

## TECHNICAL ASSISTANCE COMPLETION REPORT

Divisions: SANS, SEAE, CWEN

TA No., Country and Name		Amount Approved: \$3,000,000	
TA 6208-REG: Ninth Agriculture and Natural Resources Research at International Agricultural Research Centers		Revised Amount:	
Executing Agencies (EAs): Subproject 1: World Vegetable Center Subproject 2: International Maize and Wheat Improvement Center Subproject 3: International Rice Research Institute Subproject 4: International Water Management Institute Subproject 5: ADB	Sources of Funding:  ADB TA Special Fund (43% total cost)  EA core budgets (39%)  National Agricultural Research System (18%)	Amount Undisbursed: \$3,785	Amount Utilized: \$2,996,215
TA Approval Date: 16 Dec 2004	TA Signing Date: 16 Feb 2005	Fielding of First Consultants: 22 April 2005	TA Completion Date Original: 31 Dec 2007      Actual: 30 Nov 2009  Account Closing Date Original: 31 Dec 2007      Actual: 10 Dec 2009

**Description:** The TA encompasses five stand-alone subprojects that support the development, application, and dissemination of scientific research on problems that farmers face in the Asia and Pacific region. Four subprojects were independently executed by centers that are part of the Consultative Group on International Agricultural Research (CGIAR). These were (i) "Improving Rural Livelihoods through Development of Vegetable-Based Postharvest Technologies" implemented by The World Vegetable Center; (ii) "Improving Farmers' Incomes through Enhanced Maize Production Technologies in Drought-Prone Environments in East and Southeast Asia" carried out by the International Maize and Wheat Improvement Center (CIMMYT); (iii) "Enhancing Farmers' Incomes and Livelihoods through Integrated Crop and Resource Management in the Rice-Wheat System in South Asia" through the International Rice Research Institute (IRRI); and (iv) "Enabling Communities in the Aral Sea to Combat Land and Water Resource Degradation through Creation of *Bright Spots*" implemented by the International Water Management Institute (IWMI). For each of the four subprojects, the CGIAR centers work collaboratively with national and agricultural research system (NARS) scientists. A small fifth subproject managed by ADB entitled "Workshops for Strengthening Partnerships for More Effective Planning, Research, and Development in Agriculture in the Mekong Region and Southeast Asia" was also planned.

*Subproject 1:* Vegetable production in Cambodia, Lao PDR, and Viet Nam (collectively referred to as CLV) can be highly profitable, but is severely constrained by postharvest losses that reduce profits for farmers and marketers. Postharvest loss was estimated on average as 30% at a cost of \$300 million annually. The subproject supported needs assessment, development of improved technologies, with training provided to national agricultural research extension systems (NARES), farmers, processors, and other supply chain actors, and strengthening partnerships to increase productivity and profitability within the vegetable supply chain so that vegetable production would be less risky and more attractive for farmers in the CLV.

*Subproject 2:* The five major maize-growing countries in tropical Southeast Asia—southern PRC, Indonesia, Philippines, Thailand, and Viet Nam—have been developing high-yielding maize varieties with tolerance to various stresses, including drought, with the use of molecular tools to aid conventional breeding. The TA was intended to ensure that high-yielding varieties reach farmers' fields by varietal improvement and testing, building the capacity of national scientists and organizing a network of partners working to enhance maize productivity in the region.

*Subproject 3:* Despite tremendous gains in rice and wheat production over the past 40 years, continued population growth requires additional gains. However, rice-wheat system productivity is plateauing because of a fatigued natural resource base. Newer production technologies have not effectively reached farmers. The Rice-Wheat Consortium of the Indo-Gangetic Plains, comprised of NARS in Bangladesh, India, Nepal, and Pakistan, therefore requested ADB assistance to integrate available but new production strategies and technologies into their national systems and promote such technologies among farmers.

*Subproject 4:* Over-exploitation of water resources in the Aral Sea Basin, principally through the development of intensive irrigation, has resulted in severe environmental costs and degradation of agricultural land. It is estimated that 60% of a total of 7.5 million ha of irrigated land in this region is salinized, reducing potential cotton and wheat

yields by up to 50%. The subproject aimed to identify options for improving agricultural productivity in saline areas of Uzbekistan, Kazakhstan and Turkmenistan.

*Subproject 5:* ADB recognized the need for greater interaction among the CGIAR centers, the NARS, and ADB to ensure that research activities funded by ADB regional TA reflect the sector priorities of the region and TA outputs are linked with national programs and ADB's operational portfolio. The previous CGIAR TA funded two successful regional workshops for Central and South Asia. \$150,000 was allocated under this TA for similar collaborative events among stakeholders from Southeast Asia.

**Expected Impact, Outcome and Outputs:** The expected impact of the overall TA was to improve rural income and environment practices in the Mekong, South Asia, Southeast Asia, and East and Central Asia regions. The overall TA design and monitoring framework<sup>1</sup> had five output statements (one for each subproject). These were (i) reduce post-harvest losses of vegetable production in the Mekong; (ii) improve and stabilize maize yields and production in Southeast Asia; (iii) improve productivity and efficiency, and enhance the environment in South Asia rice-wheat systems; (iv) enhance crop yields and reduce land degradation and water shortages in Central Asia; and (v) improve research impacts on farm productivity through better coordination among key stakeholders, and effective information exchange. The six expected outputs may be summarized as (i) advanced technologies in vegetable, maize and rice-wheat production and for utilizing saline soil and water developed, tested and disseminated; and (ii) research capacities of four CGIAR centers and 16 NARS are enhanced. Since each CGIAR center established partnerships with NARS and then submitted funding proposals to ADB, ownership and stakeholder participation was high.

#### **Delivery of Inputs and Conduct of Activities**

The TA was well-formulated and the design appropriate for addressing key challenges in the agriculture sector. The engagement of a CGIAR center to coordinate each subproject and build the capacity of national-level scientists was effective. Implementation arrangements were flexible enough to accommodate changes in priorities and circumstances. All four subprojects implemented by CGIAR centers were implemented in a cost-effective manner and activities were generally completed on time (see specific cases below). Required reports were highly detailed, well written, and presented on time. Given the fairly modest resources provided, outputs were impressive. This is due to efficiency of use of the ADB funds and significant cost sharing by CGIAR centers and NARS. A considerable portion of TA activities were performed directly by CGIAR and NARS staff; the ADB financing was used for incremental personnel costs, mostly for subproject management and short-term researchers. The performance of the consultants was deemed satisfactory. ADB's supervision was also satisfactory for the 4 main components (see next paragraph regarding the fifth component).

The fifth subproject was dropped after an internal reorganization in ADB resulted in the dissolution of the umbrella entity responsible for agriculture and natural resources across ADB, the Agriculture, Natural Resources, and Social Sectors Division of the Regional and Sustainable Development Department in July 2006. The focal entity for the sector was transferred to the East and Central Asia Department, and then to the East Asia Department, and the project officer assignment also changed several times. As a result, no activities for the fifth subproject had been conducted after two years of TA implementation. In August 2007, ADB approved a minor change in scope to transfer the funds designated for subproject 5 to subproject 3. It seems that ADB could have done more to implement this fifth component, and more consideration should be given to maintaining continuity for initiatives such as these that require longer-term commitment.

*Subproject 1:* The TA agreement with the World Vegetable Center was signed in January 2005 and subproject activities were implemented between May 2005 and July 2008 with a total budget of \$696,500. The component started 3 months after the TA agreement was signed. After only 6-months of project implementation, AVRDC's Project Manager resigned from his position and was needed to be replaced. It took 7 months (May 2006) to recruit and mobilize his replacement. Two missions were fielded under Subproject 1.

*Subproject 2:* The TA agreement with CIMMYT was signed in February 2005 and subproject activities implemented during the period March 2005 to December 2008 with a total cost of \$750,000. An 8-month no-cost extension from April to December 2008 was granted to allow CIMMYT to hold a final meeting in conjunction with the 10th Asian Regional Maize Workshop. Three missions were conducted annually to coincide with the regional workshops.

*Subproject 3:* The TA agreement was signed with IRRI in January 2005 and activities were implemented between January 2005 and December 2008 with a total cost of \$848,500. When the project started, the wheat season had already passed. A no-cost extension was granted by ADB in April 2007 to allow the subproject to collect data and conduct an impact analysis on three full cropping cycles: rice in 2005, rice-wheat in 2006 and 2007, and wheat in 2008. Additional complementary activities were added to the subproject's work plan in August 2007 to absorb the additional funds unspent from subproject 5. One of these included the joint IRRI/ADB publication of a book entitled

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<sup>1</sup> Each subproject also had its own design and monitoring framework.

"Integrated Crop Resource Management in the Rice-Wheat System of South Asia." In order to conduct a media launch of the book in October 2009, and since there were some undisbursed TA funds, ADB extended the TA completion date until 30 November 2009. ADB conducted review missions in February 2006, February 2007, and November 2008.

*Subproject 4:* The TA agreement with IWMI was signed in August 2005 and activities were implemented shortly thereafter until November 2008 with a total cost of \$700,000. Annual review missions were conducted in 2005, 2006 and 2007, all reporting satisfactory progress of the TA towards achieving the stated outputs. The 2005 review mission also resulted to a small amendment to the TA implementation plan to increase coordination resources. The final report provided a comprehensive coverage of the innovations identified and capacity building activities that were required under the three key TA outputs. In view of the project success, information is required to be disseminated to farmers and government policy makers in the participating countries.

#### **Evaluation of Outputs and Achievement of Outcome**

*Subproject 1* This subproject aimed to reduce post-harvest losses of vegetable production in the Mekong region. Specifically it conducted an in-depth assessment of the vegetable supply chain in Cambodia, Lao PDR, and Vietnam, promoted low-cost postharvest technologies, including high-yielding varieties of popular vegetables with improved shipping and processing qualities, fresh produce handling and processing techniques, provided training, capacity building, and information dissemination in postharvest handling and processing and promoted partnerships among the three countries. Outcomes included: (i) average postharvest losses for high value vegetable crops in target areas were reduced by at least 10% for tomatoes and 20% for leafy vegetables (against targets of 20-40%); (ii) employment opportunities for the rural labor force (for both men and women) increased due to the support given to postharvest industries; (iii) competitiveness in the private sector increased due to the increased availability of low-cost technologies and market information; and (iv) the availability of fresh and processed vegetables, which leads to healthier diets and nutrition, has increased.

*Subproject 2* set out to increase and stabilize maize productivity in five major tropical maize-growing countries of East and Southeast Asia by developing, and enhancing the capacity of NARS to develop and deliver, stress-tolerant, high-yielding maize varieties suitable for drought-prone areas. The subproject succeeded in developing a breeding program of drought-tolerant maize varieties, with a range of successes in each country. While breeding new varieties normally take 6-12 years, the drought tolerant germplasm received and exchanged by each participating country was incorporated into their active breeding projects and will inevitably result in enhanced drought tolerance of new varieties released to farmers in coming years. In-country and regional training events were conducted to share lessons learned with each other and a wide range of industry partners, and a highly motivated network of breeders was established which remains keen to share information and pursue similar initiatives through the Asian Maize Network (AMNET).

*Subproject 3* met its outcome objectives by showing laser-assisted land leveling to be very effective in enhancing the productivity of the rice-wheat system by increasing grain yields by 0.6 t/ha and making more efficient use of irrigation water and other inputs such as fertilizers and pesticides. The output-level targets were generally met in that farmers in target areas adopted the new technologies (as assessed in the impact evaluation), and information dissemination campaigns encouraged farmer adoption, but support to farmers would be needed for wide-scale adoption, such as a machinery pool and village seed banks. Reduced- and zero-till drill-seeded wheat are attractive to farmers because of higher grain yields due to timely sowing, reduced energy use and lower land preparation costs, higher labor productivity due to locally adapted efficient tillers and seeders, effective handling and incorporation of crop residues without a need for burning, and overall higher profit.

*Subproject 4:* was successful in identifying options that could enhance crop yields by up to 20% for cotton and rice, while soil salinity in some cases declined by up to 36%. The three outputs were achieved. A number of "bright spot" farming systems were identified in Output 1 having higher productivity (up to 90%) and profitability than others operating in the same biophysical, socio-economic and policy environment. Output 2 identified changes to existing cropping systems (eg. rice-wheat rotations, introduction of fodder crops, application of phosphogypsum on high magnesium soils) to improve productivity in saline environments. The scientific capacity across the three countries was developed in Output 3 through training courses, workshops and other knowledge sharing activities.

#### **Overall Assessment and Rating**

The TA achieved the outcomes established and is rated to have been successfully implemented. Improved technologies were developed, tested, and disseminated to reduce post-harvest losses in vegetables, improve and stabilize maize yields, improve productivity and efficiency of rice-wheat systems, and enhance crop yields and reduce land degradation and water shortages in saline areas. All TA subprojects are considered as highly relevant to the needs of farmers and governments' strategies in agricultural research. The design was appropriate for reaching the stated objectives. The TA is considered effective in reaching its expected outcome. Production yields may not

have been as high as targeted, but appropriate technologies were successfully developed. The TA was efficient in using financial and human resources, but timeliness of outputs could have been improved. The results of the TA, on the other hand, are less likely to be sustainable unless continuous, long-term funding is granted. Sharing knowledge and strengthening efforts to disseminate research results to NARSs for eventual adoption by farmers were emphasized under the TA, but further efforts will be required to encourage farmers at large to adopt new technologies. Overall, the TA is rated as successful.

### **Major Lessons**

Implementation of applied research activities involving numerous partners takes time. While the TA timeframe of 3 years is generally adequate for planning purposes, it is necessary to be flexible in allowing for extensions for certain cases, e.g., to collect data across cropping cycles. Likewise, consideration should be given to supporting agricultural research in a more programmatic, strategic manner (rather than ad hoc TA) to address the sustainability of TA outputs. When funding stops, it is difficult for CGIAR centers and their partner NARS to continue to monitoring impacts and develop necessary subsequent approaches for addressing agricultural challenges.

Capacity development of NARS and cross-country collaboration is important and should be stressed under agriculture research TA. Project teams across NARS collaborated well, and the CGIAR centers should be encouraged to continue focusing efforts on training NARS staff rather than doing the work themselves, in order to improve sustainability. Continued support must be given to encourage networking between research staff of NARSs to facilitate easier access to research techniques and literature, especially on research themes that focus on issues related to resource-poor farmers in developing member countries of ADB.

Differences in agricultural policies across the countries affect the potential adoption of TA outputs. For instance, Kazakhstan has fully privatized land giving farmers greater choice in crop production; they have higher productivity and are in a better financial position to invest in new technologies than farmers in Uzbekistan and Turkmenistan.

The extension services within the participating countries are weak, so innovative dissemination options need to be developed for sustainable uptake of recommendations.

### **Recommendations and Follow-Up Actions**

ADB could do more to capture and mainstream the outcomes of agricultural research undertaken by these annual regional TAs into its core operations. The TA design included a small component (subproject 5) to strengthen partnerships and enhance linkages among CGIAR centers, NARS, and national planning agencies. Had it been implemented, this could have been very helpful in synthesizing results across the TA and developing ways to further disseminate research results and sustain policy dialogue. Future TAs and projects that address similar agriculture and natural resource management problems should promote inter-country dialogue and collaboration, and discussions among staff on using the results in agricultural investments. Consideration may also be given in establishing a repository that could document innovations introduced through such TAs. For example, as a result of partnerships on subproject 2, a regional cooperation between Lao PDR and Viet Nam could be forged for seed multiplication and commercialization of promising varieties.

Impact assessments for each subproject should be planned and budgeted for all subprojects for future TA, to measure the extent the expected benefits were achieved and define the successes and failures of the subproject, and propose future initiatives and linkages to other related efforts.

There is also a need to develop and sustain mechanisms to sensitize agricultural policymakers and encourage them to allocate more resources for wider dissemination of successful improved technologies.

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<sup>2</sup> Chris Wensley from SEAE and Randall Jones from CWEN contributed to this TCR.