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PROJECT PERFORMANCE ASSESSMENT REPORT

REPUBLIC OF UGANDA

COTTON SUBSECTOR DEVELOPMENT PROJECT
(CREDIT 2609)

AND

AGRICULTURAL RESEARCH AND TRAINING PROJECT
(CREDIT 2446)

June 14, 2005

Sector, Thematic, and Global Evaluation Group
Operations Evaluation Department

Currency Equivalents (annual averages)

Currency Unit = Uganda Shilling (USh.)

1992 (ARTP I appraisal)	US$1.00	USh 1,134	1998	US$1.00	USh 1,240
1993 (CSDP appraisal)	US$1.00	USh 1,195	1999	US$1.00	USh 1,455
1994	US$1.00	USh 979	2000 (ARTP I completion)	US$1.00	USh.1,644
1995	US$1.00	USh 969	2001	US$1.00	USh 1,756
1996	US$1.00	USh 1,046	2002 (CSDP completion)	US$1.00	USh.1,798
1997	US$1.00	USh 1,083			

Abbreviations and Acronyms

ACMD	African cassava mosaic disease
AEP	Agricultural Extension Project
ARDC	Agricultural Research and Development Centre
ARTP	Agricultural Research and Training Project
ASAC	Agricultural Sector Adjustment Credit
BOU	Bank of Uganda
BPA	Bukalasa Pedigree Albar
CDO	Cotton Development Organization
COREC	Coffee Research Centre
CSDP	Cotton Subsector Development Project
FAO/CP	Food and Agriculture Organization (Cooperative Programme with IBRD)
FORI	Forestry Research Institute
FOSRI	Food Science and Technology Research Institute
GOU	Government of Uganda
HRI	Fisheries Research Institute
IARCs	International Agricultural Research Centres
IBRD	International Bank for Reconstruction and Development ("World Bank")
ICR	Implementation Completion Report
IDA	International Development Association (IBRD affiliate)
IFAD	International Fund for Agricultural Development
IITA	International Institute for Tropical Agriculture (Nigeria)
ISNAR	International Service for National Agricultural Research
KARI	Kawanda Agricultural Research Institute
LIRI	Livestock Health Research Institute
LMB	Lint Marketing Board
MAAIF	Ministry of Agriculture, Animal Industries and Fisheries
MAK	Makerere University
MEPU	Monitoring, Evaluation, and Planning Unit
MTR	Mid-Term Review
MUARIK	Makerere University Agricultural Research Institute at Kabanyolo
NAADS	National Agricultural Advisory Services Programme
NAARI	Namulonge Agricultural and Animal Production Research Institute
NARO	National Agricultural Research Organization
NARS	National Agricultural Research System
OED	Operations Evaluation Department
PMA	Plan for Modernization of Agriculture
PPAR	Project Performance Assessment Report
PPF	Project Preparation Facility
QAG	Quality Assurance Group
RELU	Research and Extension Liaison Unit
SAARI	Serere Agricultural and Animal Production Research Institute
SAR	Staff Appraisal Report
SATU	Serere Albar Type Uganda
SCRP	Smallholder Cotton Rehabilitation Project
TA	Technical assistance
UGCEA	Uganda Ginners and Cotton Exporters Association

Fiscal Year

Government:	July 1 – June 30
Cotton Market Year:	Oct. 1 - Sept. 30

Director-General, Operations Evaluation	:	Mr. Gregory K. Ingram
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OED Mission: Enhancing development effectiveness through excellence and independence in evaluation.

About this Report

The Operations Evaluation Department assesses the programs and activities of the World Bank for two purposes: first, to ensure the integrity of the Bank's self-evaluation process and to verify that the Bank's work is producing the expected results, and second, to help develop improved directions, policies, and procedures through the dissemination of lessons drawn from experience. As part of this work, OED annually assesses about 25 percent of the Bank's lending operations. In selecting operations for assessment, preference is given to those that are innovative, large, or complex; those that are relevant to upcoming studies or country evaluations; those for which Executive Directors or Bank management have requested assessments; and those that are likely to generate important lessons. The projects, topics, and analytical approaches selected for assessment support larger evaluation studies.

A Project Performance Assessment Report (PPAR) is based on a review of the Implementation Completion Report (a self-evaluation by the responsible Bank department) and fieldwork conducted by OED. To prepare PPARs, OED staff examine project files and other documents, interview operational staff, and in most cases visit the borrowing country for onsite discussions with project staff and beneficiaries. The PPAR thereby seeks to validate and augment the information provided in the ICR, as well as examine issues of special interest to broader OED studies.

Each PPAR is subject to a peer review process and OED management approval. Once cleared internally, the PPAR is reviewed by the responsible Bank department and amended as necessary. The completed PPAR is then sent to the borrower for review; the borrowers' comments are attached to the document that is sent to the Bank's Board of Executive Directors. After an assessment report has been sent to the Board, it is disclosed to the public.

About the OED Rating System

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Relevance of Objectives: The extent to which the project's objectives are consistent with the country's current development priorities and with current Bank country and sectoral assistance strategies and corporate goals (expressed in Poverty Reduction Strategy Papers, Country Assistance Strategies, Sector Strategy Papers, Operational Policies). *Possible ratings:* High, Substantial, Modest, Negligible.

Efficacy: The extent to which the project's objectives were achieved, or expected to be achieved, taking into account their relative importance. *Possible ratings:* High, Substantial, Modest, Negligible.

Efficiency: The extent to which the project achieved, or is expected to achieve, a return higher than the opportunity cost of capital and benefits at least cost compared to alternatives. *Possible ratings:* High, Substantial, Modest, Negligible. This rating is not generally applied to adjustment operations.

Sustainability: The resilience to risk of net benefit flows over time. *Possible ratings:* Highly Likely, Likely, Unlikely, Highly Unlikely, Not Evaluable.

Institutional Development Impact: The extent to which a project improves the ability of a country or region to make more efficient, equitable and sustainable use of its human, financial, and natural resources through: (a) better definition, stability, transparency, enforceability, and predictability of institutional arrangements and/or (b) better alignment of the mission and capacity of an organization with its mandate, which derives from these institutional arrangements. Institutional Development Impact includes both intended and unintended effects of a project. *Possible ratings:* High, Substantial, Modest, Negligible.

Outcome: The extent to which the project's major relevant objectives were achieved, or are expected to be achieved, efficiently. *Possible ratings:* Highly Satisfactory, Satisfactory, Moderately Satisfactory, Moderately Unsatisfactory, Unsatisfactory, Highly Unsatisfactory.

Bank Performance: The extent to which services provided by the Bank ensured quality at entry and supported implementation through appropriate supervision (including ensuring adequate transition arrangements for regular operation of the project). *Possible ratings:* Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.

Borrower Performance: The extent to which the borrower assumed ownership and responsibility to ensure quality of preparation and implementation, and complied with covenants and agreements, towards the achievement of development objectives and sustainability. Possible ratings: Highly Satisfactory, Satisfactory, Unsatisfactory, Highly Unsatisfactory.

Contents

This report was prepared by Anthony J. Blackwood (Consultant), under the supervision of Chris Gerrard (task manager). The report was edited by William Hurlbut, and Rose Gachina provided administrative support.

Principal Ratings

Cotton Subsector Development Project (Credit 2609)

	ICR	*ICR Review**	*PPAR*
Outcome	Satisfactory	Satisfactory	Satisfactory
Sustainability	Likely	Likely	Highly Likely
Institutional Development Impact	High	Substantial	High
Bank Performance	Satisfactory	Satisfactory	Satisfactory
Borrower Performance	Satisfactory	Satisfactory	Satisfactory

Agricultural Research and Training Project (Credit 2446)

	ICR	*ICR Review**	*PPAR*
Outcome	Satisfactory	Satisfactory	Satisfactory
Sustainability	Likely	Unlikely	Not Evaluable
Institutional Development Impact	Substantial	Substantial	Substantial
Bank Performance	Satisfactory	Satisfactory	Satisfactory
Borrower Performance	Satisfactory	Satisfactory	Satisfactory

* The Implementation Completion Report (ICR) is a self-evaluation by the responsible operational division of the Bank. The Evaluation Summary (ES) is an intermediate OED product that seeks to independently verify the findings of the ICR.

Key Staff Responsible

Cotton Subsector Development Project (Credit 2609)

Project	*Task Manager/Leader*	*Division Chief/ Sector Director*	*Country Manager/Director*
Appraisal	K. Loganathan	Sushma Ganguly	Francis Colaco
Completion	Christine Cornelius*	Karen Brooks	Judy O'Connor

* Primary authors of the ICR were F. Maundrell and P. Brinn, FAO/CP

Agricultural Research and Training Project (Credit 2446)

Project	*Task Manager/Leader*	*Division Chief/ Sector Director*	*Country Manager/Director*
Appraisal	E. Quisumbing	J. Shivakumar	Brian Falconer
Completion	E. Quisumbing**	Sushma Ganguly	James Adams

** Primary author of the ICR was G. Evers (FAO/CP)

Preface

This is the Project Performance Assessment Report (PPAR) prepared by the Operations Evaluation Department (OED) for two Uganda agricultural projects. The Cotton Subsector Development Project was approved in May 1994 for an IDA Credit (26090-UG) of US$14 million. It was closed two years behind schedule in December 2001 with US$0.2 million cancelled. The Agricultural Research and Training Project was approved in December 1992 for an IDA Credit (2446-UG) of $25 million. It was closed in September 2000 fully disbursed, three months ahead of schedule.

This report is based on the Implementation Completion Reports (ICRs) prepared by the Africa region, the Memorandum and Recommendation of the President, appraisal reports (Report No. 11970, dated April 15, 1994 and Report No. 19144, dated April 9, 1999), loan documents, project files, and discussions with Bank staff (current and retired). An OED mission visited Uganda in January 2004 to discuss the effectiveness of IDA's assistance and to visit selected project sites. It met with project implementers and concerned government staff (active and recently retired), representatives of civil society, including beneficiaries, and other stakeholders. The mission also exchanged views by correspondence with other interested parties. The cooperation and assistance of all who assisted the mission is gratefully acknowledged.

The rationale for the assessment was, for the cotton project, to learn positive lessons about the process and substance of institutional reform in the context of a commodity subsector approach to agricultural development, and for the agricultural research project to examine how well the project investments, some years after closing, have contributed to the ongoing reform process for the agricultural research system (in which several African countries are now engaged in their own countries). The ICRs of both projects were generally satisfactory in presenting a full and clear account of the project experience, but in both cases the full impact of the projects could not be judged at that time and later developments, both foreseen and unforeseen, have affected project outcomes and prospects.

Following standard OED procedures, the draft PPAR was sent to the borrower for comments before it was finalized. The Borrower had no comments on the report. In accordance with the Bank's disclosure policy, the final report will be available to the public following submission to the World Bank's Board of Executive Directors.

Summary

Uganda's agriculture sector provides by far the country's main sources of income, employment, food, and foreign exchange. Agricultural growth, under the national modernization strategy, is essential for economic growth and poverty eradication. Against this background the Cotton Subsector Development Project (approved in May 1994) and Agricultural Research and Training Project (approved in December 1992) were highly relevant investments in formerly strong parts of the sector, which had been neglected since the early 1970s, both to restore cotton as a major export (produced largely by smallholders) and to provide updated agricultural technology for the whole sector.

The **cotton project** aimed to revive cotton production and exports through increased competition in cotton processing and marketing and improved supporting services to farmers. The specific objectives were improved performance in the cotton ginning industry, through liberalization within an efficient regulatory framework, improved supporting services through support for a national research and extension program, and improved credit and seed delivery.

The outcome of the cotton project is rated Satisfactory. Despite some implementation problems the cotton project substantially achieved its main objectives by the time it was completed two years late in 2001 and since then progress has continued and the gains have been consolidated. The industry has been rehabilitated from a dilapidated state. Liberal economic policies have provided incentives to international ginners to participate in a competitive and efficient processing industry, with some also providing smallholder services. Cotton research has been revived, credit and seed supply services are improving, but advisory services for cotton growers are still weak. The industry is now well served by the semi-autonomous Cotton Development Organization Authority and the Uganda Ginners and Cotton Exporters Association.

By the end of the project cotton production was averaging 100,000 bales (over 400 percent more than pre-project levels) and was 150,000 bales in the 2003/04 season despite lower cotton lint prices. Cotton export earnings have only about doubled due to low international prices, but the subsector has shown resilience to price movements. Given these developments sustainability is Highly Likely, institutional development impact is rated High and the performance of the Bank and borrower are rated Satisfactory, although the Bank started somewhat weakly by not preparing some key parts of the project adequately.

The main lessons of wide general application are:

- **Government commitment:** Despite commodity prices and natural conditions at times being unfavorable, a dilapidated agricultural industry can be put back on its feet relatively quickly by a committed government with appropriate economic and social policies and which promptly passes supporting legislation.

- **Processing industry**: Financial restructuring of a bankrupt processing industry, which in this case facilitated the return of experienced international operators, can be an essential requirement of agricultural rehabilitation.

- **Project preparation**: Uneven depth of preparation of project components can show up later in implementation problems, which can be hard to overcome and may needlessly absorb a substantial amount of supervision and borrower resources. Project designs should be fully complete at approval, especially in production-oriented projects where some components are needed to ensure that output objectives can be achieved.

The **agricultural research project** was to promote agricultural growth and diversification of the production, processing, and export base through the development and transfer of improved technology. At appraisal it was judged that without better agricultural research support, Uganda's economically dominant farming community was unlikely to contribute to rapid economic recovery, to increased productivity, and to sustainable environmental management. The run down and under-funded system and the disorganized research activities had to be brought under the National Agricultural Research Organization (NARO). The specific objectives of the project were to "(i) launch and support the key activities of NARO, (ii) strengthen the linkages and coordination among the research system, the extension service, and the agricultural faculties of Makerere University, and (iii) improve agricultural education and training capacity."

When the project was completed in 2000, agricultural research capability had been rehabilitated and was producing substantial results, despite some continuing institutional concerns (eroding salaries in NARO, over-centralization of the research network, insufficient farmer consultations, and weak supporting extension services).

Throughout the 1990s, during a time of economic liberalization and tight government finance, the borrower, with the Bank's assistance, succeeded in building a sound institutional basis for supporting agricultural research. Research activities were integrated into a national program coordinated by NARO; interaction with farmers and other stakeholders was improved; NARO was transformed from a civil service organization to a semi-autonomous status and was in a good position to start to recover costs for services and pursue more diverse funding sources, especially from private sector participation; the research infrastructure of four institutes was rehabilitated, and an agricultural training center was constructed at Makerere University and is being used. The impact on rural poverty reduction of agricultural research has been widely recognized. Regionally NARO was viewed in the late 1990s as a model research system for other countries to follow. The outcome of the agricultural research project is thus rated *Satisfactory*. The institutional development impact of the project is rated Substantial.

At completion in 2000, the expectation was that the subsequent Second Agricultural Research and Training Project (approved in 1999) would help to consolidate these substantial gains and improve impact by focusing more directly on technology adoption through extension service linkages. But the protracted (and still on-going) debate in the country regarding proposed major policy changes for agricultural research and on a new extension strategy, suggest that prospects for sustainability of the benefits of the project are still uncertain at this stage and sustainability should be rated as Not Evaluable. This does not downgrade the substantial achievements of the project during implementation and its overall satisfactory outcomes to date, but takes note of the existing uncertainties associated with formulating and implementing the new research policy and strategy. In a lengthy ongoing

transition there are risks of undermining the flow of research outputs initiated under the project.

The performance of the Bank and borrower are rated *Satisfactory* with some reservations discussed in the text on extension activities and failure to resolve institutional problems in NARO.

Experience with the project and its aftermath indicate three main lessons:

- **Public sector research:** Sustaining smallholder production requires a flow of technology from research (as was amply shown under the project in the 1990s). Public sector research is especially important in a sector dominated by poor subsistence farmers dependent on food crops. This is justified on public goods and social safety net grounds, and in terms of financial and economic efficiency, given the high returns to agricultural research for rural areas.

- **Farm systems approach:** Smallholder technology improvements should be developed through a farm systems approach (for example, taking into account mixed crops and labor constraints) if they are to be fully applicable to the needs of smallholders. Technology developed without system constraints being taking into consideration is unlikely to find strong acceptance.

- **Complementarity of research and extension:** Where a major investment is being made in boosting agricultural research, strong consideration should be given to internalizing the accompanying extension system arrangements in the project as a component and as an institutional participant.

Ajay Chhibber
Acting Director-General
Operations Evaluation

Context

1. Uganda's agriculture sector provides by far the country's main sources of income, employment, food, and foreign exchange. Agricultural growth is essential for economic growth and for poverty eradication and hence has been at the center of government's strategy since the late 1980s. Agriculture is expected to remain the mainstay and engine of growth for the economy for the foreseeable future. The main policy for agricultural growth is modernization of agricultural production[1] in keeping with the overarching modernization goal for the whole economy.[2]

2. With a favorable year-round climate and some of the best agricultural land in Africa on 81 percent of its area, Uganda produces a wide variety of tropical and sub-tropical agricultural products throughout the year. Over 88 percent of the country's population lives in the rural areas and earn their livelihood from agriculture. In 2002, the sector contributed 31 percent of total GDP (down from 51 percent in 1992 when industry and services were greatly depressed) and has shown strong growth of over 4 percent per annum since 1992. In the 1990s, agriculture commodities provided over 90 percent of exports by value. Like many other developing countries, Uganda has mainly agro-based industries, which depend on the sector for raw materials.

3. Of the four major subsectors of crops, livestock, fisheries, and forestry, the crops subsector is by far the largest in terms of area and contribution to GDP (about 75 percent of total agriculture in 1995). Much of this output is food crops for subsistence by smallholder households, with only a third sold to the domestic and export markets. Smallholder farming predominates with an estimated 2.5 to 3.0 million holdings accounting for 94 percent of all crop production. The typical smallholder cultivates 0.5-2.0 hectares per year. Plantation farming on 6 percent of the cultivable area consists entirely of sugar cane and tea estates run directly by companies with some outgrowers.

4. The livestock subsector accounts for about 16 percent of the total agricultural GDP and 10 percent of total GDP. Livestock production potential is high year-round with good quality pastures and there is a growing feed industry. Oxen power is traditionally used for field operations in some areas, including in important cotton areas. With about 17 percent of Uganda's surface area covered by lakes, rivers, and swamps (about 42,000 square kilometers), the fisheries subsector accounted for 5 percent of agricultural GDP in 1996/97 and has been second to coffee in export earnings. Almost all production is marketed. Fish farming is expanding. The forestry subsector accounts for about 4 percent of Uganda's agricultural GDP. Natural and plantation forests are widely distributed throughout the country. Many areas also feature agro-forestry activities and social and community forestry are developing.

5. With such a diverse and productive agriculture sector the demands on agricultural research are heavy and complex and offer great opportunities for raising production through research and development. The cotton subsector offers smallholders a cash cropping

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1. *Plan for Modernisation of Agriculture*, Government of Uganda (MAAF/MPED), August 2000

2. This section draws on the four-volume *Agriculture in Uganda*, National Agricultural Research Organisation, ed. Joseph K. Mukiibi, 2001. More recent data is from the Bank's *Uganda at a Glance* database.

opportunity and, if production can be restored to former levels, could be a significant source of export diversification.

Part I: Cotton Subsector Development Project

BACKGROUND

6. Cotton production grew steadily after the crop was introduced to Uganda in 1903, with a peak decade from 1964 to 1973 of well over 400,000 bales annually of superior grade medium to long staple lint. The industry benefited from being the regional center for cotton research and development under the colonial system, with the Empire Cotton Growing Corporation locating its main research station in 1923 outside Kampala. But from the mid-1970s a steady production decline set in as a result of a series of misfortunes that lasted for over 12 years (civil strife, insecurity, maladministration, economic uncertainty, food shortages necessitating food cropping, and especially the sudden forced departure of most of the Asian community, which was active in cotton ginning and marketing). Cotton production eventually fell to less than 20,000 bales in the late 1980s, a decline of over 95 percent.

7. With this collapse in output the cotton industry's institutions and infrastructure wasted away at all levels: marketing and pricing became erratic, with prices often below costs; the systems for industry financing, seed production, and cotton trading collapsed; inputs were unavailable; cotton stores and gins decayed; cotton research all but ceased and research facilities ran down; germplasm and breeding stocks were lost, and cotton extension ceased. Production was completely abandoned in some traditional cotton-growing areas because of security problems, the need to produce food, and lack of draught animals.[3]

8. Cotton industry rehabilitation was a high priority under the government's Economic Recovery Programme launched in 1987, given the emphasis on diversifying exports and reducing dependence on earnings from coffee exports (which in contrast had held up well despite the disruptions of the 1970s and 80s). A sustainable cotton industry was to supply raw material for local industry, reduce imports, and produce cotton lint for export. However, without major new resources for the cotton sector and a weak ginning industry, production remained low until the early 1990s when it tripled to over 60,000 bales. From 1994, the IDA project and parallel support from IFAD were the main funding sources that helped production to continue to rise.

PROJECT OBJECTIVES AND COMPONENTS

9. The project supported the government's strategy to revive cotton production and exports through increased competition in cotton processing and marketing and improved supporting services to farmers. The specific objectives of the project were:

- Improved performance in the cotton industry, through liberalization of cotton processing and export marketing, establishment of an efficient regulatory framework

3. *Agriculture in Uganda*, op. cit.

for the cotton industry, and improved managerial, technical, and operating efficiency in a creditworthy ginning industry;
- Improved efficiency and impact of supporting services through support for national research and extension program; and
- Improved delivery mechanisms and availability of credit and seed.

10. These objectives would contribute to the broader sectoral objective of increased agricultural growth and diversification. The project design provided financial assistance to support three broad sets of activities:

- Restructuring the cotton industry through (a) revision of the legal framework, liquidation of Government regulatory and marketing agency and establishment of an industry based regulatory body, and support of operations of the regulatory body, on a declining basis; (b) transformation of Cooperative Union owned ginneries into creditworthy operators, including strengthening management and technical training to the industry; and (c) support to Agricultural Policy Committee's (APC) oversight of the subsector policy reform and inter-agency coordination responsibilities through the Agricultural Secretariat;
- Improved supporting services through support for national research and extension programs; and
- Improved delivery mechanisms and availability of credit and seed through provision to farmers of short-and medium-term credit through intermediaries (e.g., ginneries and NGOs), as well as improved quality seed.

IMPLEMENTATION ISSUES

11. IFAD was to provide most of the funding (US$12.5 million) for the credit and seed program, amounting to 40 percent of total financing. US$2.7 million of the IFAD funds (for non-performing extension activities)[4] were reallocated from this component to the pilot extension program (after a year's delay) implemented by the National Agricultural Research Organization (NARO), and to research, ginnery restructuring, monitoring by the Cotton Development Organization (CDO) and project coordination. Partly because of this slow start and need for adjustments, the five-year implementation period was extended to seven years. The rehabilitation of cattle holding grounds was cancelled as the government's restocking program had failed and a microfinance capacity-building component was added (with US$1.25 million of IFAD funding) following the mid-term review. The failure of the oxen activity constrained cotton acreage expansion in the important Teso production areas where oxen cultivation is traditional (cattle numbers in these areas had fallen by 95 percent following civil strife and cross-border rustling, which is still a threat).

12. The IFAD-funded farm credit component performed poorly largely because of inadequate design and that the line of credit from commercial banks to ginners and thence to farmers did not materialize due to lack of interest from banks and the poor credit-worthiness

4. The ICR notes that the original extension component was designed more to fill gaps in the Bank-assisted Agricultural Extension Project than to serve cotton farmers. The latter project did not perform well, proving to be the end of the Training and Visit extension approach in Uganda, and once this was apparent, the Bank task team correctly decided to close the component early.

of ginners. Consequently, toward the end of the project an input-based system was substituted with a line of credit from Bank of Uganda to the Uganda Ginners and Cotton Exporters Association (UGCEA) and reallocation of IFAD funds. Although this was a temporary measure it continued to operate after the project closed and in the absence of full repayment (as cotton prices fell) the credit was rolled over (rising to USh. 9.8 billion in 2003, or about US$5.8 million). In common with many such administered credit arrangements, the expectation in the industry was that government would have to write off much of this indebtedness. An improvement has been UGCEA's decision only to sell pesticides while continuing to provide seeds on credit. Two parallel more hopeful initiatives may eventually replace public sector cotton credit: some 51 rural financial institutions have been established and assisted by the central bank with essential equipment and training, but expected funding (including from the World Bank) had not been forthcoming at the time of the evaluation. Second, international ginners are beginning to provide smallholder inputs in a successful credit model that does not involve the drawbacks of public sector credit.

13. The fall in world cotton prices to 30-year lows was by far the greatest implementation issue. Despite this disincentive to investment and production, project activities continued and production expanded. Natural conditions (drought and heavy rains, pest outbreaks) caused problems in some years and continued insecurity in the northern producing areas discouraged farmers from resuming cotton cropping. Extension services for cotton farmers were ineffective because of problems relating to three reorganizations of the system, exacerbated by one season of on-farm research and demonstration being lost by a delay in IFAD financing under its parallel project (Smallholder Cotton Rehabilitation Project).[5]

14. There was a surprising failure of the borrower and Bank to design and agree on details of essential core components (extension, credit, and seed supply) as parts of the project when approved. As a result, these activities were never able to catch up to play their vital roles in stimulating and indeed in facilitating production expansion. The ICR notes that preparation of these components was intentionally left until implementation, even though the two full years between identification and approval was more than adequate time and there were adequate specialist staff and consultants for the purpose – over 150 staff weeks to approval. (Nonetheless, the ICR rated quality at entry of the project as satisfactory.)

15. Arrangements for channeling funds to the ginneries proved especially difficult to agree, especially as the debt overhang problem of the ginneries was not fully resolved (a few ginneries were insolvent and many others had fragile finances and limited credit-worthiness) and, despite intensive Bank supervision, the absence of a monitoring and evaluation function missed the opportunity to identify and take action on these deficiencies more promptly and effectively. After the project closed, restructuring progressed and the ginning industry was put on a more stable basis, helped especially by the arrival of international ginning firms who have taken a longer term view of their role than earlier participants.

16. At the start of implementation relationships between the Bank and the project's senior staff were less than satisfactory to the extent that normal free and frank interactions were not

5. The appraisal report shows IFAD funding as cofinancing under the project, but it is clear from the ICR that these funds were made available under the separate IFAD project. The complexity created by the parallel IFAD operation is apparent from the files, but there is no explanation of why there could not have been a cofinancing arrangement.

possible. Two changes of task manager in a short period eventually led to improved relations. This was a difficult two-year period for the project, especially given that some key activities had to be conceived, designed, and agreed with the Bank during this early implementation.

OVERALL OUTCOME

17. The project outcome is rated *Satisfactory.* Despite the problems outlined above, the project substantially achieved its main objectives by the time it was completed only two years late in 2001 and since then progress has continued and the gains have been consolidated. The cotton industry has been revitalized with (especially, since project completion) the financial restructuring of the ginneries completed and the critical cotton ginning operations of a number of leading ginners becoming better established and more supportive of smallholder production than previously.

18. By the end of the project **cotton production** was averaging 100,000 bales and reached 120,000 bales in the 2000/01 season (four times the low pre-project level) despite lower cotton lint prices. Production thus reached 75 percent of the appraisal target with two years delay, which was reasonable under the circumstances. Since then production fell to 110,000 bales in the 2001/02 season but rose to an estimated 150,000 bales last season, aided by support from the US Agency for International Development (aimed at increasing the competitiveness of Uganda's cotton on international markets). These data are subject to a reservation, however, since they include unknown quantities of imports of seed cotton (for ginning) from Congo in particular, which is attracted by relatively high seed cotton prices to farmers (given a high farmer share at some 70 percent of export values). Although this obscures the Uganda production statistics and the project's impact, it also attests to a highly competitive ginning industry whose revival from a very poor state began under the project.

19. **Cotton export earnings** fluctuated around an increasing trend, given production variations and a declining price trend, rising from about US$12.8 million in 1994/95 to US$24-29 million in the period 1998-2003 (2001/02 was lower with an extraordinarily low world cotton price). This was achieved by production increases, the revival of an efficient processing and marketing system, and the high grade of cotton produced. The performance of the cotton processing industry as a whole improved, producing increased quantities of premium grade cotton in response to project activities (especially restructuring, rapid liberalization, and privatization of ginning and trading in keeping with national development policies). Initially many participants in the ginning industry were slow to broaden their activities beyond buying seed cotton, ginning, and marketing of cotton lint, without any interest in promoting smallholder production. This changed with the arrival of some well known corporate names in world cotton processing and trade which have adopted a longer-term approach to expanding output and are providing production services to smallholders.[6] This was achieved despite the serious implementation problems described above.

20. **Supporting production services** have been revived, led by cotton research, which has already had excellent results, and after a weak start, a decentralized extension system was

6. One major problem remains, which is receiving attention: that with liberalized marketing those advanced ginners who are also investing in smallholder production assistance have no hold over their farmers' seed cotton production, which can be sold (at higher prices) to other ginners who have not incurred any production expenses through advances to farmers.

piloted. Prospects for **rural credit** access are improving, as described above, and the basis has been laid for a reliable **seed supply** system (with a model seed multiplication process delivering high-quality pure varieties).

21. Although there were problems on the cotton growing and price incentive sides, the key to any growth at all was **restructuring of cotton processing and trading**, which was greatly aided by appropriate sector policies and legislation that opened the door to experienced international interests. **Privatized ginneries** are competing for seed cotton and the new internationally accepted premium quality standards for Uganda cotton were important in attracting foreign traders. Efficient and competitive private trading in seed cotton, seed, and lint, with prompt payments to farmers providing production incentives, has been key to counteracting low international prices. An excellent **ginnery training school** under the project has provided a cadre of Ugandan technicians and is also earning income from training technicians from other cotton producing countries. These changes have been introduced and are supported by key industry institutions that now manage the sector, namely an effective Cotton Development Organization and its offshoot, UGCEA, which are now fully funded from within the subsector. The UGCEA is promoting the provision of services to smallholders by ginners to secure supplies of seed cotton and, on their side, farmers are forming blocks of cotton cultivation to facilitate services.

22. Although poverty reduction was not an explicit project objective, the rate of rural poverty in Eastern Uganda fell from 61 percent in 1992 to 38 percent in 2000, and this must be partly due to increased cotton growing.

Relevance (Were the project's objectives right in the light of current priorities?)

23. The project's objectives were highly relevant at approval and have remained so in terms of the government's development policies and the Bank's support strategy. Sectoral goals are to diversify agricultural production, processing and the export base, while achieving food self-sufficiency and reducing poverty. The overarching policies are to liberalize the economy and encourage greater private sector participation. Restoring growth in the cotton subsector through the project strategy adopted is one of the principal means available to the government for pursuing these objectives. The cotton subsector has a number of features which the project was able to exploit and in so doing addressed several of the country's development priorities: a smallholder production base, downstream linkages into processing, trade, manufacture and export, a premium product in demand on world markets and policies attractive to international private sector participation.

Efficacy (Did the project achieve its stated objectives?)

24. **Revival of cotton production and exports:** The project made a major contribution to the revival of production and exports, but given the declining price trends and project-related deficiencies outlined above, did not quite meet the targets set at appraisal. However, since the project ended, production growth has continued. Increased competition in processing and marketing were major means of reviving the subsector as planned, but the provision of

supporting smallholder services fell short of project intentions mainly because plans were incomplete at approval.[7]

25. **Improved performance in the (post-harvest) cotton industry:** Cotton processing and export marketing have been liberalized as planned and an efficient regulatory framework has been established; managerial, technical, and operating efficiency have improved through training and facilitating the involvement of well-established international cotton companies; technical parameters have improved to satisfactory level (staple length and outturn) and Uganda lint has been re-established as premium quality; and with the restructuring eventually of the formerly bankrupt processing industry, to which most of the project's technical assistance was devoted but which did not finally occur until after the project ended, the industry is generally credit-worthy.

26. **Improved efficiency and impact of supporting services** (by supporting research and extension for smallholder production)**:** research results were highly satisfactory, but extension activities suffered setbacks that are well described in project records. Advisory services did not reach effective levels. Support for cotton research built on assistance under the IFAD project. A cotton research system was re-established based on NARO's Sere research station with outstation trial sites (the integrated pest management unit from Namulonge was moved there); a research strategy was established; facilities were improved and expanded; staff were trained; ginning work had good results; improved varieties became available and a wide range of cotton agronomy trials were producing useful results. There was considerable progress developing pest control technologies and integrated pest management (IPM) and IPM technology was transferred to the field in Lira District. An IPM manual for extension workers was produced.[8]

27. **Extension services** for cotton were not satisfactorily established – largely because the two attempts were closely associated with national programs (assisted by Bank funding) which either failed (the Agricultural Extension Project in the 1990s), or under the replacement pilot component (which started only in 1999) were part of a decentralized extension system that has yet to be implemented as planned. Even so, some useful preparatory work was done under the project, including limited farmer training.

28. **Improved delivery mechanisms and availability of credit and seed:** the credit objective was only partly achieved, since after initial failure the changed approach after the mid-term review provided directed credit (but with sustainability problems) and a satisfactory capacity building program for microfinance. The seed component was not successful in achieving its ultimate privatization objective but after a difficult start did achieve reasonable physical objectives in terms of improved dressed seed distributed, but with financial sustainability problems.

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7. This is now being corrected by the initiatives of some ginners.

8. In addition, the ICR lists an impressive set of cotton research achievements and outreach under NARO management: including several biological control technologies and; agronomy research concentrating on spacing, date of planting, control of weeds, and, more recently, intercropping with legumes. In addition, specific recommendations for western cotton growing areas have been released; a farmers' guide has been published and translated into five local languages; a lightweight plough, a planter, and an ox-weeder have been developed; and cotton research results have been published in 30 publications, including refereed journals, theses, conference proceedings, and contributions to books.

Efficiency (Was the project cost-effective?)

29. The ICR's estimate of an economic rate of return in the range of 10 to 22 percent is satisfactory methodologically and is supported by the evidence, in particular the value of increased cotton output and project costs, but the various shortcomings of the project indicate that a higher efficiency rate could have been achieved had more of the project gone according to plan. Even so, with the continued growth and deepening of the integrated cotton ginning and trading operations of several major international firms, the benefit stream appears to be on a solid upward path.

INSTITUTIONAL DEVELOPMENT IMPACT AND SUSTAINABILITY

30. **Institutional development impact** is rated as *High* given the continuing improvements that have occurred since the project was completed. The added time since the project ended in 2001, during which the institutional achievements have been expanded and consolidated, allows more confidence that institutional achievements are substantial and lasting. A strong institutional foundation has been laid at the apex for further growth of cotton production (especially CDO, UGCEA, and the whole private ginning industry).

31. However, on the research and extension side MAAIF's evolving strategy for a decentralized multi-provider system managed and funded by stakeholders, has disrupted existing services before the replacements are fully functioning.[9] The continuity of important cotton research may be affected if the decline of current agricultural research capability is not reversed at least until such time as the new system is producing results. The critical decline of agricultural research capability is discussed further below in connection with the research project.

32. Defined as the resilience of project achievements against risks, **Sustainability** is judged *Highly Likely* given the importance of the crop, supportive national and subsector policies, a vibrant cotton research effort, and the evidence of production resilience in the face of the largest unknown – falling commodity prices. The institutional strengths at the apex and the presence of a number of international firms as the backbone of ginning operations (which are increasingly active also in production services) offer strong assurance that risks to subsector prosperity should be well managed and overcome.

BANK AND BORROWER PERFORMANCE

33. **Bank performance** was mixed but is rated *Satisfactory* overall. The initial identification of a high priority needs in line with government's development strategy was undermined by weak preparation of parts of the project during two full years to approval, although there was no shortage of staff resources in total. Project implementation suffered accordingly with false starts in those key areas and a mid-term review effort was needed to devise new directions more thoroughly. This was costly for the Bank in that supervision resources averaged a high level of 27 staff weeks a year throughout and the project as a whole absorbed 8 staff-years of time from beginning to end. During supervision, the

9 . Being pursued especially under the IDA-assisted National Agricultural Advisory Services Project (NAADS).

consistent rating of project performance (both IP and DO) as satisfactory is questionable in hindsight, especially for the early period.

34. **Borrower performance** overall was *Satisfactory*, bordering on *Highly Satisfactory* but for the reservations noted here. Although as the ICR notes there were some delays on meeting covenant requirements and on funding on occasions, the government and its agencies overall remained strongly committed to the project objectives throughout. The macroeconomic policy setting was highly supportive of project objectives. However, government must share some responsibility for the delays and inefficiencies that occurred as a result of some key components not being adequately prepared (as already discussed).

LESSONS

35. The main lessons of wide general application are:

- **Government commitment:** Despite commodity prices and natural conditions at times being unfavorable, a dilapidated agricultural industry can be put back on its feet relatively quickly by a committed government with appropriate economic and social policies and which promptly passes supporting legislation.

- **Processing industry**: Financial restructuring of a bankrupt processing industry, which in this case facilitated the return of experienced international operators, can be an essential requirement of agricultural rehabilitation.

- **Project preparation**: Uneven depth of preparation of project components can show up later in implementation problems, which can be hard to overcome and may needlessly absorb a substantial amount of supervision and borrower resources. Project designs should be fully complete at approval, especially in production-oriented projects where some components are needed to ensure that output objectives can be achieved.

Part II: Agricultural Research and Training Project (Phase I)

BACKGROUND

36. Uganda has a long agricultural research tradition, starting from the early colonial period a century ago when tea, cacao, and cotton were introduced.[10] Outstanding research stations were developed at Kawanda, Namulonge, Serere, and Entebbe, which contributed to agricultural productivity beyond Uganda on a regional basis. Improved crop varieties, livestock strains, and husbandry practices flowing from these stations helped to make Uganda a leader among East African countries in the production of food and export commodities across mid-20th century decades. The Faculty of Agriculture and Forestry of Makerere University (MU) began research in agriculture in 1957. It is the oldest institution of higher learning in agriculture in Africa, offering many research programs. Uganda also hosted the East African Community (EAC) research institutes for trypanosomiasis and tsetse control and for fisheries, and established research stations with major responsibilities within the EAC for sorghum, millet, sugarcane, and cotton improvement.[11]

37. But Uganda's research system during the colonial era and the EAC period was designed largely to serve the needs of the larger commercial farmers in the EAC and of smallholders producing export crops, with much less done to address the needs of smallholder subsistence farmers. That legacy problem persisted until quite recently.

38. At appraisal in 1992 the National Agricultural Research System (NARS) comprised 9 research institutes, 11 research stations, 4 regional veterinary laboratories and 65 variety-testing centers operated by MAAIF, the Ministry of Water, the Ministry of Commerce and by Makerere University (MU). Despite some international assistance from the 1980s, once the earlier turbulence calmed sufficiently, the overall condition of these research establishments was very poor at that time.[12] Research in crops, livestock, and fisheries was implemented by three ministries; the MAAIF; in forestry by the Ministry of Water; and in food technology by the Ministry of Commerce. The Faculty of Veterinary Medicine and the Faculty of Science, of MU also conducted research on the same commodities and disciplines. Coordination was poor and resources were wasted on developing some unsatisfactory technologies. Funding was inadequate and unstable. The appraisal judged that without better agricultural research support, Uganda's economically dominant farming community was unlikely to be able to contribute to rapid economic recovery, increase productivity, and achieve sustainable environmental management. But without strong agricultural growth there was little possibility of economic recovery – hence restoring agricultural research capability was one of the keys to economic reconstruction.

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10. *Agriculture in Uganda*, op cit, includes an account of agricultural research on which this section drew.

11. This account of the condition of the research organization at appraisal is based on details in the SAR, paras. 3.1 – 3.5.

12. Apart from inadequate funding for decades, the agricultural research system had, like much of Uganda's infrastructure and institutions, suffered from economic mismanagement and social upheaval under repressive and corrupt regimes, and from warfare and extended periods of civil unrest. Although a research establishment existed on paper it did not have the resources or incentives to meet the sector's needs.

39. IDA's assistance to the (still) run-down and under-performing research system followed earlier efforts since 1986 (when relative national stability returned) to revitalize the research system, but only in a partial way through assistance for the research institutes at Namulonge, Kawanda, and Entebbe provided by USAID, EU, FAO, CIAT,[13] and GTZ. Additional rehabilitation and facilities and new equipment was required to meet expectations under the National Agricultural Research Strategy and Plan (NARSP), especially at the institutes at Serere, Jinja, Tororo, and Kifu. A NARO headquarters building (including staff housing) was needed.

PROJECT OBJECTIVES AND COMPONENTS

40. At appraisal in late 1992 it was noted that for the foreseeable future, agriculture would remain the most important sector in the Ugandan economy, providing food, employment, and export earnings. With a rapidly growing population (3 percent annually), but limited opportunity for increasing the area under cultivation, a key element of Uganda's strategy for agricultural growth was to increase the productivity of existing farms. Thus, output from the crop, livestock, and fisheries subsectors was to be increased substantially, and the technology to attain these increases had to be developed through a revived agricultural research system.

41. The overall goal of the project was *to promote agricultural growth and the diversification of production, processing, and export base through the development and transfer of improved technology*. The specific objectives of the project were to launch and support the key activities of NARO, including high-priority research; strengthen the linkages and coordination among the research system, the extension service, and the agricultural faculties of the university and agricultural colleges; and improve agricultural education and training capacity. The implicit institutional objective and means of achieving the project's development objectives (agricultural growth through an expanded flow of research outputs) was to re-establish public sector capacity to conduct agricultural research. The project's broad sectoral context was complex and challenging for such a single-purpose attack on only one of the agricultural sector's many constraints.

42. Much hangs on the interpretation of the phrase "*development and transfer of improved technology*" in the statement of objectives, both in terms of evaluating the project against its objectives and with reference to later perceptions of the performance of NARO as used to justify proposed reforms of the agricultural research system.

43. Review of the appraisal documents indicates that the reference to *transfer* of the new technologies to be developed by NARO was overstated since the extension service itself was not a partner in the project and there were limited means for NARO to effect transfer (mainly by training of extension staff and demonstration activities). But these efforts could have had only limited effectiveness at a time when the extension system itself was in grave difficulties and needed major reform if it was to transfer the new technologies needed by farmers.[14] Nor was it realistic to expect that NARO could make the difference (even the SAR noted that

13 . The International Center for Tropical Agriculture.

14. The T&V extension system had proved unsustainable and the Bank thereafter ceased to support this model further.

technology transfer depended on the extension system being more efficient). Thus, the *transfer* objective must be viewed realistically as secondary or even pro forma rather than substantial to the level required.[15] The "transfer and adoption of superior technologies" was given greater attention in the following project (Second Agricultural Research and Training Project, approved in FY99).

44. It should be noted that there was no suggestion at project appraisal that a publicly owned, managed, and financed research system was not appropriate, and hence the design did not include any aspects addressing reforms diverging from that traditional model. Given the dominance of small-scale subsistence-level producers in Uganda, many below the poverty line, that model of public sector support for agricultural research had been found to be socially and politically pragmatic in the 1980s and 1990s after the country had returned to stability. This traditional model of public research continues to be recommended by the Bank for developing technology for small market-oriented farmers and subsistence producers.[16]

45. The tough sector background in which the project was to be implemented, and thus the broad nature of the problems being faced, was well stated in the appraisal report (paras. 2.13 and 2.14) where it was clear that research was only one critical input among many required to revive the sector. The SAR noted that for sustained sectoral growth farmers must adopt improved production technologies and diversify into non-traditional export crops; yields must be raised substantially; that appropriate technologies and practices for seeds and planting material, soil management, weed management, pest control, post-harvest handling, storage and marketing must be developed; there were funding constraints including inadequate operating funds; extension services were fragmented and support services and facilities were run-down; efficient land markets were absent; destroyed infrastructure needed to be replaced, and that skilled personnel – lost due to low wages – must be recruited. It is against this difficult background that the project's results are judged.

IMPLEMENTATION ISSUES

46. The appraisal correctly identified some of the potential constraints that were to affect efficient implementation, as noted by the ICR. The main implementation issues were that NARO staff shortages affected the finance and M&E activities (through the non-competitiveness of NARO terms – for those types of specialist staff – compared with the private sector); policy/legislative shortfalls (for seed and planting material); and lack of private sector interest in seed and plant material production – with consequent reduced impact of emerging research results. Although baseline indicators were defined they were not measured at appraisal and lack of timely attention to M&E has made it difficult to assess project impact.[17] Provision of counterpart funding by the government was erratic and research operations were constrained at times by inadequate operating funds.

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15. There is only so much a research organization can achieve by "pushing" its knowledge out. There also has to be an effective extension system helping to stimulate awareness and demand for technology among potential clients. There has to be "pull" as well. Even so, a great deal of valuable technology was produced by the project, some of which is being used and some of which remains on the shelf.

16. *Agricultural Investment Sourcebook*, Agricultural and Rural Development Department, World Bank, 2004, Table 2.2.

17. The beneficiary survey conducted by NARO and reported in the ICR compensated somewhat for earlier inadequate M&E.

47. The ICR's observations on staff salary concerns were confirmed as a continuing issue during the mission's visit. The major structural salary and allowance increase of 1993, although necessary and appreciated by staff at the time, has had an adverse long-term impact on morale and the performance of NARO. All salary and allowance funds under the Credit were needed to finance the higher salaries, and in the absence of other funds little was left for performance incentives, salary scale adjustments with inflation, or even for salaries for key replacement staff. Remuneration levels have thus been largely stagnant for about ten years, which has increased staff turnover (with lagging replacement), diminished NARO's competitiveness as an employer, and staff have not been rewarded for good performance. As a result, formerly good morale has eroded. The consequent delayed recruitment (or redeployment where feasible) of critical professional staff has hampered research implementation in several programs.[18]

48. There were remarkable salary differentials between NARO levels (which have been unchanged for 10 years) and those of comparator organizations: for example the salary level for the agricultural extension agency (NAADS) is double to quadruple that for NARO staff in the senior grades (and such disparities are similar with other technical "sister" agencies). Failure to address staff salary concerns for so long weakened research capacity (by increasing departures and reducing incentives). So did the ban on recruiting replacement staff as numbers fell.[19] Most recent information provided by Bank staff indicates that the salary question is being addressed and that NARO has been authorized to recruit 20 core replacement staff.

49. The ICR also reported that concentration of most of NARO's research facilities within an arc around Kampala resulted in high transport costs traveling to and from outlying research sites and that lack of flexibility in sharing staff resources between institutes and programs reduced overall efficiency.[20] The need for decentralization of research activities is not a new issue, having been raised during project preparation but not pursued under the project. It was taken up under the second project (approved in FY99) with the establishment of 12 regional Agricultural Research and Development Centers (ARDC). More recently NARO has also taken action on the flexibility issue by switching to defining its work program and budget in terms of research "projects" that can draw on whatever resources (staff, materials, facilities, and equipment) may be needed to meet objectives, without regard to their location and routine custodianship at any given research facility. Fiscal

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18. The 1998 Public Service Review led to a recruitment freeze which has been lifted recently, but not for agricultural agencies. The mission found that the continuation of this "enfeebling of NARO," as it was characterized by some interviewees, was occurring at random (rather than through planned obsolescence) with a potential negative impact on NARO's effectiveness. The report of the agricultural committee of parliament on the 2003/2004 agricultural budget estimates refers to over 180 staff (including 65 experienced scientists) leaving since 1994 due to poor pay and job uncertainty. Some were key staff trained under the project. Moreover, without recruitment of young staff the age profile is increasing and succession planning is difficult. Staff departures are not evenly spread with some stations particularly hard hit: e.g., FIRRI has lost 11 of its 25 technical staff, 44 percent decline, and SAARI has lost eight of its establishment of 25 scientists, a drop of 32 percent.

19. These matters were the subject of lengthy discussions with the mission among a wide selection of staff at the research stations visited. It was clear to the mission that the issues were of grave concern to the staff. Back in Kampala/Entebbe there were indications that these matters were receiving attention at the time of the mission, as was urgently needed, and a draft proposal was seen.

20. On the other hand, as noted by a reviewer of this report, a decentralized multi-provider system will have high management overheads, which are likely to offset transport cost savings.

decentralization (an objective of current reforms) is channeling more resources to the districts and NARO activities could be more devolved to take advantage of this additional source of potential funding.

50. Finally, there was concern during implementation that technology adoption was partial – a finding with analogues in similar situations elsewhere. Thus, the ICR reports that a beneficiary assessment found that despite high adoption rates (of new NARO crop varieties) a relatively small proportion of adopters follow the recommended agronomic practices that give best returns with the improved varieties. This was attributed in part to NARO paying insufficient attention to the specifics of traditional mixed/relay cropping with which the improved practices were not a good fit. Again the missing extension input is highlighted, with the study noting that field extension staff indicated the need for strengthening of farmer/extension/researcher relationships.

POST-IMPLEMENTATION DEVELOPMENTS

51. With a view to provide critical context to the assessment of the project's development outcome and sustainability 4 years after the project ended, this section provides a brief overview of proposed changes in strategy for the financing, corporate structure, management and participation in agricultural research and extension. These changes have been taking shape gradually since earlier detailed proposals in 2003, which some stakeholders did not fully support, have been adjusted in the draft legislation to gain broader support.

52. **Follow-on project:** before the first project closed in 2000, the Bank in 1999 indicated its continuing confidence in the performance of NARO as the prime source of smallholder agricultural research by approving the Second Agricultural Research and Training Project.[21] Having established a unified public sector research capability under the first project, the follow-on project aimed to strengthen NARO's impact by giving increased emphasis to demand-driven, client-oriented research and promote the active participation of stakeholders, especially farmers and the private agribusiness sector, in research planning and implementation. Research was to focus on specific constraints on particular production systems and "bridging finance" was included for pilot activities on improved technology transfer under the decentralized extension system proposed for Bank support under a new Agricultural Extension Project. Thus the second project echoed the main themes of government's *Plan for Modernisation of Agriculture* (PMA) that was under preparation at the time (more on PMA is below). At that time (the project documents state) NARO was expected to "continue on-going high priority, adaptive research which address specific production constraints and have a high potential of producing significant benefits and impact, in a relatively short time....Other research areas to be supported by the project will be identified during a series of district and national level consultations between NARO and all the stakeholders of agricultural research." Thus the expectation in 1999 was that NARO would continue to be the main source of agricultural technology for smallholder agriculture.

53. The objectives of the second project responded well to concerns that NARO needed to reflect more closely the precise needs of farmers (through yet closer consultation) and be

21. In an unusual run of staff continuity, the second project team leader had been the team leader for the first project throughout, since 1991.

more directly active in promoting the adoption of improved technology.[22] However, given the uncertainties as the NARO reform agenda is fleshed out, some activities of the second project, affected by the expected policy changes, have been put on hold and funds have been reallocated to support the new extension approach.

54. **MAAIF's new strategy for agricultural research and extension:** the *Plan for Modernisation of Agriculture* was published in August 2000, as the first IDA research project came to its close, after deliberations dating back to 1996. The initial focus was on progressive modern farming techniques, but this switched later to smallholders and poverty alleviation. The PMA aims to modernize agriculture and is a major part of the national strategy to eradicate poverty by modernizing the economy. The key feature is improving smallholder technology, starting from a generally low base. Hence main parts of the Plan are to implement a new National Agricultural Research Policy to develop technology and to put in place a market-targeted advisory system "owned by stakeholders, effective, efficient, sustainable" to deliver good technical advice to farmers – the National Agricultural Advisory Services Programme. The effectiveness of current agricultural research services, specifically NARO, was then measured against the PMA strategy, which led to the identification of a need for substantial reform of the way that agricultural research is funded, planned, managed, conducted and transferred to farmers.

55. The Plan document is clear on the complexity of the task of improving smallholder agriculture, notes that research is only one of many related requirements, and points up that although research is a key ingredient, it cannot alone reduce rural poverty. This is important because continuing rural poverty is seen by some as an indicator of NARO's weak performance, even though NARO is just one of the key players in the efforts needed to relieve a complex of constraints.[23] Indeed, a key early briefing paper making the case for reform, it was stated that continuing rural poverty and low agricultural productivity had raised concerns as to NARO's effectiveness in transforming the agricultural sector in spite of NARO's good reputation.[24]

56. At the time of the OED field visit (January 2004) the details of the reform proposals were available in the NARS Reform "Master Document" (issued in December, 2002) but draft legislation was still under revision, given the need to reach consensus amongst the stakeholders. Under the current NARS Reform proposal (as reflected in the latest drafts of

22. The second project's objectives were to: (a) transfer relevant technologies and indigenous knowledge, and improved cultural practices to farmers' fields, and promote their adoption, (b) ensure that technologies being developed are addressing actual problems of farmers, (c) establish and operate the Agricultural Research and Development Centers (ARDC), (d) reinforce NARO's technical and in-service training support for the district-level extension services; and (e) strengthen NARO's effectiveness and efficiency in technology transfer, including smallholder seed production and distribution systems, integrated pest management, and soil fertility and management.

23. The relevant PMA extract says, "Consultations with poor farmers revealed two types of constraints: productivity related constraints and constraints related to governance. Productivity related constraints include: lack of sufficient food, lack of land, soil infertility, lack of proximal water sources, lack of inputs, pests and diseases, lack of skills and knowledge, lack of capital and access to credit, market problems (low prices, lack of markets), poor roads and transport networks, lack of storage and processing, insecurity where it exists, and loss of oxen due to insecurity in areas where they are used. Broad governance constraints faced by poor farmers include insecurity of persons and property, corruption, lack of accountability and transparency, poor delivery of basic public services, and weak local leadership. Lack of consultation with farmers by governmental and non-governmental organizations concerning their priorities, implementation ...." (PMA, page vii)

24. One of the main comments conveyed by NARO staff (past and present) on the genesis of the reform process was that the technical analysis in support of such a pivotal view has not been done.

legislation and proposal, now called the Core Document[25]), the following main features are relevant to assessing the sustainability of the benefits of the project:

- NARO's core management would be reorganized into a coordinating apex body – the "NARO council" – with responsibilities for formulating policies and strategies for agricultural research, setting priorities, allocating funds, and coordinating and monitoring research providers and programs.

- The Director General of NARO would be one of 16 members of the council from the public and private sectors, with the chairperson and nine private sector members appointed by the Minister of Agriculture;

- Below the council, the Director General would be ex-officio head of the NARO Secretariat for day-to-day management of the system;

- Some research funding would be separated from research delivery by establishing an Agricultural Research Trust Fund to be managed by the NARO council to fund "competitive agricultural research contracts" executed by providers; and

- The staff and research stations of the current NARO would be reorganized into 13 institutes, each of which would be separate semi-autonomous bodies corporate (with management and contracting committees). Six are current NARO research institutes and seven are NARO regional research centers already set up under the decentralization strategy.

Within this structure, drawing on the Core Document, NARO's staff and facilities would be "right-sized" and NARO institutes would be "expected to give way to the emergent private sector and, over time, to be responsible for only those strategic and public-goods areas of research that the private sector cannot take on."[26] Analysis of the likely areas which the private sector cannot "take on" (considering the public good character of smallholder research products) has yet to be done but was expected to identify a substantial menu left for public research.

57. The current uncertainties regarding the eventual approval of the bill by parliament, together with the innovative character of the NARS Reform strategy, imply a real risk of decline in the flow of smallholder benefits (from the project investments in NARO's physical and human resources) at least during a transition period. There is also a risk that the necessary priority focus and scale economies, of importance for research into major national priorities, may be difficult to achieve in a more decentralized, corporately segmented and competitive system. Finally, the competitive element of the arrangements carries the risk that smallholder needs may lose out to the more commercially attractive demands of medium and large-scale farmers. These risks have a bearing on the outcome and sustainability ratings discussed below.

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25 . *National Agricultural Research System Reform Programme – Core Document, MAAIF, March 2005*

26 . Core Document, section 5.2.1.2.

OVERALL OUTCOME

58. When the project was completed in 2000, public capacity for agricultural research had been rehabilitated and was producing substantial research results, especially for smallholders. Outcome was rated *Satisfactory* in OED's review of the ICR in 2001, confirming the ICR's rating. The expectation was that the second research project would consolidate these substantial gains by focusing on acknowledged system weaknesses and building on the substantial institutional capability established by the project for public goods research for the smallholder subsector. The present assessment confirms the rating of *Satisfactory* for the Outcome of the project based on the assessment of relevance, efficacy and efficiency described in the following paragraphs.

59. Achievements were substantial over the project's life. During a time of economic liberalization and tight government finance the borrower, with IDA's assistance, succeeded in building a sound institutional basis for supporting agricultural research in a country heavily dependent on subsistence agriculture. ISNAR (International Service for National Agricultural Research) "regards the process and collaborative efforts of donors, the international agricultural research centers and the Government in establishing NARO a model for other countries to follow."[27] All such achievements must be measured against the many challenges facing the sector, as set out in the PMA.

60. The research activities of existing institutes (formerly managed by different ministries) have been integrated into a national research program coordinated by NARO to address all the major production priorities identified through regular participatory processes with farmers and their representatives. Thus the project led to improved understanding of the importance of interaction with farmers and other stakeholders and to looking at the adoption of new varieties within the context of mixed-cropping practices. NARO was transformed from civil service to semi-autonomous status and is in a good position to initiate some cost recovery for services and pursue more diverse funding sources, especially from private sector participation.[28] However, the ICR comments, and the mission confirmed, that fixed asset management and maintenance in general could improve further. The mission also noted at the stations visited that some of the facilities and equipment provided were not in regular or full use, perhaps indicating one of the costs of declining human resources in NARO.

61. The overall impact on rural poverty reduction of agricultural research globally has been widely recognized (and it could hardly have been otherwise in Uganda in such an agricultural economy). The ICR reports exceptional rates of adoption (in the 60 to 70 percent range) for improved varieties of a number of major crops.[29] In all, more than 50 new crop

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27 . ICR, page 15, 9. Partner Comments

28. Some details of achievements are: management, administrative, accounting and financial systems have been strengthened, the research infrastructure of four institutes was rehabilitated and an agricultural training center was constructed at Makarere University and is being used. Strong functional relationships between regional and international research institutions and the faculties of MU were established. A monitoring and planning unit was established and priority setting has been operationalized with stakeholder consultations. Buildings were rehabilitated at three centers and there were cost savings sufficient to fund rehabilitation of laboratories at an additional center.

29. However, the common problem of low adoption rates for some of the cultural practices needed to realize varietal potentials is attributable in part to insufficient attention by researchers to mixed cropping practices and labor constraints – also a common problem. NARO was well aware of these weaknesses in its approach.

varieties were released. But as is often the case in smallholder situations, there are concerns over failures to adopt all aspects of a technology package. In the field the mission also learned, and read the accounts by other observers, of a number of cases in which NARO research headed off major famine risk when key food crops were under pathogen threat.

62. The main example is resolution of the African Cassava Mosaic Disease (ACMD) crisis, which was a major achievement. ACMD had a catastrophic effect on cassava production and on poverty until release of resistant varieties developed by NARO enabled recovery of the crop so that by 1999 production exceeded pre-epidemic levels. The ICR indicates that in terms of lives saved from dying of hunger, the value of the ACMD-resistant varieties introduced cannot be overemphasized. Similarly, virus-resistant sweet potato varieties have allowed that crop to re-emerge in large areas where its cultivation had virtually ceased because of endemic disease. Other major achievements were in maize breeding (out-yielding other East African varieties); a sorghum being grown specifically for a new popular brand of beer; and biological control of water hyacinth (with technology from IITA, Nigeria), another major success, with the lakeshore and waterways now cleared of that aggressive weed with large benefits to hydroelectric generation, fisheries, and water transport.[30]

63. Perhaps the most concise measure of the achievements of NARO during the project is provided by the substantial list of available technologies "on-the-shelf" which the Second Agricultural Research and Training Project would concentrate on passing to farmers in the early years.[31]

64. Regionally, NARO was viewed in the late 1990s as a model research system for other countries to follow, and information-gathering missions from several countries were hosted. IDA's Project Appraisal Document for the 2001 National Agricultural Advisory Services Project was laudatory: "NARO is considered to be a successful and well-managed institution with greater administrative capacity and greater flexibility (by virtue of its semi-autonomous status) than is present in most public sector institutions."

Relevance (Were the project's objectives right in the light of current priorities?)

65. The project's objectives could not have been more highly relevant at approval and remain so today, since the need for public research to produce public goods for smallholder subsectors has not diminished and is widely recognized. In some ways the relevance of the project objectives has been heightened by the proposed policy change toward a more complex model for the agricultural research system. The need to retain a core public research

30. Beyond these physical impacts, the ICR reports large dissemination outputs: 535 publications, 114 articles, 73 annual reports, and 150 journal articles/research papers/book chapters were produced. Twenty-four NARO and 40 MAK staff received higher degree training (29 PhD and 35 M.Sc.).

31. The appraisal document lists the following technologies as ready to go: " (a) improved cultural management of bananas to reduce the harmful effects of the Sigatoka disease, banana weevil and nematodes, (b) the rapid multiplication of planting materials of many crops, e.g., mosaic resistant cassava cultivars, high yielding clonal coffee, high yielding disease resistant Irish potato and sweet potato varieties, through tissue culture and other techniques, (c) improved varieties of beans, sorghum, cassava, groundnuts, sunflower, cotton, (d) village level on-farm storage structures for maize and other foodgrains, (e) small farm implements designed for the smaller cattle of Uganda, e.g., the improved Ugandan plow; hand shellers, hand threshers, and mechanical weeders, and (f) improved agro-forestry technologies and practices for harvesting, processing and utilizing products of conifer plantations." (PAD, page 2)

capability for smallholder technology may be heightened if commercial incentives divert resources towards addressing the technology demands of larger scale commercial farmers.

Efficacy (Did the projects achieve its stated objectives?)

66. The project achieved its objectives at completion with the exception of the overstated technology transfer objective already discussed, for which there were insufficient means in the project. Even so, adoption rates as described were good, productivity increased (and moreover production did not fall, a real possibility under the onslaught of natural causes which were overcome by NARO's work), and diversification as a long-term objective was served, especially by reversing any trend toward fewer cropping opportunities caused by crop pathogens.

Efficiency (Was the project cost-effective?)

67. Despite the implementation shortfalls described, the project was a highly efficient use of Uganda's resources. Returns to successful agricultural research are very high and in this case the evidence on outputs is convincing. Many improved varieties were released and adopted, there were instances of major cropping disasters being reversed by NARO work, and water hyacinth control was a major success.[32] Institutional outputs were also impressive and will generate benefits for years to come: a substantial list of research publications and peer- reviewed articles, training of over 1,000 extension staff, over 1,000 technical workshops, on-farm demonstrations and field days, an annual stakeholder planning meeting at each station, and considerable staff training and post-graduate upgrading.

INSTITUTIONAL DEVELOPMENT IMPACT AND SUSTAINABILITY

68. The lasting institutional impact of the project, in its original form, has clearly changed in the context of the ongoing organizational uncertainties, and uncertainty remains over how long the current transition period will last.[33] There is a need for determined and prompt action on key areas so that critical research capacity does not erode further. The risks in the short term are substantial, such that appropriate corrective actions are urgently required. It is against this uncertain background that the project is rated against these two evaluation criteria.

Institutional Development Impact

69. Although the lasting institutional impact of the project is clouded and constrained by the ongoing policy and organizational uncertainties, the pragmatic policy approach for agricultural research and extension that is likely to emerge in due course will capitalize on

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32. In the ICR, Table 3 provides a long and impressive list of the technologies available from NARO.

33. At the time of the field visit the NARS reform program was showing clear signs of stress: the case study of Uganda in ISNAR's review in late 2003 noted that major elements of the reform were being questioned on feasibility grounds (the role of local communities, decentralization of NARO given staffing constraints, stakeholder participation "in abeyance" and system linkages still had to be developed with the extension services (*A Review of Key Issues and Recent Experiences in Reforming Agricultural Research in Africa*, ISNAR, December 2003, Appendix 2.7).

the institutional advances under the project. NARO will likely play a leading role in this system. While at project completion in 2000 a rating of *High* for institutional development impact would have been justified (an upgrade from both the ICR and OED's review ratings of *Substantial*), *Substantial* is now again justified for the IDI rating, since the impact has been eroding in the last two to three years.

Sustainability

70. While there is a real risk of research benefits for smallholders from NARO declining as the reforms come into being, the resilience of the NARO system to recover quickly is judged to be good. Provided that corrective actions on incentives and staffing are not delayed, the substantial investment made under the project can continue to benefit Uganda's poor farmers. Otherwise, leakage of human resources (including out of the country) will take those benefits elsewhere and outputs will decline. However, the reform process has been so stretched out, and controversy so strong, that predicting a final outcome at this time is difficult. Hence, after careful consideration of the probabilities, remaining uncertainties inhibit choosing at this time between *Likely* and *Unlikely* resilience to risks of project benefits. Sustainability is therefore recorded as *Not Evaluable.*

71. There was an expectation that the second research project would consolidate the substantial gains of the project by focusing on acknowledged system weaknesses, especially field impact. Results "on the shelf" and a continued flow of valuable research results from work initiated under the project would be transferred to smallholders by a strengthened system. Thus a strong flow of project benefits seemed assured. But since research outcomes are lagged substantially on research inputs, what happened after the project closed affected (and will continue to affect) the longer term impact of the project.[34] The uncertainties introduced by the proposed policy changes since closing suggest that the flow of critical benefits to small farmers is now less assured, and certainly less resilient to these increased risks. Much will depend on how well the transition period is managed and how quickly current uncertainties threatening research outputs can be removed. This does not downgrade the substantial achievements of the project during implementation, as discussed above, but takes account of the uncertain implications for NARO's main smallholder customers, if indeed NARO's core capability for research is reduced under the current proposals for decentralization and dispersed management in many semi-autonomous institutes.

Bank and Borrower Performance

72. **Bank performance** with respect to the project is rated overall as *Satisfactory* with the following comments. The Bank task manager remained the same throughout, in contrast to a more common pattern of several changes of task manager. In a review of supervision the Quality Assurance Group (QAG) raised this as an issue (preferring the added insights of occasional changes of task manager), whereas the ICR correctly notes that OED has frequently criticized high task manager turnover. Borrowers have noted that high turnover

34. There are some encouraging signs emerging. Staff in the Bank's regional office have reported that early monitoring of the impact of NAADS has shown very good returns to program activities in "NAADS districts" compared with others. A major share of these benefits is likely to be attributable to the NARO technologies that NAADS is passing on to smallholders.

can cause them problems and may lead to delays as new staff require time to become familiar with the situation. Continuity of task manager in this case was on balance a benefit as can be attested by results and, moreover, the record shows that supervision was relatively intensive with above average resources and a fair number of specialists engaged from time to time.

73. The project was timely and responded to critical needs, but the design would have been greatly improved if a more productive extension component had been possible.[35] This might also be noted as a design deficiency which passed over the known problem of the concentration of research centers around Kampala and the problems this gave for conducting efficient outreach and demonstration. Later during supervision the salary issue should have received more attention rather than being allowed to linger, eventually through completion into 2004 (especially as the issue was identified at appraisal in 1992 – SAR, para. 6.12).

74. **Borrower performance** is also rated *Satisfactory*, but with the reservation that the comments above on Bank performance shortfalls also reflect on the borrower, whose project it was. Moreover, the post-project issues, as they affect in particular the IDI and sustainability ratings, also owe much to initiation of the NARS reform process (following the new model offered to it by donors), leaving the borrower to resolve the issues that are reducing research capability in the short term. Ultimately, only the borrower can ensure that in the longer-term quest for reform, the recent substantial gains in public research capacity for smallholder agriculture do not wither further.

LESSONS

75. Experience with the project and its aftermath points to three main lessons:

- **Public sector research:** Sustaining smallholder production requires a flow of technology from research (as was amply shown under the project in the 1990s). Public sector research is especially important in a sector dominated by poor subsistence farmers dependent on food crops. This is justified on public goods and social safety net grounds, and in terms of financial and economic efficiency, given the high returns to agricultural research for rural areas.

- **Farm systems approach:** Smallholder technology improvements should be developed through a farm systems approach (for example, taking into account mixed crops and labor constraints) if they are to be fully applicable to the needs of smallholders. Technology developed without system constraints being taking into consideration is unlikely to find strong acceptance.

- **Complementarity of research and extension:** Where a major investment is being made in boosting agricultural research, strong consideration should be given to internalizing the accompanying extension system arrangements in the project as a component and as an institutional participant.

35. Without going into detail, it is apparent that the hiatus in the Bank's support for agricultural extension associated with the move away from the T&V system was a contributing factor to technology transfer shortcomings during the period.

Annex A. Basic Data Sheet

COTTON SUBSECTOR DEVELOPMENT (CREDIT NO. 2609-UG)

Key Project Data *(US$ millions)*

	Appraisal estimate	*Actual or current estimate*	*Actual as % of appraisal estimate*
IDA Credit	14.00	13.78	98
Cofinancing	12.50	11.32	91
Government	4.90	3.40	69
Total project cost	31.40	28.50	91

Project Dates

	Original	*Actual*
Departure of Appraisal Mission		05/15/1993
Board approval		05/10/1994
Effectiveness	07/01/1994	11/18/1994
Closing date	12/01/1999	12/31/2001

Staff Inputs (staff weeks)

	Actual/Latest Estimate	
	N° Staff weeks	*USUS('000)*
Identification/Preparation	88.5	245.5
Appraisal/Negotiation	67.8	186.2
Supervision	187.6	641.2
ICR	2.3	16.1
Total	346.2	1,089.0

Mission Data

	Date (month/year)	No. of persons	Specializations represented	Performance Rating	
				Rating trend	Types of problems
Identification/ Preparation	June 1991				
Identification/ Preparation	Feb. 1992				
Identification/ Preparation	Jan. 1993				
Appraisal/Negotiation	July 1993	2	Financial Management Specialist		
Appraisal/Negotiation	April 1994	7	Economist (2) Operations Officer, Agriculturalist (2); Women in development Private sector		
Supervision 1	November 1994	2	Operations Officer, Financial Management Specialist	S	S
Supervision 2	February 1995	9	Financial Management Specialist (2); Operations Officer (2); Agriculturalist, IPM Specialist, M&E specialist, Extension specialist, Research specialist	S	S
Supervision 3	July 1995	2	Financial Management specialist, seeds specialist	S	S
Supervision 4	November 1995	2	Financial Management Specialist, Ginneries Specialist	S	S
Supervision 5	July 1996	5	Financial Management Specialist, Ecologist, Operations Officer, Extension Specialist, Credit Specialist	S	S
Supervision 6	September 1996	1	Financial Management Specialist	S	S
Supervision 7	December 1996	1	Financial Management Specialist	U	S
Supervision 8	June 1997	7	Financial Management Specialist, Economist (2), Operations Officer, IPM Specialist, M&E Specialist, Seed Specialist	S	S
Supervision 9	February 1998	5	Credit Specialist, Economist, Financial Management Specialist, M&E Specialist, IPM specialist	S	S
Supervision 10	July 1998	3	Operations Officer, Financial Management Specialist, Credit Specialist	S	S
Supervision 11	February 1999	4	Operations Officer, Financial Management Specialist, IPM Specialist, Credit Specialist	S	S
Supervision 12	February 2000	3	Operations Officer, financial Management Specialist, Rural Development Specialist	S	S
Supervision 13	February 2001	3	Operations officer, Financial Management Specialist, Rural Development Specialist	S	S
Completion	December 2001	2	Economist, Agriculturalist	S	S

AGRICULTURAL RESEARCH AND TRAINING PROJECT (CREDIT 2446-UG)

Key Project Data *(US$ millions)*

	Appraisal estimate	*Actual or current estimate*	*Actual as % of appraisal estimate*
IDA Credit	25.00	25.18	101
Cofinancing	–	–	–
Government	3.83	7.02	183
Total project cost	28.87	32.20	112

Project Dates

	Original	*Actual*
Departure of Appraisal Mission		06/15/1992
Board approval		12/15/1992
Effectiveness	06/24/1993	08/31/1993
Closing date	12/31/200	09/30/2000

Staff Inputs (staff weeks)

	Actual/Latest Estimate	
	N° Staff weeks	*USUS('000)*
Identification/Preparation	162.8	319.1
Appraisal/Negotiations	33.5	108.6
Supervision	189.5	702.4
ICR	14.9	63.2
Total	400.7	1,193.3

Mission Data

	Date (month/year)	*No. of persons*	*Specializations represented 1/*	*Performance Ratings 2/*	
				Implementation Progress	*Development Objectives*
Pre-preparation	Mar. 90	2	Ag; AR	n.a.	
Preparation	Apr-May 1991	6	Ag; AR; LR; FR; CR; Ex	n.a.	
Final Preparation	Sep-Oct. 1991	3	Ag; Ex; Ec	n.a.	
Pre-appraisal	Jan-Feb. 1992	4	Ag; Ex; Ec	n.a.	
Second Pre-appraisal	Apr-May 1992	7	Ag; Ex; Ag; FA; Ec	n.a.	
Appraisal	Jun-July 1992	6	Ag; FA; Pr; AR; FM	n.a.	
Supervision 1	Oct. 21-Nov. 11, 1993		Ag; AR	S	
Supervision 2	Jun 24-July 9, 1994		Ag; Fi	S	S
Supervision 3	Jan. 29- Feb. 11, 1995		Ag; FM	S	S
Supervision 4 (MTR)	Feb. 1 – 22, 1996	8	Ag; FA; TR; Ec; AR	S	S
Supervision 6	March 18 – April 8, 1997	4	Ag; AR; FA	S	S
Supervision 7	June 24 – July 9, 1997	3	Ag; EC; Tr	S	S
Supervision 8	Jan 30 – Feb. 10, 1998	3	Ag; AR; FA	S	S
Supervision 9	June 24 – July 10, 1998	5	Ag; AR; Ec; AS; Ag	S	S
Supervision 10	Nov. 9 – 23, 1998	1	Ag	S	S
Supervision 11	Aug, 3-13, 1999	2	Ag; AS	S	S
Supervision 12	Feb. 2000	36	AG; EC	S	S
ICR	Feb. 2000	3	Ag; AS,SE	S	S

1/ Ag = Agriculturalist
AR = Agricultural Research
LR = Livestock Research
FR = Forest Research
CR = Crop Research
Ec = Economist
FA = Financial Analyst
Pr = Procurement
FM = Financial Management
Ex = Extension
Ed = Agricultural Education
CE = Civil Engineer
Fi = Fisheries Research
Tr = Training
AS = Agricultural Services
SE = Socio-Economist

2/ S = Satisfactory