IITA
Research to Nourish Africa

Annual Report 2007

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Vision

To be Africa's leading research partner in finding solutions for hunger and poverty.

Who we are

IITA is an Africa-based international research-for-development organization, established in 1967, and governed by a Board of Trustees. We have more than 100 international scientists based in various IITA stations across Africa. This network of scientists is dedicated to the development of technologies that reduce producer and consumer risk, increase local production, and generate wealth. We are supported by over 30 investors most of whom are part of the CGIAR.

Contents

Introduction

Setting new R4D standards

A main 2007 highlight is the recognition of our Research-for-Development (R4D) model that addresses the major problems of hunger and poverty in Africa rather than simply contributing to the body of scientific knowledge. The external evaluators found that “the R4D concept is an effective way to articulate the challenges facing agricultural research and to motivate scientists to focus on practical outcomes.”

We have tested the model for the last four years and its effectiveness is illustrated through our achievements in sub-Saharan Africa (SSA). Some typical R4D model examples are:

IITA’s Integrated Cassava Program in Nigeria which is implemented within the framework of the Presidential Initiative on Cassava, spurred the commercialization of the crop in the country, benefitting millions of farmers and bringing in much needed foreign exchange.

In Mozambique, our Poultry Feed program produced cassava- and cowpea-based substitutes for expensive imported feeds. This helped enhance the livelihoods of cassava and cowpea growers while simultaneously providing a cheap source of feed that helped develop the country’s poultry industry.

Our yam researchers have consistently worked closely with national research partners in West Africa to build capacity in yam research and development in the subregion. Yam breeding at the Crops Research Institute (CRI) in Ghana is a good example. Our collaboration with CRI has lead to the development and release of three new improved yam varieties. We have also helped develop the skills of local researchers in yam germplasm collection, conservation and enhancement.

As part of our Cereal and legume systems project, we have routinely distributed sets of inbred maize lines to national research partners in the Democratic Republic of Congo, Nigeria, Rwanda, Zambia, Tanzania, South Korea as well as to PANNAR Seeds in South Africa. The lines were released to collaborators on request for use as sources of genes for introducing combined resistance to *Diplodia* ear rots, gray leaf spot, northern corn leaf blight, common rust and *Maize streak virus* disease as well as for other desirable agronomic traits such as high yields.

In Nigeria, our research and advocacy work with partners led to the formation of the National Nutrition Council (NNC) in 2007. The NNC is tasked to identify problems regarding nutrition, propose solutions and coordinate activities that address nutrition issues. The NNC is chaired by the President. Additionally, our work has contributed towards the establishment of a School Feeding Program in Nasarawa State.

In Borno State, we have been promoting the adoption of IITA-produced maize, soybean and cowpea varieties for several years under our "Promoting Sustainable Agriculture in Borno State" program. These varieties offer resistance or tolerance to *Striga,* considered to be the major agro-economic constraint to profitable farming in this area of Nigeria. We have also developed and promoted the use of technologies and cropping systems to control *Striga* through a farmer-participatory research and extension approach. This has resulted in the combination of our technologies with farmers' practices thereby adding more value and relevance to research products. For more information about our MTPs, please refer to the Research highlights section of this Annual Report.

The R4D model is unique in that (1) it focuses on long-term development needs to guide our research design and choice of partners; and (2) it incorporates two critical elements absent in traditional models: a mid-process *initial* outcome and an explicit phase-out strategy for IITA.

In response to specific development needs, we work with research and development partners to deliver research outputs that are achieving an *initial* outcome. We then use this research outcome to excite and attract more partners who will ultimately have to take charge of the up-scaling and out-scaling of the technologies by broadening participation and increasing the chances of success and ultimate development impact. Therefore, we gradually phase out and devolve our functions to these partners until we exit entirely from the program. It is this latter constituency of development agents, not us, which delivers the final and larger desired outcome that addresses the initially-identified development needs.

We will publish our R4D model so that our national and regional partners can review it for adoption and into their own agricultural research systems.

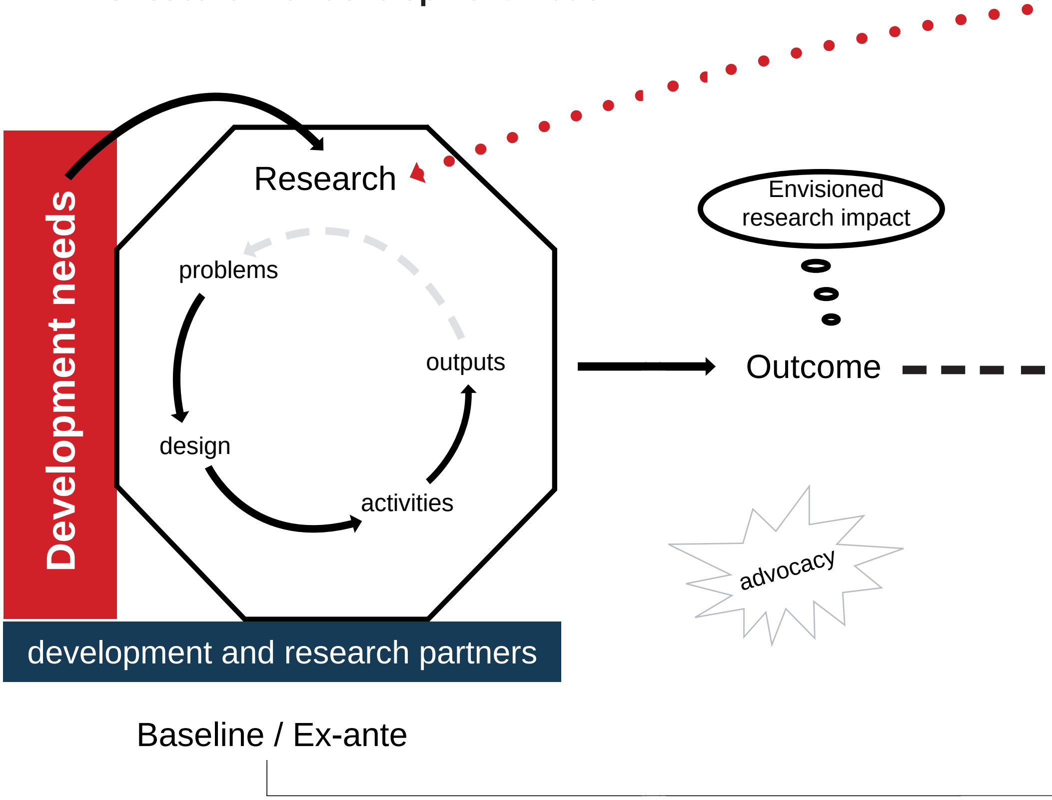
IITA staff

2007 has also been a period of change for us especially in the manner in which we internally operate and collaborate with our partners in African. In November, we transferred our corporate services to WARDA in Bénin, to reduce administrative duplication. The process took almost the whole year. It was a complex and sensitive exercise given the legal and procedural requirements associated with our own staff streamlining and the hiring of staff by WARDA. We hope this excercise will increase the operational efficiency of both centers.

Our 2007 audited financial statements reflect a sustained sound financial health and stability of the Institute, and the prudent management of the financial resources. The Institute's liquidity and reserve levels are above the CGIAR recommended benchmarks and reflect its continued ability to meet both long- and short-term obligations. The Institute's financial risks continue to be assessed, monitored, and managed to the best advantage of our mission and in the interest of our stakeholders and investors. A more detailed financial report is given in the Financial information section of this Annual Report.

This year, our scientists produced or contributed to the completion of more than 200 various publications, adding to the wealth of information and knowledge available to our beneficiaries and users. Specific information about these literature are listed in the Publications section of this report.

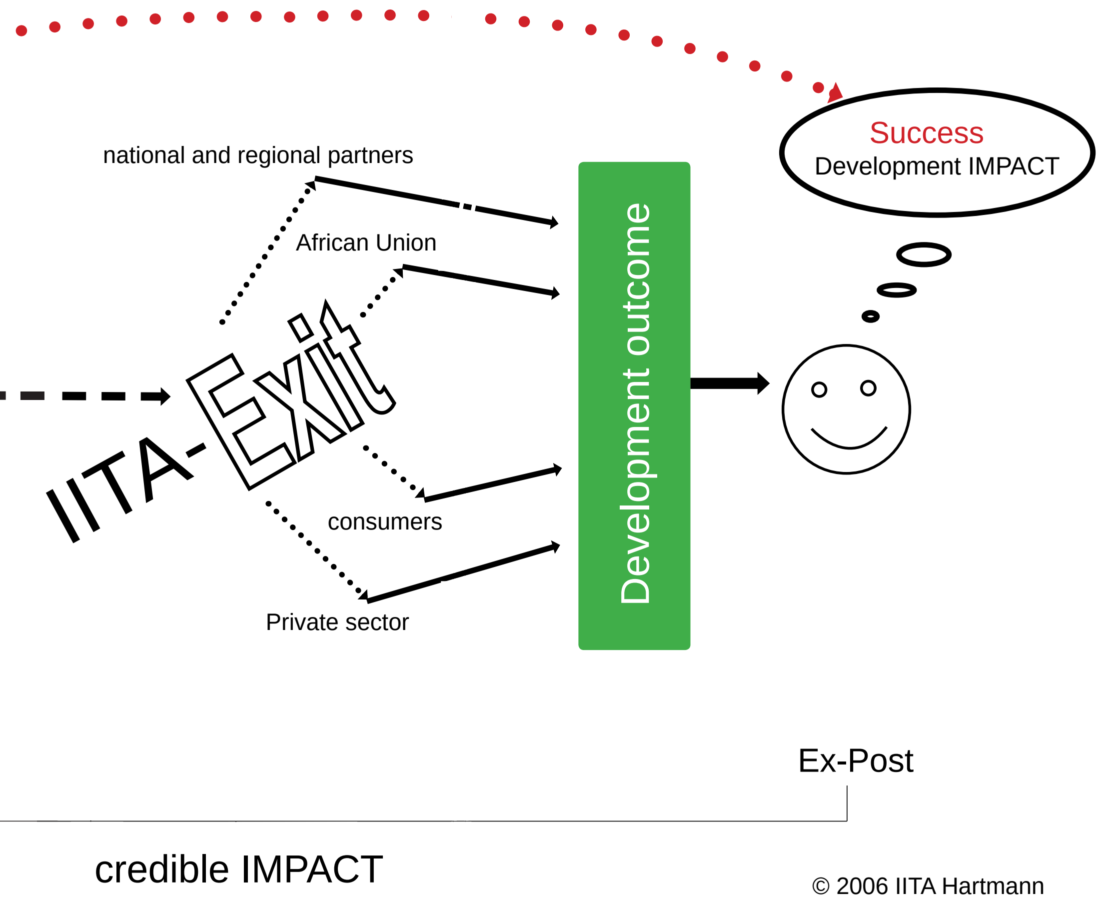
IITA's research-for-development model



1. **Development needs:** Identifies societal, producer and consumer needs that require addressing. Guarantees research relevance.

2. **Research design:** Specifies research problems that can be addressed by IITA with advanced research institutes and national partners. The design demands envisioning the potential impact.

3. **Outcome:** Defines scalable research outcomes and any advocacy activities required. A successful outcome entices partners to adoption.



4. **Exit:** Once the outcome is embraced by national/ regional partners IITA exits implementation and changes role to monitoring the research outcomes.

5. **Success/Development impact:** Ex-post evaluations are carried and compared to baseline information to measure the impact on the ultimate beneficiaries.

6. **Further work:** Development impact creates new challenges which are referred back to development needs.

Research highlights

A bountiful cassava harvest

In this year's annual report, we feature selected stories that represent our major achievements in each of our seven programs. These stories reflect our Research-for-Development (R4D) approach to address major development issues in Africa, particularly poverty and hunger. Unlike in previous years, we did not attempt a comprehensive listing of all our outputs. Instead, we chose research work that best illustrated each of our crops and cross-cutting thematic areas: Banana and Plantain Systems, Cereal and Legume Systems, Root and Tuber Systems, High-Value Products, Agriculture and Health, Agrobiodiversity, Opportunities and Threats, and the Systemwide Program on Integrated Pest Management.

Banana and plantain systems

In 2007, our work on banana and plantain in Africa primarily focuses on mitigating the threat of Banana *Xanthomonas* Wilt and black sigatoka. Scientists estimate that these diseases could rapidly wipe out banana production in the continent within the next 10 years if no adequate control measures are taken. With 30 million metric tons being produced in Africa annually, this will adversely affect the livelihoods and food security of banana-dependent communities as well as erode the genetic base of African bananas. We are at the forefront of the battle against these destructive banana diseases.

Mitigating the threat of Banana *Xanthomonas* Wilt

Since 2001, a Banana *Xanthomonas* Wilt (BXW) pandemic has been spreading rapidly in East and Central Africa, starting with an outbreak in Uganda, where an estimated US$ 4 billion in potential income could be lost by 2010 if BXW is not controlled. Other affected countries include the Democratic Republic of Congo, Rwanda, Tanzania, Burundi, and Kenya.

As BXW is a relatively new disease in the region, the lack of knowledge on disease recognition and management is considered a major factor to its rapid spread. To address this, we implemented the region-wide Crop Crisis Control Project (C3P) in partnership with Catholic Relief Services (CRS), Bioversity International, and various national partners. The program was initiated with two regional training workshops in September/October 2006 on the diagnosis and management of the disease and production of healthy banana planting materials. Until 2007, re-echo training after the initial regional workshops has built the capacity of more than 31,000 farmers and extension/research staff.

Our current approach to combat BXW is to improve farmer-preferred banana cultivars. In 2007, we initiated work to introduce a gene for BXW resistance from sweet pepper. We are implementing this initiative with Uganda's NARO, the Kenya-based African Agricultural Technology Foundation and Academia Sinica in Taiwan. Priority is given to the major local banana varieties *Kayinja* and *Nakitembe*.

We also carried out research on efficient disease management of BXW. Additionally, our entomologists are studying insect vectors of the BXW pathogen and have identified approaches for an Integrated Pest Management strategy.

Managing black sigatoka

Present in West Africa since the 1980s, black sigatoka, or black leaf streak disease (BLSD) has been causing yield losses of 30–50% in banana and plantain production in south-eastern Nigeria. For the past 10 years, we have been implementing a project on the "Strategic Improvement of Plantain and Banana in Africa" (also called Strategic *Musa* Improvement Project, SMIP) to develop BLSD-resistant hybrids that are also high-yielding and produce high-quality fruits. For this work, we were awarded the 1994 King Baudouin Award for outstanding scientific merit.

In 2007, some of our BLSD-resistant hybrids have been registered and distributed to national partners in West Africa where they are being evaluated in multi-location trials, with farmer adoption rate of 56% recorded in Cameroon, Ghana and Nigeria. Farmer adoption of our black Sigatoka-resistant cultivars is motivated by their potential for rapid multiplication through excellent sucker proliferation, high yields, resistance to other pests and diseases and good taste and cooking qualities. Farmers have reported net revenues of US$ 200 per season from the sale of suckers, on top of some US$ 8,000 per ha per year from fruit sales.

This year, we undertook efforts to empower farmers to better participate in the seedling delivery process (management of regional delivery hubs) to facilitate the rapid dissemination of BLSD-resistant cultivars through community-managed nurseries. We conducted several capacity building activities aimed at promoting professionalism in seedling production and postharvest processing among farmers. The awareness of improved hybrids in Cameroon has increased due to on-farm tests being conducted in our project sites across the country.

In East Africa, we completed on-farm evaluation studies on 4 of 56 black sigatoka-resistant EAHB-derived hybrids that we have developed. Farmers evaluated and rated these hybrids higher than

Cereal and legume systems

The farming systems in the savanna regions of Africa have a high potential for cereal and legume production. To realize this potential, we employ various interventions including the use of resilient crop varieties, balanced nutrient management practices, integrated pest management, improved postharvest technologies, linking farmers to better markets, and facilitating technology transfer using participatory methods and by strengthening the capacity of beneficiaries, partners and other stakeholders.

Maize

The past 36 years has seen a dramatic increase in the adoption and use of improved maize varieties in WCA, resulting in more productive farms and an improvement in the livelihoods of millions of people in the region dependent on the crop.

Up until 2007, our work on maize has helped more than 50 million people across the region. This translates to about US$ 10 billion in net benefits. The impact of our research work on this socio-economically important crop is highlighted by the substantial increase in the area under improved maize varieties—from about 2.6 million hectares in the early 1980s to more than 7 million in 2007. Our improved varieties cover about 1.8 million hectares. An impact assessment survey that we conducted in nine WCA countries in 2007 showed that the use of improved maize varieties, along with good cultural practices, efficient use of farm inputs and accessibility to extension support services, has resulted in maize yield gains ranging from 23% (in Cameroon) to 30% (in Nigeria). Most WCA countries were able to rapidly release these varieties for immediate use since our maize varieties need little or no further improvements for adaptation. Of the improved varieties released from 1965 to 2007, about 44% came from our maize germplasm.

In 2007, we initiated a Drought-Tolerant Maize for Africa project in collaboration with CIMMYT an orgnization in Mexico, IITA and CIMMYT are also exchanging information, ideas, and germplasm for the successful implementation of our maize programs in Africa.

This year, we continued to work with universities and advanced research institutes in the US in molecular markers, genomics,

A banana bunch showing symptoms of cigar end rot disease in East DRC proteomics and laboratory-based disease resistance and nutrient studies. In Africa, we continued to liaise with the West and Central Africa Maize Collaborative Research Network (WECAMAN) and the Semi-Arid Africa Agricultural Research and Development of the African Union (AU/SAFGRAD) in disseminating improved planting materials for extension, training and capacity building.

Soybean

In Africa, soybean is grown on about a million ha with an average annual production of one million tons. The countries with considerable area under soybean production include Nigeria, Uganda, South Africa, Zimbabwe, Rwanda, DRC, Zambia, and Malawi. In comparison to Asia and North America, soybean is a relatively new crop to tropical Africa. The production and utilization of soybean has expanded nearly 10-fold in Nigeria over the past 10–15 years. Major expansions have also been observed in Bénin, Côte d'Ivoire, Ghana, Togo, Uganda, and Zambia attributed, in part, to the crop's high protein content (40%), and our efforts to disseminate suitable varieties and appropriate production and utilization methods.

Soybean mosaic

In 2007, our work on soybean focused on improving traits such as maximizing nitrogen fixation and optimizing the production of stover, tolerance to phosphorus deficiency, resistance to major diseases, pod-shattering and lodging, tolerance to drought, and capacity to stimulate the germination of witchweed (*Striga hermonthica)* seeds while maintaining promiscuous nodulation and improved seed longevity. We developed varieties that combined these traits with other desirable agronomic features, specifically high and stable grain yields that add nitrogen and organic matter to the soil. Also, the high stover yields are a source of feed for livestock especially during the dry season. Farmers have expressed a preference for varieties with large seeds and cream color and these traits are also being incorporated into breeding lines.

From 2001–2007, we produced three new soybean lines that could fix 10% more nitrogen than the current best widely grown variety. This is in line with our breeding strategy that focuses on developing lines that are capable of nodulation with native rhizobia, thus eliminating the need for inoculation with commercial rhizobia at the time of planting.

An important trait that has been incorporated into our soybean breeding lines is the increased capacity to stimulate the germination of witchweed seeds, thereby contributing to their depletion in the soil. In 2007, we evaluated 209 soybean lines for this trait. Two lines stimulated 31% germination of witchweed seeds. The best soybean line screened for this trait caused 36% suicidal germination.

This year, we initiated variability studies of the rust pathogen and developed efficient and rapid methods to evaluate soybean lines for rust resistance. These studies were based on an earlier survey concluded in 2006 that mapped the geographical distribution of soybean rust (*Phakpsora pachyrhizi*) in Nigeria. These surveys have shown that areas affected by rust have been expanding.

Local varieties and released cultivars in Nigeria are susceptible to the Asian soybean rust, which has been present in the country since 1999. In 2006, the disease was recorded for the first time in the DRC and Ghana, but was still absent in Bénin and Sierra Leone. To control the further spread and to minimize the adverse effects of this disease, we initiated in 2007 a collaborative project with USDA-ARS at the University of Illinois to develop lines resistant to soybean rust. So far, we have received 100 soybean accessions for rust resistance screening in Nigeria. After repeated evaluation both on-station and on-farm, we identified several rust-resistant accessions, with two currently being used in our rust resistance breeding program. This year we also continued research to determine the genetic diversity in the Nigerian rust population.

Cowpea

Our major research focus on cowpea is to develop new varieties with a range of maturity dates, plant type, seed quality, and combined resistance to major diseases, insect pests, parasitic weeds (*Striga gesnerioides* and *Alectra vogelii*), and broad adaptability. Some efforts have also been made to breed cowpea for end-use quality attributes.

In 2007, using conventional breeding tools, we developed new extra-early varieties that yielded up to 2.5 t/ha grain and matured in 60 days. This is in contrast to the local varieties that produced less than 1 t/ha of grain and matured in 100 to 140 days. Similarly, we have also developed several medium-maturing dual-purpose varieties which yielded over 2.5 t/ha grain and over 3 t/ha fodder in 75–80 days. Two of these lines also had 12 to 15% higher stover yields than the local varieties.

The preferred local varieties for fresh and tender pods require staking to keep pods from touching the ground to avoid rotting. To reduce the additional cost and labor required for production of cowpea as vegetables, we developed bush-type varieties which had 30-cm long succulent pods that could yield up to 18 t/ha green pods with 3 to 4 picks, starting from 45 days after planting. These varieties were semi-erect with extra-long peduncles, protruding over the canopy and holding the pods above the ground. Continuous picking of green pods reduces the weight on peduncles and stimulates further flowering and pod setting, resulting in a continuous supply of green pods for up to 7 weeks.

Maruca pod borer feeding on cowpea

This year we also developed several lines with combined resistance to cowpea yellow mosaic, black eye cowpea mosaic, and several strains of cowpea aphid-borne mosaic. Some progress has also been made in breeding cowpea for resistance to nematodes and a few lines with good levels of resistance were identified for further testing. For insect pests, we identified new sources of genes with resistance to flower thrips and bruchids as parents for making crosses.

In 2007, we made considerable advancements in developing cowpea lines with resistance to two parasitic plants, *Striga gesnerioides* and *Alectra vogelii*, through hybridization. We tested several lines with combined resistance to these two parasite plants across different countries in Africa. We also identified resistant varieties to two newly identified *S. gesnerioides* strains. Our goal is to pyramid the selected resistance genes into improved cowpea varieties, which will increase their adaptation to the different regions in SSA.

This year, our researchers evaluated 245 cowpea lines for their ability to stimulate the germination of *S. hermonthica* seeds using the cut root assay. Among these, five cowpea lines stimulated 50–70% germination of *Striga* seeds. Such cowpea lines can be planted in rotation or relay cropped with cereals to deplete *Striga* seeds in the soil.

The genetic transformation of cowpea with *Bacillus thuringiensis* (*Bt*) genes to control cowpea pod borer (*Maruca vitrata* Fabricius), the most damaging insect for cowpea, hinges upon a regeneration system.

In 2007, we developed an efficient regeneration system for African cowpea genotypes using cotyledonary node explants. This involved testing the shoot regeneration potential of six advanced breeding lines from our own cowpea breeding program with two cowpea landrace accessions from Nigeria.

To fulfill our cowpea research mandate, we continued to collaborate with various institutions and organizations, including Bean/Cowpea CRSP, advanced laboratories in the USA and Australia, African Agricultural Technology Foundation, Network for Genetic Improvement of Cowpea for Africa, and Monsanto, specifically in our research to transform cowpea with Bt gene for *Maruca* resistance. Additionally, we continued to work with the University of Virginia to develop markers associated with resistance to the different strains of *S. gesnerioides*.

Root and tuber systems

Commercializing cassava in Nigeria

Nigeria's Presidential Initiative on Cassava of 2002 set in motion the process of achieving an annual income of US$5 billion from the processing and export of cassava over 3 to 5 years. To realize this objective, the country needed to diversify the uses of cassava and mainstream them into primary industries through the production of value-added products such as starch, ethanol, chips, and flour. In 2005, the first shipload of cassava chips was exported to China. Since then, Nigeria's export of cassava products has been actively pursued, with organic *gari* (or farina, as the roasted granule is known in Latin America) being exported to Europe and the United States. IITA's cassava commercialization program supports this Initiative.

Beginning in 2001, our strategy shifted towards a market-driven technology transfer and commercialization approach in several of our mandate crops, including cassava. Our cassava commercialization and market development activities include the hosting of the Cassava Competitiveness Workshop (2002), two subsector studies on cassava in Nigeria (2003) and significant inputs into the NEPAD Pan-African Cassava Initiative and the Presidential Initiative on Cassava. Currently, we have two centerpiece cassava projects in Nigeria: the Pre-emptive Management of the Cassava Mosaic Disease (CMD); and the Cassava Enterprise Development Project (CEDP).

Grating cassava into strips. Processed cassava is fast becoming a big business in Nigeria

Our CMD project focuses on using a fast-track approach to build a defense against the virulent form of the disease by introducing, along the southeast and south-south flanks of Nigeria, CMD-resistant varieties. In 2007, some 4,656 ha are under cultivation with the new resistant cassava varieties and farmers can harvest about 25.6 t of cassava per hectare, more than double the 12 t/ha average yield from traditional varieties. To distribute these improved varieties, we collaborated with organizations such as the Cassava Growers Association of Nigeria and we also encourage and undertake activities that enable farmer-to-farmer transfer. To supplement this project, we also extended training to growers and extension workers which includes, among others, appropriate cultural techniques and field management of these improved CMD-resistant varieties.

On the other hand, our CEDP supports micro- and small-scale agroprocessing activities in the cassava enterprise. From October 2006 to September 2007, the CEDP generated some US$14 million in income, mainly from the production and processing of cassava by small- to medium-scale enterprises, mobile grater enterprises and micro-processing centers. Farmers and cassava enterprises assisted by CEDP cumulatively earned well over US$11 million during the same period. As of 2007, we have established and are supporting 451 functional enterprises, which was a big leap from the end-2006 figure of 130. We have also assisted in setting up 30 small-scale equipment production plants in seven states and formed a network of cassava equipment fabricators across Nigeria. These enterprises, as well as the various other CEDP-assisted activities, have benefited through direct employment more that 2000 people in the project areas and have assisted women and vulnerable groups with micro-processing centers. The spillover is over ten times this figure.

The establishment of successful enterprises exemplifies our achievement. For example, the Aquada Enterprise, Abia State now exports Scintilla hyper-fine *gari* flour to Baltimore, USA, under the AGOA Initiative. It has already exported 11 tons of the flour valued at US$ 46,875. Drena Farms Limited in Delta State, exports *gari* and *fufu* to London and New York. So far, the company has exported some 35 metric tons of products valued at U$22,400. Jon Tudy Foods, Aniocha South LGA, Delta State, has supplied 2,700 20-pound bags of *gari* to the USA and currently has a standing order of 3,000 bags per month.

Under the CEDP, we develop technologies to improve labor productivity and increase yield through mechanized production.

For example, we work in collaboration with the Cassava Equipment Fabricators Association of Nigeria, Flour Millers Association and other registered bodies to develop and encourage the use of planters, harvesters, peelers, hydraulic presses and dryers with a view to adding value, removing drudgery in production and processing, and turning cassava into an income-generating crop.

Through our integrated cassava projects, we collaborated with national partners on finding new ways to utilize cassava from the basic food (*gari, fufu, lafun*) to improved food products such as high-quality *gari*, odorless instant *fufu*, and high quality cassava flour. In connection with this, we have produced and published over 37 information books and booklets on cassava in English (2006) and in French (2007).

In 2007, we provide technical backstopping and research support to a newly opened ultramodern glucose syrup factory in Nigeria that uses cassava as its major raw material and which provides a secure market for 400 tons of fresh cassava per day grown by 20,000 poor farmers nearby. Built at a cost of N2.5 billion by Ekha Agro Nig. Ltd., a private sector initiative, in partnership with the International Starch Institute (ISI) in Denmark and several Nigerian banks, the company will produce 100 tons of glucose syrup daily. It will initially produce 30,000 tons of glucose syrup per annum, saving the country about $15 million on imports. As Nigeria currently requires 120,000 tons of glucose syrup annually, the factory is set to meet immediately a quarter of national demand for the commodity, which is used in pharmaceuticals, food and brewing. The factory currently employs 50 engineers and 70 agronomists who organize and work with more than 20,000 cassava out-growers and cluster farmers who supply daily fresh cassava roots valued at about 2 million Nigerian Naira, or about US$15,000. On the advice of IITA, the company maintains 3000 hectares of cassava farmland to supplement fresh roots from its contract growers.

Nigeria is presently the world's biggest producer of cassava, with an estimated 45 million tons per year. Since 1980, the expansion of cassava production has been relatively steady, gaining momentum during the period 1988–1992 following the release of improved IITA varieties that boosted farm production. With the Presidential Initiative on Cassava, and complemented by our research-for-development work on the crop, Nigeria is well on its way to becoming a major player in the local and international markets for high-value processed cassava products.

Enhancing productivity and improving nutrition through cassava

In SSA, over 240 million people depend on cassava for food and income. Cassava provides a cheap but rich source of calories. Producers sell the crop as fresh roots or as value-added products such as *gari* (roasted cassava granules) and starch, which are also exported to Europe and America. IITA is at the forefront of cassava research-for-development in Africa to help get to the “root” of successful development. Highlights in 2007 include the development and release of new varieties with national and international partners to reduce producer and consumer risk, increase productivity and income.

Cassava brown streak disease (CBSD) poses a major threat to cassava production across the continent and urgent action is needed to further develop and disseminate resistant varieties. We collaborated with the Kizimbani Research Station in Zanzibar to develop four new cultivars that are resistant to CBSD. These groundbreaking varieties also have good cooking qualities and high yields, averaging 20 tons/ha of fresh roots.

Cassava brown streak disease leaf symptoms in TME 14 showing association of chlorosis with secondary veins.

In March 2007, Zanzibar’s Ministry of Agriculture released these new varieties as a result of strong producer demand. This was the crown on four years of intensive farmer participatory breeding trials. Farmers and small-scale entrepreneurs, like the members of the Mitakawani Cassava Processing Site, a cottage industry that adds value to the cassava roots, celebrated the release of the new cultivars.

For example, Mama Juma is twice as rich thanks to IITA’s activities in Tanzania. The development of new cultivars means the small-scale farmer now produces more cassava roots and has diversified into making flour. The flour sells for US$6 per 80-kg bag, double the price she would receive for the roots alone. She said: “The flour we make from them tastes better! We are happy because the new hybrids not only give us abundant and steady harvest but also supply our small-scale enterprises with cassava that has good processing qualities."

This year, the Alliance for a Green Revolution in Africa (AGRA) granted funds for a three-year multiplication project to expedite the dissemination of the groundbreaking resistant hybrids. However, more needs to be done to prevent the spread of this disease, especially to West Africa where it would devastate the production.

Cassava commonly grown in the region contains low amounts of protein in the storage roots, roughly only 2% of the plant's dry weight. In 2007, we developed, in partnership with our partners in CIAT, Colombia, varieties with up 14 times more protein content (28% dry weight basis) than the conventional varieties. We are also working with HarvestPlus to produce beta-carotene, iron, and zinc bio-fortified cassava. Aside from having more protein, these varieties are being enhanced with essential micro-nutrients. Bio-fortified cassava could significantly address "hidden hunger" in SSA, which, according to UNICEF estimates, is already costing the region's economies some US$2.3 billion in lost productivity. Existing practices don't need to change to realize the nutritional benefits.

Yam pest threatens potato

More than 95% of the world's 47 million metric tons of yam produced annually comes from SSA. Yam (*Dioscorea* spp.) is the preferred staple food in West Africa. It is important for survival in the region as the tubers can be stored up to six months without refrigeration, making them a valuable resource for the yearly period of food scarcity at the beginning of the wet season.

Potato is considered to be the world's most widely grown tuber crop. It is also the most important commodity crop in Southern Africa, with about 50,000 ha planted to it. Although both yam and potato are classified as tubers, the biotic stresses that affect their production and storability have always been different from each other… until now!

In 2007, our researchers observed symptoms associated with attack by a phytoparasitic nematode that is known to be a major pest of yam on potato coming from the key Nigerian potato-growing area of Jos. This major endoparasite, *Scutellonema bradys*, or simply "yam nematode", causes severe crop losses, suboptimal yields and deterioration of tubers while in storage. *S. bradys* transmits plant viruses through their feeding activity on roots, and makes them more prone to fungal and bacterial attacks, e.g., dry rot and wet rot. Yam nematode reproduces and builds up large populations in stored tubers and causes severe damage during storage. The largest population recorded was 6200 nematodes/g of tuber.

The sample potato specimens from Jos showed cracking of the cortex, a symptom associated with an *S. bradys* attack. If proven, this case represents the first record of this nematode infecting potato. To confirm the discovery, we conducted yam nematode inoculation tests on local potato tubers sourced from Ibadan, Nigeria during the same year. Potato tubers planted in sterile soil-filled pots were inoculated with about 5,000 *S. bradys*, obtained from infected yam, two weeks after transplanting from sprouting beds. Plants inoculated with the yam nematode produced tubers with substantial cracking of the cortex and evident tuber rot. Other symptoms observed that are typical of yam nematode infestation included scaly appearance, surface and deep tissue cracks and distortions, and sub-surface rotting. Morphological tests of the mature nematodes recovered from the soil, roots and tubers of the inoculated plants were confirmed to be *S. bradys*.

As the findings established that potato can be infected by yam nematode, a better understanding of the pathology of this nematode is urgently needed to determine if it is a potential quarantine problem that might impact trade of tuber crops.

Yam tuber infected with nematode

High-value products

In Africa, tree crops and vegetables play key roles in the poverty reduction strategies of many countries. Smallholder tree crop systems stimulate export-oriented economic growth in rural areas through new investment and public-private sector partnerships, significantly contributing to enhanced livelihoods and biodiversity. In urban and peri-urban areas, indigenous and exotic leafy vegetables (e.g., cabbage, amaranth, African nightshade, and lettuce), fruit vegetables (e.g., tomato, pepper) and root vegetables (e.g., carrot) are vital in the food and nutritional security and income stability of communities. We contribute towards the development of these high-value products through our two centerpiece programs: the IITA/SDC Vegetable IPM Project and the Sustainable Tree Crops Project (STCP).

The IITA/SDC Vegetable IPM Project

In 2007, we initiated a farmer-participatory collection of preferred vegetable crops in Bénin with the objective of improving local vegetable germplasm. We provided the Union of Vegetable Growers, composed of 22 farmers' groups, with 3 ha of research land with irrigation facilities where farmers brought their preferred varieties for seed/seedling multiplication in a pest-free environment. In Cotonou, we also initiated trials to optimize the dosage and application of farm yard manure to enhance soil fertility and improve the vigor of *gboma* (*Solanum macrocarpon)* and green amaranth (*Amaranthus* sp.) as components of an IPM approach in small vegetable plots in the Houéyiho site.

Pepper is a mainstay of African dishes

This year, we conducted intensive diagnosis of pesticide use patterns at 10 vegetable production sites in southern Bénin. Findings showed that vegetable producers applied at least 15 different chemical pesticides Across the country, cabbage, tomato, and gboma emerged as indicator crops of harmful pesticide regimes in the vegetable agroecosystems. In the urban and peri-urban sites of coastal Bénin and Togo, we initiated research on pesticide residues to identify pesticides that have contaminated production environments. Through the project, we monitored pesticide residue levels in irrigation and ground water as well as assessed the pesticide dissipation in soils and from plant surfaces at harvest.

Botanicals, which include cassava and orange epidermal peels, were identified as viable alternatives to chemical nematicides in the control of nematodes in Gboma and carrots. Our studies have shown that these botanicals were as efficient as Rugby10 (a chemical nematicide) and *Paecilomyces lilacinus* (an egg nematicide) in controlling nematodes.

Our IPM project this year also generated extensive baseline information on the diversity, distribution, and economic importance of pests/diseases and associated natural enemies in vegetable production, mostly in Bénin. The main crops sampled were gboma, amaranth, cabbage, carrot, lettuce, onion, pepper, aubergine, cucumber, green beans, and tomato. The baseline survey database consisted of a comprehensive pest list and geo-referenced distribution maps with accompanying graphs depicting location-specific data on economic damage for specific pests in each of the regions surveyed in the country. The database provides a basis to initiate the development of historical profiles on the changing status of vegetable pest problems (e.g., the impact of interventions).

In the search for biological alternatives to chemical pesticides, our researchers have determined that the fungus *Beauveria bassiana* is a potential effective microbial pesticide for managing Lepidoptera pests. To confirm this, we evaluated eight isolates of fungal pathogens for their respective virulence against the Diamondback moth (DBM) larvae. Across the test sites, DBM population density and mortality were consistently higher in plots treated with a chemical insecticide (Talstar) and in control plots than in those treated with the bio-pesticide *B. bassiana* 5653 (Bba5653). Additionally, cabbage yield was at least 2.5 times higher in plots treated with the biopesticide than in plots treated with Talstar or in the untreated plots. These preliminary results show that bio-pesticides could be effectively used to control specific crop pests without the toxic dangers associated with chemical-based pesticides and at the same time potentially increase yields.

Life-table studies on mite pests of gboma and amaranth conducted under the IPM project provided a basis to develop biological control approaches against the pests. A number of predatory mites (phytoseiid species) observed on *gboma* could be tapped to biologically control *P. latus* on the crop.

In 2007, three sessions of training of trainers (ToT) combined with farmer field school (FFS) in integrated plant production and plant protection of gboma, cabbage, carrot, and lettuce were completed. The training involved 81 farmers' group representatives (30% women farmers) who served as farmer-trainers of 435 vegetable producers at their respective 28 vegetable production sites in southern Bénin. The ToT/FFS was integrated with research and extension by community organizers to enable farmers to understand the need for correct and timely crop and pest observations coupled with field plot experiments as the bases for informed decision making for plant protection interventions. Participants' evaluation of the training and secondary transfer of the information and skills have shown some positive changes in the farmers' production practices.

This year, a TV documentary about the project and its promotion of the use of the bio-pesticide Bba5653 against DBM was aired. Farmers trained under the project presented and discussed their experiences on using this bio-pesticide, specifically its importance and advantages over chemical pesticides.

The Sustainable Tree Crops Project (STCP)

The STCP promotes the development of the cocoa sector by strengthening community groups, disseminating related technology and research, influencing policy and implementing policy changes, building market information systems, and strengthening labor and social systems. We coordinate and host the project in collaboration with a number of partner organizations in Cameroon, Cote d'Ivoire, Ghana, Guinea, Liberia and Nigeria.

One important achievement in 2007 is the recognition given to the project by our partners, regarding it as "an important collaborative innovation from which all stakeholders derive value. This unique partnership has never before existed for the cocoa sector, which is the most important tree-based commodity in West Africa."

Bringing together national, regional, and international expertise, the project developed a high-quality, inexpensive, and relevant farmer training approach based upon the learning concept of FFS, particularly

A happy cocoa farmer. Small-scale farmers have been trained through FFS on maximizing incomes derived from this commodity crop

to utilize indigenous knowledge and technology options existing in the communities for managing cocoa trees. Utilizing FFS, community practices on integrated crop, pest, disease, and quality management of cocoa has been successfully validated in West Africa. The approach was tested with 13,000 farmers in four countries over 3 years. In the fields of participating farmers, cocoa yields were, on average, 15% to 40% higher while requiring 10% to 20% less pesticide.

Up until 2007, the STCP has been identifying approaches to improve the effectiveness of farmers' organizations as a mechanism to enhance the farmers' role in marketing and increase their incomes. We have been testing these approaches with 15 large farmers' cooperatives, complementing it with training and providing technical support to potentially reach over 31,000 farmers in four countries. Surveys that we conducted in 2007 showed that through group sales and more transparent and direct transactions, farmers received 5% to 15% higher farm-gate incomes.

Improved production and marketing techniques can lead to significant improvements in incomes. Preliminary impact studies of the STCP, conducted this year, showed that participating households earned higher incomes from cocoa in the range of 23%–55% compared to non-participating households. This was attributed largely to the combined production and marketing interventions by the project.

National programs have expressed their intentions of integrating the approaches espoused by the project into their own activities. For example, the FFS approach has been adopted by the National Cocoa Development Committee of Nigeria in the implementation of its nationwide cocoa extension plan. Presently, the STCP provides technical backstopping to this national effort.

In developing human resources, the project has trained over 16,100 farmers and farmer-facilitators in Côte d'Ivoire, Ghana, Nigeria, Cameroon, and Liberia on FFS methodology for cocoa integrated crop and pest management (ICPM). Additionally, 46 farmer cooperatives comprising some 15 ,800 farmers from these five countries have been trained on the use of ''toolkits'' for strengthening farmer organizations. A number of information, education and communication materials have been produced, including over 50 pictorial fact sheets and poster flipcharts on cocoa ICPM for use in farmer training.

Agriculture and health

Our efforts in agriculture and health focus on science-based development activities that cut across gender and social strata to positively impact the health and nutrition of people in SSA.

Five CGIAR Centers—IITA, ICRISAT, CIMMYT, IFPRI and ICARDA—are working together with national and ARI partners in developing technologies to control mycotoxin contamination in major African food crops and encouraging farmers to adopt them. In 2007, this collaborative research produced new maize, groundnut, wheat and barley varieties that are resistant to mycotoxin contamination. Additionally, a biological control method involving the dispersal of non-toxic strains of the fungus to displace the toxic ones has shown potential for reducing aflatoxins in affected crops by as much as 99%. An ELISA-based mycotoxin detection technology was disseminated to and adopted by farmer organizations in Malawi to increase their exports of groundnuts to Europe. In Africa, resistant cultivars were deployed and simple field management strategies to reduce crop aflatoxin contamination 90% have been disseminated to farmers. Further efforts are underway to identify cost-effective technologies at critical control points along the foodfeed value chain to reduce the risk of mycotoxins.

Mycotoxins produced by ear rot-causing fungi in maize pose serious health hazards to humans. In collaboration with SRRC and USDA-RRC, we initiated in 2007 a breeding project that produced several aflatoxin-resistant crosses and backcrosses from US and IITA inbred lines. A total of 65 S5 lines were developed from the backcross populations and 144 S5 lines were derived from the F1 crosses. Several promising S5 lines with high aflatoxin resistance levels have been selected for confirmation tests. Initial screening of 58 elite maize inbred lines using artificial field inoculation with *F. verticilloides* detected significant differences in fumonisin accumulation. The new inbred lines with high resistance to aflatoxin contamination and the elite lines with low levels of fumonisin can be exploited as potentially new sources of genes in breeding programs.

An important aspect of our breeding work is the development of crop varieties with improved nutritional qualities. In maize, we continued to develop cultivars with enhanced levels of lysine and tryptophan (QPM), two essential amino acids that are deficient in the crop. In partnership with CIMMYT, Mexico and national partners, we are breeding extra-early, early-, and late-maturing QPM varieties that are resistant to the prevailing major foliar diseases and *S. hermonthica*, as well as are agronomically competitive with regular maize. So far, 4 extra-early, 10 early-, and 9 late-maturing drought-tolerant and/or *Striga*-resistant varieties adapted to the lowlands have been converted to QPM and are being evaluated through regional or on-farm trials. Streak resistance in Obatanpa, DMR-ESR-W QPM and Susuma is currently being improved and tested in WECAMAN member countries for later release to farmers.

We are breeding maize varieties with increased levels of iron, zinc, and pro-vitamin A. Several studies that we conducted in 2007 showed that elite maize germplasm can be exploited to enrich the micronutrient content of maize without reducing productivity. Promising elite maize inbred lines containing high levels of pro-vitamin A (4.5 to 9.8 µg/g), iron (24 to 42 mg/kg), and zinc (26 to 88 mg/kg) are being bred and tested to develop breeding populations and hybrids with increased micronutrient content. Preliminary results indicate that some hybrids produced from these inbred lines are agronomical competitive compared to a commercial hybrid control. It is expected that our maize breeding work would result in the development of varieties with enhanced amounts of essential nutrients.

This year, our researchers have also assessed the bioavailability of iron in selected maize varieties using an in vitro digestion [Caco-2-cell] model. Sixty-nine late-early-maturing elite IITA maize varieties were grown under uniform conditions in locations representing the forest and savanna zones of Africa. Of the varieties tested, 11 showed 21–38% more bio-available iron than the most widely grown variety, TZB-SR. These varieties also had high mineral density and high grain yield. The best three varieties are being further evaluated. To confirm the findings, we conducted evaluation studies involving human subjects of the *in vitro* iron bioavailability of two maize varieties, directly comparing the results with that of the earlier Caco-2 cell tests. Findings of this study will be published in 2008.

In cassava, screening studies conducted by our researchers in 2007 on wild species of *Manihot* showed that some of them contain high levels of protein and therefore present a potential source of breeding material for cassava with higher nutrient content. Through hybridization of wild *Manihot species, M. tristis* and *M. flavellifolia*, with locally adapted germplasm as well as *in vitro* landraces and improved clones from our partners in CIAT Colombia, we were able to produce cassava cultivars with protein content as high as 28% this same year.

This represents a four-fold increase in the content of the baseline cassava local varieties which have only about 7% protein in their roots and leaves. In addition, CIAT and HarvestPlus shared with us their *in vitro* progenies of interspecific high-protein hybrids for introgession with African adapted genepools. These lines are being crossed with high beta-carotene clones available at our genebank to obtain progenies with enhanced levels of both micro and macronutrients. Our studies have shown that it is possible to incorporate high-protein and high-β-carotene traits into a single cassava genotype through breeding.

Banana is a major source of food and nutrition for many Africans

Also in 2007, we identified a cowpea line (IT97K-1042-3) that contains the highest protein (30%), iron (77 ppm), and zinc (46 ppm). Our breeders are crossing this line with other improved cowpea varieties to develop segregating populations for further genetic improvement studies.

Agrobiodiversity

Our Agrobiodiversity Project emphasizes the long-term conservation and use of plant genetic resources, particularly of staple and underutilized crop species, for food security and sustainability of natural resources.

Conservation and use of in vitro-propagated germplasm

For the last three years, we have transferred over 2,300 accessions of cassava, 500 accessions of yams and 250 accessions of *Musa* from the field to the in vitro genebank. The in vitro genebank presently maintains 4,186 accessions of these crops. Some 2,350 of these accessions have been sent to IITA's Bénin genebank facility in Cotonou for safe duplication in 2007. During the same year, the wild *Manihot* field genebank has been rejuvenated in the field.

During the past two decades, the genebank has distributed over 60,000 accessions. In 2007, 6784 accessions were sent to 9 countries (Botswana, Burkina Faso, Germany, Japan, Mozambique, Nigeria, Republic of Korea, Senegal and USA).

To facilitate the distribution of clean tissue culture planting material and botanic seeds, we conducted virus diagnostic tests on cowpea, yam and cassava, employing various techniques like visual observation, enzyme-linked immunosorbent assay (ELISA), and polymerase chain reaction (PCR). As of 2007, our Germplasm Health Unit has more than 2,500 accessions of cowpea, Bambara groundnut, cassava, yam and *Musa*. Virus diagnostics is vital in ascertaining the health status of plants for the production of in vitro plantlets and contributing towards the on-farm management of diseases.

Conservation and use of seed crop germplasm

During the past 4 years, we regenerated and processed our Bambara groundnut seed collection, a total of 1,597 accessions, for medium- and long-term storage. Other seed crop collections that we have rejuvenated during this period of time include 8,500 cowpea accessions, 876 maize accessions, 110 African yam bean, 95 accessions of winged bean and 65 accessions of green gram.

In late 2007, we shipped about 7,000 unique seed samples from more than 36 African nations to the Svalbard Global Seed Vault, a facility built on an island in the Arctic Circle as a repository of last resort for humanity's agricultural heritage. Our shipment consisted of thousands of duplicates of unique varieties of domesticated and wild cowpea, maize, soybean, and Bambara groundnut. The seeds were packed in 21 boxes weighing 330 kg.

The processing of the seeds took several months. The seeds were shipped to Norway's Svalbard archipelago, where the vault has been constructed in a mountain deep inside the Arctic permafrost. The vault was built by the Norwegian government as a service to the global community. The vault opened on 26 February 2008.

Describing the genetic diversity of conserved germplasm

Under a Generation Challenge Program-funded activity IITA scientists have genotyped a representative sub-sample (core collection) of the entire cowpea collection held at the IITA genebank. This activity and subsequent analysis of the molecular data has allowed the definition of a smaller collection; a mini-core or reference collection that represents the entire collection in geographical, phenotypic and genotypic terms. Reference collections provides a manageable interface by which scientists including breeders, geneticists, pathologists and molecular biologists can assess and mine the great diversity present in the genebank collections for traits of interest generating a greater understanding of the potential variation in the global collection. Once interesting accessions are identified in a reference collection a scientist can request closely related accessions from the genebank for further assessment. The reference collection for cowpea has been widely requested and disseminated within and outside of IITA and is being adopted in studies on abiotic and biotic stress-tolerance.

This year, our breeders sequenced over 40,000 ESTs from cowpea differential cDNA libraries, which were obtained from the roots, leaves and stems of drought-stressed, irrigated but drought-susceptible, and drought-tolerant cowpea lines. This yielded about 17,000 unique contiguous and single sequences. Additionally, over 5,000 potential new markers were identified, including 3,226 single nucleotide polymorphisms and 1,806 microsatellite markers.

A microarray chip is also being developed. Similar genotyping was conducted on 2,575 cassava accessions using data from eight SSRs. These accessions represented a global collection, with contributions from EMBRAPA, CIAT and IITA.

In 2007, we completed a study to assess the genetic diversity and heterotic relationships of 500 African local *(Manihot esculenta* Crantz) and 398 improved cassava germplasm based on quantitative and qualitative agrobotanical characteristics, molecular marker fingerprinting and heterosis. The accessions were also tested for resistance to the cassava mosaic disease (CMD). Cassava germplasm from Guinea and Sierra Leone were similarly assessed for genetic relationship. DNA was extracted from cassava clones of 81 Guinea and 96 Sierra Leone cassava accessions and genotyped at IITA Ibadan using molecular markers. A dendrogram was obtained after generating a similarity matrix using UPGMA. The result of these studies is useful in the selection of clones for breeding, specifically to avoid inbreeding depression and to increase hybrid vigor. In breeding, distant clones are preferred over closely related ones.

Cowpea seeds on display at our gene bank in Ibadan, Nigeria

During 2007, we also assessed West African cocoa collection for genetic diversity. A total of 685 cocoa accessions from Cross River State of Nigeria and Western Ghana were characterized using SSR markers and the PAGE System. The accessions from both countries were mainly farmers' collections, with one accession from breeders' collection (designated as AMAZ) from the field genebank of the Cocoa Research Institute of Nigeria (CRIN). Preliminary results showed that the genetic base of farmers' cocoa collection is very narrow, making it vulnerable to biotic and abiotic stresses. However, this could be addressed by introducing underutilized germplasm from our national partners' field genebanks. The findings are important in designing cocoa-based multi-cropping systems that are more resilient to stresses.

Transferring traits from wild/unadapted species and creating novel diversity

In 2007, we carried out evaluation studies on the viability of seeds derived from intraspecific and interspecific crosses of *Musa acuminata* and *Musa balbisiana*; selfings of *M. acuminata* or *M. balbisiana*; and selfings or crosses between banana–plantain hybrids. From 24, 612 seeds extracted from fruits of *Musa* genotypes, 5,056 "good" candidate seeds were selected. About 3,760 embryos were excised from these candidate seeds and cultured. Some seeds were also sown directly. Viability was very high in intraspecific crosses of the AA and BB diploids in both sown seeds and embryo culture, although some apparent inbreeding depression was observed in a few of the diploid banana hybrids including high rates of late embryo mortality.

In developing black sigatoka-resistant banana and plantain cultivars, we conducted genetic analysis studies of intraspecific and interspecific hybrids. Results indicated that wild *M. acuminata* and landrace accessions of Pilang Lilin, Calcutta 4, and subsp. Zebrina and Heva are resistant to BS. F1 and F2 progenies have been produced from these plants to examine the effects of gene pyramiding for greater disease resistance. Over 50 new seedlings produced from these hybrids are being further investigated for decreasing the possible hybridity of existing alleles for BS resistance, particularly that of Calcutta 4.

This year, we also conducted seedling dehydration stress tolerance tests on *M. acuminata*, *M. balbisiana* and interspecific hybrids. Seedlings were subjected to dehydration stress and subsequently rehydrated to determine their survival rate. Seeds of *M. balbisiana* Montpellier, Butohan 2, Los Baños and *M. acuminata* were screened under normally lethal dehydration conditions. Two plants from a Butohan 2 population showed high dehydration stress tolerance and have been multiplied for further testing.

Our breeders constantly check on the health status of our in vitro conserved germplasm

Opportunities and threats

Empowering Borno farmers through sustainable agriculture

The majority of the people in Borno State, Nigeria, are farmers, herdsmen and fishermen. Agriculture is, therefore, the mainstay of their economy. The crops grown include guinea corn, millet, maize, rice, wheat, groundnut, cassava, beans and cowpeas. Others are vegetables, onions, okra and tomatoes. About 1.794 million ha of land is under crop cultivation. However, food crop production and animal husbandry have been adversely affected by drought, desertification and infestation by insects and birds with alarming regularity. This has had a negative impact on the incomes and livelihoods of farming households in the state, resulting in food insecurity and widespread rural poverty.

Our project on Promoting Sustainable Agriculture in Borno State (PROSAB) aims to improve agricultural production and increase rural incomes in Central and South Borno by developing and evaluating strategies that promote sustainable agriculture, with the goal of empowering farmers for a better future. PROSAB promotes the introduction and adoption of improved farm management practices and technologies, increased access to inputs and commodity markets, influencing policies, and farmer capacity building.

The project adopts the Participatory Research and Extension Approach involving (1) community analysis to identify livelihood opportunities, constraints and entry points to plan interventions; (2) participatory action planning to address priority problems; (3) the deployment and testing of a basket of “best-bet” technologies in model communities; and (4) capacity building. These strategies have been developed by IITA and national partners partners to address priority problems such as *Striga* infestation, poor soil fertility, drought and insect pests.

The basket of technologies provides farmers with viable options such as the deployment of resilient and high-value crops (i.e., *Striga*- and drought-tolerant maize varieties, and dual purpose soybean and cowpea varieties) as well as improved cultural practices (i.e., appropriate planting densities, maize–soybean rotation to manage diseases and enhance soil fertility, proper and timely fertilizer application, and use of “green” insecticides).

In 2007, these practices and technologies were extensively tested, evaluated and refined by and with farmers. Community-based seed multiplication and distribution facilities have been established to allow access to improved planting materials. Market information system and linkages to major food processors have also been set up to provide ready markets. Currently, large volumes of maize and soybean are being traded in the project areas. Public awareness activities such as farmer field days and interactions with state policymakers have resulted in the development of 12 policy briefs, which are currently being revised by the Borno State House of Assembly for statewide implementation.

The project's interventions have also been scaled out and adopted even by non-participating farmers in and around Borno State. For example, small-scale traders from non-project areas have linked up with the model communities to buy and sell seeds. It is envisioned that the results of this project would translate into a "technology toolkit" that could be adapted and applied according to specific farming conditions not only in Nigeria but also across Africa.

Marketing soybean in Borno state, Nigeria

Systemwide Program on Integrated Pest Management

Improving farmers' lives through better pest management

The Systemwide Program on Integrated Pest Management (SP-IPM) is a global partnership whose task is to draw together the IPM efforts of various agricultural stakeholders and to focus these more clearly on the needs of poor farmers in developing countries, particularly in managing pests, achieving greater food security, and raising their incomes within a healthier environment. The SP-IPM's principal clients (farmers and R&D organizations) benefit from the program through access to technical resources and expertise, information, advice, collaborative field activities, and capacity-building activities

We host the SP-IPM as its Convening Center and Secretariat. The program is comprised of institutional representatives from 16 organizations including The World Vegetable Center, The International Centre of Insect Physiology and Ecology, CropLife International (representative), the World Bank, and the International Association for the Plant Protection Sciences (IAPPS). Core donor partners of the SP-IPM are the Governments of Norway, Switzerland, and Italy. Current priority areas for inter-center collaborative research are: (a) Adaptation of IPM to climate variability and change; (b) Management of contaminants in foods, feeds and the environment; and (c) Improved agroecosystem resilience for soil, root and plant health.

In 2007, the SP-IPM nominated a new Chair (from outside the CGIAR) and identified a new Coordinator and completed Beneficial Impact Assessment (BIA) of the Northern Guinea Savanna (NGS) site in Nigeria. The findings indicate that the SP-IPM clearly set the stage for the rapid expansion of maize and food legume crops used as *Striga* trap. Farmers' perceptions demonstrated that with appropriate partnerships and community ownership of IPM processes, beneficial maize crop yields are highly probable in hitherto *Striga*-infested land. Technology impact of the best-bet *Striga* management options offered farmers opportunities to use land that would have otherwise been abandoned for maize production.

This was expressed by highly significant shifts towards larger size maize farms. Trained farmers also reported significant maize yield increases with a net return of up to $540 per ha. The benefit-cost ratio was 2.4, double the estimate for 2001 baseline operations for which a net loss in return on investments was estimated in cases of low market price for maize.

In pursuit of its guiding principles on IPM, specifically its position on the use of pesticides, the program initiated studies on the use patterns and pesticide fates in target agroecosystems. Vegetable production in West Africa served as the case study to assess the challenges posed by pesticides in IPM field programs as well as to investigate pesticide dissipation in soils and on plant surfaces.

For global visibility, the SP-IPM Secretariat served on the Governing Board of the International Association for Plant Protection Sciences (IAPPS) and on the international organizing committee of the XVI International Plant Protection Congress (IPPC) co-organized by IAPPS and BCPC-UK. The XCVI IPPC was held in Glasgow, Scotland, UK, 15–18 October 2007. The Congress featured a special CGIAR/SP-IPM symposium on “Emerging themes in agroecosystem, health and food safety”. The symposium featured 15 papers enabling CGIAR scientists and their partners based in Asia (China, India and Philippines), Africa (Bénin and Nigeria) and Latin America (Peru) to showcase publicly- funded IPM research results.

This year, the SP-IPM initiated the publication of IPM educational tools, with a pilot manual on “Practical plant nematology: a field and laboratory guide”. The publication was authored by nematologists from IITA, CIMMYT and the University of Ibadan, Nigeria. It was produced in partnership with Green Ink Publishing Services Ltd (UK) and the Technical Centre for Agricultural and Rural Cooperation (CTA).

The IPM Research Brief No 5, produced by the program outlines the SP-IPM’s strategy focused on three key emerging themes: adapting IPM to climate variability and change; management of contaminants in foods, feeds and the environment; and improved agroecosystem resilience for soil, root and plant health.

There is ample evidence that investment in the SP-IPM will yield returns in decisive contributions to the achievement of specific Science Council Priorities and related MDGs. However, in a scientifically-based program whose signature activities involve manipulation of organisms within the framework of society change at community level, sustained and targeted investment will hold the key to lasting success in program delivery. The SP-IPM is also grateful to a number of other governments and donor agencies, institutions and persons who provided resources, advice, information and materials in the execution of its special projects. For example, the first set of SP-IPM pilot site activities were initiated with funds from the CGIAR Finance Committee and the World Bank; the SP-IPM project on farmer-participatory research and learning was

cosponsored by the Swiss Agency for Development and Cooperation, the Global IPM Facility and the Systemwide Program on Participatory Research and Gender Analysis; support for the global Tropical Whitefly IPM project was provided by the Danish International Development Assistance, the UK Department for International Development, the Australian Centre for International Agricultural Research, the New Zealand Ministry of Foreign Affairs and Trade, the United States Agency for International Development (USAID) and the US Department of Agriculture (USDA).

The fierce banana-eating grasshopper in Cameroon

Financial Information

Sholola Shalewa,
IITA's Chief
Finance Officer

Funding overview

Funding for 2007 was US$47.443 million, of which 96.3% came from CGIAR investors (see list on page 45) and 3.7% from other sources. Expenditure was US$45.367 million (net of indirect costs recovery of US$4.221 million), of which 87.5% was used for program expenses and 12.5% for management and general expenses.

The governments and agencies that provided the largest share of our funding in 2006 and 2007 are shown in Figure 1 (top 10 donors).

IITA`s 2006 and 2007 expenditures by CGIAR system priority and MTP projects are shown in Figures 2 and 3 respectively; while the performance indicators, as prescribed by CGIAR, are reflected in Figure 4.

Figure 1. Funding: top 10 donors, 2006 and 2007

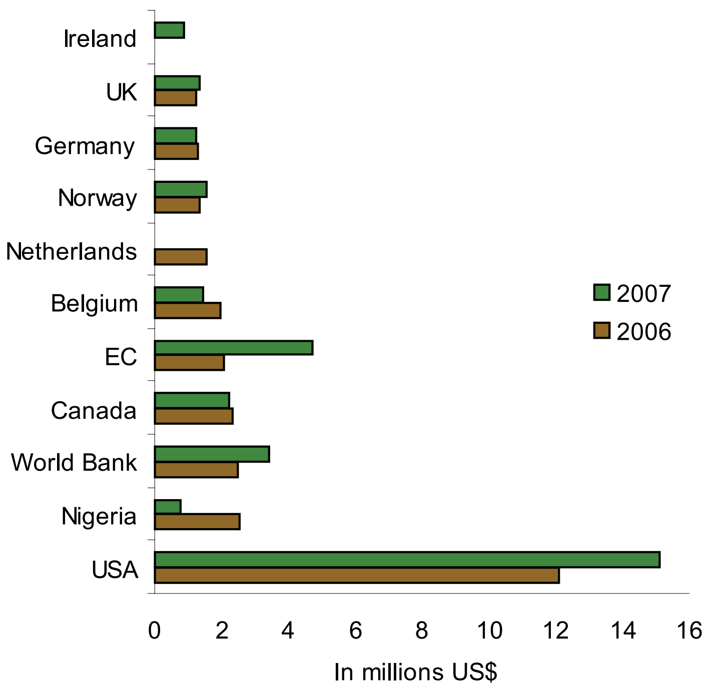
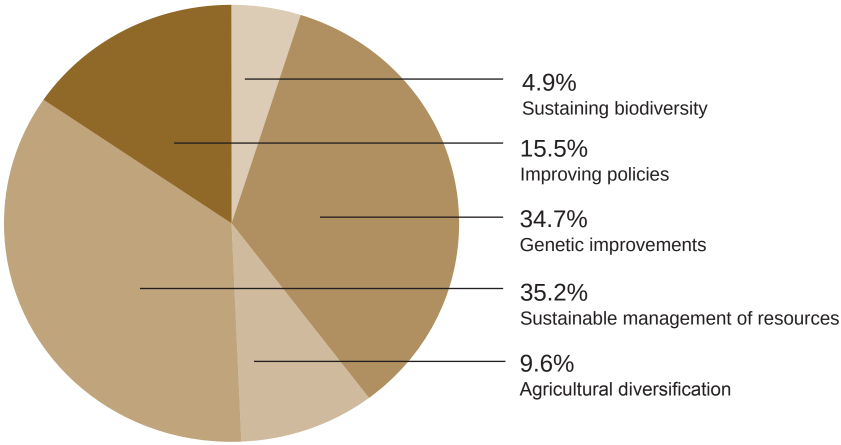
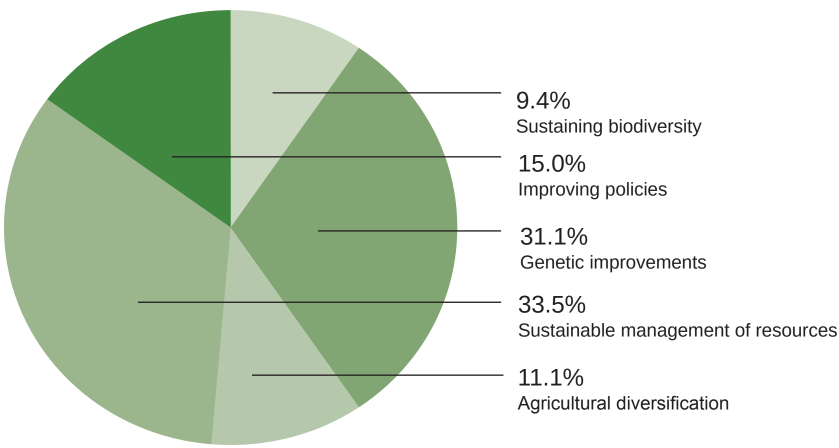


Figure 2. Expenditure by CGIAR System Priorities, 2006



Expenditure by CGIAR System Priorities, 2007



IITA investors (expressed in US$ Thousands)

African Agricultural Technology Foundation	285
Austria	716
Belgium	1,459
BMZ, Germany	1,233
Canada	2,230
Catholic Relief Service	333
Commission of the European Communities	4,748
Common Fund for Commodities	127
Denmark	693
Department for International Development, UK	1,362
Food and Agriculture Organization	123
France	175
Gatsby Charitable Foundation	297
International Fund for Agricultural Development	556
Ireland	878
Italy	227
Japan	293
Korea, Republic of	50
Netherlands	718
Nigeria	773
Norway	1,548
Rockefeller Foundation	582
Sasakawa Africa Association	55
Shell Petroleum Development Company of Nigeria Ltd.	1,808
Sweden	550
Switzerland	558
United States Agency for International Development	15,113
World Bank	3,452
Miscellaneous Projects	2,807
Challenge Programs	1,955
Total	45,704

Figure 3. Expenditure by IITA Program Portfolio: 2006 and 2007

	2006		2007	
Project	Cost ($`000)	%	Cost ($`000)	%
Agriculture and Health	2,723	6.2	2,056	4.5
Agrobiodiversity	2,202	5.0	4,339	9.6
Banana and Plantain System	5,089	11.5	4,638	10.2
Cereal and Legume System	9,028	20.4	9,218	20.3
Opportunities and Threats	2,249	5.1	2,066	4.6
High-Value Products	6,436	14.6	7,701	17.0
Root and Tuber Systems	15,434	34.9	13,926	30.7
SP-Integrated Pest Management	1,057	2.4	1,423	3.1
Total	44,218	100	45,367	100

Figure 4. Performance Indicators: Financial Health

	2006	2007
Short-term Solvency (or Liquidity)	160 days	175 days
Long-term Financial Stability (adequacy of Reserves)	160 days	175 days
Indirect Cost Rates	20.4%	21.2%
Cash Management on Restricted Operations	0.22	0.07
Audit Opinion	Unqualified / Clean Bill of Financial Health	

The Finance Office team

Publications

Our publications cater to a wide spectrum of users - from scientists to students

Journal articles

ABELE, S. and M. PILLAY. 2007. Bacterial wilt and drought stresses in banana production and their impact on economic welfare in Uganda: implications for banana research in East African highlands. Journal of Crop Improvement 19, 1/2: 173–191.

ABELE, S. and T. DUBOIS, E. TWINE, K. SONDER, O. COULIBALY. 2007. Organic agriculture in Africa: a critical review from a multidisciplinary perspective. Journal of Agriculture and Rural Development in the Tropics and Subtropics Supplement 89: 143–166.

ADANGO, E. and A. ONZO, R. HANNA, P. ATACHI, B. JAMES. 2007. Mite pests of major importance on indigenous leafy vegetables in Benin: the search for appropriate control strategies. Acta Horticulturae 752: 311–318.

ADENIJI, T.A. and A. TENKOUANO. 2007. Effect of processing on micronutrient content of chips produced from some plantain and banana hybrids. Fruits 62: 345–352.

AFOLABI, C. and P. OJIAMBO, E. EKPO, A. MENKIR, R. BANDYOPADHYAY. 2007. Evaluation of maize inbred lines for resistance to *fusarium* ear rot and fumonisin accumulation in grain in tropical Africa. Plant Disease 91, 3: 279–286.

AINA, O. and A. DIXON, E. AKINRINDE. 2007. Additive main effects and multiplicative interaction (ammi) analysis for yield of cassava in Nigeria. Journal of Biological Sciences 7, 5: 796–800.

AINA, O. and A. DIXON, E. AKINRINDE. 2007. Effect of soil moisture stress on growth and yield of cassava in Nigeria. Pakistan Journal of Biological Sciences 10, 18: 3085–3090.

AINA, O. and A. DIXON, E. AKINRINDE. 2007. Genetic variability in cassava as it influences storage root yield in Nigeria. Journal of Biological Sciences 7, 5: 765–770.

AINA, O. and A. DIXON, E. AKINRINDE. 2007. Trait association and path analysis for cassava genotypes in four agroecological zones of Nigeria. Journal of Biological Sciences 7, 5: 759–764.

AJEIGBE, H. and S.U. EWANSIHA, B. SINGH. 2007. Preliminary evaluation of genetic variability for seedling morphology among selected varieties of cowpea (*Vigna unguiculata* (l) Walp.). Biological and Environmental Sciences Journal for the Tropics 4, 2: 107–110.

AKELLO, J. and T. DUBOIS, C. GOLD, D. COYNE, J. NAKAVUMA, P. PAPARU. 2007. *Beauveria bassiana* (Balsamo) vuillemin as an endophyte in tissue culture banana (*Musa* spp.). Journal of Invertebrate Pathology 96, 1: 34–42.

AKINBO, O. and M. GEDIL, E. EKPO, J. OLADELE, A. DIXON. 2007. Detection of rapd markers-linked to resistance to cassava anthracnose disease. African Journal of Biotechnology 6, 6: 677–682.

AKINWANDE, B. and R. ASIEDU, I. ADEYEMI, B. MAZIYA-DIXON. 2007. Influence of time of harvest on the yield and sensory attributes of white yam (*Dioscorea rotundata*) in southwest Nigeria. Journal of Food, Agriculture and Environment 5, 2: 179–184.

ALABI, O.J. and F. OGBE, R. BANDYOPADHYAY, A. DIXON, J. HUGHES, and R. NAIDU. 2007. The occurrence of *African cassava mosaic virus* and *East African cassava mosaic Cameroon virus* in natural hosts other than cassava in Nigeria. Phytopathology 97, 7 (Supplement): S3–S3.

ALENE, A. 2007. Unexploited food production potentials of new varieties: evidence from hybrid maize production in western Ethiopia. Outlook on Agriculture 36, 3: 181–186.

ALENE, A. and V. MANYONG, E.F. TOLLENS, S. ABELE. 2007. Targeting agricultural research based on potential impacts on poverty reduction: strategic program priorities by agro-ecological zone in Nigeria. Food Policy 32, 3: 394–412.

ALENE, A. and V. MANYONG. 2007. Gains from high-yielding varieties with and without complementary technologies: the case of improved cowpea in northern Nigeria. Journal of Agricultural and Food Economics 2, 1: 1–14.

ALENE, A. and V. MANYONG. 2007. The effects of education on agricultural productivity under traditional and improved technology in northern Nigeria: an endogenous switching regression analysis. Empirical Economics 32, 1: 141–159.

AMOAH, P. and P. DRECHSEL, R. ABAIDOO, A. KLUTSE. 2007. Effectiveness of common and improved sanitary washing methods in selected cities of West Africa for the reduction of coliform bacteria and helminth eggs on vegetables. Tropical Medicine and International Health 12: 40–50.

AMOAH, P. and P. DRECHSEL, R. ABAIDOO, M. HENSELER. 2007. Irrigated urban vegetable production in Ghana: microbiological contamination in farms and markets and associated consumer risk groups. Journal of Water and Health 5, 3: 455–466.

AMUSA, N.A. and R. OKECHUKWU, B. AKINFENWA. 2007. Reactions of cowpea to infection by *Macrophomina phaseolina* isolates from leguminous plants in Nigeria. African Journal of Agricultural Research 2, 3: 073–075.

ASAWALAM, E.F. and S.O. EMOSAIRUE, F. EKELEME, R. WOKOCHA. 2007. Efficacy of *Piper guineense* (Schum & Thonn) seed extract against maize weevil, *Sitophilus zeamais* (Motschulsky) as influenced by different extraction solvents. International Journal of Pest Management 53, 1: 1–6.

ASSEFA, G. and K. SONDER, M. WINK, C. KIJORA, N. STEINMUELLER, K. PETERS. 2007. Effect of variety and harvesting management on the concentration of tannins and alkaloids in tagasaste (*Chamaecytisus palmensis*). Animal Feed Science and Technology 30: 1–15.

ATHMAN, S. and T. DUBOIS, C. GOLD, D. COYNE, N. LABUSCHAGNE, A. VILJOEN. 2007. Effect of endophytic fusarium oxysporum on root penetration and reproduction of *Radopholus similis* in tissue culture-derived banana (*Musa* spp.) plants. Nematology 9, 5: 599–607.

Cassava explants being prepared for in vitro conservation

BADU-APRAKU, B. 2007. Genetic variances and correlations in an early tropical white maize population after three cycles of recurrent selection for *Striga* resistance. Maydica 52: 205–217.

BADU-APRAKU, B. and A. FONTEM LUM. 2007. Agronomic performance of *Striga* resistant early-maturing maize varieties and inbred lines in the savannas of West and Central Africa. Crop Science 47: 737–750.

BADU-APRAKU, B. and A. MENKIR, A. FONTEM LUM. 2007. Genetic variability for grain yield and components in an early tropical yellow maize population under *Striga hermonthica* infestation. Crop Improvement 20: 107–122.

BADU-APRAKU, B. and M. FAKOREDE, A. FONTEM LUM. 2007. Evaluation of experimental varieties from recurrent selection for *Striga* resistance in two extra-early maize populations in the savannas of West and Central Africa. Experimental Agriculture 43: 183–200.

BANDYOPADHYAY, R. and J.H. WILLIAMS, P. OJIAMBO. 2007. Social and political challenges in the regulation of mycotoxin contamination. Phytopathology 97: S148– S148.

BANDYOPADHYAY, R. and M. KUMAR, J. LESLIE. 2007. Relative severity of aflatoxin contamination of cereal crops in West Africa. Food Additives and Contaminants 24, 10: 1109–1114.

BANDYOPADHYAY, R. and P. OJIAMBO, M. TWIZEYIMANA, B. ASAFO-ADJEI, R.D. FREDERICK, K.F. PEDLEY, C.L. STONE, G. HARTMAN. 2007. First report of soybean rust caused by *Phakopsora pachyrhizi* in Ghana. Plant Disease 91, 8: 1057–1057.

BANFUL, B. and S. HAUSER, K. OFORI, F. KUMAGA. 2007. Weed biomass dynamics in planted fallow systems in the humid forest zone of southern Cameroon. Agroforestry Systems 71, 1: 49–55.

BEED, F. and N. PAVELEY, R. SYLVESTER-BRADLEY. 2007. Predictability of wheat growth and yield in light-limited conditions. Journal of Agricultural Science 145: 63–79.

BEISEIGEL, J. and J. HUNT, R. GLAHN, R. WELCH, A. MENKIR, B. MAZIYA-DIXON. 2007. Iron bioavailability from maize and beans: a comparison of human measurements with caco-2 cell and algorithm predictions. American Journal of Clinical Nutrition 86: 388–396.

BIRUMA, M. and M. PILLAY, L. TRIPATHI, G. BLOMME, S. ABELE, M. MWANGI, R. BANDYOPADHYAY, P. MUCHUNGUZI, S. KASSIM, M. NYINE, L. TURYAGYENDA, S. EDEN-GREEN. 2007. Banana *xanthomonas* wilt: a review of the disease, management strategies and future research directions. African Journal of Biotechnology 6, 8: 953–962.

BROWN, R. and A. MENKIR, R. BANDYOPADHYAY, T.E. CLEVELAND, Z. CHEN. 2007. Comparative proteomics of near-isogenic maize inbred lines to identify potential aflatoxin-resistance markers. Phytopathology 97: S14–S14.

BROWN, R. and Z. CHEN, A. MENKIR, T.E. CLEVELAND. 2007. Using biotechnology to enhance host resistance to aflatoxin contaminiation of corn. African Journal of Biotechnology 2, 12: 557–562.

CHERRY, A. and P. ABALO, K. HELL, S. KORIE. 2007. Farm-scale trials to compare the entomopathogenic fungus *Beauveria bassiana* with pirimiphos methy + deltamethrin and essential oil of lemon grass for protection of stored cowpea against *Callosobruchus maculatus* (coleoptera: bruchidae). Annals of Applied Biology 151, 1: 1–10.

CHIANU, J. and H. TSUJII, V. MANYONG. 2007. Crop-livestock interaction in the savannas of Nigeria: nature and determinants of farmer decision to use manure for soil fertility maintenance. Journal of Food, Agriculture and Environment 5, 2: 295–301.

CHIKOYE, D. and J. ELLIS-JONES, T. AVAV, P. KORMAWA, U. UDENSI, G. TARAWALI, O. NIELSEN. 2007. Promoting integrated management practices for speargrass (*Imperata cylindrica* (l) Raeusch.) in soybean, cassava and yam in Nigeria. Journal of Food, Agriculture and Environment 5, 3&4: 202–210.

CHIKOYE, D. and U. UDENSI, A. FONTEM LUM, F. EKELEME. 2007. Rimsulfuron for postemergence weed control in corn in humid tropical environments of Nigeria. Weed Technology 21, 4: 977–981.

CORNET, D. and J. SIERRA, R. BONHOMME. 2007. Characterization of the photosynthetic pathway of some tropical food yams (*Dioscorea* spp.) using leaf natural 13C abundance. Photosynthetica 45, 2: 303–305.

COYNE, D. and E. OYEKANMI. 2007. Symbiotic nitrogen fixation of two soybean genotypes as affected by root-knot nematodes and microsymbionts. Journal of Biological Sciences 7, 7: 1221–1226.

CURLETTI, G. and J. VAYSSIERES. 2007. Note sugli agrilus curtis del Benin (col buprestidae). Lambillionea 2: 203.

DAVID, S. 2007. Learning to think for ourselves: knowledge improvement and social benefits among farmer field school participants in Cameroon. Journal of International Agricultural Extension and Education 14, 2: 35–50.

DE MORAES, G. and I. ZANNOU, E. UECKERMANN, A. OLIVEIRA, J. YANINEK, R. HANNA. 2007. Phytoseiid mites of the tribes *Afroseiulini, Kampimodromini and Phytoseiulini,* and complementary notes on mites of the tribes *Euseiini* and *Neoseiulini* (acari: phytoseiidae) from sub-Saharan Africa. Zootaxa 1628: 1–22.

DE MORAES, G. and I. ZANNOU, E. UECKERMANN, A. OLIVEIRA, R. HANNA, J. YANINEK. 2007. Species of the subtribes *Arrenoseiina* and *Proprioseiopsina* (tribe amblyseiini) and the tribe *Typhloromipsini* (acari: phytoseiidae) from sub-saharan Africa. Zootaxa 1448: 1–39.

DIXON, A. and M. AKORODA, R. OKECHUKWU, F. OGBE, P. ILONA, L. SANNI, C. EZEDINMA, J. LEMCHI, G. SSEMAKULA, M.O. YOMENI, E. OKORO, G. TARAWALI. 2007. Fast track participatory approach to release of elite cassava genotypes for various uses in Nigeria's cassava economy. Euphytica.

DJOUAKA, R.F. and A.A. BAKARE, H.S. BANKOLE, J.M.C. DOANNIO, O. COULIBALY, H. KOSSOU, M. TAMO, H.I. BASENE, K.O.K. POPOOLA, M.C. AKOGBETO. 2007. Does the spillage of petroleum products in *Anopheles* breeding sites have an impact on the pyrethroid resistance? Malaria Journal 6, 159.

DUBOIS, T. and D. COYNE. 2007. Banane, un rapide survol dans le contexte Africain = Banana, a brief overview within an African context. Caribou.

DUGJE, I. and A. KAMARA, L. OMOIGUI. 2007. Assessment of farmers' crop management practices influencing *Striga hermonthica* infestation and grain yield of sorghum (*Sorghum bicolor*). Nigerian Journal of Weed Science 20: 25–35.

EFOMBAGN, M. and S. NYASSE, O. SOUNIGO, M. KOLESNIKOVA-ALLEN, A. ESKES. 2007. Participatory cocoa (*Theobroma cacao*) selection in Cameroon: phytophthora pod rot resistant accessions identified in farmers' fields. Crop Protection 26, 10: 1467–1473.

EGESI, C. and B. ODU, S. OGUNYEMI, R. ASIEDU, J. HUGHES. 2007. Evaluation of water yam *(Dioscorea alata* l.) germplasm for reaction to yam anthracnose and virus diseases and their effect on yield. Journal of Phytopathology 155, 9: 536–543.

EGESI, C. and F. OGBE, M. AKORODA, P. ILONA, A. DIXON. 2007. Resistance profile of improved cassava germplasm to cassava mosaic disease in Nigeria. Euphytica 155: 215–224.

EGESI, C. and P. ILONA, F. OGBE, M. AKORODA, and A. DIXON. 2007. Genetic variation and genotype x environment interaction for yield and other agronomic traits in cassava in Nigeria. Agronomy Journal 99: 1137–1142.

EGESI, C. and T. ONYEKA, R. ASIEDU. 2007. Severity of anthracnose and virus diseases of water yam (*Dioscorea alata* l.) in Nigeria I: effects of yam genotype and date of planting. Crop Protection 26, 8: 1259–1265.

EKE, J. and S.C. ACHINEWHU, L. SANNI, I.S. BARIMALAA, B. MAZIYA-DIXON, A. DIXON. 2007. Seasonal variations in the chemical and functional properties of starches from local and improved cassava varieties in high rainfall region of Nigeria. Journal of Food, Agriculture and Environment 5, 3&4: 36–42.

ESSONO, G.G. and M. AYODELE, A. AKOA, J. FOKO, S. OLEMBO. 2007. *Aspergillus* species of cassava chips in storage in rural areas of southern Cameroon: their relationship with storage duration, moisture content, and processing methods. African Journal of Microbiology Research 1: 001–008.

EWANSIHA, S.U. and U.F. CHIEZEY, S. TARAWALI, E. IWUAFOR. 2007. Morpho-phenological variation in *Lablab purpureus*. Tropical Grasslands 41: 277–284.

FATOKUN, C. and Q.N. NG. 2007. Outcrossing in cowpea. Journal of Food, Agriculture and Environment 5, 3&4: 334–338.

FATUROTI, B. and G. EMAH, B. ISIFE, A. TENKOUANO, T.A. ADENIJI, J. LEMCHI. 2007. Unlocking the profit potentials of an innovation: a case study of IITA hybrid plantains and bananas. Global Journal of Agricultural Sciences 6, 2: 177–182.

Yam is a staple in West Africa

FATUROTI, B. and M.C. MADUKWE, A. TENKOUANO, A.E. AGWU. 2007. A review of policy acts and initiatives in plantain and banana innovation system in Nigeria. African Journal of Biotechnology 6, 20: 2297–2302.

FIABOE, K. and M.G.C. GONDIM, G. DE MORAES, C. OGOL, M. KNAPP. 2007. Bionomics of the acarophagous ladybird beetle *Stethorus tridens* fed *Tetranychus evansi*. Journal of Applied Entomology 131, 5: 355–361.

FIABOE, K. and M.G.C. GONDIM, G. DE MORAES, C. OGOL, M. KNAPP. 2007. Surveys for natural enemies of the tomato red spider mite *Tetranychus evansi* (acari: tetranychidae) in northeastern and southeastern Brazil. Zootaxa 1395: 33–58.

HAUSER, S. 2007. Plantain (*Musa* spp. aab) bunch yield and root health response to combinations of physical, thermal and chemical sucker sanitation measures. African Plant Protection 13: 1–15.

HONFO, F.G. and A.P.P. KAYODE, O. COULIBALY, A. TENKOUANO. 2007. Relative contribution of banana and plantain products to the nutritional requirements for iron, zinc and vitamin a of infants and mothers in Cameroon. Fruits 62, 5: 1–11.

HOUNTONDJI, F. and R. HANNA, M. SABELIS, B. AGBOTON, S. KORIE. 2007. Scaling up tests on virulence of the cassava green mite fungal pathogen *Neozygites tanajoae* (entomophthorales: neozygitaceae) under controlled conditions: first observations at the population-level. Experimental and Applied Acarology 41: 153–168.

ILE, E. and P. CRAUFURD, R. ASIEDU, N. BATTEY. 2007. Duration from vine emergence to flowering suggests a long-day or rate of change of photoperiod response in white yam (*Dioscorea rotundata* Poir). Environmental and Experimental Botany 60: 86–94.

JAMES, B. and C. ADDA, K. CARDWELL, D. ANNANG, K. HELL, S. KORIE, M. EDORH, F. GBEASSOR, K. NAGATEY, G. HOUENOU. 2007. Public information campaign on aflatoxin contamination of maize grains in market stores in Benin, Ghana and Togo. Food Additives and Contaminants 24, 11: 1283–1291.

JAMES, B. and I. GODONOU, C. ATCHA-AHOVE, I. GLITHO, S. VODOUHE, A. AHANCHEDE, C. KOOYMAN, G. GOERGEN. 2007. Extending integrated pest management to indigenous vegetables. Acta Horticulturae 752: 89–94.

JEMO, M. and R. ABAIDOO, C. NOLTE, W. HORST. 2007. Aluminum resistance of cowpea as affected by phosphorus-deficiency stress. Journal of Plant Physiology 164, 4: 442–451.

JUNGE, B. and A. SKOWRONEK. 2007. Genesis, properties, classification and assessment of soils in central Benin, West Africa. Geoderma 139, 3-4: 357–370.

KALYANI, G. and A. REDDY, P.L. KUMAR, R.D. RAO, R. ARUNA. 2007. Sources of resistance to *Tobacco streak virus* in wild *Arachis* (fabaceae: papilionoidae) germplasm. Plant Disease 91: 1585–1590.

KAMARA, A. and D. CHIKOYE, L. OMOIGUI, I. DUGJE. 2007. Influence of insecticide spraying regimes and cultivar on insect pests and yield of cowpea in the dry savannas of north-eastern Nigeria. Journal of Food, Agriculture and Environment 5, 1: 154–158.

KAMARA, A. and R. ABAIDOO, J. KWARI, L. OMOIGUI. 2007. Influence of phosphorus application on growth and yield of soybean genotypes in the tropical savannas of northeast Nigeria. Archives of Agronomy and Soil Science 53, 5: 539–552.

KERAITA, B. and F. KONDRASEN, P. DRECHSEL, R. ABAIDOO. 2007. Effect of low-cost irrigation methods on microbial contamination of lettuce irrigated with untreated wastewater. Tropical Medicine and International Health 12: 14–21.

KERAITA, B. and F. KONDRASEN, P. DRECHSEL, R. ABAIDOO. 2007. Reducing microbial contamination on wastewater irrigated lettuce by cessation of irrigation before harvesting. Tropical Medicine and International Health 12: 7–13.

In Uganda, beer bananas are put in a pit to enhance ripening before extracting the juice

KIKUNO, H. and R. MATSUMOTO, H. SHIWACHI, R. ASIEDU. 2007. Effect of sucrose treatment on root, shoot and tuber formation of vine cuttings of yams (*Dioscorea* spp.). Japanese Journal of Tropical Agriculture 51, Extra issue 2: 69–70.

KIKUNO, H. and R. MATSUMOTO, H. SHIWACHI, H. TOYOHARA, R. ASIEDU. 2007. Comparative effects of explants sources and age of plant on rooting, shooting and tuber formation of vine cuttings of yams (*Dioscorea* spp.). Japanese Journal of Tropical Agriculture 51, Extra issue 2: 71–72.

KOLAWOLE, P. and L.A.S. AGBETOYE, A.S. OGUNLOWO. 2007. Cassava mash dewatering parameters. International Journal of Food Engineering 3, 1.

KOLAWOLE, P. and L.A.S. AGBETOYE, A.S. OGUNLOWO. 2007. Strength and elastic properties of cassava tuber. International Journal of Food Engineering 3, 5.

KOLAWOLE, P. and L.A.S. AGBETOYE. 2007. Engineering research to improve cassava processing technology. International Journal of Food Engineering 3, 6.

KUMAR, P.L. and A. REDDY, R. SIVA-PRASAD, CH REDDY, F. WALIYAR. 2007. The first report of a tymovirus infecting groundnut (*Arachis hypogaea*) in India. Journal of Mycology and Plant Pathology 37: 132–133.

KUMAR, S. and C. SIREESHA, K. RANGARAO, G. REDDY, A. WALIAR, F. RAMBABU, P.L. KUMAR. 2007. Production of polyclonal antibodies for the detection of nucleopolyhedrovirus infecting *Helicoverpa armigera* (Hubner). Indian Journal of Plant Protection 35, 2: 124–127.

LATHA, T. and P.L. KUMAR, S. DORAISWAMY, F. WALIYAR. 2007. Assessment of bio-diversity of the mite vector of pigeonpea sterility mosaic virus in Tamil Nadu, India. India Journal of Plant Protection 35, 1: 138–139.

LAWSON-BALAGBO, L.M. and M.G.C. GONDIM, G. DE MORAES, R. HANNA, P. SCHAUSBERGER. 2007. Food-type effects on life history of the predatory mites *Neoseiulus paspalivorus* and *Proctolaelaps bickleyi*, candidates for biological control of the coconut mite. Experimental and Applied Acarology 43: 49–61.

LAWSON-BALAGBO, L.M. and M.G.C. GONDIM, G. DE MORAES, R. HANNA, P. SCHAUSBERGER. 2007. Life history of the predatory mites *Neoseiulus paspalivorus* and *Proctolaelaps bickleyi*, candidates for biological control of *Aceria guerreronis*. Experimental and Applied Acarology 43: 49–61.

LAWSON-BALAGBO, L.M. and M.G.C. GONDIM, G. DE MORAES, R. HANNA, P. SCHAUSBERGER. 2007. Refuge use by the coconut mite *Aceria guerreronis*: fine scale distribution and association with other mites under the perianth. Biological Control 43: 102–110.

LOKKO, Y. and J. ANDERSON, S. RUDD, A. RAJI, D. HORVATH, M.A. MIKEL, R. KIM, L. LIU, A. HERNANDEZ, A. DIXON, I. INGELBRECHT. 2007. Characterization of an 18,166 est dataset for cassava *(Manihot esculenta* Crantz) enriched for drought-responsive genes. Plant Cell Reports 26, 9: 1605–1618.

LOUMEDJINON, S. and I. GODONOU, C. ATCHA-AHOVE, B. JAMES, H. BAIMEY, D. COYNE, A. AHANCHEDE. 2007. Management of root-knot nematodes on *Solanum macrocarpon* using botanicals in Benin. Acta Horticulturae 752: 539–544.

MAHALAKSHMI, V. and J. ATALOBHOR, D. OGUNSOLA, M. LAWSON, R. ORTIZ. 2007. Development of a West African yam *Dioscorea* spp. core collection. Genetic Resources and Crop Evolution 54, 9: 1817–1825.

Farmers of Rakai district during training in macropropagation at Kyakkonda village

MAZIYA-DIXON, B. and A. DIXON, A. ADEBOWALE. 2007. Targeting different end uses of cassava: genotypic variations for cyanogenic potentials and pasting properties. International Journal of Food Science and Technology 42: 969–976.

MENKIR, A. and I. INGELBRECHT, C. THE. 2007. Testcross performance and diversity analysis of white maize lines derived from backcrosses containing exotic germplasm. Euphytica 155, 3: 417–428.

MENKIR, A. and J. KLING. 2007. Response to recurrent selection for resistance to *Striga hermonthica* (del.) Benth in a tropical maize population. Crop Science 47: 674–682.

MESELE, G. and P. NTAWURUHUNGA, A. TESHOME, H. LEGESSE. 2007. Minor insect pest becoming major threat of cassava production in Amaro, southern Ethiopia. Roots 10, 2: 21–23.

MLIGO, J.K. and B. SINGH. 2007. Registration of vuli-1 cowpea. Crop Science 47: 437–438.

MOYIB, O.K. and O. ODUNOLA, A. DIXON. 2007. SSR markers reveal genetic variation between improved cassava cultivars and landraces within a collection of Nigerian cassava germplasm. African Journal of Biotechnology 6, 23: 2666–2674.

MOYO, C. and N. MAHUNGU, J. MKUMBIRA, I. BENESI. 2007. Challenges and opportunities for improvement in cassava and sweetpotato seed systems in southern Africa. Roots 10, 2: 17–20.

MSIKITA, W. and H. BAIMEY, B. JAMES. 2007. Severity of *Curvularia* stem blight disease of cassava in West Africa. Plant Disease 91, 11: 1430–1435.

MWANGI, M. and M. MWEBAZE, R. BANDYOPADHYAY, V. ARITUA, S. EDEN-GREEN, W. TUSHEMEREIRWE, J. SMITH. 2007. Development of a semi-selective medium for isolating *Xanthomonas camprestris* pv. musacearum from insect vectors, infected plant material and soil. Plant Pathology 56, 3: 383–390.

MWANGI, M. and R. BANDYOPADHYAY, P. RAGAMA, W. TUSHEMEREIRWE. 2007. Assessment of banana planting practices and cultivar tolerance in relation to management of soilborne *Xanthomonas campestris* pv. musacearum. Crop Protection 26: 1203–1208.

NAVI, S. and R. BANDYOPADHYAY, V. TONAPI, T. RAO, S. INDIRA, R. REDDY, P. TOOLEY, D. THOMAS. 2007. Prevalence of major foliar and panicle diseases of sorghum (*Sorghum bicolor* [l.] Moench) in the deccan plateau of India. Archives of Phytopathology and Plant Protection 40, 1: 19–35.

NGAKOU, A. and D. NWAGA, C.L.N. NEBANE, N. NTONIFOR, M. TAMO, I. PARH. 2007. Arbuscular-mycorrhizal fungi, rhizobia and *Metarhizium anisopliae* enhance P, N, MG, K and CA accumulatons in fields grown cowpea. Journal of Plant Sciences 2, 5: 518–529.

NGAKOU, A. and D. NWAGA, N. NTONIFOR, M. TAMO, C.L.N. NEBANE, I. PARH. 2007. Contribution of arbuscular mycorrhizal fungi (AMF), rhizobia and *Metarhizium anisopliae* to cowpea production in Cameroon. International Journal of Agricultural Research 2, 9: 754–764.

NKAMLEU, G. and R. TSAFACK. 2007. On measuring indebtedness of African countries. African Finance Journal 9, 1: 21–38.

NKAMLEU, G. and Y. KEHO, J. GOCKOWSKI, S. DAVID. 2007. Investing in agrochemicals in the cocoa sector of Cote d'Ivoire: hypotheses, evidence and policy implications. African Journal of Agricultural and Resource Economics 1, 2: 145–166.

NTAWURUHUNGA, P. and G. OKAO-OKUJA, A. BEMBE, M. OBAMBI, J. ARMAND MVILA, J. LEGG. 2007. Incidence and severity of cassava mosaic disease in the Republic of Congo. African Crop Science Journal 15, 1: 1–9.

NWOKE, C. and J. DIELS, R. ABAIDOO, N. SANGINGA. 2007. Utilization of phosphorus from different sources by genotypes of promiscuous soybean and cowpea in a low-phosphorus savanna soil. African Journal of Agricultural Research 2, 4: 150–158.

ODEDARA, O. and J. HUGHES, G. TARAWALI, A. ODEBODE, S. WINTER. 2007. Characterisation of a potyvirus from *Centrosema pubescens* Benth. Tropical Science 47, 1: 3–15.

ODENY, D. and B. JAYASHREE, M. FERGUSON, D. HOISINGTON, J. CROUCH, C. GEBHARDT. 2007. Development, characterisation and utilisation of microsatellite markers in pigeonpea [*Cajanus cajan* (l.) millsp.]. Plant Breeding 126: 130–136.

OIGIANGBE, O. and I. IGBINOSA, M. TAMO. 2007. Bioactivity of extracts of *Alstonia boonei* (apocynaceae) de wild stem bark against *Maruca vitrata* (lepidoptera: pyralidae) Fabricius. Advances in Science and Technology 1, 1: 67–70.

OIGIANGBE, O. and I. IGBINOSA, M. TAMO. 2007. Insecticidal activity of the medicinal plant, *Alstonia boonei* de wild, against *Sesamia calamistis* Hampson. Journal of Zhejiang University - Science B 8, 10: 752–755.

OJIAKO, I.A. and V. MANYONG, A. IKPI. 2007. Determinants of rural farmers' improved soybean adoption decisions in northern Nigeria. Journal of Food, Agriculture and Environment 5, 2: 215–223.

OJIAMBO, P. and R. BANDYOPADHYAY, M. TWIZEYIMANA, A. LEMA, R.D. FREDERICK, K.F. PEDLEY, C.L. STONE, G. HARTMAN. 2007. First report of rust caused by *Phakopsora pachyrhizi* on soybean in Democratic Republic of Congo. Plant Disease 91, 9: 1024–1024.

OKOGUN, J. and N. SANGINGA, R. ABAIDOO. 2007. Evaluation of maize yield in an on-farm maize-soybean and maize-lablab crop rotation systems in the northern Guinea savanna of Nigeria. Pakistan Journal of Biological Science 10, 21: 3905–3909.

OLARINDE, L. and V. MANYONG, J. AKINTOLA. 2007. Attitudes towards risk among maize farmers in the dry savanna zone of Nigeria: some prospective policies for improving food production. African Journal of Agricultural Research 2, 8: 399–408.

OMADACHI, U.O. and B. AHMED, V. MANYONG, J. OLUKOSI, O. YUSUF. 2007. Economic analysis of balanced nutrient management technologies for maize production in Kaduna state, Nigeria. Journal of Applied Sciences 7, 1: 132–136.

OMOIGUI, L. and S. ALABI, A. KAMARA. 2007. Response of low-N pool maize population to nitrogen uptake and use efficiency after three cycles of full-sib recurrent selection. Journal of Agricultural Science 145: 481–490.

ONITILO, M. and L. SANNI, I. DANIEL, B. MAZIYA-DIXON, A. DIXON. 2007. Physicochemical and functional properties of native starches from cassava varieties in southwest Nigeria. Journal of Food, Agriculture and Environment 5, 3&4: 108–114.

OPOKU, S. and R. BHATTACHARJEE, M. KOLESNIKOVA-ALLEN, J. MOTAMAYOR, R. SCHNELL, I. INGELBRECHT, L. ENU-KWESI, Y. ADU-AMPOMAH. 2007. Assessment of genetic diversity and population structure in West African cocoa: a case study on collections from Ghana. Journal of Crop Improvement 20: 73–87.

OTEGBAYO, B. and J. AINA, L. ABBEY, E. SAKYI-DAWSON, M. BOKANGA, R. ASIEDU. 2007. Texture profile analysis applied to pounded yam. Journal of Texture Studies 38: 355–372.

OYEKANMI, E. and D. COYNE, O. FAGADE, O. OSONUBI. 2007. Improving root-knot nematode management on two soybean genotypes through the application of *Bradyrhizobium japonicum, Trichoderma pseudokoningii* and *Glomus mosseae* in full factorial combinations. Crop Protection 26, 7: 1006–1012.

PHIRI, M. and A. MHONE, V. SANDIFOLO, N. MAHUNGU, C. MOYO, S. JUMBO. 2007. Cassava silage technology officially released in Malawi. Roots 10, 2: 27–28.

PYPERS, P. and M. HUYBRIGHS, J. DIELS, R. ABAIDOO, E. SMOLDERS, R. MERCKX. 2007. Does the enhanced P acquisition by maize following legumes in a rotation result from improved soil P availability? Soil Biology and Biochemistry 39, 10: 2555–2566.

RAJI, A. and T.A.O. LADEINDE, A. DIXON. 2007. Agronomic traits and tuber quality attributes of farmer grown cassava landraces in Nigeria. Journal of Tropical Agriculture 45, 1-2: 9–13.

REDDY, A. and K. SUBRAHMANYAM, P.L. KUMAR, F. WALIYAR. 2007. Assessment of *Tobacco streak virus* (TSV) transmission through seed in groundnut and sunflower. Journal of Mycology and Plant Pathology 37: 136–137.

SANNI, L. and B. ALENKHE, R. EDOSIO, M. PATINO, A. DIXON. 2007. Technology transfer in developing countries: capitalizing on equipment development. Journal of Food, Agriculture and Environment 5, 2: 88–91.

SHITTU, T. and L. SANNI, S. AWONORIN, B. MAZIYA-DIXON, A. DIXON. 2007. Use of multivariate techniques in studying the flour making properties of some CMD resistant cassava clones. Food Chemistry 101: 1606–1615.

Cooking gari*, a high-value cassava product*

SINGH, B. and H. AJEIGBE. 2007. Improved cowpea-cereals-based cropping systems for household food security and poverty reduction in West Africa. Journal of Crop Improvement 19, 1/2: 157–172.

SINGH, B. and O. OLUFAJO, M. ISHIYAKU, R. ADELEKE, H. AJEIGBE, S. MOHAMMED. 2007. Registration of ‘ngvu-05-24’ cowpea. Journal of Plant Registrations 1: 48–49.

SOBOWALE, A. and K. CARDWELL, A. ODEBODE, R. BANDYOPADHYAY, S. JONATHAN. 2007. Persistence of trichoderma species within maize stem against *Fusarium verticillioides*. Archives of Phytopathology and Plant Protection 40, 3: 215–231.

SOBUKOLA, O.P. and O.U. DAIRO, L. SANNI, A.V. ODUNEWU, B.O. FAFIOLU. 2007. Thin layer drying process of some leafy vegetables under open sun. Food Science and Technology International 13, 1: 35–40.

SONWA, D. and B.A. NKONGMENECK, S. WEISE, M. TCHATAT, A. ADESINA, M. JANSSENS. 2007. Diversity of plants in cocoa agroforests in the humid forest zone of southern Cameroon. Biodiversity and Conservation 16, 8: 2385–2400.

SRINIVASAN, R. and M. TAMO, P.A. OOI, W. EASDOWN. 2007. IPM for *Maruca vitrata* on food legumes in Asia and Africa. Bicontrol News and Information 28, 2: 34–37.

SSEMAKULA, G. and A. DIXON, B. MAZIYA-DIXON. 2007. Stability of total carotenoid concentration and fresh yield of selected yellow-fleshed cassava (*Manihot esculenta* Crantz). Journal of Tropical Agriculture 45, 1-2: 14–20.

SSEMAKULA, G. and A. DIXON. 2007. Genotype x interaction, stability and agronomic performance of carotenoid-rich cassava clones. Scientific Research and Essay 2, 9: 390–399.

TENKOUANO, A. and D. VUYLSTEKE, R. SWENNEN. 2007. Sink competition and desuckering effects on field performance of triploid and tetraploid plantain genotypes. Journal of Crop Improvement 20, 1/2: 31–51.

THAKKAR, S.K. and B. MAZIYA-DIXON, A. DIXON, M.L. FAILLA. 2007. Beta-carotene micellarization during in vitro digestion and uptake by caco-2 cells is directly proportional to beta-carotene content in different genotypes of cassava. Journal of Nutrition 137: 2229–2233.

TINZAARA, W. and C. GOLD, M. DICKE, A. VAN HUIS, P. RAGAMA. 2007. Host plant odours enhance the responses of adult banana weevil to the synthetic aggregation pheromone cosmolure+. International Journal of Pest Management 53, 2: 127–137.

TONAPI, V. and R.R. MUNDADA, S. NAVI, R. REDDY, R. THAKUR, R. BANDYOPADHYAY, S. VARANAVASIAPPAN, N. SEETHARAMA. 2007. Effect of temperature and humidity regimes on grain mold sporulation and seed quality in sorghum (*Sorghum bicolor* (l.) Moench). Archives of Phytopathology and Plant Protection 40, 2: 113–127.

TRIPATHI, L. and J. ODIPIO, J. TRIPATHI, G. TUSIIME. 2007. Rapid technique for screening banana cultivars for resistance to *xanthomonas* wilt. European Journal of Plant Pathology.

TRIPATHI, L. and J. TRIPATHI, I. VROH BI. 2007. Bananas and plantains (*Musa* spp.): transgenics and biotechnology. Transgenic Plant Journal 1: 185–201.

TRIPATHI, L. and J. TRIPATHI, W. TUSHEMEREIRWE, R. BANDYOPADHYAY. 2007. Development of a semi-selective medium for isolation of *Xanthomonas campestris* pv. musacearum from banana plants. European Journal of Plant Pathology 117, 2: 177–186.

TWIZEYIMANA, M. and P. OJIAMBO, A. TENKOUANO, T. IKOTUN, R. BANDYOPADHYAY. 2007. Rapid screening of *Musa* species for resistance to black leaf streak using in vitro plantlets in tubes and detached leaves. Plant Disease 91, 3: 308–314.

TWIZEYIMANA, M. and P. OJIAMBO, T. IKOTUN, C. PAUL, G. HARTMAN, R. BANDYOPADHYAY. 2007. Comparison of field, greenhouse and detached-leaf evaluations of soybean germplasm for resistance to *Phakopsora pachyrhizi.* Plant Disease 91, 9: 1161–1169.

UECKERMANN, E. and I. ZANNOU, G. DE MORAES, A. OLIVEIRA, R. HANNA, J. YANINEK. 2007. Phytoseiid mites of the subfamily phytoseiinae (acari: phytoseiidae) from sub-Saharan Africa. Zootaxa 1658: 1–20.

VAN MELE, P. and J. VAYSSIERES, E. VAN TELLINGEN, J. VROLIJKS. 2007. Effects of the African weaver ant *Oecophylla longinoda* in controlling mango fruit flies (diptera: tephritidae). Journal of Economic Entomology 100, 3: 695–701.

VAN MELE, P. and J. VAYSSIERES. 2007. Weaver ants help farmers to capture organic markets. Alternatives Pesticides News 75: 9–11.

VAN MELE, P. and J. VAYSSIERES. 2007. West Africa's mango farmers have allies in the trees. Biocontrol News and Information 28, 3: 56–58.

VAYSSIERES, J. and F. SANOGO, M. NOUSSOUROU. 2007. Inventory of the fruit fly species (diptera: tephritidae) linked to the mango tree in Mali and tests of integrated control. Fruits 62, 5: 329–341.

VAYSSIERES, J. and J. REY, L. TRAORE. 2007. Distribution and host plants of *Bactrocera cucurbitae* in West and Central Africa. Fruits 62, 6: 391–396.

VAYSSIERES, J. and J.P. CAYOL, X. PERRIER, D. MIDGARDEN. 2007. Impact of *Methyl eugenol* and malathion bait stations on non-target insect populations in French Guiana during an eradication program for *Bactrocera carambolae*. Entomologia Experimentalis et Applicata 125: 55–62.

YU, J. and E. GRAZNAK, F. BRESEGHELLO, H. TEFERA, M.E. SORRELLS. 2007. QTL mapping of agronomic traits in tef [eragrostis tef (zucc) trotter]. BMC Plant Biology 7, 30.

ZANNOU, I. and G. DE MORAES, E. UECKERMANN, A. OLIVEIRA, J. YANINEK, R. HANNA. 2007. Phytoseiid mites of the subtribe *amblyseiina* (acari: phytoseiidae: amblyseiini) from sub-Saharan Africa. Zootaxa 1550: 1–47.

ZANNOU, I. and R. HANNA, B. AGBOTON, G. DE MORAES, S. KREITER, G. PHIRI, A. JONE. 2007. Native phytoseiid mites as indicators of non-target effects of the introduction of *Typhlodromalus aripo* for the biological control of cassava green mite in Africa. Biological Control 41: 190–198.

ZUNDEL, C. and R. HANNA, U. SCHEIDEGGER, P. NAGEL. 2007. Living at the threshold: where does the neotropical phytoseiid mites *Typhlodromalus aripo* survive the dry season? Experimental and Applied Acarology 41: 11–26.

Books

Advances in root and tuber crops technologies for sustainable food security, improved nutrition, wealth creation and conservation in africa: proceedings of the 9th ISTRC-AB symposium, Mombasa, Kenya, 1-5 November, 2004. 2007. Edited by N. MAHUNGU and V. MANYONG. International Society for Tropical Root Crops - Africa Branch (ISTRC-AB).

Agrolyser for cassava; lessons learned: research from IITA, NRCRI, UI, Lagos ADA and Imo state ADP. 2007. Edited by M. AKORODA and R. OKECHUKWU. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

COYNE, D. and J.M. NICOL, B. CLAUDIUS-COLE. 2007. Practical plant nematology: a field and laboratory guide. Cotonou, Benin: SP-IPM Secretariat, International Institute of Tropical Agriculture (IITA).

DAVID, S. and S. AGORDORKU, S. BASSANAGA, J.Y. COULOUD, M. ADU-KUMI, I. OKUKU, D. WANDJI. 2007. A facilitator’s handbook for conducting farmer field schools on cocoa integrated crop and pest management. Accra, Ghana: International Institute of Tropical Agriculture (IITA).

Demand-driven technologies for sustainable maize production in West and Central Africa: proceedings of the fifth biennial regional maize workshop, 3–6 may 2005, IITA- Cotonou, Benin republic. 2007. Edited by B. BADU-APRAKU, M. FAKOREDE, A. FONTEM LUM, A. MENKIR and M. OUEDRAOGO. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA); West and Central Africa Collaborative Maize Research Network (WECAMAN).

EZEDINMA, C. and J. LEMCHI, R. OKECHUKWU, F. OGBE, M. AKORODA, L. SANNI, E. OKORO, P. ILONA, C. OKARTER, A. DIXON. 2007. Status of cassava production in southeast and south-south Nigeria: a baseline report. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

EZEDINMA, C. and L. SANNI, R. OKECHUKWU. 2007. Socioeconomic studies on selected cassava markets in Nigeria. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

Soybeans being sold in a market in Nigeria

EZEDINMA, C. and U. UDENSI, R. OKECHUKWU, S. IBANA, M. AKORODA, P. ILONA, F. OGBE, L. SANNI, J. LEMCHI, D. CHIKOYE, E. OKORO, A. DIXON. 2007. Cassava weeds and management in Nigeria. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

Improve your cocoa production: a guide for farmers. 2007. Edited by S. DAVID. Accra, Ghana: Sustainable Tree Crops Program (STCP), International Institute of Tropical Agriculture (IITA).

QADIR, M. and D. WICHELNS, L. RASCHID-SALLY, P.S. MINHAS, P. DRECHSEL, A. BAHRI, P. MCCORNICK, R. ABAIDOO, F. ATTIA, S. EL-GUINDY, J.H.J. ENSINK, B. JIMENEZ, J.W. KIJNE, S. KOO-OSHIMA, J.D. OSTER, L. OYEBANDE, J.A. SAGARDOY, W. VAN DER HOEK. 2007. Agricultural use of marginal-quality water resources presents opportunities and challenges: comprehensive assessment of water management in agriculture. Edited by M. QADIR.

SANNI, L. and B. MAZIYA-DIXON, A. OKORUWA, B. AROWOSAFE, J. LEMCHI, F. OGBE, C. EZEDINMA, R. OKECHUKWU, M. AKORODA, E. OKORO, P. ILONA, T. BABALEYE, A. DIXON. 2007. Cassava utilization training for bakers, caterers, and processors in the south-south and southeast of Nigeria. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

SANNI, L. and C. EZEDINMA, R. OKECHUKWU, J. LEMCHI, F. OGBE, M. AKORODA, E. OKORO, B. MAZIYA-DIXON, P. ILONA, A. DIXON. 2007. Cassava postharvest needs assessment survey in Nigeria. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

SANNI, L. and C. EZEDINMA, R. OKECHUKWU, J. LEMCHI, F. OGBE, M. AKORODA, E. OKORO, B. MAZIYA-DIXON, P. ILONA, A. DIXON. 2007. Cassava postharvest needs assessment survey in Nigeria: synthesis report. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

TARAWALI, G. and D.K. ADEDZWA, C. EZEDINMA, R. OKECHUKWU, A. FONTEM LUM, A. DIXON, M. AKORODA, F. OGBE, J. LEMCHI, L. SANNI, P. ILONA, E. OKORO. 2007. Community analysis of Ikot Etuk Udo, Akwa Ibom state, Nigeria. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

TARAWALI, G. and J.B. AYOOLA, C. EZEDINMA, R. OKECHUKWU, A. FONTEM LUM, A. DIXON, M. AKORODA, F. OGBE, J. LEMCHI, L. SANNI, P. ILONA, E. OKORO. 2007. Community analysis of Asa north, Abia state, Nigeria. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

In Book

ABAIDOO, R. and J. OKOGUN, G. KOLAWOLE, J. DIELS, P. RANDALL, N. SANGINGA. 2007. Evaluation of cowpea genotypes for variations in their contribution of N and P to subsequent maize crop in three agro-ecological zones of West Africa. 401–412. Dordrecht, The Netherlands: Springer.

BEED, F. and S. HALLETT, J. VENNE, A. WATSON. 2007. Biocontrol using *Fusarium oxysporum*: a critical component of integrated *Striga* management. 283–300. New Jersey, USA: World Scientific.

BEED, F. and T. DUBOIS. 2007. The role of IITA in biological control of weeds. Cambridge, UK: Cambridge University Press.

BHATTACHARJEE, R. and P.L. KUMAR. 2007. Cacao. , 6:127–142. Heidelberg: Springer-Verlag Berlin.

EZEDINMA, C. and L. SANNI, R. OKECHUKWU. 2007. Marketing of gari in Benin city and Enugu, Nigeria. 11–30. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

EZEDINMA, C. and R. OKECHUKWU. 2007. Cross-border trade in cassava-based products in Dawanau market, Kano, Nigeria. 1–10. Ibadan, Nigeria: International Institute of Tropical Agriculture (IITA).

HELL, K. and P. FANDOHAN, R. BANDYOPADHYAY, S. KIEWNICK, R. SIKORA, P. COTTY. 2007. Pre-and-post-harvest management of aflatoxin in maize: an African perspective. UK: CABI Publishing.

Cowpeas play a major role in African markets and diets

KIKUNO, H. 2007. Japan capacity building program for agricultural researchers. 5–99 International Cooperation Center for Agricultural Education (ICCAE), Nagoya University, Japan.

MENKIR, A. and B. BADU-APRAKU, C. YALLOU, A. KAMARA, G. EJETA. 2007. Breeding maize for broad-based resistance to *Striga hermonthica*. 99–114. Singapore: World Scientific Publishing.

MIGNOUNA, H. and M. ABANG, R. ASIEDU. 2007. Yams. , 3:271–296. Berlin: Springer-Verlag.

NKAMLEU, G. 2007. Modeling farmers' decisions on integrated soil nutrient management in sub-Saharan Africa: a multinomial logit analysis in Cameroon. 887–899. Dordrecht, The Netherlands: Springer.

PAPARU, P. and T. DUBOIS, D. COYNE. 2007. Immunization by fungal endophytes: a novel pest and disease management approach for banana improvement. Puliyur, India: Bioscience Publications.

PILLAY, M. and L. TRIPATHI. 2007. Banana breeding. Blackwell Publishing.

TRIPATHI, L. 2007. Genetic modification of plants to enhance fungal resistance. 157–179. India: Research Signpost.

WATSON, A. and J. GRESSEL, D. SANDS, S. HALLETT, M. VURRO, F. BEED. 2007. *Fusarium oxysporum* f. sp. *Striga*, athletes foot or achilles heel? 1–11. Dordrecht, the Netherlands: Springer.

Conference Proceedings

ABAIDOO, R. and N. SANGINGA, J. OKOGUN, G. KOLAWOLE, J. DIELS, and B. TOSSAH, "Genotypic variation of soybean for phosphorus use efficiency and their contribution of N and P to subsequent maize crops in three ecological zones of West Africa," in Demand driven technologies for sustainable maize production in West and Central Africa: proceedings of the Fifth Biennial Regional Maize Workshop, 3-6 May 2005, IITA- Cotonou, Benin Republic, 2007, pp. 194–224

ABANG, M. and R. ASIEDU, P. HOFFMANN, G. WOLF, H. MIGNOUNA, S. WINTER, "Evidence for high evolutionary potential of *Colletotrichum gloeosporioides*, the causal agent of yam anthracnose disease," in Proceedings of 9th ISTRC-AB symposium, Mombasa, Kenya, 2007, pp. 602–613.

ADENIYI, O.J. and V. ADETIMIRIN, I. INGELBRECHT, R. ASIEDU, "Yam (*Dioscorea rotundata* Poir. and *Dioscorea alata* l.) meristem culture optimization and phenotypic stability of micropropagated plants," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 316–323.

ADO, S. and F. SHOWEMIMO, S. ALABI, B. BADU-APRAKU, A. MENKIR, I. USMAN, U.S. ABDULLAHI, “Maize research at IAR Samaru,” in Demand-driven technologies for sustainable maize production in West and Central Africa: proceedings of the Fifth Biennial Regional Maize Workshop, 3-6 May 2005, IITA- Cotonou, Benin Republic, 2007, pp. 107–122.

AINA, O. and A. DIXON, M. AKORODA, E. AKINRINDE, “Influence of soil water stress on vegetative growth and yield of cassava genotypes under screen house conditions,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 329–335.

AJALA, S. and A. MENKIR, A. KAMARA, S. ALABI, M.S. ABDULAI, “Breeding strategies to improve maize for adaptation to low soil nitrogen in West and Central Africa,” in African Crop Science Conference Proceedings, 2007, pp. 87–94.

AJEIGBE, H. and T. OSENI, B. SINGH, S. TARAWALI, “Effect of different cowpea-cereal row to row planting systems and insecticide sprays of cowpea on the quality of the crop residues,” in African Crop Science Conference Proceedings, 2007, pp. 1057–1061.

The sale of grains is a thriving business in Africa

AKINBADE, S. and E. AYO-JOHN, P.L. KUMAR, T. OBEN, “Determination of the most effective method for the production of polyclonal antibodies against *African cassava mosaic virus* (ACMV), genus begomovirus," in Proc. 34th Annual Conference of the Nigerian Society of Plant Protection, theme: Plant Protection Challenges in the 21st Century. 17–21 September 2007, Nasarwa State University, Keffi, Nigeria, 2007, pp. 15–16.

AKINBADE, S. and J. MGBECHI-EZERI, T. OBEN, P.L. KUMAR, "Production of monoclonal antibodies against cowpea mottle viruses," 2007, pp. 187–187.

AKORODA, M. and A. DIXON, P. ILONA, F. OGBE, R. OKECHUKWU, "Managing stem cuttings of cassava for optimum yields," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 335–341.

AKORODA, M. and A. DIXON, P. ILONA, F. OGBE, R. OKECHUKWU, C. EZEDINMA, L. SANNI, J. LEMCHI, E. OKORO, "Sustainable commercial cassava cultivation: the case of Nigeria," in Proceedings of 9th ISTRC-AB symposium, Mombasa, Kenya, 2007, pp. 193–199.

ALENE, A. "Unexploited yield and profitability potentials of improved varietal technologies: the case of hybrid maize in western Ethiopia," in Demand-driven technologies for sustainable maize production in West and Central Africa: proceedings of the fifth biennial regional maize workshop, IITA-Cotonou, Benin, 3–6 May 2005, Ibadan, Nigeria, 2007, pp. 388–401.

AMAZA, P. and J. ELLIS-JONES, A. KAMARA, J. HELSEN, H. GAYA, "A participatory adoption of improved crop technologies in the savannas of West Africa: empirical study from Borno, Nigeria," in 8th African Crop Science Society Conference, 27–31 Oct. 2007: proceedings, 2007, pp. 1369–1375.

ANDRADE, M. and A. NAICO, "Study on cassava and sweetpotato yields in Mozambique," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 200–208.

ANITHA, S. and F. WALIYAR, C. REDDY, P.L. KUMAR, "Top-down strategy (TDS) to prevent the risk of human exposure to aflatoxins," in Proc. 2nd Asian Congress of Mycology and Plant Pathology 'Microbial Diversity for Asian Prosperity', December 19–22, 2007, Osmania University, Hyderabad, India. Indian Society of Mycology and PlantPathology, Udaipur, India, 2007,

ANITHA, S. and P.L. KUMAR, F. WALIYAR, "Development of polyclonal antibody-based competitive ELISA for the estimation of aflatoxin b1-lysine biomarker in humans," in Proc. 26th Annual Convention of Indian Association for Cancer Research and International Symposium on Translational Research in Cancer, 17–19 January 2007 Bhubaneswar, Orissa, India, 2007, pp. 196–196.

ARIYO, O. and A. DIXON, G. ATIRI, S. WINTER, "Distribution of cassava mosaic begomoviruses in Nigeria," in Proceedings of the 13th ISTRC-Government symposium, 2007, pp. 373–379.

ARIYO, O. and A. DIXON, G. ATIRI, M. KOERBLER, S. WINTER, "Enhanced symptom severity and pseudorecombination of geminiviruses are important factors in possible breakdown of resistance to cassava mosaic disease," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 711–718.

ASADU, C. and A. DIXON, "Soil nutrient and cassava yields variations under continuous cultivation of three-crop mixtures in eastern Nigeria," in Proceedings of the 13th ISTRC-Government symposium, 2007, pp. 240–247.

ASIIMWE, P. and J.S. ECAAT, M. OTIM, D. GERLING, M. GUERSHON, S. KYAMANYWA, J. LEGG, "Cataloguing predators of *Bemisia tabaci* on a cassava mosaic disease resistant variety in Uganda," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 570–573.

AYODELE, M. and J. HUGHES, R. ASIEDU, "Yam anthracnose disease: field symptoms and laboratory diagnostics," in Proccedings of the 9th ISTRC-AB symposium, 2007.

Yam mosaic

BADU-APRAKU, B. and A. MENKIR, A. FONTEM LUM, M. FAKOREDE, and O. IBIKUNLE, “Recent advances in breeding for *Striga* resistant extra-early maize for the savannas of West and Central Africa,” in Demand-driven technologies for sustainable maize production in West and Central Africa: proceedings of the Fifth biennial Regional Maize Workshop, 3–6 May 2005, IITA- Cotonou, Benin Republic, 2007, pp. 25–42.

BAH, E. and A. DIXON, A. JALLOH, “Relative growth performance of eight improved cassava genotypes and 4 popular improved checks in 3 diverse agro-ecological zones in Guinea,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 341–358.

BAIYERI, K. and A. TENKOUANO, “Manure placement influenced growth and dry matter yield of a plantain hybrid,” in African Crop Science Conference Proceedings, 2007, pp. 385–390.

BAMIRE, A. and V. MANYONG, I. SANUSI, D. AWOTIDE, “Ex-ante cost - benefit analysis of biofortification of cassava roots in Nigeria,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 1–8.

BAMKEFA, B. and T. ONYEKA, A. DIXON, R. BANDYOPADHYAY, “Survey of the distribution and current status of bacterial blight and fungal diseases of cassava in Nigeria,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 683–692.

BANDYOPADHYAY, R. and A. LOGRIECO, M. HAIDUKOWSKY, A. MORETTI, J. LESLIE, A. VISCONTI, “Fungal and mycotoxin contamination of cereals and legumes from Nigeria, Ghana and Burkina Faso,” in Proc. of the XIIth International IUPAC Symposium on Mycotoxins and Phycotoxins, 21–25, 2007, Istanbul, Turkey, 2007.

BANDYOPADHYAY, R. and A. MENKIR, S. ASAAD, T. BAN, D. BERGVINSON, D. JEFFERS, J. MURAKAMI, R. ORTIZ, K. HELL, B. JAMES, P.L. KUMAR, S. NIGAM, H. UPADHYAYA, F. WALIYAR, “Consultative Group on International Agricultural Research (CGIAR) research-for-development agenda on mycotoxins for enhanced food safety and trade,” in Proceedings of XVI International Plant Protection Congress, 15–18 October, Glasgow, UK, 2007, pp. 368–369.

BENESI, I. and M. LABUSCHAGNE, A. DIXON, C. VILJEON, N. MAHUNGU, “Genotype by environment interaction for native cassava(*Manihot esculenta* Crantz) starch quality and its use in the commercial sector,” in Proceedings of the 13th ISTRC-Govt symposium, 2007, pp. 144–157.

CHIKOYE, D. and J. ELLIS-JONES, C. RICHES, L. KANYOMEKA, “Weed management in Africa: experiences, challenges and opportunities,” in XVI International Plant Protection Congress: proceedings, UK, 2007, pp. 16–17.

COULIBALY, O. “Strengthening the capacity and information exchange for food quality and export promotion in Benin and Ghana (West Africa),” in Proceedings of the Workshop on Promoting Best Practices for Capacity Building for Sustainable Development, 10–13 October 2006, Trieste, Italy, 2007, pp. 59–68.

DEMO, P. and M. AKORODA, R. ASIEDU, R. EL-BEDEWY, “Evaluation of the production potential of seed potato (*Solanum tuberosum* l.) tubers stored for different durations in diffuse light conditions,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 215–226.

DEN BREEYEN, A. and R. CHARUDATTAN, F. BEED, G. MACDONALD, J. ROLLINS, F. ALTPETER, “Biological control of *Imperata cylindrica* in West Africa using fungal pathogens,” in Proceedings of the 12th International Symposium on Biological Control of Weeds, 21–27 April, La Grand Motte, Montpellier, 2007, p. 45.

DIXON, A. and G. SSEMAKULA, F. OGBE, O. ARIYO, Y. LOKKO, P. ILONA, J. MKUMBIRA, “Cassava mosaic disease in sub-saharan Africa: variations in the pathogen, sources of resistance and host-plant resistance breeding for sustainable control,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 521–525.

DIXON, A. and J. WHYTE, N. MAHUNGU, G. SSEMAKULA, J. MKUMBIRA, P. ILONA, “Genetic improvement of cassava in sub-Saharan Africa: capitalizing on Africa landraces,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 511–520.

DUGJE, I. and A. KAMARA, L. OMOIGUI, “Assessment of *Striga* infestation in crop fields in the savanna zones of northeast Nigeria,” In demand-driven technologies for sustainable maize production in West and Central Africa, proceedings of the fifth biennial regional maize workshop, 2007, pp. 271–281.

EGESI, C. and S. OGUNYEMI, R. ASIEDU, “Evaluation of water yam (*Dioscorea alata* l.) genotypes for reaction to yam anthracnose disease,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 368–374.

EKANAYAKE, I.J. and A. DIXON, I. KASELE, and A. NOAH, “Plant water relations and photosynthetic properties of polyploidy cassava grown in the Nigerian savanna,” in Proceedings of the 13th ISTRC-Govt symposium, 2007, pp. 210–217.

EKELEME, F. and A. KAMARA, S. OIKEH, D. CHIKOYE, L. OMOIGUI, “Effect of weed competition on upland rice production in north-eastern Nigeria,” in African Crop Science Conference Proceedings, 2007, pp. 61–65.

ENI, A. and J.D'.A. HUGHES, R. ASIEDU, R. BANDYOPADHYAY, P.L. KUMAR, "Incidence and distribution of virus and virus-like diseases on yams (*Dioscorea* sp.) in the Republic of Benin," in Proc. 10th International Plant Virus Epidemiology Symposium, 15–19 October 2007, ICRIST, Hyderadad, India, 2007, pp. 123–123.

EZEDINMA, C. and J. LEMCHI, R. OKECHUKWU, F. OGBE, M. AKORODA, A. DIXON, "Status of cassava production in Nigeria," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 183–189.

EZEDINMA, C. and P. KORMAWA, V. MANYONG, A. DIXON, "Challenges, opportunities and strategy for cassava subsector development in Nigeria," in Proceedings of the 13th ISTRC-Govt symposium, 2007, pp. 627–640.

FAKOREDE, M. and B. BADU-APRAKU, A. MENKIR, S. AJALA, A. FONTEM LUM, "A review of NARES-IARC-donor collaboration to develop demand-driven technologies for improved maize production in West and Central Africa," in Demand-driven technologies for sustainable maize production in West and Central Africa: proceedings of the Fifth biennial Regional Maize Workshop, 3-6 May 2005, IITA- Cotonou, Benin Republic, 2007, pp. 3–24.

GITHUNGURI, C. and W. KIMANI, I.J. EKANAYAKE, J. IMUNGI, "The relationship between leaf area and cyanogenic potential of tuberous roots of cassava planted in a wet and a semi-arid agro-ecological zone," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 226–232.

GNANVOSSOU, D. and R. HANNA, B. PALLANGYO, M. TOKO, E. NSAMI, O. MFUGALE, "Distribution and abundance of cassava pests in Tanzania with a note on the spiralling whitefly," in Proceedings of the 9th ISTRC-AB Symposium, 2007, pp. 644–647.

ILE, E. and P. CRAUFURD, R. ASIEDU, "Is the yam (*Dioscorea* spp.) tuber-head and primary nodal complex (pnc) and the origin of the vine, feeder root and tuber? a mini review," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 235–243.

JAMES, B. and P. BRAMEL, A. LAGNAOUI, E. ERISGEN, C. ASIABAKA, "IPM contributions to the achievement of millennium development goals of halving hunger and poverty," in XVI International Plant Protection Congress: proceedings, UK, 2007, pp. 344–345.

JEREMIAH, S. and H. KULEMBEKA, E. KANJU, B. CHIRIMI, R. AMOUR, "The role of community based organizations, NGOs and farmers in technology transfer," in Proceedings of the 13th ISTRC symposium, 2007, pp. 686–688.

JUMBO, S. and N. MAHUNGU, A. MHONE, C. MOYO, V. SANDIFOLO, D. SIYENI, A. NTHONYIWA, K. SICHINGA, "Adoption and impact of improved cassava and sweetpotato varieties on food security in Malawi," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 26–33.

KAMARA, A. and A. MENKIR, L. OMOIGUI, I. KUREH, “Potential of drought-tolerant maize varieties in nitrogen-deficient soils of the Guinea savannas,” In Demand-driven technologies for sustainable maize production in West and Central Africa, proceedings of the fifth biennial regional maize workshop, 2007, pp. 180–183.

KAMARA, A. and D. CHIKOYE, L. OMOIGUI, I. DUGJE, “Cultivar and insecticide spraying regimes effects on insect pests and grain yield of cowpea in the dry savannas of north-eastern Nigeria,” in African Crop Science Conference Proceedings, 2007, pp. 179–184.

KANJU, E. and E. MASUMBA, M. MASAWE, S. TOLLANO, B. MULI, A. ZACHARIAS, N. MAHUNGU, B. KHIZZAH, J. WHYTE, A. DIXON, “Breeding cassava for brown streak resistance: regional cassava variety development strategy based on farmers and consumer preferences,” in Proceedings of the 13th ISTRC-Govt symposium, 2007, pp. 95–101.

Women farmers of Rakai district peeling banana hybrids for sensory evaluation

KAPINGA, R. and D. ZHANG, B. LEMAGA, M. ANDRADE, R. MWANGA, S. LAURIE, P. NDOHO, E. KANJU, “Sweetpotato crop improvement in sub-Saharan Africa and future challenges,” in Proceedings of the 13th ISTRC symposium, 2007, pp. 82–94.

KARIUKI, C. and R. HANNA, M. TOKO, B. NGARI, "The spread and persistence of exotic phytoseiid, *Typhlodromalus aripo* de leon (acari: phytoseiidae) and its effect on cassava green mite in Kenya," in Proceedings of the 9th ISTRC-AB Symposium, 2007, pp. 693–704.

KUMAR, P.L. "Challenges in management of plant virus diseases in sub-Saharan Africa," in Proc. 34th Annual Conference of the Nigerian Society of Plant Protection, theme: Plant Protection Challenges in the 21st Century. 17–21 September 2007, Nasarawa State University, Keffi, Nigeria, 2007, pp. 12–12.

KUMAR, P.L. and J. MGBECHI-EZERI, S. AKINBADE, A. ENI, R. ASIEDU, A. DIXON, C. FATOKUN, R. BANDYOPADHYAY, "The challenges and potential options for controlling virus diseases of legumes and tuber crops in West Africa," in Proc. 10th International Plant Virus Epidemiology Symposium, 15–19 October 2007, ICRIST, Hyderabad, India, 2007, pp. 60–60.

KUREH, I. and A. KAMARA, "Effects of sole cropping, intercropping and rotation with legume trap-crops on *Striga* control and maize grain yield in farmers' fields in the Guinea savannas," In Demand-driven technologies for sustainable maize production in West and Central Africa, proceedings of the fifth biennial regional maize workshop, 2007, pp. 169–179.

LEMA, K. and A. DIXON, N. MAHUNGU, P. ILONA, S. NLUTA, J. KIMFUEMA, S. LUKOMBO, M. BIDIAKA, "Strategic cassava production rehabilitation in the democratic Republic of Congo through accelerated germplasm development and deployment," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 540–547.

MANYONG, V. and A. BAMIRE, P. ZUCKERMAN, "Rural household expenditures for roots and tubers in south western Nigeria: an almost ideal demand system analysis," in Proceedings of the 13th ISTRC-Govt symposium, 2007, pp. 601–613.

MGBECHI-EZERI, J. and S. AKINBADE, J.D'.A. HUGHES, R. BANDYOPADHYAY, P.L. KUMAR, "Incidence of seed transmitted viruses in cowpea and soybean in Nigeria," 2007, pp. 160–160.

MKUMBIRA, J. and R. OKECHUKWU, A. DIXON, "Breeding for root quality traits in cassava," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 440–442.

MOYO, C. and N. MAHUNGU, V. SANDIFOLO, S. JUMBO, A. MHONE, P.T. MANGIRANI, "Investigations into cassava stem storage and its effects on sprouting and plant growth," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 253–258.

MWANGI, M. and R. BANDYOPADHYAY, C. NOLTE, "The status of cassava mosaic disease, bacterial blight and anthracnose as constraints to cassava production in the Pouma region of south Cameroon," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 587–592.

NEUENSCHWANDER, P. "Socio-economic benefits of some classical biological control projects in Africa," in Proc. XVI International Plant Protection Congress, Glasgow, Taiwan, 2007, pp. 540–541.

NEUENSCHWANDER, P. and R. HANNA, "Biological control and functional biodiversity in agricultural production: successful cases to improve food security in Africa," in Proceeding of the Symposium on Organic Agriculture in Development: the need for integrated production for food security, 2007, pp. 19–24.

OBEN, T. and G. ATIRI, O. FAGBOLA, S. AKINBADE, P. OYIBO, P.L. KUMAR, "Occurrence and distribution of viruses infecting fluted pumpkin (*Telfairia occidentalis*, Hook f.) in Imo state, Nigeria," 2007, pp. 122–122.

ODERO, B.O. and H. OBIERO, P.J. NDOLO, J. WHYTE, J. LEGG, J. MALINGA, T. MAGUT, "Accelerated multiplication and distribution of improved healthy planting materials of cassava varieties in western Kenya," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 267–270.

OGBE, F. and A. DIXON, J. HUGHES, "Towards the control of a severe form of cassava mosaic disease in Nigeria: diagnostic survey for cassava mosaic begomoviruses," in Proceedings of the 13th ISTRC-Govt symposium, 2007, pp. 298–306.

OGBE, F. and A. DIXON, J.D'.A. HUGHES, and F. ALABI, "Mixed infections by biological variants of *African cassava mosaic virus* and their associated severe symptoms on cassava in Nigeria," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 639–643.

OGUNJOBI, A. and A. DIXON, O. FAGADE, "Genetic diversity among *Xanthomonas axonopodis* pv. manihotis isolated from the western states of Nigeria," in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 557–563.

OMOIGUI, L. and A. KAMARA, F. MASSAWE, M. ISHIYAKU, O. BOUKAR, S. ALABI, F. EKELEME, "Evaluation of cowpea genotypes for their reactions to *Striga gesnerioides* in the dry savanna of northeast Nigeria," in African Crop Science Conference Proceedings, 2007, pp. 273–278.

ONITILO, M. and L. SANNI, B. MAZIYA-DIXON, A. DIXON, “Varietal differences in the physicochemical, functional, pasting properties and granule size of starches from different CMD resistance varieties,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 494–505.

OTOO, E. and R. ASIEDU, S. ENNIN, E. EKPE, “Yam production in the derived coastal savannah zone of Ghana - past, present and future prospects,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 275–284.

PALLANGYO, B. and R. HANNA, M. TOKO, D. GNANVOSSOU, V. MGOO, M. OTEMA, A. ONZO, F. HOUNTONDJI, E. NSAMI, O. MFUGALE, “Biological control of cassava green mite in Tanzania,” in Proceedings of the 9th ISTRC-AB Symposium, 2007, pp. 597–605.

PATINO, M. and A. DIXON, C. EZEDINMA, J. LEMCHI, R. OKECHUKWU, L. SANNI, M. AKORODA, “Cassava small-scale enterprises in Brazil: lessons for the cassava industry in Nigeria,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 828–836.

REDDY, A. and P.L. KUMAR, K. SUBRAHMANYAM, F. WALIYAR, S. NIGAM, “Frequency of mixed infection of *Tobacco streak virus* and *Peanut bud necrosis virus* in groundnut,” 2007, pp. 159–159.

SAIVISHNUPRIYA, K. and S. AROCKIASAMY, P.L. KUMAR, A. REDDY, A. NALLA, F. WALIYAR, S. NIGAM, R. BEACHY, K. SHARMA, “Development and evaluation of transgenic groundnut for resistance to *Tobacco streak virus* (TSV),” in Proc. 10th International Plant Virus Epidemiology Symposium, 15–19 October 2007, ICRIST, Hyderabad, India, 2007, pp. 57–57.

SALISU, U.C. and M.O. AKINOLA, H. AJEIGBE, “Effect of improved crop-livestock system adoption on the productivities of farmers in Kano state,” in Proceedings of the 41st Conference of the Agricultural Society of Nigeria, 2007, pp. 561–568.

SANNI, L. and B. MAZIYA-DIXON, R. OKECHUKWU, C. EZEDINMA, M. AKORODA, J. LEMCHI, F. OGBE, E. OKORO, P. ILONA, A. DIXON, “Innovative processing and utilization technologies for cassava in Africa,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 836–841.

SANNI, L. and C. EZEDINMA, J. LEMCHI, F. OGBE, R. OKECHUKWU, M. AKORODA, E. OKORO, B. MAZIYA-DIXON, P. ILONA, A. DIXON, “Cassava postharvest needs assessment survey in Nigeria,” in Proc. Proceedings of 9th ISTRC-AB symposium, 2007, pp. 746–748.

SANOGO, D. “Africa’s food status: implications and challenges in a changing world,” in Proc. Facing up to food crisis in sub-Saharan Africa: the challenges, gaps and role of agricultural policies, 2007, pp. 31–39.

SEDZRO, K.M. and K. APEDOH, R. CARSKY, “Viability and acceptability of the *Mucuna pruriens* fallow for the conservation of soil fertility in yam production,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 249–252.

SHIVAM, C.V.B. and P.L. KUMAR, R. SINGH, “Evaluation of pigeonpea genotypes for resistance to sterility mosaic disease,” 2007, pp. 133–133.

SRIDHAR-KUMAR, C. and K. SIREESHA, G. RANGARAO, C. RAMBABU, P.L. KUMAR, “Development and evaluation of immunochemical tools for diagnosis and quality control of *Helicoverpa armigera* nucleopolyhedrovirus (HANPV),” in International Conference on Emerging and Re-Emerging Viral Diereses of the Tropics and Sub-Tropics, December 11–14 2007, New Delhi, India. Indian Virological Society, New Delhi, India pages 222, 2007, pp. 222–222.

SRIDHAR-KUMAR, C. and P.L. KUMAR, K. SIREESHA, G. RANGARAO, F. WALIYAR, C. RAMBABU, “Biological and molecular characterization of a baculovirus isolated from legume pod borer, *Helicoverpa armigera* (Hubner) (noctuidae: lepidoptera),” in Proc. 26th Annual Convention of Indian Association for Cancer Research and International Symposium on Translational Research in Cancer, 17–19 January 2007 Bhubaneswar, Orissa, India, 2007, pp. 221–221.

TAMO, M. and G. GOERGEN, C. AGBOTON, R. SRINIVASAN, “Putting agro-biodiversity to work: the cowpea story,” in XVI International Plant Protection Congress, Glasgow, Taiwan, 2007, pp. 354–355.

TATA-HANGY, K. and J. LEGG, R. HANNA, M. TOKO, K. LEMA, A. DIXON, N. MAHUNGU, “Incidence and distribution of cassava diseases and pests in the Democratic Republic of Congo,” in Proceedings of the 9th ISTRC-AB Symposium, 2007, pp. 614–622.

TATA-HANGY, K. and R. HANNA, M. TOKO, K. LEMA, M. SOLO, “Changes in population abundance of the African root and tuber scale *Stictococcus vayssierei* Richard (homoptera; stictococcidae) on cassava in the Bas-Fleuve district in the democratic republic of Congo,” in Proceedings of the 9th ISTRC-AB Symposium, 2007, pp. 574–582.

TENKOUANO, A. and K. BAIYERI, “Adaptation pattern and yield stability of banana and plantain genotypes grown in contrasting agro-ecologies in Nigeria,” in African Crop Science Conference Proceedings, 2007, pp. 377–384.

TINDO, M. and R. HANNA, L. WIJNANS, C. NOLTE, G. GOERGEN, A. NGUEKAM, J. NGEVE, “Pre-planting removal of host-plant residues to reduce African root and tuber scale infestations in cassava fields in Cameroon,” in Proceedings of the 9th ISTRC-AB Symposium, 2007, pp. 633–639.

TOKO, M. and R. HANNA, J. LEGG, M. ANDRADE, A. JONE, B. AGBOTON, M. OTEMA, G. OKAO-OKUJA, R. OBONYO, E. MAMBO, “Distribution, incidence and severity of cassava diseases and pests in Mozambique,” in Proceedings of the 9th ISTRC-AB Symposium, 2007, pp. 623–633.

TOURE, M. and K. AMAGBETO, S. DOUMBIA, A.M. KOUAKOU, R. ASIEDU, G.P. ZOHOURI, “Socio-economic determinants of yam varieties adoption: probit analysis in three major’s yam production areas of Cote d’Ivoire,” in Proceedings of 9th ISTRC-AB symposium, 2007, pp. 151–158.

WALIYAR, F. and P.L. KUMAR, “Evaluation of advanced peanut breeding lines for resistance to late leaf spot and rust,” in Proceedings, 39th Annual American Peanut Research and Education Society (APRES), July 10–13, 2007, Birmingham, Alabama, USA, Alabama, USA, 2007.

WALIYAR, F. and P.L. KUMAR, M. OSIRU, E. MONYO, B. NTARE, S. NIGAM, “Centennial of research on groundnut rosett disease: what is known and what still needs to be known to achieve effective control of this menace in sub-Saharan Africa,” 2007, pp. 61–61.

WALIYAR, F. and P.L. KUMAR, S. REDDY, K. SHARMA, S. NIGAM, “Current strategies and future technologies to combat aflatoxin contamination in groundnut,” in Proc. 2nd Asian Congress of Mycology and Plant Pathology ‘Microbial Diversity for Asian Prosperity’, December 19–22, 2007, Osmania University, Hyderabad, India. Indian Society of Mycology and Plant Pathology, Udaipur, India, 2007, pp. 287–287.

WALIYAR, F. and S. NIGAM, P.L. KUMAR, “Integrated strategy for minimizing the risk of aflatoxin contamination in food crops,” in Proc. International Conference on Bridging Gaps in Agriculture Research and Development Towards Sustainable Development. Central Luzon State University, Science City of Munoz, Nueva Ecija, Philippines, 2007, pp. 18–19.

WALIYAR, F. and S. REDDY, P.L. KUMAR, B. REDDY, K. RAI, A. ASHOK, C. RAVINDER REDDY, “Surveillance for natural contamination of mycotoxins in sorghum and pearl millet grains in Andhra Pradesh and Maharastra states, India,” in Proc. 2nd Asian Congress of Mycology and Plant Pathology ‘Microbial Diversity for Asian Prosperity’, December 19–22, 2007, Osmania University, Hyderabad, India. Indian Society of Mycology and Plant Pathology, Udaipur, India, 2007, pp. 294–294.

YALLOU, C. and A. MENKIR, V. ADETIMIRIN, J. KLING, “Combining ability of diverse maize inbred lines under *Striga* infestation in Nigeria and Benin,” in Demand-driven technologies for sustainable maize production in West and Central Africa: proceedings of the Fifth biennial Regional Maize Workshop, 3–6 May 2005, IITA- Cotonou, Benin Republic, 2007, pp. 64–78.

YUSUF, A.A. and E. IWUAFOR, O. OLUFAJO, R. ABAIDOO, N. SANGINGA, “Residual benefits of soybeans genotypes and natural fallow to subsequent maize in the northern Guinea savanna of Nigeria,” in Demand driven technologies for sustainable maize production in West and Central Africa: proceedings of the Fifth biennial Regional Maize Workshop, 3–6 May 2005, IITA- Cotonou, Benin Republic, 2007, pp. 138–154.

Others

AMAZA, P. and K. OGUNDARI. 2007. Production efficiency of soybean farmers in the Guinea savannas of West Africa: empirical evidence from Nigeria: poster paper presented at the international farm management association congress held at University College Cork, Ireland, 15–20 July 2007.

GOCKOWSKI, J. and S. DAVID. 2007. Farm safety interventions in the cocoa sector.

KUMAR, P.L. and V. VADEZ. 2007. The “acid” test!

NWILENE, F.E. and O. YOUM, Y. SERE, M. TAMO, K. HELL, G. GOERGEN, B. JAMES, I. INGELBRECHT. 2007. WARDA/IITA collaboration on insect pests of rice in Africa.

SONWA, D. and S. WEISE, B.A. NKONGMENECK, M. TCHATAT, M. JANSSENS. 2007. Structure of cocoa agroforest of southern Cameroon.

TRIPATHI, L. 2007. Demystifying biotechnology.

WALIYAR, F. and P.L. KUMAR, B. NTARE, E. MONYO, S. NIGAM, A. REDDY, M. OSIRU, A. DIALLO. 2007. Groundnut rosette disease and its management.

Proceedings

Accounting for losses of micronutrients from staple foods during storage and processing. 2007.

Assessment of past and present soil conservation initiatives in Nigeria, West Africa. 2007.

Breeding crops for increased micronutrient density: a case for maize. 2007.

Developing and testing drought tolerant maize germplasm in West Africa. 2007.

Facing up to food crisis in sub-saharan Africa: the challenges, gaps and role of agricultural policies. Ibadan, Nigeria, 2007.

Infection of maize and cowpea seeds and grains by six isolates of *Fusarium verticillioides*. 2007.

Larval growth of two stemborers *Sesamia calamistis* and *Eldana saccharina* reared on diet with 6 isolates of *Fusarium verticillioides*. 2007.

Progress and achievements in breeding maize for enhanced micronutrient content. 2007.

Progress in breeding for *Striga* resistant maize in West and Central Africa. 2007.

Strategic needs for controlling cassava mosaic disease in West and Central Africa. 2007.

Technical report

MEENAKSHI, J. and N. JOHNSON, V. MANYONG, H. DE GROOTE, J. JAVELOSA, D. YANGEN, F. NAHER, C. GONZALEZ, J. GARCIA, E. MENG. 2007. How cost-effective is biofortification in combating micronutrient malnutrition? an ex-ante assessment. CGIAR., 2.

MWANGI, M. 2007. Responding to banana *xanthomonas* wilt amidst multiple pathogens and pests. Kampala, Uganda: International Institute of Tropical Agriculture (IITA).

NTAWURUHUNGA, P. and J. LEGG. 2007. New spread of cassava brown streak virus disease and its implications for the movement of cassava germplasm in the East and Central African region. Kampala, Uganda: International Institute of Tropical Agriculture (IITA).

SWALLOW, B. and M. VAN NOORDWIJK, S. DEWI, D. MURDIYARSO, D. WHITE, J. GOCKOWSKI, G. HYMAN, S. BUDIDARSONO, V. ROBIGLIO, V. MEADU, A. EKADINATA, F. AGUS, K. HAIRIAH, P. MBILE, D. SONWA, S. WEISE. 2007. Opportunities for avoided deforestation with sustainable benefits: an interim report of the ASB partnership for the tropical forest magins. World Agroforestry Centre (ICRAF); Centre for International Forestry Research (CIFOR); International Centre for Tropical Agriculture (CIAT); International Institute of Tropical Agriculture (IITA); Indonesian Soil Research Institute; Brawijaya University.

Collecting seeds from a wild banana in Namulonge

Graduate research

completed at IITA in 2007

Striga infesting a soybean plant

Mphil

Oyekanmi, Edward O; Male; Nigeria
University: University of Ibadan
Sponsor: Self
Research topic: Screening of selected microorganisms and maize genotypes for *Pratylenchus zeae* management and improved yield of *Zea mays* L.

MSc

Akello, Juliet; Female; Uganda
University: Makerere University, Uganda
Sponsor: BMZ
Research topic: Microbial Control of the banana weevil using *Beauveria bassiana* as an endophyte *Cosmopolites sordidus*

Okorogri, Elohor; Female; Nigeria
University: University of Ibadan
Sponsor: Self
Research topic: Effect of length of pre-sprouting, concentrations of colchicine and length of exposure of colchicine on ploidy induction in cassava

Olowu, Elizabeth F.; Female; Nigeria
University: University of Ibadan
Sponsor: Self
Research topic: Optimixation of invitro propagation of cassava (*Manihot esculenta* Crantz)

Popoola, B. Omowunmi; Female; Nigeria
University: University of Agriculture, Abeokuta
Sponsor: SMIP
Research topic: Banana nematodes pathogenicity trial

Popoola, Jacob; Male; Nigeria
University: University of Agriculture, Abeokuta
Sponsor: Self
Research topic: The morphology, cytology and reproductive biology of African yam bean (*Sphenostylis stenocarpa* (Hochst Ex. A. Rich) Harms

Soyode, Folarin; Male; Nigeria
University: University of Ibadan
Sponsor: Self
Research topic: Genetic variability in sprouting ability of 37 CMD resistant cassava genotypes in Nigeria

PhD

Afolabi, Clement; Male; Nigeria
University: University of Ibadan
Sponsor: Self
Research topic: Etiology of Fusarium stalk and ear rot of maize (*Zea mays*) in Nigeria

Aikpokpodion, Peter; Male; Nigeria
University: University of Ibadan
Sponsor: USDA
Research topic: Genetic diversity in Nigeria Cacao (*Theobroma cacao* L.) collections determined by phenotypic and simple sequence repeat markers

Akinola, Adebayo; Male; Nigeria
University: University of Ife
Sponsor: BNMS
Research topic: Adoption and impact of best bet nutrient management systems (BNMS) on maize farmers in the Northern Guinea Savanna of Nigeria

Lawson-Balagbo, Emile; Male; Togo
University: University of Natural Resources, BOKU
Sponsor: Austria Coconut Mite project
Research topic: Development and implementation of a biological control program for coconut mite

Oben, Tabi Tom; Male; Cameroon
University: University of Ibadan
Sponsor: Self
Research topic: Identification of pathogens associated with die-back disease of *Musa* spp. in selected locations in West and Central Africa

Onabanjo, Oluseye; Female; Nigeria
University: University of Agriculture, Abeokuta
Sponsor: Self
Research topic: Formulation of complementary foods from yellow-fleshed cassava roots and leaves.

Hardening banana seedlings in the screen house

Governing board

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IITA scientist and project managers during SP3 2007

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Abbreviations used in this report

AVRDC	Asian Vegetable Research and Development Center
CBO	community-based organization
CBSD	cassava brown streak disease
CIAT	Centro Internacional de Agricultura Tropicale
CIDA	Canadian International Developement Agency
CIMMYT	Centro Internacional de Mejoramiento de Maiz y Trigo
CGM	cassava green mite
CMD	cassava mosaic disease
CRIN	Cocoa Research Institute of Nigeria
CRS	Catholic Relief Services
EACMV-Ug	East Africa Cassava Mosaic Virus-Uganda variant
EAHB	East African highland banana
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuaria
ESARC	Eastern and Southern Africa Regional Center
FAO	Food and Agriculture Organization of the United Nations
GIS	geographic information system
IBC	IITA's Institutional Biosafety Committee
ICARDA	International Center for Agricultural Research in the Dryland Areas
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IFPRI	International Food Policy Research Institute
IIBC	International Institute of Biological Control
ILRI	International Livestock Research Institute
MAS	Marker assisted selection
MDG	Millenium Development Goals
NGO	nongovernmental organizations
NGN	Nigerian Naira
NGS	Northern Guinea savanna
NRI	Natural Resources Institute (UK)
QPM	quantity protein maize
QTL	quantitative trait loci
PREA	Participatory research and extension approach
RUVT	regional uniform variety trials
SARRNET	Southern Africa Root Crops Research Network
SP-IPM	Systemwide Program on Integrated Pest Management
SS	Sudan savanna
SSA	Sub-saharan Africa
WCA	West and Central Africa
WECAMAN	West and Central Africa Maize Network

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A vibrant market-driven economy will spur agricultural development in Africa