

IEG ICR Review

Independent Evaluation Group

1. Project Data:		Date Posted: 06/01/2016	
Country:	Bangladesh		
Project ID:	P084078		
		Appraisal	Actual
Project Name:	National Agricultural Technology Project	Project Costs (US\$M):	84.60
L/C Number:		Loan/Credit (US\$M):	62.60
Sector Board:	Agriculture and Rural Development	Cofinancing (US\$M):	19.40
Cofinanciers:	International Fund for Agricultural Development (IFAD)	Board Approval Date:	02/07/2008
		Closing Date:	12/31/2013
Sector(s):	Agricultural extension and research (50%); Crops (20%); Animal production (15%); Sub-national government administration (10%); Central government administration (5%)		
Theme(s):	Rural services and infrastructure (40%); Rural policies and institutions (40%); Participation and civic engagement (20%)		
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2. Project Objectives and Components:

a. Objectives:

The project was the first phase in a series of three Adaptable Program Loans (APLs) of a long-term program (15 years) that had an overall objective to "support GOB'S strategy to improve national agricultural productivity and farm income, with a particular focus on small and marginal farmers (PAD, p. 6)."

The Project Appraisal Document (PAD, p. 2) stated that the Project Development Objective (PDO) was to: *"improve effectiveness of the national agricultural technology system in Bangladesh."*

The Financing Agreement (p. 4) stated that the project objective was to: *"support the Recipient's Program to improve the effectiveness of the national agricultural technology system and to improve agricultural productivity and farm income."*

The revised objective according to the Restructuring Paper (p. 8, para 15) was to: *"improve the effectiveness of the National Agricultural Technology System (NATS), as measured by increase in agricultural productivity and farm income in selected districts."*

While there was a formal revision of the PDO through a Level 1 restructuring, this revision was mainly related to the scale of project activities by including the term "selected districts" in the PDO. This review will assess the outcomes against the objective stated in the Financing Agreement factoring in the change in scale. No split rating will be carried out because the PDO remained the same and the Level 1 restructuring was carried out six months before the project closing date when 93% of project expenditure was already disbursed.

The objective will be split into three sub-objective as follows:

- (i) improve the effectiveness of the national agricultural technology system;
- (ii) improve agricultural productivity; and

(iii) improve farm income.

b. Were the project objectives/key associated outcome targets revised during implementation?

Yes

If yes, did the Board approve the revised objectives/key associated outcome targets?

Yes

Date of Board Approval: 03/04/2014

c. Components:

1. Agricultural Research Support (Appraisal Cost: US\$31.90 million, Actual Cost US\$: 27.29 million). This component aimed to enhance the efficiency and effectiveness of the national agricultural research system through: (a) promotion of a pluralistic institutional structure by enabling entry of new partners to support the research system; (b) making agricultural research more participatory and demand-led; (c) developing technologies to promote sustainable intensification and diversification of agriculture and for post-harvest value addition; and (d) bridging the yield gap between what is possible and what was being currently achieved by farmers. The component would have national coverage, and the following activities would be financed:

(i) Competitive Grants Program (CGP). The Government would establish an autonomous Agricultural Research Foundation (KGF), with its own Governing Board, to manage the CGP with independence, objectivity and transparency. The Agricultural Research Foundation would invite multi-disciplinary agricultural research and development proposals from all organizations with capacity to undertake such work, including the National Agricultural Research System institutes, universities, NGOs, and the private sector. By opening the CGP to non-traditional partners, a more competitive pluralistic institutional structure for the National Agricultural Research System would be facilitated. The priority research themes for competitive funding would be identified through a demand-led process involving farmers, including researchable priority themes/constraints identified during micro-level planning of agricultural extension.

(ii) Sponsored Public Goods Research (SPGR). Long-term strategic and crosscutting research would be supported on selected priority themes of public goods nature, e.g. issues related to sustainable management of natural resources, germplasm conservation. The SPGR proposals would be largely prepared and implemented by the Agricultural Research Institutes under the National Agricultural Research System and coordinated by the Bangladesh Rural Advancement Committee. However, partnerships between national and selected international institutions, with excellence in research and education in areas of relevance to Bangladesh, would be supported, especially to build capacity/skills of national institutions in 'new sciences', e.g. molecular biology, bioinformatics.

(iii) Enhancing Institutional Efficiency. To improve governance, institutional responsibilities and management systems of the National Agricultural Research System, the 1996 Bangladesh Rural Advancement Committee Act would be amended; and, if needed, the Acts of individual institutes under the Ministry of Agriculture (and possibly the Acts of institutes under the Ministry of Fisheries and Livestock) would be revised. The amended Bangladesh Rural Advancement Committee Act would also incorporate proposal for introduction of uniform service rules for the National Agricultural Research System scientists. Bangladesh Rural Advancement Committee's organizational structure would be rationalized and its capacity strengthened for improved resource allocation, prioritization, coordination, human resource development, monitoring and evaluation of research, as well as for promoting adoption of participatory research planning and implementation processes. Concurrently, capacity of Bangladesh Rural Advancement Committee and Agricultural Research Institute would be enhanced to manage fiduciary responsibilities related to procurement and financial management. Funding would be provided for preparation and implementation of a need-based human resource development plan, including enhancement of capacity in social sciences, access to information technology (IT) tools and techniques for improved communications and dissemination of research information.

2. Agricultural Extension Support (Appraisal Cost: US\$33.16 million, Actual cost: US\$38.16 million). This component aimed to establish a decentralized demand-led extension service, which was knowledge-based with greater accountability and responsiveness to farmers, with a focus on small and marginal farmers. The following activities would be financed:

(i) Mobilization of Common Interest Groups and Producers' Organizations. A key element of the decentralized and demand-led extension system would be the mobilization, organization and capacity building of small and marginal producers into Common Interest Groups with the help of NGOs. Participating farmers would be helped to form groups based on agricultural livelihoods or some other common interest, e.g. credit, water use. Existing groups formed under other programs would also be eligible to participate, following reorganization, where necessary, and orientation in the overall extension approach under the project. Common Interest Groups would be empowered to play an increasingly important role in planning, budgeting, implementation and monitoring of extension activities. Common Interest Groups would be federated into Producers' Organizations at the Union (smallest rural and administrative local Government Unit in Bangladesh), Upazila (sub-district) and District levels, with an initial focus on developing the Union level organization. Capacity of Producer's Organizations would be strengthened to articulate, as well as to prioritize needs expressed by Common Interest Groups, enhance responsiveness of the public service to their needs, promote linkages with the private sector and play an advocacy role.

(ii) Decentralization of Extension Service . Would include: (a) targeting, motivation, organization and capacity building of Common Interest Groups to prepare and implement participatory extension micro-plans at the Union level reflecting the priority needs of the Common Interest Groups members; (b) aggregation of Union extension micro-plans to provide the Upazila extension plan, along with sub-sector (crops, livestock, fisheries) budget estimates, for review and approval by the Upazila Extension Coordination Committee (UECC); (c) funding for implementation of extension micro-plans through the Upazila accounts of the line departments; (d) technical support and training of Common Interest Groups by the Upazila and Union level extension teams who in turn would be trained and technically supported by the district level extension staff with the involvement of research scientists; (d) strengthening of research - extension - farmer linkages; and (e) the national level policy guidance, inter-agency/departmental coordination and monitoring and evaluation of the decentralized extension system by the National Extension Coordination Committee, supported by the District and Upazila level Extension Coordination Committees, with representation of all relevant stakeholders.

(iii) Enhancing Institutional Efficiency . This sub-component consists of:

(a) Knowledge Management and Human Resource Development . To enhance two-way flow of knowledge and information between Common Interest Groups and other stakeholders (extension staff, research scientists, NGOs, the private sector and the local government), the project would support establishment of Farmers' Information and Advice Centers at the Union level. Dissemination of knowledge through demonstrations, exposure visits, workshops, seminars and validation trials would be supported. Increased use of information and communication technologies would be financed. Human Resource Development support would include need-based training programs for staff of the line departments, NGOs and Common Interest Groups members. Emphasis would be placed on building skills in participatory extension management, as well as technical subjects. The project would assist with rehabilitation of selected training facilities, preparation of project specific training modules, training of trainers and engagement of guest faculties for specialized training.

(b) Institutional Strengthening. To improve the overall efficiency and responsiveness of the public extension service, the project would: (a) empower grassroots organizations of producers to participate in planning, implementation and monitoring of extension programs; (b) evaluate and revise current structure, functions and business procedures of different line departments, including capacity to manage fiduciary (financial management and procurement) responsibilities; (c) update Ministry of Agriculture's National Agricultural Policy and the New Agricultural Extension Policy and Extension Policy of the Department of Fisheries. It would assist in preparation of a new Livestock Extension Policy that is consistent with GOB'S PRSP, and a national extension implementation strategy to strengthen coordination and synergy between extension activities of different line departments and complementarity with the private sector service providers.

3. Development of Supply Chains (Appraisal Cost: US\$9.30 million, Actual Cost: US\$3.99 million). For increasing and diversifying sources of income for small and marginal farmers, development of supply chains of selected commodities would be supported on a pilot basis. For the pilot phase, the focus would be on the supply chains involving fresh vegetables, primarily for the domestic market. To maximize profitability of rice and maize crops, the project would also assist with the development of different rice and maize types for markets demanding higher value differentiated products requiring minimal incremental investment on the part of resource poor farmers. During implementation, supply chains of other commodities would be examined to identify opportunities for the small and marginal farmers. The following activities would be financed:

(i) Strengthening Farmer-Market Linkages. To help Common Interest Groups to integrate with supply chains, the project would support contractual arrangements with service providers for the implementation of location specific participatory production and marketing plans. The contracted service provider would help to develop Producer's Organizations, with focus on facilitating marketing agreements, involving both the open market channel and contract farming. Under the open market channel, Common Interest Groups would be able to choose from a basket of market options, including sale in the local market or to a procurement agent procuring on behalf of a larger trader or a processor. Under contract farming, Common Interest Groups would be linked with processors or trading organizations, building on experience gained from the on-going contract farming activities in the country. Where appropriate, contract agreements would include provision of technical support, inputs and credit by the purchasing agency. In addition, Common Interest Groups/ Producer's Organizations would be trained and demonstrated good agricultural practices. The project would also assist Common Interest Groups/ Producer's Organizations to establish low cost packing and storage facilities. Produce handling and sanitation facilities at selected local markets, where Common Interest Groups may take their produce for direct marketing, would be improved. Introduction of higher sanitary and phyto-sanitary standards required by the national and export markets would be emphasized.

(ii) Enhancing Institutional Efficiency . The focus of institutional strengthening interventions would be to improve institutional and operational effectiveness of Hortex, the specialized agency established by the Ministry of Agriculture to promote post-harvest value addition and market linkages to accelerate growth of high value chains of agricultural commodities. Technical assistance would be provided to Hortex through a long-term international consultancy to develop capacity in promoting improved post harvest management practices, quality, marketing options, agribusiness development and knowledge management and communications. Support would also be provided for: (a) capacity building of trainers and training programs aimed at capacity building of CIGs, POs,

agribusiness staff and public officials (research, extension, regulators) in commercial farming practices; (b) information sharing with the public and private sector participants; and (c) development of effective linkages with the research system and support for validation trials, especially for work on local supply chains.

4. Project Management and Coordination (Appraisal Cost: US\$9.75 million, Actual Cost: 4.36 million). This component would provide support for managing the project. Supplemental support would be provided on a need-based to strengthen procurement, financial management, procurement, communication, M&E and social and environmental safeguards capacity in the implementing units.

d. Comments on Project Cost, Financing, Borrower Contribution, and Dates:

Project Cost. Total project cost at appraisal was expected to be US\$84.6 million (PAD, Annex 5). The ICR (Annex 1) reported that the actual project cost was US\$73.81 million.

Financing. The Project was financed through an IDA Credit worth US\$62.6 million; and cofinanced with an IFAD credit worth US\$19.4 million. Actual amounts disbursed were US\$54.41 million and US\$16.99 million for IDA and IFAD Credits, respectively (ICR, Annex 1). The project's operations portal shows that US\$1.8 million of IFAD funds and US\$2.8 million of IDA funds were undisbursed. According to the ICR (para 23) these amounts were undisbursed because some activities related to Sponsored Public Goods Research grants, training and consulting services could not be completed as planned. The ICR (para 23) also noted that the IDA funds were recommitted to the country program.

Borrower Contribution. The borrower was expected to contribute US\$2.60 million of counterpart funds (PAD, Annex 5). At completion the borrower contributed US\$2.21 million (86% of appraisal amount).

Dates. The project closed late by one year. It was restructured seven times, six Level 2 and one Level 1 restructuring. The first was on March 31 2008, a Level 2, in order to set the Government's contribution in project financing to 3% of total project cost. The second was on December 17, 2012, a Level 2, in order to resolve inconsistencies between the Development Project Proposal and the Financial Agreement; also the Financial Agreement was amended to reflect establishment of Procurement Core Team, reallocation/change in financing percentages' definition of Common Interest Groups, and Operating Costs. The third was on December 2, 2013, a Level 2, in order to extend IDA Credit closing date by one year from December 31, 2013 to December 31, 2014. The fourth was on February 6, 2014, a Level 2, in order to authorize an Additional Financing in the amount of US\$7.1 million to support the scale-up of the project, and a reallocation of Credit proceeds that were approved by the Regional Vice President. Also, three new indicators were introduced to capture the quantitative achievements related to new technologies adopted, newly established Commodity Collection and Marketing Centers, and Farmers' Information and Advice Centers. The fifth was on March 4, 2014, a Level 1, where the PDO was revised; safeguard policies on environmental assessment, pest management, and indigenous peoples were triggered; and the environmental category of the project was re-classified from C to B. The sixth was on October 21, 2014, a Level 2, where PDO level targets and intermediate outcome indicators were scaled back to the without Additional Financing situation when it was decided not to proceed with Additional Financing. The seventh and last restructuring was a Level 2 on December 30, 2014 where US\$2.98 million equivalent of IDA Credit were cancelled as they could not be used within the project period. The Mid-term Review was conducted on February 13, 2012 compared to an expected date of March 31, 2011, almost one year late.

3. Relevance of Objectives & Design:

a. Relevance of Objectives:

High.

At appraisal, objectives were highly relevant to the country conditions and Government priorities. Agriculture was an important sector that accounted for 23% of the country's GDP. The non-farm rural economy accounted for 33% of GDP. The importance of agriculture and non-farm rural sectors was further highlighted given that 85% of the total poor lived in rural areas. Hence, improvements in the economic performance of agriculture and non-farm rural sectors was considered critical for reducing poverty levels. Objectives were in line with the Government's policy framework which had four priorities: intensification of major crops, diversification into high-value crops (horticulture), development of noncrop agriculture (fisheries, poultry, and livestock), and promotion of rural nonfarm activities (rural micro, small, and medium size enterprises). The project objectives also were in line with the goals of Bangladesh's Poverty Reduction Strategy Paper (**Unlocking the Potential**, National Strategy for Accelerated Poverty Reduction, 2005, p. 87) which gave high priority to accelerating agricultural growth to increase rural incomes, reduce poverty and improve food security. Objectives were also in line with the World Bank's FY06-09 Country Assistance Strategy (CAS) for Bangladesh which identified agricultural and rural development, employment generation and poverty reduction as key priority areas. The CAS (p. 40) stated that the World Bank Group would complement the Government's efforts by providing support to improve agricultural productivity by strengthening capacities for research and technology, improving the functioning of agricultural markets, and promoting diversification into such subsectors as fisheries, an

important emerging export sector."

At completion, objectives remain highly relevant to Government priorities as reflected in the 2011 Bangladesh Country Investment Plan where a sustainable and diversified agriculture through integrated research and extension has been identified as a priority area for support. Objectives are also in line with the World Bank's FY11-14 Country Assistance Strategy (CAS) for Bangladesh. The CAS (p. 11) emphasized that "improving the productivity of rice and other crops will be essential, and will require development and dissemination of higher yielding technologies, as well as better price signals for farmers."

b. Relevance of Design:

Substantial

- Design included a broad statement of objectives that lacked specificity. This was later addressed in the Financing Agreement where objectives became more focused. The Results Framework also suffered from the lack of clarity of the PDO and other related outcome indicators.
- Project design focused on intensification of rice-based cropping systems, diversification to high value crops and development of non-crop agriculture (fisheries and livestock). Design was comprehensive and aimed to support three critical areas in the agriculture sector: research, extension and marketing.
- To achieve the stated objectives design featured four components. The first would contribute to achieving the objectives through promoting improvements in agriculture research that would make the research system more responsive to farmer's demands and at the same time enhance the institutional capacity of the National Research System. These activities were expected to generate new production technologies that would positively impact productivity.
- The second component focused on enhancing extension services through decentralizing agriculture extension agencies with bottom-up and participatory approach to improve efficiency of the system. A more efficient extension system would enable better transfer and dissemination of new technologies among farmers. In turn this would positively impact productivity especially if adoption rates were high among farmers.
- The third component focused on establishing links between farmers and markets through promoting participatory planning and market - led integration in supply chains planning. Establishing these links would benefit farmers through getting better pricing for their produce and improving their income. The fourth component focused on the arrangements for project management.
- The project also emphasized capacity building activities at the research, extension and market related institutions to ensure that these institutions could effectively carry out their mandates. Design also promoted important institutional reforms including promoting new models for research funding (Competitive Grants) to attract private sector, civil society, NGO stakeholders in implementing farmers-needs driven agriculture research.
- However, design underestimated the time needed for enacting the Bangladesh Agricultural Research Council act which was a disbursement condition for the Agriculture Research component. Consequently, executing activities under this component suffered from delays. Implementation arrangements were complex and coordination among six different implementation agencies proved to be challenging.

4. Achievement of Objectives (Efficacy):

Sub-objective (i): *improve the effectiveness of the national agricultural technology system.* **Substantial.**

Outputs

Agricultural Research Support

- The project funded 109 PhD scholarships both at national (79) and international research (30) and academic institutions fully achieving their target of 109 in critically important agricultural research areas, which were identified through a comprehensive skills gap analysis at the national level.
- A total of 84 Competitive Grants Projects were completed, achieving 84% of the target of 100.
- A total of 108 Sponsored Public Goods Research were completed against the target of 45, target over achieved by 140%.
- 47 Non-NARS partners participated in Competitive grants Projects, which represents 69% of the target of 68. However, in terms of budgets utilized by Non- NARS partners, the target was exceeded by 99%.
- A total of 48 new technologies were made available for extension, which exceeded the target of 25 by 97%. The technology packages focused on: resource use efficiency and yield gap minimization for rice-based cropping system; diversification of the cropping system into high value crops; and livestock and fishery productivity enhancement. Notable among the new technologies was the development of a salt tolerant rice variety for the vulnerable coastal zone (BINA dhan-10) that led to a seed multiplication program; and a heat tolerant summer tomato variety (BARI Hybrid Tomato 8) which was developed and released with yield potential of 35-40 t/ha.
- The project supported the establishment of an integrated Agricultural Research Management Information System (ARMIS) at BARC that linked 7 national agricultural research institutes. ARMIS developed, tested, and rolled out 9 key modules in important areas such as financial management, human resources management, inventory, library management, procurement, research, training, vehicle and data bank.
- The project developed two documents (the Financial Codes Study and Institutional Development Manual) that

contained key recommendations on enhancing transparency, financial autonomy and institutional effectiveness of the National Agricultural Research System.

- With project support, Bangladesh Agricultural Research Council prepared an important strategic document on national agricultural research "Vision Document on Agriculture for 2030 and beyond".

Agricultural Extension Support

- The project established more than 20,000 Common Interest Groups (CIG) in crop, livestock, and fisheries sub-sectors. Being a village-level producer organization, these acted as key focal points for technology demonstration, dissemination, field days, training as well as input supply. However, "efforts to aggregate them into higher-level Producer Organizations to better facilitate farmers' access to technical, financial and marketing services were largely not achieved (ICR, para 52)."
- The project supported 50 collaborative extension sub-projects (target achieved), and a total of 48 technologies (16 for crops, 11 for livestock and 20 for fisheries) were made available for extension which exceeded the target of 25. In addition, 1,345 Extension plans were developed and implemented at all 1,345 Unions (target achieved). These plans were more demand-responsive and helped selecting most appropriate technologies for farmers.
- 1,916,000 farmers (393,000 Common Interest Group farmers and 1,523,000 Non-Common Interest Group farmers) adopted the technologies against the target of 388,000. Thus, overall achievement substantially exceeded the target.
- 732 Farmers' Information and Advisory Centers (FIACs) were established and functioning by project completion. FIACs provided farm advisory services at the union level.
- 32 improved post-harvest technologies and management practices were demonstrated and adopted exceeding the target value of 20 by 60%.

Outcome

- The project promoted competitive grants programs as a new approach for funding research. This was expected to be an effective approach to make research more responsive to the needs and demands of small and marginal farmers. The project also supported establishing the Agricultural Research Foundation as a non-profit pluralistic organization where public and private sector entities and NGOs could participate in the implementation of agricultural research. The project also supported high-priority strategic and cross-cutting research works that the National Agricultural Research Institutes coordinated with the Bangladesh Agricultural Research Council. These totalled 108 sub-projects covering 12 ecosystems; and 24% of these sub-projects focused on resolving agricultural technology issues related to vulnerable and climate stressed agro-ecological zones of the country.
- The project also supported the amendment of the 1996 Bangladesh Agricultural Research Council Act. This was expected to improve governance, institutional responsibilities and management of the National Agricultural Research System. Also, under the new amendment the Bangladesh Agricultural Research Council was expected to have an enhanced role coordinating, prioritizing, monitoring and evaluating research activities; in addition to allocation of resources at the national level. According to the ICR (para 49): "the amendment was approved by the Cabinet in December 2009 and passed by Parliament on March 4, 2012." However, the full operationalizing of the amendment was not yet completed.
- The project promoted a demand-driven decentralized extension approach that was expected to be responsive to farmers' needs. It also contributed to the development and dissemination of improved and new agriculture technologies, of which 48 were adopted by a total of 1.9 million farmers. In addition, it provided support to the Department of Agriculture Extension in revising and improving the National Agricultural Extension Policy. The revised policy emphasized the adoption of demand-driven decentralized extension approach in all programs of Department of Agriculture Extension. It also promoted low-cost high-impact, demand-responsive technology packages for accelerated agricultural growth in combination with differentiated targeting of agro-ecological areas as well as addressing challenges and opportunities for economically constrained areas. However, the revised policy was still pending Government approval.
- The project promoted new and innovative approaches (with regards to Bangladesh) and institutions for agriculture research, extension, farmers' group organizations. The project also contributed to capacity building of national agriculture research organizations and introduced relevant legal and institutional reforms. Based on the evidence provided, the achievement of this sub-objective is rated substantial; despite the need for more time to achieve the full impact of project support.

Sub-objective (ii): improve agricultural productivity. **Substantial.**

Outputs

The outputs mentioned above pertain to this outcome as well.

Outcome

The adoption of improved technologies promoted by the project contributed to productivity improvements in project areas. According to the summary of the Impact Study of the project (*which included a total of 6,044 randomly selected sample farmers, covering 2,522 CIG farmers, 2,522 non-CIG farmers and 1000 control farmers*) agriculture productivity in the project area, across farm sizes, has increased by 14% to 52% for crops, 54% to 65% for livestock and 60 to 76% for fisheries, as compared to 8% projected in PAD over the baseline values. Productivity improvements

varied by crop, for example, according to the ICR (p. 41) in comparison to traditional technologies: rice yield improvements ranged from 13% to 29%, wheat 16%, lentil 26%, tomatoes 40%, banana 23% and dairy cows saw an improvement in milk production by 26%. The body weight gain for most popular beef fattening rose by 71% for local cattle and 70% for cross-bred cattle. Productivity of fish aquacultures improved by 193%. The project also managed to minimize yield gap (the difference between the potential Yield in Farmers' Field under ideal management conditions and the actual yield farmers get). The project promoted a set of farmer friendly technology elements known as Rice Yield Gap Minimization to bridge yield gaps. Overall, for the three crops of paddy the yield gap was minimized from 1.30 ton per ha to 0.76 ton per ha (ICR, p. 33).

Sub-objective (iii): improve farm income. **Substantial.**

Outputs

The outputs mentioned under sub-objective (i) pertain to this outcome as well.

Supply Chain development Support

- 20 producers' organizations were established and vertically integrating small and marginal farmers with agri-business enterprises along the supply chains (target achieved). These organizations covered 402 village level Common Interest Groups and helped farmers to reduce their post harvest losses and realize better prices through providing market information, trainings on post-harvest and marketing aspects.
- 32 new and improved post-harvest technologies were successfully demonstrated and disseminated by the project exceeding the target of 20. These technologies included: improved sorting and grading, poly cap use in banana, use of gerbera cup, perforated rose cap, pulsing treatment, ice packaging of rose, use of trolley, harvesting tools, zero energy cooler, steeping technology in lemon, solar drier and modified atmospheric packaging in vegetables, fruits, and milk. 21,810 farmers adopted these new and improved post harvest technologies.
- 25 Commodity Collection and Marketing Centers were developed and pilot tested by the project (target exceeded). These centers included facilities for washing, grading and in some cases storing produce. They aimed to improve the marketing channels and links between traders and farmers, hence providing farmers with better prices for selling of their high value agricultural produce.
- 1,500 farmers, traders, and line agency officials received training in agri-business development, processing of flowers, herbals and honey products, contract farming systems, post-harvest handling, storage, packaging, and fish marketing. Also, 16,700 client-days of training were organized among beneficiaries of supply chain component significantly exceeding their target of 10,000 client days of training.

Outcome

The project pilot-tested new rural service organizations such as Commodity Collection and Marketing Centers and Farmers' Information and Advice Centers. The new and improved post harvest technologies promoted by the project helped reduce post-harvest loss of high value commodities by 5 to 18%; and helped floriculture farmers who adopted project promoted technologies to receive 60% higher price compared to non-adopters. Also, agricultural products marketed through the project supported Commodity Collection and Marketing Centers gained 10 to 15% more price for their produce compared with local markets. The project also contributed to an improvement in farm income mainly due to dissemination of new technologies and adoption of these by farmers. Increase in household incomes for marginal farmers ranged from 47% to 135% compared to a target of 133%, while small farmers saw an increase that ranged from 31% to 92% compared to a target of 41%, medium farmers saw an increase that ranged from 23% to 77% compared to a target of 33%. Also, the net household income of farmers using technologies promoted by the project increased compared to traditional farmers. The increase varied by crop, for example carp farmers achieved a 99% increase, tomato 58%, cauliflower 68%, gerbera 57% and rice ranged from 18% to 59%.

All performance triggers required to move from Phase I to Phase II of the 15 year APL were satisfactorily fulfilled :

- (i) Amendment of Bangladesh Agricultural Research Council Act;
- (ii) Establishment of Agricultural Research Foundation; and
- (iii) Decentralization of planning and funding responsibilities for demand-led extension micro plans to the Upazilla level organization.

5. Efficiency:

Economic and Financial Efficiency

ex ante

- By improving the effectiveness of the national agricultural technology system, the project was expected to generate a number of important direct economic benefits, over the short to medium term including: increased agricultural production, greater diversification and higher net farm incomes; strengthened research-extension-farmer-market linkages, and fostering public private partnerships which will increase the cost effectiveness of public handling of agricultural research and extension; increased participation and empowerment of women in agricultural production and processing; additional employment generation; improved food security, nutrition and health; positive impact on the balance of payments; and reduced poverty; improved understanding

of consequences of under-funding of agricultural research institutionalizing the prioritization of agricultural research and extension projects; improved knowledge of the impact of different types of technologies and the distribution of benefits generated from agricultural research and extension; and capacity building in M&E and impact assessment of investments in agricultural research and extension.

- Financial analysis was confined to the impact on typical farming households of adopting improved technologies associated with genetic improvement of rice (the major crop of Bangladesh), freshwater shrimp production, dairy production and value addition of vegetables. Increases in the net farm incomes, and labor requirements, due to adopting improved technologies were analyzed for landless and near landless, marginal and small farming households for typical farming systems. Net farm incomes are conservatively estimated to increase in the range of 23% to 157%, and per unit labor use by an average 28%, which was expected to bring substantial financial gains to poor people.
- An economic analysis was done based on the expected increases in net value addition on the farms that would be directly assisted through the project's decentralized extension activities. The economic rate of return (ERR) of the project, based on the productivity increases on farms directly assisted through the extension activities, was projected to be at least 34% and the Net Present Value (NPV) US\$74 million. The number of rural households directly benefiting was estimated at 330,000, a total of about 1.65 million people. No account was taken in the economic analyses of the medium to longer-term indirect benefits that would be expected to arise from new research funded through the project and that would generate new technologies in 5-10 years time, nor from the increased capacity of researchers and extension agents.

ex post

- The Economic and Financial Analysis at completion focused mainly on returns to investments under component 2 (Support to Extension) and component 3 (Supply Chain Development). The analysis used farm models to estimate on-site incremental benefits as a result of project activities.
- It was assumed that initial farm-level benefits from research that were generated under the project were captured by the analysis of benefits from activities under component 2 although some of the research benefits would take longer to materialize.
- The Economic Analysis estimated the project's contribution to Bangladesh's economy as a result of technology induced productivity enhancements and increases in net value addition on farms. The Financial Analysis looks at net income increases for particular commodities and improved returns per family day of labor. The analysis considered benefits accruing to farmers who directly received project support (20,000 members of Common Interest Groups established by the project). Broader benefits accruing to the 1.51 million non-Common Interest Groups farmers in the project area were not included. Adoption rate was estimated to be 30% by year 3 of implementation, rising to 70% in year 4 and close to 100% in year 5. Economic Analysis included selected farm systems without supply chain activities (rice-based and rice with vegetables), and with supply chain activities, livestock in the form of dairy cattle rearing and fisheries in the form of carp cultures. Average farm size was estimated at 0.4 ha. Depending on the commodity, the analysis assumed that farmers reap 75-100% of the possible benefits from improved technologies. An Economic Rate of Return was estimated at 30% at a Net Present Value of US\$79.8 million. It is worth noting that a 100% adoption rate over five years is optimistic against global experience.
- A sensitivity analysis was performed using two key variables affecting the project until the end of the analysis period: (i) falling output prices and (ii) reduced yields. The analysis showed that project returns were negatively impacted the most with a 10% decrease in rice yields resulting in an ERR of 13% while a 20% price reduction of outputs (rice plus vegetables) dropped the ERR to 26%. While this reveals that the ERR is very sensitive to rice yields, it also implies that the expanding high value crops such as vegetables are highly profitable.
- Cost effectiveness analysis showed that the estimated cost per farmer using the more decentralized project supported approach was approximately US\$1.5 compared to US\$2.1 for the centralized approach.
- The project also created a number of important externalities under components 1 and 2, which were not quantified because of the difficulty to assess in monetary terms the increased efficiency and sustainability of the research system through human capacity development and policy/legislative interventions.

Administrative and Institutional Efficiency

- The project closed 12 months late. The preparation and approval of Additional Financing took a considerable amount of time. Preparation began in the second half of 2012, however, the Bank's approval was delayed until February 2014 and August 2014 for the Government's approval. Eventually the Additional Financing was dropped due to "insufficient time to implement the planned activities" (ICR, para 89).
- The project suffered from initial implementation delays stemming from slow recruitment of PMU staff and weak implementation capacities of participating agencies.
- The implementation of the Research Support Component could not start until December 2009 due to the failure to obtain timely approval for the enactment of the Bangladesh Agricultural Research Council act, which was a disbursement condition.
- Fielding the MTR mission was also later than originally planned. Timely fielding of the MTR could have helped address implementation delays.
- About US\$3.00 million of IDA Credit was cancelled mainly because some activities related to Sponsored Public

Goods Research grants, training and consulting services could not be completed as planned. The ICR (para 23) stated that "savings resulted from cancellation were recommitted to the Country program."

- Procurement and contract management experienced delays at the beginning of implementation.

Efficiency is rated **substantial** on balance, despite some administrative and institutional weaknesses.

a. If available, enter the Economic Rate of Return (ERR)/Financial Rate of Return (FRR) at appraisal and the re-estimated value at evaluation :

	Rate Available?	Point Value	Coverage/Scope*
Appraisal	Yes	34%	50%
ICR estimate	Yes	30%	57%

* Refers to percent of total project cost for which ERR/FRR was calculated.

6. Outcome:

Relevance of objectives was rated high while relevance of design was rated substantial. The first sub-objective was rated substantial where the project promoted new and innovative approaches (with regards to Bangladesh) and institutions for agriculture research, extension, farmers' group organizations that were expected to improve the effectiveness of the national agricultural technology system. The second sub-objective was rated substantial given the productivity gains that resulted from the adoption of project-promoted improved technologies. The third sub-objective was rated substantial given significant increments in farmers' incomes due to post harvest technologies promoted by the project; and better pricing through the project supported Commodity Collection and Marketing Centers. Efficiency was rated substantial despite some administrative and institutional weaknesses.

a. Outcome Rating: Satisfactory

7. Rationale for Risk to Development Outcome Rating:

The project is phase 1 of a 15 year APL which is expected to provide sustainability to outcomes in the medium term. Also, the Government was committed to new institutions supported by the project such as the Agricultural Research Foundation (KGF) where it agreed to funnel research funds through it. According to the ICR (para 81) the majority of the research scientists and extension specialists trained under the project continue to perform their duties in the relevant institutions which bodes well for sustainability of outcomes. However, according to the ICR (para 82) there are three areas of concern:

- The institutional reforms promoted by the project need further support to deepen these reforms; and strengthen the governance of the technology system. This should be through ensuring that the recommendations of the institutional and financial reforms studies completed under the project are/will be implemented.
- The Agricultural Research Foundation needs to strengthen its fiduciary aspects to be capable of handling its Endowment Fund.
- Hortex foundation needs to strengthen its collaborative partnerships with other institutions and line agencies to maximize its potential.

a. Risk to Development Outcome Rating: Moderate

8. Assessment of Bank Performance:

a. Quality at entry:

The Government of Bangladesh had requested assistance from the World Bank to increase public investment in agricultural research and to reform the technology system. This would help the Government to achieve the objectives of the Poverty Reduction Strategy Paper (PRSP) including accelerating agricultural growth to increase rural income, reducing poverty, and improving food security.

- The World Bank agreed with the Government that a long-term programmatic approach would be most suitable to improve the effectiveness of the national agricultural technology system. Therefore, an Adaptable Program Lending (APL) instrument was seen as the most appropriate lending instrument for this long-term program.
- The project was the first phase in a three phase APL. Objectives were in line with Government priorities and the Bank's CAS at the time of preparation. The project was designed to bring together research, extension and value chain development aspects. Design also promoted institutional reforms including reorganizing Bangladesh Agriculture Research Council; and developing new models for research funding.

- Design benefitted from international and Bank experience in designing research and extension projects. Notable among other experiences included in the design was supporting institutional reforms and institutional development to improve efficiency and effectiveness of the national agriculture technology system, ensuring adequate budgetary financing to meet the operational needs for agricultural research and extension; and including monitoring and evaluation of the impact (in addition to input and output) of agricultural research and extension activities.
- However, design underestimated the time needed for the enactment of Bangladesh Agricultural Research Council Act which was the disbursement condition of the Agriculture Research Component. This contributed to implementation delays of the activities under the afore mentioned component. Also, design underestimated the time needed to frame and implement institutional and financial reform rules to operationalize the amended Act. Design also involved multiple implementation agencies which required a more robust coordination mechanism to ensure smooth implementation of activities.
- Seven risks were identified at the preparation stage, two were moderate, four substantial and one rated high. Most notable were weak procurement capacity (high), the slow pace and depth of institutional reforms (substantial); and concerns that the credibility of the institution managing the competitive grants program may be widely challenged due to weak management (moderate). Appropriate mitigation measures were included in the design. However, the risk associated with delay in amendments to the Bangladesh Agricultural Research Council Act was not foreseen at the preparation stage.
- While intensification can usually be expected to be accompanied by increased use of fertilizers and pesticides (in addition to improved seeds), the design team did not anticipate this increased chemical usage at the preparation stage. The increased use of pesticides and chemical fertilizer observed during implementation prompted the team to change the environmental classification of the project from the initial C category to B.
- M&E suffered from some design weaknesses (see section 10a).

Quality-at-Entry Rating: Moderately Satisfactory

b. Quality of supervision:

The Bank team carried out 12 supervision support missions during project implementation. The missions benefitted from the presence of a balanced skill mix to provide necessary support to the project team. The supervision missions provided recommendations and technical advice to address issues that emerged during implementation. The Bank team also addressed weaknesses in M&E design to better capture project achievements. The project's Task Team Leaders were all country based. This helped the TTLs maintain effective work relations with the implementing agencies. In the post MTR period the team provided strong technical, managerial and fiduciary support which positively impacted implementation and achievements of the project. The team also followed up on MTR recommendations to increase adoption rates among non Common Interest Group farmers. That said, there were some shortcomings in Bank support including the delay in fielding MTR mission by one year. Conducting the MTR on time could have resolved some issues that contributed to implementation delays. Also, the approval of the Additional Financing was lengthy and ended up being dropped due to insufficient time to implement the planned activities. The Bank should have carefully assessed the need for AF and the time needed for its approval. Finally, the Bank team should have changed the project environmental category earlier rather than towards project completion.

Quality of Supervision Rating : Moderately Satisfactory

Overall Bank Performance Rating : Moderately Satisfactory

9. Assessment of Borrower Performance:

a. Government Performance:

While the Government showed commitment during project preparation, there were several Government-related delays during implementation. Most notable was the delayed approval of the Bangladesh Agricultural Research Council Act. The Act was eventually enacted, but after causing considerable implementation delays. There were also delays in approving the Development Project Proposal and the Revised Development Project Proposal. In addition, the Government approval of the Additional Financing was delayed till August 2014 which resulted in dropping the Additional Financing completely due to insufficient time to implement the related activities. Finally, there were also delays in appointing the Director of the Project Coordination Unit as well as other key project staff.

Government Performance Rating Moderately Satisfactory

b. Implementing Agency Performance:

The project was implemented under two lead implementing agencies, the Ministry of Agriculture which housed the Project Coordination Unit; and the Ministry of Fisheries and Livestock. The Ministry of Fisheries and Livestock closely coordinated its activities with the Ministry of Agriculture. According to the ICR (para 93) it performed efficiently and delivered its key outputs as envisaged under the project.

- The Project Coordination Unit at the Ministry of Agriculture coordinated and facilitated the project implementation in collaboration with Project Implementation Units (PIUs) based at individual agencies located at: Department of Agriculture Extension, Department of Fisheries, Department of Livestock Services, Bangladesh Agricultural Research Council, Agriculture Research Foundation, and the Horticulture Export Development Foundation. In total the project had six implementing agencies.
- The Project Coordination Unit coordinated project implementation among the six implementing agencies and maintained strategic communication with national level policy makers. The Project Coordination Unit was supported by a national level Project Steering Committee which focused on higher level policy and enabling issues. It was chaired by Secretary of the Ministry of Agriculture and Secretary of the Ministry of Fisheries and Livestock on alternate basis. There was also a Project Management Committee to resolve coordination and other inter-agency operational issues.
- The Project Coordination Unit prepared good quality mission reports (ICR, para 92). However, project implementation performance was negatively impacted by slow appointments of key staff at the Project Coordination Unit as well as by the delays in taking action to process the Additional Financing. There were also occasional delays in the submission of information from the implementing agencies to the project coordination unit.

Implementing Agency Performance Rating : Moderately Satisfactory

Overall Borrower Performance Rating : Moderately Satisfactory

10. M&E Design, Implementation, & Utilization:

a. M&E Design:

While the Results Frame provided an adequate basis for assessing project outcomes, it suffered from some deficiencies including lack of clarity in the definition of the PDO and outcome monitoring indicators. Also, in some cases quantitative targets were confusing; for example, the target for the increase in agricultural productivity was given a combined percentage increase for all three types of farmers without providing a clear methodology how they were combined. The ICR (footnote #1) highlighted that there was an inconsistency between the key outcome indicators provided in the main text (PAD, page 8) and the Results Framework and Monitoring (PAD, Annex 3). Some deficiencies were addressed under the fourth restructuring (February 6, 2014) where three new indicators were introduced to capture the quantitative achievements related to new technologies adopted, newly established Commodity Collection and Marketing Centers, and Farmers' Information and Advice Centers.

b. M&E Implementation:

The Project Coordination Unit was responsible for overall M&E activities. The six implementing agencies (Bangladesh Agricultural Research Council, Agricultural Research Foundation, Department of Agriculture Extension, Department of Fisheries, Department of Livestock Services, and Hortex) each had its own M&E cell. These M&E cells were expected to design specific M&E plans to monitor and evaluate the project activities and report progress on key performance indicators.

- Two independent assessments were carried out to review the implementation progress and assess project impacts. These included a series of stakeholder workshops; and surveys were also carried out to obtain feedback from key beneficiaries.
- The implementation progress of M&E was reviewed by a five-member independent Experts Impact Assessment Team composed of experienced specialists in economics, rural development and rural institutions, representatives from farmers' associations and the private sector. The Impact Assessment Team also commissioned independent impact assessment studies. Findings of the Team were reported to the Project Steering Committee.
- M&E implementation suffered from some shortcomings. These included the inability of the implementation units (except at Bangladesh Agricultural Research Council) to develop their own Management Information Systems as were originally designed; lack of coordination between the M&E unit at Project Coordination Unit and M&E Cells of the implementing agencies; also the M&E Cells did not document project achievements and results more systematically; in addition M&E suffered from weak capacity of staff at the implementing agencies.

c. M&E Utilization:

The data generated by the M&E system and the independent impact assessment reports provided relevant information for assessing the project outcomes.

M&E Quality Rating: Modest

11. Other Issues

a. Safeguards:

The project was classified as a category C project (PAD, Annex 10). No Safeguard policies were triggered at the appraisal stage. On March 4, 2014 (project closed December 31, 2014. i.e. about ten months before project closed) the project went through a Level 1 restructuring where among other changes safeguard policies on Environmental Assessment (OP/BP 4.01), Pest Management (OP 4.09), and Indigenous Peoples (O.P 4.10) were all triggered; and the environmental category of the project was re-classified from C to B.

These changes were introduced after the Bank task team realized the risk of increased use of pesticides and chemical fertilizer and trial of new crops in the technology demonstrations involving crop, livestock, and fisheries (ICR, para 31). The safeguard policy on Indigenous Peoples (O.P 4.10) was triggered because the project area had some pockets with Indigenous People.

Environmental assessment (OP/BP 4.01) and Pest Management (OP 4.09). At the preparation stage an Environmental Management Framework (EMF) was developed as a proactive measure to minimize any likely adverse impact of legally allowed pesticides that may occur during storage, handling and use. Also, certain items, which are likely to have adverse environmental implications were excluded from implementation and listed in the EMF. The project adopted a process of environmental data collection and monitoring. Also, a system for environmental screening of newly-constructed Commodity Collection and Marketing Centers was introduced, however, environmental screening was not introduced for other eligible micro-plans. The positive impacts of the environmental management activities carried out under the project (in terms of increased usage of organic manure, and biogas thus saving a sizeable amount of urea, pesticides) were recorded by the environmental monitoring system established under the Department of Agriculture Extension, Department of Livestock Services, and Department of Fisheries. The project also organized training for farmers on poultry litter and carcass management. The project environmental monitoring data was regularly disclosed on the website for the general public. In a further communication the project team confirmed that the project was in compliance with the Bank's safeguard policies.

Indigenous Peoples (O.P 4.10). In a further communication the project team explained that this safeguard policy was not implemented because after all the project activities were not implemented in areas with indigenous peoples.

b. Fiduciary Compliance:

Financial Management. The Financial Management System at Project Coordination Unit and Implementing Agencies functioned adequately. Regular quarterly and annual audit reports were compiled and consolidated on timely basis. There was no pending audit issue for the project. However, the Financial Management System of the project was complex due to the presence of six implementing agencies. It sometimes ran into difficulties when it came to timely reporting and consolidation of financial reports from different accounting centers across the country, and incomplete fund reconciliation between Project Coordination Unit and the Implementing Agencies. In a further communication during the preparation of this review, the project team confirmed that external audits were unqualified.

Procurement. The procurement process and contract management experienced some initial delays. About 50 procurement plans were prepared during the project implementation period, however, the consolidation of these into fewer numbers of packages would probably have resulted in more efficient execution. Procurement management capacities at the Implementing Agencies suffered from weak capacities and high turnover among the procurement specialists; and the coordination of procurement activities between the Project Coordination Unit and the Implementing Agencies was challenging and required frequent attention and follow-up. In a further communication during the preparation of this review, the project team stated that there were no incidence of misprocurement.

c. Unintended Impacts (positive or negative):

d. Other:

12. Ratings:	ICR	IEG Review	Reason for Disagreement /Comments
Outcome:	Satisfactory	Satisfactory	
Risk to Development Outcome:	Moderate	Moderate	
Bank Performance:	Moderately Satisfactory	Moderately Satisfactory	
Borrower Performance:	Moderately Satisfactory	Moderately Satisfactory	
Quality of ICR:		Satisfactory	

NOTES:

- When insufficient information is provided by the Bank for IEG to arrive at a clear rating, IEG will downgrade the relevant ratings as warranted beginning July 1, 2006.
- The "Reason for Disagreement/Comments" column could cross-reference other sections of the ICR Review, as appropriate.

13. Lessons:

The following lessons are taken from the ICR with some adaptation of language:

- **Effective linkages between research -extension-farmers are critical to ensure technology transfer , institutional silos and lack of coordination incentives can be a constraint .** The project experience revealed that new productivity enhancing technologies developed by researchers could not always be quickly transferred to extension and onwards to farmers. This was mainly due to organizational silos and lack of incentive systems in individual agencies. There clearly continue to be opportunities to develop more effective and innovative approaches to strengthen the research-extension-farmers linkages.
- **The focus of the research and extension service agendas needs to expand more towards agriculture commercialization , value chain, and agribusiness related areas which are fast emerging as promising areas of growth.** With ongoing transformation of farming towards greater commercialization, there is a fast emerging need to expand the research and extension agendas to also effectively cover post-harvest management and value-addition. While enhancing farm-level productivity is desirable, more attention should be given to post-harvest handling of agricultural products.
- **Thorough and realistic assessment is needed of the time and bureaucratic procedural requirements needed before deciding on Additional Financing to scale -up an ongoing project .** Bank teams and Government counterparts should assess the time and bureaucratic procedural requirements needed for obtaining Government approval, and anticipate potential delays and distractions that the processing of the AF itself could cause to the implementation of an on-going project. Likewise, additional reform of Trust Fund procedures to streamline processing requirements would reduce the administrative burden on task teams and allow greater time to focus on implementation and results.

14. Assessment Recommended? Yes No

15. Comments on Quality of ICR:

The ICR provided thorough yet concise coverage of project activities. It candidly reported on most project shortcomings. It also included five lessons that reflected well the project's experience. Discussion of outcomes was logical and based on the project's achievements. However, the ICR did not report sufficiently on the sources of the data reported in the ICR and did not give enough indication of the methodology used to measure yield. Also, the ICR could have provided more detail on safeguard and fiduciary compliance.

a.Quality of ICR Rating: Satisfactory

