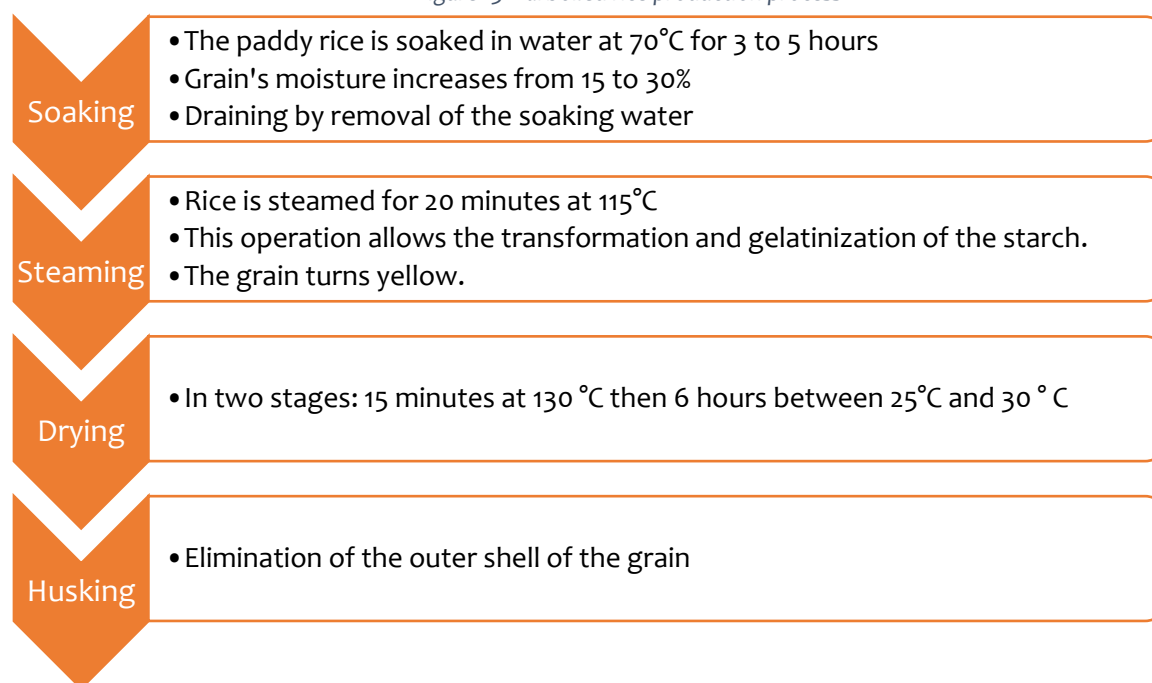
Processing yields vary greatly from one type of equipment to another (from 52 to 70 kg of white rice per 100 kg of paddy). It is also highly dependent on the rice variety, harvesting conditions, grain moisture content and storage quality.

The rice mills in Mali offer the following qualities of rice:

- **ELB**: Whole Long Blanched, a superior quality rice. It represents only 1 to 2% of the market.
- **RM25**: Rice containing 25% broken grains. It is a medium to high quality rice. It represents about 10% of the market.
- **RM40**: Rice containing 40% broken grains. It is a medium quality rice and represents 80-85% of the market.
- **BB**: Bleached Breakage.

- Parboiled rice

Figure 13: Parboiled rice production process



Source: The consultant

The parboiling process allows a slow penetration of water into the rice grain through the reorganization of the starch, giving the product elasticity and good texture. Parboiling leads to hardening of the grains, which improves hulling performance and reduces the breakage rate while becoming less susceptible to insect attack. Parboiled rice has a high nutritional value due to its richness in minerals that migrate from the pericarp and a lower glycemic index than white rice (less risk of obesity and diabetes).

5.3.2. Processing players

Rice processing is carried out by several types of players in Mali:

- **The farmers** themselves manually hull paddy rice with pestles for their own consumption.
- **Service providers using mobile hullers** offering their services to rice farmers at farm gate (18,000 small units in Mali). These small hulling units are not very efficient and produce poor quality rice with a breakage rate of at least 50% and poor whitening. This equipment does not allow sorting to separate impurities and grains, which leads to the presence of dirt and impurities in the rice.
- **Artisanal shelling units** managed by individuals or cooperatives,
- **Women's parboiler cooperatives** that produce parboiled rice. In Sikasso, paddy rice is mainly processed into parboiled rice by women and is used for self-consumption and is also exported to Guinea.
- **Mini rice mills**, produce good quality milled rice that meets the needs of consumers (low level of impurities, separation between whole grains and broken grains, etc.). They have sorting and grading machines that allow the product to be graded into different qualities of rice. In addition, a blower is used to extract the bran and separate the flour from the husked rice.
- **Industrial rice mills (5 in total in the country)**. These large industrial units are fully equipped with processing lines for all production steps from husking to packaging in small or big bags.

Most of the Malian rice is processed by mobile and artisanal units.

Contract farming is beginning to take place with the support of some development projects (GIZ CIV, IFAD-DANIDA Inclusive Project, etc.).

In this type of scheme, a processor and a cooperative establish a rice supply contract according to specifications defining the quantity of rice, the price, the payment conditions, and the quality (rice variety, moisture content <14%, maximum, impurity level, type of packaging, etc.).

In return, the processor grants advances in kind (fertilizers, seeds, motor pumps, etc.) to the cooperative which distribute them to its members.

At harvest, the cooperative collects the contracted quantity of rice from its members and supplies it to the processor. The latter deducts the advances in kind and pays the cooperative the remainder.

Table 15: List of the main private rice processing companies

Company	Manager	Rice production (in tons)	Location
Moulin Moderne du Mali	Mr. Modibo KEITA, Founder	32,400	Ségou
Planète Distribution	Mr. Ousmane CISSE, CEO	18,600	Mopti
Grands Moulins du Mali	Mr. Cyril ACHCAR, CEO	15,000	Koulikoro
SOPROTRILAD	Mr. Ibrahima CISSE, CEO	3,000	Tombouctou, Mopti
RIFAB SA	Mr. Sékou BOCOUM, CEO	500	Sévaré
MALO	Mr. Mohamed Aly NIANG, Founder	500	Ségou

Source: The Consultant

5.3.3. Challenges in rice processing

The main constraints faced by processors are summarized below:

Issue	Description
Performance of processing equipment	The efficient processing equipment available on the market is expensive. Since companies in the rice processing have limited resources and difficult access to bank financing, they choose equipment with lower performing equipment (poor yields and high energy consumption) because the initial investment is lower.
Financing of rice supply and temporary shortage of raw material (paddy)	Financing is a bottleneck, since processors who are in a contract farming scheme have to pre-finance rice purchases by in-kind supplies (fertilizers, motor pumps, etc.) and have difficulties to find financing. Even when bank credit is available, the interest rates are prohibitive (9-17%). Those who do not have the capacity to pay for rice at harvest time run the risk of seeing rice farmers sell their production to middlemen and wholesalers who pay in cash.
Quality of rice supplied by farmers	The main quality problems encountered by processors are high moisture content (>14%), varietal mix and too high impurity rates (straw, clods, stones, etc.).
Security risks	In the regions of Ségou and Mopti, security risks pose a direct threat to processing activity and an indirect one due to the drop in production. Some companies have decided to relocate their activities to Bamako, and other new projects are on hold for this reason. Those who continue their activities must find financial agreements with terrorist groups to be able to circulate without hindrance.

5.4. Commercialization

5.4.1. Commercialization of local rice

Rice commercialization is characterized by a rough organization where the role of each player is not clearly delimited, in the sense that they can play several roles at the same time, with farmers selling their rice to wholesalers, retailers and end consumers, wholesalers selling their products to semi-wholesalers, retailers and end consumers, etc.

The sector has been dominated for some decades by a small number of traditional traders who act as importers, wholesalers and, for some of them, processors. These traders handle very large volumes of rice and have a crucial influence on the market because of their financial power. They are the main players supplying the domestic market and public buyers with imported rice, such as the company Grand Distributeur Céréalière du Mali (GDCM) which is the largest Malian importer with a 50% market share for imported rice and is also active in the marketing and processing of local rice.

This dominant position of this oligopoly is further reinforced by policies of exemption from customs duties on imported rice.

It should be noted that exports of Malian rice to the neighboring countries take place informally, which makes it difficult to estimate, even though some experts estimate it at 100,000 tons per year, of which 75,000 tons are exported to Guinea and 25,000 tons to Senegal.

5.4.2. Commercialization of imported rice

The sharp increase in Malian paddy production has helped reduce the country's dependence on imports, with national production rising from a contribution to self-sufficiency of 77% in 2002 to 92% in 2019.

However, rice imports remain high (263,000 tons in 2019) and is costly for the country (USD 64.1 million or 0.37% of GDP), without considering cross-border imports from Burkina Faso, estimated at more than 2,000 tons per year²³.

Rice import is governed by Decree 505/PR-M of October 2000, regulating foreign trade, and Inter-ministerial Order No. 9-0788/MEIC-MF-SG of April 2009, which establishes the enforcement modalities of this decree.

To better control legal imports, the government has set several requirements for submitting an intention to import rice form to the Ministry of Trade and Competition. These include the following documents:

- Import intent request form.
- Copy of the certificate of registration in the Trade and Personal Property Credit Register.
- Copy of tax identification card.
- Copy of the import-export license.
- Receipt from the Chamber of Commerce and Industry of Mali.

Rice imports are regulated according to national production. The rice needs to be imported throughout the year are estimated at the beginning of the marketing period. When the supply of rice on the market is too low during specific periods (Ramadan), the government may decide to grant exemptions from customs duties and Value Added Tax (VAT) to importers based on certain criteria, so that market supply is not disrupted, and prices remain stable. However, needs are often overestimated, resulting in excessive rice imports that disrupt local rice sales.

On the other hand, VAT or customs duty exemptions that are decided to reduce the consumer price are not reflected on to the retail price, as happened in 2005 (suspension of 18% VAT) or in 2007, 2008

²³ Rice Trade and Development of the Rice Sector in West Africa, ECDPM-IPAR, October 2020

and 2009 (suspension of 18% VAT and 10% customs duty). These exemptions only benefit importers who take advantage of them to increase their margins.

5.4.3. Commercialization players

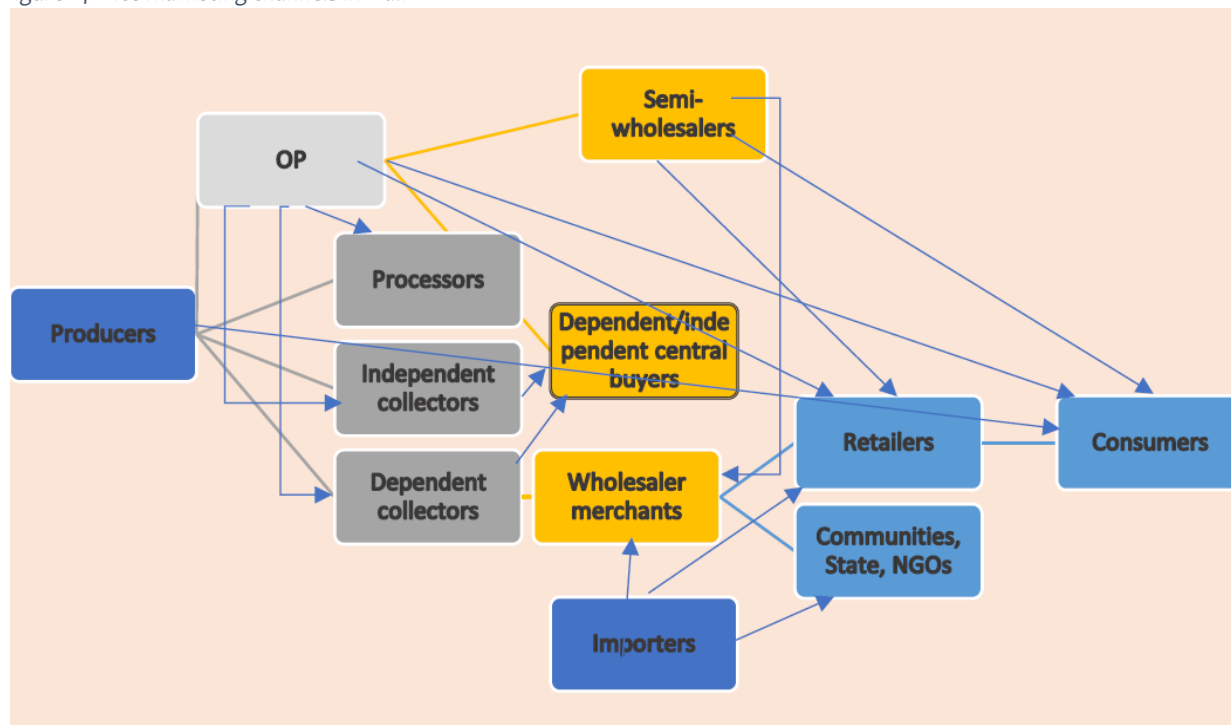
Unlike POs (cooperatives, associations, platforms, etc.), which are beginning to cooperate more effectively with each other, it was noted during the interviews that the relationship between the players involved in commercialization is characterized in most cases by mutual distrust in commercial and financial transactions and a virtual absence of formal contractualization. This mistrust is due in several cases to embezzlement, non-compliance with commercial commitments (sale to another client to increase margins, etc.), deception about the quality of the rice, etc.

Several types of players are involved in the marketing process: farmers (individual or grouped in cooperatives), collectors (independent and non-independent), aggregators, wholesalers, importers, semi-wholesalers, retailers and finally consumers.

- **Individual farmers:** they sell paddy and/or hulled rice to collectors or semi-wholesalers and even to end consumers either at farm gate or in weekly markets or grain exchanges.
- **Cooperatives (POs):** They collect rice from their members and usually sell it to wholesalers. In some cases, the most structured cooperatives with the support of development programs sell their paddy or husked rice production to processors in the framework of farming contracts. This trend has increased in recent years.
- **Processors** process the paddy into sorted white rice. Processors provide services to farmers or husk their sourced paddy. They also buy bulk rice on the market and sell it to wholesalers or retailers or even to consumers.
- **Independent collectors:** use their own funds to purchase from farmers for resale to wholesalers or processors.
- **Dependent collectors:** they are pre-financed by semi-wholesalers and wholesalers or aggregators to make their purchases. These collectors can sometimes provide loans to farmers during the lean season against payments in kind (paddy).
- **Independent aggregators:** Get deliveries from the collectors. They have their own funds which they use to buy the rice. Rice is then delivered to a wholesaler who is the head of the network. They have transit stores in the wholesale markets.
- **Dependent aggregators:** they operate with funds from the network leader with whom they agree on a yield price that can change according to supply and demand in the weekly market. The network leader closely monitors the price prevailing on the market as a control element.
- **Wholesalers** usually source their supplies from various networks of collectors or aggregators, which they pre-finance, and addition to controlling rice imports in some cases (3 wholesalers control 2/3 of Mali's rice imports). They have storage warehouses in the major urban centres. They have easier access to finance than other actors, which allows them to buy large quantities.
- **Semi-wholesalers** buy their products mainly from wholesalers. Their main customers are retailers, but they sometimes resell their products to wholesalers according to market opportunities. Their margins are reduced but their stock turnover is fast, and the quantities handled are large.
- **Retailers**, the last link in the chain before the end consumer. Most of them specialise in the sale of dry cereals (rice, millet, sorghum, etc.).
- **Public buyers:** Ministry of Defence for the military, Ministry of Health for hospitals, Ministry of Education for school canteens, Ministry of Justice for prisons, etc. They buy through competitive tenders resulting in purchase almost exclusively of imported rice, which is more competitively priced than local rice.
- **Office des Produits Agricoles du Mali (OPAM)** is responsible for the management of the national cereal security stock (SNS) and purchases to replenish the SNS. The State Intervention Stock (SIE) is a complement to the SNS and is intended to reduce market distortions and strengthen the capacity of the SNS in the event of a major crisis. It consists of 25,000 tons of rice. This stock is made up of imported rice. The Interprofession du Riz (IFRIZ) is currently negotiating to obtain a quota of local rice

in the SIE. The OPAM also buys from well-organized POs (as in the case of some POs supported by SFSA).

Figure 14: Rice marketing channels in Mali



Source: The consultant

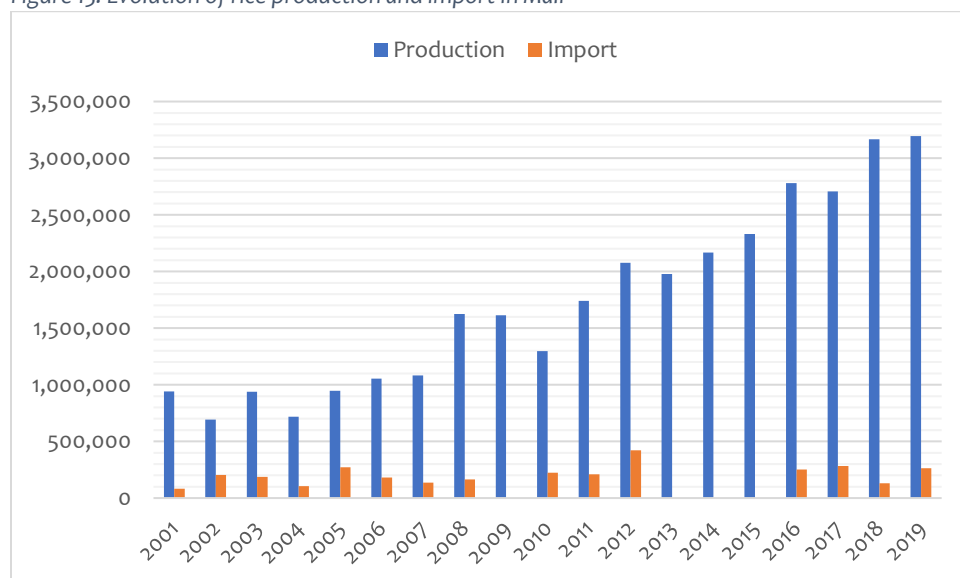
5.5. Rice consumption

5.5.1. Evolution of consumption

The increase in volumes of paddy rice produced as well as the increase in rice imports result from an increasing demand due to:

- Strong population growth (+3.5% per year on average).
- Change in eating habits in urban areas but also in rural areas which contributed to the increase in per capita rice consumption (+3.4% per year).

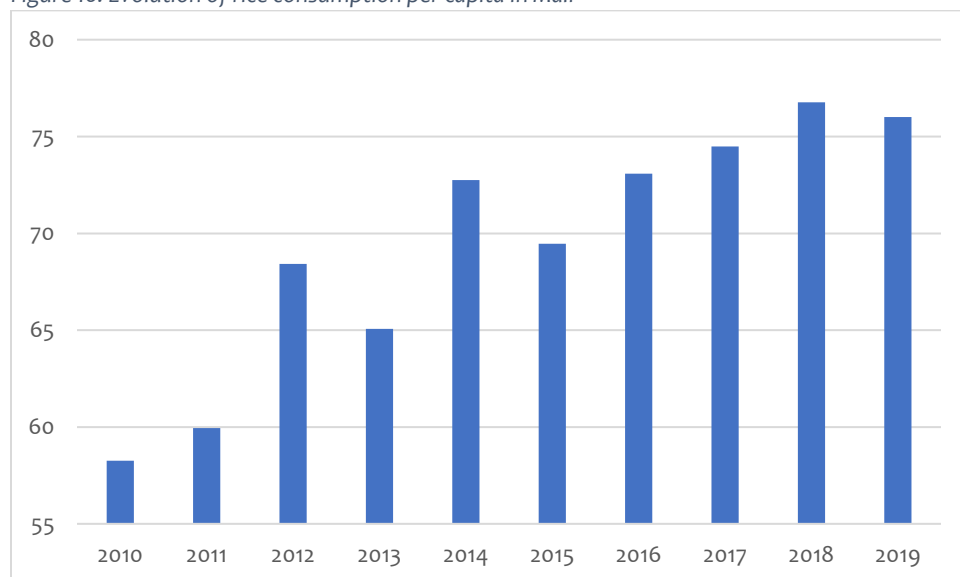
Figure 15: Evolution of rice production and import in Mali



Source: FAOSTAT / ITC

Mali's population increased by 30.6% between 2010 and 2019, from 15.0 million to 19.7 million. During the same period, per capita rice consumption rose sharply (+30.5%) from 58.3 kg/capita/year in 2010 to 76 kg/capita/year in 2019.

Figure 16: Evolution of rice consumption per capita in Mali



Source: FAOSTAT

These two factors have increased domestic demand for processed rice by an additional 617,000 tons between 2010 and 2019 (equivalent to around 1,100,000 tons of paddy rice).

Rice has become the main food product consumed in Mali, ahead of millet and fresh beef. The value of expenditure on rice consumption reached 789.6 billion CFA francs²⁴ in 2021, or 23.1% of the value of food consumed, with large variations between Bamako and the rest of the country:

- Bamako: 15.0%,
- Other urban areas: 24.9% and
- Rural areas: 22.4%.

²⁴ Annual results EMOP 2020-2021, INSTAT

If population growth and per capita rice consumption continue at the same pace over the next few years, Mali's paddy needs are expected to reach 5.5 million tons by 2030 and the production system will have to adapt quickly to meet this additional demand, otherwise imports will increase significantly.

5.5.2. Consumer behavior

Annual rice consumption by Malians has increased sharply over the past decades, as shown above. The appeal of rice to consumers is explained by many factors such as ease of cooking, availability and even by an image of social success.

Five main criteria guide the choice of Malian consumers:

- Purchasing power,
- Regular availability of the product on the market,
- Nutritional quality (grain swelling rate)
- Organoleptic quality (color, smell, texture, taste, cleanliness, etc.)
- Type of dish to be prepared.

Local rice is often less well presented (packaging, sorting, etc.) than imported rice. It is nevertheless sold at a higher price because Malian consumers prefer it for its taste. Thus, the Gambiaka variety is the most sought after, even if consumers are hardly able to identify it among all the varieties in the market.

An improvement in the quality of Malian rice (more homogeneity, no varietal mixing, no impurities and foreign bodies, more attractive packaging) can only strengthen its position against imported rice, which is bought because it is cheaper, although it is not appreciated because of its bland taste.

5.5.3. Rice market price in Mali

Rice prices at the consumer level have risen sharply in recent years due to high input and energy prices. Indeed, between 2015 and 2022, the average prices of local white rice in January (at the time of the main season harvest), increased as follows:

Table 16: Evolution of local rice prices between 2015 and 2022

City	Price 01/2015 in F CFA/kg	Price 01/2022 in F CFA	Difference
Bamako	325	410	+26,2%
Ségou	300	375	+25%
Gao	360	425	+18,1%

Source: AMASSA – Afrique Verte

Average January prices for imported rice between 2015 and 2022 have also increased, but at a more moderate rate:

Table 17: Evolution of imported rice prices between 2015 and 2022

City	Price 01/2015 in F CFA/kg	Price 01/2022 in F CFA/kg	Difference
Bamako	330	365	+10,6%
Gao	360	425	+18,1%

Source: AMASSA – Afrique Verte

Data for Segou are not significant because imported rice was not available in this production region between 2017 and 2021.

Over the study period, imported rice was always sold at 5-10% less than local rice.

5.6. Support services

5.6.1. IFRIZ – Rice Multi-Stakeholder Platform

IFRIZ is a professional organization in charge of promoting the rice value chain in Mali. It was created on in March 2016 and is headquartered in Bamako. Its mission is to act as an interface between the players in the rice value chain and the Government. Its vision is centered on food and nutritional security and the professionalization of the rice value chain players.

Like other agricultural professional organizations, its objectives are, among others, to:

1. Promote and enhance production.
2. Represent, promote, and advocate the interests of the industry's professionals.
3. Organize and coordinate the internal relations of the sector for a better planning of the production, processing, and marketing campaigns.
4. Provide services that meet the individual or collective professional needs of members.

IFRIZ brings together 4 professional families of the rice value chain, which are represented by 67 delegates in total:

- Farmers (26 delegates),
- Processors (21 delegates),
- Traders (16 delegates) and
- Transporters (4 delegates)

It is governed by a Board of 21 members drawn from the 67 delegates. The Executive Board is responsible for day-to-day business.

IFRIZ's statutes give it the possibility to set up technical committees to deal with specific issues.

The IFRIZ Strategic Plan 2022-2026 is composed of 4 major programs:

- Institutional development,
- Conquering markets,
- Sustainable development (youth and gender, 80% women in production, climate change),
- Capacity building and training for all value chain players.

IFRIZ is supported by several development programs (LuxDev, GIZ, EU, etc.) for capacity building and organizational strengthening.

5.6.2. National Offices for rice farming development

The Offices are Public industrial and commercial Establishments (EPIC). They are responsible for managing the irrigated areas under their responsibility.

6 Offices exist in Mali and are presented in the table below:

Table 18: Rice-growing areas managed by the Rice Offices

Office	Rice-growing area in hectares
Office du Niger	135,000
Office Riz Mopti	33,800
Office Riz Ségou	31,000
Office de Développement Rural de Selingué (ODRS)	9,000
Office du Périmètre Irrigué de Baguinéda (OPIB)	3,000
Office du Moyen Bani (OMB)	2,700

Source: The Consultant

a. Office du Niger

Office du Niger (ON) is the most important Office, accounting for almost 2/3 of the total area of the Offices.

It is a Public Industrial and Commercial Establishment (EPIC) under the supervision of the Secretariat of State for the Integrated Development of the Office of Niger Zone (SEDIZON) under the Prime Minister.

Its main tasks are:

- Water management,
- Maintenance of hydro-agricultural facilities,
- Delegated project management for the execution of the studies,
- Land management,
- Rural advice (compliance with the agricultural calendar, use of organic and mineral manure, use of improved seeds by farmers, diversification of crops, especially in the off-season, optimization of water management in the plots, etc.) and
- Technical assistance to farmers.

ON manages the raising of the water level by 7m from the Markala dam to Point A, to produce a gravity system irrigating up to 160km.

It relies on a staff of 735 to cover the whole area.

ON activities are planned within the framework of three-year Contract Plans that define commitments and performance.

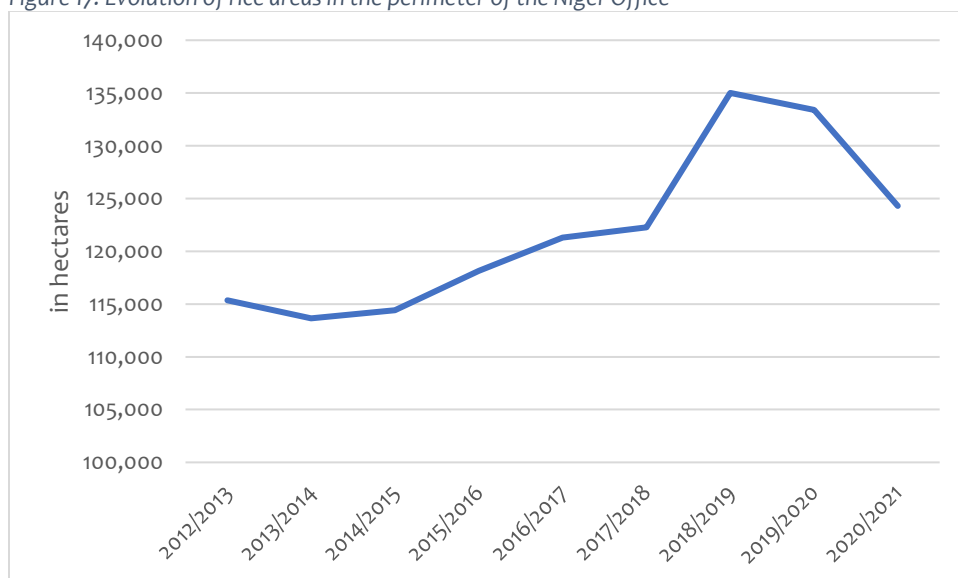
The main purpose of the ON's irrigated scheme is to produce rice during the rainy season, but they are also used for cold dry season production (horticulture), hot dry season production (off-season rice cultivation), production of sugar cane for the sugar production of SUKALA SA, a Malian Chinese PPP.

The Office du Niger perimeter is composed of 7 zones (Niono, Macina, Kolongo, N'Débougou, M'Bewani, Molodo and Kouroumari). It covers a developed area of about 135,000 hectares and 420 villages with a total population of 560,204 people. The number of active farms in the ON area is 87,597 (1.54 hectare/farm on average) of which only 10.8% are run by women (2019/2020 season).

Rice area increased between 2012 and 2018 to 135,007 ha (+17%) and then began to decrease to 124,288 ha in 2020 (-8%) due to insecurity problems in the Segou region.

As the water fee is 67,000 CFA francs per hectare, ON has lost around 800 million CFA francs (USD 1.33 million) in unrecovered revenue out of a total forecast revenue of 7 billion CFA francs for the 2020/2021 season. This shortfall is due to problems of insecurity (burnt fields, payment exemptions, rebates) in certain areas covering nearly 12,000 ha.

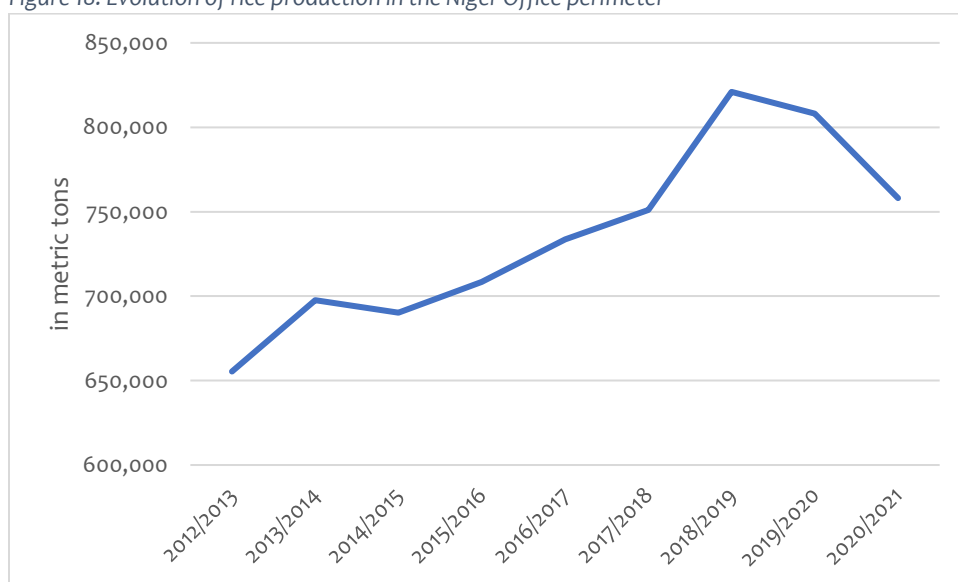
Figure 17: Evolution of rice areas in the perimeter of the Niger Office



Source: Office du Niger

Rice production has followed a similar pattern with an increase of 25.3% between 2012 and 2018 and a decrease of 7.7% between 2018 and 2020.

Figure 18: Evolution of rice production in the Niger Office perimeter



Source: Office du Niger

Yields per hectare were stable during this period, ranging from 5.7 to 6.1 tons/ha.

Production in the Office du Niger area is mainly intended for commercialization (75-79%), with the remainder for self-consumption.

The value of rice production was estimated at CFAF 113.7 billion (USD 188.5 million) for the 2020/2021 season.

b. Office du Périmètre Irrigué de Baguinéda (OPIB)

The main problems of the perimeter are:

- Agricultural land management.
- High vulnerability to climatic hazards (drought, flooding, low water).

- Insufficient water resources in the off-season.
- Invasion of the canal by aquatic plants.
- Recurrence of flooding during rainy and high-water periods.
- Damage to the road dams by trucks.
- Recurrence of pest attacks.
- Lack of drinking water points in some villages in the area.
- Insufficient control of environmental issues.
- High cost and low qualification of the workforce in the area.
- Theft of plough oxen due to proximity to Bamako.

GIZ has introduced the SRI in the area since 2018.

The evolution of production in the OPIB area over the last three years has been as follows:

Table 19: Evolution of rice area and production in OPIB area

Campaign	Area (hectares)	Output (tons)	Yield per hectare (t/ha)
2019	2,672	13,500	5.1
2020	2,679	14,522	5.4
2021	2,723	13,663	5.0

Source: OPIB

5.7. Business climate

5.7.1. Investment in Mali

Investment in Mali, including in the rice sector, is promoted, and incentivized. Mali's **investment code**, instituted by Law number 2012-016 dated 27th February 2012, covers four schemes, namely:

- Regime A, for small investments between 12.5 and 250 million CFA francs (20,000 to 400,000 USD),
- Regime B, for large investments between CFA 250 million and CFA 1 billion (USD 400,000 and 1,650,000),
- Regime C, for very large investments above CFA F 1 billion (above USD 1.65 million),
- Regime D for investments above 12.5 million CFA francs (USD 20,000) and which production is 80% for export,

The law provides for an exemption from import duties and taxes (on equipment, machinery, construction materials, etc.,) that are not manufactured in Mali for the duration of the investment, which is set at 3 years, as well as a tax exemption of:

- 5 years for Regime A,
- 8 years for Regime B,
- 10 years for Regime C,
- 30 years for Regime D.

In addition, the Code stipulates that foreign investors benefit from the same advantages and guarantees as national investors.

Foreign investors are guaranteed repatriation of profits, 100% ownership and protection against expropriation.

5.7.2. International trade and investment agreements

Mali has been a member of the West African Economic and Monetary Union - WAEMU, a customs and monetary union, since 1994. This union of 8 West African countries (Benin, Burkina Faso, Côte d'Ivoire,

Guinea-Bissau, Mali, Niger, Senegal, and Togo) has the CFA franc as its common currency. It has adopted a common external tariff and harmonized indirect tax regulations, in addition to initiating regional structural and sectoral policies.

Mali ratified the African Continental Free Trade Area (AfCFTA) agreement in 2019, which aims to allow the free movement of goods and services across the continent and strengthen Africa's trade position in the global market. The AfCFTA will create a single continental market with a population of about 1.3 billion people and a combined GDP of about US\$3.4 billion.

On the other hand, Mali has signed many international agreements:

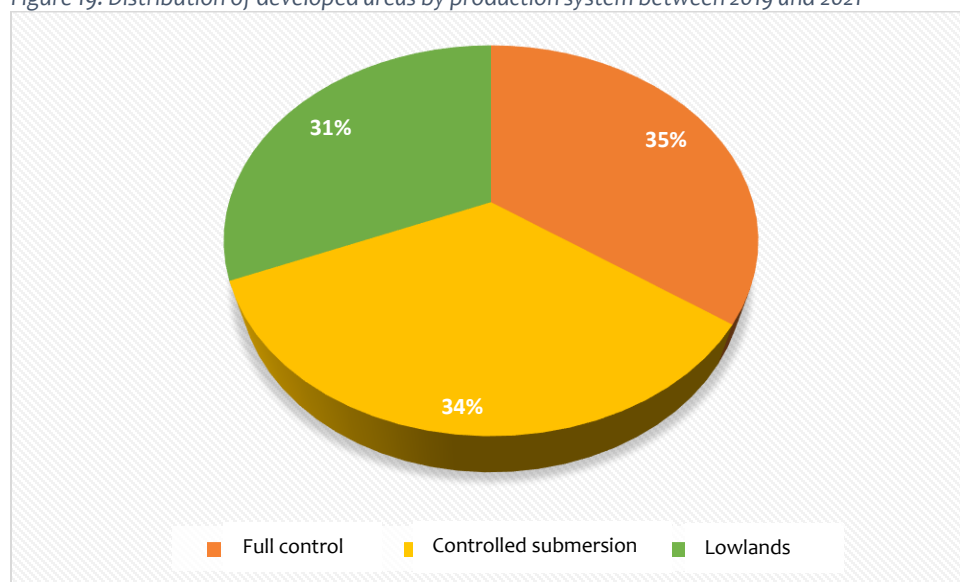
- MIGA (Multilateral Investment Guarantee Agency) which insures cross-border investments made by investors in any MIGA member country.
- ICSID Convention (International Centre for Settlement of Investment Disputes).
- Bilateral investment treaties with 22 countries of which 8 are in force (Algeria, Canada, China, Morocco, Egypt, Germany, the Netherlands, and Switzerland).

5.7.3. Infrastructure

The government of Mali is investing to develop agricultural land. Data from the Ministry of Agriculture shows that the average area developed between 2019 and 2021 was about 12,000 ha per year, which represents 0.7% of the land not yet developed.

Developed areas concern the three main types of production systems and the investment is made almost equally between the three systems as shown in the following figure:

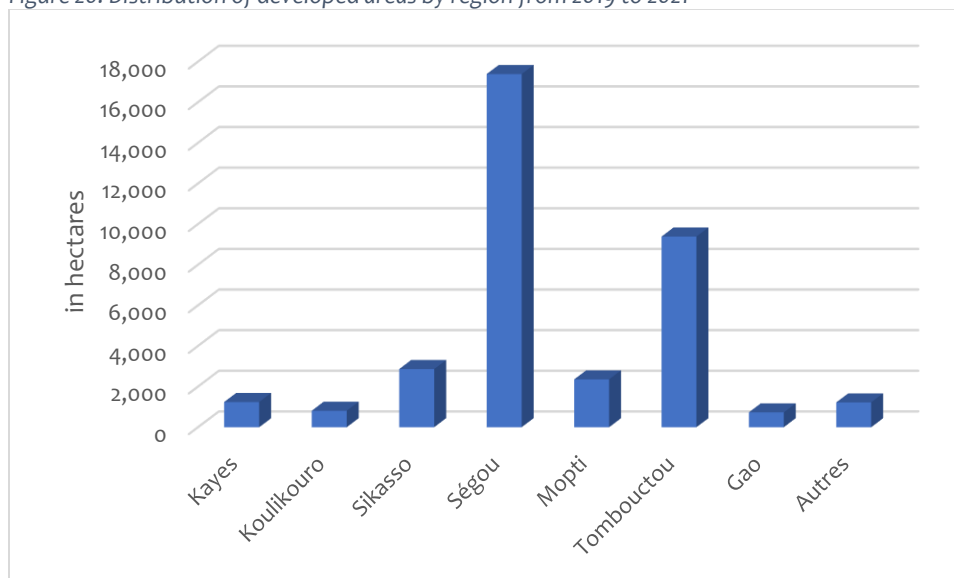
Figure 19: Distribution of developed areas by production system between 2019 and 2021



Source: Ministry of Agriculture

The geographical distribution of the developments carried out between 2019 and 2021 shows a concentration in the regions of Ségou and Timbuktu, which account for nearly 75% of the new developed areas.

Figure 20: Distribution of developed areas by region from 2019 to 2021



Source: Ministry of Agriculture

The industrial infrastructure is still underdeveloped. However, there is an operational industrial park of 200 hectares in Dialakorobougou in the Bamako region.

Several industries are already located there (animal feed, dairy industry, steel construction, etc.). There is room for new rice processing industries to set up a processing unit near the country's main consumption area.

It should be noted that there are new infrastructures in the pipeline, such as the one initiated by PATAM, a project funded by the African Development Bank in cooperation with the Ministry of Agriculture and Rural Development, which consists of creating an agri-food processing zone in Segou, one of the main rice producing areas in Mali, and which should be operational by 2025. This infrastructure will specialize in rice processing.

6. SWOT analysis

<p>Strengths</p> <p>Inputs Private sector engaged in the production, import and marketing of inputs (seeds, fertilizers, agricultural machinery). Existence of a few companies/cooperatives providing agricultural mechanization services. Cooperation between Mali and international partners (AfricaRice, Korean Cooperation, etc.) for the development of new rice varieties.</p> <p>Production Very long tradition of rice production and consumption in Mali. Increasing rice area and yields. Existence of a very large number of rice farmers' cooperatives.</p> <p>Processing Initiation of some contract farming projects between processors and rice farmers' cooperatives.</p> <p>Commercialization Malian consumers prefer local rice. Rapid growth of the Malian rice market.</p> <p>Support and supervision of the value chain Rice is considered a strategic product by the Malian government, which has developed public policies to encourage rice production (fertilizer subsidies, mechanization, etc.). Existence of public institutions in charge of supervising rice farmers and monitoring production (DRA, Offices, etc.). Creation and structuring of the Rice value chain professional organization (IFRIZ). Many international donors committed to the development of the rice value chain.</p>	<p>Weaknesses</p> <p>Inputs Production and distribution of certified seed insufficient for the country's needs. Low availability of fertilizers, especially subsidized fertilizers. Massive increase of inputs (fertilizers, plant protection products) and fuel costs over the last two years. Delay in making subsidized fertilizers available on the market. Remoteness of input distribution centers from some production areas. Insufficient mechanization of rice production.</p> <p>Production Farmers' profile (poorly educated elderly men and few financial resources). Insufficient know-how of farmers (lack of rigor in the application of cultural practices and in farm management). Production yields below potential in all production systems. Increased difficulty in finding labor for rice farming. Soil degradation due to non-application of good agricultural practices. Relatively high rate of post-harvest losses. Increasing impact of climate change (irregular rainfall, drought, floods, etc.). Low awareness of environmental issues (production of greenhouse gases) and occupational health and safety issues (management of empty fertilizer and pesticide packaging). Low level of organization and structuring of FOs. Low financial capacity of FOs to build up rice stocks. Low use of new technologies.</p> <p>Processing Most of Mali's rice production is processed using inefficient equipment (low yields, high breakage rate). Low valuation of the different qualities of rice. Insufficient know-how in the management and operation of rice processing units. Difficulty in sourcing rice for processors due to competition from wholesalers.</p>
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Difficulty in sourcing rice that meets quality standards (moisture content, impurity content, etc.), resulting in low productivity of processing operations.

Commercialization

Sector dominated by an oligopoly of wholesalers with significant financial resources.

Very poor organization of rice commercialization, with players having several roles at once (wholesaler, semi-wholesaler, retailer and even rice processor).

Very low market segmentation (almost all rice is sold in semi-bulk - 50 or 100 kg bags).

Public policies encouraging imports and with no effect on the consumer price (exemption from import duties on rice, public purchases favoring imported rice, etc.).

Financing

Difficulty for farmers to access financial institutions for management and investment credit.

Very high interest rates and application fees.

Recurrence of late or non-payment of input suppliers by farmers.

Financing institutions are withdrawing from rural areas due to insecurity.

Support and supervision of the value chain

Poorly operationalized strategies (rice farming, seeds, mechanization, etc.) due to lack of human and financial resources.

Institutions in charge of supervising farmers and monitoring production lack resources (both human and financial).

Weak coordination between donor-funded development projects

Opportunities	Threats
<p>The potential for rice production is still under-exploited (600,000 hectares developed out of a potential 2.2 million hectares).</p> <p>Strong potential to develop the rice market in Mali.</p> <p>Very large export market potential for white and parboiled rice in the sub-region (Guinea, Senegal, Mauritania).</p> <p>High demand for short-cycle rice varieties.</p> <p>Significant potential to reduce the carbon footprint of Malian rice.</p> <p>Most of the population is young (79.8% are under 35 years old).</p> <p>Very high mobile phone penetration rate²⁵ (125%).</p> <p>Internet penetration rate (29.9%) within the average for West African countries but increasing rapidly²⁶.</p> <p>Incentive investment code for national and international investors.</p> <p>Many international trade and investment agreements signed by Mali.</p>	<p>Political situation in the country and diplomatic tensions with foreign countries discourage local and foreign investment.</p> <p>Growing insecurity in several regions of the country (Ségou, Mopti, Timbuktu)</p> <p>Increasing effect of climate change (late and irregular rains, floods, etc.) negatively impacting the cropping calendar.</p> <p>Availability and price increase of fertilizers on the international market is likely to continue for several years (war in Ukraine, logistical problems, etc.).</p> <p>Increasing soil fertility problems due to overexploitation of land.</p>

²⁵ www.donneesmondiales.com/afrique/mali/telecommunication.php#:~:text=Internet%20high%20d%C3%A9bit%20in%20Mali,de%20256%20kbit%2Fs.

²⁶ <https://datareportal.com/reports/digital-2022-mali>

7. Proposed interventions to strengthen the rice value chain

The proposed interventions for strengthening the rice sector in Mali is an outcome of the SWOT analysis presented above.

They build on the value chain's strengths and the available opportunities to address the weaknesses while considering the threats.

The interventions are designed starting from the principle that the downstream has the power to pull the upstream of the value chain. Informed consumers can influence the supply of rice suppliers (industrial and artisanal processors) who in turn can direct the upstream of the value chain (rice farmers and input suppliers) to produce the rice varieties and quality demanded by the market. The interventions encompass all the segments of the rice the chain and consist in projects and activities to be implemented to achieve 5 objectives:

- Contribute to increase private investment in the rice value chain.
- Promote sustainable rice production in Mali.
- Contribute to increase rice yields using technologies (seeds, fertilizers, mechanization, agri-tech, etc.).
- Adding value to Malian rice.
- Improve the business climate and cooperation between the players in the value chain.

7.1. Proposed interventions by value chain segment

7.1.1. Inputs/Services for rice farmers

a. Seeds

Nearly 90% of Malian rice farmers use self-produced seeds. This situation is due to farmers' lack of awareness of the economic benefit in using certified seeds to improve productivity and quality. Malian seed companies face difficulties in selling certified seed directly to rice farmers and cooperatives. They address the demand of national programs and development projects funded by technical and financial partners supporting the rice sector in Mali. These programs distribute seeds to farmers free of charge, but without evidencing increase in productivity improvement of certified seeds compared to self-produced seeds. This leads to the perception among rice farmers that this support is simply a subsidy contributing to reduce production costs.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Farmers are reluctant to buy certified seeds. • Seed companies reduce their presence in rice production areas making access to certified seeds more difficult for farmers. 	<ul style="list-style-type: none"> • Farmers use self-produced seeds to reduce production costs. • Development programs accustomed farmers to received seeds for free. • Farmers are reluctant to pay for rice seeds as it is supposed to be free (self-produced or received as a subsidy). • Seeds companies face difficulties to sell certified seeds directly to farmers. 	<ul style="list-style-type: none"> • Create linkages between Seed companies, Cooperatives and Rice millers to grow specific varieties (<i>fiche 7.3.2</i>) • Implement advisory services to demonstrate the interest of using certified seeds (<i>fiche 7.3.3</i>). • Develop a pilot project with educated agripreneurs (<i>fiche 7.3.1</i>) • Educate consumers on rice varieties to pull the seed market (<i>fiche 7.3.6</i>).

b. Fertilizers

In recent years, the national and international situation has caused a sharp increase in the chemical fertilizers price in Mali (disruption of supply chains due to the COVID-19 pandemic, war in Ukraine, embargo on Mali, etc.).

However, the Malian government continued its subsidy program for rice fertilizers (DAP and urea), but due to the tripling of world prices, the budget for subsidized fertilizers could only cover one third of the usual quantities, resulting in a shortage of subsidized fertilizers and a consequent reduction in the use of these fertilizers in rice production.

As chemical fertilizers have a negative impact on the environment (risk of groundwater pollution, soil depletion, GHG emissions, etc.), the increase in their cost may be an opportunity to:

- rationalize their use.
- develop new fertilization practices.
- develop production and use of other types of fertilizers whose quality has been verified by laboratories.

Current situation	Why	What to do
<ul style="list-style-type: none">• Chemical fertilizers are becoming very expensive• Shortage of chemical fertilizers• Environmental issues related to inadequate use of chemical fertilizers are growing.	<ul style="list-style-type: none">• International situation is causing tripling of the chemical fertilizers market price• Fertilizer subsidies' budget is barely enough to subsidize one third of the usual quantity, reducing availability of fertilizers in Mali.	<ul style="list-style-type: none">• Develop the use of organic fertilizers whose quality has been verified by laboratories through SRI (<i>fiche 7.3.3</i>).• Implement Farm Field Schools to demonstrate appropriate use of chemical fertilizers, and promote organic fertilizers (<i>fiche 7.3.3</i>).• Develop a pilot with educated agripreneurs (<i>fiche 7.3.1</i>).

c. Mechanization

The mechanization of rice farming in Mali is essentially based on manual tools, with almost all farmers using dabas, hoes and picks. 47.4% of farms in Mali are equipped with animal traction and only 4.4% with motorized traction.

The number of tractors (16,320 units) is very low compared to the size of Mali's agricultural area and corresponds to an average of one tractor per 460 ha.

There are several reasons for this:

- Small plot size: 1.5 ha on average in the Office du Niger area, which is the main rice production area in the country,
- Difficult access to credit and very high interest rates (9-17%),
- Limited offer of mechanization services,
- Large number of equipment out of service due to unavailability of spare parts,
- Imports of agricultural equipment without any market study.
- Limited government support: the subsidy budget for agricultural equipment is reduced (USD 3 million in 2022).

Current situation	Why	What to do
<ul style="list-style-type: none"> • Increased difficulty in finding labour for rice farming. • Malian agriculture is underequipped. • Low availability of Mechanization service providers 	<ul style="list-style-type: none"> • Small plot Farmland size. • Access to finance is difficult and expensive • Subsidy budget for agricultural equipment is reduced. 	<ul style="list-style-type: none"> • Develop the CEMA concept by supporting agripreneurs providing mechanization services (<i>fiche 7.3.1</i>).

7.1.2. Production

a. Rice farmers

The average profile of Malian rice farmers is as follows:

- Men (93% of rice farmers are men),
- Poorly educated (68.8% of rural men and 84.4% of rural women aged between 15 and 39 have no education),
- Old (average age of 51.4 years for farm managers),
- Poor (53.1% rural poverty rate against 11.2% in Bamako).

Low productivity in rice farming results from several issues, one of the most important of which is the profile of rice farmers, which prevents the rapid adoption of new technologies and the introduction of new approaches to rice farming.

Educated young Malians have a great capacity to innovate and adopt new technologies in rice cultivation but face problems of access to land and access to finance.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Rice farmers are on average old men, illiterate, managing small farms with little access to finance, to quality inputs and to extension services. • Rice farmers lack information on market price and on required quality specifications. 	<ul style="list-style-type: none"> • Youth and women have difficulty to access to land and to finance. • Agriculture is not attracting youth because of low revenues generated and exhausting work. 	<ul style="list-style-type: none"> • Develop a new generation of educated agripreneurs using new technologies and market-oriented practices (<i>fiche 7.3.1</i>).

Box 1: Agripreneurs

An agripreneur is a person who starts, organizes, and manages a business focused on the agricultural sector.

In general, agripreneurship adds value to agricultural resources typically engaging rural human resources. Like most other forms of entrepreneurship, identifying opportunities, organizing resources, taking risks, and seeking profits are characteristics that also apply to an agripreneur, specifically in the context of the farm sector. They will identify opportunities in agriculture or related industry and start a business as a farm, distributor and sometimes act as an agent in the B2B2C model.

Newer forms of agripreneurship models link farmers to markets, both rural and urban, and adopts a decentralized approach to boost youth entrepreneurship and contribute to developing regional

economies. These models also integrate credit services, market linkages, high quality inputs and crop advisory to large cohorts of farmers²⁷

b. Access to know-how

Access to know-how, advisory services and extension services are very limited, except in areas where development projects are active. Therefore, technical, and technological innovations can hardly reach rice farmers and enable them to improve the productivity, quality, and sustainability. There are now several efficient approaches to building the capacity of rice farmers, notably using digital tools for farming advisory (decision-support mobile applications for fertilization and irrigation, for pest detection, for farm management, etc.). For example, SFSA introduced several years ago in Mali, RiceAdvice, an application developed by RiceAfrica, for fertilization advisory to rice farmers, and the results obtained in terms of yield improvement are excellent.

On the other hand, the Farmer Field Schools (FFS) approach, which was introduced in Mali by FAO in 2001, achieved positive results. It was then applied by other technical and financial partners such as GIZ, which used FFS to train 5,550 rice farmers in the System of Rice Intensification (SRI) between 2015 and 2022, helping to increase yields from 0.8 to 4.2 t/ha, and LuxDev, which used it to train members of 100 rice, sesame and fonio farmers' organizations in 2020 and 2021.

Current situation	Why	What to do
<ul style="list-style-type: none"> •Yield and quality of rice are below their potential in Mali. •High post-harvest losses in rice farming in Mali. • International donors successfully experimented FFS in rice farming in Mali. 	<ul style="list-style-type: none"> • Access to know-how and quality extension services is reduced because of the limited resources of the Ministry of Agriculture. 	<ul style="list-style-type: none"> • Implement adapted farming advisory mechanisms (digital apps, FFS, etc.) in the main rice production areas to scale-up Good Rice farming Practices (SRI, use of certified/hybrid seeds, mechanization, etc.) (fiche 7.3.3)

Box 2: Digital applications

In recent years, many digital applications have been developed by technology start-ups or international institutions.

One of those targeting the rice sector is RiceAdvice, which was developed by AfricaRice. It is an Android-based pre-season decision support tool providing farmers with specific crop management guidelines for rice production systems in Africa.

The guidelines include target yield, nutrient management, crop timing and good agricultural practices.

The tools are interactive, and guidelines are generated based on farmers' answers to multiple choice questions about farm conditions, their farming practices and the market.

Potential users are farmers, extension agents, private sector players or development agencies in Africa who are interested in advisory services for rice farming.

Farmers using RiceAdvice report yield gains between 0.6 and 1.8 tons per hectare and income gains between \$100 and \$200 per hectare. The application is used by tens of thousands of rice farmers in Nigeria, Mali, Senegal, and Tanzania.

²⁷www.researchgate.net/publication/339774768_What_is_Agripreneurship#:~:text=Quite%20similar%2C%20Agripreneur%20is%20an,typically%20engaging%20rural%20human%20resources
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Box 3: Farmer Field Schools

The Farmer Field Schools (FFS) is a people-centered learning approach, integrating participatory methods to create a learning environment where participants can exchange knowledge and experience in a risk-free setting.

Practical field exercises using direct observation, discussion and decision making encourage learning by doing.

The field is the space where local knowledge and external scientific insight are tested, validated, and integrated, in the context of the local ecosystem and socio-economic settings.

Community-based problem analysis is the entry point for an FFS group to develop a location specific curriculum. A growing range of technical topics are being addressed through FFS: soil, crop and water management, seed multiplication and varietal testing, IPM, agropastoralism, aquaculture, agroforestry, nutrition, value chain and market linkages, etc.

The 10 CEP principles²⁸ are:

- Learning by doing - adults learn better through experience rather than passive listening at lectures and demonstrations.
- Every FFS is unique, as far as content is concerned: farmers decide what is relevant and what the FFS should address.
- Learn from mistakes - each person's experience of reality is unique and valid.
- Learning how to learn - farmers build their capacity to observe, analyze and make conscious decisions.
- Problems posing/problem solving - problems are posed as challenges not constraints.
- Farmers' fields are the learning ground - the field – crop or livestock production system - is the main learning tool.
- Extension workers are facilitators, not teachers - because their role is to guide the learning process.
- Unity is strength - farmers in a group have more power than individual farmers.
- All FFS follow a systematic training process - key steps are observation, group discussion, analysis, decision making and action planning.

c. Access to finance

Access to finance is very difficult for Malian farmers: 32.7% have access to input credits and only 6.3% have access to investment credit to buy agricultural equipment.

For women, this access is even more difficult, as only 6.6% of farms run by women benefit from management credits compared to 44.6% run by men. The same observation can be made for investment credits where 9.2% of men have access to them against 0% for women.

This situation is the result of several factors: lack of collaterals, financial illiteracy, perception of agriculture as a very risky sector for financial institutions which lack specialized resources in the evaluation of agricultural projects, very high interest rates, etc.

Rice farmers and cooperatives lack the necessary skills to interact positively with financial institutions and facilitate their access to finance. There is an urgent need to improve the preparation of loan applications by rice farmers, cooperatives, and SMEs in the agricultural sector through financial literacy training (preparation of loan applications, credit and savings management, financial management, accounting, costing, financial management, etc.).

²⁸ Groenweg, K., et.al. 2006. Livestock farmer field schools: Guidelines for facilitation and technical manual. Nairobi: ILRI.

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Current situation	Why	What to do
<ul style="list-style-type: none"> •Farmers have limited access to finance in particular youth and women. •Interest rates are extremely high. •Resource mobilization and guarantee mechanisms created by the Government are not well known by farmers (FNAA- National Agriculture Support Fund, FGSP - Private Sector Guarantee Fund). 	<ul style="list-style-type: none"> •Rice farmers do not have real guarantees. •Cooperatives and SMEs' financial education is very limited •Financial institutions consider agriculture as a very risky sector. •Financial institutions do not have enough relevant expertise in agriculture 	<ul style="list-style-type: none"> •Develop financial education for Cooperatives and SMEs. •Improve capacity of financial institutions in managing agricultural projects (<i>fiche 7.3.2</i>). •Encourage financial institutions to develop specific business models for the agricultural sector (<i>fiche 7.3.2</i>). •Create linkages between Finance institutions, rice millers and Cooperatives (<i>fiche 3.2</i>). •Activate the Guarantee Fund of FNAA to guarantee credits to enhance entrepreneurship in agriculture.

Box 4: Business Linkage

Business Linkage connects the organizations involved in producing products and delivering services. It aims to create sustainable economic links between local businesses, especially SMEs. Business Linkage integrates capacity building of partners and the development of information and communication systems. Linkages enable SMEs to improve their competitiveness and acquire critical missing assets such as market access, finance, technology, management skills and specialized knowledge.

d. Sustainable production

The total equivalent CO₂ produced by Malian rice cultivation in 2021 was estimated at 7.042 million tons/year (more than triple the amount in 2014). This quantity represents 15% of Mali's total CO₂ emissions.

The lack of information among rice farmers and the lack of appreciation of sustainable production explain this situation. This was confirmed by the very few stakeholders met during the field mission that have ever heard of greenhouse gas emissions resulting from rice cultivation.

One of the main activities to be implemented to reduce GHG emissions is the scale-up of the System of Rice Intensification (SRI) in areas with a high concentration of small plots, which will allow more rice to be produced with fewer inputs while reducing methane emissions.

A national SRI development program in Mali will be operational in 2023, with the objective of converting 154,268 ha to SRI.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Increasing rice areas in the last decades also increased methane emissions in Mali. • Several donors have achieved excellent results using SRI. • A national SRI program in Mali will be operational in 2023. 	<ul style="list-style-type: none"> • Farmers have little awareness of the impact of rice farming on the environment. • Lack of appropriate equipment for scaling up SRI in all production systems. 	<ul style="list-style-type: none"> • Scale-up the areas using SRI in the small irrigation schemes to reduce methane emissions and increase yields (<i>fiche 7.3.3</i>). • Develop alternatives of sustainable fertilization (bio-fertilizers, RiceAdvice, etc.) and promote agroecology in rice farming to reduce GHG emissions (crop rotation, etc.) (<i>fiche 7.3.3</i>).

Box 5: System of Rice Intensification - SRI

SRI is an agroecological methodology used to increase the productivity of irrigated rice by changing the management of plant, soil, water, and nutrient.

It differs from conventional rice farming in several respects: age and number of seedlings, plant spacing, water management, soil fertilization, and pest control mechanisms used. Farmers first raise seedlings in carefully managed nurseries and then transplant the young plants (8-15 days old) with wide spacing between plants.

Irrigation is then provided intermittently to avoid permanent flooding during the vegetative growth phase. Soil nutrients are added in organic forms such as compost instead of chemical fertilizers. Finally, intensive manual or mechanical weed control is done without the use of herbicides.

SRI saves 90% of seeds, 25-50% of irrigation water, 25-30% of chemical fertilizers and reduces methane emissions by 35%. It increases farmers' income per hectare by 68%.

7.1.3. Processing

a. Sourcing of paddy rice

The organization of paddy rice commercialization, where a multitude of players play several roles at once (wholesalers, semi-wholesalers, retailers, etc.), is the origin of the fierce competition between players to acquire rice directly from rice farmers or cooperatives.

SMEs involved in rice processing have limited financial capacity and difficult access to credit to finance advances to their suppliers. At harvest time, they face strong competition from agents of the large players in the sector for the quantities needed to operate their units.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Fierce competition in sourcing paddy rice between processors and middlemen/traders • Processors have difficult access to finance to secure their annual requirements in paddy. • Several development projects successfully included contract farming in their activities. 	<ul style="list-style-type: none"> • Rice commercialization is poorly organized with players having multiple roles. • Quality of rice is not a priority for paddy rice buyers (availability and price are the most important criteria). 	<ul style="list-style-type: none"> • Create business linkages between cooperatives, processors and financial institutions (<i>fiche 7.3.2</i>). • Educate and inform consumers on rice quality and varieties (cooking method, type of use, etc.) (<i>fiche 7.3.6</i>).

b. Paddy rice quality

The paddy rice supplied by farmers and cooperatives to processors is generally of poor quality as it does not meet the technical specifications of commercial quality rice.

The main problems encountered by processors are the following:

- Mixing of varieties in the same bag, which does not allow for customized technical setting of equipment for each rice variety resulting in deteriorating the processing yields.
- High moisture content of the paddy (>14%), results in higher grain breakage rates, reducing the commercial value of rice.
- High rate of foreign bodies (stones, straw, etc.), which leads to equipment breakdowns reducing processing productivity.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Industrial mills have a reduced productivity due to the poor quality of paddy supplied by farmers (high moisture rate, foreign bodies, etc.). • Mixing of rice varieties in the same bag. • Rice may be supplied in inadapted packagings (fertilizer bags, etc.) 	<ul style="list-style-type: none"> • Lack of information of farmers about the requested specifications for milling. • Competition between traders and processors to source paddy rice reduce their quality requirement. 	<ul style="list-style-type: none"> • Create and develop business linkages between cooperatives, processors and financial institutions (<i>fiche 7.3.2</i>). • Develop contract farming (<i>fiche 7.3.2</i>). • Provide technical assistance to rice farmers to improve paddy quality (<i>fiche 7.3.3</i>).

c. Access to processing technologies

Access to the technologies depends on the type of processor:

- Most paddy rice is processed by the 18,000 service providers using mobile hullers. These small, inefficient units produce poor quality hulled rice. The used equipments are basic and do not separate impurities from the grains, which leads to the presence of dirt and foreign bodies in the rice.

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- Mini-rice mills produce a good quality product that meets consumer demand. They have the necessary equipment, but improvements could be made in terms of productivity and energy consumption.
- Industrial rice mills (5 in total in Mali) are well equipped.
- Women's parboiler cooperatives produce parboiled rice using artisanal equipment.

Rice processing equipment are supplied by a local manufacturer and by importers. Some processors import their production equipment directly.

There is a significant lack of information among stakeholders on efficient technologies that allow for quality rice, good productivity (processing rate) and reduced energy consumption.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Available processing equipments are inefficient. • Broken grain rate is very high (85% of commercialised white rice has min. 40% of broken grains). • Productivity of mills is very low in particular for mobile hullers. 	<ul style="list-style-type: none"> • Lack of information on available performing technologies in rice processing. • Investment cost in efficient technologies is high. • Difficult access to credit to invest in high-performance equipment 	<ul style="list-style-type: none"> • Promote and transfer processing technologies to Malian processors (<i>fiche 7.3.4</i>). • Create business linkage between processors and financial institutions (<i>fiche 7.3.2</i>).

7.1.4. Commercialization

a. Distribution of milled rice

The marketing of rice in Mali has been dominated for some decades by an oligopoly of large traditional traders who act as importers, wholesalers and even processors for some of them. These traders handle very large volumes of rice and have great influence on the market because of their financial power.

Their agents in the rice producing areas buy paddy from the rice farmers and from the cooperatives. Their main concern is to find large quantities of rice without having many requirements in terms of quality.

Alongside this oligopoly, there is a multitude of small traders who also play several roles (wholesalers, semi-wholesalers, and retailers) in the commercialization process.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Players with multiple roles are active in rice commercialization. • Traders mix different varieties and qualities of rice in the same bags. 	<ul style="list-style-type: none"> • Competition is currently based only on price not on quality because of low demand of uniformed consumers on rice specifications. 	<ul style="list-style-type: none"> • Add value to Malian rice (<i>fiche 7.3.7</i>). • Implement a traceability system taking into account the rice varieties. • Educate consumers on rice quality, varieties, cooking method and use each one (<i>fiche 7.3.6</i>). • Create linkages between Cooperatives, Millers and Distributors (<i>fiche 7.3.2</i>).

b. Adding value to Malian rice

Malian rice is mostly sold in semi-bulk (100 kg bags, sometimes in 50 kg bags). The labels do not provide sufficient information on the products or their quality.

The preference of Malian consumers for local rice is an opportunity for the players in the rice sector to enhance the value of their products. Unfortunately, there is no distinctive sign or recognized quality label for rice that could give consumers confidence in the origin of the product and there are often overruns. In fact, high quality rice is presented as Gambiaka, but it is not always this variety.

Imported rice is packaged in smaller packages of 10 to 50 kg.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Malian rice is packed in 100 kg bags with little information while imported rice is packed in attracting small packagings. • The offer of Malian rice in small packagings is very limited. 	<ul style="list-style-type: none"> • Very little marketing effort is made by Malian rice millers and traders because of the high market demand. 	<ul style="list-style-type: none"> • Create a PGI for Malian rice (<i>fiche 7.3.7</i>). • Promote and transfer processing technologies to Malian processors (<i>fiche 7.3.4</i>). • Develop linkages between retailers and rice millers through an electronic platform and B2B meetings (<i>fiche 7.3.2</i>).

Box 6: Protected Geographical Indication (PGI)

Protected Geographical Indications (PGIs) identify agricultural products, raw or processed, which have a specific geographical origin and possess qualities or a reputation which are due to that origin.

To qualify for this official sign linked to quality and origin, at least one stage in the production, processing or preparation of the product must take place in the defined geographical area.

The PGI can be based on the reputation of the product, i.e. the feeling of strong recognition by the public at a given time, and which must be associated with a specific know-how or quality attributable to the geographical origin.

A geographical indication right allows those who have the right to use the indication to prevent its use by a third party whose product does not comply with the applicable standards.

There are currently 6 PGIs in Africa: Penja pepper and Oku honey (Cameroon), Ziama-Macenta coffee (Guinea), Allada sugar loaf pineapple (Benin), Teboursouk olive oil (Tunisia) and Rooibos (South Africa).

c. Consumer education and information

Rice consumption has risen sharply over the past decade (+30%) from 58.3 kg/person/year in 2010 to 76 kg/person/year in 2019.

To develop responsible consumption, it is important to inform and educate consumers on the following aspects in particular:

- Rice varieties: specificities, best use (in a sauce, as a garnish for meat or fish, risotto, sushi, cakes, desserts, etc.), cooking times, etc.
- Rice quality: standards, % broken grains, etc.
- Nutritional information: composition, vitamins, and minerals, etc. Consumption of white rice is associated with a significantly elevated risk of type-2 diabetes and replacement of white rice with brown rice or other whole grains is associated with a much lower risk of diabetes. Parboiled rice has a very high nutritional value due to its richness in minerals that migrate from the pericarp and has a lower glycemic index than white rice (less risk of obesity and diabetes),
- Rice production process: traceability, sustainable production, hygiene, transport, etc.

An informed consumer will drive the value chain by increasing demand for specific varieties and better-quality rice, which will push processors to produce more products meeting this demand (better packaged products with the expected information). The processors will increase their sourcing of the requested varieties and be more demanding in terms of paddy quality. The rice farmers in turn will make more effort to produce paddy complying with the processors' specifications to obtain better prices to increase their margins.

The demand for specific varieties will lead to an increase in the demand for certified seed and will contribute to strengthening the Malian seed sector.

Current situation	Why	What to do
<ul style="list-style-type: none"> •Rice consumption increased sharply in the last decade. • Malian consumers prefer local rice •Rice is mainly sold in 100 kg bags •Very little information is provided on the offered rice. 	<ul style="list-style-type: none"> •Rice consumption increased because cooking rice is easy, does not take time and it is considered as a sign of social and economic success. • Malian rice is more tasty and flavoured than imported rice. 	<ul style="list-style-type: none"> • Inform and educate consumers on rice quality and varieties, the cooking method and the use each variety (<i>fiche 7.3.6</i>). • Inform and educate consumers on nutrition properties of rice (<i>fiche 7.3.6</i>).

7.1.5. Support services

a. Professional organizations

Over the past decade, professional organizations in Mali have experienced numerous episodes that have undermined their credibility (control by public authorities, poor management, corruption, embezzlement, etc.).

There are many professional organizations in the rice value chain, but they only represent the players of one segment (farmers, traders, etc.), which makes them organizations with little power to dialogue and negotiate with the government and other stakeholders in the sector.

In 2016, a new organization, the Rice value chain organization (IFRIZ), was created, bringing together four segments in the rice value chain (production, processing, commercialization, and transport).

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This organization is still in its infancy and remains fragile. Its positioning as a Multi-Stakeholder Platform makes it potentially a major actor for the development of the rice value chain. It is currently supported by several donors and development programs, and it is very important to continue this support to strengthen its governance, its advocacy capacity and to facilitate networking and cooperation between stakeholders in the sector at both national and local levels.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Representation of the rice value chain players at the national and regional levels is limited. • IFRIZ a multi-stakeholder platform has been created in 2016 and is still in its infancy. 	<ul style="list-style-type: none"> • Negative experience in the past undermined trust in professional organizations (embezzlement, political influence, etc.). 	<ul style="list-style-type: none"> • Contribute to strengthen IFRIZ and its governance (<i>fiche 7.3.8</i>).

b. Donors and development programs

Many donors and development programs are involved in the development of the rice value chain in Mali because of its economic and social importance.

However, there is very limited interaction and coordination between programs implementing activities on the ground and few synergies to increase the impact of each program.

Better coordination could improve the results for the programs and especially for the beneficiaries, as sharing experience and knowledge can only be beneficial for all, as many examples in different countries show.

Current situation	Why	What to do
<ul style="list-style-type: none"> • Several donors are heavily investing in the rice value chain development. • Results achieved by the programs are often unsustainable. • Same activities are repeated by different programs. 	<ul style="list-style-type: none"> • There is no initiative to share information and create synergies between the programs • New projects do not build systematically on results of previous programs. • Projects often work in silos. 	<ul style="list-style-type: none"> • Create a Donors' Rice value chain group to coordinate activities and create synergies between programs to improve results and sustainability of impact (<i>fiche 7.3.9</i>).

7.2. Proposed projects to strengthen the rice value chain

To strengthen the rice sector in Mali, we propose the implementation of the following projects:

Horizontal level:

- i. [Create a new generation of rice farmers and service providers to the rice value chain players](#) to:
 - Produce quality and sustainable rice that meets consumer demand, based on technology.
 - Provide high value-added services to rice farmers (mechanization, agricultural advisory services, processing, marketing, etc.).
- ii. [Create and develop business linkage between Seed producers, Agripreneurs, Cooperatives, Millers, Finance institutions and Traders](#) to:
 - Strengthen rice farmers' productivity.
 - Produce rice that meets processors' specifications.
 - Facilitate access to finance.
 - Increase the added value of Malian rice.

Production:

- iii. [Scale-up successful Good Agricultural Practices in rice production](#): use of certified seeds, mechanization, reduction of GHG emissions, reduction in post-harvest losses, etc., through rice farming advisory services (digital applications, Farm Field School, etc.).

Processing:

- iv. [Introduce and facilitate adoption of high-performance milling technologies](#)
- v. [Stimulate private-sector investment in rice milling](#)

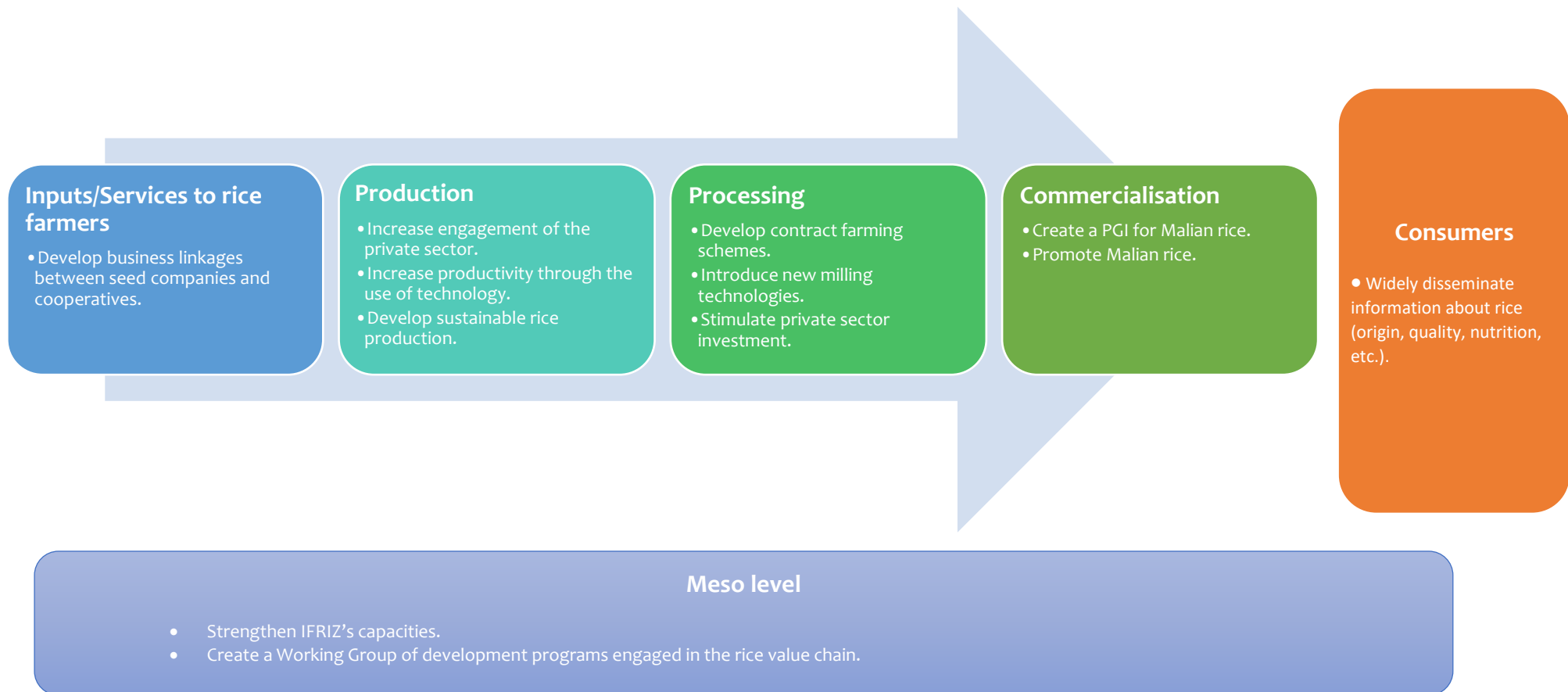
Commercialization:

- vi. [Inform and educate consumers to pull the rice value chain](#)
- vii. [Enhance the value of Malian rice](#) by creating a PGI.

Business climate:

- viii. [Support the Multi-Stakeholder Platform](#)
- ix. [Create synergies between development projects supporting the rice value chain](#)

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7.3. Project fiches

Implementation of an entrepreneurship project in the rice value chain
<p>Objectives</p> <p>Promote a new generation of agripreneurs using new technologies to contribute to the development of a modern, productive, and sustainable rice value chain.</p> <p>Make high -value-added products and services available to rice value chain players (mechanization, advisory services, processing, marketing, etc.).</p> <p>Showcase success-stories of agripreneurs to demonstrate the benefit of using technologies (seed, mechanization, SRI, etc.) and digitization in the rice value chain.</p> <p>Transfer technologies and innovations into the Malian rice value chain to reach the productivity levels of the best performing countries.</p> <p>Contribute to reduce rice import and improve food security in Mali.</p>
<p>Context</p> <p>Rice is of strategic importance to Mali from both an economic and food security perspective. Mali is the second largest rice producer in West Africa behind Nigeria and second in terms of rice yields behind Egypt (3.35 tons/ha in Mali compared to 8.8 tons/ha in Egypt).</p> <p>The potential of rice farming remains far below its potential, though: some very efficient rice farmers obtain yields of 9 to 10 tons/hectare under full-control irrigation, whereas the national average for this production system is 5.9 t/ha. In rainfed rice, some farmers obtain yields of 6.1 tons/ha while the national average is only 1.9 t/ha.</p> <p>Educated young Malians find it difficult to seize opportunities in the rice value chain due to problems of access to land and finance.</p> <p>This project builds on Mali's strengths, namely:</p> <ul style="list-style-type: none">A large majority of the Malian population is young (79.8% are under 35),Very high mobile phone penetration rate (125%).Internet penetration rate (29.9%) is in the average of West African countries but growing very fast. <p>The project is designed to enable young men and women aged between 25 and 40 in the main rice producing areas (Ségou, Mopti, Sikasso, Koulikoro) to overcome the obstacles that prevent them from creating high value-added projects in the rice sector. It will assist them in all phases of the project from the ideation process to the preparation of a bankable business plan and support for access to finance and market access.</p>
<p>Institutional partners</p> <p>Ministry of Agriculture (DRA, IER, Offices, etc.).</p> <p>Ministry of Entrepreneurship, Employment and TVET.</p> <p>API Mali</p>
<p>International Technical and Financial Partners</p> <p>African Development Bank (Boost Africa, Africa Innovation Lab, etc.)</p> <p>World Bank</p> <p>GIZ</p> <p>Tony Elumelu Foundation</p>

Mastercard Foundation	
<p>Challenges</p> <p>Difficulty in finding the required profiles of agripreneurs in the areas targeted by the project. The proposed projects are not compatible with the development objectives of the rice sector. Withdrawal of beneficiaries from the project during implementation. Security problems in some areas of the country.</p>	<p>Main steps</p> <p>Awareness campaign on entrepreneurship opportunities in the rice value chain. Setting up an ideation boot-camp for 200 beneficiaries. Implementation of a 6-month incubation program for 150 agripreneurs aiming to prepare bankable business plans. Selection of the 50 most promising projects. Implementation of a 24-month acceleration program for the 50 selected agripreneurs aiming at access to finance and access to market.</p>
<p>Profile of targeted beneficiaries</p> <p>Educated young men and women between the ages of 25 and 40 living in the areas targeted by the project.</p>	<p>Number of beneficiaries</p> <p>2,000 young people are informed about opportunities in the rice value chain. 150 beneficiaries have a bankable business plan. 50 beneficiaries obtain funding for their project.</p>
<p>Duration of the project</p> <p>36 months</p>	

Create and develop business linkages between the rice value chain players

Objectives

Create and develop business relationships and win-win partnerships between the players of the rice value chain in Mali (seed companies, agripreneurs, cooperatives, processors, traders, and financial institutions) to:

Increase the productivity of rice farming.

Produce paddy rice that meets processors' specifications.

Facilitate access to finance for the value chain's players.

Add value to Malian rice

Context

The players of the rice value chain in Mali tend to work in silos without considering the expectations of the other segments' players: rice farmers are not feeling concerned about processors' specification requirements, processors and traders compete fiercely for paddy, rice farmers and processors have difficulties in accessing finance because of their lack of financial education and because financial institutions have limited knowledge of the needs of the rice sector, etc.

The lack of cooperation between the value chain players results in missed opportunities to:

- Meet the needs of consumers in terms of available volumes of quality rice at a competitive price,

- Increase the income of all value chain's players,

- Create jobs,

- Achieve the government's objectives of self-sufficiency in rice and export to the countries of the sub-region by 2025.

Institutional partners

IFRIZ

APBEF Mali (Association of Banks and Financial Institutions)

ASSEMA (Association of Seed producers)

International Technical and Financial Partners

GIZ

Projet Inclusif (IFAD/DANIDA)

LuxDev

Challenges

Lack of interest of the targeted stakeholders.

Main steps

Financial education for agripreneurs, farmers, processors, and traders

Raising awareness of financial institutions on the specificities of the agricultural sector

Support of contract farming between Cooperatives and processors.

Reinforce an entrepreneurial (business) rather than social approach to rice farming.

Support for the development of contract farming (cooperatives/processors).

	<p>Create a dialogue framework between stakeholders and investors at the production basins' level.</p> <p>Extend the interventions of the FGSP and FNAA to the whole value chain.</p> <p>Technical assistance to cooperatives and agripreneurs to comply with processors' technical specifications. Informing the value chain players about the quality standards for rice.</p> <p>Organization of events (workshops, conferences, B2B meetings, etc.) targeting seed companies, agripreneurs, cooperatives, processors, traders, and financial institutions.</p>
<p>Profile of targeted beneficiaries</p> <p>Cooperatives, Processors, Traders, Agripreneurs, Seed companies, CEMA, Commercial banks, Microfinance institutions.</p>	<p>Number of beneficiaries</p> <p>100 cooperatives 10 industrial rice mills and mini-rice mills 100 traders 50 agripreneurs 5 seed companies 10 CEMA 5 commercial banks 5 microfinance institutions</p>
<p>Duration of the project</p> <p>48 months</p>	

Scale-up Good Rice Farming Practices	
Objectives	
<p>Introduce and transfer good rice farming practices (SRI, seeds, mechanization, agro ecology, etc.) to rice farmers to improve their productivity and the quality of their paddy through adapted agricultural advisory mechanisms (mobile applications, Farmer Field Schools or other) in the areas targeted by the project.</p> <p>Involve agripreneurs who provide farm mechanization, farm advisory services, etc., in this project.</p>	
Context	
<p>Rice productivity is below its potential in all production areas of Mali and in all production systems. Extension and advisory services for rice farmers are very limited.</p> <p>Rice farmers lack the capacity to increase yields, improve paddy quality and produce sustainably. Low awareness of the environmental (greenhouse gas emissions, climate change), consumer health and occupational safety challenges (management of empty pesticide and fertilizer packaging, etc.) among the rice value chain players.</p> <p>Low use of technologies along the value chain (seeds, mechanization, agri-tech, etc.).</p>	
Institutional partners	
<p>Ministry of Agriculture (DRA, IER, Offices, etc.).</p> <p>IFRIZ (Cooperatives).</p> <p>ASSEMA (Association of Seed producers).</p> <p>Réseau des Opérateurs d’Intrants agricoles (Network of input suppliers).</p> <p>FOSCAR Mali (Network of Extension services agents)</p>	
International Technical and Financial Partners	
<p>FAO</p> <p>GIZ</p> <p>LuxDev</p> <p>Projet Inclusif (IFAD/DANIDA)</p> <p>Adaptation Fund (RICOWAS project)</p> <p>AfricaRice</p> <p>CORAF</p> <p>International Rice Research Institute</p> <p>IFDC</p>	
Challenges	Main steps
<p>Finding technicians with the right profile to recruit to facilitate the know-how transfer.</p> <p>Extreme climatic events (floods, drought, etc.)</p> <p>Security issues in some areas.</p>	<p>Recruit and train 10 technicians to facilitate the transfer of know-how.</p> <p>Select rice farmers to participate in the farm advisory program.</p> <p>Organize the work plan of the technicians.</p>
Profile of targeted beneficiaries	Number of beneficiaries
<p>Rice farmers benefiting from the farm advisory program:</p>	<p>2,000 rice farmers</p>

<p>Rice farmers from the target areas (Ségou, Mopti, Sikasso, Koulikoro) and from all rice production systems. Minimum of 50% women and young people from 25 to 40.</p>	
<p>Duration of the project</p>	
<p>48 months</p>	

Introduction of new processing technologies	
Objectives	
<p>Introduce efficient rice processing technologies. Improve processors' productivity. Improve the quality of commercialized rice.</p>	
Context	
<p>Malian rice processors mostly use equipment that is not efficient (high breakage rate, high energy consumption, etc.).</p> <p>All types of processors acquire poor quality equipment from importers and distributors. They are little informed about the technologies available on the international market and the technical specifications needed to produce quality rice at a competitive price.</p> <p>Equipment importers and distributors favour low-cost equipment because it is easier to sell on the Malian market. Performance and durability of equipment are not a priority criterion for their customers.</p>	
Institutional partners	
<p>Ministry of Industry IER (Institut d'Économie Rurale)</p>	
International Technical and Financial Partners	
<p>UNIDO FAO GIZ LuxDev</p>	
Challenges	Main steps
<p>Lack of interest from processors to invest in new and better equipment. Low educational level of processors.</p>	<p>Prepare a study identifying international manufacturers of rice processing equipment and analyzing the performance of all available technologies in terms of processing rate, quality of rice produced and energy consumption, both for industrial units and small mobile hulling units.</p> <p>Organize B2B meetings between international rice processing equipment manufacturers, equipment importers and rice processors.</p> <p>Organize meetings in the main rice producing areas to present new technologies.</p> <p>Train the managers of the processing units on equipment maintenance, processing techniques and management of the processing units, to improve productivity.</p>

Profile of targeted beneficiaries	Number of beneficiaries
All categories of rice processors	4,000 processors
Duration of the project	
48 months	

Stimulate private investment in the rice value chain

Objectives

Promote investment opportunities in the rice value chain in Mali among national and international private sector players to attract investors in rice production and in rice processing.

Context

The Malian rice value chain is characterized by the intervention of a very large number of players having a low production capacity. Most paddy in Mali is produced by smallholders having reduced technical and financial capacities. Rice hulling is mostly carried out in very small mobile units and parboiled rice is produced by women cooperatives with artisanal tools.

There are only 5 industrial mills and a small number of mini rice-mills processing less than 5% of the paddy produced in the country.

Developing the rice value chain could be accelerated by attracting national and international investors in rice processing who have the technical and the financial resources to support rice cooperatives to produce rice in quantity and in quality.

The national and the regional markets demand and the incentives offered by the Malian investment Code may attract some big players to invest in the rice value chain.

Institutional partners

Ministry of Industry

Agence de Promotion des Investissements - API Mali (Investment promotion agency)

International Technical and Financial Partners

African Development Bank

UNIDO

FAO

Challenges

Political and security situation in the country may discourage national and international investors.

Main steps

Prepare promotional material on investment opportunities in the rice value chain in Mali.

Organize workshops and conferences in Mali and abroad to present the opportunities in the rice value chain.

Improve enforcement of business regulations.

Facilitate access to serviced industrial plots for national and international investors in rice processing.

Profile of targeted beneficiaries

National and international investors

Number of beneficiaries

600 national investors

250 international investors

Duration of the project

36 months

Inform and educate rice consumers	
Objectives	
<p>Inform and educate Malian consumers on rice varieties, quality, cooking methods and consumption modes.</p> <p>Change perception of Malian consumers on rice from a commodity to a quality product.</p> <p>Contribute to a responsible consumption of rice.</p> <p>Contribute to the development of rice varieties requested by informed Malian consumers.</p> <p>Strengthen the value chain and local development through rice valorization.</p>	
Context	
<p>Rice has a central place in the food diet of Malians, whether in urban or rural areas.</p> <p>Local rice is appreciated by Malian consumers more than imported rice thanks to its taste and its flavor. Consumers buy local rice in bulk or semi-bulk but have very little information about the different varieties, origin, nutrition facts, etc.</p> <p>Premium rice is presented as Gambiaka even though it is another variety.</p> <p>Increase in rice consumption per capita (+3.4% per year) and the rapid growth of the Malian population will result in an annual demand of 5.5 million tons of paddy rice by 2030. The productive system will have to adapt quickly to meet this additional demand, otherwise imports will increase significantly.</p>	
Institutional partners	
<p>Association des Consommateurs du Mali – ASCOMA (Consumer association)</p> <p>Ministry of Agriculture (IER, Offices, etc.)</p> <p>IFRIZ</p> <p>Gastronomy and culinary associations, chefs de cuisine</p> <p>Supermarkets and retailers</p> <p>Mass media and electronic media</p>	
International Technical and Financial Partners	
<p>FAO</p> <p>GIZ</p>	
Challenges	Main steps
<p>Use the inadequate communication channels to convey the message.</p> <p>Provide too much information that confuse consumers.</p>	<p>Conduct market research on rice in Mali to better understand the Malian consumers' requirements and behavior.</p> <p>Plan and implement a communication campaign on rice consumption on site (in supermarkets, restaurants, etc.) and in the media (TV, radio, press and electronic media).</p> <p>Plan and organize marketing events to promote Malian rice and its different qualities and varieties (website and social networks, promotional material, conferences, cooking contests, participation in exhibitions and fairs in Mali, etc.)</p>
Profile of targeted beneficiaries	Number of beneficiaries
Urban consumers	10,000,000 consumers

Supermarkets Restaurants and hotels	
Duration of the project	
48 months	

Creation of a Protected Geographical Indication (PGI)	
Objectives	
<p>Create a PGI for a rice having superior specificities and a premium quality produced in one region in Mali.</p> <p>Add value to the Malian rice by certifying the production process.</p> <p>Promotion of the PGI.</p>	
Context	
<p>Rice is a staple food in Mali. Local rice is preferred by Malian consumers but no certification or independent label recognizing the quality and the specification of the product is available in the country. The rice bags commercialized in the market do not provide consumers with enough information to make an informed choice.</p> <p>The rice market is not well segmented: almost all rice is sold in bags of 50 or 100 kg and the only choice the consumer has is local or imported rice and the broken grain rate.</p> <p>A label such as PGI certified by an independent body will create trust in the product and its production process and will create value addition for the whole value chain.</p>	
Institutional partners	
<p>CEMAPI (Malian center for industrial property promotion)</p> <p>SNL Structure Nationale de liaison of OAPI in Mali (African organization of intellectual property)</p> <p>Professional associations</p> <p>IFRIZ</p>	
International Technical and Financial Partners	
<p>FAO</p> <p>OAPI</p> <p>CIRAD (“Facilité IG” project)</p>	
Challenges	Main steps
<p>Competition between several regions willing to have a PGI.</p> <p>Security issues in the selected PGI region hindering the implementation.</p> <p>Rice growers don’t comply with the Terms of reference specifications endangering the credibility of the PGI.</p>	<p>Carry out a feasibility study of the PGI in Mali identifying the labelled products with potential demand, the production region(s) and the beneficiary groups.</p> <p>Preparation of the Terms of Reference of the PGI.</p> <p>Mapping of the PGI area and preparation of the monitoring Plan</p> <p>Preparation of the Promotion and Commercialization Strategy of PGI labelled rice.</p>
Profile of targeted beneficiaries	Number of beneficiaries
Rice farmers members of cooperatives	2,000 rice farmers
Duration of the project	
36 months	

Support to the rice Multi-stakeholders Platform	
Objectives	
<p>Strengthen IFRIZ's capacity in terms of governance, advocacy, networking, and cooperation between stakeholders.</p> <p>Contribute to making IFRIZ a credible and efficient partner for national and international organizations.</p>	
Context	
<p>IFRIZ is the Multi-Stakeholder Platform of the rice sector. It was created in 2016 with the ambition of being a facilitator between the 4 main families of the sector (farmers, processors, traders, and transporters) and to unify the voice of the rice value chain in Mali.</p> <p>However, the organization is still in its infancy and remains fragile. It needs support to better structure itself and play its role in the development of the value chain.</p> <p>Some stakeholders are cautious about IFRIZ because of negative experiences in the past, notably bad governance, and mismanagement by other professional organizations.</p> <p>Good governance, transparency in decision-making and the inclusion of all stakeholders can only help IFRIZ to become the reference partner of the rice value chain in Mali and to actively contribute to its development.</p>	
Institutional partners	
<p>IFRIZ Ministry of Agriculture</p>	
International Technical and Financial Partners	
<p>GIZ LuxDev FAO</p>	
Challenges	Main steps
<p>Lack of interest from IFRIZ leaders and members. Lack of willingness to use the knowledge gained.</p>	<p>Capacity strengthening on: Good governance. Advocacy. Networking. Funding mechanisms for the professional organization.</p>
Profile of targeted beneficiaries	Number of beneficiaries
<p>IFRIZ's National and regional decision-makers.</p>	<p>100 persons</p>
Duration of the project	
<p>36 months</p>	

Creation of synergies between development projects targeting the rice value chain	
Objectives	
<p>Create a framework for communication and exchange of experience for projects and programs supporting the rice value chain in Mali.</p> <p>Improve the impact of projects on beneficiaries.</p> <p>Create synergies and cooperation between projects to improve their respective performances.</p>	
Context	
<p>Many technical and financial partners are implementing projects and programs to support the rice value chain in Mali.</p> <p>There is very little coordination and cooperation between them, which results in missed opportunities to improve their performance and to increase the impact of their activities on beneficiaries.</p>	
Institutional partners	
N/A	
International Technical and Financial Partners	
<p>European Union</p> <p>African Development Bank</p> <p>World Bank</p> <p>International Fund for Agricultural Development</p> <p>UNDP Mali</p> <p>FAO</p> <p>GIZ</p> <p>LuxDev</p> <p>DANIDA</p>	
Challenges	Main steps
Lack of interest or availability of project leaders and/or coordinators.	<p>Organization of quarterly meetings.</p> <p>Preparation of a monthly newsletter.</p>
Profile of targeted beneficiaries	Number of beneficiaries
Projects and programs supporting the rice value chain in Mali.	10
Duration of the project	
48 months	

8. Investment opportunities in the rice value chain for the private sector

The national strategies for the development of the rice sector and the business environment in Mali offer numerous opportunities for local and international private sector investors in all the segments of the value chain.

8.1. Opportunities in the inputs value chain

Mali needs better technologies to increase rice production and improve rice yields.

- **Seeds:**

Investment in certified seed production is sought to meet national needs.

In 2021, more than 970,350 ha were sown with rice, of which more than 30% were under total control.

	Certified seeds in 2022	Seeds Addressable Market	Total
Production in tons	9,235	78,130	
Value in million USD	2.8	23.4	

- **Fertilizers:**

From 2008 to 2020, the use of fertilizers in Mali has risen sharply: nitrogen fertilizers (+142%), phosphate fertilizers (+577%) and potassium fertilizers (+4%).

Over the last three years and due to the international situation (COVID-19 pandemic, war in Ukraine, etc.) prices for nitrogen fertilizers have tripled and a shortage has been observed on the Malian market.

The fertilizer market potential is estimated at:

- 195,000 tons/year (USD 97.5 million) for nitrogen fertilizers and
- 95,000 tons/year (66.5 million) for phosphate fertilizers.

- **Mechanization:**

As labor shortages increase in rural areas due to migration to urban areas, mechanization becomes crucial. There are opportunities for agricultural equipment manufacturers to invest in this sector in Mali, particularly in the manufacture of mechanical transplanters, granular fertilizer spreaders, harvesters, threshers, or small combine harvesters adapted to small plots. Suppliers need to offer equipment, training, and after-sales service.

Opportunities also exist for post-harvest technologies such as rice dryers and storage solutions.

The National Rice Mechanization Strategy aims to achieve the following objectives by 2025:

- Increase the mechanization rate of rice farmers from 40% to 60%,
- Multiply by 20 the quantity of imported agricultural equipment compared to 2018,
- Increase local production of agricultural equipment by 150%,
- Create 10 mechanization service centers.

The market potential is presented below:

	Imports in 2018 (in '000 USD)	Potential market in 2025 (in million USD)
Tractors	9.0	179.3
Ploughs	1.0	21.0
Tiller	0.3	5.4
Harvester	0.1	1.2
Combine harvester-threshers	0.1	0.3

Equipment imported under the Investment Code is exempt from customs duties and taxes.

8.2. Opportunities in rice farming

- The Office du Niger has the potential to expand the irrigated area by 500,000 hectares through the construction of new irrigation channels. This will create opportunities for investors to produce rice on a large scale through PPP projects.
- There are opportunities to produce paddy rice for the local market, which is growing rapidly due to population growth (+3.5% per year) and increasing per capita rice consumption (+3.4% per year). Needs are expected to reach 5.5 million tons in 2030, compared with current production of around 3 million tons.

8.3. Opportunities in rice processing

Equipment:

- Most rice processing in Mali (about 80%) is carried out by mobile units and low-performance artisanal units (processing yield: 52 kg of rice/100 kg of paddy, breakage rate >50%).
- Industrial units and mini-rice mills require more efficient and less energy-intensive processing technologies at competitive costs.
- There are opportunities for suppliers of rice processing equipment for all categories of processors from artisanal to industrial units. As part of the national rice mechanization strategy, the government intends to increase investment in rice processing 20-fold by 2025.

	Imports in 2018 (in '000 USD)	Potential market in 2025 (in million USD)
Equipment for cereal processing	3.5	70.5

Processed rice and by-products:

There are opportunities for:

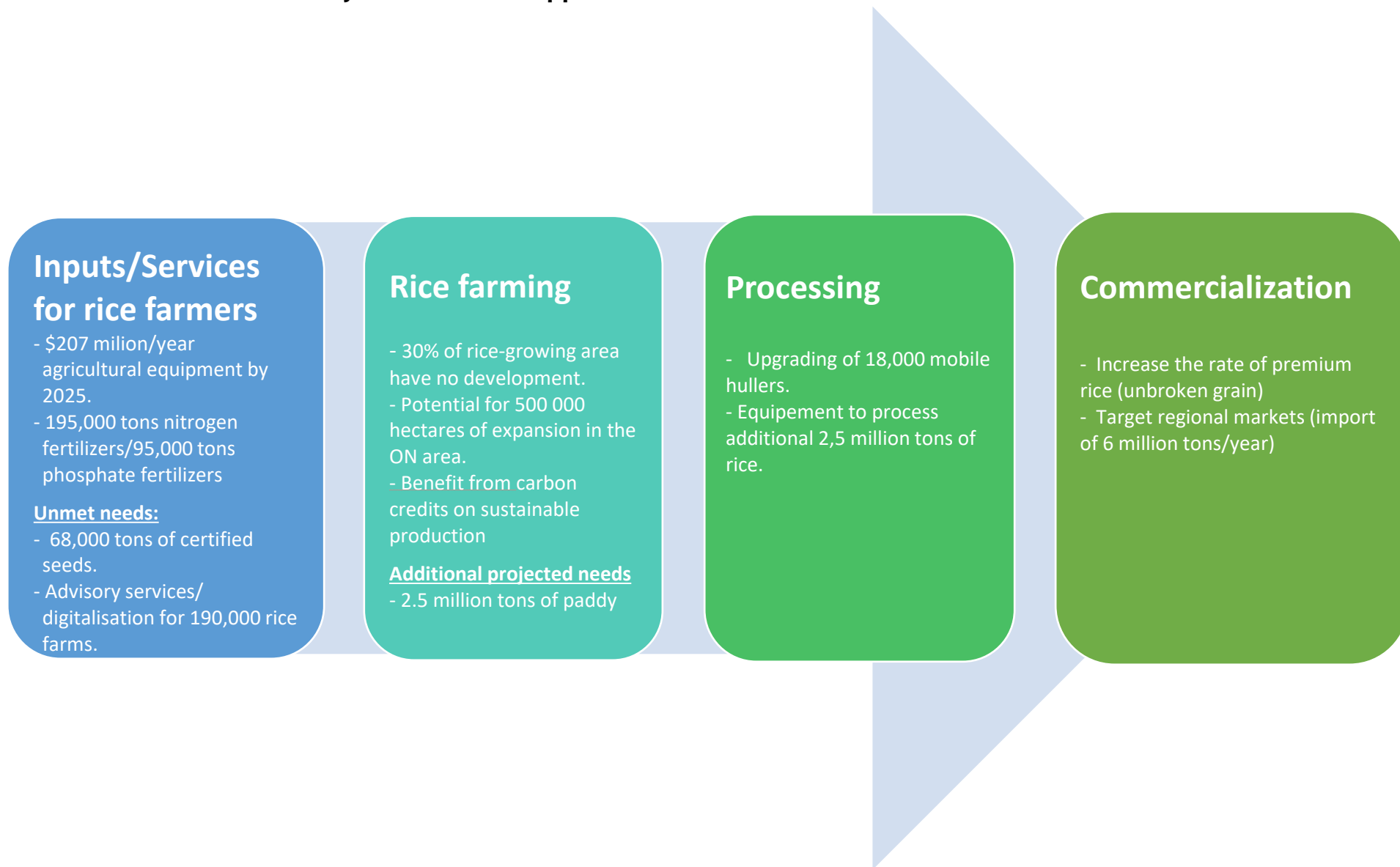
- Producing high-quality processed rice in attractive packaging (white rice, parboiled rice) for the local and regional market.

The national rice production strategy aims to export 2.6 million tons to sub-regional markets by 2025. These markets are major importers (6 million tons per year). The main markets are presented in the table below:

	Import Value In million USD	Imported quantity in '000 tons
Benin	640	1,400
Côte d'Ivoire	550	1,110
Niger	470	827
Senegal	469	1,184
Ghana	375	1,087

- Processing rice by-products to produce briquettes and pellets to replace charcoal. Each year, about 600,000 tons of rice husks are produced in Mali. Combined with other by-products (cotton, maize, and sugarcane), they can be used to produce biofuel, adding value to by-products, reducing deforestation, creating green jobs, and generating profits for investors.

Summary of investment opportunities in the rice value chain in Mali



Annex: List of reviewed documents and reports

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