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AfricaRice

# Building African capacity on policy analysis and impact assessment

**Africa Rice Center (AfricaRice) – Annual Report 2010**

**Africa Rice Center**
01 BP 2031, Cotonou, Benin
**Telephone:** (229) 21 35 01 88
**Fax:** (229) 21 35 05 56
**E-mail:** AfricaRice@cgiar.org

**Nigeria Research Station**
c/o International Institute of Tropical
Agriculture (IITA),
Oyo Road, PMB 5320, Ibadan, Nigeria
**Telephone:** (234) 805 505 5951, (234) 805 505 5954
(234) 803 403 5281
**Fax:** (44) 208 711 3786
**E-mail:** f.nwilene@cgiar.org

**Sahel Research Station**
BP 96, Saint-Louis, Senegal
**Telephone:** (221) 33 962 6441, (221) 33 962 6493
**Fax:** (221) 33 962 6491
**E-mail:** AfricaRice-sahel@cgiar.org

**East and Southern Africa Research Station**
Mikocheni B/Kawe,
Avocado Street, PO Box 33581,
Dar es Salaam, Tanzania
**Telephone:** (255) 222 780 768
**Fax:** (255) 222 780 768
**E-mail:** p.kiepe@cgiar.org

**Africa Rice Center Côte d'Ivoire**
**Abidjan Liaison Office**
01 BP 4029, Abidjan 01, Côte d'Ivoire
**Telephone:** (225) 20 21 01 20
**Fax:** (225) 20 22 01 33
**E-mail:** a.beye@cgiar.org

**Bouaké Research Station**
01 BP 2551, Bouaké 01, Côte d'Ivoire
**Telephone:** (225) 31 63 25 78
**Fax:** (225) 20 22 01 33
**E-mail:** a.beye@cgiar.org



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## About Africa Rice Center (AfricaRice)

*The Africa Rice Center (AfricaRice) is a leading pan-African research organization with a mission to contribute to poverty alleviation and food security in Africa through research, development and partnership activities. AfricaRice is a member of the Consortium of Centers supported by the CGIAR. It is also an autonomous intergovernmental research association of African member countries.*

*The Center was created in 1971 by 11 African countries. Today its membership comprises 24 countries, covering West, Central, East and North African regions, namely Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Democratic Republic of Congo, Egypt, Gabon, The Gambia, Ghana, Guinea, Guinea-Bissau, Liberia, Madagascar, Mali, Mauritania, Niger, Nigeria, Republic of Congo, Senegal, Sierra Leone, Togo and Uganda.*

*AfricaRice's temporary headquarters is based in Cotonou, Benin. Research staff are also based in Senegal, Nigeria, Tanzania and Côte d'Ivoire.*

*For more information, visit:* ***www.AfricaRice.org***

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AfricaRice

# Message from the Board Chair and the Director General

Our joint message prefacing the 2010 Annual Report details what arguably has been one of the most successful years in the life of AfricaRice. The year 2010 was one of much deserved accolades in recognition of the Center's performance and its achievements in rice research and development for Africa's rice consumers and producers.

Many first-time achievements were recorded by the Center in 2010, the most significant of which was being rated "Outstanding" in the annual CGIAR Performance Measurement Exercise. AfricaRice was one of only four CGIAR Centers to be recognized with the highest distinction in the evaluation of the Center's research results and impact, governance, institutional and financial health, and stakeholders' perceptions.

Following its placement in the "Outstanding" category, AfricaRice became the first Center, in March 2010, to sign the Constitution establishing the Consortium of CGIAR Centers.

The Center continued to receive accolades in 2010 with two AfricaRice scientists winning CGIAR Science awards during the first Global Conference on Agricultural Research for Development (GCARD) held in Montpellier, France. Dr Paul Van Mele received the CGIAR Science award for 'Outstanding Communication' for his work on the Rice Rural Learning Initiative which promotes farmer-to-farmer videos on improved rice production practices, while Dr Jonne Rodenburg received the CGIAR Science award for 'Outstanding Promising Young Scientist' for his work on the development of integrated approaches to managing parasitic weeds.

During the year, Madagascar joined the AfricaRice family as its 24th member. For a country that is among the biggest per-capita consumers of rice in the world, membership of AfricaRice opens up all kinds of opportunities for the country to realize its full potential in rice production.

AfricaRice was also involved in the organization of major events in 2010. The Second Africa Rice Congress was held in March in Bamako, Mali, under the theme *Innovations and partnerships to realize Africa's rice potential*. Approximately 500 participants from a wide cross-section of stakeholders (rice farmers, seed producers, processors, input dealers, manufacturers of agricultural machinery, national rice research and extension systems, agricultural ministries, international and advanced research institutes, non-governmental organizations and the donor community) took part in the Congress. The participants at the end of the Congress called for a 'Marshall Plan' to overcome the severe lack of capacity in rice research and development on the African continent. Proceedings of this important event are available on AfricaRice's website.

The achievements in 2010 were capped by the approval in November of the Global Rice Science Partnership (GRiSP) as the first CGIAR Research Program (CRP). GRiSP is the brainchild of three CGIAR Centers (IRRI, AfricaRice and CIAT), which have come together to try and address the multitude of problems facing rice research and development worldwide. IRRI takes the overall leadership for GRiSP and also leads activities in Asia, while AfricaRice is leading GRiSP activities in Africa and CIAT is responsible for Latin America and the Caribbean region. Co-architects and key partners of GRiSP are the Japanese International Research Center for Agricultural Sciences (JIRCAS), the Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) and the Institut de recherche pour le développement (IRD).

Two years removed from the rice crisis of 2008 that resulted in civil strife in several African countries, we are pleased to transmit a message of satisfaction for what AfricaRice has been able to accomplish in response to the crisis. The two emergency projects initiated in response to the rice crisis, the USAID-funded 'Emergency Rice Initiative to boost rice production' and the Japan-funded 'Emergency Rice Seed Project' achieved far more than expected. The two projects together provided 114,000 vulnerable farmers across 20 sub-Saharan African countries with seed of improved rice varieties and crop management

methods, and trained more than 3500 farmers, extension agents, and processors in improved rice production and processing techniques. The systems that have been put in place by these emergency projects will help increase rice production in the medium and long term in the project countries.

Other projects that have registered major successes in Africa include the 'Stress tolerant rice for poor farmers in Africa and South Asia' project (STRASA), whose first phase ended in 2010, and was renewed for another three years. Through STRASA more than 20 promising rice breeding lines that are tolerant to different abiotic stresses have been identified.

As is the practice, we feature a donor country each year when we publish our annual report. This year, the spotlight is on Germany. The relationship with Germany dates back to the establishment of the Center. Germany to this day continues to be a strong supporter of AfricaRice.

By all indications, 2010 has been a banner year for AfricaRice and its partners. We are proud of the Center's achievements and expect a bright future. Our sincere thanks to the AfricaRice member states, donors and development partners that accompanied AfricaRice through a most productive period.

***Getachew Engida***

***Papa Abdoulaye Seck***

*Chair of the Board of Trustees, Mr Getachew Engida (left), with Director General, Dr Papa Abdoulaye Seck.*

# Building African capacity on policy analysis and impact assessment

"How do we know whether we are doing the right thing?" asks Dr Aliou Diagne, AfricaRice program leader for Policy, Innovation Systems and Impact Assessment. "AfricaRice projects for increasing rice production in Africa are implemented by and through the national agricultural research systems (NARS), so AfricaRice and NARS partners have been collaborating to strengthen capacity on impact assessment. Otherwise we cannot know if our technologies and associated development interventions are fulfilling their promises. We also would not know which interventions work and which do not."

The Center provides backstopping and training so that the NARS can implement the collaborative research and development projects with AfricaRice. It is appropriate, therefore, that our partners also have the capacity to assess the impact of these and other projects.

## Helping to build a strong evidence-based policy analysis framework

### National rice statistics

In December 2007, AfricaRice launched an initiative to improve the timely availability, reliability and relevance of rice statistics and information needed for quality rice research, evidence-based policy formulation, and monitoring and evaluation of rice-related investments in sub-Saharan Africa.

Statistics is a specialized area and most countries have dedicated national statistical services. The 21 member countries of the Coalition for African Rice Development (CARD) that were to benefit from this initiative were no exception. AfricaRice was instrumental in bringing together staff from the NARS and the national


*Participants of a training workshop on strengthening the availability and access to rice statistics, held at Addis Ababa, Ethiopia, in July 2010.*

agricultural statistical services (NASS) to collaborate on this activity, in some cases for the first time. CARD is a joint initiative of the Japan International Cooperation Agency (JICA) and the Alliance for a Green Revolution in Africa (AGRA), which aims to double rice production in the 21 African countries by 2018.

When the rice price crisis struck Africa in 2008, AfricaRice worked with many partners to develop an emergency response and also to strengthen the ability to develop policies so that the countries could avoid similar crises in the future. The project to develop the national rice statistics got support from another source in the wake of the crisis. The Japanese government launched an Emergency Rice Initiative (ERI) to help countries with seed systems and policy support tools.

As part of the ERI, AfricaRice was able to facilitate capacity-building workshops to guide NARS and NASS personnel in the design and implementation of surveys to collect detailed and reliable rice-specific data in the 21 countries. After a review of methods used, participants were encouraged to adopt common survey instruments and sampling methodologies, with a view to regional harmonization to ease the process of regional data aggregation and comparative analyses.

As a direct result of these efforts, detailed data sets are now available for 20 participating countries, and the combined database is held at AfricaRice. These data provide not only the most detailed view of the countries' rice sectors at one point in time, but also a solid basis for analyzing future trends as the countries continue to increase domestic rice production in pursuit of self-sufficiency.

### National rice development strategies

CARD is committed to assisting 23 sub-Saharan African countries to develop their national rice development strategies (NRDS). It requested that AfricaRice provide a general framework for the NRDS and technical assistance to the country task forces that were to develop the strategies.

*Dr Aliou Diagne at an impact assessment training course in Freetown, Sierra Leone.*

AfricaRice subsequently developed a draft outline and format for the documents and processes required to establish NRDS and participated actively in reviewing the drafts from the first group of 12 countries at a technical meeting in February 2009. "Some of the countries were developing their NRDS before the advent of CARD," says Ibrahima Bamba, AfricaRice policy economist, "but these were subsequently adapted to the CARD framework."

Nigeria was first off the block with its NRDS being launched in early 2010. It was based on the concept of the value chain and replaced the former Presidential Initiative on rice with a change in focus from small-scale intervention to medium- and large-scale interventions to improve quality. Nigeria, which has tremendous potential for agricultural growth, has taken the bold step of targeting a near quadrupling of national rice production from 3.4 million tonnes in 2007 to 12.85 million tonnes in 2018.

## Training for effective impact assessment

"Impact assessment is now an indispensable component of programs because stakeholders are demanding

*A workshop on building a rice data system for sub-Saharan Africa held in Dar es Salaam, Tanzania.*

demonstrable and measurable impacts," says Diagne. "Donors are increasingly requesting more evidence of net return from their investments."

Resource scarcity combined with questions relating to the social, economic and environmental impact of publicly funded development projects increase the need for well-documented impact-assessment studies. As a decision-making tool, such studies improve the transparency, accountability and effectiveness of programs and policies.

There is a shortage of expertise for handling impact assessments in sub-Saharan Africa. According to Diagne, the use of trained local experts has several advantages: they are familiar with the local environment and are more likely to take local institutional issues into account; they have a sense of ownership of the data collected and the analysis; and they are in a better position to disseminate the results and provide follow-up advice on their studies.

With the emphasis placed on poverty reduction, impact assessment requires going beyond the usual adoption studies and estimation of internal rates of return to research. Consequently, the emphasis is on providing information on the *ex-ante* and *ex-post* impact of the AfricaRice- and NARS-generated rice technologies on various household, community welfare and environmental outcomes, including poverty, food security, nutrition, health and biodiversity.

Overall capacity is built through the development of individual and institutional capacity of NARS in the region through training and joint implementation of impact studies. AfricaRice has been organizing impact-assessment methodology courses for the NARS partners regularly since 2002. As of 2011, more than 200 national agricultural research scientists, university researchers, and students from 22 African countries have participated in these annual training workshops.

AfricaRice scientists have also backstopped NARS collaborators in the design and implementation of their impact studies – in particular, questionnaires and programs for statistical analysis were developed for studies in Côte d'Ivoire and Guinea. The impact assessment unit of AfricaRice and its NARS collaborators have been conducting baseline surveys on the adoption, impact and targeting of NERICA rice varieties in 17 countries – Benin, Burkina Faso, Cameroon, Central Africa Republic, Chad, Democratic Republic of Congo, Côte d'Ivoire, The Gambia, Ghana, Guinea, Mali, Nigeria, Rwanda, Senegal, Sierra Leone, Togo and Uganda.

AfricaRice also continues to host NARS scientists from project countries for 2- to 3-week training programs in Cotonou. The trained scientists have successfully applied their new knowledge to their own country data. They have cleaned their respective country databases, analyzed data and drafted the descriptive technical reports. Some scientists have run econometric analyses to derive the adoption rate and the impact of adoption of new rice varieties with a focus on NERICA varieties.

## Development of appropriate tools

"An important part of the work being done by our Program involves the development of software tools to automate the processing of survey data collected by the NARS and its analysis," says Diagne. These tools are a critical part of the technical support that AfricaRice provides to the NARS scientists involved in the implementation of various projects.

A lot of impact assessment and policy analysis involves long and tedious processing and analysis of statistical data. This can be complicated and requires specific knowledge of statistical computer programs. The tools developed by AfricaRice enable NARS scientists to process and analyze their data quickly using up-to-date analysis tools and methods.

The use of these tools by the NARS also makes it possible to standardize the software and methods of data analysis used across the various countries and therefore facilitate cross-country comparison of results.

## Stata-based tools for impact analysis

AfricaRice encouraged its NARS partners to adopt the Stata statistical package as the primary tool for statistical data analysis. The programming facilities available in Stata enable AfricaRice researchers to write sub-programs to automate many of the actions that need to be performed to process survey data and conduct sophisticated statistical and econometric analyses.

Mr Eyram Amovin-Assagba, research assistant, helps NARS representatives to build and manage their country databases. "Some of the participating countries have great difficulty transferring their data from Microsoft Access to Stata for cleaning and statistical analysis," he says, "but we have written a program to transfer them automatically into Stata with all the necessary data description, and another one to automate the data cleaning."

To enable NARS to carry out their adoption and impact studies easily, the impact-assessment team at AfricaRice developed two software tools in the form of Stata modules (or Stata add-on commands). The first module, 'Adoption', enables easy estimation of adoption models based on average treatment effect (ATE), a new methodology for studying adoption developed by the AfricaRice impact-assessment team. The second module, 'Impact', uses the latest models and methods to automate the estimation of the impact of any change (including adoption of a technology) on any behavioral or welfare outcome including non-economic ones (e.g. yield, production, income, consumption, schooling indicators).

With these two tools, NARS scientists and students no longer need to know how to program Stata to estimate ATE-based adoption models and impact. The two Stata-based tools have been used by NARS collaborating with AfricaRice in their adoption and impact studies since 2006, some of which have led to peer-reviewed publications in international journals. In particular, they have been the primary tools used in the NERICA adoption and impact studies, which have been completed in 10 countries.

NARS are also using the tools in studies not related to rice and beyond their collaboration with AfricaRice. Students in African and a few European universities that collaborate with AfricaRice, and researchers involved in the 'proof of concept' of integrated agricultural research for development (IAR4D) being implemented by the Sub-Saharan Africa Challenge Programme (SSA CP) of the Forum for Agricultural Research in Africa (FARA) are also using the tools.

*AfricaRice researcher Ali Touré (extreme right) conducts a training session on rice statistics in Liberia.*

*Training session at Freetown, Sierra Leone.*

## Emergency Rice Initiative Spreadsheet

To launch the Emergency Rice Initiative as a response to the rice crisis a workshop was held at Cotonou, in June 2008. The Emergency Rice Initiative Spreadsheet (ERIS) v1.0 software was developed by AfricaRice in advance of the ERI formulation workshop to help member countries analyze their rice production and input needs. ERIS is designed to help calculate potential yield gains, and associated needs for fertilizer and seed. It helps anticipate production gains in major rice-growing regions within the country and consequently the expected reduction in rice importation at national level.

For its first use in the ERI workshop, country-specific spreadsheets were preloaded (by AfricaRice) with the necessary primary and secondary rice production and price data from several sources, including AfricaRice surveys, FAOSTAT and USDA.

Benin, for instance, reworked its rice production target after it used ERIS. It was one of the first countries to sense the looming rice crisis as early as 2006. In that year, the Benin Ministry of Agriculture signed an accord with Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ, the German technical cooperation agency) to obtain assistance to boost national production to 900,000 tonnes of paddy (600,000 tonnes of milled rice) by 2015.

In 2008, Dr Cyriaque Akakpo, head of the rice research program of the Institut national des recherches agricoles du Bénin (INRAB), was trained in the use of ERIS. The supply of 900,000 tonnes of paddy by 2015 was entered into the ERIS, and the prediction of resources required to reach the goal – funds, seeds and fertilizers – was found to be unrealistic. Consequently, INRAB settled for the lower target of 450,000 tonnes of paddy.

ERIS continues to be used by NARS scientists to determine the resources required to meet targeted increases in production. INRAB calculated that to increase paddy production by 100,000 tonnes per year, there is a need for 60 tonnes of foundation seed to provide 2200 tonnes of certified seed for the farmers. These figures form the basis of Benin's national rice development strategy.

## Policy Analysis Matrix

The Policy Analysis Matrix (PAM) is another tool that AfricaRice and NARS have been using to study the comparative advantage of domestic rice cultivation in African countries, and the impact of helpful policies. AfricaRice scientists have been training NARS scientists in the use of PAM.

"PAM is a very simple tool that allows us to see the efficiency of resource use for rice production in a country, and assess the country's competitive advantage," says Dr Ali Touré, agricultural economist. "It also helps us understand the impact of policies at the level of the farmer, processor and trader. We have been training NARS scientists in the use of this tool to improve their ability to develop the right policies for increasing domestic rice production."

AfricaRice and partners have been using the PAM approach since 1995. PAM-based studies were conducted in Mali, Nigeria, Senegal and Sierra Leone,

and training events held in Côte d'Ivoire, Mali and Senegal. PAM was also used to study the competitiveness of rice production systems in Guinea and has recently been used as a decision-making tool in a rice and maize stratification project.

In 2010, two workshops were held for increasing the availability of and access to rice statistics, and PAM was one of the tools shared with the NARS partners. The first workshop was from 26 to 31 July at Addis Ababa, Ethiopia, and the second one from 16 to 21 August, at Ouagadougou, Burkina Faso. This helped national scientists to analyze their country's advantage in producing rice.

## Response from the national systems

The capacity-building activities that AfricaRice has implemented have received positive feedback from participants. "I join colleagues in saying a big 'thank you' for the seemingly unending drilling that we went through, which of course resulted in more strength and experience in our own part," says Luke Olarinde, a postdoctoral scientist working for SSA CP, who collaborated with the impact-assessment team at AfricaRice.

"Although the going got tough at some points, the benefits of the workshop overshadowed the tough moments. I believe that the lessons we learned will also benefit our stakeholders," says Judith Odoul, another postdoctoral scientist from FARA.

"I could learn the use of data management and analysis tools such as Access and Stata during my three-month internship at AfricaRice," adds Chantal Ingabire who was sent by the Rwanda Agriculture Research Institute (ISAR) in 2009.

In 2010, the Policy, Innovation Systems and Impact Assessment Program of AfricaRice trained 37 scientists from the NARS and universities. These included two visiting scientists from McGill University of Canada; three trainees from the University of London; six visiting scientists from FARA and one from the Ecole supérieure d'agriculture de France. The rest were NARS scientists from Benin, Côte d'Ivoire, The Gambia, Ghana, Nigeria and Sierra Leone.

At the Second Africa Rice Congress, held at Bamako, Mali, from 22 to 26 March 2010, the participants strongly recommended further capacity building of scientific human resources in the NARS. Intervention by AfricaRice has already helped African countries strengthen their capabilities for evidence-based policy analysis and impact assessment. This lays the strong foundation to help Africa not only avoid and overcome another rice crisis, but also create the necessary policy environment for the development of its rice sector.

*Discussions continue even after the normal training hours.*

# Overcoming abiotic stresses to increase production

In 2010, the three-year first phase of the project *Stress-tolerant rice for poor farmers in Africa and South Asia* (STRASA) was completed, and it was decided to continue the project in a second phase from 2011 to 2013. In the first phase, the project worked to develop breeding lines that are tolerant to drought, submergence, salinity, iron toxicity and cold.

"The most notable achievement of STRASA during the first phase was that we were able to identify more than 20 promising rice breeding lines that are tolerant to different abiotic stresses," says Dr Baboucarr Manneh, AfricaRice coordinator for the project. "We achieved this through participatory trials conducted in collaboration with farmers and the national agricultural research systems (NARS) in 14 African countries."

Through the project, STRASA partners produced more than 8000 tonnes of rice seed between 2008 and 2010.

Further, as part of capacity building in Africa, more than 900 scientists, technicians and farmers were trained in rice production, seed production, improved rice breeding techniques, and leadership and enterprise management.

Implemented in collaboration with the International Rice Research Institute (IRRI), with financial support from the Bill and Melinda Gates Foundation (BMGF), the STRASA project has a multi-pronged strategy to deal with abiotic stresses. This includes the following:

- Develop rice varieties tolerant to drought, submergence, salinity, iron toxicity and cold;
- Enhance the capacity of researchers, seed producers and extension agents to propagate stress-tolerant varieties;
- Promote seed exchange and varietal release;
- Strengthen impact assessment and targeting to identify technology combinations that best meet farmers' needs, and map the frequency, spatial coverage and severity of abiotic stresses in rice-growing environments;
- Scale up seed production and delivery of improved technologies;
- Improve project management and communication among stakeholders.

In the first phase in Africa, the project was implemented in 14 countries: Benin, Burkina Faso, Ethiopia, The Gambia, Ghana, Guinea, Madagascar, Mali, Mozambique, Nigeria, Rwanda, Senegal, Tanzania and Uganda. These countries together have 6 million hectares of rice cultivation, of which 78% is rainfed.

The abiotic stresses on which the STRASA project works have significant impact on the productivity of rice farms and farmers' incomes. AfricaRice assessed the impacts of these stresses in Benin, Burkina Faso, Mali, Nigeria, Rwanda, Senegal and Uganda.

Flooding affects 50% of irrigated areas in Burkina Faso and Rwanda, and causes more than 40% yield loss.

Drought is a major constraint in the upland ecosystem in Mali where 44% of the rice-cultivated area is affected, Burkina Faso where 45% of the area is affected and Uganda where 53% of the area is affected. It causes 40% yield loss in Mali, 36% in Burkina Faso and 53% in Uganda.

Among the STRASA Phase I countries, yield losses due to soil-related problems were higher in the lowlands than in the uplands. In Senegal and Uganda, yield losses were as high as 40% and 25%, respectively, due to soil-related constraints such as salinity and iron toxicity.

An impact assessment analysis conducted by AfricaRice in seven of the target countries (Benin, Burkina Faso, Mali, Nigeria, Rwanda, Senegal and Uganda) suggested that potential impact of research targeted to reduce yield loss due to stresses gave a global cumulative benefit of US$ 32.9 million over the three-year period 2008–2010. This meant additional income for farmers and increased rice production in Africa.

*A seed multiplication field of salt-tolerant rice varieties at Sapu in The Gambia.*

## Building tolerance to stresses

### Drought

Drought is a major problem in rice-growing areas of Africa, which are predominantly rainfed. Developing drought-tolerant rice varieties, however, is a major challenge to breeders due to the complicated tolerance mechanisms involved. Consequently, drought-tolerance breeding requires the use of precise phenotyping approaches in order to clearly differentiate between genetic and environmental effects on crop performance under drought. During the first phase of STRASA, two rain-out shelters were installed at Ikenne, Nigeria, for drought screening under controlled conditions. Field trials in Benin, Burkina Faso, Mali, Nigeria and Uganda were established in drought-prone areas and subjected to naturally occurring drought stress.

More than a thousand breeding lines and accessions were screened for drought tolerance in multiple locations such as Ikenne and Ibadan in Nigeria, Quelimane in Mozambique, and Dakawa in Tanzania.

Eighty drought-tolerant breeding lines selected from on-station trials were evaluated in participatory varietal trials with partners from NARS and farmers in Benin, Burkina Faso, Mali, Nigeria and Uganda. After two years of PVS trials, eight breeding lines stood out as the most preferred by farmers in these five countries; these lines are being validated in 2011 trials prior to submission for varietal release in the various countries.

### Submergence

In STRASA Phase I, varietal development for submergence tolerance was limited to evaluating Asian mega-varieties with the *Sub1* quantitative trait locus (QTL). Seven Asian mega-varieties with *Sub1* were evaluated in Ibadan for submergence tolerance alongside local checks and the mega-varieties without *Sub1*. The varieties with *Sub1* were superior to others after 21 days under complete submergence. The popular varieties in Nigeria, WITA 4 and FARO 35 were the most affected by submergence, showing very low yields (0.08–0.41 t/ha), while the varieties with *Sub1* yielded up to 3.6 t/ha under submergence. The seeds of the *Sub1* varieties were distributed to interested NARS in sub-Saharan Africa.

### Salinity

More than 1000 materials comprising segregating populations, advanced breeding lines and popular

*Farmers examining rice plants during a PVS trial of iron-toxicity-tolerant rice at Edozighi village in Nigeria.*

varieties from AfricaRice, NARS and IRRI were successfully screened for salt tolerance.

Marker-assisted selection (MAS) for salt tolerance has been initiated by using Pokkali and FL 478 as donors to transfer a salt-tolerance QTL, *Saltol*, into popular varieties grown in Africa including Sahel 108, Sahel 201, Sahel 202, Kogoni 91-1, ITA 212, RASSI, BG 90-2, Bouaké 189 and NERICA-L 19.

From 188 accessions collected in saline fields in Senegal and The Gambia, eight traditional varieties were found to be tolerant and are to be used as donors in the AfricaRice rice-improvement program. Molecular diversity analysis of these eight varieties revealed that at the *Saltol* locus, six of the varieties had alleles different from those found in Pokkali, a well-known salt-tolerant donor. A similar diversity study was conducted on the 60 lowland NERICAs, of which four were found to be salt tolerant with two of these lines harboring alleles different from Pokkali at the *Saltol* locus. These newly discovered salt-tolerant lines are being used in crosses to transfer novel salt-tolerance genes into widely grown lowland rice varieties in Africa.

Seeds of 104 salt-tolerant materials previously screened at the AfricaRice Sahel station in Senegal, were multiplied and used for participatory varietal selection (PVS) trials in The Gambia, Mali and Senegal. Eight lines were selected by farmers in the three countries after two years of PVS trials using different criteria such as plant height, panicle size, earliness and panicle exsertion, as well as grain yield, resistance to bird damage and lodging resistance. These lines will be characterized for their agronomic traits, pest and disease resistance. The best lines will be recommended for varietal release.

## Iron toxicity

AfricaRice efforts to develop iron-toxicity tolerance in African rice continue through a multi-pronged approach (see box Rice that thrives in iron-rich soils).

*Dr Khady Nani Dramé, AfricaRice molecular biologist, leading the iron-toxicity research at a PVS site at Diecke, Guinea.*

This includes screening, identification of iron-toxicity tolerant germplasm, varietal development, gene discovery for iron-toxicity tolerance, and introgression of the QTL for iron tolerance into popular African varieties.

## Cold

Developing rice varieties tolerant to low temperatures experienced in the Sahel zone of Africa and at high altitudes in East and Southern Africa will allow for intensification of rice production, as well as expansion into areas where extremely low temperatures currently prevent rice production. In a bid to develop cold-tolerant rice varieties for Africa, more than 500 breeding lines and accessions were evaluated under both controlled and field conditions. From these trials, breeding lines and varieties were identified that could be used either as donors in cold-tolerance breeding programs or tested with farmers in PVS trials for

eventual release as cold-tolerant varieties adapted to African conditions. Some of the tolerant materials identified were Silewah, Somewake, Stejaree, Diamante, Plovdiv22, Caloro, Koshihikari, IR74520-29-4-2-2-4-1-1, WAS21-B-B-20-4-3 and WAS169-B-B-4-2. Subsequently, more than 50 crosses were made between cold-tolerant donors and popular rice varieties grown in lowlands and highlands in Africa. MAS has also been initiated to develop cold-tolerant varieties, and an allelic diversity survey for cold-tolerant genotypes was carried out at the Biosciences eastern and central Africa Hub (BecA) laboratory in Kenya. Foreground markers for cold-tolerance QTLs and background markers for recurrent parents have been identified to facilitate MAS for cold tolerance.

During the first phase of STRASA, PVS trials were conducted in Ethiopia, Madagascar, Mali, Rwanda and Senegal. Data on farmers' perceptions were obtained during farmers' field days. A total of 126 entries were also sent to each of the countries for evaluation at one site in each country. Twenty-two promising breeding lines were selected by farmers in the five countries and these are being evaluated in a final round of PVS before submission for varietal release.

*Abdoulaye Sow, research assistant, examining rice plants in a screen house at the AfricaRice Sahel Station in Ndiaye, Senegal.*

*Technicians at the AfricaRice Sahel Station in Ndiaye, Senegal, collecting flowering panicles for crossing to generate new breeding populations.*

## A continuing process

During the first phase of the STRASA project, the AfricaRice–NARS team working in collaboration with IRRI achieved successes and these efforts are continuing into the second phase.

The rice varieties that are being developed will help overcome the hurdles imposed by the widespread environmental stresses that limit rice yields in Africa.

"When the farmers are certain that the varieties that they are planting are capable of tolerating stresses, they invest more resources, time and energy into their fields. This in turn can help increase rice production and ultimately improve farmers' livelihoods," observes Manneh.

## Rice that thrives in iron-rich soils

Iron is a 'trace element' that must be available to rice plants in very small quantities for normal growth and development. However, at high concentrations, iron is toxic to rice plants (i.e. it poisons them). Affected plants develop small brown spots that spread and merge, and finally result in reddish-colored leaves. Moreover, iron toxicity alters the plant's root structure and development, and leads to spikelet sterility (i.e. reduced yield). Iron toxicity is a major problem in lowland rice, including irrigated systems. Rice yield losses attributable to iron toxicity range from 10 to 100%, with an estimated average of 50%. Several management and cultural practices can be used to reduce the occurrence of iron toxicity in rice fields, but most of these are not affordable to African resource-poor farmers. Consequently, AfricaRice focuses on improving varieties' tolerance to iron toxicity.

For many years, AfricaRice has evaluated rice varieties, selected promising lines, and developed appropriate agronomic practices that can help farmers cope with iron toxicity. In recent years, AfricaRice molecular biologist Khady Nani Dramé and her colleagues have added new dimensions to the iron-toxicity research. They used GIS and remote-sensing tools to map the potentially toxic areas. These tools will help reveal the extent and severity of the constraint and also guide breeders in their evaluation and dissemination strategies.

A key issue is how different varieties grow and develop in different environments (in this case, under different levels of iron toxicity). What a plant (or any organism for that matter) looks like is known as its 'phenotype', and evaluating how varieties grow in different environments is known as 'phenotyping'. To make such screening for iron-toxicity tolerance efficient, it would be invaluable to have a standardized, controlled and reliable method. AfricaRice continues to review screening methods, including fields in hot spots, pots on station and a hydroponic (soil-free) environment. Field screening is difficult, requiring many repetitions, because iron concentration levels – and consequently toxicity – vary widely within and among fields even in hot-spot areas. However, farmers' fields are the environment where rice is grown for food, so any new variety considered tolerant has to be verified in field trials.

The experimental pot screening that AfricaRice conducted turned out to be inefficient, as the performance of varieties in pots on station was completely different from that of the same varieties tested in the field in a hot spot. Furthermore, testing in a hydroponic environment can only be carried out during the vegetative stage (i.e. before rice plants flower). As yet, there is no evidence that tolerance during vegetative stage is directly correlated with tolerance during reproductive stage (from the time of flowering to harvest), as reflected in final yield. This aspect is still under investigation.

Efforts to combat iron toxicity also include use of molecular breeding. AfricaRice is identifying and validating molecular markers (QTLs) associated with iron-toxicity tolerance. A few QTLs have been validated that will be used in marker-assisted selection to improve popular varieties nominated by national programs.

With tolerant material already available, PVS trials were started at three sites in each of four countries (Burkina Faso, Ghana, Guinea and Nigeria) in 2009 to determine farmers' perceptions of these materials. The first year saw farmers visiting rice gardens planted with 80 breeding lines (including a local check), from which they selected those they preferred. Ten breeding lines were retained per country for further testing. These ten lines were further evaluated in 2010 with farmers in a second phase of PVS trials and in each country three lines were selected by farmers. These three best iron-toxicity tolerant varieties are now being evaluated under farmers' management before being nominated for national release. "Even in the first year, we were seeing new varieties performing well in farmers' fields in comparison with their local varieties," Dramé enthuses.

## Dealing with bacterial blight in West Africa

Despite the significant yield and value loss that bacterial blight (BB) causes in the Sudano-Sahelian eco-region in West Africa, the disease is not very well studied. A German-funded project that ended in 2010 helped AfricaRice scientists to gain significant understanding about the disease, improve disease management and start the process of developing BB-resistant rice varieties.

"BB causes significant loss in some parts of West Africa," says Dr Yacouba Séré, AfricaRice pathologist who led the project. "In Niger, we found that the yield loss can be anywhere between 35 and 52%. In Benin (where BB occurs only in the northern part of the country), the yield loss can be up to 25%."

*A blight-infected field in West Africa.*

In addition to the yield loss, the disease can also cause value loss due to improper grain filling, says Séré. When the symptoms of the disease appear in the latter period of plant growth, there is no adverse effect on yield. However, the grains break and powder during milling.

The yield loss is more when the plant is infected at an early stage of development. If the infection is at a very early stage, the plant wilts and dies. At a slightly later stage, the leaves become blighted (burnt looking), which results in reduced photosynthesis and thereby fewer grains. The disease is caused by the bacterium *Xanthomonas oryzae* pv. *oryzae*.

Since BB had not received scientific attention on a scale similar to that of *Rice yellow mottle virus* (RYMV) and rice blast, AfricaRice scientists started to study the incidence of the disease, the diversity of the pathogen and the varietal research required to control it.

"We started our partnership work in 2007 with the national agricultural research systems (NARS) from West Africa. This was the starting point for developing the two-year project funded by the German Ministry of Economic Cooperation and Development (BMZ)," says Séré.

The BMZ-funded project covered Benin, Burkina Faso, Mali, Niger, Senegal and Togo. It aimed at filling the knowledge gap hampering the development of a control strategy, and to establish a strong research team on rice bacterial blight in West Africa.

The project was well appreciated by the donors. The project-completion report from BMZ noted: "For the first time the entire complex of the BB in rice production was systematically investigated under West African conditions in six countries. The findings reveal that the situation in West Africa is different from that in Asia. The understanding will provide a platform for the development of sustainable control strategies for the disease for West African production conditions."

The Institute of Plant Diseases and Plant Protection of the Leibniz University of Hannover, Germany, was the German partner in this project.

"We found an interesting correlation between the application of nitrogenous fertilizers and the spread of the disease, which has to be investigated further," says Séré. "If nitrogen is applied before the infection, then it can increase the disease severity. Whereas, nitrogen application after infection has no adverse effect and can even decrease the disease."

Moreover, the team also found that the disease affects some of the weeds that occur in and around rice fields. The bacteria from the weeds can infect the rice plants. The pathogen can also travel through irrigation water. Farmers in Niger have started burning the crop residues and weeds after harvest to reduce infection. The disease can survive on the grain and can be transmitted through it, though it is not seed-borne.

The effort to identify the genes for resistance to BB was done using near-isogenic lines (NILs: lines that differ from each other in only one or several resistance genes). The NILs were developed by the International Rice Research Institute (IRRI) using variety IR24. Although IR24 is susceptible to all BB pathogens in Asia, it turned out to be resistant to some of the BB pathogens in Africa – making it difficult to identify the resistance gene and questioning the efficiency of some genes (e.g. *Xa7*, *Xa14*, *Xa21*) observed in some countries.

"We need to build our own set of NILs for Africa, since the BB strains on the two continents are different," says Séré.

The research group also found that Giganté – a variety that originated from East Africa, and which is widely used as the donor for the RYMV resistance gene – is susceptible to BB. This means that the process of making varieties resistant to RYMV has to take care not to bring the susceptibility to BB into the new RYMV-resistant varieties.

"In Burkina Faso, Mali and Benin, we have some fields where we have both BB and RYMV infections. Dealing with both the diseases is difficult," observes Séré. He added that in Rwanda and Uganda many mixed infections were observed with a predominance of another leaf bacterial disease due to *Xanthomonas oryzae* pv. *oryzicola*.

According to Séré, the challenge is not only to find the right genes for resistance, so that the breeders will be able to develop BB-resistant lines, but also to advise on where the population structure of the pathogen can allow such resistant material to be deployed safely. The right gene is the one that will be durable and will remain efficient for long time. For instance, in Asia, the *Xa4* gene was efficient for a long time before a new pathogen race evolved to overcome it.

The success of this project spilled over into another project in three countries in East Africa – Rwanda, Tanzania and Uganda. This project, again funded by BMZ, and in partnership with the University of Göttingen, Germany, and the NARS of the project countries, will study the impact of climate change on BB resistance.

## Bringing multiple stakeholders together

Scientists look at rice as a crop for research, while farmers look at it as a component in an agricultural system which can provide food and livelihood to their families.

The project entitled Realizing the agricultural potential of inland valley lowlands in sub-Saharan Africa while maintaining their environmental services (RAP) has achieved initial success in bridging this divide.

"We are bridging this scientist–farmer divide through multi-stakeholder platforms (MSPs)," says Dr Joel Huat, coordinator for the RAP project. "Through these platforms we bring together all stakeholders from the rice-growing systems."

*A multi-stakeholder platform meeting in progress at Bamadougou village in Sikasso, Mali.*

The RAP project focuses on an innovation-systems approach to research. It involves a paradigm shift from the technological package approach to an integrated agricultural research approach. It aims at ensuring that researchers work together with smallholder farmers, pastoralists, extension agencies, the private sector and NGOs to achieve impact on the ground.

It is based on the understanding that the research and development challenges in the inland-valley lowlands are complex and diverse and cannot be handled by individuals or organizations working alone. These challenges call for integrated, collective and concerted action that includes multiple institutions, conducive policy framework and cost-effective technological options for sustainable production, processing and marketing.

During the first phase of the RAP project, from 2009 to 2010, MSPs were established at Dogbo in Couffo department and Houinga in Mono department in Benin, and at Doumanaba and Bamadougou in Sikasso region of Mali. These MSPs have the legal status of non-profit organizations and have been able to attract the attention of local leaders. For instance, the mayor of Doumanaba was a participant in the process of establishing the MSP there.

The MSPs facilitated activities aimed at increasing rice production, such as rice seed production in farmers' fields in Benin; testing of NERICA-L 20 in Benin and Mali; and training on technical practices provided by the agricultural extension service. The RAP project works to increase rice production in the inland valleys, which are lowlands with high potential to increase rice production. In Benin, only 4% of the area of the inland valleys is used for cultivation, and in Mali only 10% of the area is used.

According to Huat, the focus is also on rice-based cropping systems to increase diversity and income for the farmers. "In this project, we focus on rice-based cropping system and not on rice alone. We have been encouraging the growing of vegetables along with rice so that the economic returns for the farmers are more. Vegetables can be grown during the off-season when there is insufficient water for rice cultivation."

In Benin, the rice–vegetable cropping systems consist of growing leafy vegetables with rice in a production cycle. The yield of vegetable crops in rotation with rice is still low, but is moving toward a substantial productivity increase. In addition to the leafy vegetables, okra and pepper are also grown. At Bamadougou, the rice crop is rotated with potato, sweet potato or other vegetables.

The rice–aquaculture combination was also tried out as part of the RAP project in Benin. There is potential for much improvement in this system.

The third unique feature of the RAP project has been the focus on a value-chain approach. "We found it very important to identify the bottlenecks from the production to the market and find ways to resolve them," says Huat.

Working with the producers, traders, consumers and processors, the project identified the constraints and opportunities in the rice–vegetable value chains in inland valleys. The main constraints were the unavailability of good-quality rice seed; postharvest losses; poor storage methods for vegetables; high price

of seeds and fertilizers; inadequate markets for local rice; poor access to credit; and lack of rice processing equipment.

The opportunity in the lowlands in Benin was the availability of water throughout the year, allowing for off-season production of rice combined with other high-value crops and fish. Since 90% of the farmers in these areas have access to mobile phones and radios, there is immense potential for building a communication network through this infrastructure.

During the first phase, the project partners were the Institut national des recherches agricoles du Bénin (INRAB), Institut d'économie rurale (IER) in Mali, the International Institute of Tropical Agriculture (IITA), Wageningen University and Research Center (WUR) in the Netherlands, the International Center for Development Oriented Research in Agriculture (ICRA) in the Netherlands and France, and the Centre de coopération international en recherche agronomique pour le développement (CIRAD) in France.

## Developing women's seed enterprise

Where do more than 80% of the smallholder farmers in West Africa go for seeds? They go to a neighbor's farm.

If farmers can be trained to produce good-quality seed, then the existing system of community and informal exchange can be strengthened. And, if the seeds are produced and marketed by women farmers' groups, then it could be the starting point of a viable seed enterprise.

Working with the West and Central African Women Rice Farmer Group Association (WORIGA), AfricaRice has laid the foundation of grassroots seed enterprises in Benin, Togo and Senegal. Though the enterprises are still at a nascent stage, the seed of the idea has been sown.

"The idea is to see whether we can organize women rice producers into small community-based seed enterprises, support them with research products, and link them with the market," says Dr Rita Agboh-Noameshie, gender specialist at AfricaRice and the mentor for the project.

The initial financial support for the project came through a small grant provided by the US-based New Field Foundation. This was supplemented by funds from the European Union.

Though AfricaRice had been working with many of the constituent women-farmer groups of WORIGA, the Center's involvement in this project started with training programs that it organized on seed production in 2010. The training sessions were organized at Glazoué in Benin, Adéta and Danyi in Togo, and Saint-Louis and Kolda in Senegal.

In each of the countries, 30 women farmers were trained on the production of quality seed, seed selection and entrepreneurship between 6 September and 26 October 2010. In addition, a few extension agents and representatives of NGOs were also trained to strengthen follow-up and sustainability of the project.

The women were trained on techniques for seed preparation, harvest and postharvest operations, and the steps needed for seed certification. The trainers included experts from the NARS and from the national seed services.

The women farmers' groups were given foundation seeds, from which they produced commercial seeds that can be shared with their communities and other villages. The women farmers from villages around Glazoué in central Benin cultivated 550 kg of foundation seed on 12 ha of land in different villages and generated 39 tonnes of commercial seeds during 2010–2011.

"We distributed the foundation seeds of NERICA 1, 2, 4 and NERICA-L 20 that we got from AfricaRice

after the training to the farmers groups in surrounding villages to get more farmers involved in the process," says Ms Antoinnette Agoussou, President of the Imoura-Iche Union representing 18 women-farmer groups near Glazoué, which is a part of WORIGA.

Agoussou says that though the Imoura-Iche Union has been working with AfricaRice since 2000, the seed-production training project has given the partnership a new direction. The farmers' love for the NERICA varieties can be seen from the names they have given to some of them in the Dacha language spoken in and around Glazoué. They named NERICA 4 '*Gbaminaya*' meaning 'it has saved me', and NERICA 1 '*Iyatan*' meaning 'my sufferings are over'.

The ability to grow good-quality seeds has excited the members of the Imoura-Iche Union and they want to distribute excess seeds to other rice farmers in Benin. Though they have not yet thought through a marketing strategy, they feel confident that they will be able to start a seed enterprise soon.

"We are thinking of organizing a rice festival," says Ms Orounla Delphine from Okpataba village. "In this we will cook NERICA rice and encourage others to take good seeds from us."

"Teach us how to make food products from NERICA and that will attract more people to our seeds," adds Ms Mba Leontine from Tcheti village.

"We can keep 5 tonnes of seed for our needs. The rest can be distributed or marketed," says Ms Madeleine Koudere from Savè.

Agboh-Noameshie feels satisfied that the training and follow-up have been able to encourage women smallholder farmers to get into growing and marketing seeds. The results of the first season have been successful and, with greater focus on certification and marketing, the women could become seed entrepreneurs.

"If the momentum continues, then we hope that in the coming years 50 to 80% of the seeds used by farmers in the areas which have impact from the project will be of good quality and of improved varieties. At least one-half of the rice producers will be encouraged to buy seeds from the micro-enterprises, thereby increasing the income of the women farmers by 10 to 20%," said Agboh-Noameshie.

*The members of the women-farmers' group from villages around Glazoué in Benin, with the seed that they produced.*

The members of Imoura-Iche Union have started working forward from the seed linkage and want expert advice on cultivation practices. "During our training, we saw a combine harvester in operation. We want to include mechanization in our farming," hopes Koudere. Ms Jacqueline Daga of Okpataba village wants support in getting fertilizers, and another member needed training on the appropriate use of herbicides.

Though the entry point was through seed production, the team at AfricaRice did think that it would lead to other areas related to rice production. "We are helping to build a research program around the activity of training women on seed production and entrepreneurship. The project will use a scientific protocol to assess the effectiveness and impact of training farmers in making quality seed available," says Dr Aliou Diagne, AfricaRice program leader and impact assessment economist.

"This project links the strengthening of the informal seed sector in West Africa with women's empowerment. It also links women smallholder farmers to research, microfinance and markets. And, most important, it will strengthen institutions," Diagne adds.

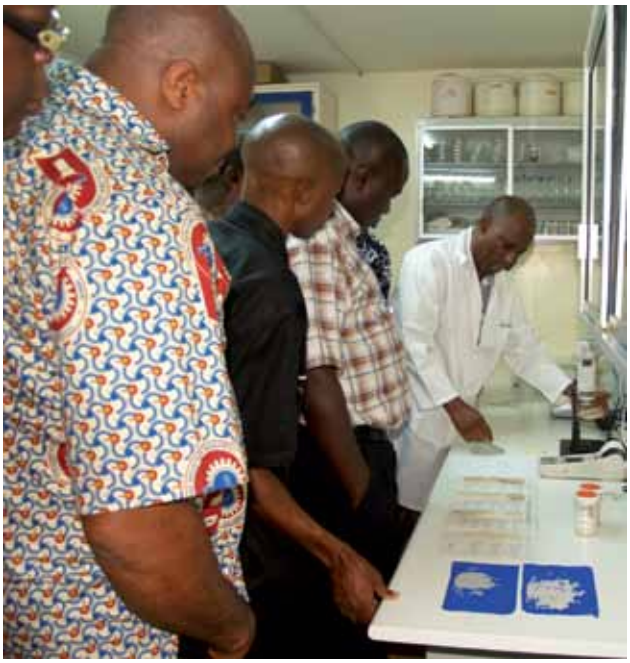
With encouraging initial results, this seeds project holds the promise of turning the smallholder women farmers into a successful businesswomen producing and marketing seeds.

## Improved grain quality, better value

"Rice is food and rice farming is the business of producing food that someone else will buy and eat," says Dr John Manful, grain quality specialist at AfricaRice when explaining the renewed thrust at the Center to improve grain quality and decrease post-harvest losses. As he spoke in his grain-quality laboratory, his assistants weighed samples of grain, and checked their cleanliness, levels of broken grains and hardness.

Like in any other business, consumers will choose the rice grain that they believe has the best quality for the price they are willing to pay. And it is here that the domestic rice produced in Africa fails to compete with the imported rice. Unlike most other cereals, rice is consumed as a whole grain and therefore its physical properties such as grain size, shape, uniformity, cleanliness and aroma are of the utmost importance for the consumer. The rice has to be free from impurities and should have cooking properties that conform to the consumer's personal and cultural preferences.

While rice research has been continually working to develop varieties that are higher yielding and resistant to stresses, paying more attention to grain-quality considerations during the breeding process can help increase the market competitiveness for African rice. With the re-establishment of the grain-quality laboratory in Cotonou, Benin in 2010, AfricaRice is trying to ensure that varieties developed meet the required grain-quality considerations. These include parameters such as milling yield, other physical properties, and the attributes of the cooked grains preferred by consumers.



*Dr John Manful explains grain quality testing to NARS partners.*

"For a rice variety to be competitive on the market, it must have certain attributes that are desired by the processor, marketer and consumer," explains Manful. "Meeting these expectations is as important as meeting the expectations of the farmers on yield and stress-resistance."

Postharvest losses may be classified as either 'quantitative' or 'qualitative'. According to Manful, quantitative postharvest losses in rice in Africa are estimated to be between 15 and 25 percent, while qualitative losses (which are estimated by the price differential between imported and locally produced rice) range from 15 to 50 percent. "It is important to reduce such losses and ensure a top-quality product that our consumers will want to buy if rice farming as a business is to be competitive in Africa."

A good rice variety should have a good milling yield, i.e. there should be minimum quantitative loss when paddy is milled to grain. Grain breakage should be low during milling, for broken grains mean lower price in the market and therefore a loss for the processor and marketer.

Due to the relative convenience with which rice can be cooked, it is fast becoming a food grain of choice in many parts of Africa. The production of rice has been increasing in recent years in many rice-growing countries on the continent. However, despite the increase in demand and in domestic supply, African markets continue to show a preference for rice imported from Asia. The reason: domestic rice reaching the market is of variable quality.

The new grain-quality laboratory at AfricaRice will provide a platform for screening breeding lines for acceptable grain quality. To complement the efforts of the main laboratory in Cotonou, smaller facilities are being established at AfricaRice stations in Dar es Salaam, Tanzania, and Saint-Louis, Senegal.

Once they are fully operational, these laboratories will also assist in evaluating rice varieties from AfricaRice's NARS partners and help in providing training for NARS scientists and researchers.

Previously, AfricaRice had a grain-quality laboratory with funding support from the Japan International Cooperation Agency (JICA) at the Center's headquarters at M'bé, Côte d'Ivoire. For many years, JICA postharvest and grain-quality experts were seconded to this facility, which also trained NARS scientists. However, the laboratory could not be relocated when the Center moved to its temporary headquarters in Cotonou.

Improving grain quality also involves examining the entire value chain from crop cultivation, through harvesting and processing, to marketing. Grain quality is not just dependent on the variety of rice, but also on the crop production environment, harvesting, processing and milling systems. Considerable amounts of rice get lost in inefficient postharvest systems in many African countries.

Improvement of grain quality and postharvest processes is one of the six themes of the Global Rice Science Partnership (GRiSP), the first CGIAR Research Program approved in 2010. GRiSP envisages research to reduce postharvest losses; improve the grain quality of new rice varieties; improve value-chain linkages and efficiencies; and improve the use of husk and straw to produce bioenergy and cut carbon emissions.

Manful feels confident that as the expertise on grain-quality evaluation and improvement becomes an integral part of rice research, cultivation, processing and marketing in Africa, locally produced rice will be able to satisfy local consumer preferences. When consumers adequately value locally produced rice from the market, the impact of increasing production in Africa will be fully felt.

# Emergency projects establish seed systems

An emergency situation calls for an immediate response. It is also an opportunity to initiate the process of change that can lead to longer-term development.

When the rice crisis hit Africa in 2008, AfricaRice initiated two emergency projects. The first project, with financial support from the United States Agency for International Development (USAID), aimed to boost rice production in Ghana, Mali, Nigeria and Senegal. The second, with support from the Government of Japan, was for improving access to rice seed in 20 countries covered by the Coalition for African Rice Development (CARD). Both projects ended in 2010, and delivered more than they set out to. Though they were emergency responses, the systems that these projects have put in place will help rice production in the medium and long term in the project countries.

The USAID-funded project was implemented in collaboration with the International Center for Soil Fertility and Agricultural Development (IFDC), Catholic Relief Services (CRS), and the national agricultural research systems (NARS) in Ghana, Mali, Nigeria and Senegal.

*AfricaRice Director General Papa Abdoulaye Seck participates in a seed distribution function in Côte d' Ivoire.*

*Rice farmers of Sare Segni village on the banks of the Niger River in Mali value their crop so much that they protect it against bird damage using a fish net that costs about US$ 100 for 0.25 hectare.*

The US$ 5.1 million project aimed to increase the use of high-yielding rice varieties, fertilizers and improved farming methods. This in turn was to increase rice production in each country by 7500 tonnes, assisting at least 10,000 farm families in each country.

"The project assisted 56,420 farm families in the four countries, which was 41% more than the target of 40,000 families," says Dr Mamadou Kabirou N'Diaye, AfricaRice coordinator for the project. "Each country delivered anywhere between 26 and 61% above what was targeted."

Each farmer received certified seed of an improved rice variety, training and advice on best-bet production practices. The project distributed 937 tonnes of certified seeds. Most farmers also received fertilizers subsidized by their governments (CRS subsidized fertilizer in Ghana in 2009).

The subsidy on seed was determined on a country-by-country basis. In Ghana and Mali, vulnerable farmers were given seeds free while better-off farmers received a 50% subsidy. In Nigeria and Senegal, the subsidy was the same for every farmer, irrespective of their financial situation – 65% and 100%, respectively.

*Abdoulaye Sow from the national seed service of Mauritania with emergency seed supplies.*

These changes resulted in increased production of rice in the project countries. N'Diaye says that the farmers involved with the project produced 106,000 tonnes of paddy, which was an estimated 51,279 tonnes more than they would have produced without the project.

The project also established links between farmers and agro-input dealers, which increased the traders' business volume and credit worthiness. The input dealers in turn were linked with the seed companies, thereby bringing them into the value chain. For the first time in their business life, these dealers sold seeds.

## Farmers become seed producers

As a positive outcome from the project, the farmers appreciated the value of good-quality seed and communicated their willingness to buy it. Many also used part of their income to buy fertilizers.

Some farmers became seed producers. The project encouraged and supported 344 farmers, including 44 women, to become seed entrepreneurs: project staff trained them on seed production and conditioning, and business management. The entrepreneurs were also provided with subsidized foundation seeds to kick-start their businesses.

To ensure that the seed subsidy reached the targeted farmers, a seed voucher and seed fair system was used. During the seed fairs the agro-input dealers and farmer organizations made their seeds available. During the project, 69 seed fairs were organized through which 32,933 farmers were given seeds.

For fertilizers, the project rode on the existing subsidies by the national governments, thereby providing subsidized fertilizer to 36,244 farmers.

"This project was unique because it brought improved rice production technologies to farmers, trained farmers on the use of these technologies and facilitated their adoption, introduced and adapted agricultural machinery such as the mini combine-harvester, thereby reducing the gap between potential and farmers' yields, as well as the cost of production," says Dr Olupomi Ajayi, who coordinated the project in Nigeria and Ghana.

## Strengthening the national seed systems

The Japanese government supported a Seed Emergency Project to improve access to rice seed in sub-Saharan Africa. This project, which started in April 2009 and ended in July 2010, strengthened the formal seed systems in 20 African countries – Benin, Burkina Faso, Côte d'Ivoire, Cameroon, Liberia, Mali, Mauritania, Nigeria, Senegal, Sierra Leone and Togo in West Africa; and Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Sudan, Tanzania, Uganda and Zambia in East and Southern Africa.

"With the Seed Emergency Project we could work with the formal (conventional) seed system, thereby strengthening the sagging structure in most of the countries," says Dr Amadou Bèye, coordinator for the Seed Emergency Project.

The formal system, run by national ministries of agriculture and the national seed services, was suffering as a result of structural adjustment reforms.

The informal seed sector – the use of farmer-saved seeds and farmer-to-farmer seed exchange – constituted more than 90% of seed exchange in most of the countries in sub-Saharan Africa. By working with the formal sector, the project could ensure that certified seeds reached the farmers, and ensure quality control at every level.

During the project period, a total of 106.9 tonnes of foundation seed of 29 rice varieties was produced across 20 countries. The foundation seed was produced by the NARS and, in some cases, by private companies.

This in turn led to the production of 668.4 tonnes of certified seed by farmers' groups in most countries and by the private sector in a few (Kenya, Malawi, Mauritania, Mozambique, Nigeria, Uganda and Zambia). Côte d'Ivoire produced 60 tonnes of certified seed, Senegal 52.4 tonnes, Togo 50 tonnes, Sierra Leone 32.5 tonnes, Mauritania and Mozambique 32 tonnes each, and Malawi 30.9 tonnes.

The project involved 73 organizations – 20 NARS, 11 seed companies, 19 input dealers and 23 NGOs – strengthening partnerships between the public- and private-sector players on seed production and marketing. It benefited 58,226 farmers in the 20 countries.

AfricaRice scientists and national experts conducted training on seed production for 562 trainees, including 190 women – mainly technicians and extension workers from NARS, NGOs and private-sector companies. These in turn trained another 13,900 extension workers.

Based on the availability of breeder seed in each country, foundation seed was produced at the NARS research stations and in the fields of private seed companies. The production of foundation seed helped make the NARS become self-sufficient so that they could avoid seed imports. Where needed, AfricaRice provided foundation seeds, as in the case of Liberia.

The seed was certified by the national seed certification system in each of the project countries. While most of the project countries produced around 30 tonnes of certified seed, Senegal produced 52.4 tonnes. Sudan, which suffered drought in 2010, could produce only 18.6 tonnes.

Each country worked out its own system to distribute seeds to the farmers. In Malawi, Mozambique, Tanzania and Zambia, seed was distributed through the voucher-for-work system, in which the farmers are given vouchers which can be exchanged for seed from the farm-input dealers.

"The most important impact of this project was that it could deliver certified seed of high-yielding varieties to those farmers for whom getting good-quality seed was a dream," observes Bèye. "The farmers also got trained on ways to make use of the new varieties to increase production in their fields."

The project also strengthened seed systems in the countries by establishing all seed classes – breeder, foundation, registered and certified. The availability of quality seeds at the grassroots level also ensures that the seeds for coming seasons will also be good, since 90% of the farmers use informally exchanged seeds. The small-scale seed growers received training for improving the selection, treatment and storage of seeds from their own farms.

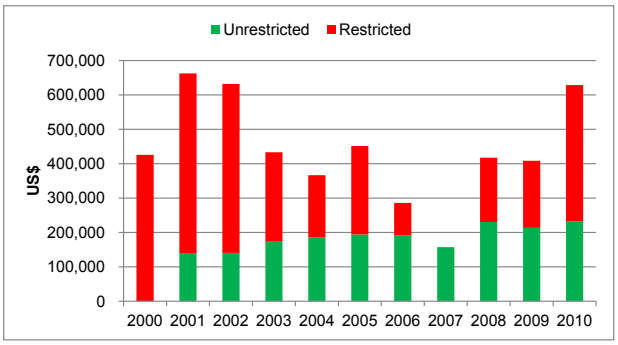
Give farmers seed, and it will help them overcome a crisis. Teach them how to grow and select their own good-quality seed, then they will prevent future crises from happening.

# Donor profile – Germany

Germany and AfricaRice have forged one of the most enduring and productive partnerships for agricultural research and development in sub-Saharan Africa (SSA).

For more than three decades, the two partners have worked together to improve food security, reduce poverty and promote the sustainable use of natural resources in SSA through high-quality research.

Germany has consistently been one of the top donors to AfricaRice; it has made important contributions to the Center's core funding through the CGIAR and to various special projects. Germany has also provided significant human, technical and intellectual resources to help AfricaRice fulfill its mission.




*German funding to AfricaRice, 2000–2010.*

Over the years, many top-class German scientists at AfricaRice have not only conducted research that has brought important benefits to smallholder farmers, but have also helped guide the Center through service on the AfricaRice Board of Trustees, such as Dr Heinrich C. Weltzien and Dr Alois Basler.

Dr Weltzien was appointed as the first Board Chair, after the Center became a full-fledged member of the CGIAR in 1986 and decided to move its headquarters to Côte d'Ivoire from Liberia. In 1992, when the Board held its first meeting in the Center's newly built facilities in Côte d'Ivoire, it named the Conference Room in his honor.

A number of German researchers worked at the Center during the 1990s, including Dr Folkard Asch, crop modeler; Dr Mathias Becker, agronomist; Dr Michael Dingkuhn, systems analyst and rainfed rice program leader; Dr Stephan Häfele, associate agronomist; and Dr Wilfried Hundertmark, water management specialist from the International Water Management Institute (IWMI). Several of these researchers have continued to work with the Center in their respective areas of expertise.

German researchers who joined the Center after 2000 include Dr Günther Hahne, director of research, 2001–2003; Dr Andreas Oswald, cropping systems agronomist, 2001–2004; and Dr Frank Mussgnug, cropping systems agronomist, 2010 to date.

## Collaborative work supported through core funds

The core funds provided to the Center by the German Federal Ministry for Economic Cooperation and Development (BMZ) and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) through the CGIAR have helped support the testing and sharing of new rice seed and the conservation and utilization of genetic diversity.

Thanks to such support, over 200 improved rice varieties have been introduced in SSA over the past 25 years, through the International Network for Genetic Evaluation of Rice in Africa (INGER-Africa), which is coordinated by AfricaRice.

Core funds have also helped AfricaRice to strengthen regional and national capacity for rice research and development through the training of national partners in collaboration with German institutions.

## Joint projects since the 1990s

As it is difficult to capture the totality of Germany–AfricaRice joint projects, only a few are highlighted here. The joint projects were in general carried out in

collaboration with German institutions as well as with other research partners.

In the early 1990s, the collaborative work focused mainly on strategic research relating to rice plant–environment interactions, particularly the mechanisms governing the tolerance of rice to the harsh agro-climatic conditions of the Sahel, in order develop more stable improved rice varieties.

## Crop models

The strategic research included studies on the physiological responses of rice varieties to temperature and solar radiation, conducted at the AfricaRice station in Ndiaye, Senegal, under irrigated conditions. This work led to the development of an easy-to-use decision tool called RIDEV (rice development), which can be used to determine best-bet planting dates to avoid cold- or heat-induced sterility in Sahelian irrigated systems. RIDEV also provides advice on the timing of crop management interventions – in particular nitrogen fertilizer application, drainage before harvesting, and harvesting – based on the variety chosen, crop establishment method (transplanted or direct-seeded), planting date and the climatic conditions of the site. AfricaRice and its partners are planning to develop a new version of RIDEV.

The knowledge obtained through these studies was also used to adapt the 'ORYZA' dynamic rice growth simulation model (originally developed by the International Rice Research Institute and Wageningen University) to Sahelian growth conditions, resulting in the ORYZA-S model. ORYZA-S predicts potential rice yields under irrigation, based on weather data (solar radiation, and minimum and maximum temperatures), choice of variety, crop establishment method and planting dates.

## Research on soil salinity

As rice is highly sensitive to salt stress in its early growth stages, soil salinity is a serious problem for rice cultivation, particularly in coastal areas, such as the Senegal River delta. The collaborative work at AfricaRice focused on salinity tolerance under Sahelian conditions.

Salt-tolerance traits in rice were identified and characterized, and screening methods were developed. The work included studies on sodium and potassium distribution in rice, and a model for sodium and potassium uptake was developed.

## Long-term fertility experiments (LTFEs)

The sustainability of highly intensive irrigated rice cropping systems is of great importance worldwide. With German support, LTFEs for intensive rice-based irrigated systems in the Senegal River valley were established at AfricaRice's research farms in the Senegal River delta and middle valley in 1991 and these trials continue today. These trials are without doubt unique in Africa. The LTFEs contain six fertilizer treatments and rice is grown twice a year. As of December 2010, some 40 crops had been grown

*Dr Heinrich C. Weltzien, the first Board Chair for AfricaRice (then WARDA).*

in succession on both research farms (Senegal River delta and middle valley).

The main aim of this research is to analyze the effect of intensive irrigated rice cropping on rice yield and the soil resource base by studying the changes of soil characteristics over time and by comparing soil nitrogen, phosphorus and potassium supply in different fertilizer treatments.

The results over 40 consecutive seasons showed that the best treatments at both sites yielded on average 7.1 to 7.5 tonnes per hectare. Soil organic carbon remained stable or increased irrespective of fertilizer application.

The LTFEs have shown that intensive monocropping of irrigated rice is sustainable in the Sahel. Yields remained stable at around 3 to 4 tonnes per hectare without the application of any fertilizer. Higher yields could be obtained by applying nitrogen every season, and phosphorus and potassium once a year.

## Integrated crop management (ICM) techniques

Based on the results of strategic research carried out in the Sahel in the early 1990s, a set of ICM recommendations for the Senegal River valley was developed.

The ICM basket includes options for improved fertilizer, weed and water management, improved varieties and efficient postharvest technologies, as well as decision-making tools, such as optimum planting date, seeding and fertilizer rates and timing of fertilizer application, based on crop modeling research.

ICM has proved to be a promising way ahead for SSA in view of the large gaps between farmers' actual yields and yields attainable under better management. The use of ICM techniques increases the productivity and profitability of irrigated rice and maintains the quality of the resource base. In Senegal, for example, ICM technology options increased average rice yields in irrigated areas from 4 to 6 tonnes per hectare.

## Participatory adaptation of appropriate technologies in West Africa

AfricaRice has placed increasing emphasis on participatory research and development by actively involving farmers and other actors in rice research and development in order to ensure that technologies address priority constraints.

As part of this strategy, a BMZ–GIZ funded project on participatory adaptation and dissemination of appropriate rice technologies for rainfed systems in West Africa was launched in 2000 and carried out over two phases.

The work was done in collaboration with the University of Hohenheim and with national partner institutions and farmers at three key sites (one in Benin and two in Nigeria).

The project helped build national partner capacity in participatory research through on-the-job training and postgraduate fellowships. It helped improve communication on farm-level constraints, potential acceptability and adoption of technologies among farmers, extension agents and researchers.

## Projects relating to peri-urban lowlands

Because of their more abundant water resources, lowlands can be a particularly valuable resource for agriculture. To ensure greater and more effective use of lowlands for crop production in West Africa, two consecutive BMZ–GIZ-funded projects were carried out at AfricaRice in the early 2000s.

The aim of the first study was to determine whether the proximity to urban markets or linkage to urban markets by good transport systems was significant for improving the agricultural use of lowlands in West Africa. It analyzed lowland use near four urban centers along an agro-ecological gradient.

The results showed the importance of market access for the development of lowlands in peri-urban areas

in West Africa, indicating that the key factor was not the proximity to urban centers *per se*, but the access to markets. The need to ensure equitable stakeholder participation and a systems perspective, including market, crop–livestock and upland–lowland inter-linkages was also highlighted.

The second project, which was an offshoot of the first, focused on a more detailed understanding of the biophysical, economic, social and policy factors influencing the development trajectories of lowlands in West Africa, especially peri-urban lowlands.

It aimed at strengthening the knowledge base supporting policy decisions and planning processes relating to the project region. It was implemented in close collaboration with national partners in Burkina Faso, Togo and Ghana, and with the Inland Valley Consortium (IVC) convened by AfricaRice.

A framework for a base model to assess policy options and their implications for lowland development was finalized. And national scientists and field staff in the three project countries were trained in data collection, management and analysis for lowland characterization.

## Project on bacterial blight of rice in West Africa

Bacterial Blight (BB), caused by *Xanthomonas oryzae* pv. *oryzae* is one of the most important diseases of irrigated rice. A two-year project funded by BMZ–GIZ was initiated in 2008 in collaboration with the University of Hannover and with national partners of six West African countries (Benin, Burkina Faso, Mali, Niger, Senegal and Togo) to develop an integrated management program for BB based on varietal resistance and sound knowledge of the pathogen's population structure.

For the first time, the entire process of BB infection and its impact on rice production was systematically investigated under West African conditions in the project countries. The epidemiological studies of the disease, investigation of the pathogen population range, and screening for resistance genes will provide a platform for the development of sustainable control strategies for BB in the sub-region.

As part of the project, a molecular polymerase chain reaction (PCR) diagnostic tool was developed. This is expected to greatly benefit the BB research in Africa, as it will facilitate the monitoring of the pathogen spectrum and the timely detection of new pathotypes.

*AfricaRice pathologist, Yacouba Séré examines bacterial blight symptoms on rice plants innoculated in the screenhouse.*

*Dr Frank Mussgnug, cropping systems agronomist, examines rice plants in the field.*

## Collaborative research with a focus on climate change

Climate change is a major threat to sustainable growth and development in Africa, particularly because of the continent's high dependence on rainfed agriculture. Joint research activities are therefore increasingly focusing on the development of effective adaptation and mitigation measures, both in terms of variety development and crop management, to help SSA rice farmers.

### Rice and sorghum crop adaptation strategies for climate change in Africa (RISOCAS)

A three-year project was launched in 2008 to deliver coping strategies for crop adaptation to changing climatic conditions, along with tools and methodologies enabling stakeholders to develop such strategies further, or to apply them to other crops or environments. The project focuses on sorghum, and upland and irrigated rice.

The project is monitoring relevant meteorological data, site-specific soil characteristics and water balances, as well as parameters of crop growth and yield. These data will be used to identify valuable traits for varietal improvement and to adapt, calibrate and field-validate crop models.

The resulting tools will allow predictive applications in the context of climate change scenarios. The potential users of the methodologies and tools are national research and extension programs, agro-meteorological forecasting and early warning services.

The project partners are the University of Hohenheim (project leader), AfricaRice, the Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) and national partners from Senegal, Madagascar and Mali.

### Mitigating climate change impact on rice disease resistance in East Africa

Studies indicate that climatic change will induce increasing temperature and declining rainfall in East Africa, with frequent periods of drought which may intensify crop disease occurrence and severity. Also by impacting on both pests and their host plants, climate change may enable some pests and diseases to expand beyond their current ranges.

A project was launched in 2010 with support from BMZ–GIZ to help address the urgent demand for climate-proofed, disease-resistant rice varieties and help adapt crop management practices to climate change, thus greatly reducing farmer risk. The project is being carried out by AfricaRice in partnership with the University of Göttingen, IRRI and national partners in Rwanda, Tanzania and Uganda.

Research results are expected to lead to the development of rice varieties that are resistant to strains of blast and BB in the region and of rice management practices

adapted to climate change. Breeders will directly benefit because of greatly improved knowledge of pathogen strains and related rice resistance genes and alleles.

Results will be used to determine the likely impact of climate change on rice disease occurrence and severity, develop recommendations for farmers to adapt crop management practices reducing the risk of disease-related yield loss, and guide breeders in the development of climate-proof, disease-resistant rice varieties for different rice production situations.

## Future outlook

It is evident from these highlights that the financial support of the Government of Germany and joint AfricaRice–Germany research activities are helping deliver the innovations needed to achieve sustainable increases in agricultural productivity, benefiting the rural poor while conserving natural resources in SSA. AfricaRice looks forward to sustained and fruitful partnerships with Germany and German institutions in pursuit of its mission.

## February

### AfroWeeds project launched

The AfroWeeds project was launched at a workshop from 1 to 5 February, at the Africa Rice Center (AfricaRice) in Cotonou, Benin. The project aims to create the first ICT-based network for weed scientists from Europe, and West, Central and East Africa, and to facilitate the development of a knowledge base to identify and control the major weeds in rice.

For the first time, all the project partners – AfricaRice, Centre de coopération internationale en recherche agronomique pour le développement (CIRAD) and national research institutions from West, Central and East Africa – met to confirm their participation in the implementation of a collective platform and draw up a list of the major weeds in the regions targeted by the project.

A working guide has been prepared to describe the characteristics of each weed species. The guide includes:

- Descriptive information (e.g. botanical name, local names, synonyms, description, ecology, biology, control measures);
- List of the identification traits (e.g. shape of the leaves); and
- Selection of illustrations (botanical drawings and photos).

During the workshop, participants were trained on how to use databases, manage herbariums, and acquire photos and illustrations relating to rice weeds.

A network of European and African weed scientists (from Benin, Burkina Faso, Chad, France, Ghana, Kenya, Mali, Nigeria, Senegal, Tanzania and Uganda) was established.

## March

### Board of Trustees congratulates AfricaRice team for success

The Board of Trustees of AfricaRice congratulated Director General Papa Abdoulaye Seck and the staff of AfricaRice for placing the Center on a path of continuous growth. The Board of Trustees had its meeting from 7 to 10 March in Cotonou.

The Board congratulated the AfricaRice team for the following achievements.

- Doubling of the Center's budget in 2010 compared to 2007, with a significant rise in fund reserves.
- Increase in recovery of contributions from African member states, which now collectively rank as the number one core donor of the Center.
- Increase in membership of the Center with more African countries joining in the period 2006–2010.
- Large number of exciting research projects addressing major challenges of rice in Africa, including climate change.
- Close partnership with national programs, the International Rice Research Institute (IRRI), and advanced research institutions.
- International recognition, such as the Agricultural Merit Order of France and the Merit Order of Senegal presented to the Director General, and the selection of AfricaRice researchers for the CGIAR's Outstanding Communication and Young Scientist awards.

## Dr Robert Carsky Awards presented

To honor the contribution and dedication of the late Dr Robert Carsky, who served as agronomist at the Africa Rice Center (AfricaRice) until his tragic death in 2004 in Bouaké, Côte d'Ivoire, an annual award in his memory has been set up by the Center.

*Mr Justin Belemkoabga receives the Dr Robert Carsky Award from Mrs Rebecca Khelseau-Carsky.*

The Carsky Awards for 2010 were presented at the end of the meeting of the Board of Trustees on 10 March by Mrs Rebecca Khelseau-Carsky. The recipients of the awards were Ms Savitri Mohapatra (in the internationally recruited staff category) and Mr Justin Belemkoabga (in the general support staff category) for their outstanding contributions to the Center.

## Africa Rice Congress calls for strengthening capacity building

The second Africa Rice Congress, with the theme of *Innovation and partnerships to realize Africa's rice potential*, was held at Bamako, Mali, from 22 to 26 March. The Congress was organized in collaboration with the Malian national agricultural research system, the Institut d'économie rurale (IER). The Government of Mali hosted the Congress, which brought together about 500 participants from 54 countries.


*Top table at the second Africa Rice Congress, including Dr Robert Zeigler, director general, IRRI (left).*

The participants included rice farmers; seed producers; processors; input dealers; manufacturers of agricultural machinery; national rice research and extension systems; representatives from agricultural ministries, international and advanced research institutes, NGOs, and the donor community; and other development partners.

In view of the severe lack of capacity in rice production, which is throttling the development of Africa's rice sector, the participants called for a 'Marshall Plan' to overcome this weakness.

During the opening ceremony, on behalf of Mali's President Amadou Toumani Touré, Prime Minister Modibo Sidibé presented distinguished service awards to Drs Jacques Diouf, Eugene Terry and Kanayo F. Nwanze for their outstanding contributions to rice research and development in Africa during their respective terms as directors general of AfricaRice.

Mr Getachew Engida, AfricaRice Board Chair, presented a plaque of appreciation to President Touré for his government's tremendous efforts to raise rice productivity through the Presidential Initiative on Rice in Mali, which has led to a 50% increase in rice production in the country.

*Dr Inoussa Akintayo (extreme left) of AfricaRice shows food products made from NERICA rice to Prime Minister Sidibé of Mali.*

The participants took the opportunity to deliberate on strategies to significantly increase rice production in Africa, develop competitive and equitable rice value chains, reduce imports, and enhance regional trade.

They enthusiastically supported the newly proposed Global Rice Science Partnership (GRiSP), an initiative of AfricaRice, IRRI and the International Center for Tropical Agriculture (CIAT) to harmonize national and international rice research agendas worldwide.

Under the main theme, the topics included rice genetic diversity and improvement; ecological intensification and diversification of rice-based systems; developing competitive rice value chains; new alliances and tools for rural learning and innovations, and policy implications; integrated management of pests, diseases and weeds in rice-based systems; and rice physiology and modeling.

An important event during the Congress was a forum on 'Investing in Africa's rice sector: opportunities and challenges', in which ways to increase investments in the rice sector in Africa – particularly through innovative public–private partnerships – were explored. Issues such as the need to increase investments for increasing the area under irrigation, improving rural infrastructure, and introducing agricultural mechanization were raised. The forum featured exhibitions of machinery, inputs and rice products.

At the end of the Congress, key recommendations were made to boost Africa's rice sector. Awards for the best presentation in each theme, the best poster, and the Most Promising Young Scientist were also presented.

## AfricaRice wins Communication and Young Scientist awards

At the Global Conference on Agricultural Research for Development (GCARD), which took place in Montpellier, France, from 28 to 31 March, AfricaRice was crowned with two prestigious international science awards by the CGIAR: one for Outstanding Communication and another for Outstanding Promising Young Scientist.

The 2009 CGIAR Outstanding Communication Award was presented to Dr Paul Van Mele, AfricaRice program leader, Learning and Innovation Systems, for the Rice Rural Learning Initiative based on farmer-to-farmer videos on improved rice production practices.

*Drs Jonne Rodenburg (center) and Paul Van Mele (extreme right) display their CGIAR awards, with (from left to right) Drs Henri Carsalade, Marco Wopereis and Papa Abdoulaye Seck.*

The videos, combined with mass media, have helped strengthen the capacities of over 600 farmer organizations across Africa, stimulated greater innovation than conventional farmer training techniques had done, and had tangible impact on the livelihoods of rural women.

The 2009 CGIAR Outstanding Promising Young Scientist Award was presented to Dr Jonne Rodenburg, AfricaRice weed scientist, for his commitment to help resource-poor rice farmers, especially women, through the development of integrated approaches to managing parasitic weeds, a major source of yield loss in rice in Africa.

Rodenburg was appreciated for his high-quality research, excellent record in publications, close involvement in building capacity of national scientists, and successful efforts in mobilizing resources for research projects.

"We are very proud of our two awardees, whose achievements testify to the new dynamism in research at AfricaRice," said Director General Dr Papa Abdoulaye Seck.

### Strengthening MAS capacity of national partners

A regional training workshop organized by AfricaRice jointly supported through its Green Super Rice (GSR) project and the West and Central African Council for Research and Development (CORAF/WECARD) project on research methods in marker-assisted selection (MAS) was held in Cotonou, from 29 March to 3 April.

The aim of the workshop was to upgrade the capacity of plant breeders from research centers and universities of 12 African countries (Benin, Burkina Faso, Côte d'Ivoire, Ghana, Liberia, Mali, Mozambique, Nigeria, Rwanda, Senegal, Sierra Leone and Uganda) to use research methodologies applied in MAS. MAS is a tool that allows the direct application of molecular markers to make plant breeding easier and breeding programs more efficient.

AfricaRice and the Institut de recherche pour le développement (IRD) experts served as resource persons for the workshop.

The participants highlighted the importance of forming a network that will enable them to exchange information on MAS-related research activities in the participating countries. They also pointed out the importance of establishing functional biotechnology laboratories in their countries and of a regional supply system to facilitate procurement of laboratory material.

## April

### African Rice Challenge Initiative launched

The Rice Challenge Initiative launching meeting was held in Montpellier, France, from 13 to 15 April. This four-year project, funded by the CGIAR Generation Challenge Programme (GCP) and led by AfricaRice, focuses on breeding for drought tolerance in the rainfed lowland ecosystems in Burkina Faso, Mali and Nigeria.

The main objective is to develop cultivars possessing high yield potential in normal years and still give good yield under drought and other major stresses of each target environment. This will help sustain rice production, beyond the three target countries, in the large rainfed lowland ecosystem across Africa.

Details of research activities, responsibilities of each partner, time frames and budget were discussed at the launch.

### AfDB-funded NERICA dissemination project reviewed

The Steering Committee Meeting of the African Rice Initiative (ARI), held in Cotonou, from 19 to 21 April, reviewed the progress made by the US$ 35 million, five-year NERICA dissemination project funded by the African Development Bank (AfDB) and planned the next steps.

The AfDB project supports the dissemination of NERICA and other improved rice varieties in seven West African countries – Benin, The Gambia, Ghana, Guinea, Mali, Nigeria and Sierra Leone.

The AfDB project is coordinated by ARI, which is hosted by AfricaRice. ARI has been supported by several partners and donors, including AfDB, Rockefeller Foundation, the Japan International Cooperation Agency (JICA) and the United Nations Development Programme (UNDP)

The Steering Committee highlighted the progress made in the pilot countries, as many promising new varieties – including new NERICA varieties – have been selected through farmer-participatory approaches. Thanks to these, rice farmers are able to make enough profit from their farms to send their children to school and provide them with better healthcare.

Since seed shortage is the biggest bottleneck in rice development in the region, the project has mounted a major effort on the production and diffusion of quality seed. Efforts are being made to put in place sustainable quality seed production and delivery strategies.

To increase the productivity of improved rice varieties, complementary technologies, such as agronomic packages, are currently evaluated in all pilot countries in collaboration with AfricaRice scientists and other resource persons. The Regional Coordination Unit has contributed to the dissemination of relevant information through the *NERICA: The New Rice for Africa – A Compendium* (AfricaRice, FAO and SAA, 2008), which was published jointly with FAO and Sasakawa Africa Association in 2008.

In view of the tangible impact made in the pilot countries and the keen interest of other SSA countries to be included in the AfDB rice project, the ARI Steering Committee meeting focused on the strategy and the development of the next phase. The project was launched in 2005, but began operations only in 2006.

### Developing the next generation of rice varieties

IRRI and AfricaRice jointly launched the Japan-funded project on 'Developing the next generation of new rice varieties for sub-Saharan Africa and South-east Asia'. The eastern and southern African launch of this project took place on 24 April, in Kirundo Province of Burundi.

The launch was attended by scientists from IRRI, AfricaRice and 38 national research and extension partners from nine eastern and southern Africa countries (Burundi, Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Rwanda, Tanzania and Uganda).

The overall aim of the project is to accelerate the development and deployment of the next generation of elite rice varieties for major production systems in SSA and Southeast Asia. To ensure the development and delivery of products (rice varieties) well-accepted by farmers and consumers, this project aims to establish a network of NARS breeders.

The project will allow IRRI and AfricaRice to rebuild rice breeding capacity at the national level in SSA and Southeast Asia, and pursue a systematic collaborative approach to rice breeding that will greatly shorten the time needed to develop new varieties. Delivery of varieties will also be accelerated through streamlining and harmonizing varietal release procedures across the regions.

## May

### Emergency Rice Seed Project benefits over 58,000 farmers

The Emergency Rice Seed Project, launched by AfricaRice with support from the Government of Japan in the wake of the food crisis, has been able to

help a total of 58, 226 vulnerable farmers obtain access to quality seed and reinforce or rebuild seed systems.

More than 60% of the project countries now have good seed capital for the production of newly released varieties, including upland and lowland NERICAs.

The seed component of the Japan Emergency Project was designed to provide access to quality rice seed to vulnerable farmers in 20 countries in western, eastern and southern Africa, who are Coalition for African Rice Development (CARD) member countries: Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Liberia, Mauritania, Mali, Nigeria, Senegal, Sierra Leone and Togo in West Africa, and Ethiopia, Kenya, Madagascar, Malawi, Mozambique, Sudan, Tanzania, Uganda and Zambia in East Africa.

A total of 73 institutions participated in the project: 20 NARS, 11 seed companies, 19 input-dealers and 23 NGOs promoting rice production. The project led to a reinforcement of the seed system in most countries and, in some cases, to start rebuilding them (Côte d'Ivoire, Liberia and Sierra Leone).

As part of the project, seed donations were made to farmers in the participating countries in the presence of partners and government officials. In Côte d'Ivoire, the AfricaRice Director General attended the seed-donation ceremony held in May 2010.

### Good-quality rice pays off

AfricaRice was invited to participate in a special side event on 'Rice post-harvest systems: Saving rice harvest and moving towards better livelihoods', at the Second West & Central Africa Agricultural Science Week and the General Assembly of CORAF/WECARD, from 24 to 28 May in Cotonou.

AfricaRice experts presented a strategic overview of the Center's rice research-for-development activities – from rice genetic diversity, seed systems, new breeding direction to postharvest practices and the quality of rice in West Africa, and rice policy and impact research.

It was noted that although rice is known to be a hardy crop in terms of withstanding grain deterioration, locally produced rice has not been qualitatively and quantitatively competitive.

Quantitative losses come from bird attacks, lodging, shattering, spillages and incomplete threshing. Qualitative losses come from the presence of stones, delayed harvest, poor handling after harvest (including stacking, drying, parboiling, milling, packaging) and the presence of mycotoxins. Improper parboiling can result in more breakages. The processing of rice mixed with stones can damage milling equipment. Additionally, the technical capacity of millers is too low to enable them to do a good job.

Experts emphasized the need for training of farmers and processors in improved processing technology and to encourage marketers to properly package their products.

## June

### AfricaRice rated 'Outstanding' by the World Bank

As part of its annual performance-linked evaluation of 15 international Centers belonging to the CGIAR, the World Bank announced that it has rated AfricaRice as 'Outstanding' in the 2009 performance measurement exercise. This is the highest of the three performance categories.

The assessment was based on a number of criteria, including results, impacts, quality and relevance of the Center's research and publications, financial and institutional health, and stakeholder perceptions.

The Performance Measurement System (PMS) is a regular annual feature of the CGIAR monitoring and evaluation system, which provides Centers with a barometer to gauge their own performance and

demonstrate accountability and transparency to their stakeholders. The World Bank uses the performance measurement data as a guideline for allocating part of its funding to the Centers.

Warmly congratulating the AfricaRice staff for their dedication and performance, Director General Papa Abdoulaye Seck said, "This is a great achievement, but we consider this as just the beginning of our journey toward our goal. So we cannot rest on our laurels."

Dr Seck also expressed his deep appreciation to all the donors and R&D partners of AfricaRice, particularly the national programs, which work hand in hand with the Center to boost rice production and rural development in Africa.

### Developing climate-proof rice

East Africa and mainly the Great Lakes region are among the most vulnerable regions to climate change in Africa. Studies indicate that climate change will induce increase in temperature and decline in rainfall in East Africa, with frequent periods of drought, which may intensify crop disease occurrence and severity. Also by impacting on both pests and host plants, climate change may enable some pests and diseases to expand beyond their current locations.

A project on 'Mitigating climate change impact on rice disease resistance in East Africa', was launched in Dar es Salaam, Tanzania, 1 to 2 June 2010 to help address the urgent demand for climate-proof, disease-resistant rice varieties and help adapt crop management practices to climate change, thus greatly reducing farmer risk.

Research results are expected to lead to the development of rice varieties resistant to strains of blast and bacterial blight in the region and of rice management practices adapted to climate change. Breeders will directly benefit because of greatly improved knowledge of pathogen strains and related rice resistance genes and alleles.

Results will be used to determine the likely impact of climate change on rice disease occurrence and severity, and to develop recommendations for farmers to adapt crop management practices that reduce the risk of disease-related yield loss.

## July

### IFAD-funded rice project reviews progress

The International Fund for Agricultural Development (IFAD) project to boost rice production in West and Central Africa (WCA) held its second implementers' meeting from 12 to 15 July in Cotonou. The key themes of this meeting were to share results, review progress, and strengthen existing strategies to sustain activities even as the project concludes.

The overall goal of this project is to improve the contribution of rice production and postharvest technologies for poverty reduction and food security in WCA. Its specific objectives are to:

- Develop comprehensive packages of NERICA seed and grain production practices and make them available to project beneficiaries;
- Build capacities of rice scientists and technicians in order to strengthen national rice research and production.

Three key studies were designed to support the ongoing processes and activities: (i) seed – production, distribution, capacity among local producers; (ii) participatory varietal selection (PVS) – rice varietal selection, field learning processes; and (iii) information – packaging, review and dissemination.

AfricaRice is implementing the IFAD-WCA Project in the Democratic Republic of Congo, Guinea and Sierra Leone through core partnerships with the Institut de l'environnement et de recherches agricoles (INERA), the Institut de recherche agronomique du Guinée (IRAG) and the Sierra Leone Agricultural

Research Institute (SLARI), respectively. Other institutions involved include NGOs, extension organizations, ministries, farmer organizations, IFAD investment projects, universities and FAO.

### AfricaRice student wins Africa-wide prize

Ms Espérance Benedicte Zossou of Benin, who is pursuing her postgraduate studies at AfricaRice, won the Third Prize in the 2009–2010 Africa-wide Women and Young Professionals in Science Competitions for her work on the 'Technological and institutional innovations triggered by farmer-to-farmer rice parboiling video in central Benin'.

The entries for the science competitions were judged in Ouagadougou, Burkina Faso, on 19 and 20 July, as a side event during the Fifth African Agricultural Science Week and the Forum for Agricultural Research in Africa (FARA) General Assembly.


*Ms Espérance Zossou with her prize.*

The Africa-wide science competitions sought to identify, recognize and reward the hard work and excellence of young professionals (aged 25–40 years) and women scientists who are engaged in innovative and pioneering research and in communicating their outputs (knowledge, technologies and approaches) to improve agricultural productivity and the livelihoods of rural communities.

One hundred submissions were received for the two competitions, from which 41 top entrants were selected to develop their abstracts into full papers.

In March 2010, Ms Zossou also won the Outstanding Young Scientist Award at the Second Africa Rice Congress, organized by AfricaRice in Bamako, Mali.

## August

### Madagascar joins AfricaRice as a member state

Madagascar, which is one of the biggest per-capita consumers of rice in the world, joined AfricaRice as its 24th member state in August.

"Rice is critical to our country's economy. We have joined AfricaRice because we realize that the future of rice production on the continent depends on this partnership," stated His Excellency Mr Mamitiana Jaonina, Minister of Agriculture of Madagascar in a letter to the AfricaRice Director General Papa Abdoulaye Seck.

Rice provides over 50% of the calories consumed in Madagascar and rice production involves about 80% of the rural households. However, the country is desperate to boost production as it is importing about 200,000 tonnes of rice every year to meet growing demand.

Warmly welcoming the new member state, Seck said that the Center has already been working closely with

the country: "We have several joint projects, such as the Japan-funded Emergency Rice Initiative." The Minister of Agriculture has invited Seck to attend a seed-donation ceremony as part of this Initiative.

Madagascar has also greatly benefited from an innovative farmer learning tool developed by AfricaRice – known as participatory learning and action-research for integrated crop management (PLAR-ICM) – which has helped double average rice yields in farmers' fields in northern Madagascar through a project supported by the Aga Khan Foundation.

## Egypt hosts training course on rice seed production technology

A training course, 'Seed production technology for Africa', jointly organized by AfricaRice, IRRI and the Agricultural Research Center of Egypt, was held in Kafr el-Sheikh, Egypt, from 1 to 6 August. It was organized under the Green Super Rice (GSR) project with support from the Bill and Melinda Gates Foundation through the Chinese Academy of Agricultural Sciences.

The course was attended by more than 30 researchers from 10 African countries (Egypt, Ethiopia, Liberia, Mali, Mozambique, Nigeria, Rwanda, Senegal, Tanzania and Uganda). It covered areas relating to quality seed production technology for hybrid and inbred varieties, as well as the use of CropStat software for statistical analysis.

The main objective of the course was to train researchers to become trainers themselves and run a similar course in their respective countries with support from their local GSR coordinator and the regional coordinator based at AfricaRice.

## *Sawah* technology to tap rice potential of lowlands

A Japan-supported project to help African rice farmers maximize the vast potential of inland valleys through ecological management was launched in Cotonou, on 16 and 17 August.

The new project will focus on testing and adapting a proven rice production technology used in Asia – known as *Sawah* – which helps to boost rice production through improved water and soil management. The *Sawah* system includes the use of small machinery for land preparation and good crop management practices (such as levelling, bunding, and developing inlet and outflow channels for water).

"With increased risk of drought in large parts of Africa because of climate change, well-managed inland valleys can contribute to food security through enhanced productivity of rice-based systems," explained Dr Paul Kiepe, speaking on behalf of the AfricaRice Director General at the project launch meeting.

It is estimated that the annual potential production of 20 million hectares of *Sawah* systems in SSA would be at least 30 to 40 million tonnes of milled rice. The increased production would help African countries sharply curtail their risky over-dependence on rice imports and stave off future food crises.

The new project will initially cover Benin and Togo and is expected to expand to other countries that are members of the Inland Valley Consortium (IVC), convened by AfricaRice.

The project partners include the International Water Management Institute (IWMI); the national programs of the IVC member countries (initially Benin and Togo); Hitotsubashi, Tsukuba and Kinki Universities in Japan; and the Universities of Hohenheim and Munich in Germany.

In addition to representatives of all project partners and other organizations with related expertise, the meeting brought together high-level dignitaries of the Government of Japan, notably the Ambassador of Japan in Benin and representatives of the Ministry of Agriculture, Forestry and Fisheries (MAFF).

## September

### Africa's national rice experts urge strong advocacy for R&D to help achieve MDGs

In view of the growing importance of rice for Africa's food security and the strategic role played by AfricaRice in advising policy makers on this critical issue, national experts from 24 AfricaRice member countries urged the Center to continue its strong advocacy efforts for increased investments in the domestic rice sector to help achieve the Millennium Development Goals (MDGs).

This was one of the key recommendations made at the National Experts Committee (NEC) meeting held in Cotonou, from 13 to 15 September.

The NEC congratulated AfricaRice Director General Papa Abdoulaye Seck and staff for the Center's 'Outstanding' rating from the World Bank.

The important decisions from the NEC meeting were the following.

- Underlining the scarcity of national rice scientists, technicians and extension workers in SSA, the NEC endorsed several measures taken by AfricaRice and its partners to strengthen national rice R&D capacity.
- The NEC reiterated its support to the new Global Rice Science Partnership (GRiSP) initiative of the CGIAR centers and other key partners working on rice. GRiSP is expected to bring the best of international rice science to Africa in a coordinated manner.


*The participants of the National Experts Committee meeting at Cotonou in September 2010.*

- The group of experts also approved the revival of AfricaRice's successful task-force mode of research partnership. In line with sub-regional and regional organizations, the new Africa-wide task-force mechanism – with strong ownership by national systems – will help build critical mass around major thematic areas of the rice sector. As part of this, an African Rice Breeding Task Force has been launched with support from the Government of Japan.
- To ensure regional price stability of rice and harmonization of rice seed and fertilizer legislations and variety release catalogues, the NEC supported AfricaRice's strategy to strengthen links with the regional economic communities.
- The NEC encouraged AfricaRice to pursue its strategy of harnessing the expertise of Egypt – which became a member state in 2009 – in irrigated rice systems and hybrid rice technology for the benefit of other member countries.
- To increase the demand for rice produced in Africa, the NEC stressed the importance of addressing marketing issues through a value-chain approach. There would need to be special emphasis on the introduction of suitable harvest and postharvest technologies.

## November

### BADEA–AfricaRice program on IRM

For the second year in a row, the Arab Bank for Economic Development in Africa (BADEA) and AfricaRice teamed up to strengthen Africa's capacity in integrated rice management (IRM) to help bridge yield gaps in farmers' fields and raise rice production in SSA.

As part of this, two training courses – one for English-speaking countries (from 15 to 26 November) and another for French-speaking countries (from 6 to 17 December) – were organized in Cotonou. The courses provided a foundation in IRM and also gave young national researchers an opportunity to establish research partnerships among themselves and within the international research networks.

More than 50 researchers and extension staff, including 20 women, from 20 countries across Africa took part in the BADEA–AfricaRice training courses. The participating countries comprised Benin, Burkina Faso, Cameroon, Chad, Côte d'Ivoire, Democratic Republic of Congo, Gabon, The Gambia, Ghana, Guinea, Liberia, Madagascar, Mali, Niger, Nigeria, Senegal, Sierra Leone, Tanzania, Togo and Uganda.

Explaining the importance of this course, AfricaRice Deputy Director General Marco Wopereis said, "Knowledge of IRM is crucial to bridge gaps that currently exist between actual farmers' yields and attainable yields through better crop management, and to fully exploit the potential of improved varieties."

AfricaRice's manuals on IRM, based on the participatory learning and action-research (PLAR) approach developed by the Center, were used by the facilitators. Participants were also exposed to AfricaRice's training videos and radio programs.

### AfricaRice lays the groundwork for setting new research priorities

AfricaRice scientists and their partners attending the Center's Research Days from 29 November to 2 December, began an important exercise to set new research priorities as part of the Center's next Strategic Plan (2011–2020).

Based on household- and village-level datasets collected from more than 20 countries in SSA, the participants were asked to propose what they considered the best possible research options that would address some of the constraints identified in these surveys; associated costs and benefits; and the likelihood of success in developing such options.

"The priority-setting exercise will be a consultative process that will involve not only rice experts from AfricaRice and its member states, but also our strategic partners and key stakeholders," said Dr Aliou Diagne, who is leading the exercise.

The participants at the Research Days discussed the achievements of each of the research programs and the action plan for the coming year.

The 2010 Research Days were marked by the innovative format of holding theme-based panel meetings along with the discussions on the agendas of research programs.

The priorities summarized from the discussions during the Research Days include the following.

- There is a need to become more visible and better in communicating AfricaRice's work.
- There is a need to help rebuild Africa's research and extension capacity.
- There is a need to pursue more integrated, cross-program projects.
- The re-establishment of the task-force mechanism is a welcome development that needs to be pursued.
- There is a need to reflect on whether AfricaRice is taking enough risk while doing research – are we innovative enough?

In addition to AfricaRice research staff and the Chair of the Program Committee of the Board of Trustees, Dr Peter Matlon, the Research Days were attended by representatives from Egypt, Ethiopia, Liberia and Uganda.

### The Global Rice Science Partnership is launched

AfricaRice is an important partner in the Global Rice Science Partnership (GRiSP), which is a bold new rice research initiative that aims to lift 150 million people out of poverty by 2035 through partnership-based research and more eco-efficient production systems that are more resilient to climate change.

GRiSP was launched as the first new CGIAR Research Program (CRP) in November 2010 in Vietnam at the International Rice Congress, which was attended by a delegation from AfricaRice led by Director General Papa Abdoulaye Seck.

Describing the potential impact of this global partnership for Africa, where rice is the fastest growing food staple, Dr Seck said, "It will help reduce Africa's current reliance on rice imports by developing its huge potential to grow more rice."

The main architects of GRiSP are three CGIAR Centers (IRRI, AfricaRice and CIAT), CIRAD, IRD and the Japan International Research Center for Agricultural Sciences (JIRCAS), which will play a strategic role in GRiSP, with hundreds of other partners worldwide representing governments, the private sector and civil society.

IRRI will lead this initiative and also oversee the activities in Asia, AfricaRice will lead the work in Africa, and CIAT will lead in Latin America and the Caribbean.

## December

### Success with multi-stakeholder involvement in inland valleys

A review workshop was held for the European Commission-funded project Realizing the agricultural potential of inland valley lowlands in sub-Saharan Africa while maintaining their environmental services (RAP), in Cotonou from 7 to 10 December.

The project seeks to improve the livelihoods of the rural poor by enhancing the productivity and competitiveness of inland valleys through sustainable intensification and diversification of agricultural

productivity and product value-chain development, while conserving land and water resources.

Over 50 participants presented and discussed the results obtained in the first phase. They also recommended technological, institutional and socio-economic interventions to enhance the sustainable productivity of rice in inland valleys. These should improve the lives and livelihoods of all the actors along the value chain.

The participants included partners involved in the project (AfricaRice, the International Institute of Tropical Agriculture, CIRAD, Wageningen University, IER, Institut national des recherches agricoles du Benin, Université d'Abomey-Calavi, and the International Center for Development-Oriented Research in Agriculture); experts from Africa (Burkina Faso and Togo); development specialists; project managers; and representatives from agricultural development institutions, NGOs and the national government.

This diversity of actors reflects the commitment of RAP to involve the entire range of stakeholders in the PLAR process.

The workshop concluded that a great deal of knowledge and experience has been gained and collaborations initiated with partners in development projects. The next step is to document this knowledge in scientific publications and produce tools that will facilitate decision making (videos, agro-socio-economic geo-referenced databases on inland valleys, etc.) in partnership with the development actors.

The participants felt that the establishment of multi-stakeholder platforms at the village level in south-western Benin and in the circle of Sikasso is already a positive sign of successful management of the land development by the actors themselves.

## AfricaRice receives the South–South Cooperation Excellence Award

AfricaRice was presented the South–South Cooperation Excellence Award 2010 at the Third Annual Global South–South Development Expo in Geneva, Switzerland, for the development of its NERICA rice varieties – 18 varieties for the upland ecology and 60 for the lowland ecology. The NERICA varieties were recognized as an innovative development product from the South.

Dr Inoussa Akintayo of AfricaRice received the award presented on behalf of Mr Yiping Zhou, Director, Special Unit for South–South Cooperation of the United Nations Development Programme (UNDP), and Dr Josephine Ojiambo, President of the UN General Assembly High-level Committee on South–South Cooperation.

"We are honored to receive this prestigious award," said Dr Papa Abdoulaye Seck, Director General of AfricaRice. "NERICA varieties have shown how science-based options can improve food security, reduce foreign exchange costs and improve the lives of poor farmers in Africa."


*Dr Inoussa Akintayo receives the South–South Cooperation Excellence Award from a representative of the UNDP's Special Unit for South–South Cooperation.*

Adapted to the agro-ecological conditions in Africa and uniquely suited to smallholders' rice farms, NERICA varieties for the upland and lowland ecologies have been developed by AfricaRice researchers in close collaboration with many partners, particularly the national programs.

"The NERICA varieties are now grown on more than 700,000 hectares across Africa and, since they are self-pollinating, farmers can keep the seed from year to year," explained Akintayo, who is spearheading the promotion of improved rice varieties in the region through the African Rice Initiative, with support mainly from Japan, UNDP and the African Development Bank.

Organized by the United Nations each year since 2008, the Global South–South Development Expo provides a forum to enable developing countries and their development partners, including donor agencies, organizations of the United Nations system, and private-sector and civil society organizations, to showcase their evidence-based South–South development solutions.

The Third Annual Global South–South Development Expo was attended by more than 400 delegates from over 40 countries, and over 100 innovative solutions that can help achieve the Millennium Development Goals were showcased.

AfricaRice was invited to take part in the Expo as well as in the High-Level Meeting on South–South and Triangular Cooperation, which was organized to facilitate knowledge sharing of best practices in South–South and triangular cooperation and to facilitate discussion of common challenges and innovative methods of capacity development.

## Statement of financial position
### As on 31 December 2010

**ASSETS**

| | 2010 (US$) | 2009 (US$) |
|---|---|---|
| **Current assets** | | |
| Cash and cash equivalent | 10,567,088 | 11,275,590 |
| Accounts receivable: | | |
| Donors | 4,611,594 | 5,034,043 |
| Employees | 278,420 | 250,847 |
| Others | 412,691 | 796,258 |
| Inventories | 318,940 | 295,383 |
| Prepaid expenses | 284,135 | 169,278 |
| **Total current assets** | **16,472,868** | **17,821,399** |
| **Property and equipment** | | |
| Property and equipment | 10,407,080 | 9,346,901 |
| Less: Accumulated depreciation | (9,599,034) | (8,544,079) |
| **Total property and equipment - Net** | **808,046** | **802,822** |
| **TOTAL ASSETS** | **17,280,914** | **18,624,221** |

**LIABILITIES AND NET ASSETS**

| | 2010 (US$) | 2009 (US$) |
|---|---|---|
| **Current liabilities** | | |
| Accounts payable: | | |
| Donors | 1,974,036 | 5,953,935 |
| Employees | 380,634 | 421,570 |
| Others | 727,763 | 762,963 |
| Employees investment account | 214,000 | 214,000 |
| Provisions and accruals | 3,186,157 | 2,673,395 |
| **Total current liabilities** | **6,482,590** | **10,025,863** |
| **TOTAL LIABILITIES** | **6,482,590** | **10,025,863** |
| **Net assets** | | |
| Unrestricted net assets: | | |
| Undesignated | 9,990,278 | 7,795,536 |
| Designated | 808,046 | 802,822 |
| **TOTAL NET ASSETS** | **10,798,324** | **8,598,358** |
| **TOTAL LIABILITIES & NET ASSETS** | **17,280,914** | **18,624,221** |

## Statement of activities

### For the year ended 31 December 2010

| | Unrestricted | Restricted | | Total | |
|---|---|---|---|---|---|
| | | Temporarily Restricted | Challenge Programs | 2010 | 2009 |
| | US$ | US$ | US$ | US$ | US$ |
| **REVENUES, GAINS AND OTHER SUPPORT** | | | | | |
| Grants | 5,991,929 | 13,710,831 | 618,502 | 20,321,262 | 21,801,167 |
| Member states – Operating income | 1,565,073 | | | 1,565,073 | 556,958 |
| Member states – Capital development income | | | | | |
| Other income | 144,899 | | | 144,899 | 100,463 |
| **Total revenue, gains and other support** | **7,701,901** | **13,710,831** | **618,502** | **22,031,234** | **22,458,588** |
| **EXPENSES AND LOSSES** | | | | | |
| Program related expenses | 3,455,328 | 13,710,831 | 618,502 | 17,784,661 | 19,226,811 |
| Management and general expenses | 3,731,745 | | | 3,731,745 | 3,514,897 |
| **Sub-total expenses and losses** | **7,187,073** | **13,710,831** | **618,502** | **21,516,406** | **22,741,708** |
| Indirect cost recovery | (1,685,137) | | | (1,685,137) | (2,914,225) |
| **Total expenses and losses** | **5,501,936** | **13,710,831** | **618,502** | **19,831,269** | **19,827,483** |
| | | | | | |
| **CHANGE IN NET ASSET** | | | | | |
| **Net surplus** | **2,199,965** | | | **2,199,965** | **2,631,105** |

## TOTAL EXPENSES – BY NATURAL CLASSIFICATION

| | Unrestricted | Restricted | | Total | |
|---|---|---|---|---|---|
| | | Temporarily Restricted | Challenge Programs | 2010 | 2009 |
| | US$ | US$ | US$ | US$ | US$ |
| Personnel costs | 3,147,985 | 3,237,261 | 101,539 | 6,486,785 | 6,354,114 |
| Supplies & services | 3,069,640 | 4,743,021 | 328,305 | 8,140,966 | 8,538,385 |
| Collaborators and partnerships costs | 9,335 | 4,137,446 | 123,340 | 4,270,121 | 5,720,546 |
| Operational travel | 665,490 | 761,197 | 45,856 | 1,472,543 | 1,079,391 |
| Depreciation | 294,623 | 831,906 | 19,462 | 1,145,991 | 1,049,272 |
| **Sub-total expenses and losses** | **7,187,072** | **13,710,831** | **618,502** | **21,516,406** | **22,741,708** |
| Indirect cost recovery | (1,685,137) | | | (1,685,137) | (2,914,225) |
| **Total expenses and losses** | **5,501,935** | **13,710,831** | **618,502** | **19,831,269** | **19,827,483** |

## Grants

### For the year ended 31 December 2010

| Donors | Grant period | Grant pledges available | Accounts receivable | Accounts payable | Grant 2010 | Grant 2009 |
|---|---|---|---|---|---|---|
| **UNRESTRICTED** | | US$ | US$ | US$ | US$ | US$ |
| Belgium | Jan '10–Dec '10 | 647,396 | | | 647,396 | 559,888 |
| Canada | Jan '10–Dec '10 | 656,619 | 656,619 | | 656,619 | 627,801 |
| France | Jan '10–Dec '10 | 246,449 | 168,425 | | 246,449 | 270,090 |
| Germany | Jan '10–Dec '10 | | | | | 213,315 |
| Japan | Jan '10–Dec '10 | 379,365 | | | 379,365 | 597,782 |
| Norway | Jan '10–Dec '10 | 244,706 | 244,706 | | 244,706 | |
| Sweden | Jan '10–Dec '10 | 486,476 | 486,476 | | 486,476 | 471,184 |
| United Kingdom | Jan '10–Dec '10 | 1,030,918 | | | 1,030,918 | 852,941 |
| USAID | Jan '10–Dec '10 | 500,000 | 500,000 | | 500,000 | 250,000 |
| World Bank | Jan '10–Dec '10 | 1,800,000 | | | 1,800,000 | 1,020,000 |
| Côte d'Ivoire | Jan '10–Dec '10 | | | | | 7,296 |
| **Total unrestricted grants** | | **5,991,929** | **2,056,226** | | **5,991,929** | **4,870,297** |
| **TEMPORARILY RESTRICTED** | | | | | | |
| AfDB I (NERICA dissemination project) | Jan '04–Dec '11 | 1,230,000 | 155,484 | | 579,585 | 404,600 |
| Services to CARD Secretariat | Oct '09–Jul '10 | 24,415 | 18,249 | | 23,494 | |
| ACP – AfroWeeds project | Oct '09–Oct '12 | 408,453 | 51,328 | | 161,465 | 7,741 |
| BADEA – IRM training | Jan '09–Dec '09 | 320,000 | | | (121,488) | 319,368 |
| BADEA 2010 – IRM training | Jul '10–Dec '11 | 330,000 | | 87,891 | 196,524 | |
| Diffusion of Improved Crop Varieties in Africa (DIVA) | Nov '09–Dec '12 | 168,300 | 45,674 | | 113,974 | |
| Chinese Academy of Agricultural Sciences (CAAS) – Green Super Rice Project | Nov '08–Oct '11 | 3,449,862 | 106,033 | | 1,630,626 | 1,168,719 |
| Canada Linkage Fund - McGill University | Apr '08–Mar '11 | 209,711 | | 50,601 | 72,593 | 78,911 |

| Donors | Grant period | Grant pledges available | Accounts receivable | Accounts payable | Grant 2010 | Grant 2009 |
|---|---|---|---|---|---|---|
| | | US$ | US$ | US$ | US$ | US$ |
| CARD Regional Workshop July 2010 | Jul ’10–Jul ’10 | 79,584 | | | 79,511 | |
| CFC–FAO (SPIRIVWA project) | Jan ’00–Jun ’10 | 536,039 | 27,610 | | 18,024 | 84,247 |
| CFC–FAO-NERICA Dissemination in Central Africa project | Jan ’08–Mar ’12 | 2,500,961 | 158,772 | | 181,676 | 341,592 |
| Conservation of Food & Health Foundation | Jul ’06–Dec ’10 | 81,000 | | | 6,177 | 25,691 |
| DFID 16-*Striga* project-University of Sheffield | May ’08–Sep ’11 | 53,250 | | 2,568 | 37,664 | 10,175 |
| Esso rice development project in Chad | Jan ’10–Dec ’11 | 214,242 | | 6,170 | 147,187 | |
| European Union (Rice policy & technology impact on food security) | Jan ’07–Dec ’10 | 1,203,184 | 97,552 | | 457,262 | 510,069 |
| European Union (RAP project) | Jan ’09–Dec ’10 | 1,424,914 | 140,231 | | 700,293 | 724,622 |
| Rice Policy (incremental fund) | Jun ’10–Dec ’12 | 2,000,000 | 811,038 | | 811,038 | |
| FAO – Liberia seed production project | Aug ’08–Jun ’09 | 168,475 | | 2,188 | (9,929) | 156,239 |
| FAO – Seed systems study project | Jan ’10–Dec ’10 | 198,500 | | | 198,500 | |
| GIZ-RISOCAS-University of Hohenheim project | Mar ’08–Feb ’11 | 236,553 | 22,045 | | (44,233) | 163,044 |
| GIZ – Characterization of bacterial leaf blight | May ’08–Apr ’10 | 86,420 | | | 4,552 | 32,045 |
| GIZ – MICCORDEA | Jan ’10–Dec ’12 | 1,608,000 | | 98,469 | 436,811 | |
| GIZ – Attributed grant | Jan ’10–Dec ’10 | 231,528 | | | 231,528 | |
| IBRD – Genebank upgrade project (GPG phase 2) | Jan ’07–Dec ’09 | 314,000 | | | | 102,918 |
| IBRD–AfricaRice full cost recovery project | Jan ’09–Dec ’09 | 29,500 | | | | 29,072 |

| Donors | Grant period | Grant pledges available | Accounts receivable | Accounts payable | Grant 2010 | Grant 2009 |
|---|---|---|---|---|---|---|
| | | US$ | US$ | US$ | US$ | US$ |
| IBRD-CGIAR collaboration fund project | Jan ’11–Open | 414,492 | | 414,492 | | |
| IFAD – HIV/AIDS and rural poverty project | Jan ’07–Jun ’09 | 165,000 | 8,250 | | | 19,956 |
| IFAD – Access to NERICA seeds: West and Central Africa project | Dec ’07–Dec ’12 | 1,500,000 | 500,406 | | 658,224 | 360,608 |
| IFAD – ESA project | Jan ’09–Dec ’10 | 60,000 | | | 15,000 | 45,000 |
| IFAR-CGIAR fellowship programs | Jan ’09–Feb ’11 | 55,000 | | 5,676 | 27,324 | 22,000 |
| IRRI–AfricaRice abiotic stress project | Jan ’08–Dec ’10 | 4,799,818 | | | 874,001 | 2,397,892 |
| Japan – Joint Africa/Asia research on hybridization between African and Asian rice species | Jan ’00–Mar ’11 | 380,000 | | 6,188 | 283,801 | 403,951 |
| Japan – Increasing the quality and competitiveness of locally produced rice in West Africa project | Jan ’03–Mar ’11 | 100,000 | 1,304 | | 81,143 | 115,732 |
| Japan – Development of interspecific OG&OS progenies adaptable to lowland conditions in West and Central Africa project | Jan ’03–Mar ’11 | 100,000 | 55,753 | | 102,112 | 97,233 |
| Japan – Identification of high yield potential varieties and their plant types in the humid zone in West and Central Africa project | Dec ’05–Mar ’11 | 100,000 | | 78,837 | 138,453 | 88,054 |
| Japan – Physiological and genetic investigation of agronomic characteristics in rice project | Jan ’07–Mar ’11 | 100,000 | 704 | | 70,392 | 136,951 |
| Japan – Development of sustainable rice farming systems in low activity clay soils in West African lowlands project | Jan ’08–Mar ’11 | 60,000 | | 73,004 | 51,895 | 66,125 |

| Donors | Grant period | Grant pledges available | Accounts receivable | Accounts payable | Grant 2010 | Grant 2009 |
|---|---|---|---|---|---|---|
| | | US$ | US$ | US$ | US$ | US$ |
| Japan – Emergency Rice Initiative | Apr ’09–Sep ’10 | 4,800,000 | | | 287,738 | 4,512,262 |
| Japan – Breeding project | Jan ’10–Dec ’14 | 6,000,000 | 150,900 | | 1,748,100 | |
| Japan – SMART-IV project | Oct ’09–Sep ’14 | 3,000,000 | | 513,200 | 727,149 | 42,733 |
| Japan – Capacity building project (Saito) | Oct ’09–Dec ’10 | 10,730 | | | 3,640 | 7,070 |
| Japan – Capacity building project (Sokei) | Oct ’09–Feb ’11 | 48,349 | 1,472 | | 26,885 | 22,936 |
| Japan – Capacity building project (Abe) | Sep ’10–Feb ’11 | 11,500 | | 2,588 | 8,912 | |
| Japan/CG fellowship program (Abe) | Nov ’10–Feb ’11 | 12,700 | | 9,285 | 3,415 | |
| Japan/CG fellowship program (Saito) | Nov ’10–Mar ’11 | 7,000 | | 7,000 | | |
| Japan – Integrated management of rice yellow mottle virus (RYMV) in lowland ecosystems project | Jan ’00–Mar ’11 | 100,000 | | 1,601 | 64,254 | 117,150 |
| JICA–AfricaRice collaboration Project | Apr ’04–Open | 164,035 | 58,171 | | 198,866 | 209,901 |
| JIRCAS–AfricaRice drought project | Apr ’05–Open | 38,211 | | | | 30,588 |
| JIRCAS collaboration project – Benin | Jun ’10–Open | 4,000 | | 3,046 | 78 | |
| Syngenta proposal development | Jan ’10–Dec ’10 | 193,530 | 1,640 | | 118,702 | |
| UNDP – Interspecific hybridization phase 2 project | Jan ’07–Dec ’09 | 512,160 | | | | 181,185 |
| UNDP – Liberia seed production project | Apr ’09–Apr ’11 | 296,604 | | 18,268 | 90,224 | 77,891 |
| UNDP Kokoyah Millennium Village Project, Liberia | Oct ’08–Jun ’11 | 230,000 | 44,982 | | 76,092 | 89,290 |
| USAID bridge fund 2009 | Jan ’09–Dec ’09 | 350,000 | | | | 350,000 |

| Donors | Grant period | Grant pledges available | Accounts receivable | Accounts payable | Grant 2010 | Grant 2009 |
|---|---|---|---|---|---|---|
| | | US$ | US$ | US$ | US$ | US$ |
| USAID-CORAF RYMV project | Jan ’10–Dec ’10 | 39,000 | | | 39,000 | |
| USAID – RYMV project | Oct ’06–Dec ’09 | 890,000 | | | | 34,278 |
| USAID – West Africa Rice Initiative project | Oct ’08–Sep ’10 | 5,100,000 | | | 2,102,578 | 2,997,422 |
| | | | | | | |
| **Sub-total temporarily restricted** | | **46,749,020** | **2,457,598** | **1,381,071** | **13,710,831** | **16,585,262** |
| | | | | | | |
| **CHALLENGE PROGRAMS** | | | | | | |
| **Water and Food** | | | | | | |
| WorldFish-Project M439 | Apr ’05–Mar ’10 | 42,946 | | | 8,471 | 20,175 |
| **Generation Challenge Program** | | | | | | |
| CIMMYT – GCP project SP1-G4008-05 | Jan ’08–Dec ’10 | 19,200 | 1,320 | | 24,223 | 6,995 |
| CIMMYT – GCP-Project SP3-G4007-08 | Aug ’07–Jul ’09 | 304,440 | 29,618 | | | 149,205 |
| GCP-I-Bridges-AfricaRice/IRD | Aug ’07–Dec ’09 | 80,000 | 9,000 | | | 22,984 |
| GCP-NAM population-AfricaRice/CIAT | Aug ’08–Jul ’09 | 114,058 | 9,994 | | 6,898 | 79,512 |
| GCP – Rice Challenge Initiative | Jun ’09–Mar ’14 | 2,717,754 | 21,799 | | 517,965 | 34,442 |
| GCP – Drought avoidance (root) | Nov ’08–Sep ’11 | 100,800 | 26,039 | | 60,944 | 32,295 |
| **Sub-total Challenge Program grants** | | **3,379,198** | **97,769** | | **618,502** | **345,608** |
| **Total restricted grants** | | **50,128,218** | **2,555,367** | **1,381,071** | **14,329,333** | **16,930,870** |
| **Total grants** | | **56,120,147** | **4,611,594** | **1,381,071** | **20,321,262** | **21,801,167** |

# Board of Trustees

(As on 7 March 2011)

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[1] Incoming Member of the Board of Trustees. Not present at the BOT meeting in March 2011.
[2] Not present at the BOT meeting in March 2011.

*AfricaRice Board of Trustees.*

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(As on 31 December 2010)

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| Angelito Medenilla | Procurement Officer |
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| Korotoumou Ouattara | Principal Accountant |
| Imourana Abdoulaye□ | Senior Accountant |
| François Tosse | Senior Accountant |
| Klana Dagnogo | Mechanical Maintenance Manager |
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| Samba Soulé Bâ | Administration and Finance Officer (Senegal) |
| Philomena P.J. Chundu | Administrative Assistant (Tanzania) |

## Research for Development Division

| | |
|---|---|
| Marco Wopereis | Deputy Director General, Director of Research for Development |
| Ashura Luzi-Kihupi | Regional Representative, Tanzania Station |
| Boubié Vincent Bado | Regional Representative and Head of Sahel Regional Station, Senegal |
| Olupomi Ajayi | Coordinator, Nigeria Station |
| Sitapha Diatta | Coordinator and Representative in Côte d'Ivoire |
| S. Gopikrishna Warrier | Science Writer |
| Cyrille Adda | Program Support and Risk Management Officer |
| Issaka Yougbare□ | Research Support Officer |
| Maïmouna Diatta | French Editor |
| Thomas Adigun | Librarian |
| Fassouma Sanogo | Translator |
| Aboubacar Madougou□ | Translator |
| Emmanuel Onasanya | Desktop Publishing Assistant |

## Program 1: Genetic Diversity and Improvement

| | |
|---|---|
| Takashi Kumashiro* | Program Leader |
| Moussa Sié | Senior Breeder and Task Force Coordinator |
| Marie-Noëlle Ndjiondjop | Molecular Biologist |
| Koichi Futakuchi | Crop Ecophysiologist |
| Mandè Semon | Upland Rice Breeder (Nigeria) |
| Baboucarr Manneh | STRASA Coordinator and Irrigated Rice Breeder |
| Ramaiah Venuprasad* | Lowland Rice Breeder (Nigeria) |
| Kazuki Saito | Agro-Physiologist |
| Kayodé Sanni | Head GRU and INGER-Africa Coordinator |
| Kofi Bimpong | PDF – Molecular Genetics – Salinity Tolerance (Senegal) |
| Karim Traoré | Grain Quality and Seed Systems Expert (Senegal) |
| Khady Nani Dramé | Molecular Biologist |
| Negussie Shoatatec Zenna | High-altitude Rice Breeder (Tanzania) |

| | |
|---|---|
| John Manful | Grain Quality Specialist |
| Abdel Latif A. El-Namaky Raafat | PDF – Hybrid Rice (Senegal) |
| Gbenga Akinwale | Research Assistant (Nigeria) |
| Bosede Popoola | Research Assistant (Nigeria) |
| Oyin Oladimeji | Research Assistant (Nigeria) |
| Daniel Tia Dro | Research Assistant |
| Fatimata Bachabi | Research Assistant |
| Mamadou Fofana | Research Assistant |
| Ayoni Ogunbayo | Research Assistant |
| Kolade Fisayo | Research Assistant |
| Souleymane Gaye□ | Research Assistant (Senegal) |
| Mohamed Abd El-Rahman* | Research Assistant (Senegal) |
| Ghislain Kanfany* | Research Assistant (Senegal) |
| Martin E. Ndomondo | Research Assistant (Tanzania) |
| Seleman R. Kaoneka | Research Assistant (Tanzania) |

## Program 2: Sustainable Productivity Enhancement

| | |
|---|---|
| Paul Kiepe | Program Leader and IVC Coordinator |
| Yacouba Séré | Plant Pathologist |
| Francis Nwilene | Entomologist (Nigeria) |
| Jonne Rodenburg | Weed Scientist |
| Susumu Abe | Soil Scientist |
| Ibnou Dieng* | Biometrician |
| Frank Mussgnug* | Cropping Systems Agronomist |
| Sander Zwart* | Remote Sensing/Water Management Specialist |
| Nhamo Nhamo | PDF – Soil Fertility and Agronomy (Tanzania) |
| Amos Onasanya | Research Assistant |
| Koffi Akator□ | Research Assistant |
| Abibou Niang | Research Assistant |
| Alassane Aw□ | Research Assistant (Senegal) |

| | |
|---|---|
| Abdoulaye Sow | Research Assistant (Senegal) |
| Abou Togola | Research Assistant |
| Amadou Touré | Research Assistant |
| Gerald Kyalo* | Research Assistant (Tanzania) |
| Petra Schmitter* | Water Management Consultant |

## Program 3: Learning and Innovation Systems

| | |
|---|---|
| Paul Van Mele□ | Program Leader, Learning & Innovation Systems Specialist |
| Julien David Reece | Agricultural Innovation Systems Scientist |
| Michael Misiko□ | Social Scientist |
| Jonas Wanvoeke | Research Assistant |
| Abdoulaye Kaboré | Research Assistant |

## Program 4: Policy and Impact Assessment

| | |
|---|---|
| Aliou Diagne | Program Leader and Impact Assessment Economist |
| Matty Demont | Agricultural Economist |
| Ibrahima Bamba | Policy Economist |
| Rita Afiavi Agboh-Noameshie | Gender Specialist |
| Godswill Makombe* | Agricultural Economist (Tanzania) |
| Ali A. Touré | PDF – Policy Economics |
| Akahoua Simon N'cho□ | Research Assistant |
| Alia Didier Yelognisse* | Research Assistant |
| Eyram Kankoe Teophile* | Research Assistant |
| Mandiaye Diagne | Research Assistant (Senegal) |
| Maimouna Ndour | Research Assistant (Senegal) |
| Yoshiko Saigenji* | Impact Assessment Consultant |

## RiceTIME: Training, Information Management and Extension Linkages

| | |
|---|---|
| Inoussa Akintayo | Head of Rice Time Unit and Coordinator, African Rice Initiative |
| Amadou M. Bèye | Japan Emergency Fund Project Coordinator (Côte d'Ivoire) |
| Mamadou Kabirou N'Diaye | USAID Emergency Fund Project Coordinator (Senegal) |

| | |
|---|---|
| Robert Anyang | Extension Agronomist |
| Boubakary Cissé | Project Assistant |
| Saidu Bah | Research Assistant |
| Kokou Ahouanton | Research Assistant |
| Malik Idriss Lompo□ | Research Assistant (Côte d'Ivoire) |
| N'kou Mobio Modeste Romaric* | Research Assistant (Côte d'Ivoire) |
| Mansour Diop | Research Assistant (Senegal) |

## Collaborating Scientists

| | |
|---|---|
| Tadashi Takita | Breeder (JICA) |
| Yoshimi Sokei | Agronomist (JICA) |
| Joel Huat | Vegetable Agronomist (CIRAD) |
| Bertrand Muller | Agro-climatologist (CIRAD) |
| Seiji Yanagihara* | Rice Breeder (JIRCAS) |
| Philippe Menozzi* | Entomologist (CIRAD) |

*Joined in 2010
□Left in 2010


*AfricaRice team members and partners during Research Days 2010.*

# Postgraduate trainees

| Name and thesis topic | Institution / University | Country of origin | Gender | Sponsor | Degree |
|---|---|---|---|---|---|
| **Abiodun, Joseph**<br>The effectiveness of insect screening technique for developing durable rice cultivars resistant to rice yellow mottle virus based on vector short-range migration | Federal University of Technology, Akure, Nigeria | Nigeria | M | Japan | PhD |
| **Anago, Romuald**<br>*Etude compare des déterminants d'innovations dans les bas-fonds de Dogbo et Houeyogbé, Bénin* | University of Abomey-Calavi, Benin | Benin | M | European Union | MSc |
| **Bakpe, Arnaud F.**<br>*Caractérisation agro-morphologique des accession de l'espèce du riz africain* Oryza glaberrima *Steud. en provenance du Liberia* | University of Abomey-Calavi, Benin | Benin | M | AfricaRice | MSc |
| **Basso, Adamou**<br>*Caractérisation des souches de* Xanthomonas oryzae *pv.* oryzae *prélevés au Niger* | Agronomic and Veterinary Institute HASSAB II (IAV), Morocco | Niger | M | Germany | PhD |
| **Bower, Jonathan**<br>The impact of participatory varietal selection on farm adoption and incomes | School of Oriental and African Studies, University of London, UK | UK | M | European Union | MSc |
| **Cissoko, Mamadou**<br>The molecular genetic basis of resistance in rice to parasitic weed *Striga* | University of Sheffield, UK | Côte d'Ivoire | M | Biotechnology and Biological Sciences Research Council (BBSRC) – Department for International Development (DFID), UK | PhD |
| **Dago, Faustin**<br>Effect of fertilizers on RYMV epidemic | University of Cocody, Côte d'Ivoire | Côte d'Ivoire | M | Japan | PhD |

| Name and thesis topic | Institution / University | Country of origin | Gender | Sponsor | Degree |
|---|---|---|---|---|---|
| **Degbey, Herve**<br>*Charactérisation agro-morphologique des accessions de l'espèce de riz africain* Oryza glaberrima *Steud. provenant du Nigeria* | University of Parakou, Benin | Benin | M | AfricaRice | MSc |
| **Delidji, Kouami Ulrich Dimitri**<br>*Etude comparative de différentes pratiques culturales sur le rendement du riz* | GASA Formation, Benin | Benin | M | Japan | MSc |
| **Djedatin, Gustave**<br>Identification and mapping of resistance genes to bacterial leaf blight in rice | University of Abomey-Calavi, Benin | Benin | M | United States Agency for International Development (USAID) | PhD |
| **Dibba, Lamin**<br>Impact of NERICA adoption on farmer livelihoods | Kwameh Nkrumah University of Science and Technology, Ghana | The Gambia | M | Strengthening Capacity for Agricultural Research and Development in Africa (SCARDA) | MSc |
| **Dieng, Momar**<br>*Impact de la PINORD sur les riziculteurs dans la vallée du fleuve Sénégal* | University Gaston Berger, Senegal | Senegal | M | European Union | DEA |
| **Dutrieux, Loïc**<br>Mapping weed infestation at the Office du Niger using remote sensing and explaining variations in water productivity | Wageningen University, Netherlands | France | M | European Union | MSc |
| **El Hassimi Sow, Mounirou**<br>*Criblage d'une collection du riz du Niger pour la résistance au virus de la panachure jaune (RYMV) et étude de la diversité génétique* | University of KwaZulu-Natal, South Africa | Niger | M | United States Agency for International Development (USAID) | PhD |
| **Haruna, Akiko**<br>An analysis of land and water right structure and their economic impact in an inland valley rice farming in West Africa | Nicholas School of Environment, Duke University, USA | Japan | F | Japan | MSc |

| Name and thesis topic | Institution / University | Country of origin | Gender | Sponsor | Degree |
|---|---|---|---|---|---|
| **Idowu, Oluyemi**<br>Genetic diversity of *Magnaporthe grisea* causing blast disease of rice in Nigeria | Obafemi Awolowo University, Ile-Ife, Nigeria | Nigeria | F | Japan | PhD |
| **Kam, Honore**<br>Marker-assisted selection for improvement of rice varieties resistant to RYMV for West Africa | University of KwaZulu-Natal, South Africa | Burkina Faso | M | United States Agency for International Development (USAID) | PhD |
| **Koudamiloro, Augustin**<br>*Caractérisation et étude biomoléculaire des insectes vecteurs de la panachure jaune du riz (RYMV) au Bénin. Perspective de contrôle avec l'huile de neem* | University of Abomey-Calavi, Benin | Benin | M | Japan | PhD |
| **Maragoudakis, Alexandros**<br>Empirical research assistance on the loss of biodiversity due to the introduction of NERICA | School of Oriental and African Studies, University of London, UK | UK | M | European Union | MSc |
| **Misra, Amee**<br>Empirical research assistance on a project aimed at assessing the impact of crop genetic improvement on poverty in sub-Saharan Africa | School of Oriental and African Studies, University of London UK | India | F | European Union | MSc |
| **Montcho, David**<br>*Diversité et bases génétiques des traits liés a la vigueur végétative et a l'adaptation du riz africain aux différentes conditions hydrologiques* | University of Abomey-Calavi, Benin | Benin | M | Bill and Melinda Gates Foundation (BMGF) | PhD |
| **Moukoumbi, Yonnelle**<br>*Diversité génétique et valorisation NERICA de bas-fond* | University of Abomey-Calavi, Benin | Gabon | F | United Nations Educational, Scientific and Cultural Organization (UNESCO) | PhD |
| **Ndour, Diouf Daba**<br>*Tolérance du riz au froid* | Cheick Anta Diop University, Senegal | Senegal | F | Stress tolerant rice for poor farmers in Africa and South Asia (STRASA) | PhD |

| Name and thesis topic | Institution / University | Country of origin | Gender | Sponsor | Degree |
|---|---|---|---|---|---|
| **Ogundairo, Aminat A.**<br>Evaluation of the biodiversity of *Oryza glaberrima* collections from Nigeria | University of Agriculture, Abeokuta, Nigeria | Nigeria | F | AfricaRice | MSc |
| **Okry, Florent**<br>Strengthening rice seed systems and agro-biodiversity conservation | Wageningen University, Netherlands | Benin | M | Netherlands Organization for International Cooperation in Higher Education and Research (NUFFIC) | PhD |
| **Souley, Issaka**<br>RYMV isolates pathotyping, serotyping and epidemiology in Niger | University of Cocody, Abidjan, Côte d'Ivoire | Niger | M | Japan | PhD |
| **van't Klooster, Kris Joppe**<br>Interaction between *Rhamphicarpa* (parasitic weed) and rice | Wageningen University, Netherlands | Netherlands | M | Department for International Development (DFID), UK | MSc |
| **Voglozin, Nohemie C. Altinel**<br>African and hybridized rice diversity and management in the lowlands and highlands of Benin | University of Maryland Baltimore County, USA | Benin | F | Borlaug LEAP Fellowship | PhD |
| **Yao, Nasser**<br>Marker-assisted selection for improvement of rice varieties resistant to RYMV for West Africa | University of KwaZulu-Natal, South Africa | Côte d'Ivoire | M | United States Agency for International Development (USAID) | PhD |
| **Yelome, Octaviano Igor**<br>*Stage en ressources phyto-génétiques et amélioration des plantes* | University of Abomey-Calavi, Benin | Benin | M | AfricaRice | MSc |
| **Zossou, Espérance**<br>*Soutenir la poste-récolte et le marché du riz local en Afrique de l'ouest* | University of Liège, Gembloux, Belgium | Benin | F | Japan | PhD |

## Training activities and workshops conducted by AfricaRice in 2010

| Theme | Workshop/ Training | Countries represented and the number of participants | Place and date | Total number of participants |
|---|---|---|---|---|
| AfroWeeds project launching workshop | Workshop | Benin 3<br>Burkina Faso 1<br>Chad 1<br>Côte d'Ivoire 1<br>France 4<br>Ghana 1<br>Kenya 1<br>Mali 1<br>Senegal 1<br>Tanzania 1<br>Uganda 1 | Cotonou, Benin.<br>1 to 5 February | 16 |
| Workshop on small and medium enterprises in Africa | Workshop | The Gambia 1<br>Guinea 1<br>Italy 1<br>Kenya 2<br>Malawi 1<br>Mali 2<br>Morocco 1<br>Nigeria 1<br>Uganda 1 | Cotonou, Benin.<br>23 to 25 February | 11 |
| Seed production training course | Training | Benin 7 | Cotonou, Benin.<br>1 to 5 March | 7 |
| Rice production course | Training | Chad 7 | Cotonou, Benin.<br>10 to 19 March | 7 |
| Training on marker-assisted selection | Training | Benin 6<br>Burkina Faso 2<br>Côte d'Ivoire 3<br>France 1<br>Ghana 2<br>Liberia 1<br>Nigeria 2<br>Mali 2<br>Mozambique 1<br>Sierra Leone 2<br>Rwanda 1<br>Senegal 1<br>Uganda 1 | Cotonou, Benin.<br>29 March to 3 April | 25 |
| Impact assessment training workshop | Training workshop | AfricaRice staff 3<br>Ghana 1<br>Mozambique 1<br>Nigeria 12<br>Rwanda 2<br>Uganda 1<br>Zimbabwe 1 | Accra, Ghana.<br>22 to 29 April | 21 |

| Theme | Workshop/ Training | Countries represented and the number of participants | Place and date | Total number of participants |
|---|---|---|---|---|
| Training on International Crop Information System | Training | Nigeria 3<br>Senegal 3<br>AfricaRice staff 15 | Cotonou, Benin.<br>29 April to 4 May | 21 |
| Impact assessment training course | Training | Benin 1<br>The Gambia 1<br>Ghana 1<br>Guinea 2<br>Mali 1<br>Nigeria 1<br>Sierra Leone 14 | Freetown, Sierra Leone.<br>31 May to 4 June | 21 |
| Launching workshop of the Rice Breeding Task Force in Africa | Workshop | AfricaRice staff 10<br>Burkina Faso 1<br>Chad 1<br>Egypt 1<br>Ghana 1<br>Guinea-Bissau 1<br>Mali 3<br>Mauritania 1<br>Mozambique 1<br>Niger 1<br>Nigeria 1<br>Senegal 1<br>Sierra Leone 1<br>Togo 1<br>Uganda 1 | Ségou, Mali.<br>23 to 26 June | 26 |
| Workshop on strengthening the availability and access to rice statistics for sub-Saharan Africa | Workshop | Ethiopia 5<br>The Gambia 2<br>Ghana 2<br>Kenya 2<br>Liberia 2<br>Mozambique 2<br>Nigeria 4<br>Rwanda 2<br>Sierra Leone 2<br>Tanzania 2<br>Uganda 2 | Addis Ababa, Ethiopia.<br>26 to 31 July | 27 |
| Training on hybrid rice seed production | Training | Egypt 14<br>Ethiopia 2<br>Liberia 2<br>Mali 2<br>Mozambique 2<br>Nigeria 2<br>Rwanda 2<br>Senegal 2<br>Tanzania 2<br>Uganda 2 | Sakha, Egypt.<br>1 to 6 August | 32 |

| Theme | Workshop/ Training | Countries represented and the number of participants | Place and date | Total number of participants |
|---|---|---|---|---|
| Project kickoff workshop – Towards increased rice production in Africa through improved small-scale farmer-managed irrigation of inland valleys – SMART-IV | Workshop | AfricaRice staff 11<br>Benin 7<br>Burkina Faso 1<br>Ghana 5<br>Japan 7<br>Nigeria 4<br>Senegal 1<br>Togo 3 | Cotonou, Benin.<br>16 and 17 August | 39 |
| Workshop on strengthening the availability and access to rice statistics for sub-Saharan Africa | Workshop | AfricaRice staff 6<br>Benin 2<br>Burkina Faso 9<br>Côte d'Ivoire 2<br>Cameroon 2<br>Central African Republic 2<br>Democratic Republic of Congo 2<br>Guinea 2<br>Madagascar 2<br>Mali 3<br>Níger 2<br>Nigeria 1<br>Senegal 2<br>Togo 2<br>Tunisia 1<br>USA 1 | Ouagadougou, Burkina Faso.<br>16 to 21 August | 41 |
| RAP workshop component 2 | Workshop | AfricaRice nominated 3<br>Benin 8<br>Mali 5 | Cotonou, Benin.<br>16 and 17 September | 16 |
| Training on seed production | Training | AfricaRice nominated 2<br>Cameroon 1<br>The Gambia 1<br>Ghana 2<br>Liberia 1<br>Nigeria 4<br>Sierra Leone 1 | Cotonou, Benin.<br>20 September to 28 October | 12 |
| GenStat training | Training | AfricaRice staff 24 | Cotonou, Benin.<br>25 to 29 October | 24 |

| Theme | Workshop/ Training | Countries represented and the number of participants | Place and date | Total number of participants |
|---|---|---|---|---|
| Training on integrated rice management | Training | AfricaRice staff 13<br>Benin 2<br>The Gambia 6<br>Ghana 1<br>Liberia 4<br>Nigeria 5<br>Sierra Leone 4<br>Tanzania 4<br>Togo 1<br>Uganda 2 | Cotonou, Benin.<br>15 to 26 November | 42 |
| Rice production course (JICA) | Training | Benin 2<br>Cameroon 1<br>The Gambia 2<br>Guinea 1<br>Madagascar 1<br>Mali 2 | Cotonou, Benin.<br>6 to 17 December | 9 |
| Integrated rice management training course | Training | AfricaRice staff 10<br>Benin 3<br>Burkina Faso 2<br>Cameroon 2<br>Chad 2<br>Democratic Republic of Congo 2<br>Côte d'Ivoire 2<br>Gabon 2<br>Guinea 1<br>Guinea-Bissau 1<br>Madagascar 2<br>Mali 2<br>Niger 2<br>Senegal 2<br>Togo 3 | Cotonou, Benin.<br>6 to 17 December | 38 |
| Training on experimental design for Rice Breeding Task Force | Training | AfricaRice staff 7<br>Burkina Faso 2<br>Guinea 1<br>Mali 3<br>Niger 1<br>Senegal 1<br>Sierra Leone 1 | Cotonou, Benin.<br>14 to 17 December | 16 |

# Publications

## Papers published in peer-reviewed journals*

**Abe SS**, Buri MM, Issaka RN, **Kiepe P** and Wakatsuki T. 2010. Soil fertility potential for rice production in West African lowlands. *JARQ–Japan Agricultural Research Quaterly*, 44(4): 343–355, ISSN: 0021-3551.

**Abe SS** and Wakatsuki T. 2010. Possible influence of termites (*Macrotermes bellicosus*) on forms and composition of free sesquioxides in tropical soils. *Pedobiologia*, 53: 301–306, ISSN: 0031-4056.

**Abe SS**, Hashimoto S, Umezane T, Yamaguchi T, Yamamoto S, Yamada S, Endo T and Nakata N. 2010. Agronomic and environmental performance of rapeseed oilcake in the lowland rice farming of Japan. *Communications in Soil Science and Plant Analysis*, 41(16): 1944–1958, ISSN: 0010-3624.

Adigbo SO, Ojerinde AO, **Ajayi O** and **Nwilene FE.** 2010. Effects of sowing methods on upland rice in lowland rice-vegetable sequence in inland valley. *Journal of Agricultural Science and Technology*, 4(3): 1–10, ISSN: 1939-1250.

Asante MD, Kovach MJ, Huang L, Harrington S, Dartey PK, Akromah R, **Semon M** and McCouch S. 2010. The genetic origin of fragrance in NERICA1. *Molecular Breeding*, DOI 10.1007/s11032-009-9382-8.

Awotide BA, **Diagne A**, Awoyemi TT and Ojehomon VET. 2010. Farm-level constraints and adoption of improved rice varieties in Nigeria. *Learning Publics Journal of Agriculture and Environmental Studies*, 1(2): 12–29.

**Bado BV**, **Aw A** and Ndiaye M. 2010. Long-term effect of continuous cropping of irrigated rice on soil and yield trends in the Sahel of West Africa. *Nutrient Cycling in Agroecosystems*, 88: 133–141, ISSN: 1385-1314.

**Bado BV**, Lompo F, Sedogo MP and Cescas MP. 2010. Establishment of the critical limit of soil-available phosphorous for maize production in low acidic Ultisols of West Africa. *Communications in Soil Science and Plant Analysis*, 41(8): 968–976, ISSN: 0010-3624.

Bentley JW, **Van Mele P** and Acheampong GK. 2010. Experimental by nature: Rice farmers in Ghana. *Human Organization*, 69(2): 129–137, ISSN: 0018-7259.

**Bimpong KI**, Carpena AL, Mendioro MS, Fernandez L, Ramos J, Reversat G and Brar DS. 2010. Evaluation of *Oryza sativa* x *O. glaberrima* derived progenies for resistance to root-knot nematode and identification of introgressed alien chromosome segments using SSR markers. *African Journal of Biotechnology*, 9(26): 3988–3997, ISSN: 1684-5315.

Chabi A, Olouko J, Mama V and **Kiepe P**. 2010. Inventaire par télédétection des agro-écosystèmes de bas-fonds dans le centre du Bénin. *Cahiers Agriculture*, 19(6): 446–453.

**Demont M**, Devos Y and Sanvido O. 2010. Towards flexible coexistence regulations for GM crops in the EU. *EuroChoices*, 9(2): 18–24, ISSN: 1478-0917.

**Demont M**. 2010. Should sustainable consumption and production be a policy priority for developing countries and if so what areas should they focus on? *Natural Resources Forum*, 34(1): 87–88, ISSN: 0165-0203.

*The names of Africa Rice Center (AfricaRice) authors are shown in bold

**Demont M**, Dillen K, Daems W, Sausse C, Tollens E and Mathijs E. 2010. On the proportionality of EU spatial ex-ante coexistence regulations: Reply. *Food Policy*, 35(2): 183–184, ISSN: 0306-9192.

de Vries ME, **Rodenburg J, Bado BV**, **Sow A**, Leffelaar PA and Giller KE. 2010. Rice production with less irrigation water is possible in a Sahelian environment. *Field Crops Research*, 116(1–2): 154–164, ISSN: 0378-4290.

**Diagne A.** 2010. Technological change in smallholder agriculture: Bridging the adoption gap by understanding its source. In: de Janvry A and Oluoch-Kosura W eds. Special Issue on Agriculture for Development in sub-Saharan Africa, *African Journal of Agricultural and Resource Economics*, 5(1), ISSN 1993-3738.

Diako C, Sakyi-Dawson E, Bediako-Amoa B, Saalia FK and **Manful JT**. 2010. Consumer perceptions, knowledge and preferences for aromatic rice types in Ghana. *Nature and Science*, 8(12): 12–19, ISSN: 1545-0740.

**Fofana M**, Cherif M, Kone B, **Futakuchi K** and Audebert A. 2010. Effect of water deficit at grain ripening stage on rice grain quality. *Journal of Agricultural Biotechnology and Sustainable Development*, 2: 100–107.

Fu RHY, **Abe SS**, Wakatsuki T and Maruyama M. 2010. Traditional farmer-managed irrigation system in central Nigeria. *Japan Agricultural Research Quarterly*, 44(1): 53–60, ISSN: 0021-3551.

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*AfricaRice research assistants Florent Kinkingninhoun (extreme left) and Simon N'cho (extreme right) train Mary Mendy from The Gambia and Vivian Ojehomon from Nigeria on impact assesssment.*

# Abbreviations

| | |
|---|---|
| AfDB | African Development Bank |
| ARI | African Rice Initiative |
| AfricaRice | Africa Rice Center |
| BADEA | Arab Bank for Economic Development in Africa |
| BB | bacterial blight |
| BBSRC | Biotechnology and Biological Sciences Research Council |
| BMGF | Bill and Melinda Gates Foundation |
| BMZ | German Federal Ministry of Economic Cooperation and Development |
| CARD | Coalition for African Rice Development |
| CIAT | International Center for Tropical Agriculture |
| CIRAD | Centre de coopération international en recherche agronomique pour le développement, France |
| CORAF/WECARD | West and Central African Council for Research and Development |
| CRP | CGIAR Research Program |
| CRS | Catholic Relief Services |
| DFID | Department for International Development, UK |
| ERI | Emergency Rice Initiative |
| ERIS | Emergency Rice Initiative Spreadsheet |
| EU | European Union |
| FAO | Food and Agriculture Organization of the United Nations |
| FARA | Forum for Agricultural Research in Africa |
| GCARD | Global Conference on Agricultural Research and Development |
| GCP | Generation Challenge Program of the CGIAR |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit |
| GIS | geographic information system |
| GSR | Green Super Rice for the Resource Poor of Africa and Asia (project) |
| GSS | general support staff |
| GRiSP | Global Rice Science Partnership |
| ICM | integrated crop management |

| | |
|---|---|
| ICT | information and communications technology |
| IER | Institut d'économie rurale, Mali |
| IFAD | International Fund for Agricultural Development |
| IFDC | International Center for Soil Fertility and Agricultural Development |
| INERA | Institut de l'environnement et de recherches agricoles, Burkina Faso |
| INGER | International Network for Genetic Evaluation of Rice |
| INRAB | Institut national des recherches agricoles du Bénin |
| IRAG | Institut de recherche agronomique du Guinée |
| IRD | Institut de recherche pour le développement, France |
| IRM | integrated rice management |
| IRRI | International Rice Research Institute |
| IRS | internationally recruited staff |
| IVC | Inland Valley Consortium |
| IWMI | International Water Management Institute |
| JICA | Japan International Cooperation Agency |
| JIRCAS | Japan International Research Center for Agricultural Sciences |
| LEAP | Leadership Enhancement in Agriculture Program |
| LTFE | long-term fertility experiment |
| MAFF | Ministry of Agriculture, Forestry and Fisheries, Japan |
| MAS | marker-assisted selection |
| MICCORDEA | Mitigating the Impact of Climate Change on Rice Disease Resistance in East Africa |
| MDG | Millennium Development Goal |
| MSP | multi-stakeholder platform |
| NARS | national agricultural research system(s) |
| NASS | national agricultural statistics service(s) |
| NBS | National Bureau of Statistics, Nigeria |
| NCRI | National Cereals Research Institute, Nigeria |
| NEC | National Experts Committee (AfricaRice) |
| NERICA | New Rice for Africa |

| | |
|---|---|
| NGO | non-governmental organization |
| NIL | near-isogenic line |
| NISER | Nigeria Institute for Social and Economic Research |
| NRDS | national rice development strategy (strategies) |
| NUFFIC | Netherlands Organization for International Cooperation in Higher Education and Research |
| PAM | Policy Analysis Matrix |
| PCR | polymerase chain reaction |
| PDF | post-doctoral fellow |
| PLAR-ICM | participatory learning and action-research for integrated crop management |
| PMS | Performance Measurement System |
| PVS | participatory varietal selection |
| R&D | research and development |
| RAP | Realizing the agricultural potential of inland valley lowlands in sub-Saharan Africa while maintaining their environmental services |
| RISOCAS | Developing rice and sorghum crop adaptation strategies for climate change in vulnerable environments in Africa |
| RYMV | *Rice yellow mottle virus* |
| SCARDA | Strengthening Capacity for Agricultural Research and Development in Africa (project) |
| SLARI | Sierra Leone Agricultural Research Institute |
| SPIRIVWA | Sustainable Productivity Improvement for Rice in Inland Valleys in West Africa |
| SMART-IV | Sawah, Market Access and Rice Technologies for Inland Valleys |
| SSA | sub-Saharan Africa(n) |
| STRASA | Stress tolerant rice for poor farmers in Africa and South Asia |
| UNDP | United Nations Development Programme |
| UNESCO | United Nations Educational, Scientific and Cultural Organization |
| USAID | United States Agency for International Development |
| WARDA | West Africa Rice Development Association (*now* AfricaRice) |
| WCA | West and Central Africa |
| WORIGA | West and Central African Women Rice Farmer Group Association |
| WUR | Wageningen University and Research Center, Netherlands |

## About the CGIAR

The CGIAR is a global partnership that unites organizations engaged in research for sustainable development with the funders of this work. The funders include developing and industrialized country governments, foundations, and international and regional organizations. The work they support is carried out by 15 Centers, in close collaboration with hundreds of partner organizations, including national and regional research institutes, civil society organizations, academia, and the private sector.

## The Centers:

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| AfricaRice | Africa Rice Center (Cotonou, Benin) |
| Bioversity | Bioversity International (Rome, Italy) |
| CIAT | International Center for Tropical Agriculture (Cali, Colombia) |
| CIFOR | Center for International Forestry Research (Bogor, Indonesia) |
| CIMMYT | International Maize and Wheat Improvement Center (Mexico, DF, Mexico) |
| CIP | International Potato Center (Lima, Peru) |
| ICARDA | International Center for Agricultural Research in the Dry Areas (Aleppo, Syria) |
| ICRISAT | International Crops Research Institute for the Semi-Arid Tropics (Patancheru, India) |
| IFPRI | International Food Policy Research Institute (Washington, DC, USA) |
| IITA | International Institute of Tropical Agriculture (Ibadan, Nigeria) |
| ILRI | International Livestock Research Institute (Nairobi, Kenya) |
| IRRI | International Rice Research Institute (Los Baños, Philippines) |
| IWMI | International Water Management Institute (Colombo, Sri Lanka) |
| World Agroforestry | World Agroforestry Centre (Nairobi, Kenya) |
| WorldFish | WorldFish Center (Penang, Malaysia) |

AfricaRice

**Africa Rice Center (AfricaRice)**
01 BP 2031, Cotonou, Benin
**Telephone:** (229) 21 35 01 88 **Fax:** (229) 21 35 05 56 **E-mail:** AfricaRice@cgiar.org
www.AfricaRice.org