The World Summit on Sustainable Development in Johannesburg last September, emphasized the key role that agriculture must play in reducing poverty, improving food security and conserving the environment on which we all depend. The Summit concluded that agriculture should be one of the five target areas where “concrete results can and must be obtained”; the others were water, energy, health and biodiversity, where sustainable agriculture can also make an important contribution.

The doubling of demand for agricultural goods and services over the next 25 years, driven by population increases, economic growth, urbanization and the need to reduce poverty and hunger, will have to be met through sustainable intensification of agricultural production systems and more efficient use of natural resources – particularly land and water. We must make better use of existing resources.

Better policies, expanded rural infrastructure, improved access to markets and financial services and more effective institutions are all essential ingredients; but without adequate public and private investment, to ensure a continuing supply of technologies that are safe, reliable and affordable, supported by greater commitment to innovative partnerships between the public and private sector, these challenges will not be met.

The Syngenta Foundation for Sustainable Agriculture was created to help improve food security and to assist resource-poor farmers and their communities improve their livelihoods. It is an important part of Syngenta’s overall commitment to corporate citizenship and to the well being of society. Through its projects and network of contacts it is well placed to work with others to help improve access by poor farmers to better technologies and to help build purposeful partnerships between the business and development community.

The advances made in modern science must be brought to bear on the huge problems faced by the developing world. We must find better ways of translating the power of science into tools and technologies that help improve the reliability and productivity of farming, particularly in the drier parts of the World. We must also ensure that the legitimate concerns of producers, markets and consumers are satisfied. We see the admission of the Foundation into the Consultative Group on International Agricultural Research (CGIAR) as an important platform to help build bridges and increase opportunities for collaboration between the public and private science that will improve the availability of knowledge, know-how and technology to poor rural communities.
The Foundation will continue to collaborate with those who share our conviction that a key to defeating global poverty lies in joint public private research partnerships. It will work to create the environment of policies, understanding, trust and incentives that encourage purposeful alliances for the benefit of sustainable agriculture across the developing world.

Last year we asked Andrew Bennett to join the Foundation as its Executive Director. He has more than 35 years in international development, and has considerable experience in bringing science and research to bear on improving the livelihoods of resource-poor farmers. Prior to his joining the Foundation, Andrew was the chief natural resources adviser at the UK Department for International Development.

I would like to thank in particular Professor Dr. Klaus Leisinger, President and Chief Executive Officer of the Novartis Foundation for Sustainable Development who generously served as interim Director of the Syngenta Foundation, and helped create a vision and focus for our Foundation. He ensured a seamless and uninterrupted transition of an excellent portfolio of projects in Mali, Eritrea and Kenya and a network of friends, from the Novartis Foundation to the newly formed Syngenta Foundation.

I am most grateful to our partners and to all who have worked hard to build the Foundation. It is my pleasure to be able to reaffirm the commitment of Syngenta to the Foundation. The challenges we face are huge but I am sure the Syngenta Foundation can make a valuable contribution towards sustainable agriculture that will increase the opportunities and choice that can improve the livelihoods of poor rural communities.

The Company is also committed to supporting sustainable agriculture around the world which will meet the needs of all society now and in the future and protect the environmental assets on which we all depend.

Heinz Imhof,  
Chairman of the Board of Trustees,  
Syngenta Foundation  
for Sustainable Agriculture
Taking Stock

I am delighted to have been given the opportunity to lead the work of the Foundation. I am firmly of the view that there is much that this Foundation can contribute towards sustainable agriculture and the forging of partnerships between the public and private sector, and through working with civil society. It is a good time to review our achievements, to identify our strengths and to build on these in developing our future programme.

Sustainability is about people, partnerships, negotiation, trade-offs and choice. It must involve improved efficiency and productivity in agriculture and land use systems. Much can be achieved through better policies, effective and honest institutions, improved infrastructure, access to fairer markets and financial services – but the availability of a continuing supply of technologies that are safe, reliable and affordable will be essential. This is why the current decline in public funding of agriculture and natural resources research is very worrying.

We have inherited a strong and diverse portfolio of projects and a valuable network of friends and partners from the Novartis Foundation for Sustainable Development. We will maintain close links with all these; they are excellent assets on which to build.

We are small, so we must focus our efforts and work with partners. Our emphasis will be on improved access and use of technology. We are uniquely placed to develop the roles that might be played by public-private partnerships and to try and turn some of the rhetoric into reality for the benefit of developing countries.

Learning by Doing

In development, theory and practice are not well correlated. This is why project work in the drier parts of the developing world will continue to absorb a large proportion of our resources. Our purpose will be not only to generate direct benefits for people but also to build partnerships, try novel approaches, learn from experience and share lessons about what really works. We will also identify and define constraints to progress.

This review is about our partners’ efforts and achievements and the projects we support in Eritrea, Mali and Kenya. We hope to help set standards of good practice that might be relevant for other African countries. All these programmes have highlighted the importance of markets and systems for the delivery of technology and seed to farmers.
Recognising the importance of working with others we were pleased to have been able to become a member of the Consultative Group on International Agricultural Research (CGIAR) in October 2003. We feel that this will help develop and improve links between public and private agricultural research and thereby enhance the flow of technologies aimed at tackling the challenges faced by poor farmers.

**Building Consensus**

Despite the urgency of the challenges we face it is unfortunate that progress seems impeded by fiercely held positions and polarised debate. What is sustainable agriculture and who decides? What will agriculture be in 10–20 years time? How to improve access to and benefit sharing for the use of genetic resources? Understanding the role that can be played by intellectual property management, or effective regulation of innovations in science – such as transgenics – in providing incentives for the development of safe, reliable and affordable technology. Finding better ways of managing scarce resources such as water and how the private sector and public/private partnerships can help. These are all areas of controversy.

To convert some of the energy and talent involved in these debates into action aimed at improving the livelihoods of poor farmers is an objective well worth pursuing. The Foundation will play a role in trying to find ways forward; in sharing experience; supporting analysis; building trust and purposeful consensus and above all in action.

These areas of work are challenging but vital. We have a highly motivated and experienced team and many excellent partners. We hope that our website will help keep you informed about our work and actions. We hope also that it will provide you with the means to make contact with us. We welcome and value your comments and ideas.

Andrew Bennett  
Executive Director
Objectives

**Goals**
To improve the livelihoods of poor rural communities through sustainable agriculture, by:
- Supporting well-targeted projects
- Helping to identify and promote good policies
- Improving access to research and technology
- Making knowledge and information more available
- Developing partnerships that increase impact and sustainability

**Objectives**
To work with rural communities in the semi-arid regions of the world to:
- Identify challenges
- Build on communal efforts and indigenous knowledge
- Increase production and productivity of farming and land-use systems
- Improve access to knowledge and technologies that are safe, reliable and affordable
- Implement locally appropriate solutions
- Assess impacts and learn lessons defining good practice
Sustainable success can only be achieved by addressing the constellations of problems – political, social, economic, ecological, biological, and technological – in close collaborations with relevant local partners.

**Emphases of Projects and Programmes**
- Soil and water conservation
- Enhancing the yield of dryland crops
- Land management systems
- Crop tolerance and resistance to pests and diseases
- Better access to technology
- Conserving crop biodiversity

**Criteria for Project Support**
- Are the purpose and objectives clear and innovative?
- Are the intended beneficiaries clearly identified and in what way have they been involved in identifying the purpose and objectives of the project?
- Is there a strong local demand for the project?
- Who are the partners and have they been engaged in the development of the project?
- Are the objectives realistic and can progress be assessed?
- Is there a clear end point or exit strategy?
- How will the benefits of the project be sustained?
- Are the resources needed available?

**Vision, realism, transparency and partnership will characterize our activities.**

*Students at the University of Asmara studying GIS software programmes.*
Partnerships and Alliances

We aim to build partnerships generating direct benefits for those in need in the dry South and to intensify research on developing countries carried out by national and international institutions.

To improve livelihoods and foster sustainable farming practices, the Foundation invests in cooperation from the outset. Effective, well-targeted coalition building itself teaches lessons in promoting sustainable agriculture across political and cultural boundaries.

Our primary aim is to intensify the research on developing countries conducted by both national and international institutions. Our current partnerships span governmental agencies, universities and research institutes and international policy and research bodies. For example, we work with the Institute of Rural Economy (IER) of the Malian Ministry of Agriculture, and support a partnership between the Kenyan Agricultural Research Institute (KARI) and the International Wheat and Maize Improvement Centre (CIMMYT). The Foundation also supports a partnership among the Centre for Environment and Development of the University of Bern, the University of Asmara and the Eritrea Ministry of Agriculture.

International alliances: CGIAR Membership

In October of last year, the Foundation joined the Consultative Group on International Agricultural Research (CGIAR), a consortium supporting a network of international agricultural research centers worldwide. This alliance of member nations, research centers, co-sponsors and numerous partner organizations deploys the benefits of science among developing countries. CGIAR studies have already produced 300 new varieties of wheat and rice and 200 new varieties of maize, and have preserved between 230 and 340 million hectares of land for cultivation worldwide. The CGIAR welcomed the Foundation’s membership as marking “an important new direction in addressing hunger and poverty around the globe,” one that establishes “new models for public-private partnerships.”
Swiss collaborations

The Foundation also works with Swiss organizations that have development project work in agriculture and foster rural development in the global South. These bodies include Swisscontact, Intercooperation, the Swiss Business and Mission Councils Foundation (Third World Solidarity), the Swiss Commission for Research Partnerships with Developing Countries (KFPE), the Swiss Forum on International Agricultural Research and the Centre for International Agriculture (ZIL).

“Tasks are huge and beyond the capacity of individuals to solve. In a globalising society we are increasingly interconnected and interdependent. It is difficult to see how this challenge can be met without new partnerships and improved technology.”

Andrew Bennett

Felix Nicolier, Syngenta Foundation;
Dr. Tsegai Gherezghiher, Director, Vision Eritrea;
Dr. Thomas Kohler, University of Bern, CDE;
Dr. Arefaine Berhe, Minister of Agriculture, Eritrea;
signing contract for renovation of agriculture field research station (from left to right).
Area¹
121,320 sq km, about 3 times the size of Switzerland

Land use¹
Arable land: 3.87%
Permanent crops: 0.02%
Other: 96.11% (1998 est.)

Population¹
4'465'651 (July 2002 est.)

Age structure¹
0 - 14 years: 42.9%
15 - 64 years: 53.9%
65 and over: 3.2%

Population growth rate¹
3.8% (2002 est.)

Birth rate¹
42.25 births / 1000 population (2002 est.)

Death rate¹
11.82 deaths / 1000 population (2002 est.)

Population per doctor²
50'000

Life expectancy at birth¹
Total population: 56.57 years
Female: 59.13 years
Male: 54.09 years

GDP from agriculture¹
17%

Annual Rainfall³
There is a considerable variance ranging from 200 mm / 7.9-inches to 1000 mm / 39.4-inches rainfall annually, in distances separated by as little as 15 km / 9.3 miles.

Agriculture¹
Sorghum, lentils, millet, vegetables, corn, cotton, tobacco, coffee and sisal.

Sources:
Eritrea borders the Red Sea in Eastern Africa. Its economy is based on small-scale farming and cattle-breeding.
In Eritrea, our aim is to contribute towards sustainable development in a young Sahelian country. The focus is on soil and water conservation, on land management and on capacity building.

**Principal Partners**
- Centre for Development and Environment (University of Bern)
- University of Asmara, College of Agriculture (Eritrea)
- National Agricultural Research Station at Halhale (Eritrea)
- Ministry of Agriculture of Eritrea
- Water Resources Department at the Eritrean Ministry of Land, Water, and Environment
- Vision Eritrea
- United Nations Mission for Eritrea and Ethiopia
- Swiss Agency for Development and Cooperation (DEZA)

**Project Objectives**
- **Foster agricultural and environmental research and monitoring**, especially soil and water conservation and plant breeding, with a focus on millet. This includes **South-South collaboration** in agricultural research between Eritrea and Mali.
- **Promote capacity building** through human resource and skills development. This includes the introduction of high-end tools and instruments, such as **Geographic Information Systems (GIS)**, as well as low-cost and participatory approaches to land management.
- **Engage in regional and local planning and development.** Activities include local/regional studies on local livelihoods, and to identify actions for local development jointly with communities and authorities.

**Key Achievements**
- **Sustainable Land Management (SLM):** Successful completion of first-ever database report, summarising the work of the SLM’s Afdeyu station, the only site in Eritrea that culls long-term systematic field data on soil erosion, soil conservation, river run-off and sedimentation.
- **Plant breeding:** Support for millet breeding program for striga-resistant and early maturing varieties, tested both on-station and on-farm at the National Agricultural Research Station at Halhale.
- **Micro-drip irrigation:** Successful completion of the test phase by our main partner, the College of Agriculture of the University of Asmara. Involving approximately 200 interested users, preliminary results indicate rise of household food security with use of simple micro-irrigation technologies.

**Future Goals**
- **Upgrade soil and water conservation field research**
  - Translate results of soil and water conservation research to small holder farmer land management systems
  - Expand micro-drip irrigation pilot programme
  - Enhance South-South transfers between Eritrean and Mali scientists
  - Complete construction of the new GIS Laboratory at the University of Asmara
SLM Project Spin offs:

Population census

For the first National Population Census, the partnership provided large-scale maps derived from satellite imaging for the country’s 17 major towns. Authorities also use this cartographic base in urban planning for construction of roads, water supply and sewage stations, and for mapping electricity grids. This portion of the project was funded by the United Nations, with the National Office of Statistics as local partner; these satellite pictures demonstrated how remote-sensing instruments are useful in map making.

Humanitarian de-mining

The UN-funded Landmine Impact Survey asked the project to prepare a nationwide map base for humanitarian de-mining.

Solar power promotion

The solar water heater project, initiated in the late 1990s, is now completely in the hands of the Swiss development organization Oekozentrum Langenbruck and its Eritrean partners. In 2002, a project sponsored workshop helped strengthen construction capabilities, with local first run of a small commercial units series in 2003. The project has orders for the solar power units from hospitals, vocational schools, and local Non-Government Organizations.

Geographic Information Systems (GIS)

Activities in capacity building have their focus at the University of Asmara, where Eritrea’s only GIS Laboratory for sustainable land management has been established. Beginning in 2002, it is meeting the needs of both students and government, including on-the-job training for administrative staff.

Regional and local planning and development

In 2002, we also supported several small community-based projects: 1) at Afdeyu, rural electrification was installed through cost sharing arrangements with the community and the government. Over 50% of households, mainly subsistence farmers, have applied for private connection to the grid to date; 2) with financial help from Swiss Humanitarian Aid the project hired a private firm to expedite the delayed construction of a small dam at Afdeyu; and 3) together with local government, Eritrean NGOs, and UNICEF, we supported several other smaller local projects, mainly for improvement of village water supplies. In each of these cases, the SLM programme chiefly provides expertise or “seed money” to close the final or minor financial gaps faced by development projects.

“The income I earned by selling one-third of my pepper was sufficient to cover almost half of the basic food needs of my family.”

Farmer in Mendefera, Eritrea, who used micro-drip irrigation to grow pepper
“After a thirty-year war of liberation and devastating three-year border conflict with Ethiopia, our country faces a massive task of reconstruction and development. Current small-scale maps, outdated and full of errors, are useless for this task. To meet the urgent need for cost-effective large-scale cartography, our department will operate the University’s GIS (Geographic Information Systems) lab for the benefit of the entire country, training both students and institutional personnel.”

Dr. Temenfei Tighe, Dean of the College of Art and Social Science, University of Asmara
Eritrea: Water Management in Siketi

This year for the first time, nearly 5000 residents of Siketi are drawing healthy drinking water from eight standpipes in the village. The collaborators in this project, which includes a reservoir, pumping system and supply pipes, were the Syngenta Foundation for Sustainable Agriculture and the Centre for Development and Environment (CDE) of the University of Bern, as part of their joint project for Sustainable Land Management in Eritrea (SLM), which also has geography students at the University of Asmara conducting their own field studies.

Around 21 kilometers south of Asmara, next to a church overlooking the road to Mendefer, Siketi offers a panorama of the surrounding fields. Here 60-year-old grandmother Wuba Gnebru carries her youngest grandchild next to a nearly finished circular structure of stone blocks. “I’m new here, but that is a good thing,” she said of the border war that forced her to leave Ethiopia and return to her home village. Looking at the reservoir that will soon hold 100 cubic meters of water, she added with a wink: “Of course this water is dedicated to Jesus, but he won’t be drinking it alone.”

Engineer Alem Tasfamariam, technical consultant of the Eritrean Ministry of Water, is happy to hear the woman’s quick wit. After Eritrean independence, he ended his Canadian exile to take up supervision of the country’s water management projects. Siketi, his home village, was known for its water resources even before the war, with plentiful ground-water reserves discovered near the village in the 1980s. The Ministry of Water dug an eight-meter well four meters in diameter. Whenever water shortages have struck the capital city, as during the drought of 1984/85, up to 30 trucks a day, each with a 13-cubic-meter tank, carried Siketi’s water to Asmara. Inexhaustible to this day, these reserves also benefit the villagers. Every morning and evening, as elsewhere throughout the country, children lead donkeys to the well, drop in their buckets, haul on the ropes and pour water into rubber drums lashed to their donkeys’ backs. Water is also scooped into special troughs for cows and goats. Basic hygiene, however, is rarely observed in the hustle and bustle at the well. Bacteria from feces contaminate the drinking water, infecting children in particular with chronic diarrhea and digestive problems.

Renovation of Siketi’s water system began even before Eritrean independence in 1991, when the open well was partly shielded by a cement cover. Residents lugged stones uphill near the church, and even laid part of the 750 meters of pipes that would supply the future reservoir. Funds for a roof and the cement inner lining, however, were not yet at hand. Only after independence did two NGOs, HABEN and UNICEF, supply the project’s estimated CHF 50,000 for materials. Price hikes after the 1998 border war, however, threatened the project with failure. At this critical juncture the SLM programme stepped in to cover the projected 20% cost overrun, having already supported the repair, planning and installation of ground-water wells in Hadmeti and Deki Lefai to the south. Now nearly complete, Siketi’s project includes an electric-powered pumping station that serves two standpipes in the upper village and six in the lower. SLM has also beneficially linked its work in Siketi to its training and development program. Programme co-worker Robert Burtscher, who teaches in the Geography Department at the University of Asmara, had one of his doctoral students carry out dissertation field studies that surveyed the needs of residents. Her comprehensive questionnaire showed that residents are ready to work at covering the operating costs of the new water supply system. Such sociological surveys, a new research tool at the young university, extend the analysis of rural life in Eritrea.

Christian Bernhart is a freelance journalist living in Switzerland.
PROJECTS MALI

Area
1.24 million sq km, 30 times larger than Switzerland

Land use
Arable land: 3.77%
Permanent crops: 0.04%
Other: 96.19%

Population
11,340,480 (July 2002)

Age structure
0 - 14 years: 47.2%
15 - 64 years: 49.8%
65 and over: 3%

Population growth rate
2.97% (2002 est.)

Birth rate
48.37 births / 1000 population (2002 est.)

Death rate
18.32 deaths / 1000 population (2002 est.)

Population per doctor
20,000 - 20% of the population has access to a doctor

Life expectancy at birth
Total population: 47.39 years
Female: 48.64 years
Male: 46.18 years

GDP from agriculture
Agricultural activities occupy 70% of Mali’s labour force and provide 42% of the GDP

Annual Rainfall
North of Kidal: < 200mm / < 7.9-inches
South of Kidal: 1300mm / 51.2-inches

Agriculture
Cotton, millet, rice, sorghum, corn, sugar cane and raising of livestock is of growing importance

Sources:
1 Central Intelligence Agency (2002). The World Factbook 2002 CIA, May 2003; (Online)
2 African Online News. AFROL Gender profiles: Mali; (Online)
Mali is located in central West Africa. 65% of the country’s area is desert or semi-desert and economic activity is focused on farming.
In Mali, our efforts are focused on the Cinzana Agricultural Research Station, which is dedicated to producing sustainable increases in crop production and productivity through improved seed breeding.

Cinzana Agricultural Research Station
The station is run and managed by the Mali Institut d’Economie Rurale. Now in its second decade, this project is sustained through funding and support by a long-standing public private partnership. There are currently 12 Ph.D. scientists on staff, with 20 technicians and 30 assistants. Facilities include laboratories for soil, plant breeding, and entomology research, a seed bank, conference facilities, housing for 20 families, a nursery school and visiting researcher housing.

Principal Partners
- Government of Mali Ministry of Agriculture
- US Agency for International Development
- Voisins Mondiaux
- Helen Keller International
- Novartis Foundation for Sustainable Development
- Intercooperation Mali

Project Objectives
- Build and operate a crop breeding centre
- Address the challenge of building sustainable domestic crop production
- Develop and disseminate to farmers new millet, sorghum and cowpea varieties
- Evaluate new cropping practices producing conservation of water and soil
- Build nutrition education programmes
- Create and support research information networks
“It is the life of the farmer to harvest his seed, not to buy it in the cities.”

Oumar Niangado, Foundation Delegate for West Africa

Key Achievements

- Built facilities for conservation of local germplasm
- Developed new varieties of millet tolerant to downey mildew and earworm, new sorghum tolerant to charcoal rot and striga, and new cowpea varieties resistant to striga, improving on-farm yields by 30% to 100%
- Initiated pilot systems for disseminating improved seeds and agronomic technologies to small-holder farmers
- Facilitated North-South technology transfer on new crop inputs, such as seed treatment
- Promoted South-South exchange among Sahel scientists

Future Goals

- Widen distribution networks for new millet seed varieties to small-holder farmers
- Initiate stakeholder education programmes on the adoption of new seed types and on improved crop management

Images from Cinzana station: millet breeding plot, weeding (from left to right)

Researcher evaluates cowpea field trial
The Miracle of Millet

The farmers of Mali, one of the world’s poorest countries, say, “Millet gives the strength to work all day.” Across sub-Saharan Africa, this tiny, tenacious, drought-resistant and highly nutritious grain forms the staff of life. Back-breaking sown and harvested mostly without animals, millet is also painstakingly pounded by hand into the flour for the porridge and couscous that are the staples of most of Mali’s 11 million people, 80 percent of them subsistence farmers. When the harvest is up, Mali has a good year. Families have enough to eat and seeds to store for the next crop.

“It is the life of the farmer…”

“It is the life of the farmer to harvest his seed, not to buy it in the cities,” observes agronomist Oumar Niangado. He has devoted his career to improving millet, the staff of life for the people of Mali, his desperately poor home country in the Sahel Region of Africa.

“As plant breeders, we must understand why farmers maintain their own varieties of millet even if they have new ones. They have been always selecting their varieties. They look for the best and reject what they don’t like.”

“There is a direct correlation between farmer knowledge and local varieties; using local varieties can lead to breakthroughs.”
“As plant breeders, we must understand why farmers maintain their own varieties of millet...”

Workshop Generates Wide-Ranging Discussion of Biotechnology

In June 2002, more than one hundred scientists, government researchers, public officials and biotechnology experts from across western Africa, Europe and the United States participated in a workshop hosted by the Institute of Rural Economy of Mali and focused on the pros and cons of biotechnology, biological safety and intellectual property.

Delegates agreed that a process of national and regional consultation is necessary to develop legislation, based on various African models of law, to effectively govern the new, quickly evolving science. Workshop sponsors included The Rockefeller Foundation, United States Agency for International Development and the Syngenta Foundation for Sustainable Agriculture.
Kenya is the regional centre for trade and finance in East Africa. Agriculture provides one third of the country’s income.
**Area**
582,650 sq km, 14 times larger than Switzerland

**Land use**
- Arable land: 7.03%
- Permanent crops: 0.91%
- Other: 92.06% (1998 est.)

**Population**
31,138,735 (July 2002 est.)

**Age structure**
- 0-14 years: 41.6%
- 15-64 years: 56.1%
- 65 and over: 2.8%

**Population growth rate**
1.15% (2002 est.)

**Birth rate**
27.61 births/1000 population (2002 est.)

**Death rate**
14.68 deaths/1000 population (2002 est.)

**Population per doctor**
Approximately 6500

**Life expectancy at birth**
- Total population: 47.02 years
- Female: 47.85 years
- Male: 46.2 years

**GDP from agriculture**
24%

**Annual Rainfall**
Rainfall is most plentiful in the Highlands and on the coast with an average of 1000 mm / 39.8-inches. The Western Plateau receives over 1780 mm / 70.1-inches annually. More than 70% of the country, however, is arid or semi-arid, receiving less than 510 mm / 20.1-inches per year.

**Agriculture**
- Tea, coffee, corn, wheat, sugarcane, fruit and vegetables, dairy products, beef, pork, poultry

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Sources:
Our work in Kenya focuses on the **Insect-Resistant Maize for Africa Project (IRMA)**. The project is a partnership among international and national public research institutions and the private sector, with the broad-based purpose of addressing one of the key agricultural production problems – losses from stem borers – in one of East Africa’s most important food crops.

**Principal Partners**
- International Maize and Wheat Improvement Centre
- Kenya Agricultural Research Institute

**Project Objectives**
- Combine conventional and novel technologies - including biotechnology - to develop maize varieties resistant to the major stem borer species
- Increase maize production and food security by disseminating relevant, new technology to farmers
- Enhance Kenyan bio-safety review programme
- Disseminate Kenyan lessons, learned from both challenges and benefits, to other interested African countries

**Key Achievements**
- Developed bio assays for transgenic maize using cry-proteins
- Tested conventionally bred stem borer resistant maize in field
- Constructed open field quarantine site
- Initiated refugia crops study
- Interviewed approximately 1000 farmers from five different ecological zones for baseline understanding of current insect management programmes, and for an understanding of the relevance to farmers of new techniques and technologies
- Initiated information exchange programme between CIMMYT and KARI scientists
- Convened annual public stakeholder meetings among farmers, government officials, local NGO’s, research communities on project status
- Built a reference non target insect collection at KARI’s Katumani research facility

**Future Goals**
- Construct biosafety greenhouse, the first for East Africa
- Enhance level of Busseola fusca stem borer control
- Conduct and publish project review
- Continue training with Kenyan scientists on bio-safety and greenhouse operations, in molecular analyses and transformation techniques
- Convert non-target insect inventory to digitised format to aid in monitoring effects from use of Bt maize, should maize be introduced in Kenyan farming systems.
- Research and evaluate small holder farmer insect resistant programme and seed delivery systems
It seems wrong that IRMA (“Insect Resistant Maize for Africa”) is understood by narrowly defined project goals. In reality the plan - now in its fifth year - contains a tightly knit network of activities. Decided in August 1999 in Mombasa, the project’s focus was on creating maize varieties – bred by using both traditional methods and genetic engineering - resistant to voracious stemborer species. But the project also includes a broad palette of social and economic studies. From the beginning all project partners, the international Maize and Wheat Improvement Centre (CIMMYT) in Mexico, the Kenyan Agricultural Research Institute (KARI) and the Syngenta Foundation (following the Novartis Foundation) were fully aware of the complexity of the challenge.

IRMA shall be exemplary in the way in which latest scientific methods and knowledge can be introduced in a developing country. Most important is the complete transparency of the project’s goals, a permanent dialogue with all stakeholders involved and the observance of all internationally used scientific and legal standards.
“The losses are quite large…”

Jürg Bürgi

Whether well-intentioned development projects like IRMA become a success story will not be determined in conferences, in labs or by field trials, but in the daily routine of usually poor, insufficiently educated smallholders.

energy to fight. The tropical climate makes working in the fields a torture. That’s why most farmers drudge only early in the morning, enough for the bare essentials. Yields are meagre and only rarely sufficient for the sustainable supply of the usually very big families.

In order to be able to buy additional maize and beans, the ordinary food crops in Kenya, Josephine and the other women of the family are forced to seek other work on a day-to-day basis.

In this poor environment, Donald Karisa Mweni is an exception. He used to be a merchant before inheriting his father’s farm. Now he tries to run it as a business, while his neighbours care only for their subsistence. Even towards noon Donald is in his field supervising the women. They are putting, barefooted and with uncovered hands, grains of pesticide around every single young maize plant to control pests. Nobody cares that small children crawl in the field. On his 12 acres in a cleverly devised system he grows alternately grass, maize, cassava, watermelons and bananas. He keeps a bull, 14 milk cows and a lot of goats. Beside watermelons and bananas the cow milk is a major source of
income. He spends money for hybrid seed, pesticide and fertilizer. When his cash runs low Donald takes a loan. Five members of his family joined in a savings association, which gives credit to its members. The interest rate is a half percent – per week.

But even smart Donald Mweni is fighting problems – not from stem-borers, which he controls by a common insecticide, but from storage pests like the weevil Sitophilus zeamais and the Large Corn Borer. While poor smallholders like Jose- phine Ndaa Mgua are used to stocking their modest supplies of maize cobs in a basket hung above the smoky fireplace, farmer Mweni needs larger storage space. After harvest he dries the maize grains and stocks them in bags in a small warehouse. The losses, he must admit, are "quite large". But he doesn’t know any remedy.

Similar problems with storage pests are known to small farmers in the highlands of northwestern Kenya. For instance, to 33 year old Robert Ngoni in Kimini. Unmarried, he lives with his brother’s family. On three acres he grows maize and seems to be quite happy with the yield. The abundance of stem-borers in this area is infrequent but causes heavy damage in bad years. Storage pests in contrast are a permanent danger. To prevent loss Robert keeps the bag with the cobs he selected before harvesting for the next sowing beside the bed in his little hut. Only the maize designated for consumption is stocked in a traditional basket store in the yard.

Although extension officers unanimously advise the farmers not to recycle seed, everybody does it. Kenyan smallholders normally do it twice – no matter whether the variety is hybrid or not, as the socio-economic survey clarified. The yield losses are only small, much smaller than the damage done by pests.

For the carefully chosen seed of the coming season only the safest place is good enough: Young farmer Robert Ngoni with maize cobs in his chamber.

Robert Ngoni has a primary school education, yet his creativity and openness towards using new methods and ideas are representative of a new type of Kenyan farmer. Because he couldn’t keep cattle he started to grow soybeans as an additional food crop. His sister-in-law is happy with the milk substitution for her baby daughter, and Robert has plans to grow soybeans as a cash crop in the future.

Discussions on best strategy against maize pests: Donald Karisa Mweni (right) with IRMA collaborators

Provisional Appraisal

After almost five years of activity, Kenya’s smallholders are still waiting for a maize variety which is resistant to stem-borers and storage pests. The wait is disappointing and frustrating, but should not cloud the project’s tangible achievements. Thanks to IRMA the country has its first solid socio-economic database on maize production; thanks to IRMA a comprehensive inventory on target and nontarget arthropods in maize fields was established; and thanks to IRMA scientific personnel have been trained in the country and abroad.

Until new maize seed – genetically modified as well as traditionally bred – is available, there is time to consider carefully whether it is reasonable or justifiable to introduce varieties of Bt-maize to the market without first having control of seed distribution. The need to reduce the considerable yield and storage losses, and the chronically persistent nutrition uncertainty, is indisputable. But it is just as evident that poor smallholders like Josephine Ndaa will find it very difficult to comply with complex production rules for Bt-maize.

The now well-documented recycling habits of poor farmers, their sceptical approach to new methods, their limited funds, their low level of education and the insufficient resources of the agricultural extension service recommend very cautious action.

Jürg Bürgi is a freelance journalist living in Switzerland.
Public Fora and Outreach

Syngenta Lectures

The Syngenta Foundation invites internationally recognized experts to Syngenta corporate headquarters in Switzerland for an open and frank exchange of ideas related to the rural livelihood of the developing world. The discussions serve both as a bridge between public and private sector perspectives, and as a way to initiate critical stakeholder dialogue on a wide range of development topics.

The complete presentations can be found on www.syngentafoundation.org

Carl Haub

Carl Haub is a senior demographer and holder of the Conrad Taeuber Chair of Population Information at the Population Reference Bureau in Washington, D.C. He is the author of numerous articles, book chapters, and publications on world population trends. Beginning in 1980, he has prepared the annual World Population Data Sheet, the most widely circulated world population data source in use. His Syngenta Foundation lecture addressed the latest trends, issues and new challenges, of global population growth.
“It has been true for many decades that population growth is a phenomenon of developing countries, and most growth will be in the world’s poorest countries.”

*Carl Haub, Syngenta Foundation lecture*

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**Gabrielle Persley**

Dr. Gabrielle Persley, Chair, the Doyle Foundation, has authored numerous articles on biotechnology’s application for developing countries. Formerly with the World Bank’s Rural Development Department where she led its biotechnology policy development, she has served as an adviser on biotechnology issues to the Asian Development Bank, FAO and currently in Kenya on the development of an African Biosciences platform. Her lecture was on a “meta review” commissioned by the International Council of Science, of 50 recently published science-based reviews on modern genetics in food and agriculture.

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**Adel El Beltagy**

Dr. Adel El Beltagy is the Director General of International Centre for Agricultural Research in Arid Areas (ICARDA), the International Centre for Agricultural Research in the Dry Areas, headquartered in Syria, and Chair of the Committee of Centre Directors of the Consultative Group on International Agricultural Research (CGIAR). His talk focused on environmental challenges of North Africa, West Asia and the Central Asia, and on the Centre’s work in the reconstruction of agricultural research in Central Asia and more recently in restoring local crop systems in Afghanistan.

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**David Hoisington**

Dr. David Hoisington, Director, The Applied Biotechnology Centre of the International Maize and Wheat Improvement Centre, headquartered in Mexico. He spoke on the changing role of agricultural research in the public sector, with special emphasis on the part played by the Consultative Group on International Agricultural Research (CGIAR) in enhancing seed breeding, crop and resource management systems in the developing world.

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**Josephine Songa / Stephen Mugo**

Two of the leading Kenyan scientists of the Insect Resistant Maize for Africa project, Drs. Mugo and Songa presented research results, key achievements and major goals of the IRMA initiative, as well as an extensive review of lessons learned on key governance, technology transfer and communications issues from this public-private partnership.

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**Andrew Bennett**

Dr. Bennett brought the Syngenta Foundation perspective in his lecture on how building access to sustainable and adequate water resources in the developing world is essential if we are to reach the UN Millennium development goal of eradicating extreme poverty.
“Such manuals are the starting point for improving agriculture in developing countries.”

*Dr. Ray Kumar*

**Papua New Guinea**

Dr. Ray Kumar’s milestone, “Insect Pests of Agriculture in Papua New Guinea”, published through sponsorship of the Foundation is the first technical reference work of its kind in Papua New Guinea (PNG). The goal was to produce a practical tool directed principally at extension agents and farmers, containing detailed diagrams of pests and their damage and help improve production and protection of food and export crops.

**Symposium: Public-Private Partnership**

In a half-day symposium in Washington D.C., the Foundation provided a platform for discussion on the governance challenges and special issues of private-public collaborations from perspectives of a NGO, from public research institutions and from a private foundation.

**Pesticide Use**

The Foundation organizes lectures internationally on how cultural backgrounds affect compliance with pesticide label directions, particularly relating to protective clothing instructions. Based upon seven years research in three developing world countries.

**Urban Gardening**

Children in Brazil, a Swiss based NGO, exhibited an urban roof-top garden at a Basel Switzerland trade show. Such gardens, with small scale vegetable production, offer opportunity for generating much needed income for the urban poor. The exhibit was sponsored in part by the Foundation.

**WOCAT seminar**

The Foundation was a sponsor of a symposium of the World Overview of Conservation Approaches and Technologies (WOCAT) in which scientists from Kenya, Ethiopia, Burkina Faso, Tanzania, South Africa, Syria and Zimbabwe jointly evaluated research tools for soil and water conservation management systems.
Upcoming Activities

- Sahel Workshop (Bamako, Mali): The purpose of this workshop is to engage civil servants, researchers, NGOs, the private sector and governments in a trans-Sahel evaluation of the area’s most prominent needs, challenges and opportunities in sustainable agriculture.

- Benefit-Sharing and Access Symposium (Basel, Switzerland): A one-day discussion on practical approaches, and related questions, in building a system of fair access, use and conservation of plant genetic resources.

Website Expansion:

Our remodelled website includes a Sahel roadmap with interviews of farmers, oral histories from the Sahel, country and crop profiles, and an ongoing weblog of topical development issues.

Website:

www.syngentafoundation.org

Our website provides information on:

- our aims, activities and projects
- the ongoing discussion on dryland agriculture issues of the developing world
- our collaborations and partnerships
- links to important organizations and events in sustainable agriculture

“We must ask whether business as usual can meet the demands of the future.”

Andrew Bennett
“Technology transfer is important in the development and deployment of new technology. Human and institutional capacity building in local institutions is critical to success and sustainability of the technology.”


Dryland Agriculture

Key challenges
- Enhance efficient use of water
- Mitigate soil, wind and water erosion
- Improve soil fertility
- Promote drought tolerant crops
- Improve pest and disease management
- Diversify livelihood
Access to Technology

We strive to
- Build human capacity
- Enhance scientific exchange
- Promote improved and fair access to technology
- Improve post-harvest crop protection
- Conserve genetic resources
- Support innovations in private and public partnerships

South-South Transfer and Collaboration

We aim to
- Increase and support opportunities for researchers in the South to exchange data and experience
- Help build more links among Sahelian scientists (for example, millet breeders from the Cinzana research Station in Mali consulting with millet breeders in Eritrea)
- Sponsor events to bring together water and soil scientists from across dryland Africa to study conservation management techniques
Heinz Imhof
Chairman
Heinz Imhof is President of the Board of Directors of Syngenta. Imhof studied agronomy at the Swiss Federal Institute of Technology (Eidgenössische Technische Hochschule, ETH) in Zurich.

Andrew Bennett
Andrew Bennett was chief natural resources adviser at the UK Department for International Development. He has over thirty-five years experience in research and rural development in Africa, Asia, Latin America and the Caribbean.

Klaus M. Leisinger
Klaus M. Leisinger is President and CEO of the Novartis Foundation for Sustainable Development. In addition to his involvement in the Foundation, he is Professor of Development Sociology at the University of Basel.

Christian Bonte-Friedheim
Christian Bonte-Friedheim is an Emeritus Professor of Agricultural Economics, and was Director General of the International Service for National Agricultural Research (ISNAR) in The Hague from 1990 to 1997. Between 1968 and 1989, he worked for the United Nations Food and Agriculture Organization (FAO) in Rome, ultimately as its Deputy Director General.

Pierre Landolt
Pierre Landolt is a member of the Board of Directors of Syngenta and also belongs to the Board of Directors of Novartis. In 1994, he also became President of the Sandoz Family Foundation. Landolt studied law at the University of Paris Assas.

Damian Heller
Secretary to the Board of Trustees
Andrew Bennett, Executive Director, Member of the Board of Trustees; Oumar Niangado, Foundation Delegate for West Africa; Hellene Karamagi, Webmaster Consultant; Marisa De Faveri, Office Manager; Felix Nicolier, Head, Project Management; Jost Frei, Consultant IRMA Project; Therese St.Peter, Head, Policy and Programme Development (from left to right).

Anna Gsell, Intern, University of Basel; Andrea Radvansky, Intern, University of Bern.