

Africa Rice Center

## **Medium-Term Plan 2010-12**

Submitted to the Science Council

of the

Consultative Group on International Agricultural  
Research (CGIAR)

June 15, 2009

**Africa Rice Center**  
**Medium-Term Plan 2010-12**

**Table of Contents**

MTP Overview .....	3
Introduction.....	3
Highlights of Project Portfolio .....	7
Center Financial Indicators.....	14
Project Portfolio.....	16
WARDA-P01: Genetic Diversity and Improvement .....	16
WARDA-P02: Sustainable Productivity Enhancement.....	27
WARDA-P03: Learning and Innovation Systems .....	35
WARDA-P04: Policy and Impact Assessment.....	46
WARDA-SWEP 01: The Inland Valley Consortium (IVC) .....	58
Annexes .....	66
Implementation of EPMR/CPER Recommendations.....	66
Financing Plan .....	71

# MTP Overview

## Introduction

The world rice situation in 2008 was rocky and remains uncertain for 2009. Rice consumers in Africa are very vulnerable to price hikes because the continent consumes far more rice than it produces. Rice consumption in sub-Saharan Africa is growing at about 4-5% per year due to rapid urbanization and demographic trends, strong preferences for rice across revenue groups, increased participation of women in the labor force, and lifestyle changes. Paddy rice production is currently catching up with average annual growth rates over the last 5 years of approximately 5% in West Africa, 3% in Central Africa, 7% in East Africa and 16% in Southern Africa. However these growth rates are not sufficient to cope with the demand for rice. In West and Central Africa where rice is a staple food, rice import volumes average between 40% and 50% of consumption needs. The rice self-sufficiency ratio in sub-Saharan Africa declined steadily from a high 112% in 1961 to 61% in 2006. Close to 10 million tons of milled rice are being imported into sub-Saharan Africa every year. With rice prices predicted to remain high, major rice producing countries closing borders to export, and global stocks at their lowest levels ever, relying on the world market for rice is clearly a risky and unsustainable strategy. It may lead to severe food insecurity and civil unrest.

High rice prices will adversely affect poor and low-income households who spend a larger proportion of their revenue on staple food relative to high-income households. Their welfare will be reduced since the soaring rice prices correspond to a reduction in their purchasing power. In a region where more than 40% of the population lives below the extreme poverty line of \$1 a day, coping with high rice prices will mean poorer households taking measures which could include the reduction of essential nutrients intake, especially in urban areas, and long episodes of food deprivation and malnutrition. Moreover, in fragile countries such as Guinea-Bissau and Sierra Leone, where annual per capita rice consumption is above 100 kg, the incidence of higher rice prices has the potential to trigger political disturbances.

The current upward trend and elevated variability in the international market indicates that relying on imports is now a very risky, costly and unsustainable strategy for many countries in sub-Saharan Africa. Africa depends on Asia's surplus rice production for its rice. However, yield growth in Asia has been slowing for the last decade, and land area for rice has been flat or even declining in a number of areas across the region. Tight rice supplies and therefore higher prices, will likely continue for years to come. Most African countries will be unable or unwilling to compete with Asian countries in bidding for rice that comes on the international market. Thus it is imperative that African countries act immediately to develop the means to become self sufficient.

It is now clear that rice in Africa can compete comfortably against imported rice as a recent study by WARDA and IITA has shown. However, data from farm-level surveys of irrigated rice production in the Sahel reveal that it is still three times more expensive to produce rice in Niger than in Thailand while Malian rice producers incurred a unit cost of production which was double that of Thailand. These high production costs are often due to low intensification, smaller size of rice farmers' plots which reduces economies of scale, and the appreciation of the CFA currency (which is pegged to the euro) against the US dollar.

To increase rice production, land and labor productivity need to be enhanced. However, critical inputs such as quality seed and mineral fertilizer are often not available or farmers are unable to buy these inputs on time. Farm size also often limits the possibility to invest in cost-reducing and factor productivity-enhancing opportunities offered by mechanization. Farmers are increasingly working in cooperatives wherever possible to access such critical machinery.

The only viable strategy for Africa is to substantially boost rice production and turn around the dependence on imports. Rice production in Africa can be increased through increasing the harvested area, either by increasing the area or increasing cropping intensity and by increasing the yield from existing land.

The three main rice ecologies in sub-Saharan Africa are the rainfed uplands, the rainfed lowlands and the irrigated systems. The constraints in these rice ecologies have various communalities such as weed and pest pressure. In addition, inter-linkages exist between the ecologies. This is true for water or nutrient flow from upland to lowland. Another fuzzy transition exists between rainfed and irrigated lowland. From the about 8 mln ha of land under rice cultivation in sub-Saharan Africa, about 40% is located in the upland ecology, 37% in the rainfed lowland ecology and 14% in the irrigated ecology.

In the upland ecology farmer yields usually range between 1 to 1.5 t ha<sup>-1</sup>. This is caused by a host of abiotic and biotic stresses, such as low soil fertility, drought, weed pressure and blast disease. The Nerica varieties have made important headway in this ecology because of their better adaptation to the local stresses leading to higher and more stable yield and shorter growth duration. However, drought and soil fertility will limit attainable yields and potential yield gains from improved technology in the upland ecology will remain relatively small.

In the rainfed lowland ecology, farmers can expect yields between 1.5 to 3 t ha<sup>-1</sup>. This is largely due to better soil fertility and when combined with good water control and appropriate management yields can be as high as 3 to 6 t ha<sup>-1</sup>. WARDA and partners from national research institutions in West Africa have developed a range of Nerica varieties suited for rainfed lowland conditions. There are also often opportunities for diversification such as growing vegetables in the dry season.

The irrigated systems have the highest yield potential because of better water control and reliability. Irrigated systems in Senegal and Mali have produced tremendous yield increases over the last 20 years from approximately 2 t ha<sup>-1</sup> to nearly 6 t ha<sup>-1</sup> in 2006. However attainable yields in these systems can be as high as 8 t ha<sup>-1</sup>. WARDA has developed a suite of integrated crop management options to enhance productivity in lowland sites based on farm surveys and farmer participatory on- and off-station research. Rice double cropping is often feasible in the irrigated systems but its development in Africa has been restricted by a lack of adequate machinery to prepare the land and harvest the crop on time. WARDA has developed high yielding short-duration varieties that are suitable for double cropping in rice irrigation schemes.

The greatest potential to enhance rice production is by closing the yield gap between actual and attainable yields in the lowland systems and expanding the rice harvested areas in both the rainfed and irrigated lowland systems. Extending the use of the valley floors may also help conserve the less stable sloping uplands.

WARDA's research, in close collaboration with IRRI is conducted in partnership with African agricultural research and extension organizations, NGOs, farmer organizations, the private sector, advanced research institutions and other rice development stakeholders and involving a large range of donors. WARDA has become a truly pan-African organization with currently 22 member states across the continent. Its temporary headquarters is located in Cotonou, Benin, with outstations in Senegal, Nigeria and Tanzania. IRRI and WARDA have jointly established a presence in Tanzania and are developing a joint research program for East and Southern Africa countries.

WARDA is convening the ROCARIZ rice research network involving 17 countries in West and Central Africa. The ECARRN network involving 10 countries in East and Central Africa is no longer operational. These networks are expected to merge into one large pan African research workshop

in 2010. WARDA is also the convenor of a System-Wide Ecoregional Program focusing on enhanced and sustainable use of inland valley systems in West Africa (The inland Valley Consortium, involving 12 countries in West Africa and 8 international institutions). IRRI and WARDA are actively collaborating in the INGER network to facilitate the exchange of rice germplasm across and between continents. IRRI and WARDA are in the process of aligning their research activities in sub-Saharan Africa and have developed a joined rice R for D strategy for East, Central and Southern Africa.

WARDA is also coordinating two more development and policy-oriented networks. The Africa Rice Initiative promotes the diffusion of Nericas and other improved varieties (covering 7 countries). The Africa Policy Research and Advocacy Group (APRAG) conducts rice policy research and advocacy in support of national and regional common agricultural policies and promotes the utilization of policy research results for competitive rice production and commercialization in the region.

Rice research and development is gaining increasing importance at national level as well. African governments are already demonstrating the political will to raise to the challenges the global rice crisis is going to pose to the food security in Sub-Saharan Africa. Indeed, in 2008 several West African countries have launched ambitious rice development initiatives with the stated objective of becoming self-sufficient in rice within 8 to 10 years time. For example, in its newly developed rice initiative, Senegal has set the goal to become self-sufficient in rice by 2015 with a planned investment budget of about 160 millions dollars for the next 3 years. Similarly, the government of Mali has set the objective of increasing total paddy production from irrigated systems in the Office du Niger region to 1 million tonnes by 2012. Côte d'Ivoire and Burkina Faso have launched similar initiatives and other West African countries are expected to follow and launch their own rice development plans. These new and ambitious initiatives follow the one launched by President Obasanjo for Nigeria in 2003 and which, according to FAO reports has contributed significantly to the 23% and 13% increase in Nigeria's domestic rice production in 2005 and 2006 respectively. As a consequence of these initiatives, excellent results were obtained in 2008 in terms of rice production in West Africa, most notably in Burkina Faso, Senegal and Mali.

The Coalition for African Rice Development (CARD) launched by JICA and AGRA in 2008 aims at doubling rice production over the next 10 years and 21 CARD candidate countries have been selected most of which are also WARDA member countries. WARDA and IRRI are among the steering committee members of CARD.

These demonstrations of political will and commitment to invest in domestic rice production capacity by so many African countries is to be saluted. However, there is clearly a need to coordinate these country initiatives at the regional and continental levels to avoid duplication of effort and wasteful competition among countries and build synergies, encourage coordinated and complementary investments based on comparative advantage, foster regional trade, harmonize domestic production support and trade policies and develop a pool of common regional infrastructures, institutions and services to reach economies of scale.

WARDA and partners are ready to rise to this rice challenge. This MTP will be a guide in conducting rice science and building capacity for impact in the continent.

The current Medium Term Plan (MTP) of the Africa Rice Center (WARDA) for the period 2010-2011 builds on the previous MTP that introduced a new research structure at the Center. Output targets for 2010 and 2011 have been updated, and output targets for 2012 have not been added as suggested by the Science Council because of the ongoing changes in the CGIAR System. Just like the previous MTP, this MTP contains four MTP projects and one SWEP:

- Project 1: Genetic Diversity and Improvement

- Project 2: Sustainable Productivity Enhancement
- Project 3: Learning and Innovation Systems
- Project 4: Policy and Impact Assessment
- Project 5: The Consortium for the Sustainable Development of Inland Valley Agro-ecosystems in Sub-Saharan Africa (IVC)

Program 1 (Genetic Diversity and Improvement) covers the area from gene to plant, and aims to enhance genetic diversity and develop improved rice lines adapted to abiotic and biotic stresses and consumer preferences, using conventional breeding, marker-assisted selection and profiting from farmer knowledge. The program has four main outputs: (i) enhanced genetic diversity generated; (ii) improved and stable rice lines and varieties with good grain quality available; (iii) enhanced knowledge of G x E interactions for abiotic and biotic stresses available; and (iv) enhanced involvement of farmers in rice genetic resources development established.

Program 2 (Sustainable Productivity Enhancement) covers crop and NRM research related to intensification and diversification and protection of environmental services, and aims to move research from plot to systems level and to introduce more systems thinking in general. The program will specifically focus on the rainfed and irrigated lowlands as greatest opportunities to boost rice production in sub-Saharan Africa are expected within these ecologies.

Program 3 (Learning and Innovation Systems) covers partnerships, learning and innovation systems and works on improving the link between farmers and input and output markets and value chain development. The program has four outputs: (i) partnerships and networks to promote rice sector development; (ii) mechanisms for pro-poor seed system development; (iii) agricultural education tools and learning pathways; and (iv) strategies and tools to strengthen the rice value chain.

Program 4 (Policy and Impact Assessment) covers the policy and impact work and includes three programs: (i) tools, methods and enhanced capacity for impact assessment, policy analysis; (ii) rice policy options and institutions for competitive domestic rice production; (iii) improved post-harvest systems for competitive domestic rice production.

The SWEP Inland Valley Consortium targets an extremely promising agro-ecology to produce rice in sub-Saharan Africa. IVC is a platform for large collaborative projects on inland valley development in sub-Saharan Africa between 12 countries in West Africa and regional and international partners convened by the Africa Rice Center. Inland valley systems offer great prospects to stem the current food crisis in Africa through enhanced use and intensification and diversification (e.g. high value crops, fish, livestock). Sustainable development of IV systems requires collective action within and beyond the CGIAR focusing on better technologies, improved water management and market access, multiple uses of water, sustainable wetland management, and land and water rights. Inland valleys returned into the donor spotlight since the outbreak of the food crisis in 2008. In 2007, IVC was judged a CGIAR Flagship by WARDA's EPMR.

In 2008, WARDA created a special unit focusing on Training, Information Management and Extension linkages (RiceTIME) to lead WARDA's contribution to the Emergency Rice Initiative (see [www.africanricecenter.org](http://www.africanricecenter.org)) and facilitate rice information management and capacity building. RiceTIME hosts the African Rice Initiative (ARI), ROCARIZ and incorporates all freestanding capacity building and development activities of the institution. All these activities, formerly housed in Program 3 have been moved to the RiceTIME unit.

This MTP is still linked to WARDA's Strategic Plan for 2003-2012. Revision of WARDA's Strategic Plan is needed to take account of the changing situation in Africa both due to the influence of global external factors such as rising food prices, declining global rice stocks, and climate change and continental changes such as those in demographics and the rising sophistication of urban

consumer demands. The need to develop a new Strategic Plan is also a direct response to the 2007 EPMR and the enlargement of WARDA's geographic mandate. The total number of WARDA member states as of June 2009 is 22, 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, the Gambia, Ghana, Guinea, Guinea Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Republic of Congo, Senegal, Sierra Leone, Togo and Uganda. The development of the new Strategic Plan has been put on hold because of the ongoing CGIAR change management process and is expected to be finalized in 2010.

## Highlights of Project Portfolio

### A Research highlights:

#### Research highlights Program 1

Morpho-physiological characterization of rice germplasm: Epidermal conductance ( $g_{min}$ ) referred to as minimal conductance is water loss through the cuticle and stomata of plants when stomatal conductance is minimal, and may have adaptive benefit related to plant water. A wide range of genetic variation of rice including *O. glaberrima* was tested. Followings are major findings: 1) In  $g_{min}$ , major water loss was not through the cuticle but through the closed stomata; 2) Two *O. glaberrima* cultivars (CG 14 and IG10) and traditional tropical japonica cultivar (Khao dam) had constantly low  $g_{min}$  across two experiments whereas the *O. sativa* improved cultivar IR 64 had higher  $g_{min}$  (the interspecific progenies had intermediate  $g_{min}$ ); 3) In the relationship between stomatal density x stomatal length and  $g_{min}$ , three *O. glaberrima* cultivars (CG 14, IG 10 and TOG 5681) showed lower  $g_{min}$  than the *O. sativa* cultivars against the same stomatal density x stomatal length value, suggesting *O. glaberrima* has less water leakage from closed stomata than *O. sativa*. QTLs associated with  $g_{min}$  will be identified in the further experiments.

Molecular characterization of a sub-collection of African rice (*O. glaberrima* Steud): A total of 256 alleles were detected using the 30 markers. Genetic distance based analysis showed 3 main genetic groups. One consisted in a mixture of *sativa*, *glaberrima* and the wild *longistaminata* accession. The second is constituted exclusively of *glaberrima*. The third one represented *glaberrima* plus the wild *barthii* accession.

Collection of local landraces: A total of 677 accessions of rice were collected in West Africa – 195 from Niger, 312 from Burkina Faso, 160 Senegal and 10 from Gambia.

Evaluation for Fe deficiency in upland: 49 high yielding inter-specific upland rice varieties were screened for tolerance to iron deficiency in Nigeria by NCRI and WARDA. Tolerant varieties such as WABC 165 and NERICA 1 were identified.

Stress-specific PVS: PVS targeting specific abiotic stresses has been started in 2008 in the following countries: Nigeria and Burkina Faso (Fe toxicity), The Gambia and Senegal (Salinity), Ethiopia (Cold).

PVS: PVS was expanded to East Africa (Rwanda, RDC, Congo Brazzaville, Ethiopia, Tanzania and Uganda) and Central Africa (Central Africa, Cameroon and Chad). Senegal released 16 WARDA-developed varieties based on PVS data and the government decision to use PVS trials as an official mechanism for varietal release.

#### Research highlights Program 2

First Report of RYMV in the Gambia: RYMV was first reported in Kenya in 1966. Later it was found in most rice-producing countries in Africa. In the westernmost countries in Africa the symptoms

were observed but the virus was never isolated. Detection of RYMV in The Gambia means that the virus is now found across Africa, from east to west.

Response of upland rice cultivars to weed competition in the savannas of West Africa: A field study was conducted to assess the effect of weed competition on the performance of upland rice in the savannah area of Nigeria at two different locations. Six varieties were tested: three NERICA varieties that showed weed competitive characteristics (1, 2 and 4), both NERICA parents and a local check (IITA 150). Farmers would have higher margin returns in Sabon-Gari if they grow NERICA1 and in Tilla if they grow NERICA4.

Management options against termites tested: The entomopathogenic fungus *Metarrhizium anisopliae*, neem oil and sawdust gave the best protection against termite attack in Benin and Nigeria. The control treatment, using tobacco, neem powder and pawpaw had the highest termite attack. Amongst the rice varieties, termite attack was significantly lower on CG14, LAC 23, NERICA 1, 2, 5 and 10 than on the other rice varieties. The local variety, OS 6 had the highest attack followed by IDSA 6.

Award for the best poster presentation: At the Tropentag 2008 being hosted by Hohenheim University in Stuttgart last October, the poster "Physiological Responses of Lowland Rice Cultivars to a Water Saving Irrigation System" from the RISOCAS project scientists was awarded the price for the best poster in the category Plant Sciences. There were about four hundred poster entries in competition divided over five categories.

### **Research highlights Program 3**

NERICA dissemination in Benin: (i) A spontaneous NERICA innovation system is emerging; (ii) Need for systematic follow-up of TUNDE project & southern NERICA producers; (iii) Proper NERICA seed production mechanism has not yet taken off in non-ARI zones; (iv) Songhaï seems to slow down or not moving ahead as fast as expected; (v) Need to stimulate a class of entrepreneurial NERICA seed producers

NERICA dissemination in Guinea: (i) NERICA seed production could not sustain in all areas because it was not rooted in a system of entrepreneurial & development actors that produce and supply complementary technologies (ii) Only in areas where a strong fertilizer market and supportive NGOs were operational could NERICA seed production sustain as a business.

NERICA dissemination in Sierra Leone: (i) four community development banks have credits for agriculture & encourage NERICA production; (ii) SL has a seed multiplication unit, but it lacks appropriate means for its production activities; (iii) NERICA varieties may not be appropriate for some regions; (iv) The role of banks in seed systems needs further study

Rice platforms in ARI countries: (i) The ARI CCER showed that marketing and processing are not well addressed and links with input and output markets need more attention; (ii) The Gambia and Mali are doing well, Benin is well on its way and Ghana is off to a good start. Guinea and Sierra Leone need more assistance

Rice rural learning support: (i) PLAR farmers involved in developing five new videos on ICM in inland valleys and irrigated systems; (ii) Rice videos translated into 20 African languages to strengthen national innovation systems; (iii) Gambian and Guinean national TV broadcast videos; WARDA distributed videos to 87 partners in 28 African countries who in turn shared them with over 300 local organizations; rice radio scripts distributed to over 300 rural radios.

PLAR impact: (i) PLAR increased farmers' yield by 56% and profits by 86% in 3 Ghanaian villages; (ii) PLAR improved social inclusion and social life

(farmer group formation); (iii) PLAR improved links with extension; (iv) video Made more explicit demands to service providers

Video impact: (i) Women who watched the rice parboiling video started to better organize themselves; (ii) asked NGOs to help them link up with credit providers; (iii) started to better trust the local NGOs; (iv) started to market their rice through new outlets; (v) improving rice parboiling techniques depended on two principal variables: to belong to a woman's group and to have seen the video.

Prerequisites for rice parboiling: (i) Credit input is important for the sustainability of parboiling; (ii) many parboiling women groups in Benin apply for micro credit through the facilitation of NGO.

Development and dissemination of ASI thresher: Rigorous collaboration with formal-sector researchers, engineers and extension workers, existing and emerging informal local networks, as well as functional service providers and output markets appeared prerequisites for the successful development and dissemination of ASI thresher; (ii) in neither Senegal nor Mali were emerging social and technical innovations at the local level properly recognized and supervised by formal institutes, nor were they used in a way to enhance organizational learning, jeopardizing success of future innovation processes.

#### **Research highlights Program 4**

Policy Research and Advocacy:

The ERIS decision-making tool: The Emergency Rice Initiative Spreadsheet (ERIS) was developed to assist member countries in developing strategies to boost domestic rice production through improved access to rice seed and mineral fertilizer.

Linkage of international prices to Africa prices: (i) Price changes in Thailand are transmitted faster to Senegal than to Mali and Benin (ii) There is no short-run transmission of price changes from Thailand to Senegal , Mali and Benin (iii) Nearly a year is required for full adjustment to price change in Thailand .

Further evidence of comparative advantage of in rice in West Africa: Two new studies show the competitiveness of locally produced rice in Benin, Guinea, Nigeria, Senegal and Togo compared to imported rice.

The use of improved technologies has improved the technical efficiency of Irrigated rice farmers' in the Senegal River Valley: Improved technologies like enhanced short/medium duration Sahel cultivars and the use of the ASI thresher have a positive impact on technical efficiency as well the compliance with input recommendations.

Women in the Senegalese River Valley' lack access to critical productive resource: (i) the most important constraints faced by women are lack of access to land, training, credit and machinery like pump. (ii) 71% of sampled women don't know how to access land for personal use (iii) 88% of women didn't receive any training in rice production.

Ex-post Impact Assessment:

Nerica Impact on poverty and inequality in Benin: Adoption of Nerica reduces the household's likelihood of being poor by 10% with the reduction higher for female headed households (14% ) than for male headed households (6%). (iii) Increase in rice income contributes significantly to a reduction in income inequality with the proportional reduction lower with NERICA adoption than with adoption of other improved rice varieties.

Adoption and Impact of the ASI thresher in the Senegal River Valley: (i) the population adoption rate of the ASI thresher in the Senegalese River Valley is estimated at 86 %, (ii) main determinants of ASI adoption are farmer experience in rice growing, participation in ASI field experience, contact with extension service and duration of exposure to the ASI thresher, (iii) The adoption of ASI has a positive impact on labor: a net gain of 22 person-days per hectare for the subpopulation of potential ASI adopters (iv) 86% of sampled women reported that ASI had no adverse effect on their profit (manual threshing and winowing is primarily the work of women laborers).

#### **Research highlights IVC:**

Weed competitiveness of lowland rice varieties of NERICA in the Guinea savannah area: Four outstanding lowland varieties of NERICA were identified for the rain-fed lowland agro-ecosystems of the Guinea Savannah. NERICA-32 proves weed suppressive, NERICA-37 possesses crop tolerance to weed interference, NERICA-42 has moderate to low weed infestation levels and low relative yield losses while NERICA-58 has stable high yields under weed-free and weedy conditions. These NERICA varieties consistently out-yielded their *O. sativa* parent IR64 by more than 1 t ha<sup>-1</sup> under weedy conditions.

Ecological and socio-technical literacy: A case study of an emerging fruit innovation system in Guinea highlights the challenges of demand-driven approaches to research prioritization. Shallow ecological knowledge and a blind faith in modern technologies by scientists and farmers alike distort prioritization. Locally available technologies are dismissed in favor of modern technologies that are inaccessible to most smallholder producers. Strengthening the ecological literacy of stakeholders may help to overcome this bias.

Knowledge on fruit fly and weaver ant in Benin: The implications of on-farm research for local knowledge related to fruit flies and weaver ants were studied in the north of Benin. All producers and fruit pickers considered low yields due to fruit flies the principle constraint for mango production, estimating economic losses between 20 and 45%. None of them could identify damage the first two days after fruit fly attack. Of the farmers involved in the on-farm study 80% reported beneficial effect of the weaver ants against 25% from the non-participating farmers. Of the fruit pickers 60% considered the ants as beneficial, naming better product quality and longer shelf live, while 40% of the pickers still considered weaver ants as a nuisance during harvest.

PLAR module on weaver ants: A Participatory Learning and Action Research (PLAR) module was developed to improve the knowledge of inland valley farmers in using weaver ants to protect their crops. In specific training sessions (five modules) farmers learn how weaver ants control stem borer in cashew trees, termites in cashew trees, how to avoid ant bites, the ecological role of the weaver ant and the how they control fruit fly attacks in mangos.

New and terminated research:

#### **New research directions Program 1:**

Germplasm evaluation to identify promising breeding materials:

- Characterization/screening of the *O. glaberrima* collection at WARDA
- Completion of the collection of the passport data for the accessions of WARDA's genebank
- Collection of new local landraces and wild species from SSA
- Nomination and exchange of breeding materials for NARS and WARDA varietal improvement programs
- Investigation of genetic diversity of lowland NERICAs and local landraces in SSA

Conventional breeding:

- Evaluation of the existing segregating populations including *O. sativa* x *O. barthii* with NARS
- Start of the crossing and selection in *O. glaberrima* x *O. glaberrima*
- Continuation of the crossings of *O. sativa*, *O. glaberrima* and NERICA
- Expansion of the exploitation of wild species other than *O. barthii*
- Start of evaluation and introduction of F1 hybrid rice in Senegal, Mali and Uganda

Marker-assisted breeding:

- Introgression of genes/QTLs for some major abiotic constraints, which have already been identified by ARI's and CG centers, into mega varieties such as NERICAs
- Continuation of the identification of QTLs and selection with molecular markers for biotic stresses, i.e. RYMV, BLB and AfRGM
- Joint breeding with some advanced NARS using molecular biology facilities

Varietal development by the participation of farmers:

- PPB (participatory plant breeding) with Mali and Burkina Faso
- Documentation of the participatory approaches adopted by WARDA
- Commitment to national seed release systems in some countries using PVS approaches (e.g. the case of Senegal)

Assistance to varietal development activities:

- Elucidation of mechanisms of important traits such as resistance to major stresses such as weeds
- Physiological characterization of all kinds of materials (landraces, breeding lines, existing cultivars and wild species) including the characteristics of seed (dormancy etc.)

Blue sky research activities not directly linked to MTP:

- Improvement of knowledge of genetic diversity of *O. glaberrima* and *O. barthii* through generation of reference genome sequences and SNP

**New research directions Program 2:**

Climate change: After the successful start of the RISOCAS project in Saint Louis, new initiatives regarding climate change were developed. Under leadership of Wageningen University Program 2 scientists are involved in the CHANGE project that tries to bring climate information to the farmers in Africa. Another proposal will be submitted shortly, where the effects of climate change on the distribution of parasitic weeds will be studied, looking at ecological and economic implications.

Parasitic weeds: The aim of the project is to extend the understanding of the molecular basis of post-attachment in rice to *Striga* species and to utilize this knowledge for improvement of both rice and sorghum in Africa by integrating the extensive knowledge on *Striga*-host interactions, novel plant-growth systems, and modern genomic and comparative genomic techniques.

Mechanization: Developing low-cost machinery for small-scale farmers is the topic of a new WARDA-IRRI collaboration in East Africa. The project will improve both the timeliness and efficiency of farm operations, reduce post-harvest losses and increase farmer's income by producing more rice of a better quality. To gain significant improvement of rice yields and grain quality will require a systemic, mechanized approach to rice production from land preparation through to market.

Pathotyping blast in Africa: The use of resistant varieties is the most economical and effective way of controlling rice blast in resource-poor farmers' fields. Unfortunately, because of the highly variable nature of the blast pathogen, it is difficult to manage blast disease through the use of resistant cultivars. The breakdown of resistance had been attributed to a poor pre-release challenge to an adequate pathogen population. Therefore, information on population diversity may be used for developing strategies to increase the durability of resistance through adequate characterization of suitable screening sites and appropriate deployment of resistant cultivars.

P-uptake in rice: Identify best-management practices to optimize productivity of new cultivars tolerant to both drought and P-deficiency on acid soils (low-P and high-Al). The identified best-management practices and new cultivars should provide upland rice farmers with at least 30% yield advantage over their variety and practices. Development of site-specific soil and crop management practices to optimize the performance of the newly develop P-efficient cultivars and identification of mechanisms for improved upland rice adaptation to acid soils deficient in P and/or high in Al.

Blue-sky research: Weeds and birds constitute major biotic production constraints in irrigated rice in the Sahel. Yet, little quantitative data is available on their effects on rice yield. Beside a main effect, supposedly the two pests also have an interaction effect on rice yield. A weedy field may attract birds more than a weed-free field. Weeds usually have shorter life cycles than the rice crop that can also start prior or at anytime beyond rice sowing. Consequently, the period of weed seed availability to birds may be much longer than the exposure to ripening rice seeds. Moreover, some weed species are more attractive for birds than rice. Weeds can serve both for seed predation and shelter to birds in the field. The main research question is whether poor weed management result in increased or decreased negative effects of birds.

### **New research directions Program 3:**

- a. Partnerships and multi-stakeholder platforms in rice sector development: To gain insights in institutional bottlenecks in the dissemination of new rice varieties and other rice technologies
- b. Social inclusion/exclusion mechanisms: (i) To develop a better understanding of how access of youth, women and poor to resources (land, seed, water, credit, training,...) influences rice sector development; (ii) Analyze socio-cultural and institutional bottlenecks of local seed systems and interactions with input and output markets; (iii) Analyse determinant and neglected actors in formal and informal seed systems through actor network analysis; (iv) assess potential development trajectories of formal and informal seed systems.
- c. Institutional innovations for land tenure and water management in IVs: (i) identify and document innovations; (ii) capture them in case study format; (iii) transform them in multi-media format and share through projects and networks.
- d. Rural learning: (i) Assess differences in learning needs and information sources of resource poor, women and youth; (ii) Assess role of communication and learning tools in strengthening emerging rice sectors; (iii) Establish and test public-private partnerships (agro-dealers, mobile companies, rural banks,...) for knowledge sharing (distribution of educational rice videos and maintaining RIGA)

- e. Post-harvest innovations: (i) participatory technology development of energy-efficient and low-cost rice parboiling equipment; (ii) assess alternative uses of rice by-products; (iii) aptitude of local and improved varieties to rice post-harvest handling and processing.
- f. The Africa Rice Initiative and other development oriented projects related to the Emergency Rice Initiative have been moved to the RiceTIME Unit.

#### **New Research directions Program 4:**

##### Policy and impact assessment

- a. More precise policy Analysis and forecasting tools for the African rice sectors: To develop in collaboration with IRRI, IFPRI and some African and northern universities a partial equilibrium model of sub-Saharan rice sectors to (i) Assess the medium- and long-term effects of changes in global rice markets and their policy implications for sub-Saharan Africa food security and (2) simulate the effects of alternative policy and investment options for Africa's rice production in the medium to long terms.
- b. Research to develop rice value chains in Africa: (i) Gain a better understanding of the nature of the market failures in the African rice seed sectors and a strategy to deal with them, (ii) strategies and policy and institutional options to stimulate the emergence of a low-cost, competitive processing sector for better quality rice (iii) strategies and policy and institutional options to stimulate the development of demand-driven rice value chains in sub-Saharan Africa.

##### Ex-post Impact Assessment:

- a. Widening of the research outputs and indicators assessed: (i) Assessment of the impact of video and other media supported learning, (ii) Assessment of the influence and impact of policy research, and (iii) Assessment of impact on more poverty and environmental indicators.
- b. Widening of the impact assessment methods and tools used: (i) use of randomized control trials (RCT), (ii) Estimation of direct and indirect impacts, (iii) use of ICT tools for data collection and information dissemination (PDA and web-based tools)

##### New research direction IVC:

Multi-stakeholder processes: One of the major hurdles impeding inland valley development is land tenure and land use conflicts. Land in inland valleys is seldom owned by the producer leading to low level of investment, and subsequently, to low production and eventually to environmental degradation and abandonment. A study will be undertaken to (i) Elaborate with all stakeholders a development plan, (ii) Trace bottlenecks in the rice value chains, and (iii) Build capacity of the rural population in conflict management and improved rice production technologies.

Integrated cropping systems: Most if not all cropping systems in inland valleys can be considered as integrated, be it rice-vegetables, rice-fish or rice-livestock, and so on. With the help of the newly arrived vegetable agronomist a study will be undertaken to (i) Gain a better understanding of interactions in integrated systems like rice-vegetables, and (ii) To improve the production of integrated systems.

Improved low-cost water management technologies for small scale farmers: In the framework of the newly developed SMART project the existing Sawah technology will be adapted to the West African physical and social environment. The emphasis will be on (i) Solving land tenure problems, (ii) Securing long term leases for rice producers, (iii) Develop with farmers low-cost water management technologies, and (iv) Introduce small-call machinery to increase labor productivity.

## Changes in collaborative arrangements

WARDA and IRRI continue to align their research agendas for sub-Saharan Africa and opened a joint office in Dar-Es-Salaam, Tanzania in May 2009.

During the period of this MTP, WARDA will intensify its collaboration with European research institutes, in particular with Wageningen University and Research Center in the Netherlands, with Hohenheim University in Germany, and CIRAD, INRA and IRD in France. To this effect, a MOU was signed between WARDA and these three French research institutes early June 2008 in Paris.

WARDA will remain an active partner within the Generation, HarvestPlus, Water and Food and sub-Saharan Challenge Programs.

## Alignment of CGIAR Priorities

The table below summarizes the alignment of the overall project portfolio with the system priorities. With the number 6a we have indicated capacity building and development activities and with 6b new research outside the SPs and the MTP.

Pr.	1a	1b	1c	1d	2a	2b	2c	2d	3a	3b	3c	3d	4a	4b	4c	4d	5a	5b	5c	5d	6a	6b
1	30	5	0	0	10	10	10	0	0	0	0	0	0	0	5	10	0	0	0	10	5	5
2	0	0	0	0	0	0	0	0	15	0	7	0	20	8	25	20	0	0	0	0	0	5
3	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	10	15	5	30	20	15	0
4	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5	15	20	20	20	10	5
IVC	0	0	0	0	0	0	0	0	15	5	10	5	15	10	15	15	0	0	0	10	0	0

## Center Financial Indicators

WARDA is continuing its efforts to improve its short and long term reserves to absorb unexpected adverse financial developments. The Center has come a long way in improving its financial health.

Liquidity and Adequacy of reserves (expressed in days of operation)

Year	2002	2005	2006	2007	2008
Days	(5)	87	102	114	181

Starting 2006, the Institution has exceeded the benchmark of 90 days and the reserve has grown steadily, reaching 181 days based on actual closing figures. That is the testimony of the effort made the Board, Management and Staff to strenghen the financial health of the Center in order to face current funding uncertainties.

As indicated in the previous years, several efforts has been made by Management to improve the following 2 indicators:

	<b>2008</b>	<b>2007</b>
Indirect Cost ratio	28.8%	32.5%
Restricted AR Ratio	1.53	2.58

In 2008 indirect cost has dropped, same the AR ratio.

# Project Portfolio

## WARDA-P01: Genetic Diversity and Improvement

### Project Overview and Rationale

#### Rationale

Rice yields in Africa are affected by a large number of abiotic and biotic stresses. The major abiotic stresses addressed through this program are drought, acidity, salinity, Fe toxicity and extreme temperatures. The major biotic stresses that are considered are: RYMV, BLB, blast, African Rice Gall Midge, stemborers and termites. In this project both conventional breeding and biotechnology will be used to exploit the rich reservoir of genetic resources present in the indigenous germplasm pool of African rice *O. glaberrima*, its wild relatives *O. barthii* and *O. longistaminata* and *O. sativa* landraces. These have high potential for use as a source for resistances to major stresses in rice as well as a source for high nutrient content. Because they have been neglected and under-utilized in the past, very little information is currently available. Biotechnology tools can unlock the diversity of genes conferring stress-resistance and other agronomically-useful traits thought to be hidden in the *Oryza* spp. and identify molecular markers to exploit their transfer through marker-assisted selection. Interspecific crosses are generating progeny that can be tested at hot spots for major stresses. Biotechnology can also assist in overcoming sterility barriers in crossing two different species. Farmers are instrumental in selecting varieties that fit to their local growing conditions and in providing feedback for breeders. Introduced interspecific varieties will strongly enhance the genetic diversity of farmers fields.

#### Goal

To improve the well-being of rice producers and consumers in Africa.

#### Purpose

To provide farmers with superior germplasm, adapted to local growing conditions and stresses and consumer preferences

#### Outputs Description

*Changes from Previous MTP*

None

#### **Output 1: Enhanced genetic diversity generated**

Description:

Activities

- 1.1 Identify, characterize, and add germplasm for performance evaluation in relation to environmental stresses and micronutrients composition to establish a core collection
- 1.2 Exchange and utilization of rice breeding resources in SSA through INGER

### 1.3 Characterize genes and molecular markers for superior germplasm

Alignment to CGIAR Priorities : 1A: Promoting conservation and characterization of staple crops; 1B: Promoting conservation and characterization of underutilized plant genetic resources; 2A: Maintaining and enhancing yields and yield potential of food staples; 2B: Improving tolerance to selected abiotic stresses; 2C: Enhancing nutritional quality and safety; 6B: Free-standing training;

#### **Output 2: Improved and stable rice lines and varieties with good grain quality available**

##### Description:

##### Activities

- 2.1 Characterize germplasm and develop breeding lines for yield, and resistance/tolerance to upland constraints
- 2.2 Characterize germplasm and develop breeding lines for yield and resistance/tolerance to lowland constraints
- 2.3. Develop genetically diverse intra- and interspecific lines
- 2.4. Enhancing nutritional quality of superior germplasm
- 2.5 Ex-post assessment of adoption and impact of NERICA and other improved rice varieties on productivity, farmer income, poverty and biodiversity

Alignment to CGIAR Priorities : 1A: Promoting conservation and characterization of staple crops; 1B: Promoting conservation and characterization of underutilized plant genetic resources; 2A: Maintaining and enhancing yields and yield potential of food staples; 2B: Improving tolerance to selected abiotic stresses; 2C: Enhancing nutritional quality and safety; 6B: Free-standing training;

#### **Output 3: Enhanced knowledge of G × E interactions for abiotic and biotic stresses available**

##### Description:

##### Activities

- 3.1 Characterization of genes and molecular markers for biotic and abiotic stresses
- 3.2 Physiological and morphological characterization of germplasm and breeding lines to assist gene-finding for important traits
- 3.3 Determine spatial and temporal diversity of abiotic and biotic stresses

Alignment to CGIAR Priorities : 1A: Promoting conservation and characterization of staple crops; 1B: Promoting conservation and characterization of underutilized plant genetic resources; 2A: Maintaining and enhancing yields and yield potential of food staples; 2B: Improving tolerance to selected abiotic stresses; 2C: Enhancing nutritional quality and safety; 6B: Free-standing training;

#### **Output 4: Enhanced involvement of farmers in rice genetic resources development established**

## Description:

### Activities

- 4.1 Participatory varietal selection of rice germplasm adapted to local conditions (rice garden)
- 4.2 Identification of gender-specific farmer and consumer preferences
- 4.3 Multi-location farmer-led evaluation of germplasm
- 4.4 Ex-post impact assessment of participatory varietal selection

Alignment to CGIAR Priorities: 4C: Improving water productivity; 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas; 5D: Improving research and development options to reduce rural poverty and vulnerability;

## **Impact Pathways by Output**

### **Output 1: Enhanced genetic diversity generated**

Availability of a widely ranging genetic source is an ultimate basis of all breeding work. Output 1 enhances the access of NARS and WARDA breeders to various breeding material existing in Africa and other regions. Increased information on both genetic and phenotypic characteristics also accelerates breeding efficiency. Thus, this output can increase the number of high performance varieties in the pipeline for dissemination. Through dissemination mechanisms such as the Rice Research Network in West and Central Africa (ROCARIZ) and the Rice Research network in East and Central Africa (ECARRN) and the African Rice Initiative (ARI), they are efficiently diffused to farmers' fields and will lead to productivity enhancement.

### **Output 2: Improved and stable rice lines and varieties with good grain quality available**

This output forms the core of WARDA's breeding activities. A number of high agronomic-performance lines with good grain quality and high nutritional value will be produced. They are effectively evaluated by farmers using participatory approaches with NARS and farmers (farmers participatory selection: PVS) and disseminated through the ROCARIZ, ECARRN and ARI networks mentioned earlier. In the dissemination process, the lines are included in the pipeline of the national varietal release systems as well as in non-formal seed systems such as Community-based Seed System (CBSS) approaches, working with NGOs and farmer organizations since national systems are not operational in many cases. The disseminated varieties will lead to increased and stabilized rice production in the region and enhance the nutritional conditions of rice consumers.

### **Output 3: Enhanced knowledge of G × E interactions for abiotic and biotic stresses available**

Resource-poor rice farmers in the region face multiple abiotic and biotic constraints. Knowledge of such constraints per se and of tolerance mechanisms in rice is indispensable to efficiently develop tolerant lines. Breeding for stress tolerance will be accelerated and promised lines developed to contribute to enhanced rice production. Such lines will be evaluated and adopted by farmers through existing evaluation and dissemination programs (PVS) and mechanisms (ROCARIZ, ECARRN and ARI).

Varieties out of this testing will go through the informal (community based seed supply systems working with NGOs, farmer organizations) and formal seed release systems of the countries to reach farmers. Through adoption farmers will enhance rice productivity and stability of yield and mitigate impacts of climate change.

**Output 4: Enhanced involvement of farmers in rice genetic resources development established**

Through participatory approaches and working throughout WARDA's member countries and in the major rice ecologies, breeders can develop lines which are more likely to be acceptable to a range of farmers. NARS partners will be trained, adopt and adapt these participatory approaches in order to develop and select varieties better suited to farmer conditions and consumer preferences. Varieties resulting from enhanced involvement of farmers will go through the informal (community based seed supply systems working with NGOs, farmer organizations) and formal seed release systems of the countries to reach farmers and lead to enhance rice productivity and stability of yield.

**International Public Goods**

The development, testing, dissemination and uptake of improved lines and varieties for impact will require several activities related to germplasm characterization for biotic and abiotic stress resistance/tolerance and for yield performance and food quality. The project will use Africa Rice Center (WARDA) key strategic approaches in farmer participatory varietal selection (PVS) for research and for development with NARS for extension; it will implement its partnership model with NARS and with research and development networks (ECARRN and ROCARIZ), the African Rice Initiative and NGOs. Varietal development will include the use of key modern breeding and biotechnology tools, while testing of varieties will be done through regional yield trials to ensure spillover in similar agro-ecological zones across countries. Furthermore, the collaboration with numerous institutions in Africa, America, Europe and Asia will ensure that improved germplasm will be of use not only in Africa but also in other continents.

**Alignment to CGIAR Priorities**

<b>Program 1 contribution the CGIAR System Priorities</b>				
<b>Priority Area 1: Sustaining Biodiversity</b>	<b>Priority Area 2 Genetic Improvements</b>	<b>Priority Area 3 Diversification and High-value Commodities</b>	<b>Priority Area 4 Sustainable Management of Natural Resources</b>	<b>Priority Area 5: Policies and Institutional Innovation</b>
1a - Conservation of plant genetic resources for food and agriculture	2a – Maintaining and enhancing yield of food staples	3a – Increasing income from fruit and vegetables	4a - Promoting integrated land, water and forest management at landscape level	5a - Science and technology policies and institutions
1b- Promoting conservation and characterization of under-utilized plant genetic resources to increase income	2b – Improving tolerance to selected abiotic stresses	3b – Increasing income from livestock	4b - Sustaining and managing aquatic ecosystems for food and livelihoods	5b - Making international and domestic markets work for the poor
1c - Conservation of indigenous livestock	2c - Enhancing nutritional quality and safety	3c – Enhancing income through increased productivity of fisheries and aquaculture	4c – Improving water productivity	5c - Rural institutions and their governance

Program 1 contribution the CGIAR System Priorities				
1d - Conservation of aquatic animal genetic resources	2d - Genetic enhancement of high value species	3d – Promoting sustainable income generation from forests and trees	4d – Promoting sustainable agro-ecological intensification in low- and high-potential environments	5d – Improving research and development options to reduce rural poverty and vulnerability

1a High      2a, 2b, 2c, 4d, 5d Medium      1b, 4c Low

## Elaboration of Partners Roles

### ARI

Institut de Recherche pour le Développement (IRD), France: Joint training on RYMV, BLB, population development, rice germplasm exchange for a project (iBridge) to address sterility problems in interspecific crossing, joint proposal development

Centre de Coopération internationale en Recherche Agronomique pour le Développement (CIRAD), France: Physiological evaluation of drought tolerant materials, supervision of PhD students, determining phenological adaptation to climate change, development of an eco-physiological crop model for yield reduction under different cultivation environments, joint proposal development

Japan International Research Center for Agricultural Sciences (JIRCAS), Japan: Varietal evaluation for adaptability to P deficiency, varietal improvement for drought and blast

### IARC

CIP, Peru: Staff training in relation to germplasm management

CIAT, Columbia: Population development, rice germplasm exchange, genomics knowledge sharing, staff training

IRRI, Philippines: Population development, rice germplasm exchange, genomics knowledge sharing, training, screening for abiotic stresses (Iron toxicity, salinity, cold and drought) tolerance, coordination of the Asian area in joint projects such as STRASA and Green Super Rice Project, joint proposal development

### NARI

Benin (INRAB, CBRST); Burkina Faso (INERA and DTA); Cameroon (IRAD); Central African Republic (ICRA); Chad (ITRAD); Congo (CRAL); Congo, The Democratic Republic of the (INERA); Cote d'Ivoire (CNRA); Ethiopia (AARC); Gambia (NARI); Ghana (CRI); Guinea (IRAG); Guinea-Bissau (INPA); Liberia (CARI); Mali (IER); Madagascar (FOFIFA); Mauritania (CNRADA); Mozambique (NIAR); Niger (INRAN); Nigeria (NCRI); Rwanda (ISAR); Senegal (ISRA and ITA); Sierra Leone (SLARI); Tanzania (ARI); Togo (ITRA); Uganda (NARO): Technology evaluation and adaptation, evaluation of germplasm, capacity building, PVS

Japan International Cooperation Agency (JICA), Japan: Genetic and agronomical characterization of NERICA varieties

Philrice, Philippines: Rice germplasm exchange for a project (iBridge) to address sterility problems in interspecific crossing

### Private sectors

Farmer organizations such as FEPRODES, Senegal; CIRB, Burkina Faso; Cooperative des

Producteurs du la Vallee du Kou, Burkina Faso; Benkadi, Burkina Faso; Siniyassigui, Burkina Faso; Ifiya, Burkina Faso; Efu Ndado Multipurpose Association, Nigeria; Edozhigi Farmers Association, Nigeria; Emiworongi Rice Farmers, Nigeria: Technology evaluation and adaptation, seed production, PVS

### **NGOs**

NGOs such as Sasakawa Global 2000, Japan; CASTOR, Benin; MOUNGNOU, Burkina Faso; Symbiose, Senegal; FODDE-PILS, Senegal; SODAGRI, Senegal: Technology evaluation and adaptation, evaluation of germplasm, capacity building, PVS

### **Universities**

Benin (FSA/UAC, UNIPAR): Supervision of students (BSc, MSc and PhD) in research on various rice stress

Nihon University, Japan: physiological evaluation of rice varieties

University of Adelaide, Australia: Determination of micronutrients in grains

Chinese Academy of Agricultural Sciences (CAAS), China: Providing Chinese materials for evaluation in relation to general adaptability to SSA and resistance to RYMV, BLB, AfRGM and P deficiency, identification of genes/QTLs associated with resistance to drought and P deficiency etc., overall coordination of a project (Green Super Rice Project) in which WARDA is involved

Cornel University: SNP assay of *O. glaberrima* and *O. barthii* and their utilization for rice breeding

University of Louvain la Neuve, Belgium: Improvement of screening methods for Fe toxicity, development of segregating populations for Fe toxicity, capacity building of NARS

University of Hohenheim, Germany: Screening for Fe toxicity, elucidation of tolerant mechanisms to Fe toxicity

Duke University, USA: Backstopping of drought research

## Logical Framework

	Outputs	Intended Users	Outcome	Impact
<b>Output 1</b>	<b>Enhanced genetic diversity generated</b>	<ul style="list-style-type: none"> <li>• WARDA breeders and NARS scientists</li> <li>• Genetic resources managers in WARDA and NARS</li> </ul>	<ul style="list-style-type: none"> <li>• Increased quality and quantity of germplasm information to be used varietal development</li> <li>• Increased possibility to use a wider range of germplasm in agricultural research in rice</li> </ul>	Increased rice productivity through accelerated research efficiency
<i>Target 2010: Materials</i>	Indigenous rice landraces and wild relatives of WARDA's collection morphologically and genetically characterized.			
<i>Target 2011: Materials</i>	New Indigenous rice landraces and wild relatives collected from sub-Saharan Africa (SSA) morphologically and genetically characterized.			

	Outputs	Intended Users	Outcome	Impact
<i>Target 2011: Materials</i>	Indigenous landraces and wild relatives of WARDA's collection characterized in relation to resistance to blast, RYMV, and bacterial leaf blight			
<hr/>				
<b>Output 2</b>	<b>Improved and stable rice lines and varieties with good grain quality available</b>	<ul style="list-style-type: none"> <li>• NARS scientists</li> <li>• Extension agencies</li> <li>• Farmers</li> </ul>	<ul style="list-style-type: none"> <li>• Practical varieties with higher performance and better nutrition for upland</li> <li>• Practical varieties with higher performance and better nutrition for lowland</li> </ul>	<ul style="list-style-type: none"> <li>• Improved uptake of calories and nutrition by rice farmers and consumers</li> <li>• Increased food security in rural and urban</li> </ul>
<i>Target 2010: Materials</i>	CSSL lines available to breeders for regional evaluation			
<i>Target 2011: Materials</i>	Populations of inter- and intra-specific progeny for better performance in relation to resistance to Fe toxicity (with IRRI), salinity (with IRRI), cold (with			

	Outputs	Intended Users	Outcome	Impact
	IRRI), drought (with IRRI), blast, RYMV and/or P deficiency generated			
<b>Output 3</b>	<b>Enhanced knowledge of G × E interactions for abiotic and biotic stresses available</b>	<ul style="list-style-type: none"> <li>• WARDA breeders and NARS scientists</li> <li>• Extension agencies</li> </ul>	<ul style="list-style-type: none"> <li>• Increased knowledge on developing countermeasures to abiotic and biotic stresses</li> <li>• Accelerated breeding efficiency to develop stress resistant varieties</li> </ul>	Negative impacts by abiotic and biotic stresses mitigated
<i>Target 2010: Materials</i>	Respective genes/QTLs associated with bacterial leaf blight (BLB) resistance and AfRGM resistance identified			
<i>Target 2010: Materials</i>	Main physiological and morphological mechanisms associated with abiotic stresses (Fe toxicity and drought) identified in key environments			
<i>Target 2010: Practices</i>	MAS applied for resistance to BLB and AfRGM			

	<b>Outputs</b>	<b>Intended Users</b>	<b>Outcome</b>	<b>Impact</b>
<i>Target 2010: Other kinds of knowledge</i>	Enhanced knowledge of BLB pathogen diversity			
<i>Target 2011: Materials</i>	Improved lines with the pyramid of resistant genes for AfRGM, BLB and RYMV developed using molecular markers			
<i>Target 2011: Materials</i>	Respective QTLs associated to drought, salinity, cold and Fe-toxicity tolerance identified (with IRRI)			
<i>Target 2011: Practices</i>	MAS applied for tolerance to drought, salinity, cold and Fe toxicity (with IRRI)			
<hr/>				
<b>Output 4</b>	<b>Enhanced involvement of farmers in rice genetic resources development established</b>	<ul style="list-style-type: none"> <li>• NARS scientists</li> <li>• Extension workers</li> <li>• Farmers</li> </ul>	<ul style="list-style-type: none"> <li>• High performance varieties farmers' acceptability of which are guaranteed</li> <li>• Increased information on farmers varietal preference</li> </ul>	<ul style="list-style-type: none"> <li>• Increased rice production</li> <li>• Improved food security in rural and urban</li> </ul>
<i>Target 2010: Materials</i>	Elite drought-tolerant lines evaluated in West Africa and East Africa (with IRRI)			

	<b>Outputs</b>	<b>Intended Users</b>	<b>Outcome</b>	<b>Impact</b>
<i>Target 2010: Materials</i>	Superior lines tolerant to salinity (with IRR1), drought (with IRR1), cold (with IRR1), Fe toxicity (with IRR1) and/or P deficiency identified by farmers			
<i>Target 2011: Practices</i>	Lines with superior abiotic stress tolerance identified in the past evaluation by farmers exposed to up-scaled farmers' selection in both number of sites and number of farmers per site			

# WARDA-P02: Sustainable Productivity Enhancement

## Project Overview and Rationale

### *Rationale*

In sub-Saharan Africa rice is cultivated in four different ecologies: in rainfed uplands, in lowlands with varying degrees of water control in deep water, and in mangrove swamps. The last two ecologies, deep water and mangrove swamps are locally vital but have limited regional importance and, therefore, do not feature on WARDA's research agenda. The research mandate of these ecologies has been handed over to national researchers that are backstopped by WARDA staff. The remaining two ecologies have mutual but also ecology-specific constraints and opportunities. Rice cultivation presently covers 6.7 million hectares, 2.7 Mha (or 37%) of which is devoted to upland ecosystems, mostly in the moist savanna and humid forest zones, and contributing 19% to the total rice production in SSA. Yields in the uplands are constrained by frequent drought, low soil fertility (due to deficiencies of N, P) and soil acidity. Rice production is further hampered by biotic stresses such as blast disease, stem borers, termites and weeds. Lowland rice is produced on 4 Mha; three quarters of it is rainfed (contributing 48% to the total rice production in SSA), while one quarter is irrigated (contributing 33% to the total rice production in SSA). Irrigated rice and associated production systems are generally input intensive and market oriented. Rice yield gaps between attainable and actual yields are high, even in input-intensive systems. Attainable yields with full water control are in the range of 7 to 9 tons ha<sup>-1</sup>, while actual paddy yields on farmers fields are 3 to 6 tons ha<sup>-1</sup>. The attainable yield without full water control is 4 to 5 tons ha<sup>-1</sup>, while the actual yield is typically 1 to 3 tons ha<sup>-1</sup>. To close the yield gaps, improved crop and NRM options are being generated and adapted to address the major constraints of irrigated rice-based systems. Major constraints are a lack of water control, weed management, and to a lesser extent soil fertility, iron toxicity, African rice gall midge (AfrGM), and rice yellow mottle virus (RYMV). The options for integrated crop and NRM management, targeting water-saving, labor-saving, gains in yield and product quality, reduced production costs, are developed with farmers at the farm and village levels. Improving water use efficiency can make dramatic contributions to increasing productivity and household food security, and enhance market opportunities. Moreover, increased water availability provides the opportunity to grow more than one crop per year. However, land use intensification should not endanger environmental services of lowlands, such as the water buffering capacity and natural biodiversity. Intensification can also result in build-up of pests and diseases, while degradation of the resource base can lead to abandonment of the site. New challenges include competition for water with increasing demand from urbanization and expansion of irrigation schemes, and climate change, which may lead to a drop in water availability and increasing incidences of salinity and alkalinity. Finally, integrated systems, like rice and aquaculture, livestock, vegetables, and fruit trees offer an array of opportunities for intensification and diversification, leading to additional income and improved nutrition for the farming community.

### **Goal**

Contribute to food security and well-being of rice producers and consumers in Africa.

### **Purpose**

To enhance the output and productivity of rice-based systems through intensification and diversification, while minimizing potential negative effects on environmental services

## Outputs Description

*Changes from Previous MTP*

None

### **Output 1: Integrated management options for weeds, pests and diseases available**

Description:

Activities

- 1.1 Develop IPM strategies for rice stem borers and African rice gall midge
- 1.2 Characterize and integrate management options for blast in rainfed ecosystems
- 1.3 Determine incidence and control options for parasitic weeds in rice
- 1.4 Develop technologies for integrated management of rice weeds, pests and diseases

Alignment to CGIAR Priorities: 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas; 6B: Free-standing training;

### **Output 2: Sustainable intensification options for rice-based systems developed**

Description:

Activities

- 2.1 Assessment of constraints and opportunities for intensification of rice-based systems
- 2.2 Develop opportunities for intensification and income generation with resource-poor farmers
- 2.3 Increase resource-use efficiency of high input systems

Alignment to CGIAR Priorities: 4C: Improving water productivity; 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas; 6B: Free-standing training;

### **Output 3: Profitable opportunities for diversification of the farmers' portfolio of enterprises made available**

Description:

Activities

- 3.1 Assessment of constraints and opportunities for diversification of rice-based systems
- 3.2 Develop options to exploit temporal and spatial niches for inclusion of high value crops
- 3.3 Develop options to exploit temporal and spatial niches for inclusion of aquaculture

Alignment to CGIAR Priorities : 3C: Enhancing income through increased productivity of fisheries and aquaculture; 4B: Sustaining and managing aquatic ecosystems for food and livelihoods; 4C: Improving water productivity;

#### **Output 4:**

#### **Use of environmental services optimized and safeguarded for future generations**

##### Description:

##### Activities

- 4.1 Development of water-resources productivity assessment methodology
- 4.2 Adapting rice-based farming to cope with the effect of climate anomalies on future outputs
- 4.3 Develop strategies for mitigation of environmental degradation due to rice farming
- 4.4 Develop multi-stakeholder processes methodologies for equitable use of shared resources

Alignment to CGIAR Priorities : 4B: Sustaining and managing aquatic ecosystems for food and livelihoods; 4C: Improving water productivity; 6A: New research;

#### **Impact Pathways by Output**

##### **Output 1: Integrated management options for weeds, pests and diseases available**

The tools and management options developed in Output 1 will be developed with NARES collaborators in partnership with farmers to analyze the relative magnitude of yield loss (spatial and temporal variability) and loss in profitability due to biotic stresses. NARS partners will be trained in the use of decision tools and the outcome of such tools (alternative management options) will be used to advise farmers on ways to reduce the reliance on agro-chemicals, and minimize the impact on the environment. Such tools will be included in training modules and will also allow to derive extension messages (posters, radio scripts, videos) that will be distributed through PLAR training (working with national extension agencies, NGOs and farmer organizations), and WARDA's rice networks, such as IVC, ROCARIZ, ECARRN and ARI. Alternative management in farmers' fields will lead to enhanced rice productivity and reduced negative impact on the environment.

##### **Output 2: Sustainable intensification options for rice-based systems developed**

This output 2 focuses on developing knowledge and innovation capacity and systems and modeling tools aimed to increase the efficiency of rice-based systems and improve food production, with a special focus on water and nutrient management. One pathway will include training of NARS researchers on the use of such systems and modeling tools. Another pathway will use the tools to derive site-specific options that allow enhanced nutrient and water efficiency in farmers' fields that are translated in extension messages (posters, radio scripts, videos) distributed through PLAR training (aimed at national extension agencies, NGOs and farmer organizations) and WARDA's rice networks, such as IVC, ROCARIZ, ECARRN and ARI

##### **Output 3: Profitable opportunities for diversification of the farmers' portfolio of enterprises made available**

Output 3 aims at increasing the possibility of diversification for increased human health from an increased variety of products as well as increased income from the inclusion of high-value commodities like fish and vegetables.

Technologies and management options will be tested at key sites with NARS partners and in partnership with farmers. Successful technologies and management options will be scaled-out through NGOs, national extension agencies and farmer organizations to benefit farmers and increase their income and nutritional status using extension messages such as posters, radio scripts, videos and through PLAR training and through WARDA's rice networks such as IVC, ROCARIZ, ECARRN and ARI.

#### **Output 4: Use of environmental services optimized and safeguarded for future generations**

Output 4 will provide methodologies to assess the relative importance of various environmental goods and services and will develop management options to counter negative environmental impacts of rice-system development for direct and in-direct (e.g. downstream) users. The methodologies and tools that will be developed in partnership with NARS partners will allow ex-ante assessment of different land and water use scenarios taking into account environmental and climate change. Actions by farmers, and other stakeholders (up and downstream) based on the outcome of these tools will reduce the risk of jeopardizing the quality of natural resources in rice-based systems. Such tools will be available on dedicated websites and further outscaled through focused training courses and are likely to be used by CGIAR and NARS scientists, extension staff and policy and decision makers.

Direct and in-direct users of environmental services and goods of rice-based systems will become aware of promising management options developed in this output through publications, radio scripts, and videos with a strong link to the IVC.

### **International Public Goods**

The program takes a broad view of the development and innovation context of rice-based systems, in close collaboration with Program 3 and Program 4. At the regional and national level, challenges and opportunities for intensification and diversification of rice-based systems are identified, including current and potential rice-based systems performance, access to markets, water availability, soil quality, etc. Multi-stakeholder platforms (MSPs) involving NARES partners and other stakeholders are formed to ensure joined research agenda setting and stimulate co-learning. Research activities are planned and implemented in partnerships with NARES partners, sister CG centers, and AROs in several countries and at strategically selected sites based on jointly identified research themes and priorities identified by the MSPs that fit within WARDA's Strategic Plan and MTP. The multi-country and multi-location approach ensures that results obtained are valid for a broad range of biophysical and socio-economic settings. It will also facilitate the development of IPGs, such as modeling tools of varying complexity, maps, databases, learning tools and resource management decision tools that can be used for up- and out-scaling of results and for ex-ante impact analyses.

## Alignment to CGIAR Priorities

Program 2 contribution the CGIAR System Priorities				
Priority Area 1: Sustaining Biodiversity	Priority Area 2 Genetic Improvements	Priority Area 3 Diversification and High-value Commodities	Priority Area 4 Sustainable Management of Natural Resources	Priority Area 5: Policies and Institutional Innovation
1a - Conservation of plant genetic resources for food and agriculture	2a – Maintaining and enhancing yield of food staples	3a – Increasing income from fruit and vegetables	4a - Promoting integrated land, water and forest management at landscape level	5a - Science and technology policies and institutions
1b- Promoting conservation and characterization of under-utilized plant genetic resources to increase income	2b – Improving tolerance to selected abiotic stresses	3b – Increasing income from livestock	4b - Sustaining and managing aquatic ecosystems for food and livelihoods	5b - Making international and domestic markets work for the poor
1c - Conservation of indigenous livestock	2c - Enhancing nutritional quality and safety	3c – Enhancing income through increased productivity of fisheries and aquaculture	4c – Improving water productivity	5c - Rural institutions and their governance
1d - Conservation of aquatic animal genetic resources	2d - Genetic enhancement of high value species	3d – Promoting sustainable income generation from forests and trees	4d – Promoting sustainable agro-ecological intensification in low- and high-potential environments	5d – Improving research and development options to reduce rural poverty and vulnerability

4c, 4d High

3a, 4a Medium

3c, 4b Low

## Elaboration of Partners Roles

Partner	Role	Output
<b>Universities</b>		
University of Hanover (Germany)	Joint project on Bacterial Leaf Blight (BLB) in Burkina Faso, Benin, Mali, Niger, Senegal, Togo and a joint proposal called Mitigating the impact of climate change on rice disease resistance in East Africa	1
University of Sheffield (UK)	Joint project on Striga sp. in rice in Cote d'Ivoire and Tanzania	1
Gaston Berger University (Senegal)	Joint project on elements of rice system intensification in Senegal	2
University of California Santa-Cruz (USA)	Joint project on elements of rice system intensification in Senegal	2
University of Hohenheim (Germany)	Joint project on adaptation to climate change in Mali, Senegal and Madagascar	4

<b>Partner</b>	<b>Role</b>	<b>Output</b>
Wageningen University (the Netherlands)	Adaptation of simulation tools and environmental degradation, climate change in Benin, Senegal, Ethiopia, Zimbabwe	4
CAAS	Joint project called Green Super Rice for the Resource Poor in Africa and Asia in Nigeria, Rwanda, Tanzania, Mali, Senegal, Liberia, Mozambique and Uganda	1, 2
<b>IARC</b>		
IRRI	Joint project called Green Super Rice for the Resource Poor in Africa and Asia in Nigeria, Rwanda, Tanzania, Mali, Senegal, Liberia, Mozambique and Uganda	1, 2
WorldFish	Joint project on Community-based Fish Culture in Mali	3
<b>ARI</b>		
CIRAD (France)	Joint project on adaptation to climate change in Mali, Senegal and Madagascar, seconded vegetable scientist in Benin and seconded crop modeler in Senegal	3, 4

## Logical Framework

	<b>Outputs</b>	<b>Intended Users</b>	<b>Outcome</b>	<b>Impact</b>
<b>Output 1</b>	<b>Integrated management options for weeds, pests and diseases available</b>	<b>NARS scientists; extension agents; land users</b>	<b>Increased knowledge on weeds, pests and diseases management</b>	<b>Negative impacts of weeds, pests and diseases on productivity mitigated</b>
<i>Target 2010: Practices</i>	Integrated management option for BLB available and tested by NARS			
<i>Target 2011: Materials</i>	Upland NERICAs characterized for resistances and tolerances against Striga spp			
<hr/>				
<b>Output 2</b>	<b>Sustainable intensification options for rice-based systems developed</b>	<b>Policy makers; NARS scientists; extension agents; land users</b>	<b>Recommended technologies for intensified land management adopted</b>	<b>Increased food security of rural and urban populations</b>
<i>Target 2010: Other kinds of knowledge</i>	Characterization of interaction between rice-vegetable systems in terms of productive resource management			
<i>Target 2011: Policy strategies</i>	Decision support systems (DSS) tested and adapted to improve productive resource efficiency of rice-vegetable system			
<hr/>				
<b>Output 3</b>	<b>Profitable opportunities for diversification of the farmers' portfolio of enterprises made available</b>	<b>Policy makers; NARS scientists; extension agents; land users</b>	<b>Recommended technologies for management of integrated land use systems adopted</b>	<b>Increased health and income of rural population</b>

	<b>Outputs</b>	<b>Intended Users</b>	<b>Outcome</b>	<b>Impact</b>
<i>Target 2010: Other kinds of knowledge</i>	Agronomic and economic performance of rice-vegetable systems in inland valley characterized			
<i>Target 2011: Other kinds of knowledge</i>	Improving yield and farmer's outcomes of rice-vegetable systems through agro-ecological intensification approach			
<hr/>				
<b>Output 4</b>	<b>Use of environmental services optimized and safeguarded for future generations</b>	<b>Policy makers; NARS scientists; extension agents; land users</b>	<b>Technologies and tools for sustainable use of natural resources available</b>	<b>Negative impacts of human interventions on the environment and its services mitigated</b>
<i>Target 2010: Practices</i>	New version of rice growth model validated and calibrated for use in a changing climate			
<i>Target 2011: Practices</i>	New model for optimal rice planting dates under a changing climate developed			

# WARDA-P03: Learning and Innovation Systems

## Project Overview and Rationale

### Rationale

Meeting the CGIAR System Priorities requires strong partnerships to conserve under-utilized genetic resources and biodiversity (SP1a), to boost genetic improvements to produce food at lower cost or to bring about institutional changes and policy improvements essential for sustainable reduction in hunger and poverty (SP5). A better understanding of forces that influence institutional relationships, learning and innovation will help to shape future R&D strategies for pro-poor development (SP5a, 5c, 5d). Past impact studies have revealed that the relatively low adoption rates of NERICAs is mainly due to farmers' limited access to seed (and knowledge). This limited access is caused by weak local and national capacities and a range of social, institutional and policy-related challenges. There is therefore need to develop and test organizational models aimed at improving the formal and informal seed sectors, and to enhance their interactions. However, few analyses exist on such models of intervention. Therefore, the documentation of local and national rice seed systems in Africa deserves urgent attention. Such documentation must highlight the resilience of seed systems, and must seek ways to strengthen the role of marginalized groups such as youth and women in the increasing rice production through conservation of germplasm and access to new quality seed. This can be achieved through interactive rice learning cycles and appropriate innovative processes to generate and disseminate seed and technologies especially among marginalized communities such as those in post-conflict countries.

Over recent years, rice production in SSA has increased at a rate of 6% per annum. As more and more farmers start growing rice, the need for technologies, information and training is also increasing. The national extension services, researchers and NGOs have to cope with the agro-ecological and socio-cultural challenges, which counter top-down extension approaches. Since 2001, WARDA has therefore developed the Participatory Learning and Action Research (PLAR) methodology to enhance social learning around inland valley rice production. Its impacts on farmers' livelihoods have been positive. However, there is need for further assessment of PLAR and to identify or develop mechanisms to fine-tune it, scale it up and out. There is also potential for merging participatory approaches with technology-mediated learning, which will be of value to policymakers, donors and development agencies. Establishing continuous rice learning cycles through dialogue among farmers, extension, research, and other key stakeholders in the rice sector is crucial for innovation. In collaboration with Program 1 for instance, P03 will seek to strengthen participatory monitoring and evaluation (PM&E) especially within PVS activities, and the dissemination of rice knowledge. PM&E is a powerful social tool for enabling local people to articulate their objectives & own learning initiatives meant for local development. Community-based PM&E systems can create a transparent process between WARDA's partners and farmers. This will enhance learning, and will result in systematic feedback through generation, management and analysis of site-specific data (case studies or success stories).

Apart from enhancing learning about seed and crop management, rice post-harvest systems equally need to be reinforced in order to improve the quality of local rice. While the market and policy environment is assessed elsewhere within WARDA, P03 will mainly develop strategies and tools to improve partnerships and institutions in technology development and dissemination. The promotion of pro-poor knowledge-enhancing strategies and studies will be based/disaggregated on critical classifications such as farmer groups, gender and rice systems. The roles of farmer (e.g. women) groups in partnerships for rice research, dissemination, processing and consumption will also be critically examined and strengthened through our partners.

The proposed Rice Information Gateway for Africa (RIGA) will be crucial in enhancing the efficiency of and impact on the entire rice sector in the region, thereby responding to recommendations made by WARDA's fifth EPMR. Through networking and the RIGA platform, resource-use and research efficiency will be enhanced, capacity building improved, and rapid and efficient technology dissemination to end-users made easier. This will be further achieved through broadened communication strategies for learning and innovation across all levels of rice research and development. While RIGA is appropriate for wider reach at higher institutional level, and useful for national institutions, other strategies that rely on modern technology will be developed for dissemination to and effective feedback from change agents, grassroots organizations and multiple actors in the rice sector.

The Science Council appreciated WARDA's partnership approach and the increased involvement of the regions universities, but it asked about the effectiveness of partnerships and how they can contribute to the CGIAR SPs. Networks and partnerships are operational structures within the broader innovation system, hence Program 3 uses an innovation systems research approach to help shed light on their role and relevance. With more and more actors entering the rice sector in Africa, increased understanding of the changing roles and patterns of interactions will help improve overall system performance. For instance, we need to map and analyse rice innovation systems and linkages across all levels to strengthen strategies for dissemination of new rice varieties, improve production and processing. These will deliver outputs that directly feed into SP5 (Improving policies and facilitating institutional innovation to support sustainable reduction of poverty and hunger). WARDA's Program 4 targets mainly policy and impacts, while Program 3 mainly investigates actors, institutions and mechanisms with an emphasis on seed, learning and value chains.

## **Goal**

To improve livelihoods in Africa through stronger partnerships, and by fostering effective learning mechanisms and efficient rice innovation systems.

## **Purpose**

Increase the effectiveness of processes shaping the development and dissemination of sustainable rice technologies.

## **Outputs Description**

*Changes from Previous MTP*

None

### **Output 1: Partnerships and networks to promote rice sector development**

Description: Activities

1.1 Catalyze the formation of productive relationships between different kinds of actors with different kinds of knowledge relevant to rice sector development

1.2 Describe the characteristics of the various different partnerships and relationships observed among such actors, and assess which kinds of relationships lead to appropriate knowledge sharing and effective collaboration for rice research and development

1.3 Find ways to build appropriate linkages across disciplines and between different kinds of organizations to enable rice stakeholders to share relevant knowledge and so undertake effective innovation

1.4 Develop a Rice Information Gateway for Africa (RIGA) to enhance the effectiveness and impact of research and development

Alignment to CGIAR Priorities : 5D: Improving research and development options to reduce rural poverty and vulnerability;

### **Output 2: Mechanisms for development of pro-poor seed system**

#### Description:

##### Activities

2.1 Document and examine the resilience and role of African rice seed systems, and assess prospects for reinforcing them through integration with research strategies

2.2 Test-apply mechanisms that bridge formal and informal rice seed systems, including CBSS and PM&E

2.3 Map and analyse rice innovation systems and assess their role in rice genetic resource management

2.4 Assess social inclusiveness of institutions and policies affecting seed systems

2.5 Ex-post impact assessment of CBSS and PVS

Alignment to CGIAR Priorities : 5A: Improving science and technology policies and institutions; 5B: Making international and domestic markets work for the poor; 5C: Improving rural institutions and their governance; 6A: New research;

### **Output 3: Rice learning processes and tools**

#### Description:

##### Activities

3.1 Facilitate the application of socially acceptable, verifiable and effective learning processes and approaches

3.2 Build national capacities to develop and use PLAR, PM&E, video and rural media programs

3.3 Strengthen the functioning of agricultural training institutes and rural learning centers.

3.4 Examine uptake pathways to innovatively exploit media (especially radio / video-facilitated learning) to disseminate rice knowledge and trigger innovation

3.5 Ex-post impact assessment of radio and video-mediated learning

Alignment to CGIAR Priorities: 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas; 5A: Improving science and technology policies and institutions; 5C: Improving rural institutions and their governance; 6A: New research;

#### **Output 4: Strategies and tools to strengthen the rice value chain**

##### Description:

##### Activities

- 4.1 Assess the factors affecting the dissemination and adoption of post-harvest technologies
- 4.2 Explore income-generation opportunities and develop local capacities for value addition
- 4.3 Develop analytical and decision-making tools, such as experimental auctions for consumer technology valuation, enterprise webs
- 4.4 Facilitate and document institutional innovations in the post-harvest innovation system
- 4.5 Ex-post impact assessment of institutional innovations in rice value chains.

Alignment to CGIAR Priorities: 5B: Making international and domestic markets work for the poor; 5D: Improving research and development options to reduce rural poverty and vulnerability;

### **Impact Pathways by Output**

#### **Output 1: Partnerships and networks to promote rice sector development**

Partnerships and networks are brokers between research and end-users and allow for sharing and wider diffusion of knowledge and technologies. As per their constituency, WARDA's networks and Rice TIME Unit are highly focused on capacity building, with the NARES being the direct beneficiaries. Insights into the functioning and dynamics of partnership and network models will be shared with R&D decision-makers through policy briefs and various other means. Knowledge on rice varieties, rice-growing ecosystems, actors, networks, institutions and policies will be embedded in the Rice Information Gateway for Africa (RIGA) linked to IRRI's Rice knowledge Bank and will influence the wider research community and various actors in the rice sector, including policymakers and the private sector.

#### **Output 2: Mechanisms for development of pro-poor seed system**

Mechanisms for the development of pro-poor seed systems serve two purposes: (i) to develop and disseminate improved varieties including the NERICAs and (ii), to create/share knowledge on formal and informal seed systems. Formal mechanisms are usually relied upon to share NERICA seed and passport data with the research or international community. Adaptable mechanisms are needed for disseminating improved technologies to farmers. Mechanisms for the development of seed systems include market opportunities for the NERICAs, especially for women seed producers. Income generated from such opportunities can be used to alleviate poverty for instance through education and better investment in agriculture. The combination of various mechanisms to develop and disseminate rice seed and knowledge will enhance farmer access to seed, ability for seed production, rice processing and delivery. This is a broad approach being embraced at WARDA that promises sustainable impacts on livelihoods. Output 2 will be of direct importance for farmers, useful to policymakers, relevant for the private sector and rice researchers (at WARDA, NARES) and other stakeholders. The resultant knowledge will be proliferated through the African

Rice Initiative, and other channels such as seed production training courses and learning materials that will be hosted on RIGA for easy access by WARDA partners engaged in capacity building.

### **Output 3: Rice learning processes and tools**

Dynamic agricultural education tools and effective interactive learning processes that embrace dialogue will result in effective rural learning cycles and sustained innovation that benefits from a holistic range of development, research and extension partners. Innovative exploitation of media for instance, to reach many farmers qualitatively and reliance on video and radio to disseminate knowledge and trigger rice-related innovations is valuable. Videos and publications on their production, distribution and impact are currently being used as lecture materials in various major universities in the world and will be further shared with African universities. The challenge is now for practitioners, academics, policy makers and researchers to establish a sustainable cycle of production and application of education tools and to enhance sustainability of interactive learning processes. Lessons learnt will be shared with the Commonwealth of Learning, FARA, FAO, various Communities of practice (e.g. the Communication Initiative), NGOs, national extension services and communication departments at universities. As this output relates to SP 5C it will also be of interest to the wider CGIAR community

### **Output 4: Strategies and tools to strengthen the rice value chain**

Rice sector development needs sustainable links between rice production, processing and marketing along rice value chains. Tools to map linkages and identify weak points in the value chain will help multiple actors, including private sector and service providers in making strategic decisions with regard to vertical or horizontal integration. Experimental auctions to establish consumer preferences for rice technologies will help researchers, private sector and policymakers in making better decisions. Strategies will help mainly policy makers to create an environment conducive to market development. The tools and strategies will be shared with concerned actors via workshops, WARDA networks and RIGA.

## **International Public Goods**

This program has a large development dimension and entails focused research on mechanisms, contexts and outcomes in rice research and production in Africa. The program draws heavily on innovation systems research approaches to improve national and regional rice R&D efforts. Partnerships, networks and multistakeholder platforms will be relied upon to contribute to outputs, and will also be studied as mechanisms with respect to their effectiveness, bottlenecks and new opportunities to strengthen the rice sector. The Rice Information Gateway for Africa (RIGA) will be a key IPG for WARDA in the long term. Multi-country studies on partnerships, seed systems, rural learning and postharvest systems will lead to new policy recommendations, ultimately leading to more socially-inclusive research themes of importance to the wider region. The expected IPGs from Program 3 are: (1) a Rice Information Gateway for Africa (RIGA); (2) socially acceptable mechanisms to enhance production and dissemination of quality rice seed and knowledge; (3) technology-mediated learning tools and processes; (4) a peer-reviewed reference book with case studies on rice seed, crop and post-harvest management, rural learning and value chain development in Africa; (5) tools and case studies for capacity building.

## Alignment to CGIAR Priorities

Program 3 contribution the CGIAR System Priorities					
Priority Area 1: Sustaining Biodiversity	Priority Area 2 Genetic Improvements	Priority Area 3 Diversification and High-value Commodities	Priority Area 4 Sustainable Management of Natural Resources	Priority Area 5: Policies and Institutional Innovation	
1a - Conservation of plant genetic resources for food and agriculture	2a Maintaining and enhancing yield of food staples	3a Increasing income from fruit and vegetables	4a - Promoting integrated land, water and forest management at landscape level	5a - Science and technology policies and institutions	
1b- Promoting conservation and characterization of under-utilized plant genetic resources to increase income	2b Improving tolerance to selected abiotic stresses	3b Increasing income from livestock	4b - Sustaining and managing aquatic ecosystems for food and livelihoods	5b - Making international and domestic markets work for the poor	
1c - Conservation of indigenous livestock	2c - Enhancing nutritional quality and safety	3c Enhancing income through increased productivity of fisheries and aquaculture	4c Improving water productivity	5c - Rural institutions and their governance	
1d - Conservation of aquatic animal genetic resources	2d - Genetic enhancement of high value species	3d Promoting sustainable income generation from forests and trees	4d Promoting sustainable agro-ecological intensification in low- and high-potential environments	5d Improving research and development options to reduce rural poverty and vulnerability	
5c, 5d	High	4d, 5a	Medium	3a, 5b	Low

## Elaboration of Partners Roles

### Partners and their roles

#### NARI

National institutions in: Benin; Burkina Faso; Cameroon; Congo, The Democratic Republic of the; Ghana; Guinea; Mali; Nigeria; Senegal; Sierra Leone; Uganda: Develop national capacities in seed production; monitor and evaluate project activities

#### Private sectors

Rice farmer groups in Benin; Burkina Faso; Ghana; Mali; Nigeria; Senegal: influencing research agenda by taking part in various participatory research and learning modes (PVS, CBSS, PLAR and video)

**NGOs**

Catholic Relief Services: quick assessments of seed systems and establishment of voucher system for pro-poor targeting

Countrywise Communications: contribute to training national video teams and establishment of innovative learning pathways in Ghana and Uganda

Farm Radio International: capacity building and monitoring of rural radio network

Sasakawa Global 2000: coordinate video activities in Uganda

**Universities**

Université d'Abomey-Calavi (Benin): supervise MSc students on themes related to learning and postharvest systems

Bayero University in Kano (Nigeria): supervise MSc students on themes related to learning and postharvest systems

Makerere University (Uganda): supervise MSc students on themes related to learning and postharvest systems

Wageningen University (the Netherlands): contribute to social science research (PhD level) on seed systems and rural learning (MSc level)

University of Gembloux (Belgium): Supervise PhD research on video, post-harvest innovations and livelihood changes

McGill University (Canada): development of improved rice processing technologies and valorization of rice by-products

**IARC**

IRRI: development of e-learning courses

## Logical Framework

	Outputs	Intended Users	Outcome	Impact
<b>Output 1</b>	<b>Partnerships and networks to promote rice sector development</b>	<ul style="list-style-type: none"> <li>• Farmers</li> <li>• Research community and various actors in the rice sector</li> <li>• Policymakers</li> <li>• Private sector</li> <li>• NGO/CBO</li> </ul>	<ul style="list-style-type: none"> <li>• Rice Information Gateway for Africa (RIGA) established</li> <li>• Knowledge on networks and partnerships in the rice innovation system</li> <li>• Institutional PM&amp;E strategy</li> </ul>	<ul style="list-style-type: none"> <li>• Rice sector strengthened</li> <li>• WARDA's partnership strengthened</li> <li>• inter-institutional linkages, better delivery of benefits</li> </ul>
<i>Target 2010: Other kinds of knowledge</i>	A Rice Information Gateway for Africa (RIGA) operational			
<i>Target 2010: Other kinds of knowledge</i>	Analytical tools and framework developed to map and assess partnerships			
<i>Target 2011: Other kinds of knowledge</i>	Analytical tools and framework to assess partnerships tested in at least 3 countries			
<i>Target 2011: Other kinds of knowledge</i>	Public-private sector funding mechanisms identified to expand RIGA			
<b>Output 2</b>	<b>Mechanisms for</b>	<ul style="list-style-type: none"> <li>• Farmers</li> </ul>	<ul style="list-style-type: none"> <li>• Strategies for</li> </ul>	<ul style="list-style-type: none"> <li>• Effective</li> </ul>

	Outputs	Intended Users	Outcome	Impact
	<b>development of pro-poor seed system</b>	<ul style="list-style-type: none"> <li>• Seed producers</li> <li>• Policymakers</li> <li>• Private sector</li> <li>• NARES</li> <li>• Intermediary organisations</li> <li>• WARDA breeders</li> <li>• National Universities</li> </ul>	<p>effective production and dissemination of quality seed from national to farmers' level, including mechanisms to link formal and informal seed systems</p> <ul style="list-style-type: none"> <li>• A peer-reviewed reference book with case studies of rice seed systems in Africa.</li> </ul>	<p>development and dissemination of rice technologies</p> <ul style="list-style-type: none"> <li>• Development and dissemination of improved varieties as well as the creation of knowledge about the functioning of formal and informal seed system.</li> <li>• NERICA seed and passport data are shared with the international community</li> <li>• Improvement of farmers' livelihoods and poverty alleviation</li> </ul>
<i>Target 2010: Other kinds of knowledge</i>	In-formal seed systems analysed in three countries (incl. post-conflict countries)			
<i>Target 2010: Other kinds of knowledge</i>	Multi-media kit on seed production developed			
<i>Target 2011: Policy strategies</i>	Strategies documented for bridging formal and informal rice seed systems			
<i>Target 2011: Other kinds of knowledge</i>	Multi-media kit on seed production used by NARES			

	Outputs	Intended Users	Outcome	Impact
	from at least 6 countries			
<b>Output 3</b>	<b>Rice learning processes and tools</b>	<ul style="list-style-type: none"> <li>• Development agencies</li> <li>• National extension services</li> <li>• National institutions</li> <li>• Universities</li> <li>• Policymakers</li> <li>• Academics and practitioners</li> <li>• CGIAR community</li> <li>• International and intergovernmental organisations</li> <li>• Farm radio international</li> <li>• Rural radios</li> </ul>	<ul style="list-style-type: none"> <li>• Insights in effectiveness, gender relevance and social equity issues of various learning and scaling-up methods</li> <li>• Educational videos and media programs</li> </ul>	<ul style="list-style-type: none"> <li>• Effective rural learning systems</li> <li>• Availability of lecture material</li> </ul>
<i>Target 2010: Capacity</i>	Rice videos translated in three new languages and 100,000 farmers reached			
<i>Target 2010: Other kinds of knowledge</i>	At least two cases documented of private sector engagement in rural learning			
<i>Target 2010: Capacity</i>	Technology-mediated learning applied in at least 10 countries			

	<b>Outputs</b>	<b>Intended Users</b>	<b>Outcome</b>	<b>Impact</b>
<i>Target 2011: Capacity</i>	Technology-mediated learning applied in five new countries			
<i>Target 2011: Capacity</i>	Effective mechanisms for rural learning documented in at least three countries			
<hr/>				
<b>Output 4</b>	<b>Strategies and tools to strengthen the rice value chain</b>	Private sector Development organizations WARDA CGIAR center National universities	<ul style="list-style-type: none"> <li>Capacity building tools and strategies to strengthen the rice value chain.</li> <li>Insights in impact assessment methodologies for various farmers educational approaches</li> </ul>	<ul style="list-style-type: none"> <li>Rice value chain strengthened</li> <li>Effective impact assessment methodologies for farmers educational approaches more effective</li> </ul>
<i>Target 2010: Other kinds of knowledge</i>	Publication on consumer preferences in relation to different varieties and processing technologies			
<i>Target 2010: Other kinds of knowledge</i>	Report on energy-efficient parboiler development and alternative uses of rice by-products			
<i>Target 2011: Other kinds of knowledge</i>	Institutional innovations in the post-harvest innovation system documented			

# WARDA-P04: Policy and Impact Assessment

## Project Overview and Rationale

### Project Overview and Rationale

The strategy for increasing rice production in most of Africa has traditionally focused on increasing yield, while neglecting the roles of policies, markets and institutions in the development of whole rice market value chains. The importance of changes in national and international trade policies and their effects on domestic rice competitiveness as well as the contribution of rice sector to income and employment generation, food security and welfare have not previously been given the attention they deserved. A deeper understanding of the policy, social, institutional and market environment in which rice production and trade is taking place is vital in developing strategies for competitive rice sectors within a background of continuously growing demand for rice. Likewise, given the relative importance of rice imports in sub-Saharan Africa (SSA) and the requirements of bringing the quality of locally milled rice to conformity with imported rice to satisfy consumer demand, it is imperative to integrate these factors in the rice research for development program in order to propose evidence-based policy options for a sustainable domestic rice sector to decision-makers. Equally important is the need to understand and properly take account of the important role of women in the development of the rice sectors in SSA.

Furthermore, with less than eight percent of world rice production being traded in international markets, and with major exporting countries in Asia undergoing structural changes, a dependence on imports to satisfy rice consumption needs in SSA will be exposed to unpredictable external supply and price shocks. Hence, there is an urgent need to develop a much deeper understanding of the likely scenarios for rice sector development in the region, and their poverty, social, economic and environmental implications [CGIAR System Priorities (SP) 3a, 4c, 4d]. Such analysis would help in prioritizing alternative research and development investments to promote strategies for building market-driven and sustainable rice sector development in Africa (SP5b). Allied directly to this is the need to systematically assess the impacts of technical and institutional changes within the rice sector (SP5a), with particular emphasis on productivity, profitability and poverty at the individual, community and national levels (SP3a, 5c, 5d).

### Goal

To enhance income and food security in Africa through sustainable rice sector development engendered by the widespread adoption of rice technologies, improved farming practices, favorable policies, effective institutions and programs.

### Purpose

Generate evidence-based knowledge and information that supports development of demand-driven rice technologies, policies and institutions to improve livelihoods, nutrition and economic development.

### Outputs Description

*Changes from Previous MTP*

No major changes have been implemented

## **Output 1: Tools, methods and enhanced capacity for impact assessment, policy analysis and priority setting**

### Description:

- 1.1 Develop tools and methods for impact assessment, policy analysis and priority setting
- 1.2 Projection of demand and supply patterns of rice in Africa under various policy and trade scenarios
- 1.3 Ex-ante assessment of the social, economic and environmental impacts of rice-based technological changes at the national and regional levels
- 1.4 Enhanced NARES capacity in policy analysis and impact assessment

Alignment to CGIAR Priorities : 1A: Promoting conservation and characterization of staple crops; 2A: Maintaining and enhancing yields and yield potential of food staples; 2B: Improving tolerance to selected abiotic stresses; 4C: Improving water productivity; 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas; 5A: Improving science and technology policies and institutions; 5B: Making international and domestic markets work for the poor; 5D: Improving research and development options to reduce rural poverty and vulnerability;

## **Output 2: Rice policy options and institutions for competitive domestic rice production**

### Description:

- 2.1 Identify policies and institutions that increase the market participation and benefits from rice commercialization of poor farmers and women groups
- 2.2 Identify policies and institutions that improve the smallholder rice farmers access to agricultural input markets
- 2.3 Analyze agricultural trade policies and their effects on the livelihoods of smallholder rice farmers and on the development of the rice sector and national economies of Sub-Saharan African countries

Alignment to CGIAR Priorities : 4C: Improving water productivity; 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas; 5B: Making international and domestic markets work for the poor; 5C: Improving rural institutions and their governance; 5D: Improving research and development options to reduce rural poverty and vulnerability; 5A: Improving science and technology policies and institutions;

## **Output 3: Improved post-harvest systems for competitive domestic rice production**

### Description:

#### Activities

- 3.1 Assess post-harvest systems and identify institutions for promoting markets for quality rice
- 3.2 Assess the rice value chain and develop strategies for stimulating investment in the rice sector and the emergence of small-scale rice processing enterprises

### 3.3 Ex-ante impact assessment of improved rice post-harvest systems and grain quality on local rice competitiveness and poverty

Alignment to CGIAR Priorities : 5A: Improving science and technology policies and institutions; 5B: Making international and domestic markets work for the poor; 5C: Improving rural institutions and their governance; 5D: Improving research and development options to reduce rural poverty and vulnerability;

## Impact Pathways by Output

### **Output 1: Tools, methods and enhanced capacity for impact assessment, policy analysis and priority setting**

The tools developed in Output 1 will be used primarily by WARDA researchers and their NARS collaborators in the national agricultural research institutes, universities and Ministries to set research and development priorities, assess impact of agricultural research, development projects and policy and institutional changes, and to forecast the likely scenarios for rice sector development in the region, and their poverty, economic and environmental implications. The capacity building component of Output 1 will be implemented by sharing knowledge and expertise in policy analysis and impact assessment with the NARS collaborators through networking, organized group trainings, visiting scientist schemes, co-supervision of student theses, backstopping (physically and by e-mail) and joint implementation of studies and publications. The outcome of this multifaceted capacity enhancement platform will be the availability of a critical mass of NARS researchers and policy analysts in the region with the broad set of skills and expertise required to implement the social science research agenda in the various national and regional agricultural research medium term plans. Furthermore, with the capacity enhancement platform of Output 1, the methodologies, tools and models developed in Output 1 can be widely tested, validated and used by NARS collaborators who are also the key collaborators in the studies in Outputs 2 and 3.

### **Output 2: Rice policy options and institutions for competitive domestic rice production**

This output provides knowledge on the micro and macro effects of international and regional trade policies on domestic rice production, commercialization and trade. It also assists in identifying production and trade policies, and institutional and structural arrangements to promote the competitiveness of rice grown by smallholders. All the research outputs will be disseminated through publications, policy briefs, seminars and workshops targeted at policymakers in sub-regional and regional organizations (ECOWAS, UEMOA and AU) as well as the international scientific community. Furthermore, appropriately packaged relevant research outputs will be made available to organized farmers organizations (ROPPA, Rice Farmers Associations) to assist policy advocacy to enhance sustainable domestic rice production and trade. The knowledge generated directly and indirectly by the three outputs will lead to the formulation and implementation of better policies and the emergence of better market and non-market institutions that stimulate public and private investments in the sustainable development of the rice sectors, create new market opportunities for locally-produced rice, increase the market participation of poor rice farmers in general and women farmers in particular, increase the national food supplies of SSA countries, reduce SSA dependence on rice imports, create value-adding employment opportunities within and outside the rice sector and in rural and urban cities. These outcomes when realized will in turn promote food security and poverty reduction in SSA and thereby contribute significantly to the achievement of Millennium Development Goals (MDGs) in SSA.

### **Output 3: Improved post-harvest systems for competitive domestic rice production**

The, ex-ante and ex-post impact assessment of improved post-harvest technologies generates knowledge and methodologies for scaling-up and scaling-out of innovations to improve post-harvest technologies, practices and institutions. The knowledge thus generated will be utilized by farmers, NGOs, national extension agencies, rice millers and traders for improving post-harvest interventions, commercialization and investment decisions. These improvements will in turn lead to reduction in post harvest losses and improvement in local rice quality and the development of competitive domestic rice sectors. All the research outputs will be disseminated through publications, policy briefs, seminars and workshops targeted at rice stakeholders (rice producers, processors, traders, extension, NGOs, policy makers etc..) in national and sub-regional and regional organizations. Furthermore, appropriately packaged relevant research outputs will be made available to organized farmers organizations. The knowledge generated will create new market opportunities for locally-produced rice, increase the market participation of poor rice farmers in general and women farmers in particular, increase the national food supplies of SSA countries, reduce SSA dependence on rice imports, create value-adding employment opportunities within and outside the rice sector and in rural and urban cities. These outcomes when realized will in turn promote food security and poverty reduction in SSA and thereby contribute significantly to the achievement of Millennium Developments Goals (MDGs) in SSA.

### **International Public Goods**

Research and capacity building activities within this project are identified based on constraint analysis and rigorous prioritization exercises involving the NARES partners and other stakeholders. This approach involves the end-users of policy research in the problem identification as well as the research process. Each research activity is planned and implemented in several countries based on research themes and priorities defined in the WARDA Strategic Plan and MTP using a common conceptual framework and data collection and analysis methodologies. All the studies are implemented by the NARS with WARDA providing funding, training, backstopping and coordination. The multi-country and multi-location approach to data collection adopted ensures that 1) results across countries and locations will be comparable and easily aggregated across countries, 2) findings and lessons learned from the studies can be generalized outside the study countries, and 3) that recommendations from the project can be scaled-up and -out to appropriate recommendation domains. Such domains could be, for example (a) production ecology (upland, lowland and irrigated), (b) scale of production (small-, medium- and large-scale) and (c) policy groupings (UEMOA and non-UEMOA countries).

Through this platform for close collaboration with NARS combining capacity building and joint implementation of research activities and its direct access to the policy making process through the Council of Ministers, WARDA is in a position of comparative advantage to lead the implementation of rice policy research at the regional and continental levels with the aim of producing practical long-term agricultural and rice sector development strategies in SSA that ensure the uptake of policy research outputs.

## Alignment to CGIAR Priorities

Program 4 contribution the CGIAR System Priorities				
Priority Area 1: Sustaining Biodiversity	Priority Area 2 Genetic Improvements	Priority Area 3 Diversification and High-value Commodities	Priority Area 4 Sustainable Management of Natural Resources	Priority Area 5: Policies and Institutional Innovation
1a - Conservation of plant genetic resources for food and agriculture	2a – Maintaining and enhancing yield of food staples	3a – Increasing income from fruit and vegetables	4a - Promoting integrated land, water and forest management at landscape level	5a - Science and technology policies and institutions
1b- Promoting conservation and characterization of under-utilized plant genetic resources to increase income	2b – Improving tolerance to selected abiotic stresses	3b – Increasing income from livestock	4b - Sustaining and managing aquatic ecosystems for food and livelihoods	5b - Making international and domestic markets work for the poor
1c - Conservation of indigenous livestock	2c - Enhancing nutritional quality and safety	3c – Enhancing income through increased productivity of fisheries and aquaculture	4c – Improving water productivity	5c - Rural institutions and their governance
1d - Conservation of aquatic animal genetic resources	2d - Genetic enhancement of high value species	3d – Promoting sustainable income generation from forests and trees	4d – Promoting sustainable agro-ecological intensification in low- and high-potential environments	5d – Improving research and development options to reduce rural poverty and vulnerability

5b,c,d High

5a, Medium

1a, 2a, 2b, 4c, 4d Low

## Elaboration of Partners Roles

### NARI

- National agricultural research systems (NARS): They are the main collaborators for all three outputs. They support the implementation of multi-country impact assessment and policy studies and training. NARS participate in impact assessment training and also coordinate and implement country studies to facilitate the monitoring and impact evaluation of rice research outputs. Specific collaborators are mentioned below:

- Uganda - National agricultural Research organization (NARO) - participating in the impact assessment workshops and are also implementing Priority setting and Impact assessment research in collaboration with WARDA

- Rwanda -Institut des Sciences Agronomiques du Rwanda (ISAR) – participating in the impact assessment workshops and are implementing Priority setting and Impact assessment research in collaboration with WARDA

- Democratic republic of Congo - INERA (Institut national pour l'étude et la recherche agronomique) and PNR (programme national riz) - participating in the impact assessment workshops and are implementing Priority setting and Impact assessment research in collaboration with WARDA. Also involved in the IFAD funded project on 'Enhancing Smallholder Access to NERICA for Alleviating Rural Poverty in West and Central Africa'
- Chad - ITRAD (Institut de recherche agronomique pour le développement) - implementing the CFC project on 'Improving the competitiveness of rice in Central Africa' in collaboration with WARDA.
- Togo - ITRA (Institut togolaise de recherche agricole - implementing a ROCARIZ funded survey and an impact assessment survey in Togo in collaboration with WARDA; conducting a baseline survey on Participatory Varietal Selection.
- Ghana – CSIR (Crops research institute), CSIR-SARI, University of Legon - implementing ROCARIZ funded surveys and the African Rice Initiative (ARI) baseline survey of the NERICA Dissemination Project in Ghana in collaboration of WARDA
- Nigeria - NCRI, NISER - implementing the African Rice Initiative baseline and the post harvest survey in Nigeria in collaboration with WARDA.
- Cameroon - IRAD (Institut de recherche agricole pour le développement) - implementing the CFC project on Improving the Competitiveness of Rice in Central Africa in collaboration with WARDA
- Republic of central Africa - ICRA (institut centrafricain de la recherche agronomique) - implementing the CFC project on 'Improving the Competitiveness of Rice in Central Africa' in collaboration with WARDA.
- Benin - PAPA/INRAB (programme d'analyse de la politique agricole / institut national de recherche agricole du Bénin) - conducting impact assessment surveys in the country in collaboration with WARDA. They implement the ARI baseline surveys, and are implementing the surveys of the project entitled 'Enhancing Smallholder Access to NERICA for Alleviating Rural Poverty in West and Central Africa'.
- Mali - IER - in collaboration with WARDA in implementing the USAID funded project on the emergency rice production project and the rice statistics and information data systems.
- Niger - Niamey University (Department of Rural Economy) - coordinating the in-country policy studies and identifies potential students to be involved in the data collection process.
- Niger - INRAN (National Institute for Agronomic Research), through the department of rural economy - involved in the implementation of the rice data and information exchange framework.
- Guinea - Observatoire Riz(ORIZA-Guinee)/BCEPA, Institut de Recherche Agricole de la Guinée (IRAG), Service Nationale de la Promotion Rurale et de la Vulgarisation (SNPRV) - implementing the rice sector competitiveness surveys, the impact assessment surveys, and ARI baseline surveys in the country. They are also involved in the IFAD funded project on 'Enhancing Smallholder Access to NERICA for Alleviating Rural Poverty in West and Central Africa'
- The Gambia - National Agricultural Research Institute (NARI) - implementing the ARI baseline surveys and also participating in impact assessment training workshops.

- Senegal: Institut Senegalais de Recherche Agricole (ISRA): in the implementation of the BMG foundation project on biotic and abiotic stresses and other Impact assessment research in the country.
- Sierra Leone: Rice Research Station Rokupur: implementing ARI baseline survey and participate in the IFAD funded project on Enhancing Smallholder Access to NERICA for Alleviating Rural Poverty in West and Central Africa.

### **SROs**

- The Forum for Agriculture Research in Africa: Assisting the Sub-Saharan Africa Challenge program (SSA-CP) in the evaluation/proof of concept of the Integrated Agricultural Research for Development (IAR4D) approach.
- Economics Task Force of ROCARIZ in member countries: They support the implementation of multi-country impact assessment and policy initiatives through studies and training
- CORAF, UEMOA, ECOWAS: They support Regional policy studies, and participate in the training and capacity building initiatives conducted by the Impact assessment Unit
- Planning agencies in member countries: Implementation of multi-country studies and uptake of national policies

### **Development Organizations**

- FAO; USAID: National and regional studies, organization of policy relevant workshops

### **Universities**

National Universities such as the University of Abomey Calavi in Benin; University of Ibadan in Nigeria, University of Togo, University of Makerere in Uganda are some of the universities that are already collaborating with the Impact assessment Unit. Program 4 is involved in the supervision of student research projects from the University of Abomey Calavi at both graduate and undergraduate levels. National studies also act as dissemination pathways of impact assessment tools.

- University college London: conducting impact assessment studies on NERICA in Ghana, Gambia, Sierra Leone, Nigeria and Mali.
- McGill University: conducting post harvest research in Nigeria and Benin. Development of research methodologies, models and joint publications
- University of Florence, Italy: conducting impact assessment studies on NERICA in Mali
- University of Wisconsin, USA: conducting impact assessment studies on NERICA in Mali
- Wageningen University: Development of research methodologies, models and joint publications

### **IARC**

- IFPRI, IRRI, IITA, ICRISAT: participating in joint research activities, workshops and publications. For example, currently IRRI and WARDA are collaboratively implementing the BMG foundation project on Biotic and biotic stresses

**ARI**

- CIRAD: Development of research methodologies, models and joint publications

**NGOs**

- Oxfam Canada; ROPPA, Cotonou: Policy advocacy at national, regional and WTO levels

## Logical Framework

	Outputs	Intended Users	Outcome	Impact
<b>Output 1</b>	<b>Tools, methods and enhanced capacity for impact assessment, policy analysis and priority setting</b>	<b>NARS, University and CGIAR researchers and policy analysts at Government Ministries and the Donors community</b>	<b>Tools are used to analyze rice policies and assess and monitor impacts and set agricultural research and investment priorities</b>	<b>Enhance institutional impact culture and capacity to analyze policies and assess and monitor impact of agricultural research and development in SSA</b>
<i>Target 2010: Practices</i>	Econometric tools for impact assessment extended and made available to the larger research community through the internet.			
<i>Target 2010: Capacity</i>	At least 15 NARS scientists trained in impact assessment methods			
<i>Target 2010: Capacity</i>	At least 10 NARS scientists trained in policy analysis methods.			
<i>Target 2011: Other kinds of knowledge</i>	A framework for assessing the impact of stimulating demand for country-of-origin and branded products on producer and consumer welfare			
<i>Target 2011: Capacity</i>	At least 15 NARS scientists trained in impact			

	<b>Outputs</b>	<b>Intended Users</b>	<b>Outcome</b>	<b>Impact</b>
	assessment methods			
<i>Target 2011: Capacity</i>	At least 10 NARS scientists trained in policy analysis methods available to the larger research community through the internet.			
<hr/>				
<b>Output 2</b>	<b>Rice policy options and institutions for competitive domestic rice production</b>	<b>NARS researchers and policy analysts at Government Ministries, policymakers, rice stakeholders and the Donors community</b>	<b>Enhanced policy environments for the rice sector development</b>  <b>Rice policy information and options are debated and evaluated</b>  <b>Rice policy and institutional changes adopted</b>	<b>Increase income for local rice producers, processors, and traders; increased rice sector employment, reduced rice imports; reduced national poverty</b>
<i>Target 2010: Other kinds of knowledge</i>	The nature and scope of gender inequity in irrigated rice systems documented for two new countries			
<i>Target 2010: Policy strategies</i>	The nature of the market failures in rice seed systems in West and Central Africa analyzed and policy and institutional arrangement			

	<b>Outputs</b>	<b>Intended Users</b>	<b>Outcome</b>	<b>Impact</b>
	options for developing national and regional seed systems proposed.			
<i>Target 2011: Policy strategies</i>	Policy options for SSA countries in the face of a highly distorted and thin global rice market			
<i>Target 2011: Other kinds of knowledge</i>	Assessment of the impact of access to credit on timing and productivity of productive and facilitating inputs in irrigated rice farming in Irrigated rice systems.			
<hr/>				
<b>Output 3</b>	<b>Improved post-harvest systems for competitive domestic rice production</b>	<b>NARS researchers and policy analysts at Government Ministries, policymakers, rice stakeholders, rice producers, rice processors, rice traders, etc.</b>	<ul style="list-style-type: none"> <li>• <b>Increased awareness on the effects of poor grain quality on local rice marketability and policy and institutional changes implemented</b></li> <li>• <b>policy and institutional changes that improve Post-harvest practices implemented</b></li> <li>• <b>Improved post-</b></li> </ul>	<b>Increased income for local rice producers, processors, and traders; increased rice sector employment, reduced rice imports; reduced national poverty</b>

	Outputs	Intended Users	Outcome	Impact
			<p>harvest practices and technologies adopted by rice producers, processors and traders;</p> <ul style="list-style-type: none"> <li>• Increased supply of good quality local rice</li> </ul>	
<i>Target 2010: Other kinds of knowledge</i>	Ex-ante assessment of the impact of improved grain quality on domestic rice competitiveness completed for one new country			
<i>Target 2011: Other kinds of knowledge</i>	Ex-ante assessment of the impact of improved grain quality on domestic rice competitiveness completed for one new country			

# WARDA-SWEP 01: The Inland Valley Consortium (IVC)

## Project Overview and Rationale

### Introduction

The Consortium for the Sustainable Development of Inland Valley Agro-ecosystems in Sub-Saharan Africa or the Inland Valley Consortium (IVC) was established in 1993 to respond to social and environmental challenges in West Africa, related to poverty and food security on the one hand and degradation of the natural resource base on the other. It was one of the first ecoregional programs of the CGIAR; IVC became fully operational in 1994 with the arrival of a full-time coordinator. Membership grew gradually from an initial seven to a total of 12 West African countries (Benin, Burkina Faso, Cameroon, Côte d'Ivoire, Ghana, Guinea, Mali, Nigeria, Senegal, Sierra Leone, The Gambia and Togo). Presently, five CG centers are involved [Africa Rice Center (WARDA), International Institute for Tropical Agriculture (IITA), International Livestock Research Institute (ILRI), International Water Management Institute (IWMI), and WorldFish Center] as well as five international research and development institutions [West and Central African Council for Agricultural Research and Development (CORAF), Centre de coopération internationale en recherche agronomique pour le développement (CIRAD), United Nations Food and Agriculture Organization (FAO), Wageningen University and Research Center (WUR) and the World Vegetable Center (AVRDC)]. During Phase 1 of the IVC (1994-1999), extensive biophysical and socio-economic characterization work was executed at 18 key sites. In 2000 the second phase of the Consortium started. In this phase, IVC project activities were integrated into Africa Rice Center (WARDA) Program 3 (Rice Policy and Development). Research objectives in Phase II (2000-2005) focused on four main themes: Characterization of inland valley land use dynamics; Development and evaluation of technologies for improved production systems and natural resources management; Socio-economic and policy aspects of improvements in inland valley land use systems, and technology dissemination processes and impact pathways for inland valley development. In September 2004, IVC was evaluated externally for the third time in its history. Recommendations from this Center-commissioned External Review (CCER) served as a guideline for the framework of the Strategic Plan for IVC Phase 3. The stakeholders used the CCER recommendations as guidelines for drafting the new strategic plan at the annual workshop in April 2005. The draft was presented to the Consortium Management Committee in September 2005. The stakeholders identified four main research themes for Phase 3: 1) increasing inland valley productivity, 2) mitigating negative impacts affecting ecosystem services, 3) benefits from past achievements and transfer of technologies, including local innovations, and 4) systematic stakeholder capacity building. The new MTP outputs presented below are based on these research themes. The draft of the new stand-alone MTP was presented to the Annual Workshop in Serekunda, The Gambia, in May 2006 and approved by the Consortium Steering Committee.

### Rationale

More than two thirds of sub-Saharan Africa's 725 million people earn less than USD 2 per day. With population growth rate exceeding the growth rate of regional food production, the future for Africa's poor remains precarious. Besides food insecurity and widespread poverty in SSA environmental problems are becoming increasingly dramatic, differentiated by depletion and degradation of natural resources. Cultivated soils are losing their inherent fertility and are subject to erosion due to over-exploitation and inappropriate land management practices. Tropical forests are being destroyed at an alarming rate to meet the increasing demands for arable land, fodder and fuel wood. However, a promising and largely unexploited land resource is the estimated 190 million ha of inland valleys (also referred to as bas-fonds, wetlands, dambos, swamps, fadamas, vleis, etc.) Inland valleys are defined as the upper reaches of river systems. An inland valley comprises valley bottoms and minor floodplains, which may be submerged for part of the year,

their hydromorphic fringes and contiguous upland slopes and crests that contribute runoff and seepage to the valley bottom. Depending on the country, only about 10-25% of these inland valley lowlands are currently used for agricultural production. Since its inception 12 years ago, IVC has gained substantial experience in understanding and managing the inland valleys in WCA. Considerable progress has been made in documenting low-cost water management technologies and developing information systems and decision support tools for the exploitation of inland valleys (SP5d). The time is opportune to benefit from this experience and concentrate on transfer of the acquired knowledge. For technology transfer IVC adopted the Participatory Learning and Action Research (PLAR) methodology, which was developed through consultation with an IFAD-supported project (Participatory Adaptation and Diffusion of technologies for rice-based Systems). IVC continues to collaborate with Africa Rice Center (WARDA) on PLAR methodology development with special emphasis on integrated natural resource management. This provides a strong foundation for expanding IVC activities into east and southern Africa with the benefit of continued political will and a willingness of communities to work cooperatively in the exploitation of inland valleys and wetlands. A wise and sustainable use of natural resources and functions of wetlands offers a prime opportunity to assure the food and environmental security of significant numbers of the rural poor (SP3, 4). IVC has comparative advantage, and is playing a role in the Challenge Programs on SSA as well as Water and Food. In the next five years IVC will continue to focus on value-adding integrated systems such as crop-livestock, rice-fish culture, rice-vegetables (SP3), and to pay greater attention to biodiversity issues (SP1) with the continued active participation of the NARS and the donor community.

## **Goal**

To improve the livelihood of rural communities through the adoption and use of sustainable technologies fulfilling the production potential of the inland valleys in SSA

## **Purpose**

To develop appropriate technologies helping farmers to profitably increase productivity of inland valleys, while conserving the environment and biodiversity

## **Outputs Description**

### *Changes from Previous MTP*

Previous output 3 suffered from a lack of focus, while activities focusing on the social components were not visible. So, the activities have been reshuffled to improve the focus of each output and make a clear distinction between outputs. Output 1 still focuses on production increase, but now from a clear systems perspective. Output 2 has now a clear environmental focus, while output 3 focuses on addressing all social issues that may hinder inland valley management and development.

### **Output 1: Productivity of inland valley agro-ecosystems increased**

#### Description:

#### Activities

- 1.1 Develop improved crop and natural resources management technologies
- 1.2 Optimize natural resources use through adoption of integrated systems

### 1.3 Improve income security through farm diversification

Alignment to CGIAR Priorities : 3A: Increasing income from fruit and vegetables; 3B: Increasing income from livestock; 3C: Enhancing income through increased productivity of fisheries and aquaculture; 3D: Promoting sustainable income generation from forests and trees ; 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas;

#### **Output 2: Environmental degradation of inland valley ecosystems mitigated**

##### Description:

##### Activities

- 2.1 Develop tools for inventorying inland valley resources for sustainable land use
- 2.2 Develop databases and decision making tools for inland valley development
- 2.3 Identify, test and scale up of promising local innovations
- 2.4 Test alternatives for agrochemical use and its impact

Alignment to CGIAR Priorities : 4A: Promoting integrated land, water and forest management at landscape level; 4B: Sustaining and managing aquatic ecosystems for food and livelihoods; 4C: Improving water productivity; 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas;

#### **Output 3: Social constraints to inland valley development alleviated**

##### Description:

##### Activities

- 3.1 Analyze interactions between stakeholders in multi-stakeholder processes
- 3.2 Study value chain development in inland valleys
- 3.3 Formulate policies for sustainable and equitable use of inland valley resources

Alignment to CGIAR Priorities : 3A: Increasing income from fruit and vegetables; 3B: Increasing income from livestock; 3C: Enhancing income through increased productivity of fisheries and aquaculture; 3D: Promoting sustainable income generation from forests and trees ; 4D: Promoting sustainable agro-ecological intensification in low- and high-potential areas;

## **Impact Pathways by Output**

### **Output 1: Productivity of inland valley agro-ecosystems increased**

The productivity of inland valley agro-ecosystems is generally low, and production is far below its attainable level. Output 1 assembles all activities focused on productivity increase at the field level. Emphasis is on addressing the three major biophysical production constraints in inland valleys; poor water management, high incidence of weeds and low level of mechanization. Other production constraints like low soil fertility, and the occurrence of pests and diseases will also be addressed. Technologies are developed in close collaboration with farmers through participatory

learning and action research focusing on ecological intensification and diversification of inland valley systems. Diversification focuses on rice-fish cultures and rice-vegetable rotations. The tools and technologies are disseminated to NGO collaborators, national researchers and extension agents through manuals and also, and to inland valley users in particular, through participatory learning and action research (PLAR), and training videos and radio scripts focusing on principles and technologies related to ecological intensification and diversification of inland valley systems.

### **Output 2: Environmental degradation of inland valley ecosystems mitigated**

Negative impacts of human activities on inland valleys, like erosion, pollution and loss of ecosystem services will be studied. These interactions surpass the plot level so activities of output 2 focus on the catchment level and beyond. New tools to inventory inland valley resources will be developed and made available to planners. The spatial information technology that is presently available is sufficiently robust to develop tools for spatial modeling of environmental interaction at catchment level as well as country-wide inland-valley inventories. Successful technologies will be made available to national researchers and planners, including training in environmental analyses.

### **Output 3: Social constraints to inland valley development alleviated**

Activities of this output focus on the social and cultural context that range from catchment to national policy level. Emphasis will be on social, cultural and political hindrances to inland valley development, like land tenure, access of women to land, value chain development and agricultural policies. Guidelines and policy recommendations will be developed that lead to better and more equitable use of inland valley resources, while social solutions are tested using conflict management tools like the multi-stakeholder platform approach. Knowledge banks and information systems will be distributed through policy briefs, video, radio and the web.

## **International Public Goods**

The International Public Goods (IPGs) of the IVC can be classified in six general categories: decision-making tools (1), policy recommendations (2), databases (3), agricultural technologies (4), manuals, training modules and fact sheets (5) and scientific publications (6).

The decision-making tools and policy recommendations apply (IPGs 1-2) to the complex issues of inland valley development. They involve various disciplines (e.g. from hydrology to economics) and hierarchical levels (from farm household to the central government) and require fundamental considerations (e.g. natural biodiversity versus crop intensification; complete or partial development). These tools and recommendations will be the principal outcomes of various research endeavors and symposia and workshops with national and international participation.

Through field studies, inland valleys of different agro-climatic zones are selected and farmers, village chiefs, local or regional decision-makers, professionals from NGOs, NARES and bilateral development agencies are interviewed and confronted with different scenarios. By means of geographic information on inland valleys, potentially suitable or vulnerable valleys may be identified. This GIS database can be combined with information on perceptions of stakeholders and development trajectories to create a powerful tool. Tools and recommendations will be made public through symposia, websites and dissemination of publications and CDs.

The databases (IPG 3) are the results of biophysical and socio-economic characterizations of inland valleys carried out by national consortium members, geographic information from satellite images and GPS measurements, and meteorological information from partner institutes. These databases can be made publicly available through the IVC website.

Agricultural technologies (IPG 4) and improved farm practices will be developed, tested and validated through various experimental studies. For the development and testing of these technologies, participatory on-farm research will be backstopped by controlled on-station experiments. The technologies will be validated through multi-location, on-farm trials with a broad selection of farmers. The principal methodology used throughout this process will be the Participatory Learning and Action Research (PLAR) developed by Africa Rice Center (WARDA). The new and validated technologies and farm practices will be disseminated through manuals, (PLAR) training modules, fact sheets, workshops, symposia proceedings and scientific publications (IPGs 5-6). Those materials will be made easily available to farmers, extension services and research centers.

## Alignment to CGIAR Priorities

IVC contribution the CGIAR System Priorities				
Priority Area 1: Sustaining Biodiversity	Priority Area 2 Genetic Improvements	Priority Area 3 Diversification and High-value Commodities	Priority Area 4 Sustainable Management of Natural Resources	Priority Area 5: Policies and Institutional Innovation
1a - Conservation of plant genetic resources for food and agriculture	2a – Maintaining and enhancing yield of food staples	3a – Increasing income from fruit and vegetables	4a - Promoting integrated land, water and forest management at landscape level	5a - Science and technology policies and institutions
1b- Promoting conservation and characterization of under-utilized plant genetic resources to increase income	2b – Improving tolerance to selected abiotic stresses	3b – Increasing income from livestock	4b - Sustaining and managing aquatic ecosystems for food and livelihoods	5b – Making international and domestic markets work for the poor
1c - Conservation of indigenous livestock	2c - Enhancing nutritional quality and safety	3c – Enhancing income through increased productivity of fisheries and aquaculture	4c – Improving water productivity	5c - Rural institutions and their governance
1d - Conservation of aquatic animal genetic resources	2d - Genetic enhancement of high value species	3d – Promoting sustainable income generation from forests and trees	4d – Promoting sustainable agro-ecological intensification in low- and high-potential environments	5d – Improving research and development options to reduce rural poverty and vulnerability

3a, 4a, 4c, 4d High

3c, 4b, 5d Medium

3b, 3d Low

## Elaboration of Partners Roles

Three CGIAR centers are actively involved in IVC: Africa Rice Center (WARDA) as convening center, IITA, and IWMI. The following NARES are members of IVC: INRAB in Benin; INERA in Burkina Faso; IRAD in Cameroon; CNRA in Côte d'Ivoire; SARI and CRI in Ghana; IRAG in Guinea; IER in Mali; NCRI in Nigeria; LWDD in Sierra Leone; ISRA in Senegal; IRAT in Togo; and NARI in The Gambia. Each of these NARES are heading a national coordination unit for inland valley development in their respective countries involving a range of local partners with interest in inland valley development. The sub-regional organization CORAF, the UN organization FAO and the ARIs

CIRAD, and Wageningen UR are international members of IVC. They actively participate in research planning, project formulation and capacity building of the national members.

Specific roles:

#### **IARC**

IITA: involved in the special project Realizing Agricultural Potential of Inland Valley Systems (RAP-IVS), in which it leads the value chain component.

IWMI: involved in the special project Sawah, Market Access and Rice Technologies in Inland Valley Systems (SMART-IVS) in which it will lead the socio-economic adoption component.

#### **NARI**

INERA, CNRA and NCRI: partners in the SPIRIVWA project that focused on enhancement of rice productivity in inland valleys.

INRAB, ITRA, LWDD: partners in the SMART-IVs and RAP-IVs projects.

#### **ARI**

CIRAD: partner in the RAP-IVS project, focusing on ecological intensification and diversification of inland valley systems

#### **Universities**

Wageningen UR: partner in the RAP-IVs project, focusing on the establishment of multi-stakeholder platforms for inland valley systems

#### **Development Organization**

FAO: partner in writing a manual on inland valley development,

#### **SROs**

CORAF: participates in workshops as observer.

## Logical Framework

	Outputs	Intended Users	Outcome	Impact
<b>Output 1</b>	<b>Productivity of inland valley agro-ecosystems increased</b>	<b>Poor rural inland valley populations</b>	<b>Adoption of more profitable technologies</b>	<b>Improved livelihoods of rural populations</b>
<i>Target 2010: Other kinds of knowledge</i>	Study on integrated weed management in inland valleys in West Africa published			
<i>Target 2011: Practices</i>	The effect of land preparation and water management on soil fertility modeled			
<hr/>				
<b>Output 2</b>	<b>Environmental degradation of inland valley ecosystems mitigated</b>	<b>Inland valley users; scientists and decision makers</b>	<b>Adoption of recommendations for environmentally-sound inland valley management</b>	<b>Negative impacts of human activities on ecosystem services mitigated</b>
<i>Target 2010: Other kinds of knowledge</i>	Study on Rhamphicarpa fistulosa on rice published			
<i>Target 2011: Practices</i>	Effective no-herbicide weed control strategies developed			
<hr/>				
<b>Output 3</b>	<b>Social constraints to inland valley development alleviated</b>	<b>NARS scientists; policymakers; inland valley users; extension agents</b>	<b>More appropriate land use technologies and inland valley development options available</b>	<b>Increased food security in inland valleys</b>
<i>Target 2010: Other kinds of knowledge</i>	Actors and their relationships involved in inland valley development			

	<b>Outputs</b>	<b>Intended Users</b>	<b>Outcome</b>	<b>Impact</b>
	identified			
<i>Target 2011: Other kinds of knowledge</i>	Better understanding obtained of ways to intervene to modify these partnerships so we can actually achieve the relationships required for inland valley development			

# Annexes

## Implementation of EPMR/CPER Recommendations

### Progress in implementing EPMR recommendations

Recommendations	Action taken/progress to date
<p><b>Recommendation 1</b></p> <p>Because phenotypic variability of <i>O. glaberrima</i> has not been studied as extensively as that of <i>O. sativa</i>, the Panel recommends exploring more systematically the phenotypic variability of <i>O. glaberrima</i> for desirable traits, using sound, up to date screening methods, focusing on processes and mechanisms of these traits.</p>	<p><b>March 2009</b></p> <p>A PMF has been recruited as of March 2009 to implement agro-morphological characterization of <i>O. glaberrima</i> accessions stored in WARDA's genebank using up to date screening methods.</p> <p>To be achieved by Jan. 2011.</p>
<p><b>Recommendation 2</b></p> <p>To capitalize on the excellent work done on the understanding of the genetic structure of <i>O. glaberrima</i>, the Panel recommends that the Genetic Resources Unit, breeders and molecular biologists of WARDA collectively focus on defining core collections of <i>O. glaberrima</i>, i.e. collections of accessions representative of the diversity of the whole species.</p>	<p><b>March 2009</b></p> <p>A PMF has been recruited as of March 2009 to (i) identify the diversity of <i>O. glaberrima</i> accessions stored in WARDA's genebank and to determine a core collection; and (ii) carry out DNA extraction for molecular characterization of <i>O. glaberrima</i>.</p> <p>To be achieved by Jan. 2011</p>
<p><b>Recommendation 3</b></p> <p>The creation of a first generation of interspecific hybrid progenies (NERICAs) should not be seen as the end, but as the beginning of a great "genetic adventure" aimed at making the best possible use of the African gene pools (<i>O. glaberrima</i>, <i>O. sativa</i> and other species).</p>	<p><b>March 2009</b></p> <p>The 2009 workplans for all rice breeders specifically target both intra and inter-specific crosses to broaden genetic diversity: including inter-specific crosses involving <i>O. barthii</i>; enhancing % of <i>glaberrima</i> in inter-specific crosses; identify superior <i>glaberrima</i> germplasm for intra-specific crosses; eliminate sterility gene in <i>glaberrima</i> to favor its use; identify promising <i>glaberrima</i> for abiotic and biotic stress tolerance.</p> <p>This is a continuous activity</p>
<p><b>Recommendation 4</b></p> <p>The Panel recommends that WARDA seek to secure, on a sustainable basis, the funding of INGER-Africa, which is a network essential for the diffusion of genetic progress. The Panel further recommends that INGER-Africa clearly focus</p>	<p><b>March 2009</b></p> <p>Funds for INGER available in 2008-2010 through IRRI/WARDA abiotic stresses project and GPG2 funding.</p>

Recommendations	Action taken/progress to date
<p>on understanding Genotype x Environment interaction patterns across testing sites, and capitalize on the benefits that derive from it.</p>	<p>A new strategic plan for INGER/GRU has been written.</p> <p>The Japan breeding project will allow a more systematic analysis of G x E interactions across sites with full participation of NARS, IRRI and WARDA.</p> <p>This is a continuous activity</p>
<p><b>Recommendation 5</b></p> <p>(1) recruit without delay two scientists, in irrigation engineering/hydrology and in crop-water modeling/land use-planning, respectively; (2) develop a strategy to mainstream water management research into the Center's core research program; and (3) help strengthen the capacity of national organizations for conducting research on the rice-water-soil interfaces, in collaboration with IWMI and other relevant partners.</p>	<p><b>March 2009</b></p> <ul style="list-style-type: none"> <li>• The water management specialist position to work on inland valley lowlands has been advertised.</li> <li>• A crop modeler from CIRAD will join the WARDA team in Senegal.</li> <li>• A strategic plan on water management has been written</li> <li>• A major project on ecological intensification of inland valley systems has started in 2009.</li> <li>• A project to explore adaptation of the Asian Sawah lowland model to African growth conditions with IVC will start mid 2009.</li> </ul> <p>To be achieved by end of 2009.</p>
<p><b>Recommendation 6</b></p> <p>The Panel recommends that WARDA develop, in collaboration with weed scientists from advanced research institutions, a strategic vision for future research in weed management, and revisit its decision to focus almost entirely on the expected weed competitiveness of NERICAs.</p>	<p><b>March 2009</b></p> <p>WARDA's agronomist in St. Louis is spending most of his time on weed research, as is the agro-physiologist based in Cotonou.</p> <p>A strategic vision for future research in weed management is nearing completion with inputs from the IRRI weed scientist based in the Philippines.</p> <p>To be achieved by mid 2009</p>
<p><b>Recommendation 7</b></p> <p>In order to improve the priority setting process, the Panel recommends that WARDA collect relevant background information, assign appropriate weights to the constraints identified, focusing only on a few major constraints of regional interest for each rice ecosystem, and better define homogeneous target areas (e.g. through stratification of the biophysical and socio-economic environments).</p>	<p><b>March 2009</b></p> <p>The recent priority setting conducted with IRRI for the Bill and Melinda Gates Foundation for biotic and abiotic stresses is a first step in that direction.</p> <p>Village level surveys ongoing in 12 countries.</p> <p>This will need to be complemented using GIS and modeling studies to define target areas.</p> <p>More work will also be done to understand the spatial and temporal diversity of biotic stresses and to determine pathogen diversity</p>

Recommendations	Action taken/progress to date
	<p>within the continent.</p> <p>To be achieved by mid 2010.</p>
<p><b>Recommendation 8</b></p> <p>The Panel recommends that WARDA allocate more time and resources to development of concepts and methodologies, and to understanding genetic and physiological mechanisms and processes responsible for superior performance in the appropriate genetic backgrounds (<i>O. sativa</i>, <i>O. glaberrima</i>, or NERICAs, according to the situation).</p>	<p><b>March 2009</b></p> <p>Pheno-typing and detailed physiological modeling are key issues in the IRRI/WARDA project on abiotic stresses (STRASA) and in the Green Super Rice Project.</p> <p>Collaboration has been established with Wageningen UR and Cirad and Hohenheim University to look at temperature effects on rice growth and development.</p> <p>The posting of a Cirad modeler at WARDA is envisaged for mid 2009.</p> <p>This is a continuous and ongoing effort</p>
<p><b>Recommendation 9</b></p> <p>In order to ensure that available scientific talent is utilised primarily for science, and in order not to compromise research quality, the Panel recommends that WARDA make every effort to achieve a reasonable balance between in-house scientific activities and external network or partnership activities that focus more on development than on research.</p>	<p><b>March 2009</b></p> <ul style="list-style-type: none"> <li>• An annual evaluation system for scientific staff (including support staff) has been introduced as of January 2008.</li> <li>• Transfer of two scientists from Cotonou to the outstations as of April 2008.</li> <li>• Transfer of weed scientist in Senegal to Tanzania by June 2009.</li> <li>• Transfer of SWIHA</li> <li>• Establishment of RiceTIME</li> </ul> <p>This is a continuous and ongoing effort</p>
<p><b>Recommendation 10</b></p> <p>Because of research gaps in the social sciences research program (policy analysis, rainfed production economics, adoption studies), the Panel recommends that WARDA recruit a rural sociologist and fill other positions in the social sciences (production economist, policy economist) in a timelier manner.</p>	<p><b>March 2009</b></p> <ul style="list-style-type: none"> <li>• Sociologist has arrived</li> <li>• Innovation systems specialist hired</li> <li>• PMF hired in Nigeria</li> <li>• Agricultural economist hired mid 2009 to be based in Tanzania</li> </ul> <p>To be achieved by mid 2009</p>
<p><b>Recommendation 11</b></p> <p>The Panel recommends that WARDA make the necessary investments and provide funds on a regular basis to ensure communications (e-mail and internet) that meet the performance standards expected at an international research institute, both at its headquarters and outstations.</p>	<p><b>March 2009</b></p> <p>WARDA has taken full responsibility for running all ICT systems on the station. Effective June 2008 arrangements have been finalized with Benin Telecom and the 1Mb band width has been upgraded to 2Mb. The existing VSAT link has been increased from 512 Kb to 1Mb which is being used exclusively for various email links, including VPN, Pop3 and video-conferencing. In July 2008 WARDA engaged the services of CGNET on consultancy basis to review the existing ICT system and make recommendations for improvements. The final report is available</p>

Recommendations	Action taken/progress to date
	<p>and follow-up action is being taken. The VSAT link at St. Louis in Senegal is also fully restored and being upgraded. The new ICT manager is on board effective Jan 2009 and busy working on plans for upgrading the system.</p> <p>To be achieved by end 2011</p>
<p><b>Recommendation 12</b></p> <p>Because good statistical design and analysis is an essential component of research quality, the Panel recommends hiring as soon as possible one full time biometrician, preferably with good experience in Genotype x Environment interaction analysis, design of on-farm field trials, and analysis of survey data coming from Participatory Varietal Selection.</p>	<p><b>March 2009</b></p> <p>The biometrician has been hired on a consultancy basis since 1 March 2008. The new biometrician will join WARDA in June 2009.</p> <p>To be achieved by June 2009</p>
<p><b>Recommendation 13</b></p> <p>The Panel recommends that WARDA develop a medium and long term strategy for a phased expansion in Central, East and southern Africa, in line with available funds, without compromising critical mass in West Africa. Moreover, the programmatic alignment of WARDA with IRRI in East and southern Africa should specify their respective roles based on their respective comparative advantages.</p>	<p><b>March 2009</b></p> <p>A joint WARDA/IRRI strategy has been developed. A joint WARDA/IRRI office will be opened in March, 2009 in Tanzania.</p> <p>Achieved</p>
<p><b>Recommendation 14</b></p> <p>Because the System Wide Initiative on HIV/AIDS (SWIHA) is not expected to contribute to WARDA's core research outputs, the Panel recommends that WARDA transfer its convening role to a partner more suited to leading the SWIHA initiative.</p>	<p><b>March 2009</b></p> <p>The SWIHA consortium has been transferred to IFPRI.</p> <p>Achieved</p>
<p><b>Recommendation 15</b></p> <p>Because technology generation must take into account the heterogeneity of the environments and the farming populations, including the different needs of farmers, for better targeting of technologies and better adoption, the Panel recommends that WARDA, in its adoption and impact studies, involve suitable interdisciplinary teams from its research program (breeding, natural resource management, socio-economics).</p>	<p><b>March 2009</b></p> <p>Impact studies involve multi-disciplinary teams.</p> <p>Achieved</p>
<p><b>Recommendation 16</b></p> <p>The Panel recommends that the Program Committee augment its resources by relying on an external Board-appointed Scientific Advisory Committee (SAC) comprised of 3-4 outstanding scientists with knowledge of rice and/or other cereals from around the globe, who would provide in-depth guidance on technical quality and strategic directions of science undertaken by WARDA.</p>	<p><b>March 2009</b></p> <p>Scientific Advisory Committee:</p> <ul style="list-style-type: none"> <li>• Dr. Alain Ghesquière (France)</li> <li>• Dr. Takeshi Horie (Japan)</li> <li>• Dr. J. Neil Rutger (USA)</li> </ul> <p>Participation in 2008 Research Days.</p> <p>Achieved</p>

Recommendations	Action taken/progress to date
<p><b>Recommendation 17</b></p> <p>The Panel recommends that the Financial Procedures Manual (which was last issued in 2001) be updated and suitably revised, as needed, and that compliance with these procedures be ensured by the Board and Management so that the financial control environment operates as intended.</p>	<p><b>March 2009</b></p> <ul style="list-style-type: none"> <li>• Following the IITA/WARDA alignment, there is a need to harmonize some of the financial procedures of the two centers. The Local Implementation Committee has been discussing those areas where procedures will require harmonization as a matter of priority.</li> <li>• Meeting of IITA/WARDA Finance Working Group in August 2008 made specific recommendations for approval by management of both centers.</li> <li>• For 2009 WARDA has secured funding from the CGIAR secretariat to recruit a consultant who will help with the review and update of financial procedures.</li> </ul> <p>To be achieved by end 2009</p>
<p><b>Recommendation 18</b></p> <p>The Panel recommends that the staff and heads of Corporate Services of WARDA and IITA: a) continue a very collaborative approach to ensuring that the transfer/alignment of corporate services proceeds smoothly; b) closely monitor on a regular basis the progress made by the various Transition Task Forces, Steering Committee, and the Local Implementation Committees at Cotonou and other sites covered by the Memorandum of Agreement; and c) seek to benefit from the experience of other Centers that are aligning corporate services. Nevertheless, it cautions WARDA that in seeking efficiency gains from the alignment of corporate services, it ensures that research quality and relevance are not compromised, and that scientists continue to have access to adequate technical support during and after the alignment process.</p>	<p><b>March 2009</b></p> <p>Recruitment of 90 former IITA staff as WARDA GSS completed; WARDA is handling all new recruitments for IITA in Benin.</p> <p>Finance Working Group formed and 3 meetings held.</p> <p>Two meetings of LIC held to review cross-cutting issues</p> <p>Two meetings were held with IITA IRS to address staff concerns</p> <p>Appointment of common external auditors is finalized (E&amp;Y).</p> <p>Station facilities, buildings and farm equipments have been inspected jointly for formal handover to WARDA</p> <p>Learning from ICRAF and ILRI (HR management information system)</p> <p>Consultations are ongoing on office space reallocation</p> <p>Office space re-allocation will be finalized by April 2009</p>

# Financing Plan

Africa Rice-Table 1: Allocation of Project Costs by Priority Area and Priorities, 2010  
in \$millions

Project	Priority Area 1		Priority Area 2			Priority Area 3				Priority Area 4				Priority Area 5				Non-Priority Area			Total
	1A	1B	2A	2B	2C	3A	3B	3C	3D	4A	4B	4C	4D	5A	5B	5C	5D	Developm ent Activities	New Research Areas	Stand- alone Training	
PO1: Genetic Diversity and Improvement	1.522	0.254	0.507	0.507	0.507							0.254	0.507				0.507		0.254	0.254	5.073
PO2: Sustainable Productivity Enhancement						0.730		0.340		0.973	0.389	1.216	0.973						0.243		4.864
PO3: Learning and Innovation Systems						0.094							0.187	0.281	0.094	0.563	0.375			0.281	1.875
PO4: Policy and Impact Assessment	0.070												0.070	0.209	0.279	0.279	0.279		0.070	0.139	1.395
RiceTIME Unit																		3.279			3.279
WARDA-SWEP 01: The Inland Valley Consortium						0.288	0.096	0.192	0.096	0.288	0.192	0.288	0.288				0.192				1.920
<b>Total</b>	<b>1.592</b>	<b>0.254</b>	<b>0.507</b>	<b>0.507</b>	<b>0.507</b>	<b>1.112</b>	<b>0.096</b>	<b>0.532</b>	<b>0.096</b>	<b>1.261</b>	<b>0.581</b>	<b>1.758</b>	<b>2.025</b>	<b>0.490</b>	<b>0.373</b>	<b>0.842</b>	<b>1.353</b>	<b>3.279</b>	<b>0.567</b>	<b>0.674</b>	<b>18.406</b>

Africa Rice-Table 2: Allocation of Project Costs to CGIAR Priorities, 2008-2012  
in \$millions

Projects					
Priorities	Actual 2008	Estimated 2009	Proposal 2010	Plan 1 2011	Plan 2 2012
WARDA-SWEP 01: The Inland Valley Consortium					
3A	0.133	0.215	0.288	0.302	0.325
3B	0.044	0.072	0.096	0.101	0.108
3C	0.089	0.143	0.192	0.201	0.216
3D	0.044	0.072	0.096	0.101	0.108
4A	0.133	0.215	0.288	0.302	0.325
4B	0.089	0.143	0.192	0.201	0.216
4C	0.133	0.215	0.288	0.302	0.325
4D	0.133	0.215	0.288	0.302	0.325
5D	0.089	0.143	0.192	0.201	0.216
<b>Total Project</b>	<b>0.887</b>	<b>1.433</b>	<b>1.920</b>	<b>2.013</b>	<b>2.164</b>
PO1: Genetic Diversity and Improvement					
1A	1.409	1.296	1.522	1.602	1.917
1B	0.235	0.216	0.254	0.267	0.319
2A	0.470	0.432	0.507	0.534	0.639
2B	0.470	0.432	0.507	0.534	0.639
2C	0.469	0.432	0.507	0.534	0.639
4C	0.235	0.216	0.254	0.267	0.319
4D	0.469	0.432	0.507	0.534	0.639
5D	0.470	0.432	0.507	0.534	0.639
Stand-alone Training	0.235	0.216	0.254	0.267	0.319
New Research Areas	0.235	0.216	0.254	0.267	0.319
<b>Total Project</b>	<b>4.697</b>	<b>4.320</b>	<b>5.073</b>	<b>5.340</b>	<b>6.388</b>
PO2: Sustainable Productivity Enhancement					
3A	0.163	0.598	0.730	0.592	0.612
3C	0.076	0.279	0.340	0.276	0.286

Projects	Actual 2008	Estimated 2009	Proposal 2010	Plan 1 2011	Plan 2 2012
Priorities					
4A	0.218	0.798	0.973	0.789	0.816
4B	0.087	0.319	0.389	0.315	0.326
4C	0.272	0.997	1.216	0.986	1.020
4D	0.218	0.797	0.973	0.789	0.816
New Research Areas	0.054	0.199	0.243	0.197	0.204
<b>Total Project</b>	<b>1.088</b>	<b>3.987</b>	<b>4.864</b>	<b>3.944</b>	<b>4.080</b>
PO3: Learning and Innovation Systems					
3A	0.038	0.127	0.094	0.051	0.064
4D	0.076	0.253	0.187	0.102	0.128
5A	0.114	0.380	0.281	0.153	0.192
5B	0.038	0.127	0.094	0.051	0.064
5C	0.228	0.760	0.563	0.306	0.384
5D	0.152	0.507	0.375	0.204	0.256
Stand-alone Training	0.114	0.380	0.281	0.153	0.192
<b>Total Project</b>	<b>0.760</b>	<b>2.534</b>	<b>1.875</b>	<b>1.020</b>	<b>1.280</b>
PO4: Policy and Impact Assessment					
1A	0.061	0.154	0.070	0.060	0.114
4D	0.061	0.154	0.070	0.060	0.114
5A	0.182	0.462	0.209	0.179	0.343
5B	0.243	0.616	0.279	0.238	0.458
5C	0.243	0.616	0.279	0.238	0.458
5D	0.243	0.616	0.279	0.238	0.458
Stand-alone Training	0.122	0.308	0.139	0.119	0.229
New Research Areas	0.061	0.154	0.070	0.060	0.114
<b>Total Project</b>	<b>1.216</b>	<b>3.080</b>	<b>1.395</b>	<b>1.192</b>	<b>2.288</b>
RiceTIME Unit					
Development Activities	2.566	3.852	3.279	1.710	1.466
<b>Total Project</b>	<b>2.566</b>	<b>3.852</b>	<b>3.279</b>	<b>1.710</b>	<b>1.466</b>
<b>Total</b>	<b>11.214</b>	<b>19.206</b>	<b>18.406</b>	<b>15.219</b>	<b>17.666</b>

### Africa Rice-Table 3: Summary of Project Costs, 2008-2012

in \$millions

Project	Actual 2008	Estimated 2009	Proposal 2010	Plan 1 2011	Plan 2 2012
PO1: Genetic Diversity and Improvement	4.697	4.320	5.073	5.340	6.388
PO2: Sustainable Productivity Enhancement	1.088	3.987	4.864	3.944	4.080
PO3: Learning and Innovation Systems	0.760	2.534	1.875	1.020	1.280
PO4: Policy and Impact Assessment	1.216	3.080	1.395	1.192	2.288
RiceTIME Unit	2.566	3.852	3.279	1.710	1.466
WARDA-SWEP 01: The Inland Valley Consortium	0.887	1.433	1.920	2.013	2.164
Total	11.214	19.206	18.406	15.219	17.666

Africa Rice-Table 4: Summary of Priority Costs, 2008-2012  
in \$millions

Priorities	Actual 2008	Estimated 2009	Proposal 2010	Plan 1 2011	Plan 2 2012
1A	1.470	1.450	1.592	1.662	2.031
1B	0.235	0.216	0.254	0.267	0.319
2A	0.470	0.432	0.507	0.534	0.639
2B	0.470	0.432	0.507	0.534	0.639
2C	0.469	0.432	0.507	0.534	0.639
3A	0.334	0.940	1.112	0.945	1.001
3B	0.044	0.072	0.096	0.101	0.108
3C	0.165	0.422	0.532	0.477	0.502
3D	0.044	0.072	0.096	0.101	0.108
4A	0.351	1.013	1.261	1.091	1.141
4B	0.176	0.462	0.581	0.516	0.542
4C	0.640	1.428	1.758	1.555	1.664
4D	0.957	1.851	2.025	1.787	2.022
5A	0.296	0.842	0.490	0.332	0.535
5B	0.281	0.743	0.373	0.289	0.522
5C	0.471	1.376	0.842	0.544	0.842
5D	0.954	1.698	1.353	1.177	1.569
Development Activities	2.566	3.852	3.279	1.710	1.466
Stand-alone Training	0.471	0.904	0.674	0.539	0.740
New Research Areas	0.350	0.569	0.567	0.524	0.637
Total	11.214	19.206	18.406	15.219	17.666

Africa Rice-Table 5: Investments by Undertaking, Activity and Sector, 2008-2012  
in \$millions

	Actual 2008	Estimated 2009	Proposal 2010	Plan 1 2011	Plan 2 2012
Increasing Productivity	4.570	7.456	8.026	6.966	7.845
Germplasm Enhancement & Breeding	3.206	3.806	4.200	3.887	4.474
Production Systems Development & Management	1.364	3.650	3.826	3.079	3.371
Cropping systems	1.364	3.650	3.826	3.079	3.371
Livestock systems	0.000	0.000	0.000	0.000	0.000
Tree systems	0.000	0.000	0.000	0.000	0.000
Fish systems	0.000	0.000	0.000	0.000	0.000
Protecting the Environment	0.941	1.769	2.051	1.827	2.015
Saving Biodiversity	0.983	0.936	1.111	1.169	1.386
Improving Policies	0.979	2.296	1.482	1.107	1.617
Strengthening NARS	3.741	6.749	5.736	4.150	4.803
Training and Professional Development	1.505	2.710	2.233	1.570	1.829
Documentation, Publications, Info. Dissemination	0.984	2.012	1.719	1.262	1.499
Organization & Management Counselling	0.862	1.427	1.168	0.845	1.004
Networks	0.390	0.600	0.616	0.473	0.471
<b>Total</b>	<b>11.214</b>	<b>19.206</b>	<b>18.406</b>	<b>15.219</b>	<b>17.666</b>

Africa Rice-Table 6: Project Investments by Developing Region, 2008-2012

in \$millions

Project	Region	Actual 2008	Estimated 2009	Proposal 2010	Plan 1 2011	Plan 2 2012
PO1: Genetic Diversity and Improvement	SSA	4.697	4.320	5.073	5.340	6.388
<b>Total Project</b>		<b>4.697</b>	<b>4.320</b>	<b>5.073</b>	<b>5.340</b>	<b>6.388</b>
PO2: Sustainable Productivity Enhancement	SSA	1.088	3.987	4.864	3.944	4.080
<b>Total Project</b>		<b>1.088</b>	<b>3.987</b>	<b>4.864</b>	<b>3.944</b>	<b>4.080</b>
PO3: Learning and Innovation Systems	SSA	0.760	2.534	1.875	1.020	1.280
<b>Total Project</b>		<b>0.760</b>	<b>2.534</b>	<b>1.875</b>	<b>1.020</b>	<b>1.280</b>
PO4: Policy and Impact Assessment	SSA	1.216	3.080	1.395	1.192	2.288
<b>Total Project</b>		<b>1.216</b>	<b>3.080</b>	<b>1.395</b>	<b>1.192</b>	<b>2.288</b>
RiceTIME Unit	SSA	2.566	3.852	3.279	1.710	1.466
<b>Total Project</b>		<b>2.566</b>	<b>3.852</b>	<b>3.279</b>	<b>1.710</b>	<b>1.466</b>
WARDA-SWEP 01: The Inland Valley Consortium	SSA	0.887	1.433	1.920	2.013	2.164
<b>Total Project</b>		<b>0.887</b>	<b>1.433</b>	<b>1.920</b>	<b>2.013</b>	<b>2.164</b>
<b>Total</b>		<b>11.214</b>	<b>19.206</b>	<b>18.406</b>	<b>15.219</b>	<b>17.666</b>

Africa Rice-Table 7: Summary of Investments by Developing Region, 2008-2012

in \$millions

Region	Actual 2008	Estimated 2009	Proposal 2010	Plan 1 2011	Plan 2 2012
SSA	11.214	19.206	18.406	15.219	17.666
<b>Total</b>	<b>11.214</b>	<b>19.206</b>	<b>18.406</b>	<b>15.219</b>	<b>17.666</b>

Africa Rice-Table 8: Expenditure by Object, 2008-2012  
in \$millions

Object of Expenditure	Actual 2008	Estimated 2009	Proposal 2010	Plan 1 2011	Plan 2 2012
Personnel	5.525	6.849	6.564	5.427	6.300
Supplies and services	3.230	5.213	4.996	4.131	4.795
Collaboration/ Partnerships	1.160	5.362	5.139	4.249	4.933
Operational Travel	0.702	0.880	0.843	0.697	0.809
Depreciation	0.597	0.902	0.864	0.715	0.829
<b>Total</b>	<b>11.214</b>	<b>19.206</b>	<b>18.406</b>	<b>15.219</b>	<b>17.666</b>

Africa Rice-Table 9: Member and Non-Member Unrestricted Grants, 2008-2010

in \$millions NC = National Currency

Member	Type NC	Actual 2008 (US\$)	Actual 2008 (NC)	Estimated 2009 (US\$)	Estimated 2009 (NC)	Proposal 2010 (US\$)	Proposal 2010 (NC)
<b>Unrestricted Grants</b>							
<b>Member</b>							
Belgium	EUR	0.497	0.400	0.208	0.160	0.293	0.220
Canada	CAD	0.703	0.829	0.526	0.658	0.557	0.658
Cote d' Ivoire	USD	0.009	0.009	0.000	0.000	0.000	0.000
France	EUR	0.239	0.175	0.130	0.100	0.133	0.100
Germany	EUR	0.230	0.162	0.149	0.115	0.153	0.115
Japan	JPY	0.603	54.313	0.510	49.948	0.505	49.948
Sweden	SEK	0.459	3.300	0.370	3.300	0.427	3.300
United Kingdom	GBP	0.821	0.500	0.714	0.500	0.784	0.525
United States	USD	0.250	0.250	0.250	0.250	0.250	0.250
World Bank	USD	0.710	0.710	0.750	0.750	0.750	0.750
<b>Subtotal</b>		<b>4.521</b>		<b>3.607</b>		<b>3.852</b>	
<b>Non-member</b>							
Africa Rice-Member States	USD	1.894	1.894	0.560	0.560	0.750	0.750
<b>Subtotal</b>		<b>1.894</b>		<b>0.560</b>		<b>0.750</b>	
<b>Total Unrestricted</b>		<b>6.415</b>		<b>4.167</b>		<b>4.602</b>	

Africa Rice-Table 9a: Member and Non-Member Unrestricted and Restricted Grants, 2008-2010

in \$millions

Member / Non-Member	Actual 2008	Estimated 2009	Proposal 2010
<b>Unrestricted Grants</b>			
<b>Member</b>			
Belgium	0.497	0.208	0.293
Canada	0.703	0.526	0.557
Cote d' Ivoire	0.009	0.000	0.000
France	0.239	0.130	0.133
Germany	0.230	0.149	0.153
Japan	0.603	0.510	0.505
Sweden	0.459	0.370	0.427
United Kingdom	0.821	0.714	0.784
United States	0.250	0.250	0.250
World Bank	0.710	0.750	0.750
<b>Subtotal</b>	<b>4.521</b>	<b>3.607</b>	<b>3.852</b>
<b>Non-member</b>			
Africa Rice-Member States	1.894	0.560	0.750
<b>Subtotal</b>	<b>1.894</b>	<b>0.560</b>	<b>0.750</b>
<b>Total Unrestricted</b>	<b>6.415</b>	<b>4.167</b>	<b>4.602</b>
<b>Restricted Grants</b>			
<b>Member</b>			
AFDB	0.475	0.481	0.500
Canada	0.031	0.075	0.068
China	0.000	1.119	1.130
European Commission	0.519	1.160	1.105
FAO	0.020	0.000	0.000
Germany	0.187	0.081	0.607
IFAD	0.305	0.512	0.423

Member / Non-Member	Actual 2008	Estimated 2009	Proposal 2010
Japan	1.246	6.220	4.090
Nigeria	0.054	0.000	0.000
Rockefeller Foundation	-0.001	0.000	0.000
UNDP	0.351	0.239	0.143
United Kingdom	0.006	0.018	0.011
United States	0.070	2.993	2.600
World Bank	0.622	0.103	0.350
<b>Subtotal</b>	<b>3.885</b>	<b>13.001</b>	<b>11.027</b>
<b>Non-member</b>			
Common Fund for Commodities - CFC	0.720	0.613	0.500
Conservation Food and Health Foundation, Inc	0.019	0.011	0.000
Generation/CP	0.212	0.189	0.006
HarvestPlus/CP	0.016	0.000	0.000
IRRI	1.528	1.503	1.768
The Arab Bank for Economic Development in Africa (BADEA)	0.000	0.320	0.401
Water & Food/CP	0.000	0.010	0.009
<b>Subtotal</b>	<b>2.495</b>	<b>2.646</b>	<b>2.684</b>
<b>Total Restricted</b>	<b>6.380</b>	<b>15.647</b>	<b>13.711</b>
<b>Total Grants</b>	<b>12.795</b>	<b>19.814</b>	<b>18.313</b>

Summary and Statement of Activities	Actual 2008	Estimated 2009	Proposal 2010
<b>Total Grants</b>	<b>12.795</b>	<b>19.814</b>	<b>18.313</b>
<b>Center Income</b>	<b>0.315</b>	<b>0.500</b>	<b>0.600</b>
<b>Revenue</b>	<b>13.110</b>	<b>20.314</b>	<b>18.913</b>
<b>Total Investment</b>	<b>11.214</b>	<b>19.206</b>	<b>18.406</b>
<b>Surplus (Deficit)</b>	<b>1.896</b>	<b>1.108</b>	<b>0.507</b>

Africa Rice-Table 10: Allocation of Member, Non-Member Grants and Other Sources to Projects, 2008-2010

in \$millions

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
PO1: Genetic Diversity and Improvement	Member	AFDB	0.000	0.030	0.000
		China	0.000	0.142	0.143
		Japan	0.666	1.513	1.941
		Rockefeller Foundation	-0.001	0.000	0.000
		UNDP	0.188	0.100	0.000
		United States	0.070	0.090	0.048
		World Bank	0.189	0.103	0.000
	Non Member	Common Fund for Commodities - CFC	0.036	0.042	0.038
		Generation/CP	0.174	0.189	0.000
		HarvestPlus/CP	0.016	0.000	0.000
		IRRI	1.333	1.312	1.542
		The Arab Bank for Economic Development in Africa (BADEA)	0.000	0.000	0.067
	Unrestricted + Other sources		2.026	0.799	1.294
	<b>Project Total</b>			<b>4.697</b>	<b>4.320</b>
PO2: Sustainable Productivity Enhancement	Member	China	0.000	0.977	0.987
		Germany	0.187	0.081	0.607
		Japan	0.187	0.806	0.585
		UNDP	0.026	0.021	0.000
		United Kingdom	0.006	0.018	0.011
		United States	0.000	1.242	1.242
		World Bank	0.081	0.000	0.000
	Non Member	Generation/CP	0.038	0.000	0.006
		IRRI	0.095	0.093	0.110
		The Arab Bank for Economic Development in Africa (BADEA)	0.000	0.000	0.067
		Water & Food/CP	0.000	0.010	0.009
Unrestricted + Other sources		0.468	0.739	1.240	

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
<b>Project Total</b>			<b>1.088</b>	<b>3.987</b>	<b>4.864</b>
PO3: Learning and Innovation Systems	Member	IFAD	0.217	0.485	0.401
		Japan	0.073	0.643	0.169
		United States	0.000	0.875	0.689
		World Bank	0.081	0.000	0.000
	Non Member	IRRI	0.062	0.061	0.072
		The Arab Bank for Economic Development in Africa (BADEA)	0.000	0.000	0.067
	Unrestricted + Other sources		0.327	0.470	0.477
<b>Project Total</b>			<b>0.760</b>	<b>2.534</b>	<b>1.875</b>
PO4: Policy and Impact Assessment	Member	Canada	0.008	0.075	0.068
		European Commission	0.519	0.476	0.425
		IFAD	0.011	0.027	0.022
		Japan	0.035	1.729	0.413
		United States	0.000	0.165	0.000
		World Bank	0.081	0.000	0.000
	Non Member	IRRI	0.038	0.037	0.044
		The Arab Bank for Economic Development in Africa (BADEA)	0.000	0.000	0.067
	Unrestricted + Other sources		0.524	0.571	0.356
<b>Project Total</b>			<b>1.216</b>	<b>3.080</b>	<b>1.395</b>
RiceTIME Unit	Member	AFDB	0.475	0.451	0.500
		Canada	0.023	0.000	0.000
		FAO	0.020	0.000	0.000
		Japan	0.233	1.119	0.300
		Nigeria	0.054	0.000	0.000
		UNDP	0.137	0.118	0.143
		United States	0.000	0.621	0.621
		World Bank	0.081	0.000	0.350
	Non Member	Common Fund for Commodities - CFC	0.437	0.509	0.462
		The Arab Bank for Economic Development in	0.000	0.320	0.066

Project	Member		Actual 2008	Estimated 2009	Proposal 2010
		Africa (BADEA)	0.000	0.320	0.066
	Unrestricted + Other sources		1.106	0.714	0.837
<b>Project Total</b>			<b>2.566</b>	<b>3.852</b>	<b>3.279</b>
WARDA-SWEP 01: The Inland Valley Consortium	Member	European Commission	0.000	0.684	0.680
		IFAD	0.077	0.000	0.000
		Japan	0.052	0.410	0.682
		World Bank	0.109	0.000	0.000
	Non Member	Common Fund for Commodities - CFC	0.247	0.062	0.000
		Conservation Food and Health Foundation, Inc	0.019	0.011	0.000
		The Arab Bank for Economic Development in Africa (BADEA)	0.000	0.000	0.067
	Unrestricted + Other sources		0.383	0.266	0.491
<b>Project Total</b>			<b>0.887</b>	<b>1.433</b>	<b>1.920</b>
<b>Total Restricted</b>			<b>6.380</b>	<b>15.647</b>	<b>13.711</b>
<b>Total Unrestricted + Other sources</b>			<b>4.834</b>	<b>3.559</b>	<b>4.695</b>
<b>Total</b>			<b>11.214</b>	<b>19.206</b>	<b>18.406</b>

Africa Rice-Table 11: Internationally and Nationally Recruited Staff, 2008-2012

in \$millions

	<b>Actual 2008</b>	<b>Estimated 2009</b>	<b>Proposal 2010</b>	<b>Plan 1 2011</b>	<b>Plan 2 2012</b>
NRS	239	261	256	246	250
IRS	49	57	54	49	52
<b>Total</b>	<b>288</b>	<b>318</b>	<b>310</b>	<b>295</b>	<b>302</b>

## Africa Rice-Table 12: Currency Structure of Expenditure, 2008-2010

in millions of units and percent

Currency	Actual 2008			Estimated 2009			Proposal 2010		
	Amount	\$ Value	% Share	Amount	\$ Value	% Share	Amount	\$ Value	% Share
Others	0.000	0.898	8	0.000	1.537	8	0.000	1.473	8
USD	5.607	5.607	50	9.603	9.603	50	9.203	9.203	50
XOF	0.000	4.709	42	0.000	8.066	42	0.000	7.730	42
<b>Total</b>		<b>11.214</b>	<b>100 %</b>		<b>19.206</b>	<b>100 %</b>		<b>18.406</b>	<b>100 %</b>

Africa Rice - Table 13: Statement of Financial Position (SFP), 2008-2010  
in \$millions

Assets, Liabilities and Net Assets	2008	2009	2010
<b>Current Assets</b>			
Cash and Cash Equivalents	4.435	5.029	6.035
Investments	0.000	0.000	0.000
Accounts Receivable			
- Donor	4.016	6.220	5.748
- Employees	0.255	0.268	0.281
- Other CGIAR Centers	0.506	0.498	0.586
- Others	0.425	0.446	0.468
Inventories	0.438	0.460	0.483
Pre-paid Expenses	0.256	0.268	0.282
Total Current Assets	10.331	13.189	13.883
<b>Non-Current Assets</b>			
Net Property, Plan and Equipment	0.713	1.055	1.362
Investments	0.000	0.000	0.000
Other Assets	0.000	0.000	0.000
Total Non-Current Assets	0.713	1.055	1.362
Total Assets	11.044	14.244	15.245
<b>Current Liabilities</b>			
Overdraft/Short Term Borrowings	0.000	0.000	0.000
Accounts Payable			
- Donor	2.479	4.578	5.221
- Employees	0.307	0.322	0.338
- Other CGIAR Centers	0.095	0.100	0.105
- Others	0.392	0.411	0.432
Accruals and Provisions	1.590	1.511	1.284
Total Current Liabilities	4.863	6.922	7.380
<b>Non-Current Liabilities</b>			
Accounts Payable			
- Employees	0.214	0.246	0.283
- Deferred Grant Revenue	0.000	0.000	0.000
- Others	0.000	0.000	0.000
Total Non-Current Liabilities	0.214	0.246	0.283
Total Liabilities	5.077	7.168	7.663
<b>Net Assets</b>			
Unrestricted			
- Fixed Assets	0.713	1.055	1.362
- Unrestricted Net Assets Excluding Fixed Assets	5.254	6.021	6.220
Total Unrestricted Net Assets	5.967	7.076	7.582

Restricted	0.000	0.000	0.000
Total Net Assets	5.967	7.076	7.582
Total Liabilities and Net Assets	11.044	14.244	15.245

Africa Rice-Table 14: Statement of Activities (SOA), 2008-2010  
in \$millions

		Unrestricted	Restricted		Total		
			Temporary	Challenge Programs	2008	2009	2010
Revenue and Gains	Grant Revenue	6.415	6.153	0.227	12.795	19.814	18.313
	Other revenue and gains	0.315	0.000	0.000	0.315	0.500	0.600
	Total revenue and gains	6.730	6.153	0.227	13.110	20.314	18.913
Expenses and Losses	Program related expenses	2.655	5.658	0.227	8.540	17.953	17.054
	Management and general expenses	3.741	0.494	0.000	4.235	3.454	3.281
	Other losses expenses	0.000	0.000	0.000	0.000	0.000	0.000
	Sub Total expenses and losses	6.396	6.152	0.227	12.775	21.407	20.335
	Indirect cost recovery	-1.561	0.000	0.000	-1.561	-2.201	-1.929
	Total expenses and losses	4.835	6.152	0.227	11.214	19.206	18.406
	Net Operating Surplus / (Deficit)	1.895	0.001	0.000	1.896	1.108	0.507
	Extraordinary Items	0.000	0.000	0.000	0.000	0.000	0.000
	NET SURPLUS / (DEFICIT)	1.895	0.001	0.000	1.896	1.108	0.507
Object of Expenditure	Personnel	4.106	1.371	0.048	5.525	6.849	6.564
	Supplies and services	0.168	2.903	0.159	3.230	5.213	4.996
	Collaboration/ Partnerships	0.003	1.157	0.000	1.160	5.362	5.139
	Operational Travel	0.258	0.424	0.020	0.702	0.880	0.843
	Depreciation	0.300	0.297	0.000	0.597	0.902	0.864
	Total	4.835	6.152	0.227	11.214	19.206	18.406