WWF-FAO-IRRI global initiative to improve food security, enhance livelihoods and reduce water conflicts in irrigated rice – a concept note

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THE CHALLENGE

Almost one billion people live in conditions of extreme poverty, with many more struggling to sustain livelihoods that are directly dependent on the world's finite and threatened natural resources. Yet the population, especially in the world's poor countries, continues to increase at an alarming rate. The world urgently needs to find ways to massively increase its supply of affordable food.

This challenge is perfectly captured by the first Millennium Development Goal (MDG 1): *Eradicate extreme poverty and hunger*. While the breakthrough in rainfed agriculture is eagerly awaited, rainfall in regions where it is most needed tends to be erratic, seasonal and, with climate change, increasingly unreliable and unmanageable. There is no advantage in planting drought-resistant varieties or in water conservation if no rain falls at all, or if it all falls at once or at the wrong time. Even when rainfall is adequate, the poor, risk-averse farmer can only know at the end of the season (not at the start) whether or not to invest in the barely affordable inputs necessary to protect the crop against pests or fertilizers and to increase yield. Rainfed farming is likely to remain unreliable and suboptimal for the foreseeable future.

Most experts agree, therefore, that increases in the world's irrigated areas and in crop productivity are crucial for the achievement of MDG 1, at least in the short to medium term.

Irrigation is expensive, however, and an investment must have a return. As far as public investments in irrigated food staples are concerned, recent studies suggest that rice is the most likely to prove viable. The future role of rice in relation to global food security is therefore unequivocal and the production of more rice is to be encouraged. Indeed, even if per capita consumption continues decreasing, it is estimated that total demand will still increase by 25 percent to 770 million tonnes of milled rice by 2030.

Rice is typically grown in submerged paddy (i.e. irrigated wetland) fields, therefore also irrigated rice has a high level of water consumption. In a typical year, global production of the three main staples – rice, maize and wheat – is more or less the same in terms of tonnes, but only some 15 percent of maize and 30 percent of wheat is usually irrigated, compared with between 50 and 60 percent of rice. In very approximate terms, the global paddy crop requires up to five times the irrigation withdrawals needed by the other two major cereals combined – even before any presaturation requirements and distribution losses are accounted for, even though the evapotranspiration of rice is similar to other cereals.

Freshwater resources are becoming increasingly scarce as a result of excessive, unmanaged human demand, which goes against MDG 7, which requires that any strategy intended to ensure the global food supply will also *ensure environmental sustainability*.

The high water demand of irrigated wetland rice is not necessarily a problem during the rainy season when:

- there is no competition for water;
- there is a neutral to beneficial impact on biodiversity;
- wetland rice fulfils a secondary livelihood role (rice-fish systems, the sale of hunting licences, or the presence of a lush landscape);
- it is necessary for leaching of salts or the prevention of saline intrusion; or

- it contributes to flood mitigation, groundwater recharge or river flows through return flows.

Wetland rice culture is beneficial to both the environment and the livelihoods of those dependent on it, including downstream populations. Also, in terms of water quality, while intensive cultivation practices may pollute water resources, wetland paddy fields may act as purifiers.

When water is scarce (i.e. during the dry season), however, the economic, environmental and even social costs of irrigating wetland rice may not be justifiable. Similarly, where water is unreliable, persistent wetland rice cultivation in one location can contribute to food insecurity in another. Yet the dietary, social and cultural significance of irrigated wetland rice, together with its food security potential, further underscores the need to grow more. It is necessary to do so in ways that enhance the positive environmental role that wetland rice plays in some locations while minimizing the negative effects that result or could result elsewhere. New-build rice schemes are likely to be more costly in environmental terms, especially in sub-Saharan Africa where much of the new-build is expected, at least for the next 20 to 30 years. New-build schemes could be destined for wetland rice but also for other forms of rice irrigation.

There is increasing knowledge of how to grow more rice while reducing the negative impact on the freshwater environment. Various on-farm practices that increase yields or reduce water requirements have been developed – from improved wetland cultivation to systems that eliminate the wetland nature of the paddy fields for existing fields or which do not create wetland conditions. Irrigation system-level strategies to improve overall efficiency and water productivity are better understood, while progress is being made in applying integrated water resource management concepts and instruments in river basins. Nevertheless, there are constraints:

- Some technologies are unproven or considered controversial.
- Most on-farm practices require radical change to off-farm service delivery and regulatory mechanisms which are often overlooked, while typical basin or system-level interventions do not usually support the introduction of improved on-farm practices or may not result in improved water productivity.
- No practices have to date been included at international development policy level; their adoption tends to be the exception rather than the norm.
- The expected gains in water productivity are often not achieved for a variety of reasons:
  - Various vague or non-rigorous definitions of water-use efficiency and productivity are adopted on one particular scale (e.g. the field); it is therefore impossible to evaluate the potential for water saving on different scales in a comprehensive framework based on sound water balances.
  - There is a lack of understanding of the water delivery or drainage services which farmers need to receive in order to adopt the recommended field practices.
  - Local interventions are not considered part of a larger context both geographically and institutionally.

The challenges lie herein!

THE OPPORTUNITY

A similar situation arose in the 1980s around crop pest management. At the time there was limited consensus with regard to the concept of integrated pest management (IPM), but following a process not dissimilar to that proposed herein, IPM is now established as a global standard, administered by the Food and Agriculture Organization of the United Nations (FAO).

As a result of an international workshop coorganized by the World Wide Fund for Nature (WWF), the International Rice Research Institute (IRRI), the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) and the Philippine Rice Research Institute (PhilRice), and hosted by IRRI at its headquarters in Los Baños, Laguna, Philippines on 7–8 March 2006, there is now an opportunity to develop a similar concept for irrigated rice. It could take the form of mutually agreed guidelines established at international development policy level and aimed at development agencies and the community of field practitioners; as with IPM, they could be applied in the planning stage of future irrigated rice initiatives as well as during the rehabilitation and upgrading of existing schemes.

Difficulties have arisen from the differing frameworks of understanding about key issues:

- the definition of water-use efficiency and productivity;

- the level within the catchment or basin at which it should be measured;
- the crucial difference between consumption and withdrawal;
- the relative merits of investment versus institutional approaches; and
- service linkages and how discrete institutional entities might best be functionally integrated for effective, multi-objective service delivery.

Participants at the Los Baños workshop – drawn from academia, the Consultative Group on International Agricultural Research (CGIAR) network, WWF, research institutions, public institutions, the NGO (non-governmental organization) sector, FAO and private practices – came from a wide range of relevant disciplines including agronomy, economics, development practice, irrigation engineering, institutions, social sciences, the environment and conservation.

After wide-ranging and at times intense discussion of the various issues, the following was agreed:

- On-farm approaches to water saving in irrigated rice identified to date have the potential for wider, normative adoption in the development process.
- Most of the on-farm approaches require off-farm measures, including the provision of the right infrastructure, effective service delivery, easily understood incentive mechanisms and appropriate institutions.
- The various system-level water management strategies to improve water productivity and efficiencies at system level are also increasingly understood and adopted.
- The evaluation of the potential for water savings and improving productivity or efficiency requires a framework with clear concepts of water-use efficiency and productivity on different scales.
- To be mainstreamed into the development process, both on-farm approaches and off-farm measures need some sort of validation from a well-respected international panel of distinguished experts supported by a technical core group of researchers.
- Decision-making by farmers and the adoption of new practices does not take into account only water-related factors but also a range of socio-economic factors.
- In line with MDG 8 – *develop a global partnership for development* – a partnership approach is needed.

THE PARTNERSHIP

The following organizations have agreed to form a partnership with the intention of seizing the opportunity to establish global guidelines for sustainable irrigated rice production within the next 3 years:

- Food and Agriculture Organization of the United Nations (FAO)
- International Commission on Irrigation and Drainage (ICID)
- International Crops Research Institute for the Semi Arid Tropics (ICRISAT)
- International Food Policy Research Institute (IFPRI)
- International Rice Research Institute (IRRI)
- International Water Management Institute (IWMI)
- World Wide Fund for Nature (WWF)

National and regional institutions in the partnership include:

- PCARRD (Philippine Council for Agriculture, Forestry and Natural Resources Research and Development);
- DRRI (Directorate of Rice Research Institute) of ICAR (Indian Council of Agricultural Research);
- WARDA (Africa Rice Centre); and
- Latin American institution – yet to be defined.

These partners will call on civil society organizations and NGOs, with the whole exercise supported by a broader coalition of other international agencies, national/ governmental organizations, NGOs, civil society and professional entities, development practitioners and researchers.

THE CONCEPT

The objective

The initiative is intended to contribute to the following overall objective:

Increased water productivity in irrigated rice production contributing to the achievement of MDGs 1 and 7.

There will be a single component with five outputs, intended not to copy or replicate other initiatives but to build on, complement, facilitate or add value to them. These other initiatives include but are not limited to:

- the International Rice Commission (IRC) with its mandate to promote national and international action

with regard to the production, conservation, distribution and consumption of rice;
- the ground-breaking and timely work carried out under the multi-agency, Comprehensive Assessment of Water Management in Agriculture;
- FAO knowledge-based, pro-poor field work programmes;
- the Intergovernmental Group on Rice (IGGR);
- the International Network for Water and Ecosystem in Paddy Fields (INWEPF);
- the long-standing work of IRRI on the development of water-saving technologies in rice production;
- the work of IWMI, not least with regard to the adoption of basin level water management indicators;
- the work of ICID; and
- the work of IFPRI regarding the economic allocation of natural resources.

Furthermore, this initiative will be time-bound with a specific exit point under the following immediate objective:

Guidelines for environmentally responsible irrigated rice culture agreed and acknowledged in international development policy by mid-2010.

The approach

Before global guidelines can be offered to the international development community, a thorough evaluation and high-level peer-review is required. A high-level advisory panel is to be established, supported by a technical core group and operational secretariat, with the following mandate:

- Validate a comprehensive multiscale and multidisciplinary framework to assess the farm, system and basin level options and their linkages.
- Identify indicators suggested by the framework to facilitate assessment of options, potential benefits, related constraints and necessary accompanying measures and jointly monitor food security and the sustainable use of natural resources.
- Assess the validity and suitability or otherwise of the options in specific agroclimatic zones and socio-economic contexts, taking into account gender issues and the circumstances of vulnerable groups, with attention to quantitative issues, but not at the exclusion of qualitative issues wherever relevant.
- Identify the off-farm measures necessary to facilitate and encourage widespread adoption of on-farm options, and also measures required at other levels to ensure the adoption and effectiveness of system and basin-level options. In the latter case, attention must be paid to:
  - what investment proposals need to achieve in terms of water productivity in the broader basin level context;
  - the type of legal and policy frameworks needed to legitimize, regulate, monitor and realize the full potential of such investments;
  - the nature and purpose of service delivery and the differences accruing to scale at various levels within the catchment and basin; and
  - intersectoral coordination and capacity-building.
- Identify constraints to the adoption of the options and establishment of the enabling environment; suggest ways to remove them.
- Validate the most promising options and strategies in different contexts and subsequently build and expand consensus with respect to them.
- Craft global guidelines to be followed for investments and other interventions in irrigated rice production.
- Facilitate adoption of the guidelines by the international development community, especially funding institutions such as international development banks and bilateral donors.

This is expected to require five substantive steps:

1. Develop, with inputs from a broad-based consultation, and agree on an appropriate framework for the assessment of the on-farm, system- and basin-level options and the identification of associated off-farm measures necessary to facilitate the adoption of the on-farm options.
2. Agree on a set of appropriate indicators reflecting the assessment framework.
3. Collate, call for and review the baseline literature and field case studies relevant and applicable at farm, scheme and basin levels.
4. Commission technical studies, field assessments and targeted consultations necessary to fill any knowledge gaps and validate promising options; it is expected that these studies and consultations will be largely specified by the panel, but not exclusively

so, and other study proposals can emanate from or be channelled through the technical core group for the consideration and authorization of the panel.

5. Assess and validate recommended on-farm, scheme- and basin-level options and accompanying measures; prepare and disseminate a technical report presenting and justifying the panel's conclusions and recommendations.

Meanwhile, a draft technical manual and modular training material will be developed in close consultation with the panel and a strategy proposed for their adoption and dissemination. They will be targeted at practitioners and piloted in different institutional contexts and regions before being finalized on the basis on any feedback arising and under the supervision of the panel.

The outputs

Output 1 entails wide agreement among development practitioners, especially those working at international development policy level, with regard to:

- the environmental challenges and opportunities associated with irrigated rice;
- the on-farm, scheme and basin options available to reduce environmental costs or enhance environmental benefits in irrigated rice production;
- off-farm institutional, regulatory and incentivization measures – without which the on-farm options will have limited uptake and success or the scheme and basin options will have limited impact; and
- the pressing need to adopt both on- and off-farm measures sooner rather than later.

In oredr to achieve Output 1 the panel must consult with and involve a wide range of stakeholders through workshops, e-based fora and consultations, and expert meetings.

Output 2 comprises a detailed technical report describing the work, conclusions and recommendations of the advisory panel. Developed from the baseline literature survey, relevant case studies and follow-on technical studies, the report will be subject to widespread peer review and revision before final dissemination.

Output 3 comprises guidelines for the wise use of water in irrigated rice production. Although the actual format and contents are difficult to define before the panel completes its deliberations, it is expected that the guidelines will be based *inter alia* on an assessment of stakeholder perceptions; needs are likely to include assessment and project preparation checklists, methodologies, and status, monitoring and impact indicators.

Output 4 is a technical manual targeted at practitioners, similar in form to the FAO Irrigation and Drainage Papers; it is to describe the analytical techniques and procedures necessary to implement the guidelines, and sections are planned to cover all on- and off-farm measures from scheme to basin level.

Output 5 comprises an "off-the-shelf" training kit for students and development practitioners working in the irrigated rice sector. Although based very much on the technical manual, the training kit will be modular in form so that courses can be site-specific or technically focused according to the specializations of the students – agronomists, engineers, environment or institution specialists.

THE ADVISORY PANEL AND ITS SUPPORT

For maximum impact, the panel will:

- comprise highly respected members with distinguished track records and international reputations, including senior representatives of major international development finance agencies;
- include members with an interest in the food security potential of rice, rural development and the sustainable management of natural resources (as opposed to research) – i.e. members from rice-growing countries. Rice has limited trade potential and its expanded production is likely to be of more relevance to national food security than to international trade. There is also the additional advantage that rice-growing, food-insecure countries represent the demand side of the equation and their representatives may have a strategic advantage when it comes to converting the options and measures into standard development practice.

The strategy of the advisory panel will be consultative, inclusive and based on a series of meetings and consultations (open and specialist) at regular intervals and at critical milestones for the duration of the initiative. By definition, participants will not be involved in the minutiae of the operations, whether technical or administrative. The initiative will therefore be supported by:

- an operational secretariat, which FAO has offered in principle to host at its Regional Office for Asia and the Pacific in Bangkok; and
- a technical core group to undertake focused research, field assessments and consultations to inform and support the panel's deliberations.

Membership of the technical core group will be demand-driven and adaptive, comprising subject matter specialists assigned temporarily to tasks at the request of the advisory panel and for the purpose of providing the advisory panel with technical briefings.

For the purposes of consistency and convenient peer review, the core group will in the initial stages be based on a roster of known and respected experts, including those involved to date. As a reflection of the inclusive paradigm of the advisory panel, work carried out by members of the core group will, as far as possible, pay due regard to the work of other experts and institutions with whom linkages will be established wherever meaningful. Annual expert meetings are proposed to share the ongoing work of the initiative with a broader constituency and so that the core group may benefit from external advice and experience.

Finally, some sort of management structure will be required. Its form and modus operandi will be developed at a later stage in order to reflect the specific monitoring and general oversight conditions of the initiative's eventual donors and sponsors (yet to be identified).

CONCLUSION

The initiative is an excellent opportunity for conservation, development and research communities to make a joint contribution towards achieving three Millennium Development Goals. The results will be relevant to the search for environmentally responsible, socially equitable food security, and highly significant given the new areas of cooperation to be explored and exploited.

Initiative globale WWF-FAO-IRRI pour l'amélioration de la sécurité alimentaire, l'accroissement des moyens d'existence et la réduction des conflits liés à l'eau en riziculture irriguée – note conceptuelle

Le riz est une des cultures alimentaires de base les plus importantes dans le monde, mais c'est la seule à être produite essentiellement sous irrigation. Il en résulte que les besoins en eau de la production mondiale de paddy sont cinq fois supérieurs à ceux, combinés, des deux autres céréales de base. Les études confirment que l'instauration d'une sécurité alimentaire réelle à l'échelle mondiale devra probablement faire appel à une extension substantielle de la superficie dévolue à la riziculture irriguée. L'eau douce est soumise à une pression de prélèvement croissante et il est essentiel de réduire au maximum les impacts négatifs, sur les écosystèmes de l'eau douce, des modes de production tant actuels que futurs. Des approches prometteuses sont en cours d'identification au niveau de l'exploitation agricole, mais ces approches tendent à dépendre de l'existence complémentaire de mesures en dehors de l'exploitation, telles que l'offre de services spécifiques, des réglementations incitatrices et des définitions novatrices de l'efficience en matière d'utilisation de l'eau. De plus, tant les mesures à l'échelle de l'exploitation que les mesures hors de son champ doivent être validées et standardisées en termes de pratiques internationales du développement. L'initiative de partenariat décrite ci-après est conçue dans ce but précis. Elle propose de mettre en place, pour une durée de trois ans, un Groupe de travail consultatif international de très haut niveau, disposant du soutien d'un groupe technique central et d'un secrétariat permanent. Il passera commande des études et analyses nécessaires pour les validations évoquées ci-dessus, et en fera l'évaluation. Outre les rapports techniques destinés aux décideurs en matière de politiques de développement, le groupe de travail produira des directives et du matériel de formation faisant l'objet d'une large distribution à l'intention des praticiens du développement.

La iniciativa mundial del WWF, la FAO y el IRRI para mejorar la seguridad alimentaria, mejorar los medios de vida y reducir los conflictos por el agua en la producción de arroz de regadío – nota de exposición de conceptos

El arroz es uno de los principales cultivos de alimentos básicos del mundo, pero es el único que se produce principalmente mediante regadío. La consecuencia es que los requerimientos de agua de los arrozales del mundo son cinco veces mayores que los de los otros dos cereales sumados. Los estudios confirman que en el futuro, para la seguridad alimentaria mundial se requerirá probablemente un aumento considerable de la superficie mundial de arrozales de regadío. En vista de la presión creciente sobre el agua dulce, es indispensable que tanto en los sistemas nuevos como en los viejos se reduzcan al mínimo las repercusiones negativas en los servicios de suministro de agua dulce del ecosistema. Se están identificando métodos prometedores que podrían aplicarse en las fincas, pero éstos suelen depender de la aplicación de medidas complementarias no agrícolas que incluyen la prestación de servicios, incentivos reglamentarios y una definición innovadora del uso eficiente del agua. Además, tanto las medidas que se adoptan en las fincas como las que han de aplicarse fuera de ellas deben validarse e incorporarse a la práctica internacional en materia de desarrollo. La iniciativa de asociación aquí descrita tiene justamente esa finalidad: propone el establecimiento de un Panel consultivo internacional para un período de tres años, con el apoyo de un grupo técnico básico y una secretaría. El Panel encargará y examinará los estudios y análisis necesarios para los fines de la validación. Los productos que han de obtenerse incluyen no sólo un informe técnico destinado a los responsables de la elaboración de políticas, sino también directrices y material de capacitación a los que se dará una distribución más amplia entre los profesionales del desarrollo.

Bringing hope, improving lives Raising productivity in rainfed environments: attacking the roots of poverty

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INTRODUCTION

Most of the regions with extensive poverty in Asia are dominated by rainfed ecologies where rice is the principal source of staple food, employment and income for the rural population. Success has been limited in increasing productivity in rainfed rice systems.

Rice yields in these ecosystems – home to 80 million farmers who farm a total of 60 million ha – are low (1.0–2.5 tonnes/ha) and tend to be variable because of the erratic monsoons. Soil moisture is too high in the wet season and too low in the dry season, which limits opportunities for crop diversification. Given the low productivity in food production and limited employment opportunities elsewhere, the poor lack the capacity to purchase food, even at low prices. People in rainfed areas often belong to ethnic minorities and their plight may therefore be compounded by social and political marginalization.

Rainfed systems are hindered by drought, submergence, problem soils and other abiotic stresses. Over the last three decades, potential solutions to many of these problems have been discovered in cultivated and wild rice germplasm, making genetic enhancement a viable strategy for improving the livelihood of the rural poor. Following the scientific advances made in recent years, researchers have identified promising genetic materials and clear breeding strategies for the development of varieties with several important traits that were difficult to address using conventional methods. There are good prospects for breeding into high-yielding rice varieties several important traits, such as tolerance to drought, submergence, phosphorus deficiency and saline soils.

IRRI is able to bring together the research of advanced research institutes (AdRIs) and the private sector in industrialized countries with research by National Agricultural Research and Extension Systems (NARES) in developing countries. The efficiency of breeding activities is enhanced through allele mining and gene discovery using functional genomics. Given the level of poverty, the small size of farms, insecure tenure and the risks involved in rainfed rice farming, farmers are unwilling to invest in improved rice production and resource management techniques, and they instead continue to adopt inappropriate farm practices that degrade natural resources. Soil conditions and the method of crop establishment affect nutrient availability and management, weed competition, soil water extraction and the rice plant's adaptive strategies for successful performance.

Water stress is the main limitation to rice productivity and yield stability in rainfed systems. The development and transfer of improved farm level resource management strategies require: a deeper understanding of the interaction of soil, water and pests; the integration of knowledge into the development of improved crop management options; and the evaluation and refinement of options with farmer participatory research. The risk involved in rice cultivation can be reduced by: enhanced seedling vigour; improved crop establishment methods to avoid drought and submergence; better tolerance of sodium, iron and aluminium toxicity and phosphorus and zinc deficiency; and resistance to biotic stresses, in particular blast. Women – the principal rice farmers in poverty stricken areas – must be involved in farmer participatory research for screening improved varieties and validating improved crop management options if the technologies are to be widely adopted.

THE RAINFED PROGRAMME

In rainfed areas, there is limited scope for increasing income through rice cultivation alone due to:

- the small farm size in rice-based systems; and
- the policy of maintaining rice prices at an affordable level.

By increasing rice productivity, area becomes available for the production of non-rice crops and for other farm enterprises.

Additional employment for landless households can result from diversification: products that are perishable and more commercial than rice generate employment in processing, storage and marketing activities. The adoption of shorter-duration rice varieties, improved crop and resource management options, changes in timing of crop establishment etc. can facilitate intensification and diversification of low productivity rice-based systems to optimize system productivity and improve the livelihoods of marginal and small farmers.

The rainfed programme aims to:

- develop superior germplasm and improved crop and natural resource management practices that facilitate the intensification and diversification of rainfed systems; and
- find innovative and effective ways to communicate these practices so as to facilitate adoption by resource-poor farmers.

IRRI, in partnership with NARES and AdRIs in industrialized countries, will integrate upstream research in genomics, genetics and physiology with applied and adaptive research on crop improvement and management to develop elite germplasm and best management options that would substantially increase and stabilize yield under stress conditions compared to currently grown varieties; this germplasm will be shared with NARES partners through the International Network for Genetic Evaluation of Rice (INGER).

IRRI will also facilitate and use the Consortium for Unfavorable Rice Environments (CURE, established in 2002) to understand the site specificity of problems, validate and adapt new technologies with farmer participatory research involving men and women, and fast-track the diffusion of knowledge-intensive technologies by facilitating linkages among research, extension and development. While raising productivity in rainfed systems, IRRI and its partners will ensure that the quantity and quality of natural resources – soil, water and biotic resources – are maintained so that the capacity of future generations to satisfy their food requirements is not compromised.

IMPACT PATHWAYS

The intermediate outputs of the programme are:

- standard phenotyping capacity for crop improvement research on drought and submergence tolerance;
- the genetic basis of traits (QTLs – quantitative trait loci) from genotypes tolerant of abiotic stresses;
- markers for introgressing the traits into widely grown improved varieties; and
- improved knowledge of the physiology of stress tolerance.

Breeders in NARES will use these outputs to develop improved varieties. Elite lines with high yields, resistance to key pests, superior grain quality, and tolerance of abiotic stresses developed under NARES-IRRI breeding networks and shuttle breeding programmes will be shared among NARES through INGER to evaluate their suitability under specific agroecological conditions.

NARES will use the knowledge and elite lines in their crop improvement programmes and will eventually release superior germplasm as varieties to farmers through national extension systems. IRRI and NARES – via the CURE platform – will validate and adapt new technologies and improved crop and resource management practices to optimize the yield of improved varieties and fast track technology dissemination; farmer participatory experiments will be community-based, recognizing the central role of women. Geographic information systems (GIS) and systems modelling will be used to map areas suitable for extension of the improved technologies. Impact assessment activities will be undertaken to assess constraints to the adoption of technologies by the intended users, as well as the economic, social and environmental impact of the diffusion of technologies.

RESEARCH APPROACH TO DEVELOP INTERNATIONAL PUBLIC GOODS

In most cases, research activities will focus on a specific problem affecting several countries. Applied and adaptive research will be conducted at key sites representing specific subecosystems for several countries and working groups will be organized for collaborative research between IRRI and participating NARES. Annual review and planning meetings will be held to plan research activities, review work progress and share research outputs. Research on a single country will be undertaken only if the product or knowledge has generic value that can benefit several countries facing the same problem.

ELABORATION OF PARTNERS' ROLES

Programme 1 has a wide range of partners in NARES, universities and AdRIs, in addition to other CGIAR (Consultative Group on International Agricultural Research) centres and challenge programmes. The main vehicle for research partnership under this programme is CURE – a NARES-constituted network established in mid-2002 to tackle high priority problems facing resource-poor farmers in monsoon Asia. CURE is governed by a steering committee, composed of key NARES representatives from seven countries and the IRRI deputy director general for research. The steering committee provides overall guidance to the research agenda of the consortium; approves funding proposals, budgetary allocations and work plans; and facilitates all research activities and dissemination of research outputs within participating countries.

The consortium coordinating unit, which serves as the secretariat of CURE, facilitates the initiation and establishment of the working groups – interdisciplinary teams of researchers from NARES and IRRI which may also include other international agricultural research centres (IARCs), AdRIs, and NGOs. In consultation with the steering committee, the consortium coordinating unit coordinates fundraising, provides administrative support and facilitates communication among the working groups, which hold at least one review and planning workshop each year. A progress report is presented at the annual CURE steering committee meeting when the following year's work plans are put on the table for approval. The participatory mode in which the working groups operate ensures that NARES and other in-country partners have ownership of all project outcomes as well as the ability to deploy them beyond the project period.

PROGRAMME OUTPUTS

The rainfed programme comprises the following five outputs:

1. Superior drought-tolerant and aerobic rice germplasm and management options developed for water-short rainfed environments by 2012

Almost half of the 60 million ha of rainfed lowlands and plateau uplands in Asia are drought-prone or have a short monsoon season. Variation in rice production is closely related to total annual rainfall, but even when total rainfall is adequate, shortages in critical periods markedly reduce productivity. The inherent risk in rice cultivation in the drought-prone ecosystem reduces productivity even in favourable years, because farmers avoid using optimal quantities of inputs when they fear crop loss. Risk-reducing technologies can therefore encourage higher investment in inputs and adoption of high-yielding varieties, thereby increasing productivity and reducing poverty.

Research at IRRI and AdRIs has shown that conventional breeding for reproductive stage tolerance is complicated by the strong relationship between plant phenology and sensitivity to stress. The difficulty of selecting for improved yield under drought stress has led to efforts in recent years to identify alleles for QTLs affecting drought response, and to introgress them into popular high-yielding varieties through marker-assisted backcrossing. QTLs with enough effect on grain yield to be useful in marker-assisted breeding are yet to be identified.

2. Superior germplasm and management options to overcome submergence stress developed by 2012

More than 40 million ha of ricelands (including land using supplementary irrigation during the rainy season) in South and Southeast Asia are affected annually by flash flooding from heavy rains and runoff from higher elevations, causing temporary submergence of rice plants. Complete submergence for 10 days or more can occur at any time during the growing season, resulting in re-planting of seedlings, or partial to total crop failure. Previous research has succeeded in fine-mapping a major gene (Sub1) which accounts for most of the variation in tolerance of submergence in rice varieties. A marker linked to this gene can facilitate its transfer into new or existing high-yielding varieties that are locally adapted and possess the quality aspects preferred by local consumers. Sources of tolerance of submergence during germination have also been identified and this trait needs to be transferred into high-yielding varieties.

Combining superior germplasm with suitable management strategies (e.g. nursery, seedling and nutrient management) can substantially reduce losses from submergence. Agronomic and physiological studies will be conducted on existing varieties and improved lines to assess the effect of the Sub1 gene on yield, grain quality, seedling vigour and other agronomic traits. New and existing management options – including nursery and nutrient management options to produce robust seedlings and enhance plant recovery after submergence – will be developed and validated in farmers' fields. Studies on farmers' indigenous knowledge and practices, and criteria for the selection of technologies, will be conducted to understand the constraints to technology uptake and devise policy options for fast-tracking technology diffusion.

3. Superior germplasm with tolerance of salinity and other soil problems, together with suitable management options, developed by 2012

In South and Southeast Asia, problem soils (excess salt, nutrient deficiencies and toxicities) limit rice productivity on more than 30 million ha. A major problem in coastal areas of India, Bangladesh, Viet Nam and Indonesia is salinity from salt intrusion that renders the soil unproductive or unsuitable for rice farming. Inland, salinity and alkalinity from groundwater irrigation have been expanding in northwestern India, Pakistan and central Myanmar. Salinity is also associated with abiotic stresses such as phosphorus and zinc deficiency and iron deficiency and toxicity.

Most rice soils are characterized by high P and Zn fixing ability and currently about 50 percent of ricelands are P deficient. In these areas, rice yields are low because suitable tolerant high-yielding rice varieties are not available. In coastal areas, farmers often grow only one crop: during the monsoon season when freshwater is available and rainfall helps flush salinity from the soil. Poverty is extensive because of the land's poor productivity; in some areas, in an attempt to improve livelihoods, farmers have resorted to traditional shrimp farming using brackish water with negative consequences for the environment.

There is considerable potential for increasing rice productivity in salt-affected and other problem soil areas and physiological and biochemical studies have highlighted a few useful traits underlying tolerance of these stresses in rice. Two major QTLs, one for seedling stage salt tolerance (Saltol) and one for P deficiency tolerance (Pup1), together with some other QTLs, are being tagged for marker-assisted breeding. Candidate genes are being identified which could help combine superior alleles for tolerance of salt and other abiotic stresses associated with problem soils. Nursery and nutrient management options together with proper handling of seedlings during transplanting could reduce seedling mortality and improve crop stand. Various soil reclamation methods and water management techniques could be effective in mitigating the harmful effects of excess salts and nutritional problems during the most sensitive stages of plant growth. Further research to build on past achievements could contribute to higher levels of tolerance in high-yielding varieties beyond the levels observed in any of the tolerant but low-yielding landraces currently grown in affected areas. The new varieties could bring additional land and water resources into use for rice cultivation.

4. Superior germplasm and improved management options for uplands developed by 2012

Upland rice-based systems in Asia are estimated to cover around 15 million ha, including both the area sown and land used as a part of the rice-based rotation. Sloping and plateau uplands account for a substantial rice area in the Lao People's Democratic Republic, Viet Nam, Myanmar, northeastern and eastern India, and Nepal. Much of the Asian upland is characterized by high incidence of poverty, poor physical access to markets, ill functioning markets and subsistence-oriented agriculture with low productivity. Many households belong to minority ethnic and tribal groups that are economically and socially marginalized and are the poorest of the poor. Rising population pressure and the consequent intensification of marginal areas for food production have contributed to environmental degradation and a further reduction in agricultural productivity.

IRRI's approach to upland research has undergone a major paradigm shift in recent years: the focus has changed from "upland rice" to "rice in the uplands." The new approach calls for intensification of favourable pockets in uplands for food production, in order to reduce pressure to intensify food production in less favourable and more fragile areas. It involves integrated land, water and forest management at landscape level for uplands. The major biophysical constraints to productivity growth of rice in uplands are low soil fertility, soil erosion in sloping areas, severe weed infestation, rodents, blast fungus, nematodes and root aphids. Over the past decade, important scientific progress has been made in addressing this seemingly intractable set of constraints, thus substantially improving the likelihood of reducing poverty and protecting the environment. These scientific gains need to be further consolidated and translated into specific technologies suited to major production systems in the uplands.

5. Resource management options and strategies for intensification and diversification of rainfed systems developed by 2012

For areas with short and erratic monsoons, such as the plateau uplands in eastern India and Bangladesh, system productivity and farmers' livelihoods could be improved through the development and deployment of shorter maturity rice varieties so that residual moisture could be used for growing pulses, oilseeds and vegetables in the seasonally fallow land after rice. In coastal areas with brackish water, the expansion of highly profitable shrimp farming has affected the long-term sustainability of the resource base, creating social tension between resource-rich and resource-poor households. Opportunities exist for developing a more harmonious and sustainable rice aquaculture system that would optimize the productivity of fresh and brackish waters in coastal areas.

There is also a need to develop sustainability indicators to monitor ecosystem health and thereby minimize the adverse environmental effects that may be associated with rice intensification. IRRI will work with NARES and other CGIAR centres at the systems level to match shorter-duration rice varieties with suitable varieties of non-rice crops and aquaculture species, and to develop optimal resource management practices for improving system productivity and farmers' livelihoods while sustaining the natural resource base for future generations.

Susciter l'espoir, améliorer les conditions de vie – augmenter la productivité dans les environnements pluviaux: s'attaquer à la pauvreté à sa source

En Asie, la plupart des régions où la pauvreté est généralisée sont dominées par des écosystèmes pluviaux. Les rendements du riz dans ces écosystèmes – où l'on compte environ 80 millions d'agriculteurs – restent faibles à 1,0-2,5 tonnes/ha, et les pauvres vivant dans ces écosystèmes n'ont pas les moyens d'acheter des denrées alimentaires. L'Institut international de recherche sur le riz (IRRI) met actuellement en oeuvre un nouveau programme « Augmenter la productivité dans les environnements pluviaux: s'attaquer à la pauvreté à sa source », dans le but de stimuler la productivité de ces environnements et, ce faisant, augmenter les revenus des riziculteurs. L'initiative est fondée sur le Consortium de recherche sur la riziculture en environnement défavorable, créé en 2002. Il travaille en collaboration avec les instituts de recherche de pointe et le secteur privé dans les pays industrialisés et avec les systèmes nationaux de recherche et de vulgarisation agricoles dans les pays en développement.

L'on s'attend à ce que les options ci-après soient mises au point d'ici à 2012:

1. Options en matière de matériel génétique supérieur de riz (variétés aérobies résistantes à la sécheresse) et de gestion pour les environnements pluviaux manquant d'eau.
2. Options en matière de matériel génétique supérieur et de gestion visant à vaincre le stress dû à la submersion.
3. Options concernant le matériel génétique supérieur tolérant la salinité et d'autres problèmes du sol, ainsi que des options de gestion appropriées.
4. Options en matière de matériel génétique supérieur et de gestion améliorée pour les hautes terres.
5. Options et stratégies concernant la gestion des ressources pour l'intensification et la diversification des systèmes pluviaux.

Nuevas esperanzas y una vida mejor – aumento de la productividad en zonas de secano para combatir las causas de la pobreza

En la mayoría de las regiones de Asia con situaciones extendidas de pobreza predominan las ecologías de secano. En estos ecosistemas, en los que residen 80 millones de agricultores, el rendimiento del arroz es escaso – de 1,0 a 2,5 toneladas por hectárea – y la población pobre carece de capacidad para comprar alimentos. El Instituto Internacional de Investigación sobre el Arroz (IRRI) está ejecutando un nuevo programa de aumento de la productividad en zonas de secano para combatir las causas de la pobreza, con el propósito de fomentar la productividad en entornos de secano para incrementar así los ingresos de los agricultores. La iniciativa, que se basa en el Consorcio para los entornos arroceros desfavorables (CURE) establecido por el IRRI en 2002, comporta la colaboración con investigaciones de instituciones de investigación avanzada y del sector privado en países industrializados, así como de los sistemas nacionales de investigación y extensión agrícolas de países en desarrollo.

Los productos que se espera obtener de la iniciativa para 2012 consisten en la elaboración de las siguientes opciones técnicas:

1. Germoplasma superior de arroz aeróbico y resistente a la sequía y opciones para la gestión de entornos de secano con escasa disponibilidad de agua.
2. Germoplasma superior y opciones de gestión para superar la tensión debida a la sumersión.
3. Germoplasma superior con tolerancia a la salinidad y otros problemas del suelo, junto con opciones de gestión idóneas.
4. Germoplasma superior y opciones mejoradas de gestión para las tierras altas.
5. Opciones para la gestión de los recursos y estrategias de intensificación y diversificación de los sistemas de secano.

The African Rice Initiative: history and achievements[1]

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INTRODUCTION

Rice is the world's leading food crop and one of the major staples for millions of people in sub-Saharan Africa (SSA). It is the most rapidly growing food source in Africa and is of significant importance for food security in an increasing number of low-income food-deficit African countries. The annual demand for rice in sub-Saharan Africa is increasing at an unprecedented rate of 6 percent per annum, fuelled to a certain extent by rapid population growth, increasing urbanization and associated lifestyle changes, and by the relative ease of preserving and cooking rice (Nwanze *et al.*, 2006).

Rice consumption in eastern, western, central and southern Africa outweighs production by far. In order to meet demand, over US$ 1.5 billion in foreign exchange is spent annually on rice imports, placing increasingly heavy demand on the scarce foreign currency reserves of the region's countries, which are among the most impoverished in the world (Nwanze *et al.*, 2006). Urgent attention is required to reverse this trend if SSA is to achieve the United Nations Millennium Development Goal of reducing extreme poverty and hunger by half by 2015.

Approximately 20 million farmers are engaged in the rice sector in SSA and about 100 million people depend on it for their livelihoods (Nwanze *et al.*, 2006). However, the sector is plagued by a number of constraints, including:

- biophysical constraints (e.g. poor soil fertility; drought and poor rainfall in upland rice; iron toxicity in lowland rice; salinity problems in irrigated rice);
- insufficient use of appropriate technologies (e.g. improved rice germplasm in uplands and lowland/irrigated fields; harvesting and post-harvest processing technologies; fertilizers and other inputs);
- poorly developed lowlands and poor field-level water management practices in lowland/irrigated rice; and
- inappropriate policies, organizational and institutional factors (e.g. limited capacity of the national agricultural research and extension institution; poor infrastructure and market development; absence of national seed policies; and limited working resources and competing activities).

DEVELOPMENT OF NERICA VARIETIES

To tackle these constraints, the Africa Rice Center (WARDA) created a new plant type: high-yielding and resistant to local stresses, designed specifically for smallholder farming conditions in SSA. WARDA scientists initially focused attention on the upland (dryland) ecology, as it represents about 40 percent of the total area under rice cultivation in West Africa and employs about 70 percent of the region's rice farmers, many of whom are women (Nwanze *et al.*, 2006). The most widely grown rice species, *Oryza sativa*, is originally from Asia and was introduced into Africa only 450 years ago. Another, less well-known rice species, *O. glaberrima* (Steud), is originally from Africa and was domesticated in the Niger River Delta over 3 500 years ago (Viguier, 1939; Carpenter, 1978). The Asian species (*O. sativa*) is known for good yield, absence of lodging and grain shattering, and high fertilizer returns. The African rice species (*O. glaberrima*) often has good weed competitiveness and exhibits resilience against some major African biotic and abiotic stresses (Koffi, 1980; Jones *et al.*, 1997).

[1] The authors thank all WARDA scientists, research assistants and technicians for their availability and the quality of data provided. Gratitude is expressed to all donors, especially the Rockefeller Foundation for its support to the Coordination Unit since the inception of ARI, the African Development Bank for funding the Multinational NERICA Dissemination project, and the Japanese Government, JICA and UNDP for their invaluable support to WARDA and ARI.

In 1992, WARDA and its partners launched the Interspecific Hybridization Project (IHP) in an attempt to combine the useful traits of both cultivated rice species (*O. sativa* and *O. glaberrima*). The result was the first interspecific rice progenies from cultivated varieties (Jones *et al.*, 1997). With the support of donors from Japan and the United States and in collaboration with numerous partners in the IHP, WARDA developed interspecific lines with desirable traits tailored to African conditions. In 1999, the interspecific lines were named New Rice for Africa: NERICA (WARDA, 1999) and this name was trademarked by WARDA in 2004. In 2000, WARDA received the prestigious CGIAR King Baudouin Award for its achievements with NERICAs (WARDA, 2000). This award was later followed by the World Food Prize, awarded to Dr Monty Jones in 2004 in recognition of his leading role in the development of upland NERICA lines, and by the Fukui International Koshihakari Rice Prize of Japan, awarded to Dr Moussa Sié in 2006 for his work on lowland NERICAs.

NERICA represents one of the most important advances in the field of rice varietal improvement in recent decades (Nguyen and Ferrero, 2006). It constitutes a wide range of interspecific varieties with different characteristics: high-yielding; early-maturing (80–100 days); resistant and tolerant to Africa's major pests and diseases; tolerant to drought and to iron toxicity.

ABOUT THE AFRICAN RICE INITIATIVE

Guinea was one of the first countries where NERICA was tested. Following the success of the tests, WARDA and partners joined forces to create a mechanism to scale up the dissemination of the technology throughout SSA. This culminated in the launch of the African Rice Initiative (ARI) in March 2002.

The main goal of ARI is the promotion and dissemination of NERICAs and other new improved rice varieties and related technologies in sub-Saharan Africa, where they can make a significant contribution to poverty reduction and food security.

ARI is a non-core programme of WARDA. It is governed by a steering committee comprising: a representative from each pilot country and from non-pilot countries, two WARDA representatives, Sassakawa Global 2000 (SG2000), UNDP (United Nations Development Programme – representing the donor community), a representative from FARA (Forum for Agricultural Research in Africa) and from farmers' organizations, as well as the ARI secretariat coordinator. FAO (Food and Agricultural Organization of the United Nations), the Rockefeller Foundation, the African Development Bank (ADB) and other interested donors are accepted as observers.

ARI currently receives support from ADB (funding a multinational NERICA dissemination project in seven countries), the Japanese Government, JICA (Japanese International Cooperation Agency), the Rockefeller Foundation, UNDP and CIDA (Canadian International Development Agency).

It also benefits from strong partnerships established with FAO, SG2000 and subregional organizations such as FARA and CORAF.

ACHIEVEMENTS

Establishment of stakeholders' platforms

The first activity was the establishment of a stakeholders' platform in each pilot country to serve as discussion and planning fora for all related rice sector issues in each country.

Introduction of new materials to farmers

While farmers cultivate previously released varieties, over 100 examples of new material have been introduced through a PVS (participatory varietal selection) approach during a 4-year period, and many new promising varieties have been identified by farmers: NERICAs 8, 9, 10 and 11 are the most popular; they are extra early and have good grain quality.

Varietal characterization and maintenance

To facilitate adoption and increase utilization, all named or newly introduced varieties are characterized and results are made available to the public (Table 1). Seed purity and homogeneity are also addressed regularly in order to ensure the good quality of the seed produced and distributed to end-users.

Seed production and distribution

Seed availability is a key constraint to NERICA dissemination. Demand is very high and increases every season – Nigeria alone has projected a requirement of more than 30 000 tonnes of NERICA 1 for 2007.

ARI therefore produces foundation seed in addition to breeder seed. This is necessary because the seed system has collapsed in most SSA countries and private seed companies are reluctant to invest in rice seed businesses.

TABLE 1
Main characteristics of NERICA 1–18

Variety	Plant height (*cm*)	Tillering ability	Days to maturity (*days*)	Potential yield (*kg*)	Resistance to leaf blast	Resistance to insects	Resistance to lodging
NERICA 1	100	Good	95–100	4 500	Medium	Good	Good
NERICA 2	100	Good	90–95	4 000	Resistant	Good	Good
NERICA 3	110	Good	95–100	4 500	Medium	Good	Good
NERICA 4	120	Good	95–100	5 000	Medium	Good	Good
NERICA 6	130	Good	95–100	5 000	Resistant	Good	Good
NERICA 7	130	Good	95–100	5 000	Medium	Good	Good
NERICA 8	100	Good	75–85	5 000	Good	Good	Moderate
NERICA 9	105	Good	75–85	5 000	Good	Good	Moderate
NERICA 10	110	Good	90–100	6 000	Good	Good	Moderate
NERICA 11	105	Good	75–85	7 000	Good	Good	Moderate
NERICA 12	115	Good	90–100	5 500	Good	Good	Moderate
NERICA 13	120	Good	90–100	6 000	Good	Good	Moderate
NERICA 14	110	Good	75–85	5 000	Good	Good	Moderate
NERICA 15	130	Good	90–100	5 000	Good	Good	Moderate
NERICA 16	130	Good	90–100	6 000	Good	Good	Moderate
NERICA 17	115	Good	90–100	6 500	Good	Good	Moderate
NERICA 18	130	Good	90–100	5 000	Good	Good	Moderate

Between 2003 and 2006, the coordination unit produced over 80 tonnes of foundation seed of released NERICAs – 60 tonnes in 2006 alone (Figure 1) – for distribution to NARS (National Agricultural Research Systems). The foundation seed received from the coordination unit was used to produce over 3 000 tonnes of good quality registered seed for distribution in seven pilot countries.

ARI coordination has also dispatched seed to many non-pilot countries, including post-conflict countries such as Liberia and Sierra Leone, where over 3 tonnes of NERICA seed were dispatched in 2006, thanks also to the logistic support of FAO and the United Nations Mission in Liberia (UNMIL).

Status of NERICA dissemination

With the support of FAO, JICA, SG2000, WARDA, NARS, UNDP and the Rockefeller Foundation, NERICA has been tested in nearly all SSA countries. As a result, 18 upland and 60 lowland NERICAs have been named, of which 18 upland and 11 lowland NERICAs have been released (in 20 countries) or adopted (in 7 countries) (Tables 2 and 3).

They are currently cultivated on over 150 000 ha, with the largest areas in Guinea, Nigeria, Côte d'Ivoire and Uganda.

Development of complementary technologies

To increase the productivity of the NERICAs, complementary technologies (e.g. fertilizer rate and timing, crop density, weeding regime, sowing depth and harvest timing) are under evaluation: results will be published in appropriate journals.

Diversification of the use of rice as food

While dissemination is the primary activity, ARI has also focused on the diversification of the use of rice as food, developing a range of NERICA-based processed products, such as cookies, biscuits, pancakes, cakes and wafers (Photo 1). The quality of the products indicates that rice flour is a perfectly valid replacement for wheat flour in many types of baking and confectionery. Furthermore, introduction of the new technologies to rural communities will create added value for rice and empower women in SSA countries.

PHOTO 1
NERICA-based products

FIGURE 1
Trends in seed distribution (tonnes)

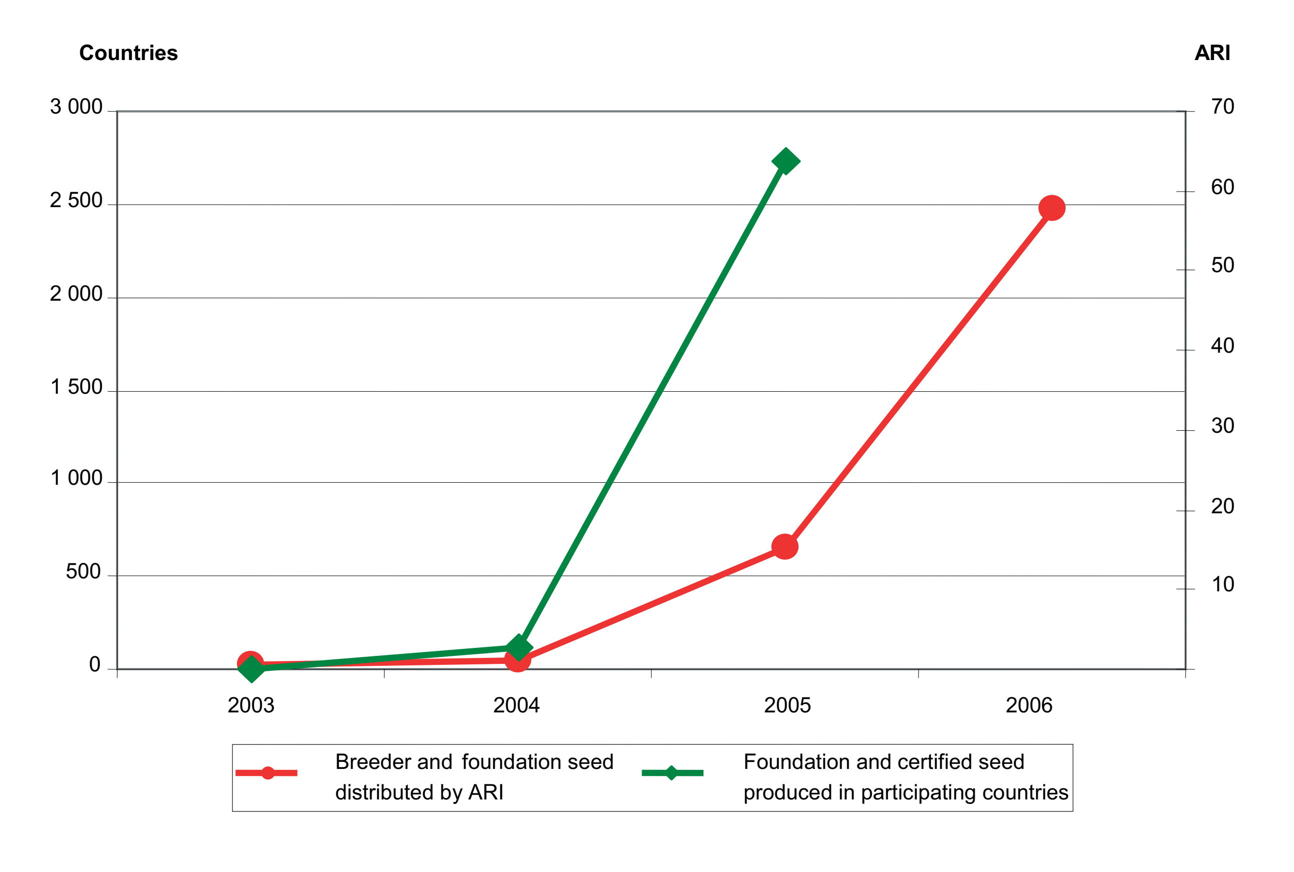

TABLE 2
Upland NERICA varieties adopted/released[a] in selected sub-Saharan African countries

Country	NERICA																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	**Total**
Benin	A	A		A															**3**
Burkina Faso												R	R		A		R	A	**5**
Congo										A									**1**
Democratic Republic of the Congo				A		A	A												**3**
Côte d'Ivoire	R	R	A	A	A														**5**
Ethiopia	A	A	R	R															**4**
Gambia	A	A	A	A	A	A	A												**7**
Ghana	R	A																	**1**
Guinea	R	R	R	R	R	R	R												**7**
Kenya	A			A						A	A								**4**
Madagascar			A	A															**2**
Mali				R				A	A					A				A	**5**
Nigeria	R	R	A																**5**
Sierra Leone	A	A	A	A	A	A													**6**
Sudan				A			A												**2**
Togo	A		A	A															**4**
Uganda	A		A	R															**3**
Total	**11**	**8**	**9**	**13**	**4**	**4**	**4**	**1**	**1**	**2**	**1**	**1**	**1**	**2**	**1**	**0**	**1**	**2**	

[a] A: adopted, R: released.

TABLE 3
Lowland NERICA varieties adopted/released[a] in selected sub-Saharan African countries

Country	NERICA-L								WAS 161-B-9-2	WAS 122-IDSA-15-WAS-6-1	WAS 127-B-5-2	Total
	19	20	34	39	41	42	49	60				
Burkina Faso	R	R			R			R				**4**
Cameroon	A											**1**
Gambia									R	R	R	**3**
Mali	R					R						**2**
Niger				R			R					**2**
Sierra Leone	A	A										**2**
Togo	A		A									**2**
Total	**5**	**2**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	

[a] A: adopted, R: released.

Capacity building

To enhance the capacity of NARES in seed production, training has been provided for 30 seed technicians from pilot and non-pilot countries; they have in turn contributed to the training of numerous colleagues and over 400 farmers. Over 20 monitoring and evaluation specialists have also been trained and they are currently assessing project progress, in particular in the pilot countries.

In collaboration with WARDA and JICA, ARI has conducted four international workshops where NERICAs were discussed. More than 200 participants from several SSA countries attended the workshops.

Partnership

NERICA dissemination is a complex task requiring collaboration. A strong partnership has therefore been developed with the private sector, seed companies, farmers and NGOs, who are invited to field days and monitoring tours. Over 6 000 farmers and other end-users attended field days in the seven pilot countries during the 2005 and 2006 cropping seasons. Banks and businessmen have thus been sensitized to contribute to seed production and PVS, for example:

- The Regional Bank of Solidarity (BRS) has supplied over US$ 80 000 credit to farmers' organizations for seed production in Benin (Photo 2).
- Tundé Motors, a car dealer, is funding seed production and PVS in several districts of Benin (Photo 3).
- On 10 March 2007, Société BSS-SIPRI SARL launched an ambitious NERICA project in Benin in collaboration with the SATAKE Corporation, with the aim of producing and commercializing NERICA rice in Benin and neighbouring countries.

PHOTO 2
Field visit by the Representatives of BRS-Benin

PHOTO 3
Tundé SA Chairman presenting his vision on rice development in Benin

- Songhaï (NGO based in Benin) has signed an MOU (Memorandum of Understanding) with WARDA and it plans to produce and commercialize NERICA products in Benin and neighbouring countries.

OUTLOOK

Making seeds available to farmers is the main target for the coming years. While continuing to produce breeder and foundation seed at WARDA and in collaboration with NARS, partners among NGOs, farmers' organizations and individual seed growers will be identified and encouraged to produce certified seed. NERICA is popular among farmers and can have a strong impact on livelihoods. Detailed characterization of NERICA varieties is therefore required to support farmers' decision-making. Agronomic and post-harvest technology packages should be developed or released in order to enhance performance and quality. Prerequisites for enabling technologies such as NERICA to raise food security in the region include farmers having improved access to seed and information, as well as favourable policies supporting the development of the agricultural sector. Finally, lowland NERICAs have shown high-yielding ability and efforts are being made to extend them more to farmers.

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Initiative africaine sur le riz: historique et réalisations

Le riz est la culture vivrière la plus importante du monde et l'un des principaux aliments de base pour des millions de personnes en Afrique subsaharienne. Il s'agit de la source d'alimentation qui se développe le plus rapidement en Afrique et revêt une importance considérable pour la sécurité alimentaire dans un nombre croissant de pays africains à faible revenu et à déficit vivrier. La demande annuelle de riz en Afrique subsaharienne augmente à un rythme sans précédent de 6 pour cent par an, stimulée jusqu'à un certain point par la croissance démographique rapide, l'intensification de l'urbanisation, les changements qui s'ensuivent dans les styles de vie et la facilité relative de la conservation et de la cuisson de cet aliment (Nwanze *et al.*, 2006).

Plus de 1,5 milliard de dollars EU en devises sont dépensés chaque année pour les importations de riz dans le but de satisfaire la demande en Afrique – ce qui prouve combien la région est tributaire des approvisionnements extérieurs pour l'un de ses aliments de base.

Pour réduire les importations, l'ADRAO a mis au point une nouvelle variété de riz NERICA pour l'Afrique et a lancé, avec ses partenaires, l'Initiative africaine sur le riz, en tant que mécanisme pour promouvoir NERICA et ses technologies complémentaires partout en Afrique subsaharienne.

Ce document résume les réalisations de cette Initiative à ce jour.

La Iniciativa Africana sobre el arroz, su historia y sus realizaciones

El arroz es el principal cultivo alimentario del mundo, y uno de los alimentos básicos más importantes para millones de habitantes del África subsahariana. Es, además, la fuente de alimento que crece con más rapidez en África, y tiene especial importancia para la seguridad alimentaria en un número cada vez mayor de países africanos de bajos ingresos y con déficit de alimentos. Actualmente la demanda anual de arroz en el África subsahariana crece a un ritmo sin precedentes, del 6 % anual, que puede atribuirse en cierta al rápido incremento demográfico, a la urbanización creciente con los cambios de estilo de vida que conlleva, y a la conservación y cocción relativamente fáciles de este cereal (Nwanze *et al.*, 2006).

Las importaciones de arroz destinadas a satisfacer la demanda de África ocasionan cada año un gasto de más de 1 500 millones de USD en divisas; este dato pone en evidencia que la región depende considerablemente de suministros externos para abastecerse de uno de sus alimentos básicos.

Con el propósito de reducir las importaciones, el Centro Africano del Arroz desarrolló el Nuevo arroz para África (NERICA) y creó, junto con sus asociados, la Iniciativa africana sobre el arroz (ARI) como mecanismo de promoción del NERICA y sus tecnologías complementarias en toda el África subsahariana.

En este documento se resumen las realizaciones alcanzadas por el ARI hasta la fecha.

Rice in Central America at a critical crossroads: FLAR's activities to increase competitiveness of national production[1]

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INTRODUCTION

Rice is traditionally grown in Central America in three distinct systems:

- unfavoured upland, predominately on hillsides;
- favoured upland, in high rainfall areas; and
- unimproved irrigated.

During the 1980s, much of the area planted to unfavoured upland production was lost because of non-competitive production and the importation of cheaper rice. In the 1990s, the trend continued and large areas devoted to favoured upland were also displaced. The remaining area in favoured upland and unimproved irrigated rice is currently threatened by imported rice, mainly as a result of the liberation of imported rice under the Central American Free Trade Agreement (CAFTA) with the United States.

The most significant trend in rice in Central America over the last two decades has been the decline in area. Area planted in Costa Rica has declined from over 70 000 ha in 1980 to even less than the current area of 50 000 ha, i.e. a loss of almost one-third. In Honduras, the rice area has decreased by70 percent since 1980; Mexico has lost two-thirds of its rice area; and in Panama it has declined by nearly 10 percent. Only Nicaragua has not witnessed large declines in rice area, but that is due to the fact that the country is recuperating from large declines experienced during the country's civil war.

Overall, the area cultivated to rice in Central America and Mexico declined by approximately 25 percent (> 100 000 ha) in the last two decades. Nevertheless, overall production decreased by only 12 percent due to improved yields in the more favoured upland areas and irrigated systems – a reflection of the transition from low-yielding, unfavoured upland production to the more productive and stable rainfed and irrigated systems.

The rice sector in Central America is clearly under threat from imported rice, which comes almost exclusively from subsidized production in the United States. While the problem has been serious for years, the favoured production systems are now expected to be increasingly threatened by CAFTA (already signed by several countries and in the process of being approved by others). CAFTA permits a progressive increase in the import quotas of rice. These countries already import a significant portion of their domestic needs (85% in Mexico, 50% in Costa Rica, 40% in Nicaragua and 20% in Panama). Rice production in Central America is particularly vulnerable to imported rice as yields are low. The only means of preventing the loss of this important crop – that generates significant revenue and is major source of employment – is to increase yield and reduce costs in order to increase the competitivity of national production.

RESULTS FROM FLAR INTERVENTION

Efforts to increase the competitiveness of national production were initiated in 2003/04 in Costa Rica, Nicaragua and Guatemala with the objective of stimulating yield and reducing production costs. The programme focused on irrigated rice in Costa Rica and Nicaragua and on rainfed rice in Guatemala and southern Costa Rica. The salient features of the technical intervention in the irrigated ecology were based upon six strategic management practices:

[1] The assistance of the agronomists: Norman Oveido, SENUMISA, Costa Rica; Carlos Mendez, ANAR, Nicaragua; and Eduardo Gudiel, ARROZGUA, Guatemala is appreciated. Part of the work was supported by grant funds from the Common Fund for Commodities (www.common-fund.org).

- planting date;
- seeding density;
- early pest management using insecticide-treated seed;
- balanced nutrition to obtain high yield;
- early weed control; and
- appropriate irrigation water management.

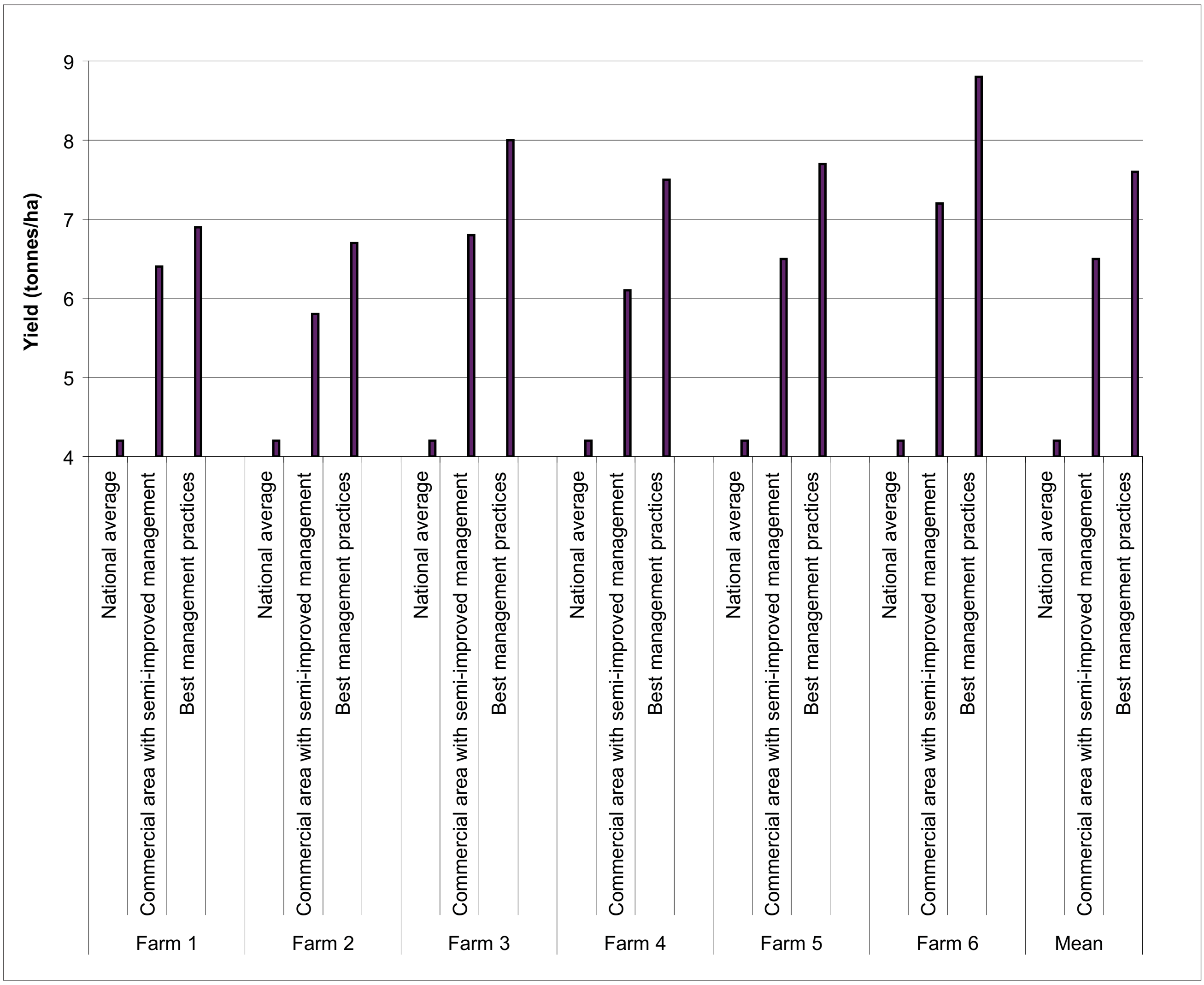
Integrated application of the six practices can result in large yield increases. The technology is "knowledge-based" and scale neutral, i.e. it is suitable for farmers of different economic or technical levels. The technology does not require additional investment in equipment or inputs, but focuses on the precision management of already-used inputs. In upland rice areas, the technological improvements are: land preparation and fertilizer practices during the dry season combined with reduced densities, treated seeds (where required) and balanced nutrition.

Costa Rica – irrigated rice

In the first year, the technology was introduced on two irrigated rice farms during the high solar radiation season. On the first, yield increased from 3.5 to 7.2 tonnes/ha. On the second, 200 ha were planted under improved management with a yield of 7.5 tonnes/ha, while 600 ha planted on the same farm using traditional management practices gave a yield of 5 tonnes/ha.

FIGURE 1

Summary of yield data from six commercial farms in Costa Rica comparing national average yield with commercial yields under semi-improved management and demonstration plots with best management practices



In 2004/05, demonstration plots were established on six farms (Figure 1) and farmers began using the improved technology on a commercial basis – referring to it as "semi-improved practices". On all six farms, commercial fields where just some of the improved practices were adopted gave yields 1.5–2.4 tonnes/ha greater than in previous years under conventional management practices. With full utilization of the improved technology (best management practices) a further 1–2 tonnes/ha were achieved.

The figures are derived from 359 ha of demonstration plots and over 1 500 ha of commercial fields. It is clear that yields can readily be increased to over 8 tonnes/ha with only partial use of the improved technologies; it is feasible to increase yields to 9–10 tonnes/ha when all recommended practices are employed.

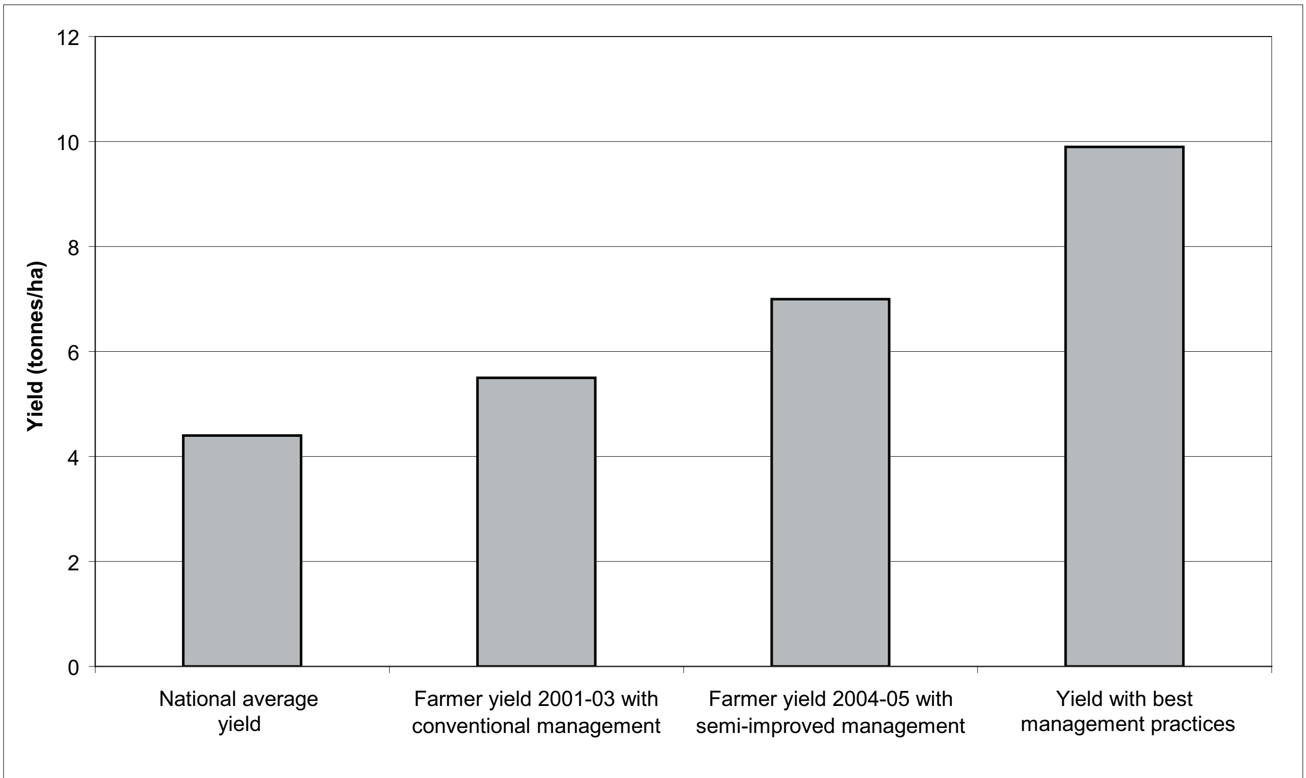
Nicaragua – irrigated rice

Work in Nicaragua commenced in 2003/04 on the farm of just one grower who visited Venezuela and became familiar with the improved management practices. In the first season, yields of 10–12 tonnes/ha were obtained on several 500 m^2 plots. In the following season (2004/05), the programme expanded to cover several farms with demonstration plots as well as commercial areas. A summary of the results are presented in Figure 2. It is clear that improved management practices can readily double yields in Nicaragua. On a commercial basis, yield increased by 2.6 tonnes/ha and on smaller demonstration plots (2–5 ha), yields superior to 10 tonnes/ha were frequent.

Costa Rica – favoured upland rice

Approximately two-thirds of the rice area in Costa Rica is lowland rainfed. Much of upland production occurs in the south under high rainfall and limited solar radiation. National average yield in upland conditions is only 3.2 tonnes/ha, but costs are similar to those for irrigated conditions. Land preparation and fertilizer management are major problems due to the continuously wet field conditions. In addition, farmers use large amounts of agrochemicals (e.g. insecticides, fungicides and foliar nutrients) and, what is more, almost all applications are preventive, i.e. without a scientific basis. In 2003/04,

FIGURE 2
Yield of on-farm demonstration plots in Nicaragua using improved crop management practices compared to historic yields and conventional crop management



small trials were established to evaluate the efficiency of preparation and fertilization on dry land prior to the initiation of the rainy season. This technique permits growers to prepare land and apply and incorporate fertilizers in dry soil, using only inexpensive non-selective herbicides to eliminate weeds – similar to a stale seedbed preparation. This practice greatly reduces the costs of land preparation and weed control while increasing fertilizer efficiency. In addition, insecticide-treated seeds were introduced to eliminate early applications of non-selective insecticides, particularly pyrethrum-based chemicals. Finally, seeding density was reduced to approximately 100 kg/ha (about one-half of normal seeding rates) in order to reduce foliar fungal diseases and produce healthy plants capable of responding to improved fertilizer management. Balanced fertilizer use eliminated the need for expensive foliar applications. In summary, the improved practices reduced production costs by approximately US$ 200–300/ha, roughly equivalent to a gain in yield of 1 tonne/ha.

In 2005, demonstration plots were established on approximately 100 ha in eight farms. Plots on six of the farms gave yields in excess of 6 tonnes/ha, i.e. nearly double the average yield in rainfed conditions (Table 1). Two plots were lost due to lodging since the farmer used excessive quantities of seed (138 kg/ha) and a variety that is particularly susceptible to lodging (CR 4477). The average yield on the six remaining farms was 6.4 tonnes/ha (almost 3 tonnes/ha greater than the national average yield under favoured upland conditions) and costs were approximately US$ 600/ha resulting in a very competitive cost of US$ 100/tonnes.

Guatemala – favoured upland rice

Guatemala is not a major rice-producing country and imports nearly 80 percent of national needs from the United States. Nearly all national production is concentrated in the upland sector (as in Costa Rica). On the basis of the initial results from Costa Rica, demonstration plots were established in four farms utilizing dry land preparation and fertilization technology combined with reduced seeding. In addition, unnecessary use of inputs (e.g. foliar nutrient and growth hormones) was eliminated together with preventative applications of insecticides and fungicides. Simply reducing unnecessary input usage reduced costs by the equivalent of approximately 1 tonne/ha (similar to the reduction observed in Costa Rica). Yield increases were also in the range of 1 tonne/ha (again, similar to Costa Rica) (Figure 3).

CONCLUSION

The technology for more competitive production in both the irrigated and upland sector is available, but further effort is required in technology transfer. High yields of irrigated rice (8–10 tonnes/ha) can be readily obtained, making rice production competitive with imported rice. Thanks to the improved production technologies in upland conditions, small growers can be competitive and increase their income.

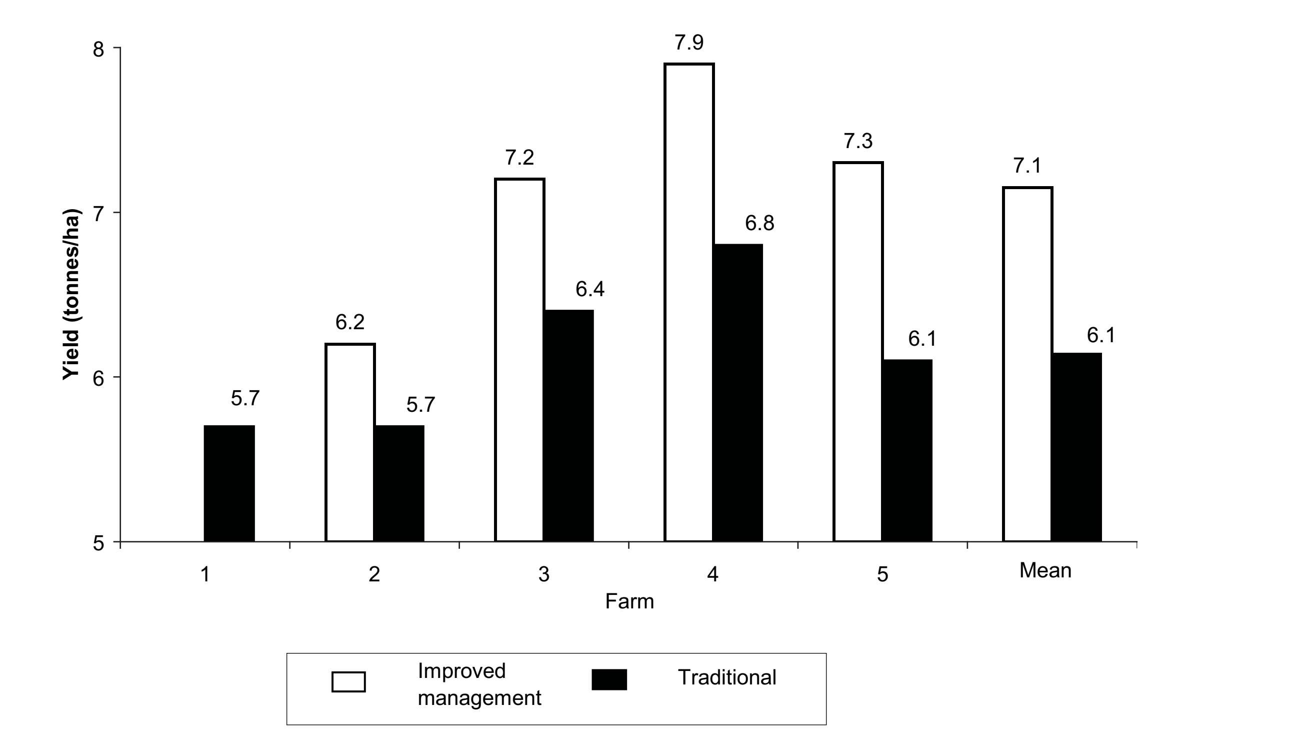
The challenge is to extend the improved production technologies to more farmers, but none of the three countries involved in the project have an extension service for rice. The public sector extension service is essentially inoperative and growers associations are responsible for extending the technologies. Growers associations in Nicaragua and Guatemala are relatively new and the FLAR member in Costa Rica is a consortium of seed companies.

In Costa Rica, a unified extension system can be developed by integrating the management and organizational skills of the private seed sector with the human resources of the growers association.

TABLE 1
Yield in high rainfall upland conditions using improved fertilizer and land preparation practices

Farm	Area (*ha*)	Basic fertilizer (*ppi*)	Side-dressing fertilizer	Planning rate (*kg/ha*)	Treated seeds	Yield (*tonnes/ha*)
3	16	150N-40P-60K	0N-Zn-S	120	Yes	6.2
4	9	150N-40P-60K	0N-Zn-S	110	Yes	6.6
5	4	100N-40P-60K	50N-Zn-S	110	Yes	6.0
6	18	133N-40P-60K	25N-Zn-S	100	Yes	6.3
7	9	150N-40P-60K	50N-Zn-S	110	Yes	7.0
8	8	150N-40P-60K	50N-Zn-S	129	No	6.5
Mean						**6.4**
National average yield						**3.5**

FIGURE 3
Yield of on-farm demonstration plots comparing improved management practices with traditional production practices



In Nicaragua, the key components for a successful technology transfer programme are already in place. Assistance is required to develop an extension methodology and strategy for reaching relatively large numbers of growers. The leadership capacity is present in ANAR (National Rice Growers Association of Nicaragua), which has successfully collaborated with the millers association and the public sector extension service. Assistance is required to provide the technical training and organization of an extension programme led by the growers association.

Guatemala also has the capability to develop in rice via the Guatemalan Rice Association (ARROZGUA) of growers and millers, which is a key resource for developing a successful extension service. The organizational and management skills are already in place, while additional assistance is required in technical areas and technology transfer.

In Costa Rica and Nicaragua, the technology's impact is most immediate in the irrigated sector; the technology is already available, including high-yielding varieties. However, most Central American countries depend heavily upon rainfed rice and the uplands are dominated by small, poverty-stricken rice growers, especially in Nicaragua. In the short term, yield improvement and cost reductions are feasible via aggressive technology transfer. However in the long term, incomes cannot be expected to increase significantly, given that most rice cultivation is in smallholdings and yields will remain relatively low due to the lack of adequate solar radiation during the rainy season.

The only means for small rice farmers to survive in a competitive market is to achieve high yields; this requires irrigation to allow planting during the dry season when there is high solar radiation. Simple water-capturing techniques combined with adequate storage can provide sufficient water resources for supplementary irrigation or complete irrigation during the dry season for small areas. The captured water, normally stored in small ponds, can be used for supplemental irrigation in areas of periodic drought or for production during the dry season when climatic conditions are more favourable for high yields. Assistance is required to introduce and promote known water-harvesting technologies, which – combined with improved crop management practices – can result in high yields and incomes from small areas.

Tournant décisif pour le riz en Amérique centrale: les activités du Fonds latino-américain de réserve du riz irrigué visent à augmenter la compétitivité de la production nationale

En Amérique centrale, la production de riz dans les écosystèmes montagneux défavorables perd du terrain face au riz importé qui est plus économique, tandis que les faibles rendements signifient que la production de riz pluvial dans les zones favorables et de riz irrigué non amélioré est actuellement menacée par la libéralisation du riz importé au titre du Traité de libre-échange entre l'Amérique centrale et les États-Unis. Le Fonds latino-américain de réserve du riz irrigué a été le premier, en 2003/04, à prendre des mesures pour rendre plus compétitive la production nationale dans la région. Il existe des techniques favorisant une production plus compétitive à la fois pour le riz irrigué et le riz pluvial. Il reste à mettre à la portée d'un plus grand nombre de riziculteurs les techniques de production améliorées. Par ailleurs, des techniques simples de captage de l'eau associées à un stockage approprié peuvent fournir des ressources en eau suffisantes pour une irrigation supplémentaire ou une irrigation d'appoint durant la saison sèche dans de petites zones. L'eau captée, normalement stockée dans de petits étangs, servira à compléter l'irrigation dans les zones où la sécheresse frappe périodiquement ou pour la production durant la saison sèche, lorsque les conditions climatiques sont plus favorables à des rendements élevés.

América Central, el arroz en la encrucijada: actividades del FLAR para una mayor competitividad de la producción nacional

La producción de arroz en sistemas de tierras altas poco propicios de América Central viene perdiendo terreno a favor del arroz importado, que resulta más barato. Al mismo tiempo, a causa de su bajo rendimiento la producción en entornos propicios de tierras altas y la de arroz de regadío no mejorado se ven amenazadas por la liberalización del arroz importado en el marco del Tratado de Libre Comercio entre Centroamérica y Estados Unidos (CAFTA). El Fondo Latinoamericano para el Arroz de Riego (FLAR) comenzó en 2003/04 a desplegar esfuerzos para aumentar la competitividad de la producción nacional en la región. Actualmente se dispone en América Central de una tecnología para una producción más competitiva tanto en zonas de regadío como en las tierras altas. Queda pendiente el problema de extender a más agricultores las tecnologías productivas mejoradas. Por otra parte, mediante técnicas sencillas de captación de aguas y con un adecuado almacenamiento es posible proporcionar recursos hídricos suficientes para el riego complementario o el riego completo de superficies pequeñas en la estación seca. El agua captada, que normalmente se almacena en pequeños estanques, se puede emplear para complementar el riego en zonas que sufren sequías periódicas, o en la producción durante la estación seca cuando las condiciones climáticas son más propicias para un rendimiento elevado.

Rice projects currently supported by the FAO Crop and Grassland Service

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The FAO Crop and Grassland Service hosts the Secretariat of the International Rice Commission. In the current 2006–07 biennium, the Service also provides technical support to seven projects related to rice production for food security in member countries and regions of FAO. This paper provides a brief description of the project activities aimed at promoting collaboration with other partners.

TRUST FUND PROJECTS

GCP/RAF/411JPN: Intra-African Training and Dissemination of Technical Know-how for Sustainable Agriculture and Rural Development Project within the Framework of South-South Cooperation, 2006–2011

The Government of Japan recently approved funding of US$ 4 357 025 to support project activities over a 5-year period. The project is designed to contribute to the sustainable spread and dissemination to farmers, foresters, fishermen, extension workers and government officials in 14 selected African developing and least-developed countries (LDCs) of the technological know-how accumulated by African experts who have already benefited from training under past Japanese technical cooperation programmes. Implemented within the framework of South-South collaboration, African experts from advanced developing countries in Africa who have benefited from Japanese training will be used for training and dissemination. The project tentatively covers Angola, Benin, Burkina Faso, Chad, Guinea, Lesotho, Malawi, Mali, Mozambique, Senegal, Sierra Leone, Swaziland, the United Republic of Tanzania and Uganda. The project is consistent with the New Partnership for Africa's Development (NEPAD) – Comprehensive Africa Agriculture Development Programme (CAADP). Its LDC focus and contribution to increased production and trade by addressing supply side constraints mean that it conforms to the spirit of the WTO Doha Round and Japan's commitment to supporting developing countries in achieving the Millennium Development Goals (MDGs), particularly MDG 1 – to reduce world hunger and poverty by half by 2015. The project will organize technical seminars, workshops and training courses for Africans, in Africa, with African trainers. Technical areas to be covered, subject to concurrence by the beneficiary countries, include: market access, small-scale irrigation and water management, aquaculture development and rice cultivation. Inception workshops are to take place soon.

GCP/UGA/035/JPN: Dissemination of NERICA and Improved Rice Production Systems to Reduce Poverty and Food Deficit in Uganda, 2006–08

In 2006, the Government of Japan approved funding of US$ 1 239 983 to support project activities over a 2-year period. Uganda is a landlocked country in central Africa. The 2004 population is estimated at about 26 million, 89 percent of which lives in rural areas. The GDP (gross domestic product) in 2004 was estimated to be US$ 6.9 billion and the GNP (gross national product) was about US$ 270. Rice is not the main staple food in the country, but its consumption has been increasing recently, partly as a result of urbanization and school lunch programmes. Approximately 60 000–70 000 tonnes of rice are imported annually, but since 2000 the Ugandan Government has made increasing rice production a priority. The project aims to increase rice production and the income of resource-poor farmers by improving the dissemination of NERICA and other rice technologies. The project activities are: promotion of the efficient use of natural resources and building national and local capacity in rice-based production systems. It is expected that 30 000 family members will benefit from the project activities, in particular women, as they constitute the majority of upland rice growers. The project will strengthen rice production and milling operations, enhancing the role of the private sector in providing market outlets for locally grown rice with particular attention to disadvantaged farmers. The inception workshop was held in November 2006.

GTFS/RAS/198/ITA: Support to the Regional Programme for Food Security in the Pacific Island Countries – Rice Production in Papua New Guinea (PNG), 23 months

The Government of Italy under the framework of the project GTFS/RAS/198/ITA in May 2005 approved funding of US$ 243 000 to support the activities of Rice Production in Papua New Guinea for a 23-month period. The expected outcomes of the rice development project are that about 3 000 rural households will have access to quality rice seeds, rice cultivation technology, extension services and rice milling facilities for rice production primarily for household consumption and to produce at least 2 500 tonnes of rice over a 3-year period.

TECHNICAL COOPERATION PROJECTS

TCP/EGY/3102 (A): Rice Straw Management and Conservation of Environment, 2006–08, Egypt

In June 2006 FAO approved funding of US$ 287 000 to support project activities during an 18-month period. It has been estimated that 55 percent of the 3 million tonnes of straw residues which are produced by rice growers are burned in-field as a practical means of disposal. Rice producers share these responsibilities, with priority given to clearing and cultivating land within 10–14 days of harvest in preparation for sowing the following crop (wheat or berseem). The opportunities available for the use of residues have not generally been appreciated. This has resulted in considerable loss of value to growers, and created extensive aerial pollution that has become unacceptable to communities living adjacent to or downwind from rice-growing areas. In Cairo it is called "the black cloud". By introducing rice technologies and building up national capacity, the project aims to achieve better utilization of rice straw so as to reduce air pollution and water contamination, improve the ecological environment, enhance soil fertility and increase farmers' incomes. The inception workshop was held in February 2007. The knowledge and skills of about 100 researchers and local extension staff on technologies for integrated management of straw will be improved. By the end of the project, about 1 000 farmers will be trained in new technologies for integrated management of straw, and there will be increased public awareness of the negative sides of burning rice straw.

TCP/INS/3003 (T): Accelerated Adoption, Capacity Building, and Training for RiceCheck-Group Procedures that Increase Productivity and Net Income from Smallholders' Integrated Rice Crop Management, 2006–07, Indonesia

In November 2005 FAO approved funding of US$ 387 000 to support project activities during an 18-month period. The Government of Indonesia accords highest priority to addressing the food-security and import-cost implications of rice importation. The project's objective is to strengthen national capacity to enable rice smallholders to adopt integrated rice crop management (IRCM)-RiceCheck procedures for increasing productivity and efficiency in rice production, thus helping to fulfil the national strategies of sustained increasing rice production and of strengthened rural livelihoods. The knowledge and skills of about 300 researchers, local extension staff and farmers on RiceCheck/IRCM procedures will be improved. At the end of the project, the country will have adequate manpower and expertise for upscaling the transfer of RiceCheck/IRCM procedures.

TCP/INS/3102: Accelerated Training on Improved Rice Production Technologies in Support to the Presidential Initiative to Increase Rice Production by 2 Million Tonnes, Indonesia, 2007–08

In August 2007 FAO approved additional funding of US$ 93 000 to support activities aimed at rapidly enhancing the national capacity for wide adoption of existing improved production technologies in order to increase the productivity of rice cultivation for meeting the objectives of the Presidential Initiative, especially in the following areas: capacity to apply integrated crop management systems (ICMS) in the cultivation of high-yielding and hybrid rice; and production and distribution of registered and certified rice seed.

TCP/SRL/3102 (D): Strengthening National Capacity for Hybrid Rice Development and Use for Food Security and Poverty Alleviation, Sri Lanka

In January 2007 FAO approved funding of US$ 329 000 to support project activities during an 18-month period. Rice is the staple food of 19 million people in Sri Lanka. Significant gains have been achieved in national rice production during the last two decades and national rice yield has increased to 3.9 tonnes/ha. However, paddy production meets only 90 percent of the national requirement. The objective of the project is to assist the Government of Sri Lanka in strengthening national capacity in hybrid rice development and use in order to increase rice production and maximize the return from investment in irrigation and group farming for food security and poverty alleviation. The knowledge and skills of about 100 researchers, extension workers, seed production supervisors and seed growers involved in hybrid rice development and hybrid seed production will be improved. At the end of the project, the country will have adequate manpower and expertise in hybrid rice breeding, F_1 seed production and commercial hybrid rice production for upscaling the transfer of hybrid rice technology to farmers under group farming schemes and associations of F_1 seed production as well as to non-governmental organizations (NGOs) and the private sector involved in rice production in the countries.

TCP/SUD/3101 (T): Training on Improved Rice Technologies for the Enhancement of Irrigated Rice Production in the White Nile State, Sudan, 2006–08

In February 2006 FAO approved funding of US$ 279 000 to support project activities during an 18-month period. The Government of the Sudan intends to make investments to address the growing demand for rice. One of the targeted areas for rice expansion is the White Nile State, where vast swampy areas adjoining the banks of the White Nile have proven to be suitable for rice production. The objectives of the assistance are to: strengthen national capacity and local technology transfer and extension capacities in support of rice production through properly tailored training and by enabling the National Rice Training Centre to plan, implement, train and monitor the rice development programme; provide a platform for enhancing national capacities and facilitating effective future South-South cooperation between the Sudan and other countries; enhance rice crop productivity; and accelerate the implementation of the Rice Revitalization Programme for food security, poverty alleviation and economic empowerment of rural dwellers in the country. Due to unforeseen circumstances, the project's activities were delayed for several months and will be resumed in May 2007.

TCP/VIE/3101 (D): Capacity Building for Improvement of Seed Source Quality and Rice Production for Food Security in the Highland and Mountainous Regions in Viet Nam, 2007–09

In May 2007 FAO approved funding of US$ 257 000 to support project activities during an 18-month period as part of the Government's effort to attain a national strategy for social equity, peace and sustainable development through building up the capacity and expertise for rice production in the highlands and mountainous regions of Viet Nam. The main objectives of the project are: to improve the expertise and capacity in production, conservation and distribution of high quality seeds of locally adapted rice varieties through the training of research and extension staff of the Northern Mountainous Agriculture and Forestry Science Institute (NOMAFSI) and farmers in five mountainous provinces; and to improve the capacity of extension staff and farmers in rice crop management for high rice yield and sustainable production through participatory on-farm demonstration and farmers field schools on integrated rice crop management technologies.

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