CGIAR

Research Program on Rice

Global Rice Science Partnership

GRiSP

Annual Report 2012

The Global Rice Science Partnership (GRiSP), a research program of the CGIAR, represents for the first time ever a single strategic and work plan for global rice research. GRiSP brings together hundreds of scientists to embark on the most comprehensive attempt ever to harness the power of science to solve the pressing development challenges of the 21st century. Cutting-edge science is deployed to develop new rice varieties with high yield potential and tolerance of a variety of stresses such as flooding, salinity, drought, soil problems, pests, weeds, and diseases. Improved natural resource management practices will allow farmers to fully realize the benefits of such new varieties on a sustainable basis while protecting the environment. Future rice production systems are designed to adapt to climate change and to mitigate the impacts of global warming. Policies conducive to the adoption of new varieties and cropping systems will be designed to facilitate the realization of development outcomes. GRiSP will train future rice scientists and strengthen the capacity of advisory systems to reach millions of farmers. For impact at scale, GRiSP scientists collaborate with hundreds of development partners from the public and private sector across the globe.

GRiSP was launched in 2010 and is coordinated by three members of the CGIAR Consortium—the International Rice Research Institute (IRRI, the lead institute), Africa Rice Center (AfricaRice), the International Center for Tropical Agriculture (CIAT)—and three other leading agricultural agencies with an international mandate and with a large portfolio on rice: Centre de Cooperation Internationale en Recherche Agronomique pour le Développement (Cirad), L'Institut de Recherche pour le Développement (IRD), and the Japan International Research Center for Agricultural Sciences (JIRCAS). Together, they align and bring to the table consortia, networks, platforms, programs, and collaborative projects with over 900 partners from the government, nongovernment, public, private, and civil society sectors.

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Suggested citation:
GRiSP (Global Rice Science Partnership). GRiSP Annual Report 2012. Los Baños (Philippines): International Rice Research Institute. 56 p.

Consortium

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CRP 3.3 (GLOBAL RICE SCIENCE PARTNERSHIP) PERFORMANCE MONITORING REPORT 2012

A. Key messages (1 ½ page)

The Global Rice Science Partnership (GRiSP) entered its second year in 2012. GRiSP's mission is fully aligned with the CGIAR SLOs:

GRiSP mission	CGIAR system-level outcomes
Reduce poverty and hunger	Reduced rural poverty (SLO 1) Improved food security (SLO 2)
Improve human health and nutrition	Improved nutrition and health (SLO 3)
Reduce the environmental footprint and enhance ecosystem resilience of rice production systems	Sustainably managed natural resources (SLO 4)

GRiSP continued to receive strong international endorsement, as highlighted at the G20 Meeting of Agricultural Chief Scientists in September in Guadalajara, Mexico, where GRiSP and two other CRPs (Maize, Livestock and Fish) were presented. In their communiqué, the chief scientists state: "*We strongly support these global initiatives and their novel partnerships for implementation, and encourage active participation and alignment of the national policy and research agenda of the G20 countries with these global initiatives.*" GRiSP actively contributes to the GCARD Roadmap and participated in the GCARD 2012 Conference in October in Punta del Este, Uruguay. In that same month, President José Mujica of Uruguay read out on the radio a full paper on GRiSP and the importance of the Uruguayan rice sector to it. GRiSP's coordinating partners actively contribute to international fora and networks, such as the Council for Partnership on Rice Research in Asia (CORRA) and the Coalition for African Rice Development (CARD), among many others. The Indian Council for Agricultural Research fully aligned its long-standing collaboration with IRRI with GRiSP. GRiSP contributed to important national rice policy documents and strategies, for example, in Laos (www.fao.org/investment/tci-publications/country-highlights/en/). GRiSP also contributed to the elaboration of a strategic orientation framework for a regional rice initiative in West Africa, aiming at the adoption of policies to modernize rice production systems, reduce rice imports, and improve regional trade. Partnership interactions with its many NGO, public-sector, and private-sector partners are strengthened through 15 purpose-oriented consortia, networks, and platforms. Five Africa-wide Task Forces (Rice breeding, Rice agronomy, Rice processing and value addition, Gender in rice research and development, and Rice policy) have now been established to achieve a critical mass in thematic areas in the rice sector, based on principles of sustainability, buildup of critical mass, and ownership by the national systems. The Africa-wide Rice Breeding Task Force involves breeders from 30 countries. In Latin America, CIAT continues to coordinate the Latin American Fund for Irrigated Rice (FLAR) with 27 institutions (encompassing rice producers' associations, milling and seed companies, and national public research programs) from 17 countries to provide innovative and technological solutions to the needs of rice farmers and the rice industry. Two significant achievements illustrate some of the important outputs and outcomes in 2012:

1. GRiSP scientists published a paper in *Nature* describing the discovery of the *PSTOL1* gene that enables rice plants to grow bigger and better roots to absorb more phosphorus, an important but limited nutrient. This gene discovery unlocks the potential of rice to produce under certain conditions up to 20% more grain by using soil or fertilizer P resources more efficiently. The *PSTOL1* discovery was made possible through more than 10 years of research collaboration between GRiSP scientists from IRRI, the Japan International Research Center for Agricultural Sciences, the University of Milano in Italy, the University of the Philippines Los Baños, and the Institute for Agricultural Biotechnology and Genetic Resources Research and Development in Indonesia.

2. Five rice varieties carrying the *SUB1* gene, which confers tolerance of prolonged submergence, were recently released for commercial use in five countries in South and Southeast Asia. These varieties showed yield advantages of 1 to more than 3 t/ha after complete submergence for various durations in naturally flooded fields. Sub1 varieties are now grown by more than 4 million farmers in Asia, and the benefits of planting this rice are trickling down and changing rice farming, which has never been a lucrative living before for small and marginal farmers, about 50% of whom are women.

Total expenditures (funding from all sources) was $99,058 M against an approved budget of 108,635 M $. Funds explicitly used for gender research were $658,000 (financial report L131) plus an additional $250,000 budgeted under GRiSP program coordination. Many gender activities are mainstreamed and have not been made explicit.

B. Impact pathway and intermediate development outcomes (IDOs)

The current overall GRiSP impact pathway, theory of change (including gender dimension), and baseline situation can be found on page 41 (Figure 12) of the GRiSP proposal (www.irri.org/images/downloads/grisp/GRiSP%20Full%20Proposal.pdf). At the end of 2012, a process was started to define IDOs and sharpen our impact pathways and supporting theories of change. Currently, nine IDOs are under consideration: increased rice yield, increased resource-use efficiency, decreased poverty of net rice consumers and producers, increased sustainability and environmental quality of rice-based cropping systems, improved efficiency and value-added in the rice value-chain, improved nutritional status derived from consumption of rice products, increased rice genetic diversity, increased pro-poor and gender-equitable knowledge and technology delivery systems, increased gender equity in the rice value chain.

A set of indicators will be developed that will allow us to track progress towards the realization of these IDOs, both at specific geographic locations and at global scale. Baseline data (household surveys) have been collected, analyzed, and reported for Nepal, India (Assam, West-Bengal, Chatttisgarh, Odisha), Bangladesh, Cambodia, Pakistan, Sri Lanka, and 18 rice-producing countries in Africa.

Additional data were collected in Myanmar, India, Bangladesh, Tanzania, and the Philippines. In Latin America, a survey was initiated to measure the adoption and socioeconomic impacts of improved varieties (including Costa Rica, Nicaragua, Panama, Bolivia, Venezuela, and Peru). GRiSP national partners in Africa conducted baseline surveys for all actors in the rice value chain and consumer preference surveys in the Rice Sector Development Hubs. NARES partners and extension agents were trained in 17 countries on using tablets and smartphones for baseline data collection. A Web-based application is under development for automation of GRiSP's impact and monitoring and evaluation in Africa

C. Progress along the impact pathway

C.1 Narrative of major achievements, by theme (1 ½ pages)

Progress is monitored according to GRiSP's M&E strategy, mainly using annual milestone tracking, documentation of success stories, and dedicated adoption and impact assessments

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Theme 1 (Harnessing genetic diversity to chart new productivity, quality, and health horizons) invested in the development of infrastructure and improved research protocols. A global phenotyping network was established to accelerate the discovery of new useful genes. Researchers at CIAT developed protocols for standardizing physiological measurements related to nitrogen-use efficiency in field conditions using remote-sensing technology (infrared cameras). This technology allows the screening

of large numbers of genotypes and, after the standardization, it can be extended to other abiotic stresses. A bioinformatics platform for analysis of next-generation sequencing (NGS) reads was established, including mapping to the current reference genome, identification of genomic variants, merging of different samples, variant functional annotation, and some basic population genetics. This pipeline was validated on the whole-genome sequencing of 15 different accessions. Infrastructure for drought screening has been enhanced at AfricaRice and established at national institutes in Burkina Faso, Mali, and Nigeria. These facilities are significant as they enable breeding for drought tolerance in multiple locations in Africa.

Theme 2 (Accelerating the development, delivery, and adoption of improved rice varieties). IRRI initiated the transformation of its breeding activities from a research-centric, supply-driven, multiple-team organization into a demand-driven breeding product development pipeline structure. IRRI's rice breeding activities are now carried out in 10 new product pipelines. Seven of these are for *variety development* targeting specific rice production ecosystems and regions, whereas three are cross-cutting *trait development* pipelines. The new breeding structure will allow faster development of new varieties for specific market segments using new breeding approaches and high-throughput solutions for molecular breeding. The Hybrid Rice Development Consortium (HRDC) in Asia had 32 private-sector and 32 public-sector members. The hybrid germplasm supply to HRDC members has increased 10-fold compared with pre-HRDC levels, illustrating the great benefits from this public-private partnership model. A new Hybrid Rice Consortium for Latin America was formed and includes most of the main regional rice research institutions. In Africa, the Africa-wide Breeding Task Force has become a very effective multi-environment testing network.

Theme 3 (Ecological and sustainable management of rice-based production systems). In the Irrigated Rice Research Consortium (IRRC), which works across 10 Asian countries, activities comprised crop nutrition and establishment, pest management, improving irrigation water-use efficiency, and reducing postharvest losses. New research focuses on increasing crop productivity while reducing the environmental footprint and protecting the environment. In Africa, national partners started detailed yield and productivity gap surveys in 19 countries using a common methodology after a one-week training at AfricaRice. Based on these surveys, first baskets of "good agricultural practices" will be identified for testing with partners in 2013. Mapping of inland valleys, prime areas for rice cultivation in Africa, using spatial information from satellites showed great promise in Benin, Burkina Faso, Mali, and Togo. A participatory design and implementation system to improve water control in inland valley systems entirely based on farmer inputs was tested successfully in Benin and Togo with 200 farmers.

Theme 4 (Extracting more value from rice harvests through improved quality, processing, market systems and new products). The supply chains for postharvest technologies were strengthened to ensure last-mile delivery. This included support to national distributors and their networks for hermetic storage systems and further support to local manufacturers of the flatbed dryers in the Philippines, Cambodia, Indonesia, and Myanmar. Laser land leveling was re-introduced in Cambodia and has made good progress in Vietnam, where sales of equipment have started, with the first farmer buying one set in 2012. Business models for using those technologies were piloted in the Philippines, Vietnam, and Cambodia. Manufacturers from eight countries were trained in Senegal in the construction of the ASI thresher-cleaner and a mini-combine harvester.

Theme 5 (Technology evaluations, targeting and policy options for enhanced Impact) provides critical feedback to all other GRiSP themes, allowing them to develop well-targeted, demand-driven products and delivery approaches toward technologies, management systems, and information that farmers and other users really need. A value chain and market research team was established at IRRI to provide support to the newly restructured breeding program in product development. The team will analyze preferences of consumers, producers, and other actors in the rice value chain by collecting data on consumers' purchase and consumption habits. The team will also analyze supply chain

constraints for technology adoption and policy measures to support efficient value chain operation. The output of the team will be essential to GRiSP's breeding program as it strategically aligns its new product profiles to match the demands of producers and consumers in target countries. AfricaRice facilitated policy dialogue and regional rice policy harmonization in West Africa involving the Economic Community of West African States (ECOWAS), focusing in particular on elaborating a common external tariff for rice.

Theme 6 (Supporting the growth of the global rice sector) focuses on reaching large numbers of farmers through multiple actors, public, private, and civil society organizations. It is about partnerships and models that are localized and financially sustainable, and inclusive of smaller farmers and women. In Asia, IRRC Country Outreach Programs continued in farmer fields in Myanmar (5 regions), the Philippines (6 regions), Indonesia (3 regions), and Vietnam (11 districts in An Giang Province; extended to at least 2 other provinces in the Mekong Delta). These and other outreach activities have been integrated with national programs in the Philippines (Philippines Food Staples Self-Sufficiency Program), Indonesia (Integrated Crop Management [ICM] for rice being rolled out through 60,000 farmer field schools), Vietnam (1 Must Do, 5 Reductions; *Mot Phai*, *Nam Giam*), and China (3-Controls technology). In Africa, national research partners identified up to three Rice Sector Development Hubs in their respective countries through consultation workshops with key value chain actors and research and development partners to concentrate research efforts and work in a systematic manner toward outcomes and impact. A total of 56 Hubs had been identified in 20 countries. In a workshop in Uruguay, GRISP developed a global framework for agronomy extension, with each region contributing to its formulation. Essential building blocks include communication tools and extension capacity development. In Africa, curricula for group training on integrated crop management and seed production were developed through consultation with stakeholders from NGOs and farmer organizations, validated in group training events held in 2012, and further improved and finalized.

C.2 Progress toward outputs (1 ½ page)

Theme 1. BGI and IRRI developed a sequencing strategy that will produce reference genomes for the major rice types. As of now, about 3,000 rice germplasm accessions/lines have been sequenced (at an average depth of 10X). The sequence information together with geographic data associated with individual rice accessions will allow us to select appropriate types of rice for the evaluation of specific traits and isolation of novel genes. In the C_4 rice project, that aims to introduce C4 photosyntheis into rice to increase yield potential by 25-50%, many of the C_4 biochemical genes have been transformed into rice and gene pyramiding has started to construct the basic C_4 pathway. Resistance to rice tungro bacilliform virus was found to be controlled by a single recessive gene located near 22 Mb on chromosome 7, and a single nucleotide polymorphism (SNP) was found in a gene for translation initiation factor (eIF4G). DNA markers specific to this eIF4G SNP were developed for marker-assisted breeding of tungro-resistant rice cultivars. At CIAT, three promising promoter-gene combinations were identified at the reproductive stage in two drought environments with more than a 10% yield advantage over the conventional checks. In Africa, loci with resistance to African rice gall midge (AfRGM) were identified in both *O. sativa* and *O. glaberrima* accessions. Markers linked to each of the loci with resistance have been identified, thus facilitating MAS for AfRGM resistance. Breeding lines showing resistance to five strains of BLB collected in West Africa were identified and a recessive resistance gene, *xa/B3*, was mapped. Simple sequence repeat (SSR) markers linked to the locus were identified, thus facilitating MAS for BLB resistance.

Theme 2. In total, 52 new rice varieties were released by AfricaRice, CIAT, IRRI; and their partners. In addition, 47 rice varieties were released by IRRI and its partners in late 2011 that had not yet been captured in the GRiSP 2011 report. As part of the new approach, two new regional breeding hubs, one for South Asia (at Hyderabad, India) and one for Eastern and Southern Africa (at Bujumbura, Burundi,

contributing to the Africa Rice Breeding Task Force) were launched. At CIAT, two lines coming from breeding different strategies were identified to increase yield potential.

Theme 3. Advances were made in the development of crop establishment technologies (direct dry seeding, mechanized transplanting), weed control, nutrient management (especially the *Nutrient Manager* tool), water management (ongoing research on sprinkler irrigation and nonflooded, aerobic rice; dissemination on alternate wetting and drying), insect pest control (host-plant resistance and insect pesticide resistance breakdown, ecological engineering), rodent control, and integrated crop management. In Latin America, simple, low-tech, low-cost water-capturing techniques were combined with storage facilities to provide water resources for supplementary irrigation during the rainy season and complete irrigation in the dry season. Two supplemental irrigations during the rainy season increased rice yield by 70%. Irrigated rice produced during the dry season yielded 9.3 t/ha, nearly double the national average rice yield in Nicaragua. Similar results were observed in Mexico. In Africa, use of a *Nutrient Manager* decision-support tool led to a yield increase of 1.9 t/ha (or 30%) compared to farmer practices in Senegal. A weed identification tool was developed by AfricaRice and CIRAD, allowing the identification of close to 200 lowland weed species. Two farmer-to-farmer videos on labor-saving weed management options—"rotary-hoe weeding in lowland rice" and "safe and efficient use of herbicides"—were developed. The videos are available in English, French, Portuguese, Swahili, and Dagbani. A participatory approach to improve water control in inland valley lowlands, totally relying on farmer inputs, was successfully evaluated with 200 farmers in Benin and Togo.

Theme 4. A new solar dryer prototype was developed in collaboration between the public and private sector. Research in the development of new value-added by-products from rice gained momentum with studies conducted on the logistics of rice straw collection, pretreatment, storage, and densification for energy generation purposes and on the digestibility of straw as feedstock for animals. The identification of varieties of different qualities and varieties and mutants carrying potential specialty quality traits was completed. About 1,000 *O. glaberrima* lines were screened for their nutritional properties, including glycemic indices, confirming that *O. glaberrima* lines contain slower digesting starches.

Theme 5. The Global Rice Information Gateway initiative was initiated to provide real-time area, yield, and production estimates for Asia by combining modern techniques such as satellite-based remote sensing with weather and crop modeling. A high-resolution rice map (at 1 ha) was developed for a number of South and Southeast Asian countries. Crop models are being used to assist in forecasting actual yields. A handbook was produced, compiling the rice polices pursued by the major rice-producing and rice-consuming countries in Asia. A new methodology was evaluated in Togo and Benin to map inland valleys based on spatial information from satellite imagery.

Theme 6. Partnerships have underpinned the release, seed multiplication, and outscaling of stress-tolerant rice varieties for salinity, submergence, and drought in South Asia. Roughly 4 million farmers in India and Bangladesh have been reached with such new varieties through 260 small, medium, and large public- and private-sector seed companies/corporations. A software called *Nutrient Manager*—based on sound science from many years of site-specific nutrient management research—allows farmers to very simply determine their fertilizer requirement. Its release through mobile phone technology in the Philippines and Indonesia, with 20,000 and 10,000 farmers, respectively, being reached over a period of a few months, indicates the potential of new IC technologies.

C.3 Progress toward the achievement of outcomes (1 ½ page)

The use of adjusted water management in rice fields to reduce methane emissions has been recognized by the UNFCCC as a Small-Scale Methodology in the Clean Development Mechanism to promote the reduction of greenhouse gas emissions and sequestration of carbon. The approval makes

explicit reference to the water-saving technologies developed by GRiSPs' lead agency, IRRI: "*Alternate wetting and drying method and aerobic rice cultivation methods are covered, see www.knowledgebank.irri.org/watermanagement*." (https://cdm.unfccc.int/methodologies/DB/D6MRRHNNU5RUHJXWKHN87IUXW5F5N0).

Stress-Tolerant Rice for Africa and South Asia (STRASA) aims to develop and disseminate rice varieties tolerant of drought, submergence, salinity, iron toxicity, and cold stress for use in South Asia and sub-Saharan Africa; build capacity of researchers and seed producers; and promote the exchange of elite germplasm, donor varieties, and knowledge (information from project report 2102, obtainable from IRRI). In 2012, the project estimated that more than 50,000 tons of different categories of seeds of stress-tolerant varieties were produced this year and over 4 million farmers have been reached. This success is attributed to several factors, among which a far-reaching network of partners along the research to adoption continuum and an effective awareness program targeting appropriate partners, policymakers, and farmers are the most important. The *SUB1* gene is being introduced in four mega-varieties from West Africa and another four mega-varieties from Madagascar. Private companies are using *SUB1* in their hybrid rice breeding programs.

The Cereal Systems Initiative for South Asia (CSISA) aims to enhance farm productivity and farmer livelihoods in the irrigated areas across the South Asian countries of India, Pakistan, Bangladesh, and Nepal.The CSISA Knowledge Bank (www.knowledgebank.irri.org/csisa; 4,000+ page views) was introduced as an accessible medium for compiling, synthesizing, and disseminating knowledge on localized best-bet technologies. Materials can be sorted according to technology, cropping system, type, and geographic relevance. Materials are available in English, Hindi, Urdu, Bangla, Punjabi, Tamil, Nepali, and Santhali. Numerous modes of outreach along with practical training, with conventional materials such as fact sheets, posters, calendars, and brochures, complemented with creative tools such as videos, radio programs, jingles, and community dramas, were created and disseminated (over 175 "materials"). A large number of partnerships (300+), including public, private, NGOs, farmer cooperatives, and service providers, were developed that helped in creating awareness and this accelerated the adoption of new technologies. CA-based technologies have achieved economic gains (laser land leveler: US$150‑250/ha; residue management: $150‑170/ha; direct-seeded rice: $100‑145/ha; unpuddled transplanting of rice: $100‑250/ha; zero-tillage: $200‑250/ha). In Bangladesh, new high-yielding varieties of rice seed were distributed, and farmers were engaged in participatory trials for stress-tolerant varieties. In total, the project was able to reach more than 140,000 ha of farmers' fields through the dissemination of new technologies for participatory farmer trials and seed minikit distribution. Findings reveal that the proportion of female labor contribution (unpaid and paid labor) in crop production varies by country, degree of mechanization, cropping system, farm size, socioeconomic status, and availability of male members. Female labor inputs in relation to male labor range from 40% to 60% in eastern UP, Tamil Nadu, and Bihar, India. In Gazipur (Bangladesh), female labor participation in rice production is less than 10% due to social norms.

The project "Improving the competitiveness of rice in Central Africa" aims to improve food security and rural incomes through innovative interventions that promote competitive domestic rice production and marketing. The project was carried out at two pilot project sites in Cameroon, Chad, and the Central African Republic. Six processing centers for quality rice were established in the project countries. These centers improve the competitiveness of rice by offering a "one-stop" solution covering the whole rice value chain from quality seed through paddy production and marketing to processing of high-quality rice and the production of flour and rice-based products for the markets. The centers have succeeded in bringing together all the stakeholders in the rice value chain and in linking smallholder farmers to the market. A new approach—co-sharing—was developed to bring together private operators (traders, processors) and farmers, who each took shares in cooperatives within which they then worked to produce, process, and commercialize quality products with the objective of making profits and earning dividends. These cooperatives are backstopped by micro-

financial institutions in the implementing countries. Because of this approach, around 179,000 farmers are now engaged in business in their cooperatives thanks to the project's reach and outscaling through other projects.

C.4 Progress toward impact (1/4 page)

Several ex post impact assessment studies are being undertaken. A meta-impact study is in progress to determine the extent of economic and social impacts of the rice technologies that have been developed, validated, and disseminated by the IRRC in Asia. The existing body of evidence generally provides an indication of the strong positive economic effects of IRRC technologies on rice farmers in various Asian countries (i.e., higher net income, lower input costs) (Rejesus et al., 2012). Through participant observation, farmer interviews, and responses from various adoption studies, specific environmental impacts of selected IRRC technologies and practices have been observed. For example, some studies revealed the important greenhouse gas implications of site-specific nutrient management and alternate wetting and drying. A reduction in chemical rodenticides was observed in impact studies on ecologically based rodent management, and possible increased use of preemergence herbicides (and weed resistance) was noted in impact studies of dry-seeded rice. At IRRI, a strategic assessment model is being developed as the world's most advanced attempt to quantify ex ante the impact potential of agricultural research for the poor. It is the first such model to combine multimarket relationships with nonlinear, positive shutdown price supply functions, to embed welfare analysis of labor demand effects, to reflect baseline subnational poverty variation over space and time, and to quantify the health effects associated with reduced caloric deficiency. AfricaRice conducted an ex ante impact assessment of the potential impact of rice research on income and poverty in sub-Saharan Africa and started working with farmers through a rice sector development hub network that will allow a much more systematic approach toward achievements of outcomes and impact. By pursuing its GRiSP R&D activities, sub-Saharan Africa's rice production is projected to increase from 18.4 million tons (rough rice) in 2010 to 46.8 million tons in 2020. The projected annual income benefit to rice farmers is around $1 billion (Boosting Africa's Rice Sector, AfricaRice).

D. Gender research achievements (1 page)

Baseline survey data were collected and analyzed on the different roles and responsibilities of women and men from different socioeconomic groups in rice-based agriculture in Asia, Africa, and Latin America. Data synthesis will be completed in 2013, but early results indicate that, in Southeast and South Asia, women contribute at least half of the total labor inputs in rice production. In eastern India and Nepal, women contribute 60–80% of total labor inputs per hectare. In Africa, women undertake much of the work in traditional rainfed, mangrove, and upland rice production systems. However, women's labor contributions in rice farming vary from region to region, and even within regions. For example, labor supplied by women for rice cultivation varies from 3% for floating rice cultivation (using animal traction) in Mali to 80–100% in mangrove swamp rice cultivation in the Gambia and Liberia.

Studies were conducted in Asia and Africa to assess the consequences of extreme climate variability on men and women in ensuring food security and sustaining livelihoods. As coping strategies in Africa, majorities of men and women changed their rice varieties grown and cropping pattern and grew more cash crops. Certain farmers shifted from crops to livestock, while others migrated and embarked on other income-generating activities. Men migrate farther away than women to big cities, where they can find paid jobs or do individual business.

The impacts of the development and dissemination of stress-tolerant varieties and labor-saving technologies in rice were assessed. Preliminary studies on the impacts of the adoption of submergence-tolerant rice varieties on women in eastern India revealed that, because of the ability of

Swarna-Sub1 to recover after 10–14 days of submergence, women do not have to do gap filling or replanting of crops that did not survive flooding as well. Also, providing women farmers with access to stress-tolerant seeds, such as the submergence-tolerant Swarna-Sub1, will increase resilience to extreme climate variability. Labor-saving technologies and mechanization are especially relevant for women rice farmers who provide labor for backbreaking rice operations such as transplanting, weeding, harvesting, and threshing. With labor-saving technologies, women have more leisure, and more time to take care of their children, help them with school lessons, prepare food, clean their house, and take care of livestock for additional income. Mechanical threshing at the farm level can improve efficiency in threshing, reduce losses, remove drudgery, and improve health, mostly for women).

In Vietnam, women are the specific target group for implementing principles of ecological engineering at the village level to enhance the ecological resilience of rice landscapes against insect pests (http://ricehoppers.net). Working with women's associations in the province of Tien Giang, 200 women farmers from 10 districts were trained on the theory and practice of ecological engineering. Women farmers, after ecological engineering was introduced, significantly reduced their insecticide use by 21.6%. Their spending for insect control decreased from $27/ha to $16/ha, a 41.6% decline.

Many of GRiSP's improved postharvest technologies have women farmers and entrepreneurs as clients, such as improved on-farm storage of rice and rice seeds, and improved parboiling processes in Africa. Fifty women rice processors in Senegal (Femmes de Pont Gendarme, FPG) were trained in leadership, marketing, business management, and entrepreneurship. An easily distinguishable house brand (Ndanane) was developed, which has become popular, leading to greatly increased demand for produce of FPG. This performance on the market has also attracted another women's group of 300 members of a neighboring village to request the same training from AfricaRice-Senegal. The use of improved parboiling equipment has improved the quality of parboiled rice produced by women in Benin. In Burundi, an innovative program with ex combatant women has so far led to 400 women taking up rice farming as part of their rehabilitation.

D.1 Gender equality targets defined

GRiSP has collected baseline data (literature, own surveys) on the main dimensions of gender equality (among others, labor distribution, empowerment index) in South and Southeast Asia, and Africa, and a synthesis report is forthcoming in 2013. The collection of sex-disaggregated data is fully mainstreamed in GRiSP's household surveys, focus group discussions, and other socioeconomic data collection and analysis instruments. Targets are set for the inclusion of women in participatory R&D activities such as participatory varietal selection (mostly, a minimum of 30% women's participation).

D.2 Institutional architecture for gender mainstreaming in place (integration of gender across the research cycle)

IRRI, AfricaRice, and CIAT have appointed gender focal points to lead and coordinate the implementation of GRiSP's gender strategy and to liaise with senior management. Together, these focal points constitute GRiSP's "Gender in Rice Research Team" that is responsible for overall design, implementation, and evaluation of GRiSP's gender strategy. Socioeconomic staffing for specifically conducting gender research consists of two and a half senior scientists, two postdoctoral fellows (four more to be recruited in 2013), and eight scientific support staff. In addition, a number of senior scientists (and their support teams) specifically include women farmers or entrepreneurs as target beneficiaries of the technologies they develop, such as GRiSP's postharvest specialists, business model developers, entomologists (see example of ecological engineering above), agronomists (see example of the 50 women from Pont Gendarme, Senegal, and the Burundi ex-combatant women above), and breeders (by taking women's needs and preferences obtained during PVS into account). In most training and capacity-building events, targets are set for the inclusion of women (varying from a

minimum of 30% to 50% women's participation). By the end of 2012, GRiSP initiated a revision of its gender strategy, which will be completed in 2013.

E. Partnerships building achievements (1/2 page)

GRiSP is managed and coordinated by its founding partners IRRI, AfricaRice, CIAT, Cirad, IRD, and JIRCAS through their equal participation in GRiSP's Program Planning and Management Team. Other partners contribute to planning and implementation processes through various mechanisms, such as participation on GRiSP's oversight committee and on the many steering and advisory committees of the components embedded within GRiSP. GRiSP is implemented through a variety of partnership arrangements (consortia, platforms, networks, and (grant) projects) that evolve in size and composition across the impact pathway from product development to having impact "at scale" (GRiSP Partnership in motion; www.grisp.net/main/summary).

The GRiSP coordinating partners employ several mechanisms to align GRiSP with national rice sector programs and with the priorities and strategies of its main national R&D partners:

- In Asia, IRRI holds country planning meetings every 3 years with most of the Asian countries it collaborates with to align priorities, agree on joint goals and objectives, monitor ongoing joint activities, and develop new ones.
- In Africa, AfricaRice Center is an autonomous intergovernmental association of 24 (as of November 2012) member countries covering West, Central, East, and North Africa. Its objectives, strategies, and research activities are aligned with those of its member states and get approved by the AfricaRice Council of Ministers.
- In Latin America, the main mechanism for coordinating and aligning rice R&D with country priorities and strategies is through the Latin American Fund for Irrigated Rice (FLAR) that includes 15 member countries.

GRiSP interacts closely with all major regional fora and economic communities that have a major interest in development of the rice sector. GRiSP uses these interactions to align its agenda with those of these fora that represent national and regional interests and development priorities. These fora include, among others, the Council for Partnership on Rice Research in Asia (CORRA); regional fora involved in GFAR (e.g., FARA, FORAGRO, and APAARI at the continental level and CORAF and ASARECA in Africa at the subregional level); higher-level political bodies and development initiatives targeting food security and poverty, such as CAADP (NEPAD), CARD, ASEAN, SAARC, and APEC; Regional Economic Communities (REC) such as the Economic Community of West African States (ECOWAS); international and regional development funds and banks, including IFAD, the World Bank, ADB, AfDB, and IDAB (many of those contribute directly as donors to GRiSP through the CGIAR funding mechanisms and through bilateral projects).

F. Capacity building (1/2 page)

Some 2,638 people received training at AfricaRice, CIAT and IRRI through special courses; among the trainees are extension agents, advice providers, farmers, processors (millers), and academics from NARES partners and local universities. In addition, many in-country training activities took place. For example, in Bangladesh, "training of trainer" activities were coupled with technical innovations and backstopping in Rangpur and Mymensingh districts. In total, 214 training events were organized involving 20,572 stakeholders composed of 736 agricultural professionals and 19,836 farmers, including 5,006 women. In India, 14,573 large-scale participatory demonstrations were conducted across five hubs. A total of 441 training events focused on conservation agriculture (CA)-based crop management technologies, communication skills, and data management reached a total of 36,454 stakeholders, including 3,718 agricultural professionals and 32,736 farmers (1,857 women). South-south partnership between the Philippines and Africa under CARD has enabled 22 young extension

officers from Ethiopia, Nigeria, Ghana, Sierra Leone, and Burundi to receive 4 months of training in rice production and extension at PhilRice and IRRI. Curricula for group training on integrated crop management and seed production were developed through consultation with stakeholders from NGOs and farmer organizations in Africa, validated in group training events held in 2012, and further improved and finalized.

G. Risk management (less than 1/2 page)

The main risk is a reduction in CGIAR W 1,2 funding. In 2012, the funding level was not in accordance with GRiSP's approved growth scenario. Lack of clarity on CGIAR funding that existed in 2010-11, coupled with reduced bilateral grant income, resulted in CIAT not being able to contribute as originally planned to GRiSP. Without the approved growth in CGIAR funding, GRiSP was not able to expand its scholarship and capacity-building program, nor prepare for a second call for proposals on its competitive frontier project scheme.

A second risk we identify lies in the external pressure to make CRPs accountable for outcomes (so-called intermediate development outcomes) that are beyond their control. According to the ISPC, "*The realization of IDOs is not under control of the CRPs and depends on multiple, often iterative, steps conducted by other players and necessarily with substantial additional investment (typically 10 x). While the CRPs are accountable for their outputs and have some control over the near-term adoption and use of their research results, the development outcomes occur, particularly at scale, as a result of activities, policies, and investments outside the CGIAR [CRP].*"[1] Hence, the development of IDOs and their targets by the CRPs should be carefully weighed against an acceptable level of accountability, and should not result in a cascading of accountabilities among its various partners (the "passing the bucket" effect).

H. Lessons learned (1 page)

A total of 91 milestones were planned, many of which were contributed to by two or three of GRiSP's CGIAR centers. Counting each of them separately, we get 134 milestones, of which only 65% were fully accomplished (green), 27% partially accomplished (yellow), and 8% not accomplished (red). Overall, the relatively high scores for yellow by all three centers may reflect the consequences of unmet approved growth in funding and some too ambitious targets set out by the scientists. Ambitions were set too high in Themes 5 and 6, and in 2013, milestones will be critically reviewed and scaled back where needed.

Percentage scoring among themes:

Theme	Green	Yellow	Red
1	90	10	0
2	69	14	17
3	67	27	7
4	67	33	0
5	49	44	7
6	45	36	18

[1] *ISPC: Strengthening Strategy and Results Framework through Prioritization*

Annex 1: CRP indicators of progress, with glossary and targets

CRPs involved with this indicator	Indicator	Glossary/guidelines for measuring the indicator	2012	Comments	2013 target
KNOWLEDGE, TOOLS, DATA					
All	1. Number of flagship "products" produced by CRP	These frameworks and concepts are significant and complete enough to have been highlighted on Web pages, and publicized through blogs, press releases, and/or policy briefs. They are significant in that they should likely change the way stakeholders along the impact pathway allocate resources and/or implement activities. They should be products that change the way these stakeholders think and act. Tools, decision-support tools, guidelines, and/or training manuals are not included in this indicator.	> 23	GRiSP's flagship products are principally new varieties, discovered genes, genetic diversity created and maintained, crop and natural resource management technologies, etc. An incomplete list would include the *SUB1* gene, *PSTOL1* gene, *Saltol* gene, drought-tolerance genes (counted as one), several genes related to pest and disease resistance (counted as one), genes conferring aroma, Golden Rice, C_4 rice, aerobic rice, hybrid rice, ecological engineering, direct-seeded rice, site-specific nutrient management, water-saving technologies, ecologically based pest control (e.g., rodents), remote-sensing-based rice mapping, hermetic storage, conservation agriculture options for rice (including minimum tillage), laser land leveling, several mechanization options (counted as one), weed diagnostics, and community seed banks.	23
All	2. % of flagship products produced that have explicit target of women farmers/NRM managers	The Web pages, blogs, press releases, and policy briefs supporting indicator #1 must have an explicit focus on women farmers/NRM managers to be counted.	22%	Five technologies: ex-combatant women trained in rice technologies in Burundi, a Senegalese women's group trained in marketing of locally	25%

				produced rice, ecological engineering for women in Vietnam, several postharvest technologies (on-farm storage, rice processing), InfoLady farmers in Bangladesh trained on rice technology transfer.	
All	3. % of flagship products produced that have been assessed for likely gender-disaggregated impact	Reports/papers describing the products should include a focus on gender-disaggregated impacts if they are to be counted.	13%	Three technologies: adoption of stress-tolerant varieties, mechanized crop establishment, branding effects of rice in Africa	15%
All	4. Number of "tools" produced by CRP	These are significant decision-support tools, guidelines, and/or training manuals that are complete enough to have been highlighted on Web pages, and publicized through blogs, press releases, and/or policy briefs. They are significant in that they should likely change the way stakeholders along the impact pathway allocate resources and/or implement activities.	> 32	16 Rice Knowledge Banks (14 country-specific, 1 general, 1 CSISA), *Nutrient Manager*, rice doctor, good agricultural practices for rice in East Africa, WeedSmart, SHROVAL rainfed rice management practices, rice simulation models (ORYZA2000, RIDEV, SAMARA, etc.; counted as one), PVS manual, seed production training manual, integrated rice management manual for Africa, Pani-pipe tool for water management, International Crop Information System, International Rice Information System, season-long extension training manual, *Handbook on rice policy for Asia*, weed management decision-support tool, video on community approaches to inland valley development in sub-Saharan Africa, manual on farmer-participatory inland valley lowland development	30
All	5. % of tools that have an explicit target of women farmers	The Web pages, blogs, press releases, and policy briefs supporting indicator #4 must have an explicit focus on women farmers/NRM managers to be counted.	3%	Participatory Variety Selection explicitly targets 30% women participation (others not inventoried)	5%

All	6. % of tools assessed for likely gender-disaggregated impact	Reports/papers describing the products should include a focus on gender-disaggregated impacts if they are to be counted.	3%	Participatory Variety Selection	5%
All	7. Number of open-access databases maintained by CRP		6	International Rice Information System, World Rice Statistics, Household Survey Database, Rice Knowledge Bank, AfricaRice information system, weed identification tool, AfricaRice genebank information system	6
All	8. Total number of users of these open-access databases			Not inventoried	
All	9. Number of publications in ISI journals produced by CRP		215	AfricaRice: 48; IRRI: 155; CIAT: 12	270
1,2,3, 4, 6	10. Number of strategic value chains analyzed by CRP		1	Rice Value Chain	1
1,5,6,7	11. Number of targeted agroecosystems analyzed/characterized by CRP	Use the Millennium Ecosystem Assessment (MEA) typology of cultivated systems and of forests and woodland systems (MEA, 2005, Ecosystems and Human Well-Being: Current State and Trends, Volume 1) to define these agroecosystems and specify the regions concerned.		NA	
1,5,6,7	12. Estimated population of above-mentioned agroecosystems			NA	
CAPACITY ENHANCEMENT AND INNOVATION PLATFORMS					
All	13. Number of trainees in short-term programs facilitated by CRP (males)	The number of individuals to whom significant knowledge or skills have been imparted through interactions that are intentional, structured, and purposed for imparting knowledge or skills should be counted. This includes farmers, ranchers, fishers, and other primary sector producers who receive training in a variety of	>> 1,702	AfricaRice: 184 IRRI: 1,462 CIAT: 56 These numbers represent mainly those training activities given at headquarters with a few in-country	1500

		best practices in productivity, postharvest management, linking to markets, etc. It also includes rural entrepreneurs, processors, managers, and traders receiving training in the application of new technologies, business management, linking to markets, etc., and training to extension specialists, researchers, policymakers, and others who are engaged in the food, feed, and fiber system and natural resources and water management. Include training on climate risk analysis, adaptation, mitigation, and vulnerability assessments as they relate to agriculture. Training should include food security, water resource management/IWRM, sustainable agriculture, and climate change resilience. .		training activities. Many more people were trained in-country, but no system exists yet within GRiSP to collect those numbers accurately.	
All	14. Number of trainees in short-term programs facilitated by CRP (females)	(see above, but for females)	>> 936	AfricaRice: 146 IRRI: 756 CIAT: 34 These numbers represent mainly those training activities given at headquarters with a few in-country training activities. Many more people were trained in-country, but no system exists yet within GRiSP to collect those numbers accurately.	1000
All	15. Number of trainees in long-term programs facilitated by CRP (males)	The number of people who are currently enrolled in or graduated in the current fiscal year from a bachelor's, master's, or PhD program or are currently participating in or have completed in the current fiscal year a long-term (degree-seeking) advanced training program such as a fellowship program or a postdoctoral studies program. A person completing one long-term	238	AfricaRice: 37 PhD students, 62 MSc/BSc students IRRI: 134 in total CIAT: 0 PhD students, 5 MSc/Bsc students	200

		training program in the fiscal year and currently participating in another long-term training program should be counted only once.			
All	16.Number of trainees in long-term programs facilitated by CRP (females)	(see above, but for females)	154	AfricaRice: 9 PhD students, 31 MSc/BSc students IRRI: 111 in total CIAT: 1 PhD student, 2 MSc/BSc students	150
1,5,6,7	17. Number of multi-stakeholder R4D innovation platforms established for the targeted agroecosystems by the CRPs	To be counted, a multistakeholder platform has to have a clear purpose, generally to manage some type of tradeoff/conflict among the different interests of different stakeholders in the targeted agroecosystems, and inclusive and clear governance mechanisms, leading to decisions to manage the variety of perspectives of stakeholders in a manner satisfactory to the whole platform.		NA	
TECHNOLOGIES/PRACTICES IN VARIOUS STAGES OF DEVELOPMENT					
All	18. Number of technologies/NRM practices under research in the CRP (Phase I)	Technologies to be counted here are agriculture-related and NRM-related technologies and innovations, including those that address climate change adaptation and mitigation. Relevant technologies include but are not limited to • Mechanical and physical: new land preparation, harvesting, processing, and product-handling technologies, including biodegradable packaging. • Biological: new germplasm (varieties, breeds, etc.) that could be higher-yielding or higher in nutritional content and/or more resilient to climate impacts; affordable food-based nutritional supplementation such as vitamin A-rich sweet potatoes or rice, or high-protein maize, or improved livestock breeds; soil	67	GRiSP Themes 1–4 develop products that are technologies/NRM practices through a pipeline approach. For rice varieties, breeding lines are continuously produced, evaluated, and moved through the pipeline into national release systems. NRM technologies are disembodied and are constantly under research for further improvement, while at the same time "delivered" to stakeholders for adaptation and adoption each year and in different countries. The following number of products are under research, per theme (see GRiSP	67

		management practices that increase biotic activity and soil organic matter; and livestock health services and products such as vaccines. • Chemical: fertilizers, insecticides, and pesticides sustainably and environmentally applied, and soil amendments that increase fertilizer-use efficiencies. • Management and cultural practices: sustainable water management practices; sustainable land management practices; sustainable fishing practices; Information technology; improved/sustainable agricultural production and marketing practices; increased use of climate information for planning disaster risk strategies in place; climate change mitigation and energy efficiency; and natural resource management practices that increase productivity and/or resiliency to climate change. IPM, ISFM, and PHH as related to agriculture should all be included as improved technologies or management practices. New technologies or management practices under research counted should be only those under research in the current reporting year. Any new technology or management practice under research in a previous year but not under research in the reporting year should not be included.		document): Theme1: 17 Theme 2: 25 Theme 3: 14 Theme 4: 11	
All	19. % of technologies under research that have an explicit target of women farmers	The papers, Web pages, blogs, press releases, and policy briefs supporting indicator #x must have an explicit focus on women farmers/NRM managers to be counted.	8%	Senegalese women (50) seed and paddy producers have been trained in producing quality branded rice for the Dakar market, ex-combatant women trained in rice technologies in Burundi, ecological engineering for women in Vietnam, several postharvest technologies (on-farm storage, rice	10%

				processing), InfoLady farmers in Bangladesh	
All	20. % of technologies under research that have been assessed for likely gender-disaggregated impact	Reports/papers describing the products should include a focus on gender-disaggregated impacts if they are to be counted.	9%	Six technologies: adoption of drought-tolerant varieties, submergence-tolerant varieties, and salt-tolerant varieties, mechanized crop establishment, branding effects of rice in Africa	10%
1,5,6,7	21 Number of agroecosystems for which CRP has identified feasible approaches for improving ecosystem services and for establishing positive incentives for farmers to improve ecosystem functions as per the CRP's recommendations	Use the Millennium Ecosystem Assessment (MEA) typology of cultivated systems and of forests and woodland systems (MEA, 2005, Ecosystems and Human Well-Being: Current State and Trends, Volume 1) to define these agroecosystems; identify the regions if possible.		NA	
1,5,6,7	22. Number of people who will potentially benefit from plans, once finalized, for the scaling up of strategies	Indicate the potential number of both women and men.		NA	
All, except 2	23. Number of technologies/NRM practices field tested (Phase II)	Under "field testing" means that research has moved from focused development to broader testing and this testing is underway under conditions intended to duplicate those encountered by potential users of the new technology. This might be in the actual facilities (fields) of potential users, or it might be in a facility set up to duplicate those conditions.	67	GRiSP Themes 1–4 develop products that are technologies/NRM practices through a pipeline approach. Hence, these products are usually both under research and under field testing with some of GRiSP's 900 partners, and the same number applies as in row 18. Most products are even at the same time in the dissemination stage by yet other partners. For example, the technology of alternate wetting and drying for saving water is under	67

				research for its effects on greenhouse gas emissions and for improved nutrient management (e.g., at IRRI), while it is under field testing under conventional nutrient management with certain partners (e.g., in Africa), while it is being released and disseminated with other partners in other countries (e.g., in the Philippines, Vietnam, and Bangladesh).	
1,5,6,7	24. Number of agro-ecosystems for which innovations (technologies, policies, practices, integrative approaches) and options for improvement at system level have been developed and are being field tested (Phase II)	Use the Millennium Ecosystem Assessment (MEA) typology of cultivated systems and of forests and woodland systems (MEA, 2005, Ecosystems and Human Well-Being: Current State and Trends, Volume 1) to define these agroecosystems and specify the regions where field testing is underway.		NA	
1,5,6,7	25. % of above innovations/approaches/options that are targeted at decreasing inequality between men and women				
1,5,6,7	26. Number of published research outputs from CRP used in targeted agroecosystems				
All, except 2	27.Number of technologies/NRM practices released by public and private sector partners globally (Phase III)	In the case of crop research that developed a new variety, for example, the variety must have passed through any required approval process, and seed of the new variety should be available for multiplication. The technology should have proven benefits and be as ready for use as it can be as it emerges from the research and testing	77	Here, we do not count products developed under Theme 1 as these are seen more as prebreeding products (discovered genes, breeding populations). For varieties developed under Theme 2, we include only an estimate of	77

		process. Technologies made available for transfer should be only those made available in the current reporting year. Any technology made available in a previous year should not be included.		released varieties: through CIAT and FLAR: 10; through AfricaRice and partners: 9; through IRRI and partners: 33. Products developed under Themes 3 and 4 are not really "released" by partners; rather, they are adapted and disseminated by partners. As explained in row 23, all of these products are under dissemination (in whole, or through component technologies) by some partner in some of GRiSP's target countries because of the pipeline approach used: 25.	
POLICIES IN VARIOUS STAGES OF DEVELOPMENT					
All	28. Numbers of policies/regulations/ administrative procedures analyzed (Stage 1)	Number of agricultural enabling environment policies/regulations/administrative procedures in the areas of agricultural resource, food, market standards and regulation, public investment, natural resource or water management, and climate change adaptation/mitigation as it relates to agriculture that underwent the first stage of the policy reform process, that is, analysis (review of existing policy/regulation/administrative procedure and/or proposal of new policy/regulations/administrative procedures). . Please count the highest stage completed during the reporting year, and don't double count for the same policy.	2	GRiSP contributed to policy dialogues, analyses of the rice sector, and rice sector development plan formulation in Laos (www.fao.org/investment/tci-publications/country-highlights/en/). GRiSP also contributed to the elaboration of a strategic orientation framework for a regional rice initiative in West Africa, aiming at the adoption of policies to modernize rice production systems, reduce rice imports, and improve regional trade.	2
All	29. Number of policies/regulations/	… that underwent the second stage of the policy reform process. The second stage includes public		Not inventoried	

	administrative procedures drafted and presented for public/stakeholder consultation (Stage 2)	debate and/or consultation with stakeholders on the proposed new or revised policy/regulation/administrative procedure.			
All	30. Number of policies/regulations/ administrative procedures presented for legislation (Stage 3)	: … underwent the third stage of the policy reform process (policies were presented for legislation/decree to improve the policy environment for smallholder-based agriculture).		Not inventoried	
All	31. Number of policies/regulations/ administrative procedures prepared passed/approved (Stage 4)	: … underwent the fourth stage of the policy reform process (official approval (legislation/decree) of new or revised policy/regulation/administrative procedure by relevant authority).		Not inventoried	
All	32. Number of policies/regulations/ administrative procedures passed for which implementation has begun (Stage 5)	: … completed the policy reform process (implementation of new or revised policy/regulation/administrative procedure by relevant authority).		Not inventoried	
OUTCOMES ON THE GROUND					
All	33. Number of hectares under improved technologies or management practices as a result of CRP research	Indicate the regions where this is occurring and whether the application of technologies is on a new or continuing area.	4,763,000	Being a global partnership, GRiSP does not have an accurate system in place to keep track—worldwide—of the adoption of improved technologies resulting from its research. Specific numbers can be found in project reports for certain geographic areas where the project operates (e.g., see section C3 of the report; GRiSP does not have a system in place that aggregates estimated results from all individual projects and from all its partners—specific project reports can	4,763,000

				be supplied upon request). However, a fair estimate can be made of the global adoption of GRiSP-derived improved rice varieties based on a synthesis of pertinent literature and adoption studies (the same methodology was employed to derive USAID FtF indicators in 2011): ex post impact studies show that 70% of Asian rice area is modern varieties, 70% of which have IRRI germplasm. We assume that the average varietal age is 15 years (replacement rate). So, that equals 134,000,000 ha *0.7*0.7/15 = 4,380,000 (harvested) ha of annual new adoption of IRRI-derived varieties in Asia. For sub-Saharan Africa, the actual adoption rate of NERICA varieties is about 26% and 24% for other improved varieties. Harvested area of NERICA varieties in 2009 was about 1.1 million ha and 1.7 million ha were under other improved varieties. Assuming a replacement rate of once every 15 years, this gives 187,000 hectares of annual new adoption of AfricaRice-derived varieties in sub-Saharan Africa. For LAC: No reliable adoption data are available. Assuming the same adoption pattern as in Asia, the following area is obtained: 6,000,000*0.7*0.7/15 = 196,000 ha. We did not make an estimate of the worldwide adoption of improved crop and NRM technologies; we assume	

				that, mostly, these will overlap with the adoption of improved varieties.	
All	34. Number of farmers and others who have applied new technologies or management practices as a result of CRP research	Indicate the regions where this is occurring and whether the application of technologies is on a new or continuing area and indicate 34 (a) number of women farmers concerned 34(b) number of male farmers concerned	7,741,000 Male: 3,870,500 Female: 3,870,500 Roughly 50% of rice farmers are women	Asia: Estimating that 70% of the harvested rice area is physical rice area, that the average farm size of rice farmers is 1 hectare, and assuming an average of two farmers per household, the number of farmers applying new technologies is 1.4 times the area under new technologies: the number of farmers is 6,128,000. In Africa, with farm size of 0.5 ha and assuming three to four farmers per household, this gives 3.5*187,000/0.5 = 1,309,000 farmers. For LAC: Farm sizes in southern LA are large (we assume 20% of total area), but we estimate 1 ha again for Central America and northern LA. Assuming again two farmers per household, we arrive at 0.8*2*196,000 = 313,000 farmers.	7,741,000 Male: 3,870,500 Female: 3,870,500 Roughly 50% of rice farmers are women

Annex 2: Performance indicators for gender mainstreaming with targets defined

Performance Indicator	CRP performance approaches requirements	CRP performance meets requirements	CRP performance exceeds requirements
1. Gender inequality targets defined	Sex-disaggregated social data are being collected and used to diagnose important gender-related constraints in at least one of the CRP's main target populations.	Sex-disaggregated social data collected and used to diagnose important gender-related constraints in at least one of the CRP's main target populations. And The CRP has defined and collected baseline data on the main dimensions of gender inequality in the CRP's main target populations relevant to its expected outcomes (IDOs).	Sex-disaggregated social data collected and used to diagnose important gender-related constraints in at least one of the CRP's main target populations. And The CRP has defined and collected baseline data on the main dimensions of gender inequality in the CRP's main target populations relevant to its expected outcomes (IDOs). And The CRP targets changes in levels of gender inequality to which the CRP is or plans to contribute, with related numbers of men and women beneficiaries in main target populations.
2. Institutional architecture for integration of gender is in place	- CRP scientists and managers with responsibility for gender in the CRP's outputs are appointed, and have written TOR. - Procedures defined to report use of available diagnostic or baseline knowledge on gender routinely for assessment of the gender equality implications of the CRP's flagship research products as per the Gender Strategy. - CRP M&E system has protocol for tracking progress on	- CRP scientists and managers with responsibility for gender in the CRP's outputs are appointed, and have written TOR and funds allocated to support their interaction. - Procedures defined to report use of available diagnostic or baseline knowledge on gender routinely for assessment of the gender equality implications of the CRP's flagship research products as per the Gender Strategy. - CRP M&E system has protocol for tracking progress on integration of	- CRP scientists and managers with responsibility for gender in the CRP's outputs are appointed, and have written TOR and funds allocated to support their interaction. - Procedures defined to report use of available diagnostic or baseline knowledge on gender routinely for assessment of the gender equality implications of the CRP's flagship research products as per the Gender Strategy. - CRP M&E system has protocol for tracking progress on integration of gender in research. And A CRP plan approved for capacity development in gender analysis.

	integration of gender in research.	gender in research. And A CRP plan approved for capacity development in gender analysis.	And The CRP uses feedback provided by its M&E system to improve its integration of gender into research.

GRiSP's Mission

GRiSP's mission is to reduce poverty and hunger, improve human health and nutrition, reduce the environmental footprint, and enhance the ecosystem resilience of rice production systems through high-quality international rice research, partnership, and leadership.

Objectives

1: To increase rice productivity and value for the poor in the context of a changing climate through accelerated demand-driven development of improved varieties and other technologies along the value chain.

2: To foster more sustainable rice-based production systems that use natural resources more efficiently, are adapted to climate change and are ecologically resilient, and have reduced environmental externalities.

3: To improve the efficiency and equity of the rice sector through better and more accessible information, improved agricultural development and research policies, and strengthened delivery mechanisms.

Global research themes

1: Harnessing genetic diversity to chart new productivity, quality, and health horizons.

2: Accelerating the development, delivery, and adoption of improved rice varieties.

3: Ecologically and sustainably managing rice-based production systems.

4: Extracting more value from rice harvests through improved quality, processing, market systems, and new products.

5: Enhancing impact through technology evaluations, targeting, and policy options.

6: Supporting the growth of the global rice sector.

CGIAR Research Program on Rice
Global Rice Science Partnership

CGIAR is a global research partnership for a food-secure future. Its science is carried out by the 15 research centers of the CGIAR consortium in collaboration with hundreds of partner organizations.


IRRI


CIAT
Centro Internacional de Agricultura Tropical
International Center for Tropical Agriculture
Consultative Group on International Agricultural Research


Africa Rice Center
Centre du riz pour l'Afrique
AfricaRice


cirad
AGRICULTURAL RESEARCH
FOR DEVELOPMENT


IRD
Institut de recherche
pour le développement


JIRCAS
JAPAN