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Report No: ICR00004085

IMPLEMENTATION COMPLETION AND RESULTS REPORT

IDA 47690

ON A

CREDIT

IN THE AMOUNT OF SDR 79.5 MILLION

(US\$120.0 MILLION EQUIVALENT)

AND

TF-97184

GRANT FROM THE

GLOBAL ENVIRONMENT FACILITY TRUST FUND

IN THE AMOUNT OF US\$7.2 MILLION

TO THE

REPUBLIC OF UGANDA

FOR THE

AGRICULTURAL TECHNOLOGY AND AGRIBUSINESS ADVISORY SERVICES PROJECT

February 15, 2019

Agriculture Global Practice  
Africa Region

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## CURRENCY EQUIVALENTS

(Exchange Rate Effective January 27, 2019)

Currency Unit = Ugandan Shillings (UGX)

UGX 3,675 = US\$1

US\$1.40 = SDR 1

FISCAL YEAR

July 1 – June 30

## ABBREVIATIONS AND ACRONYMS

AASP	Agricultural Advisory Service Provider
ACDP	Agriculture Cluster Development Project
AEZ	Agro-Ecological Zone
ARSP	Agricultural Research Service Provider
ARTP	Agricultural Research and Training Project
ATAAS	Agricultural Technology and Agribusiness Advisory Services Project
CBA	Cost-Benefit Analysis
CBSD	Cassava Brown Streak Disease
CCF	Commercialization Challenge Fund
CGS	Competitive Grant Scheme
CMD	Cassava Mosaic Disease
CPF	Country Partnership Framework
CRG	Competitive Research Grant
DANIDA	Danish International Development Agency
DARST	District Adaptive Research Support Team
DAES	Directorate of Agricultural Extension Services
DP	Development Partner
DPO	District Production Officer
DSIP	Development Strategy and Investment Plan
EAAPP	Eastern Africa Agricultural Productivity Project
EFA	Economic and Financial Analysis
EIRR	Economic Internal Rate of Return
ESMF	Environmental and Social Management Framework
FAO	Food and Agriculture Organization of the United Nations
FAW	Fall Army Worm
FG	Farmer Group
FID	Farmer Institutional Development
FM	Financial Management
GAC	Governance and Anti-Corruption
GDP	Gross Domestic Product

GEF	Global Environment Facility
GEO	Global Environmental Objective
GHG	Greenhouse Gas
GoU	Government of Uganda
HLFO	Higher-Level Farmer Organization
ICR	Implementation and Completion Results Report
ICT	Information and Communication Technology
IFAD	International Fund for Agricultural Development
IPF	Investment Project Financing
IRI	Intermediate Results Indicator
ISR	Implementation Status and Results Report
IST	Implementation Support Team
LG	Local Government
LSMS	Living Standards Measurement Survey
M&E	Monitoring and Evaluation
MAAIF	Ministry of Agriculture, Animal Industry, and Fisheries
MIS	Management Information System
MSIP	Multi-Stakeholder Innovation Platform
MTR	Midterm Review
NAADS	National Agricultural Advisory Services
NARI	National Agricultural Research Institute
NARO	National Agricultural Research Organization
NARP	National Agricultural Research Program
NARS	National Agricultural Research System
NDP	National Development Plan
NPV	Net Present Value
OWC	Operation Wealth Creation
PARI	Public Agricultural Research Institute
PCU	Project Coordination Unit
PDO	Project Development Objective
PIM	Project Implementation Manual
PPP	Public-Private Partnership
R&D	Research and Development
R&E	Research and Extension
RF	Results Framework
SLM	Sustainable Land Management
STEP	Systematic Tracking of Exchanges in Procurement
TFP	Total Factor Productivity
TIMP	Technologies, Innovations, and Improved Management Practice
UBoS	Uganda Bureau of Statistics
UNPS	Uganda National Panel Survey
USAID	United States Agency for International Development
ZARDI	Zonal Agricultural Research and Development Institute

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## TABLE OF CONTENTS

<b>DATA SHEET .....</b>	<b>1</b>
<b>I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES.....</b>	<b>6</b>
<b>A. CONTEXT AT APPRAISAL.....</b>	<b>6</b>
<b>B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE).....</b>	<b>11</b>
<b>II. OUTCOME .....</b>	<b>16</b>
<b>A. RELEVANCE OF PDOs.....</b>	<b>16</b>
<b>B. ACHIEVEMENT OF PDOs (EFFICACY).....</b>	<b>17</b>
<b>C. EFFICIENCY .....</b>	<b>23</b>
<b>D. JUSTIFICATION OF OVERALL OUTCOME RATING .....</b>	<b>24</b>
<b>E. OTHER OUTCOMES AND IMPACTS (IF ANY).....</b>	<b>25</b>
<b>III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME .....</b>	<b>28</b>
<b>A. KEY FACTORS DURING PREPARATION.....</b>	<b>28</b>
<b>B. KEY FACTORS DURING IMPLEMENTATION .....</b>	<b>28</b>
<b>IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME ..</b>	<b>30</b>
<b>A. QUALITY OF MONITORING AND EVALUATION (M&amp;E).....</b>	<b>30</b>
<b>B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE .....</b>	<b>31</b>
<b>C. BANK PERFORMANCE.....</b>	<b>33</b>
<b>D. RISK TO DEVELOPMENT OUTCOME .....</b>	<b>35</b>
<b>V. LESSONS AND RECOMMENDATIONS .....</b>	<b>36</b>
<b>ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS.....</b>	<b>38</b>
<b>ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION .....</b>	<b>50</b>
<b>ANNEX 3. PROJECT COST BY COMPONENT.....</b>	<b>53</b>
<b>ANNEX 4. EFFICIENCY ANALYSIS .....</b>	<b>54</b>
<b>ANNEX 5. BORROWER, CO-FINANCIER, AND OTHER PARTNER/STAKEHOLDER COMMENTS ..</b>	<b>59</b>
<b>ANNEX 6. SUPPORTING DOCUMENTS (IF ANY) .....</b>	<b>60</b>
<b>ANNEX 7. SUPPORTING TABLES AND FIGURES.....</b>	<b>62</b>



**DATA SHEET**

**BASIC INFORMATION**

**Product Information**

Project ID	Project Name
P109224	Agricultural Technology and Agribusiness Advisory Services
Country	Financing Instrument
Uganda	Investment Project Financing
Original EA Category	Revised EA Category
Partial Assessment (B)	Partial Assessment (B)

**Related Projects**

Relationship	Project	Approval	Product Line
Supplement	P108886-Uganda Sustainable Land Management Country Program	22-Jun-2010	Global Environment Project

**Organizations**

Borrower	Implementing Agency
Republic of Uganda	Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)

**Project Development Objective (PDO)**

Original PDO

The Project Development Objective is to increase agricultural productivity and commercialization of participating rural households by transforming and improving the performance of agricultural technology development and advisory service systems in Uganda



PDO as stated in the legal agreement

The objective of the Project is to increase agricultural productivity and incomes of participating households by improving the performance of agricultural research and advisory service systems in the Republic of Uganda.

**FINANCING**

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
<b>World Bank Financing</b>			
P109224 IDA-47690	120,000,000	119,997,789	115,179,982
P108886 TF-97184	7,200,000	7,200,000	7,200,000
<b>Total</b>	<b>127,200,000</b>	<b>127,197,789</b>	<b>122,379,982</b>
<b>Non-World Bank Financing</b>			
Borrower/Recipient	497,300,000		298,977,005
Other Development Partners (IFAD, EU, Danida)	41,000,000	14,700,000	4,619,920
<b>Total</b>	<b>538,300,000</b>	<b>14,700,000</b>	<b>303,596,925</b>
<b>Total Project Cost</b>	<b>665,500,000</b>		<b>425,976,907</b>

**KEY DATES**

Project	Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
P109224	22-Jun-2010	20-Dec-2011	06-Oct-2014	30-Jun-2015	25-Jun-2018
P108886	22-Jun-2010	06-Jun-2013	06-Oct-2014	30-Jun-2016	25-Jun-2018



**RESTRUCTURING AND/OR ADDITIONAL FINANCING**

Date(s)	Amount Disbursed (US\$M)	Key Revisions
14-Apr-2015	59.92	Change in Implementing Agency Change in Results Framework Change in Components and Cost Change in Loan Closing Date(s) Change in Financing Plan Reallocation between Disbursement Categories Change in Institutional Arrangements Change in Financial Management Change in Procurement Change in Implementation Schedule
17-Aug-2017	114.02	Change in Loan Closing Date(s)

**KEY RATINGS**

Outcome	Bank Performance	M&E Quality
Moderately Satisfactory	Moderately Satisfactory	Modest

**RATINGS OF PROJECT PERFORMANCE IN ISRs**

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	29-Nov-2010	Moderately Satisfactory	Moderately Satisfactory	1.01
02	10-Jul-2011	Moderately Satisfactory	Moderately Satisfactory	2.32
03	13-Mar-2012	Moderately Satisfactory	Moderately Satisfactory	2.34
04	12-Nov-2012	Moderately Satisfactory	Moderately Satisfactory	20.72
05	30-Jun-2013	Moderately Satisfactory	Moderately Satisfactory	46.82
06	11-Feb-2014	Moderately Unsatisfactory	Moderately Unsatisfactory	54.78
07	18-Nov-2014	Moderately Unsatisfactory	Moderately Unsatisfactory	62.19
08	23-Jan-2015	Moderately Unsatisfactory	Moderately Satisfactory	64.56





09	14-Aug-2015	Moderately Satisfactory	Moderately Satisfactory	64.89
10	26-Oct-2015	Moderately Unsatisfactory	Moderately Unsatisfactory	69.45
11	02-May-2016	Moderately Satisfactory	Moderately Satisfactory	73.80
12	25-Dec-2016	Moderately Satisfactory	Moderately Satisfactory	86.36
13	29-Jun-2017	Moderately Satisfactory	Moderately Satisfactory	110.86
14	27-Dec-2017	Moderately Satisfactory	Moderately Satisfactory	120.00
15	25-Jun-2018	Moderately Satisfactory	Moderately Satisfactory	120.10

## SECTORS AND THEMES

### Sectors

Major Sector/Sector (%)

**Agriculture, Fishing and Forestry 75**

Agricultural Extension, Research, and Other Support Activities 65

Public Administration - Agriculture, Fishing & Forestry 10

**Industry, Trade and Services 25**

Agricultural markets, commercialization and agri-business 25

### Themes

Major Theme/ Theme (Level 2)/ Theme (Level 3) (%)

**Private Sector Development 10**

Public Private Partnerships 10



<b>Finance</b>	<b>20</b>	
Finance for Development	20	
Agriculture Finance	20	
<b>Urban and Rural Development</b>	<b>80</b>	
Rural Development	80	
Rural Markets	40	
Rural Infrastructure and service delivery	40	
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## I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

### A. CONTEXT AT APPRAISAL

#### Context

1. **At appraisal, 70 percent of Uganda’s population was engaged in agriculture, overwhelmingly on small, low-productivity farms.**<sup>i</sup> The sector accounted for 28 percent of GDP, half of export revenues and half of all land area, with the median landholding size being just 1.8ha.<sup>ii</sup> Only tea and sugar were grown on large estates. The average annual agricultural growth rate had doubled from 1.2 percent (2005 – 2007) to 2.5 percent (2008 – 2010) because of the 2008 food price spike rather than productivity increases. Despite being endowed with favorable natural resources and varied climate conditions suitable for a wide variety of crops and livestock, growth in agricultural Total Factor Productivity (TFP) was negative, at –3 percent, between 2000 and 2010.<sup>iii</sup> It was evident that despite having the potential to serve as East Africa’s breadbasket, Uganda’s agricultural growth was slow, inefficient, and unsustainable—enhancing the sector’s performance required a technology-powered productivity boost, coupled with deeper and stronger linkages to the market.

2. **Agricultural research and advisory services in Uganda provided the greatest impacts on agricultural productivity, growth, and poverty reduction, relative to other rural investments.** Over the 1980 – 2003 period, the estimated internal rate of return (IRR) on agricultural research and extension (R&E) investments in Uganda was 65 percent, above the Sub-Saharan Africa aggregate of 55 percent. The average elasticity of productivity with respect to agricultural research was estimated to be 0.38; in turn, the elasticities of GDP per capita and poverty with respect to productivity were 0.95 and 0.60, respectively (Alene and Coulibaly 2008).<sup>iv</sup> Using data from 1992–1999, Fan and Zhang (2008)<sup>v</sup> demonstrated that spending on agricultural R&E had larger and more cost-effective impacts on agricultural growth and poverty incidence in Uganda than comparable investments in rural roads and education.<sup>vi</sup> An evaluation of only the advisory system estimated the direct impact of the National Agricultural Advisory Services (NAADS) program to be a 37–95 percent increase in per capita agricultural gross revenue between 2004 and 2007 for participating households, relative to nonparticipants; the return on the program’s expenditures was estimated at 8–49 percent (Benin et al. 2011).<sup>vii</sup> Given this body of evidence and the wide reach of Uganda’s agricultural R&E system (more than 725,000 farmers or 15 percent of all farmers), the economic rationale for investment in a core public good was extremely strong at appraisal.

3. **A large-scale Agricultural Technology and Agribusiness Advisory Services Project (ATAAS) was the flagship program of the Government of Uganda (GoU) in the agriculture sector, with counterpart financing accounting for three-fourths of the project cost of US\$665.5 million.** At appraisal, the GoU had identified agriculture as one of the top five priority sectors for public investment in the first National Development Plan (NDP 2010/11–2014/15), with productivity enhancement and promotion of commercialization being recognized as critical for realizing growth, employment, and socioeconomic transformation. Furthermore, the Development Strategy and Investment Plan (DSIP 2010–2015), developed by the Ministry of Agriculture, Animal Industry, and Fisheries (MAAIF) as a tool for moving the sector’s agenda, produced four program areas: (i) enhancing sustainable production and productivity (ii) improving access to markets and value addition (iii) creating an enabling environment and (iv) institutional strengthening in the agriculture sector. ATAAS was designed to be a large-scale investment that directly



addressed all four areas by supporting agricultural research and development (R&D), advisory services, the interface between national institutions mandated with agricultural research (National Agricultural Research Organization [NARO]) and advisory services (NAADS), and market links between farmer organizations and agribusinesses. Given the project's convergence with government priorities, the GoU committed to providing counterpart financing for 74.7 percent of total project costs at appraisal.<sup>viii</sup> This commitment was reflected in significant budget allocations for both NAADS (US\$500 million) and NARO (US\$126 million) in the five-year Medium-Term Expenditure Framework (MTEF). Together, the R&E share of the government budget was projected to be 2.7 percent over the 2007 – 2015 period; with ATAAS, this share was projected to grow to 3.2 percent, in line with budget allocations in Kenya and South Africa.<sup>ix</sup>

4. **ATAAS was also a successor to two World Bank projects that had made foundational investments in the institutional development of the main implementing agencies.** Since 1992, IDA had made a long-term commitment to support institution building for core public services, such as agricultural R&E, reflected in investment projects and Pillar 2 of the Country Assistance Strategy 2005–2009<sup>x</sup>, 'Enhancing Competitiveness, Production and Incomes'.<sup>xi</sup> As part of this commitment, the Bank financed two projects – the NAADS Project and the Second Agricultural Research and Training Project (ARTP II) – that ran in parallel and were successfully closed in 2009 (rated Moderately Satisfactory and Satisfactory, respectively) after laying the institutional foundations for ATAAS. While NAADS was designed as a 25-year program to establish a pluralist, sustainable, and demand-driven agricultural advisory service,<sup>xii</sup> ARTP II made complementary investments in NARO's physical infrastructure and research planning, implementation, technology transfer, and impact evaluation capacities. At appraisal, both institutions were well positioned to deliver an ambitious ATAAS, which was intended to develop a unified framework by forging formal linkages between research and advisory services to deliver greater effectiveness and outreach than its predecessor projects.

5. **The deep consensus on the ATAAS approach was reflected in external financing from the World Bank, Global Environment Facility (GEF), International Fund for Agricultural Development (IFAD), and commitments from the European Union (EU) and Danish International Development Agency (DANIDA).** At appraisal, a GEF grant of US\$7.2 million from the World Bank-led GEF Strategic Investment Program was blended into the project to finance Sustainable Land Management (SLM) activities, to respond to land degradation, erosion, erratic rainfall, and other climate risks in Uganda. ATAAS was designed to scale up existing, low-cost SLM interventions such as mulching, organic soil amendments, soil and water conservation structures, and improved land and water use, through a stronger R&E services system.<sup>xiii</sup> In addition, an IFAD loan of US\$14 million was to be presented to the IFAD Executive Board for approval, after which IDA and IFAD were to cofinance project costs with a *pari passu* ratio of 90 percent for IDA and 10 percent for IFAD. An EU contribution through a trust fund and additional DANIDA funds aggregating to US\$26.3 million were also going to be mobilized after the effectiveness of the IDA Credit, but this did not eventually materialize.<sup>xiv</sup> The coordination of financial support, technical knowledge, and international experience among development partners (DPs) was expected to lower the costs of government-led coordination of DP support and reduce waste arising from overlapping donor activities in line with DP commitments on aid effectiveness.

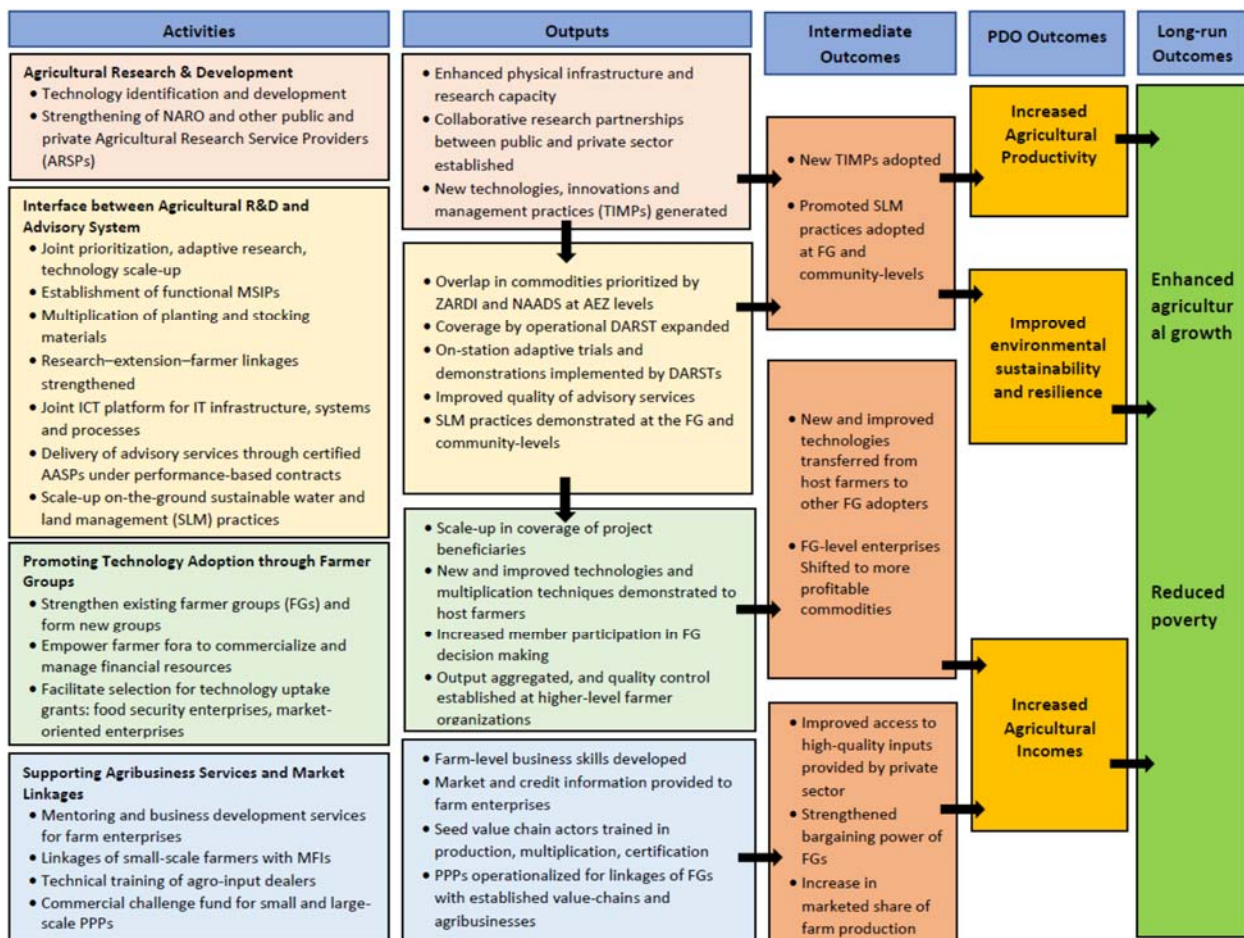
### Theory of Change (Results Chain)

6. **The theory of change underlying ATAAS** was that the demand-driven development of agricultural technologies for marketable commodities, coupled with delivery of market-oriented advisory services



through farmer groups (FGs), would enhance the adoption of productivity-enhancing technologies, innovations, and improved management practices (TIMPs). In turn, this would lead to higher yields, a growth in high-quality marketable surplus, larger revenues, incomes, and shifts toward a more profitable enterprise mix over time. Activities promoting farmer institutional development (FID) would reinforce this pathway by (a) improving aggregation and strengthening the bargaining position of the FGs and (b) providing matching grants to build linkages with established value chains and agribusinesses. Consequently, the higher volumes and quality of agricultural output will command market premiums and generate larger revenues, further reinforcing income gains. In the long term, agricultural productivity and income increases will be protected against climate risks through SLM activities, leading to higher and sustainable agricultural growth and poverty reduction (figure 1).

**Figure 1. Project Theory of Change**



Note: AASP = Agricultural Advisory Service Provider; AEZ = Agro-Ecological Zone; ARSP = Agricultural Research Service Provider; DARST = District Adaptive Research Support Team; MFI = Microfinance; MSIP = Multi-Stakeholder Innovation Platform; PPP = Public-Private Partnership; ZARDI = Zonal Agricultural Research and Development Institute.

7. **The critical assumptions underlying the theory of change are the following:** (a) the off-the-shelf and new technologies generated by the research system are sufficiently adapted to all nine AEZs served



by ZARDIs; (b) the frequency, duration, and quality of demonstration, training, and advisory services can induce behavioral change and adoption of improved TIMPs and SLM practices by farmers; (c) farmers in their groups will demand high-quality and improved technologies, even in the presence of imperfectly substitutable inputs varying on the price and quality dimensions; (d) the capacity of the advisory services system does not decline through and beyond the project lifetime; (e) SLM beneficiaries will have the organizational and financial capacity to provide maintenance on the infrastructure beyond the lifetime of the project; (f) market linkages are strong and stable enough for surplus of tracked commodities to reach agribusinesses and high-value markets; and (g) aggregate increases in output of tracked commodities are not large enough to depress market prices (no general equilibrium effects).

### Project Development Objectives (PDOs)

8. As stated in the Financing Agreement and in line with the Project Appraisal Document (PAD), the development objective was to “increase agricultural productivity and incomes of participating households” by improving the performance of agricultural research and advisory service systems in the Republic of Uganda.<sup>xv</sup> In addition, the project’s Global Environment Objective (GEO) was to enhance the environmental sustainability and resilience of agricultural production to land degradation and climate risks.

### Key Expected Outcomes and Outcome Indicators

9. The PAD states that project performance was to be assessed against the following three outcomes:

- (a) Percentage increase in average agricultural yields of participating households (PDO 1)
- (b) Percentage increase in agricultural income of participating households, by gender (PDO 2)
- (c) Additional hectares and kilometers of land area with improved land and water management practices (GEO)

10. **At appraisal, beneficiaries were defined as participating farming households which directly benefit from NAADS support through FGs.**<sup>xvi</sup> For PDO 1, the results were to be measured using five outcome indicators: 15 percent increase in average crop yields (maize, rice, beans) of beneficiaries and 20 percent increase in livestock productivity (milk, eggs) of beneficiaries. The two PDO 2 indicators were 20 percent increase in agricultural income of beneficiaries (male, female). Lastly, the two GEO indicators were 11,165 additional ha (terraces, low-till agriculture, watershed rehabilitation, agroforestry, woodlots, vegetative, small-scale irrigation, water harvesting) and 9,900 additional km (contour bunds, grass bunds) of land area covered by SLM practices. In addition, the project included 17 Intermediate Results Indicators (IRIs). The following seven IRIs were directly relevant outputs for monitoring progress toward outcomes I, II, and III, with the rest presented in annex 1:

- (a) Direct project beneficiaries (number), of which female (%)
- (b) Indirect project beneficiaries (number), of which female (%)
- (c) Number of technologies demonstrated by the project in project areas (by enterprise)
- (d) Percentage of targeted beneficiaries using improved technologies (by enterprise, incl. SLM)



- (e) Percentage of targeted beneficiaries who are satisfied with advisory services (by gender)
- (f) Share of farm production marketed by targeted beneficiaries (in value terms, by gender)
- (g) Number of operational PPPs for agribusiness and market linkages

## Components

11. The original project had the following five components.

- (a) **Developing Agricultural Technologies and Strengthening the National Agricultural Research System** (Appraisal: US\$137.8 million;<sup>xvii</sup> Closing: US\$115.5 million total<sup>xviii</sup>). This component provided support to NARO for technology identification and development and institutional capacity building of National Agricultural Research System (NARS). The main activities included (i) implementation of strategic national and zone-specific research programs; (ii) support to competitive research grants (CRGs); (iii) support to build the competencies of public and private Agricultural Research Service Providers (ARSPs); (iv) equipment, facilities, and transport for research; (v) enhanced governance through stakeholder participation and research partnerships; and (vi) exploring options for sustainable financing mechanisms for NARS.
- (b) **Enhancing Partnerships between Agricultural Research, Advisory Services, and Other Stakeholders** (Appraisal: US\$72.4 million; Closing: US\$67.1 million) to finance the development of activities that facilitate closer links between NARO, NAADS, private ARSPs and AASPs, farmer fora, processors, and marketing agents. The main activities included (i) joint priority setting, adaptive research, and technology scale-up through nine ZARDIs, district adaptive research support teams (DARSTs) covering all Ugandan districts, and multi-stakeholder innovation platforms (MSIPs) established from community to zone levels;<sup>xix</sup> (ii) scale-up of SLM practices through farm trials, ZARDI demonstrations, and farmer field days; (iii) joint monitoring and evaluation (M&E); and (iv) joint information and communication technology (ICT) applications for NARO and NAADS.
- (c) **Strengthening the National Agricultural Advisory Services** (Appraisal: US\$317.8 million; Closing: US\$151.5 million) to finance the delivery of demand-driven and market-oriented advisory services through performance-based contracts with professional and certified AASPs at the district level. It was designed to provide support for (i) FID and the mobilization of the FGs as enterprises and (ii) technology uptake grants to the FGs to help uptake of productivity-enhancing technologies and practices by market-oriented enterprises and enterprises focused on food security.
- (d) **Supporting Agribusiness Services and Market Linkages** (Appraisal: US\$63 million; Closing: US\$6.7 million) to promote integration of smallholders in value chains by supporting collaboration between agribusiness, farmers, AASPs, and researchers. Collaboration was intended to be achieved through (i) provision of agribusiness development services and (ii) the establishment of a Commercialization Challenge Fund (CCF) to provide matching grants to FGs and emerging farmers for links with established value chains and for promising marketing, value addition, and agro-processing activities.



- (e) **Project Management** (Appraisal: US\$74.5 million; Closing: US\$53.6 million) to support coordination between the NAADS and NARO Secretariats and the management of project activities.

Table 1 below shows the project costs at Appraisal and actual disbursements at Closing, disaggregated by component and financing entity. Out of the original signed credit amount of XDR79.5 million (\$120m), the project disbursed XDR 78.498 million, which is equivalent to \$110.55 million (average over the period) and \$115.18 million (historical), factoring in currency variations. The World Bank cancelled XDR1,595, equivalent to \$2,220. The system-generated datasheet (p.2) reflects the IDA disbursement in historical terms and Table 1 reflects the average over the project period.

**Table 1. Project Costs at Appraisal and Closing, by Component (US\$, millions)**

Components	At Appraisal					At Closing				
	IDA	GEF	DPs	GoU	Total	IDA	GEF	IFAD	GoU	Total
C1	25.5	—	8.6	104.0	<b>137.8</b>	51.5	—	3.0	61.0	<b>115.5</b>
C2	11.5	7.2	3.9	49.8	<b>72.4</b>	14.1	7.2	0.2	45.5	<b>67.1</b>
C3 <sup>a</sup>	58.1	—	19.9	239.8	<b>317.8</b>	12.4	—	1.4	138.1	<b>151.5</b>
C4 <sup>b</sup>	11.5	—	4.0	47.5	<b>63.0</b>	1.0	—	0.1	5.5	<b>6.7</b>
C5	13.6	—	4.7	56.2	<b>74.5</b>	13.1	—	0.2	40.3	<b>53.6</b>
C6 (NEW)		—	—	—	<b>0.0</b>	18.5	—	—	8.5	<b>26.9</b>
<b>Total</b>	<b>120.0</b>	<b>7.2</b>	<b>41.0</b>	<b>497.3</b>	<b>665.5</b>	<b>110.5</b>	<b>7.2</b>	<b>4.6</b>	<b>299.0</b>	<b>421.4</b>

*Note.* The World Bank disbursed US\$110.55 million (average over the period), which is equivalent to US\$115.18 million (historical) after factoring in currency variations and cancelled US\$2,220. The disbursement of the GEF grant of US\$7.2 million was in U.S. dollars and did not experience currency variations. IFAD canceled its support to advisory services after disbursement of US\$4.6 million of its US\$14.7 million commitment; the remainder was allocated to the Agriculture Cluster Development Project (ACDP). At appraisal, US\$26.3 million was expected to be financed by EU and DANIDA but this financing did not materialize due to policy changes in their aid programs, and the GoU committed to filling this gap.

a. At restructuring, Component 3 was terminated.

b. At restructuring, Component 4 was terminated and replaced by a new Component 6.

**B. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)**

Key Dates	Milestone
November 6, 2009	<b>Decision to proceed with project preparation (Project Concept Note approved)</b> <ul style="list-style-type: none"> <li>• Project prepared and presented to the Board for approval within 7 months</li> </ul>
June 22, 2010	<b>Board approval by the World Bank Board</b> <ul style="list-style-type: none"> <li>• Project size at approval: <b>US\$665.5 million</b>—IDA: US\$120.0 million; GEF: US\$7.2 million (blended with IDA); GoU: US\$497.3 million; IFAD: US\$14.7 million; and financing gap: US\$26.3 million (expected from EU, DANIDA which eventually is taken up by the GoU)</li> </ul>
July 19, 2011	<b>Project Financing Agreement and GEF Grant Agreements Signed</b> <ul style="list-style-type: none"> <li>• Gap of 13 months due to (a) a lengthy parliamentary ratification process, an intervening election campaign period leading up to the general elections on February 18, 2011, and the subsequent period before the constitution of a new parliament; (b) GoU-World Bank negotiations on pending accountability and governance issues that were addressed through enhanced governance and anti-</li> </ul>





Key Dates	Milestone
	corruption (GAC) measures; and (c) revisions in draft NAADS guidelines to align beneficiary selection methods with project design in the negotiated PAD
December 20, 2011	<p><b>Project declared effective</b></p> <ul style="list-style-type: none"> <li>• Further delay of 5 months from signing of the agreement to effectiveness due to approval procedures under the GoU (especially the parliamentary approval process for subsidiary agreements) and restructuring of NAADS Secretariat.</li> <li>• Effectiveness coincides with an almost total overhaul of management of NAADS Secretariat in November 2011. Although replacements are made by February 2012, the new team takes time to fully understand the project.</li> </ul>
July 1, 2014	<p><b>Government adopts reforms in Agricultural Extension Services</b></p> <ul style="list-style-type: none"> <li>• The GoU adopts Single Spine extension system in Uganda transferring extension services function from NAADS back to a newly created Directorate of Extension Services at the MAAIF. Under the same reform process, NAADS is reassigned the role of input distribution and strategic interventions.</li> <li>• Despite a significant paradigm shift in extension delivery system from pluralistic ‘publicly funded, privately provided’ to the earlier model of ‘publicly funded and publicly provided’ system, the World Bank remains committed to delivery of the project even when key cofinancing partner, IFAD, opts to discontinue engagement.</li> <li>• New institutional mandates of NAADS and the MAAIF necessitate restructuring of project. The World Bank commits to support the Government to build capacity of the new extension system, starting with a policy and strategic framework.</li> </ul>
April 9, 2015	<p><b>First Project Restructuring (Level 2)</b></p> <ul style="list-style-type: none"> <li>• <b>Project restructured to reflect six main changes:</b> <ul style="list-style-type: none"> <li>○ Modification of project components and activities under NAADS. new component introduced related to capacity building of the new extension system under the MAAIF</li> <li>○ Reduction/revision of project size/scope from US\$665.5 million to US\$421.3 million</li> <li>○ Revision to the Results Framework (RF) to match revised scope</li> <li>○ Inclusion of start-up activities of the new operation (ACDP)</li> <li>○ Modification of institutional implementation arrangements (NAADS dropped)</li> <li>○ Extension of closing date by 1.5 years from June 30, 2016, to December 31, 2017</li> </ul> </li> </ul>
September 2017	<p><b>Second Project Restructuring (Level 2)</b></p> <ul style="list-style-type: none"> <li>• Outbreak of Fall Army Worm (FAW) in Uganda threatens to erode gains made by project; the GoU requests for reallocation of project resources to address outbreak and an extension of closing date by 6 months to undertake required activities—and also address effects of the prolonged drought of 2016/17).</li> <li>• Restructuring granted, incorporating 2 main changes: (a) re-allocation of project resources to address FAW interventions and (b) extension of closing date by 6 months from December 31, 2017, to June 25, 2018.</li> </ul>

12. **Delay between approval and effectiveness.** ATAAS was approved on June 22, 2010 but became effective only on December 20, 2011. The 18-month lag was due to three factors: (a) election-related delays in parliamentary approval procedures, (b) negotiations on pending accountability and governance issues that were addressed through enhanced GAC measures, and (c) revisions in draft NAADS guidelines to align beneficiary selection methods with project design in the negotiated PAD.<sup>xx</sup> Project effectiveness then coincided with a nearly complete staff overhaul at NAADS between November 2011 and January



2012, consequently slowing down disbursement and joint NARO-NAADS activities such as planning, M&E, and ICT.

13. **First Level 2 restructuring.** In July 2014, large-scale policy and institutional changes interrupted project implementation, leading to a Level 2 restructuring in March 2015. The GoU approved major reforms in the extension system, introducing a Single Spine system, which transferred the extension services mandate from NAADS to the MAAIF. Further, the GoU decided to reorient technology uptake grants for FG enterprises, delivered through the NAADS extension system in Component 3, into a national mechanism for distribution of agricultural inputs outside of ATAAS.<sup>xxi</sup> The formal policy change addressed the problem of input provision through NAADS, which (a) started during initial implementation but was not allowed under ATAAS design, (b) crowded out financial and human resources from the project, and (c) generated ineligible expenditures.

14. **At this stage, the GoU's financial allocation to NAADS components shifted out of ATAAS,<sup>xxii</sup> with no carry-over in budget and staff to the MAAIF.** In light of this policy change, IFAD reached an agreement with the GoU to cancel its support to advisory services. After the World Bank's midterm review (MTR) in October 2014, it was determined that restructuring the project was necessary to align activities with reduced resources and extension capacity. Consequently, the following amendments were made: (a) change in implementing agency from NAADS to the MAAIF; (b) dropping of Components 3 and 4, originally the remit of NAADS, and with a subset of their activities retained under Component 6/a new Component 3, named 'Strengthening Agricultural Support Services'; (c) revisions to the RF to reflect the reduced scope of project activities; and (d) extension of the closing date from June 30, 2016 to December 31, 2017 to allow completion of proposed activities and initiate start-up activities for the ACDP.

15. **Post restructuring, project implementation overcame initial challenges, as delays in constituting the MAAIF Implementation Support Team (IST) meant that key leadership and technical positions were filled by November 2016.** However, the stability at NARO during the entire project cycle meant that Component 1 and 2 activities under its remit remained on track, leading to a doubling of IDA resources and continued budgetary support by the GoU. These additional resources were deployed toward three critical changes that helped ATAAS achieve its PDOs: (a) the development and launch of a new extension strategy in December 2016; (b) the building up of new R&E, farmer-market linkages through NARO, the MAAIF, and local governments (LGs), coupled with a strong mobilization of DARSTs and MSIPs at zonal, district, and local levels; and (c) the rapid scale-up of SLM activities after a transition from a hotspot approach implemented by FGs to a landscape approach implemented by communities, with support from LGs, NARO, and the MAAIF.

16. **Second Level 2 restructuring.** In September 2017, a six-month, no-cost extension to the closing date was made to develop and disseminate measures to address the threat of FAW, a new pest of maize, beans, and other annual crops that invaded Uganda and threatened to reverse productivity gains achieved by ATAAS. Further, the extension would help complete ACDP start-up activities such as the piloting of an e-voucher scheme and the development of ICT-based platforms (Component 6), the initiation for which was delayed by nine months due to (a) changes in the top leadership of the MAAIF following national elections in 2016; (b) delayed parliamentary ratification of the new ACDP credit; and (c) delays in procurement process caused by the migration from the old PROCYS system to the Systematic Tracking of Exchanges in Procurement (STEP) system, requiring training of procurement staff. Therefore, the no-cost extension was a timely response to the evolving needs of the project, the rapidly changing institutional



environment, and emerging threats in the agriculture sector. No other changes were made during the second restructuring.

### Revised PDOs and Outcome Targets

17. **The PDO remained the same after the first restructuring, but the RF underwent five key changes:** (a) the definition of beneficiaries was changed from “members of NAADS FGs” to “members of FGs receiving support from contracted project group promoters or district extension workers under MAAIF;” (b) the number of direct project beneficiaries was upgraded from IRI to PDO indicator; (c) end targets were raised for 3 IRI indicators; (d) end targets were lowered for 3 indicators (including 1 PDO indicator); and (e) 6 IRI indicators were eliminated as their corresponding activities were no longer part of the restructured project (see annex 7 for details).

### Revised PDO Indicators

18. **At the first restructuring stage, the two headline PDO indicators remained unchanged, with changes restricted to:** (a) addition of cassava to tracked commodities as a result of a joint NARO-MAAIF prioritization process and (b) the addition of gender-disaggregated agricultural income as an indicator. However, the GEO indicator measuring additional land coverage in kilometers was dropped, to address an anomalous definition of the former indicator.<sup>xxiii</sup> The intermediate indicator on number of project beneficiaries disaggregated by gender was moved to the PDO level, as was required of projects approved or restructured after July 1, 2009.

19. **Intermediate indicators and outcomes relevant only to the dropped components were removed from the RF,** and new intermediate outcomes and indicators related to the new proposed components and activities were added. There have also been changes to targets based on the baseline. These changes are elaborated in annex 7 (see table 4).

### Revised Components

20. **After the first restructuring, ATAAS had four components:** (a) Developing Agricultural Technologies and Strengthening the National Agricultural Research System; (b) Enhancing Partnerships between Agricultural Research and other Value Chain Stakeholders; (c) Strengthening Agricultural Support Services (Component 6); and (d) Program Management, Coordination, and Monitoring and Evaluation (Component 5).

21. **Component 1 activities remained as initially appraised but were allocated a larger budget** to (a) develop outreach strengthening activities at NARO to maintain an uninterrupted flow of new technologies from research to farmers; (b) finalize research infrastructure rehabilitation and procurement of laboratory equipment; and (c) increase allocation for Competitive Grant Scheme (CGS) support, especially for ‘targeted’ or solution-oriented competitive grants focused on priority value chain issues and partnerships.

22. **Component 2 was modified to be jointly implemented by NARO Secretariat and the MAAIF, with extension activities scaled up to fill the vacuum left by the exit of NAADS advisory provision.** The transfer of extension functions from NAADS to the MAAIF meant that all NAADS staff positions in the districts and subcounties, as well as AASP contracts, were terminated. This necessitated the design of



activities targeted at strengthening of the district extension system under the MAAIF, with the following changes being most noteworthy: (a) greater allocation for enhancement of technology upscaling activities, especially adaptive research through DARSTs, demand-driven technology demonstrations through MSIPs, and institutional and human capacity strengthening for other partners<sup>xxiv</sup> and (b) the acceleration of SLM interventions after procurement delays until this point.<sup>xxv</sup> Furthermore, the restructuring transferred the joint M&E (former Subcomponent 2.4) to the programme management component and the joint ICT (former Subcomponent 2.5) to Subcomponent 6.3.

23. **Activities under the new Component 6 facilitated the development of sustainable channels for market-oriented technology uptake** through targeting (a) farmer empowerment and organization of strengthened links to markets, (b) support for the design of a new extension strategy and its institutional and implementation arrangements, and (c) development and operationalization of ICT tools to improve the effectiveness of public agricultural programs.<sup>xxvi</sup> All activities under the original Component 4 were included except (a) the provision of market information services and (b) the Commercialization Challenge Fund (Subcomponent 4.2), which was then moved, to be implemented under the ACDP.

24. **Component 5 remained similar with the integration of the ATAAS M&E activities and strengthening project coordination.** The last component was renamed 'Programme Management, Coordination and M&E' and included (a) NARO management and coordination, (b) MAAIF management and coordination, and (c) strengthened M&E systems. The overall coordination between NARO and the MAAIF was to be further strengthened through the establishment of an IST/a Project Coordination Unit (PCU) in the MAAIF, with clearly assigned lead responsibilities. Since the original ATAAS did not have a provision for a joint PCU, the NAADS and NARO Secretariats were de facto working in parallel; the new PCU was intended to address these administrative inefficiencies and coordination challenges.

## Other Changes

### *Changes in Financial Management and Disbursement Arrangements*

25. **One of the main issues that led to project restructuring was the inadequate fiduciary compliance** which led to the use of technology uptake grants for input provision, a purpose for which they were not explicitly designed and approved. This issue was resolved with ineligible expenditures of US\$1.36 million being identified and refunded to IDA. In fact, the separation of advisory services (MAAIF) and input provision (NAADS) functions was carried out with an objective of eliminating the recurrence of such ineligible expenditures in the future.

26. **The budget for district-level activities under Component 2 were to be now held by the respective ZARDIs with no funds expected to flow from the ministry to the districts and subcounties.** Due to increased activities and resources to NARO, coupled with its reporting weaknesses, staffing levels at NARO headquarters and ZARDIs were to be enhanced through recruitment of one accountant to be based at headquarters and three accountants to be assigned to all nine ZARDIs to support district-level activities.



## Changes in Procurement

27. **At the restructuring stage, it was anticipated that the MAAIF's capacity would be stretched with three major IDA-financed projects being planned.** The main risks identified were (a) inadequate number of technical staff in the Procurement Unit to support increased procurement volumes of complexity, (b) delayed initiation and preparation of Procurement Plans, (c) lack of a reliable system for monitoring progress with available tools such as the PPMS not being used, and (d) inadequately prepared bidding documents with incomplete qualification requirements and inconsistent evaluation of published criteria. These risks were addressed by (a) the preparation of a manual to elaborate procurement arrangements under the MAAIF; (b) the hiring of a dedicated procurement specialist for ATAAS and the ACDP, hiring of project coordinator, SLM specialists, M&E, and so on to support implementation; and (c) the monthly monitoring of progress reports by a procurement coordinator.

## Rationale for Changes and Their Implication on the Original Theory of Change

28. Although there was no explicit theory of change for the project at appraisal, the first restructuring's two major effects on the research-extension-adoption-productivity-income pathways can be assessed through the reconstructed theory of change (figure 1). First, the reconfiguration of technology dissemination under the new policy and extension strategy helped strengthen the channels from agricultural R&D to technology adoption, which had been weakened by the diversion of NAADS financial and human resources from advisory services (Components 2 and 3) to input distribution, in the months leading up to the first restructuring. On the other hand, the dropping of technology uptake (Subcomponent 3.2) and CCF matching grants for FG enterprises (Subcomponent 4.2) meant that (a) the focus of aggregation and market links shifted from established NAADS FGs to preexisting MSIPs and functional FGs under the MAAIF and (b) FGs and nucleus farmers were able to generate more marketable surplus due to productivity gains but no longer had direct access to financial support for integrating with established value chains, or commercializing their production, thus lowering the magnitude of income gains that could have been achieved.

## II. OUTCOME

### A. RELEVANCE OF PDOs

Relevance Rating of PDO: High

### Assessment of Relevance of PDOs and Rating

29. **Uganda's Vision 2040 and NDP - II continue to prioritize strategic investments in agricultural productivity and commercialization.** At closing, the project continued to be consistent with and highly relevant for the GoU's long-term vision and medium-term strategy. Vision 2040 aims at transforming Uganda from a predominantly peasant and low-income country to a competitive upper-middle-income country with a per capita income of US\$9,500 by 2040. It identifies agriculture as one of the nine strategic opportunities to accelerate growth and as a sector whose labor productivity needs to increase to capitalize on the opportunity.<sup>xxvii</sup> NDP - II (2015/16–2019/20), laying out medium-term policies that would support achieving Vision 2040, remained consistent with NDP - I in prioritizing agriculture as one of five areas with the greatest multiplier effect. In particular, it demonstrates continuity with the ATAAS approach by targeting investments in selected commodities, with a strong emphasis on strengthening agricultural



research, implementing the Single Spine extension system, adapting farm-level technology, using farm inputs effectively, promoting SLM, increasing financial access, and strengthening agricultural institutions for service delivery.<sup>xxviii</sup>

30. **Similarly, the PDO continues to be aligned with the agricultural policy of the GoU.** The Agriculture Sector Strategic Plan (ASSP 2015/16–2019/20) reviewed progress on DSIP programs and maintained course with its investment objectives of increasing agricultural production and productivity, providing access to critical farm inputs, improving agricultural markets and value addition, and ensuring service delivery. Markedly, the plan designates the MAAIF as responsible for service delivery, reflecting the change in mandate for NAADS midway through ATAAS implementation. The project’s theory of change continues to be strongly aligned with sectoral strategic government objectives.

31. **Finally, the PDO remains relevant and aligned with the FY16–FY20 Country Partnership Framework (CPF).**<sup>xxix</sup> The World Bank’s CPF overlaps significantly with GoU priorities, with ‘raising incomes in rural areas’ comprising one of the three selected strategic focus areas. Its associated objective of increased agricultural commercialization, one of the six objectives under the three focus areas, is squarely in line with the ATAAS PDO.

## B. ACHIEVEMENT OF PDOs (EFFICACY)

Rating: Substantial

32. **The project fully achieved its development objectives of increasing agricultural productivity and incomes of participating households.** For the headline PDO indicators of agricultural productivity (PDO 1) and agricultural income (PDO 2), all seven indicators surpassed their targets comfortably. In retrospect, a case for upward revision of headline PDO targets at restructuring could be made; however, the project team deliberately adopted a conservative approach at both restructurings given (a) the disruption and uncertainty caused by the institutional shift that triggered the first restructuring and (b) the threat to project gains posed by FAW before the second restructuring. For direct project beneficiaries (PDO 3) and additional SLM coverage (PDO 4), all three revised targets were achieved as well.

### Assessment of Achievement of Each Objective/Outcome

#### PDO Indicator 1: Percentage increase in average agricultural yields among participating households

33. **The rapid generation of productivity-enhancing technologies in response to FG demand opened the pathway connecting agricultural R&D to productivity.** The project supported core research and financed innovation through 91 collaborative research projects under the CGS. The recipients of CGS grants were drawn from 16 public agricultural research institutes (PARIs), 4 universities and colleges, and 18 private sector enterprises. Consequently, the stock of agricultural technologies generated by the NARO system grew from 600 to 888 between appraisal and closing, a 48 percent increase, far exceeding the PAD target of 20 percent.<sup>xxx</sup> About 81 new technologies developed for 5 tracked commodities—market-oriented commodities identified through a bottom-up prioritization process from FGs to implementing agencies—included<sup>xxxi</sup> (a) 10 varieties of maize with resistance to striga, drought, necrosis, early maturity, and highland adaptability; (b) three cold-tolerant lines of rice with smart options for weed management; (c) five iron and zinc-fortified beans varieties; (d) Cassava Brown Streak Disease (CBSD)-tolerant cassava, in addition to 10 highland-adapted clones and 11 clones with resistance to Cassava Mosaic Disease (CMD)



and CBSD; and (e) eight dairy technologies covering high-nutrient feed, high-quality forage and grasses.<sup>xxxii</sup> For maize and beans technologies, yields even under drought conditions were 4–5 times higher than baseline yields; the multiples for cassava were up to 15 times and similar gains were estimated for other technologies. The project's excellent performance in raising agricultural yields is thus in large part a function of the productivity boost generated by the demand-driven technology development in the NARO system.

34. **Agricultural TIMPs were widely scaled up through NAADS FGs and advisory system.** Several of NARO's new and off-the-shelf technologies were widely disseminated through NAADS FGs in the early years of the project. The rapid adoption of new technologies and practices is reflected in early trends, which were captured by the Uganda Bureau of Statistics (UBoS) Baseline Survey (2013). Together, these trends show the following during 2011–2013: (a) the share of beneficiaries with direct access to extension grew from 47.8 percent to 59.0 percent; (b) the adoption of technologies disseminated by NAADS grew from 36.1 percent to 49.2 percent; (c) the share of beneficiaries trained by NAADS grew from 46.8 percent to 67.5 percent; and (d) on all TIMPs dissemination and adoption metrics, project beneficiaries registered faster growth than non-beneficiaries. Furthermore, this rapid dissemination was supplemented by a large and growing pool of project beneficiaries—1.36 million<sup>xxxiii</sup>—who were members of more than 54,000 FGs, with 40,024 FGs and 704 higher-level farmer organizations (HLFOs) being registered and trained in FID at the MTR stage;<sup>xxxiv</sup> thus magnifying the impact of the agricultural R&E system through farmer-farmer learning, adoption, aggregation, and commercialization.

35. **By closing, coordinated NARO-MAAIF-LG extension outreach and support to the seed value chain had led to greater availability and adoption of improved TIMPs.**<sup>xxxv</sup> After initial delays in constituting the MAAIF IST in the post-restructuring period, the new extension strategy and delivery system built on NAADS achievements to deliver impressive results during 2016–2018. Agricultural TIMPs were disseminated through nine ZARDIs, DARSTs, and LG staff in all 122 Ugandan districts. A total of 216 on-station adaptive trials, 11,771 on-farm demonstrations, and 186 SLM community-level interventions were conducted nationwide by ZARDIs, DARSTs, and district-level extension officers,<sup>xxxvi</sup> covering 12 commodities that included locally prioritized products such as bananas, coffee, and fish.<sup>xxxvii</sup> About 327,059 new direct beneficiaries were reached, enlarging the pool of beneficiaries to 1.68 million at closing. Among direct beneficiaries, the cumulative adoption rate was 78 percent, with 95.3 percent, 63.3 percent, and 31.7 percent of crop enterprises, livestock enterprises, and SLM farmers, respectively, reporting the use of improved TIMPs at closing.<sup>xxxviii</sup> Consequently, across 24 metrics of technology access and adoption, access to credit, market information, and training utilization, the share of beneficiaries surpassed non-beneficiaries at closing.<sup>xxxix</sup> Partly, the high adoption rates reflected greater private sector supply of NARO technologies, as the project provided foundation seeds and multiplication training to 14 seed companies, several entrepreneurs, and three community producers (see 'Mobilizing Private Sector Financing' for more details).<sup>xl</sup> Further, it is evident that the increased availability and adoption of high-quality seeds, clean planting materials, and high-productivity dairy breeds coupled with better soil, fertilizer, pasture, and fodder management techniques and implementation of SLM interventions contributed to substantial gains in agricultural yields and incomes.

36. **Among project beneficiaries, agricultural productivity gains surpassed project targets.** At closing, yield growth for maize (80.5 percent), rice (180.4 percent), cassava (126.3 percent), beans (47.6 percent), and milk (120 percent) far exceeded the targeted increases of 15 percent and 20 percent for crops and milk, among project beneficiaries (column 5, table 2). There are two statistical caveats to the



pre-post comparison made here. First, although the baseline survey (UBoS 2013) was intended to update provisional baseline yields in the PAD,<sup>xlii</sup> it did not collect yield information from beneficiaries and reported country-level yields as a proxy; consequently, the comparison in table 2 assumes pre-project yields were statistically equal across beneficiaries and non-beneficiaries. To test for robustness to alternative sources of information, yields at closing were also compared to (a) provisional PAD baseline values and (b) revised (higher) MTR baseline values.<sup>xliii</sup> In both cases, yields for all five tracked commodities still exceeded their targets (see annex 7, table 5). Second, the endline sample was only drawn from direct beneficiaries at closing (host farmers, SLM participants, and learners at adaptive trials) and did not capture yields among indirect beneficiaries in FGs, who adopted technologies after learning from host farmers. To address this issue, the Implementation and Completion Results Report (ICR) team commissioned an additional survey of more subsistence-oriented, risk-averse ‘adopters’ from the same FGs to construct a weighted endline that is representative of indirect beneficiaries. The percentage change in commodity yields is computed by comparing this weighted endline against the UBoS baseline.

**Table 2. Assessment of PDO 1 (Agricultural Productivity)**

(1)	(2)	(3)	(4)	(5)
Commodity	Baseline, MT/a	Targets, MT/ha	Weighted Endline, MT/ha	Percentage change
Maize	1.30	1.50	2.30	80.50
Rice	1.00	1.15	2.80	180.40
Cassava	1.70	1.90	4.10	126.30
Beans	0.50	0.58	0.70	47.60
Milk*	3.00	3.60	6.60	120.00
	Source: UBoS Baseline Survey Report (2013)	Original Targets Crops: 15% Livestock: 20%	Source: Impact Evaluation (2018)	

Note: Host farmers received foundational technologies, demonstrations, and advisory services from ATAAS. Adopters in FGs received inputs from host farmers and not directly from ATAAS. \*The unit for milk yield is liter per day per cow.

37. **In addition to yield growth over the project period, cross-sectional evidence shows that at closing, crop yields were significantly higher among beneficiaries.** The Impact Evaluation (2018) data show that using the crop-cuts method, yields for maize, rice, cassava, and beans were, respectively, 125 percent, 154.1 percent, 95.7 percent, and 200 percent higher among beneficiaries at closing. Second, using the less reliable recall method, beneficiary yields remained statistically larger than non-beneficiaries, even though the differentials were smaller (annex 7, table 6). Third, these yield differential patterns held for all nine AEZs, when disaggregated by their corresponding ZARDs. In the absence of comparable agricultural investment projects with the scale and geographical coverage of ATAAS, these endline results are strong indicators of project impact on agricultural productivity, especially when coupled with the evidence on yield growth over the project life cycle (table 2). However, in the absence of an M&E system, systematically tracking characteristics and outcomes for treatment and control groups through the project life cycle, an ex post evaluation through experimental or quasi-experimental methods cannot be undertaken.

38. **Project-level productivity growth also contributed to the small productivity gains for beans, maize, and rice nationally until 2016, the latest year for which data are available** (annex 7, table 7).<sup>xliiii</sup> On the other hand, national-level cassava production exhibits a secular downward trend until 2016,





reflecting the widespread effects of CBSD during this period. In contrast, the high cassava yields recorded at endline among ATAAS beneficiaries is directly attributable to the wide promotion and dissemination of NAROCass 1 and NAROCass 2, high-yielding CBSD, and CMD-tolerant varieties that a large share of farmers have adopted. Similarly, the recovery of maize and beans yields among ATAAS beneficiaries after the devastation caused by FAW in the 2016–2017 season is neither captured in the pre-post comparison (table 2) nor in the national-level production series which does not report outcomes after 2016.

## **PDO Indicator 2: Percentage increase in agricultural income of participating households, by gender**

39. **Market participation, marketed surplus, and agricultural incomes grew with agricultural productivity gains and increased adaptability to climate shocks, pests, and diseases.** The commercial orientation of the NAADS FID program and extension system, coupled with large productivity gains in market-oriented tracked commodities, translated to growth in market participation, marketed surplus, and agricultural incomes during the project period. Between 2010 and 2013, ATAAS contributed to improvements on all three dimensions: (a) the share of subsistence farmers dropped by 2.7 percentage points (from 80.8 percent to 78.1 percent), with a corresponding increase in the share of commercial farmers (from 12.8 percent to 14.9 percent); (b) 66.6 percent of beneficiaries reported higher marketed surplus; and (c) average incomes grew by 15 percent among beneficiaries, with 43 percent attributing income changes to adoption of TIMPs or building on NAADS support.<sup>xliv</sup> Although the utilization of public extension services declined in 2015 after the exit of NAADS, the use of improved TIMPs continued to raise agricultural incomes. Between 2013–2014 and 2015–2016, 15.6 percent of the national rural population moved out of poverty and the share of the ‘chronically poor’ engaged in agriculture declined from 22 percent to 19 percent.<sup>xlv</sup> Since 2016, a series of shocks—drought (2016–2017); plant disease (CBSD, CMD, and banana wilt disease); and pest infestation (FAW in 2017–2018)—have hit production and caused shortages of cassava, banana, maize, and beans in many regions across Uganda. However, the combination of pest management techniques and the cultivation of drought and disease-resilient varieties (for example, NAROCass 1 and 2 for cassava; NAROBan 1, 3, and 4 for bananas) by project beneficiaries have commanded even higher prices during these shortages, reflecting their relative inoculation to shocks.

40. **The project also supported MSIPs and built community seed enterprises that helped FGs link to value chain players and output and input markets and capitalize on income-generating opportunities.** At appraisal, ATAAS was designed to provide technology uptake and commercialization grants through FGs to enable farmers to access technologies as well as production and business development services, to contract with agribusinesses and integrate with established value chains through PPPs. However, nearly no progress was made on these activities due to diversion of NAADS resources to input provision, leading to Subcomponents 3.3 and 4.2 being dropped at restructuring. Therefore, in the post-restructuring period, the project’s market link activities were concentrated on supporting (a) zonal, district, and subcounty-level MSIPs, platforms which linked agricultural producers, FGs, agro-dealers, traders, and agro-processors, and (b) community seed-producing enterprises, which were organized and trained in the multiplication of foundation seeds. ATAAS provided training and financial support to operationalize 78 MSIPs covering all nine AEZs, engaged in diverse commercial activities such as rice seed multiplication, maize flour processing, banana wine production, honey production, ghee making, fish farming, and so on.<sup>xlvi</sup> Although heterogenous in type of enterprise and size (often 40–100 members), several MSIPs resulted in the formation of cooperatives that reduced transaction costs for members, and other feeder enterprises by taking on the tasks of collecting, aggregating, processing, and branding their marketed



surplus to achieve greater volumes, quality control, bargaining power, and secure higher prices. On the other hand, community seed-producing enterprises were able to aggregate and sell large volumes of high-quality seedlings and cuttings —especially for highly demanded commodities such as rice and maize— thus generating sizable additional income for farmers.

41. **Net agricultural incomes more than doubled among project beneficiaries over the project life cycle.** At appraisal, the baseline value of net household agricultural income<sup>xlvii</sup> reported in the PAD (UGX 4,120,000) was clearly erroneous, given that corresponding values were significantly smaller in its data source, the UNHS 2005–2006 household survey (UGX 434,400 for men and 217,200 for women).<sup>xlviii</sup> Drawing on the average agricultural income calculated using the Living Standards Measurement Study (LSMS)/UNPS 2010–2011 household survey (UGX 986,668),<sup>xlix</sup> it is further corroborated that the true agricultural income at appraisal was less than one-fourth of the PAD baseline value. Given this error, the baseline for agricultural income and targets were revised at MTR using the UBoS baseline survey (2013), which comprises a more credible benchmark to evaluate project performance. Against this baseline, the project is found to have raised net agricultural incomes by more than 2.6 times for men and nearly 3 times for women over 2013–2018. Even after adjusting for inflation, the corresponding metrics are 2 times and 2.3 times, far exceeding the restructuring targets of 20 percent and 15 percent. It is also evident that the project surpassed its appraisal targets as well, when evaluated against benchmarks from other nationally representative household surveys conducted in the years immediately preceding and succeeding appraisal (UNHS 2005–06, LSMS 2010–2011, and LSMS 2011–2012) (annex 7, table 7).

**Table 3. Performance on PDO 2**

(1)	(2)	(3)	(4)	(5)
Gender	UBoS Baseline/MTR, UGX	Endline (2018), UGX	Percentage Change, Nominal	Percentage Change, Real
Men	975,730	3,600,846	269	204.8
Women	698,200	2,751,231	294	225.5
	Impact Evaluation (2018)/UBoS Baseline Survey Report (2015)	Impact Evaluation (2018)	Targets Men: 20% Women: 15%	Targets Men: 20% Women: 15%

42. **At closing, project beneficiaries reported higher agricultural income than non-beneficiaries across all enterprise and gender sub-samples.** Cross-sectional data collected as part of the Impact Evaluation (2018) show that net agricultural incomes for beneficiaries operating maize, rice, cassava, beans, and dairy enterprises were 57.8 percent, 39.5 percent, 27.8 percent, 400.5 percent, and 1,387.5 percent, respectively, higher than non-beneficiaries. Next, the effect of land size and gender is accounted for by calculating on a per-hectare basis for men- and women-operated enterprises. These comparisons show that for enterprises operated by women, net agricultural incomes for maize, rice, cassava, beans, and dairy were 51 percent, 86.5 percent, 6.6 percent, 610.5 percent, and 578.1 percent, respectively, higher. For enterprises operated by men, the corresponding differentials were 63.8 percent, 21.7 percent, 45.4 percent, 255.4 percent, and 1,963.7 percent (annex 7, table 8). Because sample sizes are small for each commodity-gender combination—especially for rice and dairy enterprises—these differentials are presented as corroborative evidence of project impact on net agricultural incomes. Further, it must be noted that several beneficiary enterprises also produced non-tracked commodities such as bananas,



coffee, and fish, which were locally prioritized, received ATAAS support, and generated additional agricultural income which contributed to the large differentials in relation to non-beneficiaries.

**PDO Indicator 3: Direct project beneficiaries (number), of which female (%)**

43. **At closing, the pool of project beneficiaries covered 1.68 million farm households; that is, at least 25 percent of Uganda’s rural households.**<sup>i</sup> At appraisal, this indicator defined ‘participating households’ as members of NAADS FGs who directly benefit from project interventions. Based on an assessment of NAADS FGs, an estimated 46,000 FGs were active at the appraisal stage. Averaging 23.1 members per group, the number of FGs grew to more than 54,000 by 2013, with aggregate number of members being 1,357,900.<sup>ii</sup> Further, it was estimated that 75 percent of all growth in FGs over 2011–2013 was due to NAADS support to formation, registration, provision of technologies, advisory services, and market information. After restructuring, the pace of FG formation and the degree of functionality of NAADS FGs declined, as NAADS was no longer engaged in FID. However, with the strengthening of existing NARO outreach activities through links with the new MAAIF-LG extension system, the number of direct beneficiaries grew by 327,059 (90 percent host farmers for demonstrations, 8 percent SLM, and 2 percent adaptive trials learners),<sup>iii</sup> enlarging the pool to 1.68 million and exceeding the revised target by 4.5 percent; measured against the appraisal target of 1.71 million, the closing number is 1.7 percent lower. Further, women accounted for 52 percent of this total number of beneficiaries. Notably, several beneficiaries were members of 16,022 new and established FGs and 396 HLFOS that had survived after the exit of NAADS from FID.<sup>iiii</sup> However, the number of indirect beneficiaries—members of FGs who learned from direct beneficiaries—were not tracked, thus underestimating total beneficiaries. Other indirect beneficiaries included seed dealers, producers, and out growers; private sector seed producers and farmer-based community seed producers; and seeds inspectors for quality assurance, whose capacities were built by the project for multiplying technologies generated by research.

**PDO Indicator 4: Additional land area with improved land and water management practices (kilometres, hectares)**

44. **After slow initial progress, SLM interventions rapidly exceeded appraisal and restructuring targets, building resilience to local agro-climatic shocks across 32 landscapes in 77 subcounties.** At appraisal, the project established targets of 11,000 ha and 9,900 km of additional land area to be covered by SLM practices; at restructuring, the former target was revised downward to 6,000 ha given delays in start-up activities, but the latter remained unchanged. The technologies selected for promotion and scaling-up were terraces, contour bunds, grass bunds, conservation agriculture (low-till), rehabilitation/reclamation of degraded watersheds, agroforestry woodlots, agronomic/vegetative SLM practices (mulching, intercropping, rotations, integrated nutrient management, grassland improvement, and so on), small-scale irrigation, and water harvesting.<sup>lv</sup> In the post-restructuring period, the capacity of 240 extension workers and 517 community-based facilitators (53 percent women) across all nine ZARDIs were built through training to organize local groups and reinforce the sustainability of investments. Eventually, SLM interventions were executed in 40 districts, 77 subcounties, and 32 landscapes.<sup>lv</sup> At closing, the total coverage achieved was 20,930 ha, 248.8 percent above the revised target.<sup>lvi</sup> In particular, highlands terracing and rehabilitation of degraded watersheds was adopted by a large share of communities, with their final coverage of 3,391 ha and 3,337 ha being 771 percent and 556 percent of respective targets. Notably, the impacts of SLM interventions were not restricted to the tracked commodities—some of the most dramatic effects on beneficiary yields and incomes were in coffee and



banana plantations, where soil erosion due to erratic rainfall has been brought under control due to organized collective action supervised by local facilitators. Using the Ex Ante Carbon-Balance Tool (EX-ACT) tool, it was assessed that in aggregate, SLM interventions on all ATAAS sites would have sequestered 1,964,831 tons of carbon over the lifetime of the project (US\$151.3 million in 2018 prices), a sizable positive externality for Uganda.<sup>lvii</sup>

### Justification of Overall Efficacy Rating

45. **Achievement of the PDO is deemed Substantial.** The project exceeded all its PDO indicators' targets and there is strong and clear indication that the results recorded can be attributed to project interventions. However, the project encountered some delays, particularly in the registration of farmers and traders through ICT platforms, which will now be piloted and scaled after closing as part of the ACDP. Therefore, the full extent of the project's contribution to market integration of farmers have not been revealed at the time of the ICR.

### C. EFFICIENCY

#### Assessment of Efficiency and Rating

Efficiency rating: Modest

46. **Economic and financial analysis (EFA) at appraisal.** The EFA conducted at appraisal anticipated strong economic profitability, with the economic internal rate of return (EIRR) estimated to be 33.9 percent while the net present value (NPV) amounted to US\$1.3 billion.<sup>lviii</sup> The analysis approached all project components and activities as an integrated package and accounted for three streams of benefits: (a) increase in yields as a result of more productive and resilient technologies developed by NARO and disseminated by advisory and extension services;<sup>lix</sup> (b) shift to a more profitable commodities mix as a result of strengthened market links; and (c) increase in the farm-gate prices share of wholesale prices, arising from higher smallholder bargaining power in value chains and output quality improvements. All project costs were considered in the analysis.

47. The analysis focused on several commodities promoted in Uganda under NAADS: sorghum, maize, cassava, Irish and sweet potatoes, millet, simsim, groundnut, beans, bananas, coffee, and cotton; notably, it did not include rice and investments in livestock production. It was expected that yields will increase between 4 percent (coffee) and 50 percent (groundnut), while the income of participating households will increase by 20 percent by the end of the project. The analysis did not account for the benefits resulting from SLM activities which translate into a reduction of greenhouse gas (GHG) emissions.<sup>lx</sup>

48. **EFA at project closing.** To re-estimate the project profitability at its completion, the EFA at appraisal was revisited by adjusting the key parameters including number of beneficiaries, yield increases, adoption rate, project annual cost streams and considering benefits arising from SLM. The ex post analysis examines the combined impact of R&E on yields,<sup>lxi</sup> which rose because of TFP growth and intensive use of inputs. Project carbon balance is included in addition to the three benefit streams used in the EFA at appraisal. Rice—one of the tracked commodities missing in the appraisal EFA—is also added to the model. The adoption rate is conservatively taken to be 49.2 percent, using the lower estimate from 2013,<sup>lxii</sup> given that the endline estimate of 78 percent was computed from a sample that underrepresented FG members who were not host farmers.<sup>lxiii</sup> The EFA also conservatively models a delay of 5 years between project appraisal and enterprise shifts to a more profitable commodity mix, to account for slow implementation,



production lags, learning, and time taken to build market links. This analysis has been carried out for a 20-year period at 2018 prices in 2010 constant terms.<sup>lxiv</sup>

49. **Summary results of the EFA:**

- (a) **The project yielded an EIRR of 37.5 percent, an NPV of US\$700 million, and an NPV per beneficiary of US\$309.** The project is therefore more profitable than estimated at appraisal, mainly due to larger yield growth than anticipated and accounting for substantial environmental benefits. However, the NPV is lower than estimated at appraisal, reflecting the different cost and benefit flows generated by a longer project implementation period.
- (b) **The results were also subjected to additional sensitivity tests** to capture the impacts of exogenous negative shocks (elite capture, adverse weather shock, increase in fuel prices, and unexpected drops in agricultural prices) and positive shocks (favorable weather, decrease in fuel prices, and unexpected spikes in agricultural prices) on project profitability. All things being equal, even in the case of extreme elite capture—which generates the largest negative impact—the project would still yield an EIRR of 13 percent. Conversely, favorable weather shocks will generate maximum positive impacts, with EIRR growing to 50 percent. This additional robustness generates confidence that ATAAS was in fact efficient in producing economically meaningful gains (see annex 4).

50. **Implementation efficiency.** The project performed better than anticipated in terms of EIRR and worse than anticipated in terms of NPV. This mixed performance partially reflects the following time and cost related efficiency considerations.

51. First, the project closed 3 years after the closing date planned at appraisal, due to (a) a 12-month delay between planned and actual effectiveness dates, (b) an 18-month extension at the first restructuring stage, and (c) a 6-month no-cost extension at the second restructuring stage. Although mitigating circumstances—delays due to elections and parliamentary approval, initial staff overhaul at NAADS and large shift in extension policy, delays in constitution of the MAAIF IST, and the threat of the FAW—explain each of the three instances, their cumulative effect was a slower rate of converting project inputs to outputs.

52. Second, the total project costs at closing represented 63.1 percent of the project costs at appraisal, with the drop in GoU commitment—US\$198.2 million—accounting for most of the difference. Consequently, the restructured project scaled back significant direct support to several activities planned at the design stage—for example, FID, technology uptake grants, and matching grants for commercialization—thus reducing the potential number of beneficiaries, technology adoption, farmer-farmer learning, and long-term integration with value chains.

53. Given the project's high economic profitability and countervailing time and cost-related efficiency considerations, project efficiency is rated Modest.

#### **D. JUSTIFICATION OF OVERALL OUTCOME RATING**

54. The overall outcome rating is Moderately Satisfactory based on the above assessments:



- **Relevance of objectives (Rating: High).** The project’s objectives, design, and methodology were highly relevant and have continued to be relevant to the sector, as evidenced by its continued alignment with Vision 2040, NDP - II (2015/16–2019/20), ASSP (2015/16–2019/20), and the FY16–FY20 CPF.
- **Efficacy of achieving objectives (Rating: Substantial).** The project achieved all its objectives for PDO indicators, based on project survey data, counterpart reporting, and nationally representative surveys. About 73.3 percent (22 of 30) of the targets associated with 12 intermediate indicators were also met or exceeded.<sup>lxv</sup>
- **Efficiency (Rating: Modest).** The project profitability was estimated to be higher than at appraisal, consistent with outcomes achieved by the project. However, major implementation delays resulted in inefficiencies, which lowered the efficiency of the project.

## E. OTHER OUTCOMES AND IMPACTS (IF ANY)

### Gender

55. **The project surpassed its targets for inclusion of women in FGs.** The mainstreaming of gender in all project activities, including FID, was designed to increase women’s participation and voice in FGs. Endline data on project beneficiaries indicate that 52 percent of the 1.68 million beneficiaries were women and women were beneficiaries of larger increases in agricultural income, as mentioned earlier. A process evaluation survey undertaken in 2017 showed that 94.3 percent of women reported that their voice had been considered for decision making in FGs, substantially exceeding the project target of 65 percent. Moreover, more than half the households reported joint decision making on purchase, sale, and utilization of assets (land, livestock, and farm equipment) even as joint ownership rates remained lower in comparison, indicating substantial bargaining power for women beneficiaries of ATAAS.<sup>lxvi</sup> Notably, these changes were recorded as the collection of gender-disaggregated data and, with the hiring of a specialist, became institutionalized in NARO during project implementation. Further, the project supported the development of a gender strategy by NARO, which was integrated in all project activities and other programs implemented by the agency.

### Institutional Strengthening

56. **ATAAS financing has built a pipeline of scientific researchers, technicians, and support staff who will continue to deliver agricultural TIMPs through the public research system long after closing.** Among NARO researchers, several scientists from National Agricultural Research Institutes and ZARDIs received project-financed training at the PhD (31) and MSc (8) levels. Many received specialized training such as apiculture, plant breeding and pathology, tick epidemiology, fish nutrition, crop agronomy, and management while others engaged in the broader disciplines of knowledge management, natural resource management, and climate-smart agriculture. Graduate students signed a bond to work at NARO for 3–5 years upon completion of their program, ensuring their availability to continue working with technology development and dissemination. About 34 percent of the scientists were women and by the end of the project, 32 percent had received their degrees while 19 percent had submitted their theses and the remainder are still in progress.<sup>lxvii</sup> In addition, the project supported mentoring and peer-to-peer coaching programs for young scientists (33) and staff to facilitate knowledge sharing across PARIs. Lastly,



409 staff members also received short-term training, based on identified gaps and prioritized needs in functional areas ranging from e-procurement to resource mobilization.<sup>lxviii</sup>

57. **NARO is now a mature public research organization equipped with the capacity to fulfil its mandated role.** The combination of complementary support provided by ATAAS and the World Bank-financed regional Eastern Africa Agricultural Productivity Project (EAAPP) has contributed to significant construction and rehabilitation of physical infrastructure, the establishment of well-equipped modern laboratories, and purchase of field research equipment. Coupled with the enhanced capacity of scientists, technicians and support staff, NARO has now in place the requisite physical capacity, human resources, and procedures to respond better to public demands for technology development and dissemination; compete more effectively for international funding; and develop partnerships with regional scientific institutions, PARIs and CGIAR, DPs, and farmer representative bodies.

58. **The project also supported the design of a new extension strategy and has helped establish a demand-driven advisory system coordinated by the MAAIF, LGs, and DARSTs.** By the restructuring stage, ATAAS had helped establish DARSTs in all Ugandan districts to support technology demand, dissemination, and adoption. DARSTs supported the setting up of 216 technology development sites for adaptive research, 11,771 research demonstrations, and selection of several strategic enterprises for adaptive research and seed multiplication. After restructuring, ATAAS supported the design of a new extension strategy and operating guidelines reflecting key principles articulated in the Comprehensive Africa Agriculture Development Programme (CAADP) framework. Further, the Directorate of Agricultural Extension Services (DAES) conducted capacity strengthening of 5,385 LG agricultural extension staff (97 percent of target) from 122 districts<sup>lxix</sup> through 11 training courses on subjects including livestock disease control, agronomy and fertilizer optimization, value chain development, SLM, and extension.<sup>lxx</sup> This skills upgrade of the new extension and LG staff will enable them to deliver high-quality advisory services tailored to community level demands.

59. **The ground has been prepared for ICT-powered agricultural interventions in the ACDP.** Under ATAAS, an ICT specialist was hired to provide leadership in development of e-platforms at the MAAIF, with ICT officers also mainstreamed at the NARO Secretariat and selected ZARDIs. Consequently, seven ICT platforms have been scoped and one—e-Certification—has been validated and piloted and was used to provide 4,276 certificates to traders. Other platforms such as e-M&E, e-Extension, and e-Markets are active but expected to come online under the ACDP and help accelerate project management and service delivery significantly. In addition, the MAAIF and NARO staff have also been trained as certified information security manager or certified information systems auditor, as well as in optic fibre networks and IT infrastructure, library, and Microsoft projects. An ICT4Agriculture benchmark study was also undertaken in Kenya, Rwanda, and Egypt, with participants drawn from all MAAIF directorates and NARO. The lessons learned have shaped the development requirements for applications that are expected to improve the performance of the ACDP by enhancing (a) flow of information to farmers: e-extension, e-MIS, and e-advisory; (b) flow of information from farmers to program officers on the performance of public agricultural programs: e-M&E; (c) facilitation of market links through e-marketing and e-certification; (d) production support through e-vouchers; and (e) publicly accessible platform for agricultural information and statistics (e-ag statistics).



### Mobilizing Private Sector Financing

60. **The project also supported the provision of high-quality NARO technologies through private sector channels.** At appraisal, one of the project's objectives was to promote multiplication of planting and stocking materials through the private sector. To achieve this objective, ATAAS supported the capacity building of seed companies, farmer-based community seed producers, and seed inspectors in multiplying technologies generated by NARO research. The technical staff from nine seed companies were trained by NARO in maize foundation seed production. In addition, the technical staff from five seed companies were sensitized on newly released biofortified bean varieties, and breeder seeds were provided. At least three community seed producers received foundation seeds and multiplication training to produce quality-declared seed, with other FGs receiving foundation seeds and on-demand demonstrations to initiate pasture grasses and legume multiplication. Several entrepreneurs were also provided with clean cassava planting materials of newly released varieties and were trained in multiplication of certified planting materials. Although quantitative data on changes in private sector supply were not collected, these interventions—particularly at the community, FG, and entrepreneur levels—aneccdotally accelerated the availability and adoption of newly released NARO technologies. In addition, the project provided technical assistance to the National Seed Certification Service and supported the use of fingerprint tracking and labelling technologies to trace authentic inputs and address the issue of fake input provision, which had reduced take-up in some geographies.<sup>lxxi</sup>

### Poverty Reduction and Shared Prosperity

61. **ATAAS technologies and the project's FAW response has successfully prevented a loss of yields and incomes among farmers, who comprise a large majority of the bottom 40 percent.** Since 2015, ATAAS beneficiaries have faced several climate and production shocks that threatened to reverse the productivity and income gains made during project implementation. El Nino-induced drought (2016–2017), plant diseases affecting cassava (CBSD and CMD) and banana (BWD), and pest infestation that targeted maize and beans (FAW in 2017–2018) have hit agriculture and caused shortages and food insecurity in many regions across Uganda. To their credit, the World Bank, GoU, NARO, and the MAAIF have responded swiftly and disseminated drought and disease-resilient varieties (for example, NAROCass 1 and 2 for cassava and NAROBan 1, 3, and 4 for bananas) and pest management techniques to protect yields. In particular, their rapid response in terms of surveillance, monitoring, mass communication, pest control, and adaptive research has been successful in containing the FAW outbreak in Uganda, which has since reached 44 African countries and caused yield losses of 15–20 percent in several of them.<sup>lxxii</sup> After the constitution of a national taskforce and deployment of emergency project support in all jurisdictions,<sup>lxxiii</sup> the MAAIF has committed to (a) continued provision of support to districts with pesticides and other items for demonstration purposes and (b) surveillance for pests and diseases in priority commodities through the ACDP. Together, ATAAS interventions and their institutionalization have ensured that a large share of farmers did not suffer the type of economic shocks that have reportedly led to poverty increases in neighbouring countries.

### Other Unintended Outcomes and Impacts

Not Applicable.





### III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

#### A. KEY FACTORS DURING PREPARATION

62. **The project was prepared in close collaboration with other DPs, with an emphasis on integrating the proposed NARO program with lessons from predecessor IPFs and the EAAPP.** From the identification stage onwards, joint World Bank-IFAD missions were undertaken to prepare ATAAS, with participation from EU and DANIDA representatives as well. The missions engaged with NARO and NAADS to facilitate and review the preparation of a joint proposal on the implementation arrangements for the design of a better R&E interface and collaborative activities such as M&E to ensure institutionalization at all operational levels. The missions also provided feedback that ensured the incorporation of lessons from ARTP-II's ICR in the proposed NARP during the ATAAS project period.<sup>lxxiv</sup> Given the simultaneous preparation of World Bank-financed EAAPP which also supported agricultural R&D, a large share of ATAAS preparation also focused on updating NARP to outline distinct research activities and budgets for infrastructure, goods and services, training and workshops, technical assistance and studies, M&E, CGS, research programs, staffing and operation, and maintenance.

63. **By appraisal, a draft Project Implementation Manual (PIM) and a detailed GAC Action Plan were also prepared to enhance the accountability and efficiency of the NAADS extension system.** Responding to higher public scrutiny and field reports of frequent changes in NAADS operations at the subcounty level, the project preparation team ensured the preparation of draft PIM, the NAADS Core Document, NARP, and the NARO-NAADS Partnership Framework by appraisal. Second, a communications strategy was designed to address the negative publicity on past NAADS irregularities, with a deliberate effort to inform the public and policy makers of the new direction, rules, and principles that were designed to improve NAADS' performance. Third, a GAC team assessed key issues related to proposed ATAAS activities and presented a detailed action plan to ensure that procurement and financial management (FM) risks were managed through (a) inclusion of GAC targets in annual NARO and NAADS work plans; (b) tracking and reporting of action against governance, FM, procurement and corruption indicators; (c) monitoring of GAC actions on annual audit recommendations; and (d) the establishment of a functional complaints handling mechanism for NAADS.<sup>lxxv</sup>

#### B. KEY FACTORS DURING IMPLEMENTATION

64. **Overall, project implementation was completed moderately satisfactorily,** meeting all of the PDO targets and 22 of 30 IRI indicator targets, with 99.5 percent of IDA and 100 percent of GEF funds disbursed by financial closure.<sup>lxxvi</sup> In the lead-up to the MTR and restructuring, that is, the period between February 2014 to October 2015, the project was rated Moderately Unsatisfactory four times, due to the following developments related to NAADS: (a) a shift in focus from supporting FID and advisory services to input distribution, (b) poor FM and procurement of inputs outside of the Procurement Plan, and (c) poor implementation of the M&E function and follow-up of implementation.<sup>lxxvii</sup> Consequently, the disbursement rate also dropped from November 2014, as the allocation for NAADS implemented components represented the majority of the ATAAS investment. However, the project team and the GoU managed to put the restructured project back on track and implementation progress was reported to be Moderately Satisfactory in all Aide Memoires and Implementation Status and Results Reports (ISRs) since the May 2016 mission.



65. **Several challenges adversely affected the implementation of the project.** These are discussed in the following paragraphs.

66. **The late entry into effectiveness of the project.** The project was approved on May 25, 2010, and became effective on December 20, 2011, causing a delay of 13 months in implementation. The causes of this delay are described in the section on 'Significant Changes during Implementation'.

67. **Policy and institutional shifts.** Post-ATAAS effectiveness, the GoU's introduction of a new extension policy in 2013 and the subsequent transfer of the extension mandate to the MAAIF from NAADS, the lead agency responsible for implementing more than 60 percent of the project (by cost), meant that the project underwent a major realignment midway through implementation. At restructuring, modifications were made to (a) components and activities, (b) the RF, to match the revised scope of project activities, (c) institutional and implementation arrangements, and (d) closing date.

68. **Disruptions in human resources and institutional capacity.** Project effectiveness coincided with a nearly complete staff overhaul at NAADS between November 2011 and January 2012. After the handover of extension from NAADS, delays in establishing the MAAIF IST (constituted in June 2016) meant that key leadership and technical positions were filled, starting November 2016. Both periods of transitions translated to delays in project implementation.

69. **Drought, pests, and plant disease.** Similar to most farmers, ATAAS beneficiaries faced several climate and production shocks that threatened to reverse the productivity gains made during project implementation. In particular, the widespread drought conditions induced by *El Nino* (2015–2016), plant diseases affecting banana and cassava (CBSD, CMD, and BWD), and pest infestation that threatened maize and beans (FAW in 2017–2018) caused shortages of high-quality commodities in many regions across Uganda. To their credit, the GoU, NARO, and the MAAIF responded swiftly and disseminated varieties adapted to drought, CBSD, CMD, BWD, and FAW to protect yields and deliver high prices to project beneficiaries in markets that were experiencing shortages.

70. **Due to these challenges, throughout implementation, the World Bank team and the implementation agencies demonstrated their proactivity and resourcefulness.** This is demonstrated by the immediate response to the extension policy shift and FAW-related crises to conduct two Level 2 restructurings of the project and extensions of the closing date as described previously. In addition, the World Bank team, NARO, the MAAIF, and LGs made considerable and concerted efforts to pick up speed and ensure the achievement of project objectives despite significant disruption and considerable delays.

71. **The restructured project's turnaround was driven by the leadership of NARO and the MAAIF.** After restructuring, NARO, the MAAIF, and LGs signed a tripartite Memorandum of Understanding to develop a common framework to guide development and operation of partnerships with relevant stakeholders such as ZARDIs and DARSTs for adaptive research, demonstrations, and technology scale-up. Further, an IST was established and its project coordinator was assigned key management duties to (a) accelerate decision making at the MAAIF and avoid implementation delays, (b) establish the use of a time-bound monitoring tool and provide monthly reporting of project milestones to the World Bank to avoid any slippages and take timely corrective actions, (c) enforce a requirement for NARO and the MAAIF to track the processing of all procurements in their Procurement Plans and sharing monthly status reports with the World Bank, (d) engage a procurement consultant to audit capacity at the institutes and build in-



house procurement capacity. The IST's successful completion of these tasks and the World Bank's timely supervision and feedback were critical ingredients for the project's turnaround. Furthermore, this IST has been strengthened to become the PCU for the ACDP, the World Bank's follow-on project.

#### IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME

##### A. QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Rating: Modest

##### M&E Design

72. **The RF was largely well designed but suffered from deficiencies that were amplified due to poor implementation.** Each of the RF indicators was directly linked to a project outcome, adequately measured progress toward the overall PDO, and the framework outlined the frequency of data collection, data collection instruments, and responsibility for data collection. However, there were three sets of shortcomings with the M&E design: (a) PDO-level indicators were incompletely defined (livestock productivity) and had baseline values that were erroneous (agricultural income) or outdated (crop yields), thus introducing ambiguity in benchmarking progress and project evaluation; (b) while baseline values were intended to be updated through a survey by the original effectiveness date, the responsibility was delegated to four entities (NAADS, NARO, MAAIF, and UBoS) when tasking one could have led to greater accountability; and (c) the indicator on percentage of same commodities in ten top priorities for ZARDI and NAADS (by the AEZ) was ambiguous relative to planning processes and consequently, not reported by implementing agencies before being dropped at restructuring.

##### M&E Implementation

73. **The M&E framework was inadequately implemented due to several reasons:** (a) an M&E manual was not developed in time to outline the timing, responsibility, and methodological approach of baseline, midline, and endline surveys; (b) a digital management information system (MIS) was not developed to maintain records during the lifetime of the project; (c) ad hoc consulting firms were used instead of UBoS to conduct surveys and produce reports; (d) the high turnover in M&E specialists and change in implementing agencies did not allow for consistency in approaches used for tracking, managing, and processing data. Consequently, project M&E implementation was affected by suboptimal utilization of available data (UBoS baseline survey not completely included in the revised RF), loss of institutional memory (NAADS survey data on FGs not handed over during transfer at restructuring), and reduced ability to monitor against comparable targets. Further, project evaluation is unable to capture project successes on several dimensions outside of the RF that a well-functioning M&E system would generate.

##### M&E Utilization

74. **Corrective actions were taken based on frequently tracked indicators but M&E utilization was mixed due to weaknesses in data processing and management for others.** At the MTR stage, M&E data on project outputs were used to identify pre-restructuring progress (for example, DARST district coverage) and delays (no SLM activities) in the implementation of planned activities. Further, M&E data played an instrumental role in refining the activities of the project at joint review and planning meetings. In



particular, the use of well-defined M&E indicators enabled participants from NAADS to monitor the rate of technology generation from NARO institutions. This information sharing was directly responsible for the upward revision of end targets for NARO's activities in technology generation and CRGs, which were performing well at that stage and continued to do so until closing. Conversely, the slow processing of baseline information and weaknesses in data transfer from NAADS to MAAIF prevented the project from utilizing real-time feedback on progress toward PDO targets on indicators for number of beneficiaries, adoption, yields, and incomes.

### **Justification of Overall Rating of Quality of M&E**

75. The overall rating of the M&E is Modest. This is because of the substantial shortcomings in the M&E system's design and implementation identified above.

### **B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE**

76. **Environmental safeguards.** The project was considered Category B at appraisal. The potential direct impacts on the environment were related mainly to civil works, the use of pesticides and fertilizers, and the generation of laboratory and other waste. The potential indirect impacts on the environment were related to agricultural intensification and the expansion of agriculture to non-agricultural lands such as forests and wetlands. The proposed project therefore triggered two safeguard policies: (a) Environmental Assessment (OP/BP 4.01) and (b) Pest Management (OP 4.09). An Environmental Assessment was conducted, and several provisions were made to ensure compliance.

77. At NARO, a specialist was appointed to oversee implementation of environmental safeguards for all planned civil works in line with the Environmental and Social Management Framework (ESMF) guidelines on gender, waste management, and occupational health and safety considerations. The screening of relevant Environmental and Social Management Plans was done to guide construction activities and partnerships with the International Labour Organization and Ministry of Gender, Labor, and Social Development were established for capacity building in social risk management. Lastly, the application of integrated pest management practices has been successfully demonstrated and the use of pesticides/chemicals has been limited.

78. During the third mission, environmental safeguards was rated Moderately Unsatisfactory due to the challenges that the MAAIF faced in implementation of the ESMF. The lack of safeguards capacity, a delay in training of project implementers, delay in implementation of the Strategic Environmental and Social Assessment, and absence of reporting on environmental issues in the quarterly and semiannual progress reports were noted. By MTR, this rating had been upgraded to Moderately Satisfactory after NARO appointed a specialist for implementation of safeguards, screening of planned civil works under ESMPs and the successful demonstration of IPM practices. By the eighth mission, it was noted that the MAAIF had recruited a full-time environmental specialist and decommissioning and restoration of all construction sites had been completed. Later, the MAAIF also developed a draft environment and social safeguards (ESS) management policy, guidelines, and plans for operationalizing the system. The guidelines include the ESS Manual; Environmental and Social Risk Management Procedure including the Environmental and Social Grant screening checklist and risk register template; and management plans for biodiversity, waste/hazardous waste, pests, natural resources, and stakeholders.<sup>lxxviii</sup>



79. **Social safeguards.** NARO has designated a social safeguards coordinator and has institutionalized ESS in all its projects. Focal points at the district level have been identified for all nine ZARDIs to address issues on HIV/AIDS, child labor, sexual harassment and gender, in addition to grievance redress mechanisms being established in all NARO programs. It also began reporting on social risks and safeguards management and developed a policy on sexual harassment, which forms the basis of strong protections in workers' contracts against sexual harassment in the workplace and sex with minors. Furthermore, NARO has also developed a Gender and Diversity strategy to guide the process of addressing project-related gender concerns, which the World Bank has recommended to be expanded to the ACDP.<sup>lxix</sup> In view of the above, social safeguards was rated Moderately Satisfactory through the project period, but this rating improved to Satisfactory during the tenth mission by which time most of the achievements noted above had been realized.

80. **FM.** The FM of the project has been consistently rated Moderately Satisfactory due to weaknesses of the internal control system characterized by (a) insufficient supporting documentation for a range of expenditures, (b) low quality of the planning and budget follow-up, and (c) delays in implementing external and internal auditors' recommendations. During the early implementation period, disbursement was slow and there were several instances of ineligible expenditures on input provision, with this figure rising to an estimated UGX 19 billion by July 2012. At the restructuring stage, the GoU and the World Bank reached an agreement that 75 percent of the ineligible expenditures was to be considered as expenditure from government resources and the remaining amount—about US\$1 million—was refunded to IDA.

81. Other early challenges included (a) delays in transfer of funds to the districts, (b) excessive cash transactions by NAADS and some NARO research institutes, and (c) significant delays in accounting for project advances by both NAADS and NARO and their respective districts and institutes. It was also noted that while NARO consistently submitted the quarterly intermediate financial reports within the submission deadline, NAADS did not meet the required deadline. An FM review (March 2017) covering the MAAIF, NARO, PARIs, and ZARDIs found that the compliance levels on accounting for staff advances had remained low. In response, a report on advances was required to be integrated with quarterly IFRs submitted to the Bank. In 2017, when the auditor general issued a qualified opinion on NARO's financial statements, the Bank team made it mandatory for NARO to seek approval from the Ministry of Finance for budget reallocation and increases in expenditure ceilings for per diem allowances, seminars, and workshops to curtail irregular and unsupported payments. In general, the MAAIF was receptive to the World Bank's comments on its FM, but it was slow at implementing the recommended actions due to capacity constraints.

82. **Procurement.** During project implementation, procurement was throughout rated Moderately Satisfactory, except during the ninth mission when it was rated Moderately Unsatisfactory. This assessment reflected the fact that after a slow start, many major NARO contracts were executed with fewer delays despite the misalignment of work plans and procurement. The World Bank conducted a post-procurement review of the NARO Secretariat and confirmed that the arrangements remained adequate for implementation. However, during the ninth mission, there were evident challenges that included delayed procurement activities caused by bureaucracies in the procurement cycle players, management of contracts, lack of contract management information from users, and insufficient funding for some initiated procurements.



83. **At the start of the project and up to the time of restructuring ATAAS, procurement under NAADS continued for a long time to be slow and behind schedule and several cases of potential misprocurement were noted.** In many such cases, additional procurements outside the agreed Procurement Plan were undertaken even as those agreed to in the plan remained behind schedule. Further, the management overrode procurement and internal control procedures at the district and subcounty levels, with the absence of procurement records, prequalified suppliers, non-involvement of contract committees, and single sourcing being common violations. In fact, this trend was one of the rationales for the GoU decision to separated advisory/extension service provision from inputs delivery in NAADS.

84. **Post restructuring, when the MAAIF took over the advisory/extension component of the project from NAADS, it had limited capacity for procurement and implementation,** especially in the absence of technical staff who could prepare terms of reference and initiate procurements. The tenth mission noted that the key challenges presented by both the MAAIF and NARO related to (a) bureaucracies in the procurement cycle, (b) operational challenges with the STEP system including Internet unreliability, (c) delayed evaluation processes, and (d) management of contracts. These challenges were addressed by (a) the preparation of a manual to elaborate procurement arrangements under the MAAIF; (b) the hiring of a dedicated procurement specialist for ATAAS and the ACDP and the monthly monitoring of progress reports by a procurement coordinator; and (c) hiring of project coordinator, SLM specialists, M&E specialists, and so on to support implementation.

### **C. BANK PERFORMANCE**

#### **Quality at Entry**

85. **The World Bank's performance in ensuring quality at entry was Moderately Satisfactory.** The project design was informed by data, existing national capacities, and extensive lessons learned from the two preceding IDA-financed IPFs, ARTP-II (closed June 2009, rated Satisfactory) and NAADS (closed December 2009, rated Moderately Satisfactory). It also drew on and directly operationalized program areas identified by the recently concluded DSIP formulation process. Joint missions conducted with other DPs enabled the preparation team to receive shared knowledge from ongoing projects supported by DANIDA, U.S. Agency for International Development, and IFAD that had promoted agribusiness and agricultural commercialization. Procurement, FM, and safeguards were adequately analyzed and addressed during project preparation and appraisal.

86. **Assessment of project design.** The project design was based on a clear operational logic connecting its components from technology generation to supporting agribusiness services and building market links. The emphasis on demand-driven and participatory approach to technology identification in research and the adoption of a pluralist approach to extension focused on FID were innovative features of its design. The project design also reflected complementarities with the simultaneous EAAPP, which aimed to strengthen regional cooperation in technology generation, training, and dissemination. The project activities were carefully selected to ensure that efforts were not duplicated, and resources would not be wasted.

87. **However, in retrospect, it is evident that some design choices were imperfect.** First, the reliance of agribusiness development activities on CCF matching grants exposed a large share of Component 4 to non-disbursement, a risk that materialized by the MTR, leading to a scaling down of agribusiness



development activities. Second, the decision to have two parallel NARO and NAADS Secretariats implement the project without a single PCU for overall coordination and reporting roles significantly weakened the R&E links that the project sought to forge. Third, the M&E arrangements were incompletely defined and diffused responsibility to an extent that accountability was compromised.

88. **Adequacy of risk and mitigation measures.** The original residual risk rating for ATAAS was Substantial and this was mainly attributed to governance problems associated with NAADS and FM and procurement risks. However, the low-probability and high-impact risk of policy change in the NAADS mandate was neither identified as an entity-level risk<sup>lxxx</sup> nor is it clear that any mitigation measures could have sufficiently addressed its effects without significantly altering project implementation. On the other hand, the risk of ineligible expenditures was foreseen but the mitigation measure of the preparation of an anticorruption and governance plan going beyond IDA's standard fiduciary measures proved to be insufficient in retrospect, reflecting the rating of Substantial for this residual risk at appraisal.

### Quality of Supervision

89. **The World Bank's performance during project implementation was Moderately Satisfactory.**

90. **The World Bank supervised the project adequately, navigating major changes in institutional capacity and policy environment and addressing production shocks faced by beneficiaries.** Throughout the project cycle, the World Bank team faced the challenges outlined in the 'Key Factors during Implementation' section. The World Bank's agility is demonstrated by the timely responses to the extension policy shift and FAW-related crises to conduct two Level 2 restructurings of the project and extensions of the closing date as described previously. In addition, the World Bank team made considerable and concerted efforts to pick up speed and ensure the achievement of project objectives despite significant disruption and considerable delays caused due to (a) NAADS staff overhaul at effectiveness and (b) the slow constitution of a new MAAIF IST after restructuring.

91. **The World Bank also used project supervision resources well, organizing 10 implementation support missions with all three supervision task team leaders being based in Kampala.** A seasoned team of local and international staff, as well as consultants, advised the client on M&E, procurement, and FM issues, as they emerged during implementation. During each mission, meetings with leaders of implementing agencies were accompanied with field visits to 3–4 districts sampled from different AEZs, to form a representative understanding of the nationwide coverage of ATAAS. This close supervision enabled the World Bank to coordinate responses to shocks such as drought, new plant diseases, and pests, which threatened to derail the project. Communications and consultations with the client were regular, open, and transparent with reporting ratings and candid discussions on key issues, including at midterm, ensuring that the project made some progress even during the episodes of delays. At midterm, actionable and detailed action plans were elaborated to ensure that the project achieves its objective by the closing date.

92. **A key area that could have benefited from closer support by the task team is M&E.** An M&E specialist as a full-time member of the World Bank team could have provided timely support to NAARO, NAADS, and then the MAAIF and enhanced the quality of M&E utilization for measuring progress in the project. Further, the quality of documentation in the early ISRs, which did not fully document the rationale for project ratings, could have been improved.



### Justification of Overall Rating of Bank Performance

93. The overall World Bank performance rating was Moderately Satisfactory. The World Bank team prepared a project that benefited from lessons learned from predecessor projects. The project was largely well designed with the notable exceptions discussed above. The team also provided adequate implementation support and addressed critical issues on time. The team was proactive and prepared well-documented Aide Memoires and ISRs after the MTR, with clear action plans to address the identified implementation gaps. This in turn allowed for the intended results to be achieved.

#### D. RISK TO DEVELOPMENT OUTCOME

94. **Policy sustainability.** The inclusion of ATAAS approaches to technology development, extension, and SLM in agricultural strategies, plans, and budgets will ensure continuity of project interventions. First, the ASSP (2015/16–2019/20) has now replaced the DSIP (2010–2015) as the MAAIF’s national agriculture strategy, but its four main priorities take forward the approach supported by ATAAS.<sup>lxxxii</sup> Second, the recently developed National Agriculture Policy also has provisions that will help sustain the activities supported under ATAAS. Third, the GoU has recently increased funding for the new agricultural extension system established under the project, thus ensuring that resources will remain available for NARO, the MAAIF, and LG structures currently cooperating to deliver and disseminate agricultural TIMPs. Fourth, SLM interventions have now been mainstreamed into LG development plans and budgets (for example, Kanungu and Sembabule), ensuring the maintenance and repair of existing community-level structures (terraces, trenches, contour bunds, and grass bunds) through monitoring and collective action organized by trainers and extension officers. Further, LG plans and budgets have been supplemented by the development and implementation of SLM byelaws and ordinances (for example, Kisoro, Kanungu, and Isingiro) to supervise the engagement between local residents, trainers, and subcounty extension officers. The risk to development outcome on the policy sustainability dimension is Low.

95. **Institutional capacity.** The project had supported in-house capacity development at NARO and the MAAIF. The deliberate emphasis of the project on using NARO and the MAAIF’s existing institutional structures and planning, budgeting, coordination, M&E, and reporting processes resulted in the following successes: (a) both institutions have now built the requisite physical capacity, human resources, budgets, and systems to operate a demand-driven technology development and dissemination system; (b) demand articulation and participatory priority setting has been institutionalized in both institutions and at the provincial and district levels, with close collaborations between FGs, ZARDIs, and LGs; (c) NARO is now exploring the option of commercializing its technology outputs and could become a financially sustainable entity supplying the needs of Uganda and neighbouring countries, where its technologies are being scaled up; and (d) the enabling systems established in ATAAS (FM, M&E, and ICT) are expected to benefit ACDP implementation and will likely filter down to district and subcounty level institutions affiliated with NARO and the MAAIF. The risk to development outcome on the dimension of institutional capacity is Low.

96. **Pests and disease.** In June 2016, Uganda experienced a FAW outbreak which had caused yield losses of 15–20 percent as well as devastating economic and social damage in several African countries. Based on the project’s success in containing the threat from FAW through surveillance, monitoring, mass communication and pest control in all jurisdictions,<sup>lxxxiii</sup> the MAAIF has committed to (a) continued provision of support to districts with pesticides and other items for demonstration purposes and (b) surveillance for pests and diseases in priority commodities through the ACDP. Further, the GoU is in





contact with the Brazilian government to explore collaboration mechanisms and the establishment of a biological control facility in the country. The GoU has also expressed its commitment to continue providing support to research on development of more sustainable control options for FAW. While a newly established early warning system and the above actions are likely to contain outbreaks of several pests and diseases, new crop and livestock threats are always emerging and require constant vigilance. The risk to development outcome on the dimension of pests and diseases is rated Moderate.

97. **Sustainability of technology adoption.** ‘Operation Wealth Creation’ (OWC) is an ongoing public program that aims to support several strategic agricultural interventions such as mechanization, small-scale irrigation, value addition, output marketing, and post-harvest handling. Most significantly, OWC also disseminates farming inputs free of charge, which are not complemented with advisory services. The continued provision of free, and often, lower-quality inputs under OWC could crowd out the demand for NARO’s improved seeds and planting materials, thus leading to dis-adoption and potential reversal of gains in agricultural productivity produced by ATAAS. The risk to development outcome on the dimension of sustainability of technology adoption is High.

98. Aggregating across the risk factors outlined above, the risk to development outcome is rated Moderate.

## V. LESSONS AND RECOMMENDATIONS

99. **Large-scale, flagship projects must minimize their exposure to policy risk to operate in dynamic, short-term political environments.** At appraisal, ATAAS was designed to be the GoU’s flagship project in the agriculture sector, with a large financial scale and national coverage. However, nearly US\$318 million (48 percent of the total project cost) was allocated to Component 3, 75 percent of which was to be financed by the GoU allocation for NAADS. This design feature left the project highly exposed to a risk of policy and institutional shifts, especially in a political environment in which the role of NAADS came under high public scrutiny during preparation and immediately after the project’s Board approval.<sup>lxxxiii</sup> In retrospect, the project could have reduced the concentration of big-ticket and politically visible activities—technology promotion, beneficiary selection for uptake grants, and matching grants for commercialization—under one implementing agency, to reduce the risk of disruptive institutional change.

100. **Project effectiveness can be accelerated by bringing parliamentarians on board during the preparation stage, in countries where parliamentary approval is required.** In Uganda, similar to several other countries, parliamentary approval is a condition for effectiveness. In the case of ATAAS, the planned project effectiveness date was delayed by 12 months owing to a lengthy parliamentary ratification process that requires approval of subsidiary agreements, an intervening national election campaign period, and the subsequent period before the constitution of a new parliament. It is conceivable that early communications outreach to key policy makers like the Uganda Parliamentary Agriculture Committee could have accelerated the ratification process. In future projects, communications outreach coupled with study tours that illustrate proof of concept through similar World Bank projects in other countries could be considered as a mechanism for accelerating effectiveness, reducing transaction costs, and shortening project life cycles.



101. **Government commitment and leadership at both the national and local levels is critical for the success of large projects.** After restructuring, NARO, MAAIF, and district LGs have displayed strong leadership and coordination on the following dimensions of project management. First, all three entities signed a tripartite MoU to develop a common framework to guide development and operation of partnerships with relevant stakeholders such as ZARDIs and DARSTs for adaptive research, demonstrations, and technology scale-up. Second, the DAES under the MAAIF has taken major steps to building the Single Spine extension system by conducting capacity strengthening of 5,385 LG agricultural extension staff from all Ugandan districts through 11 training courses on subjects such as livestock disease control, agronomy and fertilizer optimization, value chain development, SLM, and extension.<sup>lxxxiv</sup> This rapid skills upgrade enabled newly hired extension staff to buy in to ATAAS interventions and deliver high-quality advisory services tailored to community-level demands. Third, SLM was mainstreamed rapidly through joint NARO/MAAIF/LG interventions, as described in paragraphs 44 and 103.

102. **The establishment of a single PCU can enhance coordination and administrative efficiency of complex projects with a multiplicity of implementation actors.** At appraisal, NARO and NAADS were jointly responsible for Component 2 and R&E interfaces and partnership arrangements were planned at the national, zonal, and district levels. However, an explicit coordination unit was not created within the MAAIF, to which both Secretariats would have reported independently. This oversight resulted in the slow mobilization of Component 2 activities such as joint strategic planning, M&E, and SLM until restructuring, when corrective action was taken and a PCU was established within the MAAIF. After this change, R&E partnerships between ZARDIs, DARSTs, and LG extension staff have accelerated service delivery, as evidenced by the rapid mobilization of SLM interventions. However, the M&E system was not able to fully recover from early setbacks such as the delayed preparation of an M&E manual, absence of a comprehensive baseline survey, and loss of data tracking FGs during the transfer from NAADS to the MAAIF, leading to suboptimal utilization of the system for real-time monitoring and ex post evaluation.

103. **The mainstreaming of SLM at the local-government level is a blueprint for success for future projects focused on landscape management.** The project has built capacities for SLM planning, expansion, and maintenance at the lowest levels. After restructuring, ATAAS supported: a) the development and use of guidelines for integrating SLM into the joint NARO/MAAIF/LG technology demonstrations, b) the establishment of an SLM Technical Committee, and c) the recruitment of SLM specialists to strengthen on-the-ground implementation capacity. By project closing, zonal SLM officers were integrated into the zonal R&E liaison offices. Enterprise SLM platforms built around large-scale interventions were consolidated at the sub-zonal level in all the nine ZARDIs and are expected to sustain these activities through community-organized maintenance and repair in future agricultural seasons. In particular, LGs have taken full ownership of SLM interventions, ensuring rapid scale-up by mobilizing local leaders, identifying local trainers, conducting training of trainers, and supervising on-the-ground progress. Coupled with inclusion in district budgets and development plans, LGs have ensured that the project's success on the SLM dimension is on strong footing for the future as well.



**ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS**

**A. RESULTS INDICATORS**

**A.1 PDO Indicators**

**Objective/Outcome:** The Project Development Objective (PDO) is to increase agricultural productivity and incomes of participating households by improving the performance of agricultural research and advisory service syst

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Increase in average agricultural yields of participating households	Percentage	0.00	15.00	15.00	111.00
		31-Dec-2013	30-Jun-2015	31-Dec-2010	25-Jun-2018
Milk production	Percentage	3.00	20.00	20.00	120.00
		31-Dec-2013			25-Jun-2018
Percentage increase in milk yield in litres	Percentage	3.00	20.00	20.00	120.00
		31-Dec-2013	30-Jun-2015	31-Dec-2013	25-Jun-2018
Crops	Percentage	0.00	15.00	15.00	108.70
		31-Dec-2013			25-Jun-2018
Maize	Percentage	1.30	15.00	15.00	80.50



		31-Dec-2013	30-Jun-2015	31-Dec-2013	25-Jun-2018
Rice	Percentage	1.00	15.00	15.00	180.40
		31-Dec-2013	30-Jun-2015	31-Dec-2013	25-Jun-2018
Cassava	Percentage	1.70	15.00	15.00	126.30
		31-Dec-2013	30-Jun-2015	31-Dec-2013	25-Jun-2018
Beans	Percentage	0.50	15.00	15.00	47.60
		31-Dec-2013	30-Jun-2015	31-Dec-2013	25-Jun-2018

**Comments (achievements against targets):** 1) The targets for yield increases were 15% for all 4 crops and 20% for milk. Since there was no target for "agricultural yields" in general and the completion value for this indicator cannot be left blank, a simple average of all 5 commodities is computed and reported. 2) Since there was no general indicator for "Crop" and the completion value for this indicator cannot be left blank, a simple average of all 4 crops is computed and reported. 3) To maintain consistency with ISR RFs, the units of measure for "Baseline" is MT/Ha (crops) and Lt/day/animal (milk) for the commodities below. The percentage increases in "Actual Achieved at Completion" are calculated using baseline and endline yield values reported in the main text of the ICR. 4) The dates for "Original Target" and "Actual Achieved at Completion" reflect the dates for expected (at Board Approval) and actual Project closing. Since the targets for this indicator were not revised, the dates for "Baseline" and "Formally Revised Target" are kept the same. The date for "Baseline" is recorded as 31 December 2013 for indicator values that were updated using the baseline survey.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Increase in agricultural income of participating households	Percentage	0.00	20.00	20.00	215.50
		31-Dec-2013	30-Jun-2015	31-Dec-2013	25-Jun-2018
Male	Percentage	975730.00	20.00	20.00	204.80



		31-Dec-2013	30-Jun-2015	31-Dec-2013	25-Jun-2018
Female	Percentage	698200.00	15.00	15.00	225.50
		31-Dec-2013	30-Jun-2015	31-Dec-2013	25-Jun-2018

**Comments (achievements against targets):** 1) The general indicator for "increase in agricultural income of participating households" was gender-disaggregated at restructuring and was no longer tracked. Since the completion value cannot be left blank, a beneficiary-weighted average of male and female increases is computed and reported here. 2) To remain consistent with ISRs, the "Baseline" value is reported in UGX. The percentage values for gender-disaggregated increase in agricultural income of participating households reported in "Actual Achieved at Completion" are computed after adjusting nominal incomes at baseline and closing for inflation. 3) The dates for "Original Target" and "Actual Achieved at Completion" reflect the dates for expected (at Board Approval) and actual Project closing. Since the targets for this indicator were not revised, the dates for "Baseline" and "Formally Revised Target" are kept the same. The date for "Baseline" is recorded as 31 December 2013 for indicator values that were updated using the baseline survey.

**Objective/Outcome:** The Global Environmental Objective (GEO) is to enhance the environmental sustainability and resilience of agricultural production to land degradation and climate risks.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Additional land area with improved land and water management practices	Hectare(Ha)	0.00	11000.00	6000.00	20930.00
		31-Dec-2010	30-Jun-2015	02-Mar-2015	25-Jun-2018

**Comments (achievements against targets):** 1) The unit of measure for first "additional land area" indicator in the RF is Hectare, is reported above. The second indicator is in Kilometers, and is reported below in this table. 2) The date for "Baseline" is recorded as 31 December 2010 to correspond to the date for Board Approval of the PAD because this value was not updated during the baseline survey. The dates for "Original Target" and "Actual Achieved at Completion" reflect the dates for expected (at Board Approval) and actual Project closing. The date



for "Formally Revised Target" reflects the date for the first Level 2 Restructuring, when the target was reduced.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Additional land area with improved land and water management practices (Ha)	Hectare(Ha)	0.00	11000.00	6000.00	20930.00
		31-Dec-2013	30-Jun-2015	02-Mar-2015	25-Jun-2018

**Comments (achievements against targets):** This indicator is reported twice and is redundant.

#### Unlinked Indicators

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Direct project beneficiaries	Number	1357900.00	1710000.00	1578000.00	1684959.00
		31-Dec-2013	30-Jun-2015	02-Mar-2015	25-Jun-2018
Female beneficiaries	Percentage	47.00	49.00	49.00	51.50
		31-Dec-2013	30-Jun-2015	02-Mar-2015	25-Jun-2018

**Comments (achievements against targets):** 1) The target was surpassed (106.8% achieved). 2) The dates for "Original Target" and "Actual Achieved at Completion" reflect the dates for expected (at Board Approval) and actual Project closing. The date for "Formally Revised Target" reflects the date for the first Level 2 Restructuring.



**A.2 Intermediate Results Indicators**

**Component: 1. Developing Agricultural Technologies and strengthening the National Agricultural Research System**

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Increase in the number of technological innovations generated for dissemination (cumulative)	Number	600.00 26-May-2010	720.00 30-Jun-2015	800.00 02-Mar-2015	888.00 25-Jun-2018

**Comments (achievements against targets):** The value for baseline value is taken from the PAD and the original target is computed using the 20% increase that was targeted at appraisal.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of collaborative Research Projects implemented (annual)	Number	41.00 26-May-2010	58.00 30-Jun-2015	60.00 02-Mar-2015	90.00 25-Jun-2018

**Comments (achievements against targets):** This indicator is disaggregated as public (72) and private (18), when reported at closing.

**Component: 2. Enhancing partnerships between agricultural research and other value chain stakeholders**

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Technologies demonstrated in	Number	44.00	83.00	95.00	164.00



the project areas (number)		31-Dec-2013	30-Jun-2015	02-Mar-2015	25-Jun-2018
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**Comments (achievements against targets):** 1) The date for "Baseline" reflects the date for the baseline survey. The date for "Original Target" also reflects the expected Project closing date at Board Approval.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Percentage of targeted beneficiaries using improved agricultural technologies	Percentage	0.00	0.00	0.00	0.00
		25-May-2010	30-Jun-2015	25-May-2010	25-Jun-2018

**Comments (achievements against targets):** This indicator is disaggregated by type of improved technology (crop, livestock, SLM, fisheries) in the RF and a general value was not tracked through the project duration. The disaggregated indicator values are reported in the ICR.

**Component: 3. Strengthening Agricultural Support Services**

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Proportion of men and women perceiving that their voice has been taken into account in decision making of the farmer group	Percentage	70.00	75.00	75.00	95.60
		26-May-2010	30-Jun-2015	26-May-2010	25-Jun-2018

**Comments (achievements against targets):** This indicator is gender-disaggregated in the RF. For women, the corresponding values are 15, 65, 65, and 94.3.





Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of primary farmer organizations registered as higher level farmer organizations	Number	100.00	0.00	225.00	42.00
		31-Dec-2013	30-Jun-2015	31-Dec-2013	25-Jun-2018

**Comments (achievements against targets):** 1) The date for "Baseline" reflects the date for the baseline survey. The date for "Original Target" also reflects the expected Project closing date at Board Approval.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
New Extension Strategy designed and approved	Yes/No	N	Y	Y	Y
		02-Mar-2015	29-Dec-2017	02-Mar-2015	25-Jun-2018

**Comments (achievements against targets):** 1) The date for "Baseline" reflects the date for the first Level 2 Restructuring, since this indicator was introduced at that point. The date for "Original Target" also reflects the expected Project closing date at the first Level 2 Restructuring.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Targeted ICT initiatives scoped, piloted and ready for scale	Number	0.00	5.00	5.00	1.00
		02-Mar-2015	29-Dec-2017	02-Mar-2018	25-Jun-2018

**Comments (achievements against targets):** 1) 5 ICT initiatives are scoped but only 1 of them is also piloted and ready for scale (20% of target)



achieved). 2) The date for "Baseline" reflects the date for the first Level 2 Restructuring, since this indicator was introduced at that point. The date for "Original Target" also reflects the expected Project closing date at the first Level 2 Restructuring.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of farmers reached through ICT innovations piloted.	Number	0.00	440000.00	440000.00	4276.00
		02-Mar-2015	29-Dec-2017	02-Mar-2015	25-Jun-2018

Comments (achievements against targets): 1) 9.7 percent of target was achieved. 2) The date for "Baseline" reflects the date for the first Level 2 Restructuring, since this indicator was introduced at that point. The date for "Original Target" also reflects the expected Project closing date at the first Level 2 Restructuring.

Component: Programme management and M&E

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Percentage of results monitoring indicators reported on time as outlined in the M&E plan	Percentage	85.00	100.00	100.00	93.80
		02-Mar-2015	29-Dec-2017	02-Mar-2015	25-Jun-2018

Comments (achievements against targets): 1) This is an annual target and not a cumulative one. The number of years of achievement of this target was not tracked. 2) The date for "Baseline" reflects the date for the first Level 2 Restructuring, since this indicator was introduced at that point. The date for "Original Target" also reflects the expected Project closing date at the first Level 2 Restructuring.

Indicator Name	Unit of	Baseline	Original Target	Formally Revised	Actual Achieved at
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	Measure			Target	Completion
Annual audit recommendations implemented as a proportion of all actions recommended	Percentage	100.00 02-Mar-2015	100.00 29-Dec-2017	100.00 02-Mar-2015	85.00 25-Jun-2018

**Comments (achievements against targets):** 1) This is an annual target and not a cumulative one. The number of years of achievement of this target was not tracked. 2) The date for "Baseline" reflects the date for the baseline survey. The date for "Original Target" also reflects the expected Project closing date at the first Level 2 Restructuring.



**B. KEY OUTPUTS BY COMPONENT**

<b>Objective/Outcome 1</b>	
Outcome Indicators	1. Percentage increase in average agricultural yields of participating households (maize, beans, rice, cassava, milk)
Intermediate Results Indicators	<ol style="list-style-type: none"> <li>1. Number of technological innovations generated for dissemination (cumulative)</li> <li>2. Number of collaborative research projects implemented (cumulative)</li> <li>3. Number of adaptive trials and demonstrations implemented by ZARDIs and LGs annually</li> <li>4. Number of technologies demonstrated in project areas</li> <li>5. Percentage of target beneficiaries using improved technologies</li> </ol>
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	<ol style="list-style-type: none"> <li>1. The stock of agricultural technologies generated by the NARO system grew from 600 to 888. 81 new technologies were developed for the 5 tracked commodities</li> <li>2. 72 public and 18 private collaborative research projects implemented</li> <li>3. 216 on-station adaptive trials, 11,771 on-farm demonstrations (crop, livestock, fisheries), and 186 SLM community-level interventions were conducted nationwide</li> <li>4. 164 technologies demonstrated in project areas (maize – 41, beans – 34, cassava – 34, rice – 27, dairy – 28)</li> <li>5. 78% of beneficiaries (crop – 95.3%, livestock – 63.3%, SLM – 31.7%) reported the use of improved technologies</li> </ol>
<b>Objective/Outcome 2</b>	
Outcome Indicators	1. Percentage increase in agricultural income of participating households (men, women)



Intermediate Results Indicators	<ol style="list-style-type: none"> <li>1. Percentage of target beneficiaries using improved technologies (by seeds, management technique, and SLM)</li> <li>2. Proportion of men and women perceiving that their voice has been taken into account in decision making of the farmer group</li> <li>3. Number of primary farmer organizations registered as higher level farmer organizations through assistance</li> <li>4. Number of targeted ICT initiatives scoped, piloted and ready for scale</li> <li>5. Number of farmers reached through ICT innovations piloted</li> </ol>
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	<ol style="list-style-type: none"> <li>1. 78% of beneficiaries (crop – 95.3%, livestock – 63.3%, SLM – 31.7%) reported the use of improved technologies</li> <li>2. 95.7 percent of men and 94.3 percent of women perceived that their voice was taken into account in decision making of the farmer group</li> <li>3. 42 farmer organizations were registered as HLFOs</li> <li>4. 5 ICT initiatives were scoped; 1 was piloted and ready for scale.</li> <li>5. 4,276 farmers reached through piloted ICT innovations</li> </ol>
<b>Objective/Outcome 3</b>	
Outcome Indicators	1. <u>Direct project beneficiaries (number), of which female (%)</u> .
Intermediate Results Indicators	<ol style="list-style-type: none"> <li>1. Number of farmers reached through ICT innovations piloted</li> <li>2. Proportion of men and women perceiving that their voice has been taken into account in decision making of the farmer group</li> </ol>
Key Outputs by Component (linked to the achievement of the Objective/Outcome 3)	<ol style="list-style-type: none"> <li>1. 1.36 million farmers belonged to more than 54,000 FGs at MTR, with 40,024 FGs being registered and trained in farmer institutional development. 327,059 new direct beneficiaries were reached by closing.</li> <li>2. 4,276 farmers reached through piloted ICT innovations</li> </ol>



	3. 95.7 percent of men and 94.3 percent of women perceived that their voice was taken into account in decision making of the farmer group
<b>Objective/Outcome 4</b>	
Outcome Indicators	1. Additional land area with improved land and water management practices
Intermediate Results Indicators	1. Number of adaptive trials and demonstrations implemented by ZARDIs and LGs annually 2. Percentage of target beneficiaries using improved technologies
Key Outputs by Component (linked to the achievement of the Objective/Outcome 3)	1. 186 SLM community-level SLM interventions were conducted nationwide (40 districts, 77 sub-counties, and 32 landscapes) 2. 31.7% of SLM beneficiaries reported the use of improved technologies, innovations and management practices 3. 240 extension workers and 517 community-based facilitators (53 percent women) across all nine ZARDIs were trained to organize local groups and reinforce the sustainability of investments.

**ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION****A. TASK TEAM MEMBERS**

<b>Name</b>	<b>Role</b>
<b>Preparation</b>	
Madhur Gautam	Task Team Leader
Sergiy Zorya Task	Co-Task Team Leader
Christine Cornelius	Program Coordinator
Nightingale Rukuba-Ngaiza	Sr. Counsel
Luis Schwarz	Sr. Finance Officer
Wilson Onyang Odwongo	Sr. Rural Dev. Specialist
Stephen Danyo	NRM Specialist
Sandra Sargent	ICT Operations Officer
Hermann Pfeiffer	Sr. Agricultural Officer
Lisa Paglieti	Economist
Anis Wan	Operations Officer
Moses Kibirige	Sr. PSD Specialist
Vildan Verbeek-Demiraydin	Sr. Economist
Varun Kshirsagar	Economist
Martin Fodor	Sr. Environment Specialist
Mary Bitekerezo	Sr. Social Development Specialist
Howard Bariira Centenary	Procurement Specialist
Michael Okuny	FM Specialist
Barbara Magezi Ndamira	Public Sector Specialist
Harriet Kiwanuka	Team Assistant
Hawanty Page	Sr. Program Assistant
<b>Supervision/ICR</b>	
Rasit Pertev	Task Team Leader(s)
Joseph Oryokot	Task Team Leader(s)



Annet Tamale Katuramu, Rahmoune Essalhi, Donald Paul Mneney	Procurement Specialist(s)
Edwin Nyamasege Moguche	FM Specialist
Marie Lolo Sow	Team Member
Kevin John Crockford	Team Member
Janet Christine Atiang	Team Member
Jeehye Kim	Team Member
Ashesh Prasann	Lead Author, ICR
James Muli Musinga	Team Member, ICR
Catherine Asekenye Barasa	Social Specialist
Herbert Oule	Environmental Specialist

**B. STAFF TIME AND COST**

Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US\$ (including travel and consultant costs)
<b>Preparation</b>		
FY08	4.850	85,829.39
FY09	31.570	209,360.25
FY10	81.948	486,438.25
<b>Total</b>	<b>118.37</b>	<b>781,627.89</b>
<b>Supervision/ICR</b>		
FY11	41.692	164,020.86
FY12	20.497	83,866.74
FY13	37.196	104,301.52
FY14	21.560	55,816.99
FY15	38.976	214,103.48
FY16	28.959	104,369.28
FY17	10.209	64,525.76
FY18	21.384	92,190.63
FY19	26.323	107,731.09





<b>Total</b>	<b>246.80</b>	<b>990,926.35</b>
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**ANNEX 3. PROJECT COST BY COMPONENT**

<b>Components</b>	<b>Amount at Approval (US\$, millions)</b>	<b>Actual at Project Closing (US\$, millions)</b>	<b>Percentage of Approval (US\$, millions)</b>
Component 1: Developing Agricultural Technologies and Strengthening the National Agricultural Research System	137.8	115.5	83.9
Component 2: Enhancing Partnerships between Agricultural Research and Other Stakeholders	72.4	67.1	92.7
Component 3: Strengthening the National Agricultural Advisory Services	317.8	151.5	47.6
Component 4: Supporting Agribusiness Services and Market Linkages	63.0	6.7	10.6
Component 5: Program Management	74.5	53.6	71.9
Component 6: (NEW) Strengthening Agricultural Support Services	0.0	26.9	
<b>Total</b>	<b>665.5</b>	<b>421.4</b>	<b>63.3</b>



## ANNEX 4. EFFICIENCY ANALYSIS

### Economic and Financial Analysis at Project Appraisal

1. The EFA undertaken at ATAAS project appraisal is based on cost-benefit analysis (CBA), using 12 percent as the economic opportunity cost of capital in Uganda. The benefits considered in the calculations stem from increased yields because of (a) more productive and resilient technologies developed by NARO and disseminated by advisory and extension services, (b) a shift toward a more profitable commodity mix as a result of strengthened market links, and (c) a higher share of farm-gate prices into wholesale prices, arising from strengthened integration of smallholders in the value chains. The economic internal rate of return (EIRR) at appraisal was estimated at 33 percent while the NPV using a 12 percent discount rate amounted to US\$1.26 billion.
2. The analysis focused on several commodities promoted in Uganda under NAADS: sorghum, maize, cassava, Irish and sweet potatoes, millet, simsim, groundnut, beans, bananas, coffee, and cotton. These crops were grown on around 80 percent of Uganda's total cultivated area. It was expected that yields will increase between 4 percent (coffee) and 50 percent (groundnut), while the income of participating households will increase by 20 percent by the end of the project.
3. The analysis did not account for the benefits resulting from SLM activities which translate to a reduction in GHG emissions. All project costs were considered in the analysis.

### EFA at Project Closing

4. To reestimate the project profitability at its completion, the EFA at appraisal was revisited by adjusting the key parameters including yield increases, adoption rate, and project annual cost streams and considering benefits arising from SLM activities.

### Methodology and Basic Assumptions

5. As at project appraisal, the methodology used is the CBA which is based on valuation in monetary terms of project costs and benefits. It is predicated on the comparison of the with-project situation to the without-project situation (counterfactual), the result arising from the project being the incremental net benefits. The analysis has been carried out for a 20-year period at 2018 prices in 2010 constant terms. The exchange rate used for converting local currency (Ugandan shilling) to U.S. dollar is the official real effective exchange rate during the first quarter of 2018 in 2010 constant terms.<sup>1</sup> As at project appraisal, a 12.0 percent discount rate has been used to reflect the social opportunity cost of capital in Uganda.
6. The economic benefits considered in the calculation of economic profitability indicators are those that are readily quantifiable. They derive mainly from increases in the yields of tracked commodities. The financial cost and benefit flows have been converted into economic values with specific conversion factors calculated using import and export parity prices. Based on the World Bank commodity price data and

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<sup>1</sup> Source: The Central Bank of Uganda, [https://www.bou.or.ug/bou/collateral/exchange\\_rates.html](https://www.bou.or.ug/bou/collateral/exchange_rates.html).



forecasts,<sup>2</sup> the conversion factor stands at 1.17 for maize, 0.80 for sorghum, 0.49 for rice, 0.67 for groundnuts, 2.10 for coffee, 1.61 for banana, and 3.64 for cotton.

7. The analysis examines the combined impact of R&E on yields<sup>3</sup> which are expected to increase because of TFP growth and intensive use of inputs. Project benefits would originate from the following sources: (a) increased crop yields, (b) shift toward a more profitable commodity mix, (c) higher share of farm-gate prices in wholesale prices, and (d) project carbon balance. The range of commodities considered in the analysis has been expanded with the inclusion of rice.

8. The project environmental impact has been estimated using EX-ACT and accounted for in the calculation of the project economic return. EX-ACT was developed by the FAO for estimating project impact on GHG emission and carbon sequestration. It allows to assess a project's net carbon-balance, defined as the net balance of CO<sub>2</sub> equivalent GHG emitted or sequestered because of project implementation compared to the without-project scenario. It estimates the carbon stock changes (emissions or sinks), expressed in equivalent tons of CO<sub>2</sub> per hectare and year. Over the analysis period of 20 years, ATAAS constitutes a carbon sink of 1,964,831 tCO<sub>2</sub>eq, equivalent to 1.2 tCO<sub>2</sub>eq sequestered per hectare per year.

9. The model developed is based on the initial Excel model built at project appraisal, which had been refined at the project MTR. It is worth noting that some formula errors identified at project MTR in the initial Excel file have been corrected, leading the EIRR at appraisal to drop from 36 percent to 33 percent.

10. Farm budgets (by hectare) have been prepared for farms using existing traditional technologies and beneficiary farms using improved new technologies released by NARO. The gross revenue is calculated based on yields per hectare and farm-gate sale prices. Then, the gross margin is calculated by deducting from the gross revenue the costs of inputs and labor. As at appraisal, it has been assumed that labor costs account for 80 percent of total variable costs. The assumptions regarding input intensity (amounts spent on input purchase per hectare) remain also unchanged. The farm-gate sale prices are assumed to be 80 percent of the whole sales prices. Table 4.1 shows the financial wholesale prices in 2010 and 2018.

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<sup>2</sup> The Pink Sheet released on June 4, 2018, and the commodities price forecast released on April 24, 2018.

<sup>3</sup> Their impacts are hardly dissociable.



**Table 4.1. Wholesale Financial Prices (UGX per kg)**

Crops	Wholesale price in 2010	Wholesale price in 2018
Sorghum	736	1050
Maize	750	700
Cassava	400	1000
Irish Potato	630	1200
Sweet Potato	550	900
Millet	929	1800
Sim Sim	2450	4400
Ground Nut	2100	4350
Beans	1300	2100
Banana	450	1150
Coffee	2000	3500
Cotton	450	1150
Rice	1719	2900
CPI (price index)	100.00	165.00

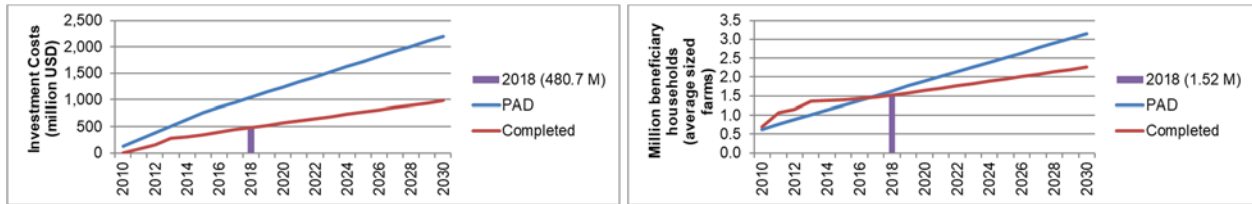
11. Under Component 1, NARO has developed 288 new technologies and innovations for crop and livestock production, fisheries, forestry, and farm mechanization. For tracked crop commodities, NARO has released 81 new high-yielding crop varieties resistant to pests, diseases, and drought. The Impact Evaluation (2018) report shows that yields achieved at project completion for the four tracked crop commodities are as follows: 2.3 t per ha for maize, 4.1 t per ha for cassava, 0.7 t per ha for beans, and 4.1 t per ha for rice. Despite the extremely long drought experienced in Uganda, these yields are higher than those assumed in the EFA at appraisal for high-performing farms: 1.8 t per ha for maize, 3.0 t per ha for cassava, 0.7 t per ha for beans, and 2.8 t per ha for rice (included at project restructuring). This implies that the yield growth considered in the EFA at appraisal was underestimated.

12. Based on the actual yields achieved, assumptions made at appraisal regarding the efficiency (TFP) differential and the input intensity factor have been adjusted at project completion. The Impact Evaluation (2018) endline data on non-beneficiary yields was used to update the parameters for 'low-performing farms', that is, farms which did not adopt new TIMPs, and beneficiary yields computed in the weighted endline were used for 'high-performing farms' (that is, farms which adopted new TIMPs). Using the conservative UBoS survey estimate from 2013, an adoption rate of 49 percent has been factored in the calculations.

13. The updated EFA at project closing was prepared valuing costs and benefits as at May 2018, at 2010 constant prices. All the project components have been accounted for in the computation of the total economic cost. The project costs were valued and factored in the calculation according to the actual disbursements over the project implementation period. The actual project cost streams are much lower than estimated at project appraisal, mainly due to the change in the Government's extension policy. The number of beneficiary households is also smaller than the figures retained at appraisal (figure 4.1).



Figure 4.1. Comparison of Total Costs and Adopting Beneficiary Households



Results and Sensitivity Analysis

14. Accounting for all expected benefits listed above, the project would yield an EIRR of 37.5 percent and an NPV of US\$700 million at a 12 percent economic discount rate. The project is therefore profitable from an economic standpoint. This result is better than the one estimated at project appraisal, mainly because of considering higher than anticipated yields and additional environmental benefits.

Table 4.2. NPV and EIRR

Year	PAD			Investment Costs	Net benefit	Completed			Investment Costs	Net benefit	Discounted Net benefit		
	Aggregate Crop Net Benefit (without project)	Aggregate Crop Net Benefit (with project)	Aggregate Crop Net Benefit (with project)			Discounted Net benefit (without project)	Aggregate Crop Net Benefit (with project)	Aggregate Env Net Benefit (with project)					
2010	-2,037	2,037	0	-127	-127	-127	-2,356	2,356	0	0	0		
2011	-2,147	2,188	0	-127	-86	-76	-2,393	2,394	0	-73	-71		
2012	-2,152	2,234	0	-127	-44	-35	-2,441	2,441	0	-84	-83		
2013	-2,157	2,281	0	-127	-3	-2	-2,500	2,499	0	-119	-120		
2014	-2,163	2,329	0	-127	39	25	-2,662	2,749	0	-25	62		
2015	-2,168	2,377	0	-127	81	46	-2,869	3,081	0	-45	167		
2016	-2,174	2,425	0	-96	154	78	-2,953	3,157	0	-52	151		
2017	-2,180	2,473	0	-96	197	89	-3,053	3,247	0	-42	152		
2018	-2,186	2,522	0	-96	240	97	-3,171	3,356	0	-42	144		
2019	-2,192	2,571	0	-96	283	102	-3,202	3,404	0	-42	159		
2020	-2,199	2,621	0	-96	326	105	-3,234	3,452	0	-42	176		
2021	-2,205	2,671	0	-96	369	106	-3,267	3,500	0	-42	192		
2022	-2,212	2,722	0	-96	413	106	-3,299	3,550	0	-42	209		
2023	-2,219	2,773	0	-96	457	105	-3,332	3,600	0	-42	226		
2024	-2,226	2,824	0	-96	501	103	-3,366	3,651	0	-42	243		
2025	-2,234	2,876	0	-96	546	100	-3,399	3,702	0	-42	261		
2026	-2,241	2,928	0	-96	591	96	-3,433	3,754	0	-42	279		
2027	-2,249	2,981	0	-96	636	93	-3,468	3,807	0	-42	297		
2028	-2,257	3,034	0	-96	681	89	-3,502	3,860	0	-42	316		
2029	-2,265	3,090	0	-96	729	85	-3,537	3,914	0	-42	335		
2030	-2,274	3,149	0	-96	778	81	-3,573	3,969	0	-42	354		
				NPV @ 12%			1,264			NPV @ 12%			700
				Total ERR			33.9%			Total ERR			37.5%
				Million beneficiaries			3.15			Million beneficiaries			2.26
				NPV/beneficiary, USD			402			NPV/beneficiary, USD			309

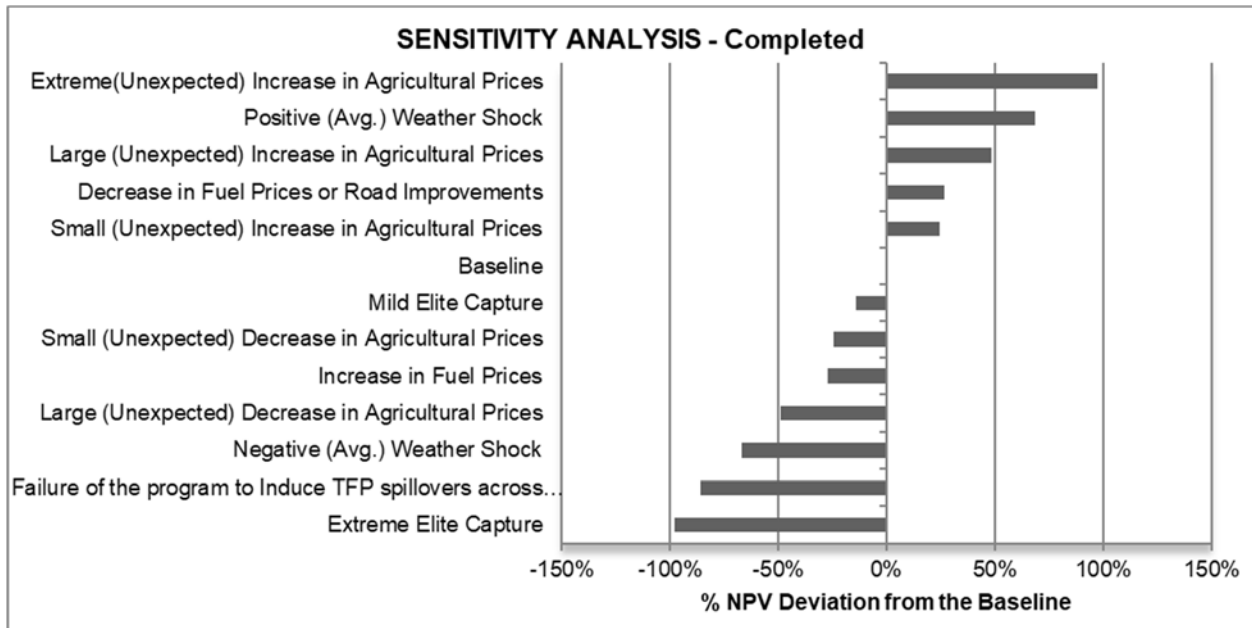
15. The results were tested for robustness to a set of unobservable exogenous shocks: an elite capture of advisory and NARO services, a change in output prices, and a change in transport costs arising from lower fuel prices and better rural roads. All things being equal, an extreme elite capture (0.5 percent households reached each year) would reduce the NPV to US\$16 million and an EIRR of 13 percent. An unexpected 50 percent decrease in agricultural prices would yield an NPV of US\$359 million and EIRR of 32 percent. A 20 percent increase in transport costs would yield an NPV equivalent to US\$511 million and an EIRR of 32 percent. All these results are computed under the assumption of impact delays of 5 years identified at the project MTR.



Table 4.3. Sensitivity Analysis Results

Sensitivity	Model Experiment	Completed	
		% NPV Deviation from the Baseline	NPV (million USD 2010)
Extreme Elite Capture	0.5 % Households Reached each year + no spillovers	-98%	16
Failure of the program to Induce TFP spillovers across	No TFP Spillovers to members not receiving inputs	-86%	100
Negative (Avg.) Weather Shock	50% Exogenous Yield Decrease	-67%	231
Large (Unexpected) Decrease in Agricultural Prices	50 % Decrease in Real Prices (from the Baseline)	-49%	359
Increase in Fuel Prices	20 % Increase in Transport Costs	-27%	511
Small (Unexpected) Decrease in Agricultural Prices	25% Decrease in Real Prices (from the Baseline)	-24%	529
Mild Elite Capture	1 % Households Reached each year	-14%	603
<b>Baseline</b>	<b>Default Parameters</b>	<b>0%</b>	<b>700</b>
Small (Unexpected) Increase in Agricultural Prices	25% Increase in Real Prices (from the Baseline)	24%	870
Decrease in Fuel Prices or Road Improvements	20 % decrease in Transport Costs	27%	889
Large (Unexpected) Increase in Agricultural Prices	50% Increase in Real Prices (from the Baseline)	49%	1,040
Positive (Avg.) Weather Shock	50% Exogenous Yield Increase	69%	1,181
Extreme(Unexpected) Increase in Agricultural Prices	100% Increase in Real Prices (from the Baseline)	97%	1,381

Figure 4.2. Sensitivity Analysis





**ANNEX 5. BORROWER, CO-FINANCIER, AND OTHER PARTNER/STAKEHOLDER COMMENTS**

In any correspondence on  
this subject please quote No. FAD 46/141/03



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February 4, 2019

Dr. Joseph Oryokot  
Task Team Leader  
Agriculture Cluster Development Project  
Uganda Country Office - World Bank  
**Kampala.**

**ICRR – AGRICULTURE TECHNOLOGY AND AGRIBUSINESS ADVISORY  
SERVICES (ATAAS) – P109224**

Following your request for comments on the draft ATAAS Implementation Completion and Results Report (ICRR), the Ministry has reviewed the document and concurs with the findings of the report.

Looking forward to receiving your final version of the report.

  
Pius Wakabi Kasajja  
PERMANENT SECRETARY





## **ANNEX 6. SUPPORTING DOCUMENTS (IF ANY)**

### **Project Documents**

- Project Appraisal Document on a Proposed Credit in the Amount of SDR 79.5 Million (US\$120.0 million equivalent) and a Proposed Grant from the Global Environment Facility Trust Fund In the amount of US\$7.2 million to the Republic of Uganda for an Agricultural Technology and Agribusiness Advisory Services Project, May 26, 2010
- Financing Agreement, May 2010
- Restructuring Datasheet, Report No. RES20476
- Restructuring Paper on a Proposed Project Restructuring of Agricultural Technology and Agribusiness Advisory Services Project, Credit No. 47690 - UG, approved on March 2015 to the Republic of Uganda, Report No.: RES16578
- Restructuring Paper on a Proposed Project Restructuring of Agricultural Technology and Agribusiness Advisory Services Project, to the Republic of Uganda, Report No.: RES29231

### **Aide Memoires**

- Implementation Support Mission, January 2012
- Implementation Support Mission, August 2012
- Implementation Support Mission, January 2013
- Implementation Support Mission, August 2013
- Implementation Support Mission, December 2014, Midterm review
- Implementation Support Mission, August 2015
- Implementation Support Mission, March 2016
- Implementation Support Mission, November 2016
- Implementation Support Mission, November 2017
- Implementation Support Mission, June 2018

### **ISRs**

- November 2010
- June 2011
- February 2012
- October 2012
- June 2013
- February 2014
- November 2014
- January 2015
- August 2015
- October 2015
- May 2016
- December 2016
- June 2017



- December 2017
- June 2018

**Documents from Borrower/Implementing Agency**

- Final Report on Impact Evaluation of Agricultural Technology & Agribusiness Advisory Services Project, August 2018
- The Republic of Uganda Agricultural Technology and Agribusiness Advisory Services (ATAAS) Project Implementation Completion and Results Report, July 20, 2018
- Competitive Grant Scheme Support to Collaborative Research and Development Projects, 2014-2018, Completion Report, July 2018
- Final Report on Process Evaluation of the Agricultural Technology & Agribusiness Advisory Services Project, October 2017
- National Agricultural Research Organization, Technology Compendium, October 2017

**Other Documents**

- National Agricultural Advisory Services (NAADS) Final Report for Programme Implementation Progress Survey, 2014
- National Agricultural Advisory Services (NAADS) Agricultural Technology and Agribusiness Advisory Services (ATAAS): Baseline Survey Report, 2015
- UNPS Wave 3 Report
- UNPS Wave 4 Report
- UNPS Wave 5 Report



ANNEX 7. SUPPORTING TABLES AND FIGURES

Table 4. Original and Revised Indicators

Indicators	Action per Restructuring
<b>PDO INDICATORS</b>	
Percentage increase in average agricultural yields of participating households Crops: Maize, beans, and rice Livestock: Milk and poultry	<b>Revised.</b> Tracked commodities added cassava and dropped poultry. Definition of ‘participating households’ changed from ‘members of NAADS FGs’ to ‘members of FGs receiving support from contracted project group promoters or district extension workers under MAAIF’.
Percentage increase in agricultural income of participating households <i>Note:</i> Baseline value of UGX 4,120,000 does not correspond to its source (UNHS 2005/06)	<b>Revised.</b> Indicator modified to disaggregate by gender. Men: End target set to UGX 1,170,876. Women: End target set to UGX 802,930.
Additional hectares and kilometers of land area with improved land and water management practices (hectares)	<b>Revised.</b> End target decreased from 11,000 ha to 6,000 ha. Indicator for kilometers dropped.
Direct project beneficiaries (number), of which female (%)	<b>Upgraded.</b> From IRI to PDO indicator <b>Revised.</b> End target decreased from 1.71 million to 1.58 million
<b>INTERMEDIATE RESULTS INDICATORS</b>	
<b>Component 1: Developing Agricultural Technologies and Strengthening the NARS</b>	
1. Number of technological innovations generated for dissemination (cumulative)	<b>Revised.</b> Indicator modified from percentage to number and end target increased from 720 to 800.
2. Number of collaborative research projects implemented (cumulative)	<b>Revised.</b> Public/private disaggregation added and end target increased from 58 to 60.
<b>Component 2: Enhancing Partnerships between Agricultural Research, and Other Stakeholders</b>	
3. Number of adaptive trials and demonstrations implemented by ZARDIs and LGs annually (by seeds, management technique, and SLM)	<b>New indicator added</b>
4. Number of technologies demonstrated, by enterprise	<b>Moved</b> from old Component 3: Strengthening the NAADS <b>Revised;</b> definition of ‘enterprise’ changed to tracked commodities
5. Percentage of target beneficiaries using improved technologies (by seeds, management technique, and SLM)	<b>Moved</b> from old Component 3: Strengthening the NAADS
Percentage of the same commodities in 10 top priorities for ZARDI and NAADS (by AEZ)	<b>Dropped</b>
Proportion of the districts with the operational District Adaptive Research Support Teams	<b>Dropped</b>



Indicators	Action per Restructuring
<b>New Component 3: Strengthening Agricultural Support Services</b>	
6. Proportion of men and women perceiving that their voice has been taken into account in decision making of the FG	<b>Unchanged</b>
7. Number of primary farmer organizations registered as higher-level farmer organizations through assistance	<b>New indicator added</b>
8. New extension strategy designed and approved reflecting key principles of agricultural extension services as articulated in CAADP's framework for Africa Agricultural Productivity (AAP) and operational guidelines published	<b>New indicator added</b>
9. Number of targeted ICT initiatives scoped, piloted, and ready for scale	<b>New indicator added</b>
10. Number of farmers reached through ICT innovations piloted	<b>New indicator added</b>
Share of farm production marketed by targeted beneficiaries (in value terms, by gender)	<b>Dropped</b> from old Component 4: Supporting Agribusiness Services and Market Linkages
Number of operational PPPs for agribusiness and market linkages	<b>Dropped</b> from old Component 4: Supporting Agribusiness Services and Market Linkages
Percentage of targeted beneficiaries who are satisfied with advisory services (by gender)	<b>Dropped</b> from old Component 3: Strengthening the NAADS
<b>New Component 4: Programme Management and M&amp;E</b>	
11. Percentage of result monitoring indicators reported on time as outlined in the M&E plan	<b>New indicator added</b>
12. Annual audit recommendations implemented as a proportion of all actions recommended	<b>New indicator added</b>
The Complaint Handling Mechanism for NAADS established and functional	<b>Dropped</b>

**Table 5. Performance on PDO 1 (PAD, MTR)**

	(1)	(2)	(3)	(4)	(5)
Commodity	Baseline (PAD)	Baseline (MTR)	Endline	Performance % (PAD)	Performance % (MTR)
Maize	1.5	2.4	3.4	126.7	41.7
Rice	1.3	2.3	2.9	123.1	26.1
Cassava <sup>a</sup>		3.5	4.1		17.1
Beans	0.7	1.4	1.6	128.6	14.3



	(1)	(2)	(3)	(4)	(5)
Commodity	Baseline (PAD)	Baseline (MTR)	Endline	Performance % (PAD)	Performance % (MTR)
Milk	3.0	1.2	7.4	146.7	516.7
Poultry <sup>a</sup>	200.0				
Source	FAOSTAT (2006–2008 average)	FAOSTAT (2013)	Beneficiaries - IE (2018)	Targets Crops: 15% Livestock: 20%	Targets Crops: 10% Livestock: 15%

Note: a. At MTR, the RF was changed on two dimensions: (a) cassava was added to and poultry subtracted from the list of tracked commodities and (b) baseline year was changed to 2013 and targeted improvements were revised downward for crops (from 15 percent to 10 percent), livestock (from 20 percent to 15 percent), and agricultural incomes for women (from 20 percent to 15 percent). MT per ha is the unit for crop yield. Liters per animal per day is the unit for milk yield. Eggs per bird per year is the unit for egg yield.

Table 6. Endline Crop Yields, Impact Evaluation (2018)

Crop	Recall Method, 2017 (Season B)			Crop-cut, 2018 (Season A)		
	Non-beneficiaries	Beneficiaries	Percentage Difference	Non-beneficiaries	Beneficiaries	Percentage Difference
Maize	3.0	3.4	13.3	1.6	3.6	125.0
Rice	2.1	2.9	38.1	2.4	6.1	154.1
Cassava	4.0	4.1	2.5	9.3	18.2	95.7
Beans	0.7	1.6	128.6	0.6	1.8	200.0

Table 7. Baseline Benchmarks for Agricultural Income

Year	Average Agricultural Income	Source, Methodology
2005	326,400	UNHS 2005-06 (Cash income only)
2010	986,668	LSMS/UNPS 2010–2011 (Household survey)
2011	1,228,116	LSMS/UNPS 2011–2012 (Household survey)
2013	820,000	UBoS baseline (ATAAS beneficiaries)

Table 8. Agricultural Incomes, 2018 (Borrower's ICR)

	Gross Income/Farmer (UGX)	Total Cost/Farmer (UGX)	Net Income/Farmer (UGX)	% Difference in Net Incomes Beneficiary versus Non-beneficiary Farmers
<b>Beneficiaries</b>				
Maize	1,018,517	552,600	465,917	74
Rice	4,738,500	1,611,620	3,126,880	1,170
Cassava	2,405,700	81,600	2,324,100	148
Beans	915,087	139,600	775,487	349
Milk	3,788,000	1,551,250	2,236,750	229
<b>Non-Beneficiaries</b>				
Maize	941,625	674,188	267,437	
Rice	1,192,909	946,704	246,205	
Cassava	964,103	25,775	938,328	
Beans	313,991	141,354	172,637	
Milk	1,227,000	547,500	679,500	



**Table 9. Results of the Assessment of ATAAS by Implementation Support Missions**

Project Components		Implementation Support Mission										
		Before Restructuring				After Restructuring						
		1	2	3	4	5	6	7	8	9	10	
PDO and GEO							MS	MS	MS	S		
Component 1: Developing Agricultural Technologies and Strengthening the National Agricultural Research System	Technology Development				MS	S						
	NARO and ARSP Institutional Strengthening								S	S	S	
Component 2: Enhancing Partnerships between Agricultural Research and Other Stakeholders	Joint Planning and Adapt Research				MS	MS						
	SLM											
	Institutional and Human Capacity Building									MS	MS	S
	Joint Results Framework											
	Joint ICT											
Component 3: Strengthening the National Agricultural Advisory Services	FID				UN							
	Technology Promotion											
	Technology Uptake Grants											
	Farmer Empowerment					MU		MU	MS	MS	S	
	Support New Extension System											
	Development of ICT Support System											
	Start-up for the ACDP											
Component 4: Supporting Agribusiness Services and Market Linkages	Agriculture Business Development Services				MS							
	CCF											
Component 5: Program Management	MAAIF/IST				MS		MS	MS	MS	MS		
	NARO											
• Procurement							MS		MU	MS		
• Financial Management					MS	MS		MS	MS	MS		
• Financial Management Risk					Sub	Sub				Sub		



Project Components	Implementation Support Mission									
	Before Restructuring				After Restructuring					
	1	2	3	4	5	6	7	8	9	10
• Environmental Management			MU	MS	MS			MS	MS	MS
• Social Safeguard									MS	S
<b>PROJECT IMPLEMENTATION</b>					<b>MS</b>		<b>MS</b>	<b>MS</b>	<b>MS</b>	<b>MS</b>

Note: MS = Moderately Satisfactory; MU = Moderately Unsatisfactory; S = Satisfactory; Sub = Substantial; UN = Unsatisfactory

<sup>i</sup> Author’s calculations using World Development Indicator (WDI) data from 2010.

<sup>ii</sup> Uganda National Panel Survey (UNPS) (2009–2010) Report – Wave I.

<sup>iii</sup> Source: Compiled from the USDA International Agricultural Productivity database, available at:

<https://www.ers.usda.gov/data-products/international-agricultural-productivity/>. TFP is calculated as a residual obtained by netting out from output growth all other measurable sources of growth at this level of data aggregation: examples are growth in agricultural land expansion, increased numbers of workers living on farms, and increased use of purchased inputs such as fertilizers.

<sup>iv</sup> Alene, A. D., & Coulibaly, O. (2009). The impact of agricultural research on productivity and poverty in sub-Saharan Africa. *Food policy*, 34(2), 198-209.

<sup>v</sup> Fan, S., & Zhang, X. (2008). Public expenditure, growth and poverty reduction in rural Uganda. *African Development Review*, 20(3), 466-496.

<sup>vi</sup> In this literature, returns to research subsume investments in dissemination, because it is through dissemination that adoption occurs.

<sup>vii</sup> Benin, S., Nkonya, E., Okecho, G., Randriamamonjy, J., Kato, E., Lubade, G., & Kyotalimye, M. (2011). Returns to spending on agricultural extension: the case of the National Agricultural Advisory Services (NAADS) program of Uganda. *Agricultural Economics*, 42(2), 249-267.

<sup>viii</sup> Table 5-A: Project Costs by Component in Project Appraisal Document.

<sup>ix</sup> Project Appraisal Document.

<sup>x</sup> World Bank. 2005. *Uganda - Joint assistance strategy - 2005-2009 (English)*. Report # 34310

<sup>xi</sup> At appraisal, IDA had invested US\$50 million in NAADS over the last seven years, along with seven other DPs in a basket funding arrangement totaling US\$110 million. IDA had also invested US\$64 million in NARO over the last 17 years through two phases of the ARTP.

<sup>xii</sup> NAADS was designed as a component of the GoU’s Plan for Modernization of Agriculture (PMA)—the framework for investments in the sector.

<sup>xiii</sup> Improved land and water management deliver a triple dividend in adaptation, mitigation, and productivity by accumulating carbon in soil and biomass and by intensifying production to protect woodlands, tropical high forests, and bush from agricultural expansion. The former three contracted by approximately 25 percent between 1990 and 2005, while the latter expanded by 15 percent. Thus, interventions to promote SLM belong with the promotion of agricultural technology as complementary actions.

<sup>xiv</sup> At appraisal, US\$26.3 million was expected to be financed by EU and DANIDA but this financing did not materialize due to policy changes in their aid programs, and the GoU committed to filling this gap.

<sup>xv</sup> Financing Agreement dated July 19, 2011.

<sup>xvi</sup> It was also assumed that each member of an FG was represented by one participating household.

<sup>xvii</sup> Component costs include contingency allocations (Annex 5, PAD).

<sup>xviii</sup> ATAAS expenditures at closing (data provided by the borrower).

<sup>xix</sup> MSIPs were intended to be platforms that improve knowledge sharing and coordination among different stakeholders to achieve a common objective. Functional MSIPs were to drive joint demand-driven needs assessments, implementation coordination, as well as stakeholder reviews of activities within the farming systems and value chains. Platforms at the lower levels would provide for relatively informal ad hoc interactions between FGs. More formal and sustained MSIPs would be



established at zonal and national levels to achieve collaboration and learning in an innovative system context. The key actors or stakeholders are comprehensively identified in the National Agricultural Research Program (NARP) proposal as (a) the farmers, agricultural producers, and their organizations or fora; (b) agrodealers, market agents, traders, and agro-processors; (c) the policy makers of the MAAIF, the infrastructure service sector, the Ministry of Trade, and financial services; (d) the research and knowledge generation sector; and (e) intermediaries, brokers, and extension organizations of all types (technical, financial, and commercial). The actual composition of MSIPs would differ greatly depending on the level of their establishment.

<sup>xx</sup> ISR (November 10, 2010).

<sup>xxi</sup> OWC.

<sup>xxii</sup> Restructuring Paper (June 22, 2010).

<sup>xxiii</sup> Restructuring Paper (June 22, 2010).

<sup>xxiv</sup> The MAAIF was to contract the R&E link coordinators called technology-linked officers to constitute, together with dedicated NARO scientists, the R&E link units at the ZARDI-level. This team was to be responsible for strengthening the DARSTs in undertaking outreach activities and facilitating their links with various actors such as nongovernmental organizations and farmer organizations, currently supporting extension in different districts. This team was also mandated to take lead responsibility for agricultural extension content development in response to demands from farmers and other stakeholders.

<sup>xxv</sup> At the national level, an SLM coordinator was assigned to oversee implementation of the subcomponent across the participating institutions and work in close collaboration with NARO, the MAAIF departments, and zonal SLM specialists integrated into the zonal R&E liaison offices.

<sup>xxvi</sup> The responsibility for ensuring the development and implementation of the ICT subcomponent was determined to rest with the MAAIF. An ICT specialist was assigned to provide the IT leadership at the MAAIF, with ICT officers to be mainstreamed at NARO Secretariat, the MAAIF, and selected ZARDIs.

<sup>xxvii</sup> Vision 2040.

<sup>xxviii</sup> Under priorities of the plan, NDP - II emphasizes continuity with the ATAAS approach: "In agriculture, emphasis will be placed on investing in 12 enterprises (Cotton, Coffee, Tea, Maize, Rice, Cassava, Beans, Fish, Beef, Milk, Citrus and Bananas), along the value chains. Focus will be on: Strengthening agricultural research; implementing the single spine extension system; technology adaptation at the farm level; increasing access to and effective use of critical farm inputs; promoting sustainable land use and soil management; increasing access to agricultural finance with specific options for women farmers; and strengthening agricultural institutions for effective coordination and service delivery."

<sup>xxix</sup> World Bank. 2016. *Uganda - Country partnership framework for the period FY16-21 (English)*. Washington, D.C.: World Bank Group. Report # 101173

<sup>xxx</sup> Baseline = 600 (PAD). In the borrower's ICR, the baseline value is 690, corresponding to 2013. Using the restructured indicator and values, the performance of 888 generated technological innovations still exceeds the target of 800.

<sup>xxxi</sup> Impact Evaluation (2018).

<sup>xxxii</sup> Borrower's ICR.

<sup>xxxiii</sup> Mid-Term Review, Restructuring Paper, Closing mission ISR.

<sup>xxxiv</sup> Borrower's ICR (2018).

<sup>xxxv</sup> Author's calculation using rural population share and average household size for project beneficiaries.

<sup>xxxvi</sup> Borrower's ICR (2018).

<sup>xxxvii</sup> The commodities covered included (a) crops: apples, banana, beans, cassava, coffee, cowpeas, green gram, groundnuts, maize, potato, rice (upland and lowland varieties), finger millet, simsim, sorghum, soybeans, and sweet potatoes; (b) fish; (c) livestock: cattle, dairy cattle, goats, and poultry; (d) apiary: agro-machinery; (d) forestry: tree technologies; and (e) soil and land management technologies covering various crops and integrated farming system (Borrower's ICR 2018).

<sup>xxxviii</sup> Author's calculation using disaggregated adoption rates and shares of direct beneficiaries from the borrower's ICR (2018).

<sup>xl</sup> Borrower's ICR (2018).

<sup>xli</sup> The provisional baseline values for yields in the PAD were FAOSTAT (2006–2008) averages.

<sup>xlii</sup> The MTR baseline values in the RF at restructuring refer to a 2013 baseline but could not use the UBoS (2013) data as the report was finalized after restructuring. Instead, the ATAAS M&E team used the FAOSTAT 2013 values as baseline for post-restructuring ISRs, which is the data source used in annex 7, table 5.

<sup>xliii</sup> FAOSTAT.

<sup>xliv</sup> NAADS Programme Implementation Progress Survey (2014).

<sup>xliv</sup> LSMS/UNPS Wave V Report (2016).

<sup>xlvi</sup> MAAIF presentations (eighth and ninth implementation support missions).





- <sup>xlvii</sup> Defined as average revenues of the participating households derived from crop and livestock activities net of variable inputs.
- <sup>xlviii</sup> Only monthly cash income is reported by occupation in UNHS 2005–2006. This is annualized by multiplying by 12.
- <sup>xlix</sup> Author’s calculations using raw data.
- <sup>l</sup> Author’s calculation using rural population share and average household size for project beneficiaries.
- <sup>li</sup> “Assessment of Functionality of Farmer Groups in Uganda” (NAADS/ATAAS 2014).
- <sup>lii</sup> Impact Evaluation (2018), Borrower’s ICR (2018).
- <sup>liii</sup> Uganda Cooperative Alliance (2017), Borrower’s ICR (2018).
- <sup>liv</sup> Project Appraisal Document (2010).
- <sup>lv</sup> Impact Evaluation (2018).
- <sup>lvi</sup> Borrower’s ICR (2018), Closing Mission Aide Memoire (June 2018).
- <sup>lvii</sup> Borrower’s ICR (2018).
- <sup>lviii</sup> These parameters draw on the background spreadsheets used to conduct the EFA at appraisal.
- <sup>lix</sup> At appraisal, the NAADS was retained to implement this component.
- <sup>lx</sup> The project environmental impact has been estimated using EX-ACT and accounted for in the calculation of the project economic return. EX-ACT was developed by the Food and Agriculture Organization of the United Nations (FAO) for estimating project impact on GHG emission and carbon sequestration. It allows to assess a project’s net carbon balance, defined as the net balance of CO<sub>2</sub> equivalent GHG emitted or sequestered because of project implementation compared to the without-project scenario. It estimates the carbon stock changes (emissions or sinks), expressed in equivalent tons of CO<sub>2</sub> per hectare and year. Over the analysis period of 20 years, the ATAAS project constitutes a carbon sink of 1,964,831 tCO<sub>2</sub>eq, equivalent to 1.2 tCO<sub>2</sub>eq sequestered per hectare per year.
- <sup>lxi</sup> Their impacts are hardly dissociable.
- <sup>lxii</sup> UBoS Baseline Survey (2015).
- <sup>lxiii</sup> Impact Evaluation (2018).
- <sup>lxiv</sup> *Source:* The Central Bank of Uganda, [https://www.bou.or.ug/bou/collateral/exchange\\_rates.html](https://www.bou.or.ug/bou/collateral/exchange_rates.html).
- <sup>lxv</sup> Results Framework in Impact Evaluation (2018).
- <sup>lxvi</sup> Process Evaluation of ATAAS (October 2017).
- <sup>lxvii</sup> Borrower’s ICR (2018).
- <sup>lxviii</sup> Training areas included e-procurement (36); leadership and change management (25); communication and dissemination of research results (45); data analysis and reporting (22); project M&E (37); managing agricultural research for impact (75); resource mobilization (70); project impact assessment (23); and environmental, gender, and social management systems. (136). *Source:* Borrower’s ICR (2018).
- <sup>lxix</sup> New districts were created after restructuring.
- <sup>lxx</sup> The trainings targeted district production officers (DPOs) and subject matter specialists from 122 districts across the country, production secretaries, farmer leaders, and district production and marketing officers (DPMOs). The trainings courses were on (a) Livestock: Ticks and Tick-borne Diseases Control; Infectious/Zoonotic Diseases/Avian Influenza, and Enhancing Livestock Food Security (Dry Season Feeding) in Ruminants; (b) Crops: Agronomy; Fruit and Vegetable Production for Extension Link Farmers; Handling of Agro-Chemicals and Fertilizer Optimization; (c) Food Processing, Value Addition and Agribusiness: Trainings on Fruit Value Chain and Production Techniques; Post-harvest Handling Technologies; Agribusiness and Commodity Value Chain Development for Crops (Maize, Beans, Coffee, Horticulture, Dairy and Beef); Nutrition and Family Life Education (FLE); Agribusiness Development; (d) SLM: SLM practices; Soil Conservation and Micro Irrigation for Agricultural Extension Officers; Agricultural Risk Management (ARM); (e) Extension: Training in Agricultural Extension Management; Mindset Change in Agricultural Production; Agricultural Statistics.
- <sup>lxxi</sup> Borrower’s ICR (2018).
- <sup>lxxii</sup> FAO Report <http://www.fao.org/news/story/en/item/1142085/icode/>.
- <sup>lxxiii</sup> FAW was first noticed in June 2016 and confirmed in February 2017. In response, the GoU rapidly constituted a national taskforce and ATAAS supported the development of a national FAW Control Strategy and Action Plan. The project also carried out the following studies: Socio-Economic Impact, Distribution and Genetic Diversity, Yield Loss Assessment, Insecticide Screening for Control, Germplasm Evaluation, Exploration of Biological Control, and Capacity Building and Dissemination. Several recommendations have already been implemented to help farmers reduce their losses.
- <sup>lxxiv</sup> Aide Memoire ‘Stocktaking Mission’ (November 2009).
- <sup>lxxv</sup> Aide Memoire ‘Appraisal Mission’ (April 2010).
- <sup>lxxvi</sup> Reported as of May 31, 2018.
- <sup>lxxvii</sup> ISR (November 7, 2014).



<sup>lxxxviii</sup> Borrower's ICR (2018).

<sup>lxxxix</sup> Closing Mission Aide Memoire.

<sup>lxxx</sup> The political scrutiny on NAADS operations increased after Board approval. On July 6, 2010, President Museveni suspended disbursement for NAADS, on account of allegations of corruption by its officials in the 'Prosperity-for-All' program, a commercial agriculture and antipoverty program administered by the agency (New Vision, Uganda).

<sup>lxxxix</sup> (a) Enhancing agricultural production, productivity, and value addition through the provision of agricultural technology and agribusiness advisory services; (b) enhancing strategic commodities productivity through the delivery of technical inputs; and (c) developing and improving markets and commodity value chains focusing on the 12 priority strategic commodities that include beans, cassava, rice, coffee, tea, and dairy.

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