

Document of  
**The World Bank**  
**FOR OFFICIAL USE ONLY**

Report No: ICR00004539

IMPLEMENTATION COMPLETION AND RESULTS REPORT

IDA-46740 AND IDA-53290

ON A

CREDIT

IN THE AMOUNT OF SDR 49.04 MILLION  
(US\$ 69.00 MILLION EQUIVALENT)

AND

TF-10953, TF-11435 AND TF-99108

GRANT

IN THE AMOUNT OF SDR 99.55 MILLION  
(US\$ 71.06 MILLION EQUIVALENT)

TO THE

REPUBLIC OF RWANDA

FOR A

LAND HUSBANDRY, WATER HARVESTING AND HILLSIDE IRRIGATION PROJECT  
(P114931)

DECEMBER 17 , 2018

Agriculture Global Practice  
Africa Region

## CURRENCY EQUIVALENTS

(Exchange Rate Effective June 30, 2018)

Currency Unit = Rwanda Francs (RWF)

---

874 = US\$1

---

US\$ 1.407 = SDR 1

FISCAL YEAR

July 1 - June 30

Regional Vice President: Hafez M. H. Ghanem

Country Director: Carlos Felipe Jaramillo

Senior Global Practice Director: Juergen Voegelé

Practice Manager: Dina Umali-Deininger

Task Team Leader(s): Aimee Marie Ange Mpambara, Winston Dawes

ICR Main Contributor: Irina Schuman

## ABBREVIATIONS AND ACRONYMS

<b>ARAP</b>	Abbreviated Resettlement Action Plan
<b>CAS</b>	Country Assistance Strategy
<b>CFE</b>	Common Framework for Engagement
<b>CIDA</b>	Canadian International Development Agency
<b>CPS</b>	Country Partnership Strategy
<b>DIME</b>	Development Impact Evaluation Unit
<b>EAX</b>	East Africa Commodity Exchange
<b>ECAAT</b>	Eastern and Central Africa Agriculture Transformation Project
<b>EFA</b>	Economic and Financial Analysis
<b>EIRR</b>	Economic Internal Rate of Return
<b>EMP</b>	Environmental Management Plan
<b>ESMF</b>	Environmental and Social Management Framework
<b>FA</b>	Financing Agreement
<b>FIRR</b>	Financial Internal Rate of Return
<b>FM</b>	Financial Management
<b>FRDP</b>	Feeder Roads Development Project
<b>GAFFSP</b>	Global Agriculture and Food Security Program
<b>GDP</b>	Gross Domestic Product
<b>GIS-DIF</b>	Geographic Information System based on a Dynamic Information Framework
<b>GoR</b>	Government of Rwanda
<b>GRC</b>	Grievance Redress Committee
<b>LWH</b>	Land Husbandry, Water Harvesting and Hillside Irrigation
<b>ICR</b>	Implementation Completion and Results Report
<b>IDA</b>	International Development Association
<b>IFC</b>	International Finance Corporation
<b>ISM</b>	Implementation Support Mission
<b>M&amp;E</b>	Monitoring and Evaluation
<b>MINAGRI</b>	Ministry of Agriculture and Animal Resources
<b>MINERENA</b>	Ministry of Environment
<b>NAEB</b>	National Agriculture Export Development Board
<b>NPV</b>	Net Present Value
<b>O&amp;M</b>	Operation and Maintenance
<b>PAD</b>	Project Appraisal Document
<b>PAH</b>	Project Affected Household
<b>PAP</b>	Project Affected Person
<b>PDO</b>	Project Development Objective
<b>PFI</b>	Participating Financial Institutions
<b>PIU</b>	Project Implementation Unit
<b>PMP</b>	Pest Management Plan
<b>PSTA</b>	Strategic Plan for the Transformation of Agriculture
<b>RAB</b>	Rwanda Agriculture and Animal Resources Development Board
<b>RAP</b>	Resettlement Action Plan
<b>RBPM</b>	Result Based Performance Management

<b>RCA</b>	Rwanda Cooperative Agency
<b>RDB</b>	Rwanda Development Board
<b>REMA</b>	Rwanda Environment Management Authority
<b>RGCC</b>	Rwanda Grain and Cereals Corporation
<b>RPF</b>	Resettlement Policy Framework
<b>RSSP</b>	Rural Sector Support Project
<b>RWF</b>	Rwandan Franc
<b>SACCO</b>	Savings and Credit Cooperative
<b>SAIP</b>	Sustainable Agriculture Intensification and Food Security Project
<b>SDR</b>	Special Drawing Rights
<b>SHG</b>	Self-Help Group
<b>SPIU</b>	Single Project Implementation Unit
<b>SSIT</b>	Small-Scale Irrigation Technology Development Program
<b>SWAp</b>	Sector Wide Approach
<b>TTL</b>	Task Team Leader
<b>USAID</b>	United States Agency for International Development
<b>USD</b>	United States Dollar
<b>WUA</b>	Water User Association

## TABLE OF CONTENTS

<b>DATA SHEET .....</b>	<b>ERROR! BOOKMARK NOT DEFINED.</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>9</b>
<b>II. OUTCOME .....</b>	<b>12</b>
<b>A. RELEVANCE OF PDOs .....</b>	<b>12</b>
<b>B. ACHIEVEMENT OF PDOs (EFFICACY) .....</b>	<b>13</b>
<b>C. EFFICIENCY .....</b>	<b>16</b>
<b>D. JUSTIFICATION OF OVERALL OUTCOME RATING .....</b>	<b>17</b>
<b>E. OTHER OUTCOMES AND IMPACTS (IF ANY).....</b>	<b>17</b>
<b>III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME.....</b>	<b>19</b>
<b>A. KEY FACTORS DURING PREPARATION .....</b>	<b>19</b>
<b>B. KEY FACTORS DURING IMPLEMENTATION .....</b>	<b>20</b>
<b>IV. BANK PERFORMANCE, COMPLIANCE ISSUES, AND RISK TO DEVELOPMENT OUTCOME ..</b>	<b>21</b>
<b>A. QUALITY OF MONITORING AND EVALUATION (M&amp;E) .....</b>	<b>21</b>
<b>B. ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE .....</b>	<b>23</b>
<b>C. BANK PERFORMANCE .....</b>	<b>25</b>
<b>D. RISK TO DEVELOPMENT OUTCOME .....</b>	<b>26</b>
<b>V. LESSONS AND RECOMMENDATIONS .....</b>	<b>27</b>
<b>ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS.....</b>	<b>29</b>
<b>ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION .....</b>	<b>38</b>
<b>ANNEX 3. PROJECT COST BY COMPONENT .....</b>	<b>41</b>
<b>ANNEX 4. EFFICIENCY ANALYSIS.....</b>	<b>42</b>
<b>ANNEX 5. BORROWER, CO-FINANCIER AND OTHER PARTNER/STAKEHOLDER COMMENTS ...</b>	<b>49</b>
<b>ANNEX 6. BORROWER’S IMPLEMENTATION COMPLETION REPORT – A SELECTION OF SUCCESS STORIES.....</b>	<b>50</b>
<b>ANNEX 7. THE PROJECT IN PICTURES.....</b>	<b>53</b>
<b>ANNEX 8. SUPPORTING DOCUMENTS .....</b>	<b>57</b>



**DATA SHEET**

**BASIC INFORMATION**

**Product Information**

Project ID	Project Name
P114931	Land Husbandry, Water Harvesting and Hillside Irrigation
Country	Financing Instrument
Rwanda	Investment Project Financing
Original EA Category	Revised EA Category
Partial Assessment (B)	Partial Assessment (B)

**Related Projects**

Relationship	Project	Approval	Product Line
Supplement	P124785-Rwanda Land, husbandry water harvesting and hillside irrigation	09-Apr-2011	Recipient Executed Activities
Additional Financing	P147543-Land Husbandry, Water Harvesting and Hillside Irrigation AF	19-Dec-2013	IBRD/IDA

**Organizations**

Borrower	Implementing Agency
Republic of Rwanda/ Ministry of Finance and Economic Planning	RAB LWH/RSSP SPIU, Rwanda Agriculture and Animal Resources Development Board

**Project Development Objective (PDO)**

## Original PDO

The Project Development Objective (PDO) is to increase the productivity and commercialization of hillside agriculture in target areas.

**FINANCING**

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
<b>World Bank Financing</b>			
IDA-46740	34,000,000	34,000,000	31,907,491
TF-11435	7,800,000	7,800,000	7,800,000
TF-10953	13,265,000	13,265,000	13,265,000
IDA-53600	35,000,000	35,000,000	32,311,971
<b>Total</b>	<b>90,065,000</b>	<b>90,065,000</b>	<b>85,284,462</b>
<b>Non-World Bank Financing</b>			
Borrower/Recipient	23,030,000	0	0
Local Communities	7,600,000	0	0
<b>Total</b>	<b>30,630,000</b>	<b>0</b>	<b>0</b>
<b>Total Project Cost</b>	<b>120,695,000</b>	<b>90,065,000</b>	<b>85,284,462</b>

**KEY DATES**

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
22-Dec-2009	02-Jun-2010	31-Jan-2013	30-Jun-2014	29-Jun-2018
09-Apr-2011	15-Jun-2011		31-Dec-2015	31-Dec-2015



**RESTRUCTURING AND/OR ADDITIONAL FINANCING**

Date(s)	Amount Disbursed (US\$M)	Key Revisions
08-Nov-2013	19.65	Change in Results Framework Reallocation between Disbursement Categories Change in Safeguard Policies Triggered Change in Procurement
29-Oct-2015	30.00	Reallocation between Disbursement Categories
01-Jun-2017	47.71	Change in Loan Closing Date(s) Change in Financing Plan Reallocation between Disbursement Categories Change in Implementation Schedule
30-Nov-2017	54.63	Change in Implementing Agency

**KEY RATINGS**

Outcome	Bank Performance	M&E Quality
Satisfactory	Satisfactory	Substantial

**RATINGS OF PROJECT PERFORMANCE IN ISRs**

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	24-Jun-2010	Satisfactory	Satisfactory	.72
02	08-Jan-2011	Satisfactory	Satisfactory	2.42
03	10-Aug-2011	Satisfactory	Moderately Satisfactory	5.33
04	13-Mar-2012	Satisfactory	Satisfactory	7.02
05	10-Nov-2012	Satisfactory	Satisfactory	10.36
06	09-Jul-2013	Satisfactory	Satisfactory	17.42
07	05-Jan-2014	Satisfactory	Satisfactory	24.94
08	04-Aug-2014	Satisfactory	Satisfactory	33.69
09	30-Jan-2015	Satisfactory	Satisfactory	43.41
10	27-Jun-2015	Satisfactory	Satisfactory	46.52
11	10-Feb-2016	Satisfactory	Satisfactory	51.07





12	28-Sep-2016	Satisfactory	Satisfactory	58.98
13	13-Apr-2017	Satisfactory	Satisfactory	66.42
14	22-Oct-2017	Satisfactory	Satisfactory	74.42
15	30-Apr-2018	Satisfactory	Satisfactory	83.94
16	29-Jun-2018	Satisfactory	Satisfactory	85.28

## SECTORS AND THEMES

### Sectors

Major Sector/Sector (%)

**Agriculture, Fishing and Forestry 75**

Agricultural Extension, Research, and Other Support Activities 8

Irrigation and Drainage 44

Public Administration - Agriculture, Fishing & Forestry 11

Other Agriculture, Fishing and Forestry 12

**Industry, Trade and Services 25**

Agricultural markets, commercialization and agri-business 25

### Themes

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

**Finance 0**

Finance for Development 6

Agriculture Finance 6

**Urban and Rural Development 0**

Rural Development 86

Rural Markets 21

Rural Infrastructure and service delivery 60

Land Administration and Management 5



<b>Environment and Natural Resource Management</b>	<b>0</b>
Renewable Natural Resources Asset Management	10
Biodiversity	5
Landscape Management	5

**ADM STAFF**

<b>Role</b>	<b>At Approval</b>	<b>At ICR</b>
Regional Vice President:	Obiageli Katryn Ezekwesili	Hafez M. H. Ghanem
Country Director:	Johannes C.M. Zutt	Carlos Felipe Jaramillo
Senior Global Practice Director:	Inger Andersen	Juergen Voegele
Practice Manager:	Karen Mcconnell Brooks	Dina Umali-Deiningger
Task Team Leader(s):	Loraine Ronchi	Aimee Marie Ange Mpambara, Winston Dawes
ICR Contributing Author:		Irina Schuman



## I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

### A. CONTEXT AT APPRAISAL

#### Context

1. At appraisal, Rwanda had been on a strong path of economic growth and poverty reduction. The country's post-conflict reconstruction efforts have resulted in impressive economic performance, with GDP growing at 8.3 percent annually between 2000 and 2009, in real terms. The poverty headcount ratio, by the national poverty line, dropped from 58.9 percent in 2000-01 to 56.7 percent in 2005-06 and further down to 44.9 percent in 2010-11<sup>1</sup>. But the growth rates had been showing signs of slowdown, and the economy needed a new impetus.
2. Agriculture had been a fundamental driver of earlier progress but would have to modernize going forward. Agriculture value added had grown at 5.5 percent annually since 2000; in 2009, the farming sector represented 30 percent of the country's economy, about half of its export revenues (food exports included), and 81 percent of its employment. Poverty was mainly rural (at 67 percent) and tied to subsistence farming, but the modernization of the agriculture sector had the greatest potential of lifting people out of poverty and promoting growth<sup>2</sup>. Still, food insecurity remained significant; in 2006, 52 percent of the households were food insecure or vulnerable, with higher concentrations in the Western and Southern provinces. As it transitioned from reconstruction to development, the Government stressed that agriculture should continue to play a leading role in the country's development, but it would have to modernize. Rwanda's long-term vision, articulated in the country's Vision 2020 document, was to become a middle-income country by the year 2020. Agriculture, a fundamental pillar of this vision, would have to transform from a subsistence system to a market-oriented one, with the help of sector policies that would promote intensification, productivity increases, and value addition.
3. The Strategic Plan for the Transformation of Agriculture in Rwanda, Phase II (PSTA II), covering 2009-12, provided further details. As such, it outlined key shortcomings of the farming sector. Soil degradation, in a context of demographic pressure, land scarcity, and lack of proper land husbandry (particularly in the hillsides, where 90 percent of the land is to be found), has been a key reason for the farmers' low yields. Poor levels of input use, mainly water, seeds and fertilizers, were also undermining productivity. Together with weak market linkages, poor skills and knowledge, and limited access to financing, they would curtail farmers' ability to secure marketable surpluses or switch to higher value crops. To address these multiple challenges, PSTA II laid out a comprehensive agenda for action, resting on four interrelated programs. These were: (i) intensification and development of sustainable production systems; (ii) professionalization of producers; (iii) commodity chains and agribusiness development, and (iv) institutional development. PSTA II was implemented using a Sector Wide Approach (SWAp), involving coordination of development partners around a country-owned program.
4. The Land Husbandry, Water Harvesting and Hillside Irrigation Project (hereafter referred to as the Project) came out of the PSTA II process and was well aligned with the Strategic Plan. The Ministry of Agriculture and

---

<sup>1</sup> According to Rwanda's Integrated Household Living Conditions Survey, EICV4 (2013/14) available on <http://www.statistics.gov.rw/publication/rwanda-poverty-profile-report-results-eicv-4>

<sup>2</sup> World Bank 2007 *Promoting Pro-Poor Agricultural Growth in Rwanda: Challenges and Opportunities*. Agricultural Policy Note (IBRD: Washington DC).



Animal Resources (MINAGRI) developed a nation-wide land husbandry, water harvesting and hillside irrigation (LWH) program, and presented it to its development partners in March 2008. The Government LWH program aimed to operationalize the first component of PSTA II, and foresaw the development of 101 pilot watersheds, covering 30,250 ha of land. The World Bank Project originally committed to financing some of these; other development partners, such as USAID or CIDA, were also expected to contribute as part of the SWAp.

5. This World Bank commitment was fully aligned with its Country Assistance Strategy (CAS) for Rwanda for FY09-12 and designed to contribute to its Outcome 1.1.: sustainably raising agricultural production, particularly of food crops. The CAS was framed around two strategic themes: (i) promote economic transformation and growth, and (ii) reduce social vulnerability. Agriculture production, with an emphasis on sustainable approaches, was one of the four components of the CAS's first strategic theme. To achieve greater impact, the CAS foresaw that interventions to increase commercialization of agriculture should complement support to agricultural production. The Project design, with its double focus on increasing productivity and commercialization of hillside agriculture, while promoting sustainable land husbandry practices, was well suited to respond to these CAS objectives.

### **Theory of Change (Results Chain)**

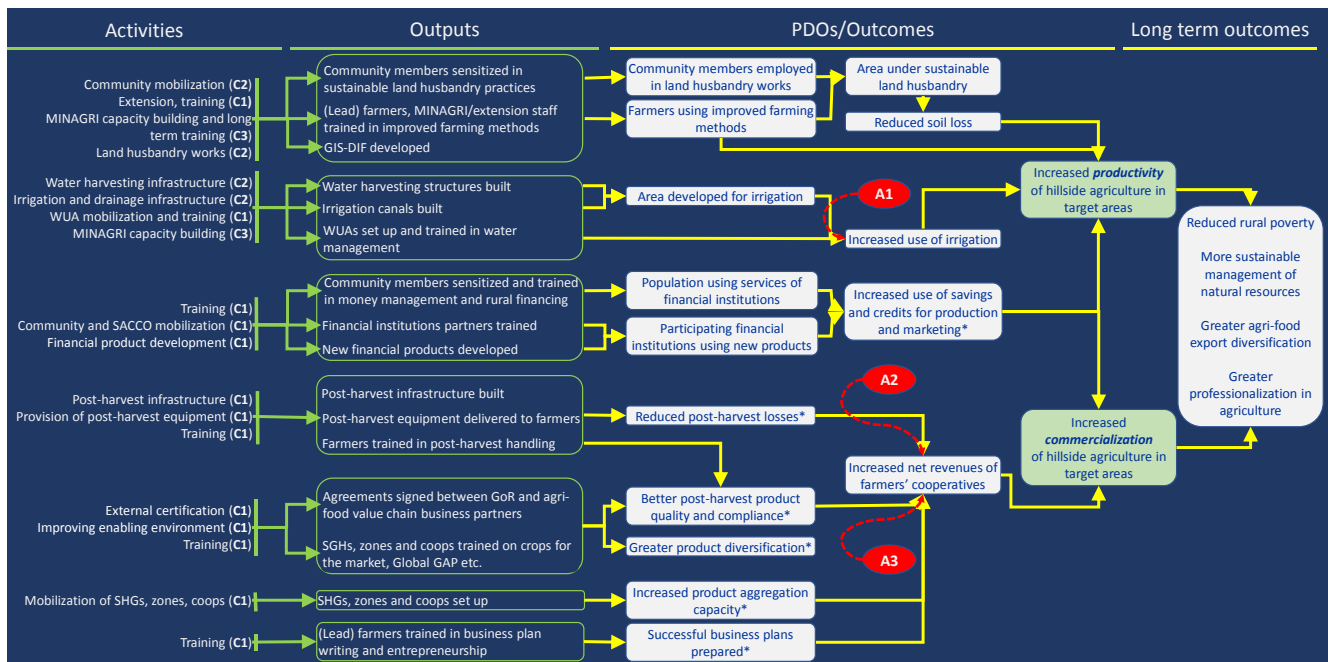
6. The Project embarked on achieving two outcomes: increasing productivity and increasing commercialization of hillside agriculture in target areas. These would jointly contribute to longer-term outcomes, such as reduced rural poverty, sustainable environmental management, export diversification and professionalization of agriculture. By targeting farmers engaged in traditional subsistence farming and helping them become commercially-oriented, the Project had the ambition of succeeding at not "taking people out of poverty but the poverty out of people"<sup>3</sup>.

7. The Project Appraisal Document (PAD) laid out a clear and concise results chain, and coherently identified and addressed several critical assumptions for achieving the desired outcomes. A schematic representation of the Theory of Change for the Project follows below.

8. The achievement of the Project development objectives rested on critical assumptions (A1, A2 and A3 in the chart below), which were captured in the PAD. A1 pertained to increasing productivity in *irrigated* areas and implied that water user associations (WUAs) became sustainable, and farmers gained proper knowledge about irrigation methods and watering techniques. As such, the Project focused greatly on mobilizing and training WUAs. A2 and A3 pertained to increasing commercialization in the Project area. A2 posited that the Project should focus on commodities that have solvent markets and can access the needed infrastructure (roads and electricity) to reach consumers. For this, the Project design had a strong market-focus in its commodity-targeting and relied on a dedicated horticultural market study, marrying an assessment of agronomic and market potentials. For each site, eligible crops were then selected in a participatory fashion, using a set of pre-defined filters and relying on market intelligence collected from a variety of sources. The Project coordinated with the Rwanda Feeder Roads Development Project (FRDP, P126498), mainly on the selection of project sites. Finally, A3 implied that, to achieve increased commercialization, linkages between farmers and downstream value chain actors had to be effectively established. To this end, the Project capitalized on successes in other countries and included activities to foster contractual linkages between entrepreneurs and smallholders, such as mobilization of farmers' organizations, development entrepreneurs' associations and active facilitation during implementation.

---

<sup>3</sup> Aide-Memoire for Joint July 2012 Implementation Support Mission Land Husbandry, Water Harvesting and Hillside Irrigation Project and Third Rural Sector Support Program, 16-27 July 2012



Note: Boxes marked with \* indicate intermediate outcomes implied in the PAD narrative but not tracked through specific indicators

### Project Development Objectives (PDOs)

9. As stated in the Financing Agreement (FA) and in line with the PAD, the development objective of the project was to increase the productivity and commercialization of hillside agriculture in target areas in Rwanda’s territory.

### Key Expected Outcomes and Outcome Indicators

10. Project performance was assessed against two outcomes, measured by three outcome indicators:

- **Objective 1: Increase productivity of hillside agriculture in target areas**, measured by two indicators, namely productivity of targeted irrigated command area (dollars/ha), and productivity of targeted non-irrigated hillsides (dollars/ha). Both productivity indicators are showing the change in the value of crop production per unit of land, while differentiating between irrigated and rainfed project areas;
- **Objective 2: Increase commercialization of hillside agriculture in target areas**, measured by the share of commercialized crops from target areas (percentage) in the total crop production.

11. Expressed in economic terms, these indicators allowed comparison and aggregation across diverse multi-crop production and marketing systems, as well as the factoring in of any changes in crop production and marketing patterns during project implementation. All three indicators were measured using periodic surveys and cooperative reports, while also drawing on the MINAGRI’s market information system (for local prices).

### Components

12. Component A - Capacity Development and Institutional Strengthening for Hillside Intensification (Appraisal: US\$ 12.12 million; closing: US\$ 19.47 million<sup>4</sup>): Component A aimed at developing the capacity of individuals and

<sup>4</sup> Exclusive of Government contribution



institutions for improved hillside land husbandry, stronger agricultural value chains and expanded access to finance. Overall, it financed the “soft” investments of the Project. It had four sub-components, namely: A1 Strengthening Farmer Organizations; A2 Extension; A3 Marketing and Finance; and A4 Capacity Development and Institutional Strengthening: MINAGRI and its Agencies. Activities financed under this component covered: setting up and building the organizational capacity of farmers’ organizations (through community mobilization, training etc.) but also building MINAGRI’s capacity to conduct such campaigns; mobility, training, and community outreach for the Rwandan extension services (particularly for services pertaining to horticulture crops); building post-harvest infrastructure (such as storage facilities, pack-houses, cold chain facilities); technical assistance for improving product quality and phytosanitary conditions, including support for strengthening the associated regulatory framework and its implementation; development of tailored rural finance products as well as mobilization, training and sensitization to strengthen farmers’ saving capacity and use financial services; and establishing the use of and capacity for a GIS based dynamic information framework, as a decision support system responsive to climate, climate change and proposed water, land and crop uses under the Project.

13. Component B - Infrastructure for Hillside Intensification (Appraisal: US\$ 18.46 million; closing: US\$ 102.09 million<sup>5</sup>): Component B contributed to the overall objectives of the Project by financing its “hard” investments, in complementarity with Component A. It had three sub-components, namely: B1 Land Husbandry Infrastructure; B2 Water Harvesting Infrastructure; and B3 Irrigation Infrastructure. Activities financed under this component covered: soil conservation measures and infrastructure, appropriate to differing slope categories (e.g. contour bunding, green manuring, progressive and radical terracing); building infrastructure for downstream reservoir protection (e.g. silt trap zones, fencing, planting perennials); developing water harvesting infrastructure (e.g. valley dams and reservoirs); and developing water conveyance structures for hillside irrigation, accompanied by setting up water user associations and the needed studies, consultations, capacity building, etc.

14. Component C - Implementation through the Ministerial SWAp Structure (Appraisal: US\$ 3.42 million; closing: US\$ 3.72 million<sup>6</sup>): Component C aimed at ensuring that Project activities were effectively managed within the new SWAp structure for Ministerial implementation of programs and projects at MINAGRI. The Ministry was reorganized shortly before the Project appraisal, both as part of a Government-wide rationalization, and to facilitate the implementation of the agriculture sector’s programs under a SWAp structure. Activities financed under this component covered: technical assistance, training workshops, surveys and studies, as well as equipment (e.g. vehicles), meant to assist MINAGRI with the implementation of the new SWAp structure; in this context, attention was given to strengthening their monitoring and evaluation and management information systems. Finally, this component also financed, for a limited amount of time, personnel costs related to the implementation of the Government’s LWH activities.

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

### **Revised PDOs and Outcome Targets**

15. The PDO has not changed during project implementation. The corresponding outcome targets were revised upwards several times during the project life, as a reflection of strong project performance, allocation of additional financial resources, and extension of project closing dates. At the same time, the baseline values for two PDO

---

<sup>5</sup> Exclusive of Government contribution

<sup>6</sup> Exclusive of Government contribution



indicators (i.e. productivity of irrigated command areas and productivity of non-irrigated hillsides) were revisited downward in 2013 (see paragraph 28).

### **Revised PDO Indicators**

16. The three original PDO indicators remained by-and-large unchanged, though with some minor course corrections to their definitions<sup>7</sup>. The number of direct project beneficiaries, originally an intermediary result indicator, was elevated to a PDO indicator in 2011, to follow the evolving World Bank guidelines.

### **Revised Components**

17. There were no changes to the design of Project components during implementation; scaling-up, extensions and budget reallocations are discussed in the following section. However, within the original components, there were some adaptations to the scope of certain Project activities.

18. The portfolio of Component A activities diversified over the course of Project implementation. For instance, after securing additional funds from the Global Agriculture and Food Security Program (GAFSP) in 2011, the Project mainstreamed nutrition in the project areas through: (i) nutrition awareness and behavioral change training; (ii) promotion of kitchen gardens; and (iii) introduction of bio-fortified crops (i.e. iron fortified beans).

19. Component B activities underwent a paradigm shift following the Project midterm review. At appraisal, the Project was designed to follow an integrated approach for its land husbandry (L), water harvesting (W) and hillside irrigation (H) dimensions, which should have been applied jointly at each project site. However, the first three years of implementation have shown that this was not always feasible; for instance, irrigation did not always make sense in some hilly and wet areas, though land husbandry alone could still have made a major difference. Consequently, the Project switched to an adaptive approach, depending on the specific watershed characteristics, with W and H infrastructure implemented where it made economic sense. At the same time, given the remoteness of some of the LWH sites, the Project quickly recognized, as early as in 2010, that building access roads to these sites was a necessity; these were subsequently included in the land husbandry contracts for some of the sites.

### **Other Changes**

20. Between 2011 and 2013, the Project secured another US\$ 106.07 million, adding to its original IDA allocation of \$34 million; its total net commitments rose to US\$ 140.07 million (exclusive of counterpart financing). The extra funds came from IDA additional financing (US\$ 35 million, effective March 2014), GAFSP (US\$ 50 million, effective June 2011)<sup>8</sup>, USAID (US\$ 13.27 million, effective May 2012), and CIDA (US\$ 7.8 million, effective May 2012).

21. The Project was restructured in 2011, 2013, 2015, and 2017. The 2011 Project restructuring was triggered by the addition of the GAFSP contribution. It involved an update of the disbursement profiles, minor reallocations between disbursement categories, an upward revision of project targets, commensurate with the increased funds, and an extension of the project closing date from June 30, 2014 to December 31, 2015. This restructuring was key for setting up a basket funding approach, based on a pooled designated account from which all LWH program

---

<sup>7</sup> For instance, the productivity of non-irrigated areas was erroneously assessed against “non-irrigated command areas” at appraisal, but this was promptly amended to “non-irrigated hillside”, expressed as catchment area, after the project became effective.

<sup>8</sup> Due to a glitch in the Bank’s Operations Portal, the GAFSP amount cannot be captured in the Data Sheet at the time of the submission of this ICRR.





activities would be funded by each source in proportion to their contribution to the pooled account. It also captured the expected contributions from USAID and CIDA, which materialized in the following year.

22. The 2013 restructuring was approved in November of that year, following the Project mid-term review conducted in January, and the processing of the IDA additional financing. The mid-term review confirmed the soundness of the project design and recommended only light changes. Most significantly, the restructuring involved a US\$ 13.53 million budget reallocation from Components A and C to Component B (see paragraph 29). Baseline values for two PDO indicators (i.e. productivity of irrigated command areas and productivity of non-irrigated hillsides) and for one Component B indicator (i.e. land protected against soil erosion in project area) were revisited downward (see paragraph 28), while targets for most indicators were revisited upward. New indicators were introduced, to measure the social and nutritional outcomes of the Project. Definitions of some of the indicators were refined or revisited, e.g. measurement of sediment yield rather than soil loss, or consideration of net, rather than gross revenues, to measure cooperatives' progress. The Project closing date was extended again, this time through June 30, 2017, to account for an expanded program.

23. The 2015 restructuring affected only a reallocation between disbursement categories, without implications on the project performance. Finally, the 2017 restructuring involved a last extension of the Project closing date, through June 30, 2018 (see paragraph 27).

24. There were two changes in the implementation arrangements: (i) the gradual merger of the LWH and the Rural Sector Support Project (RSSP) implementation units, completed in 2012, and (ii) the transfer of the resulting SPIU from MINAGRI to the Rwanda Agriculture and Animal Resources Development Board (RAB) that happened in early 2018.

25. The LWH IDA contributions (original allocation and additional financing) were denominated in Special Drawing Rights (SDR). LWH faced a US\$ 8 million financing gap, due to SDR to USD exchange rate movements. The Government of Rwanda agreed to close this gap from its own resources, thus raising the counterpart financing to a new total of US\$ 15.33 million. This was largely focused on post-harvest infrastructure and support to operationalization of new irrigated hillside schemes during the last year of Project implementation.

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

26. Neither of the changes outlined above altered the original PDO or the Project components. Following the GAFSP financing (2011) and the mid-term review (2013), a nutrition and food security dimension was mainstreamed into the original Theory of Change. Improved nutrition and food security became additional longer-term outcomes, stemming, indirectly, from all the original Project activities leading to higher productivity and commercialization of agricultural produce, and directly, from a few new activities focused on improving food consumption at household level<sup>9</sup>. Such new activities included development of kitchen gardens, campaigns to raise nutritional awareness etc., but remained relatively modest in the overall resource allocation at Project level.

27. In fact, the midterm review and the several restructuring papers reaffirmed the soundness of the original Theory of Change and of the resulting Project design. This was further reinforced by the demonstrated pull-factor the Project exerted in further catalyzing other development partners' efforts and resources. Mobilizing additional

---

<sup>9</sup> Improving food consumption at household level became a new intermediate result indicator, introduced in the Project results table in 2013.





resources, which helped expand the geographic scope of Project activities, justified the first two extensions, while the third extension was necessary to allow the completion of critical infrastructure work under the Muyanza and Rwamagana-34 schemes. These, together with a strong project performance that exceeded many of its intermediary mileposts, called for well-justified upward adjustments in several of its targets.

28. In turn, the downward revision of the baseline values for three indicators was because, at appraisal, these values were only available as averages on national level; however, they were replaced by the more appropriate project site-specific measurements taken after appraisal.

29. An underrun of Component A and C costs, due to local providers taking up the delivery of technical assistance and training originally budgeted for international consultants, made possible the budgetary reallocations of 2013. The savings were used to cover the additional costs incurred under Component B (mainly subcomponents B2 and B3), due to: (i) low domestic capacity and competition; (ii) limited interest shown by international companies; and (iii) higher than expected material costs (e.g. fuel, equipment).

30. The integration of the LWH/RSSP3 SPIU was driven by a logic of efficacy and alignment with the PSTAs. The transfer of SPIU oversight from MINAGRI to RAB was motivated by a broader government administration restructuring logic, whereby ministries would focus on policy-making function, while executing agencies (such as RAB) are tasked with policy and projects implementation.

## II. OUTCOME

### A. RELEVANCE OF PDOs

#### **Assessment of Relevance of PDOs and Rating (Rating: High)**

31. The Project continued to be consistent with and relevant for the Government vision and strategy at its closing. Vision 2050 now captures the new long-term aspirations for the country and is about ensuring high standard of living for all Rwandans and attaining upper middle-income country status by 2035 and high-income status by 2050. The National Strategy for Transformation 2017-24 lays out the economic, social and governance pillars that would support achieving Vision 2050; increasing agriculture quality, productivity and production, as well as sustainably exploiting natural resources remain key objectives of the economic transformation, to which the Project activities contributed directly. The Project closing in June 2018 coincided with the transition of the sector strategy from PSTA III to PSTA IV. PSTA III, covering 2014-17, remained consistent in its focus on the transition from a subsistence to a market-oriented and value creating sector, and on rapid growth in agriculture production and commercialization that would boost rural incomes and reduce poverty. The new PSTA continues and accelerates changes begun under PSTA III to enhance productivity and profitability and encourage private investment. The Project Theory of Change continued to be strongly aligned with these strategic government objectives.

32. Moreover, positive experiences from Project implementation were scaled up through the next generations of the agriculture strategy. The participatory bottom up approach of farmers' groups formation along with the dedicated capacity building efforts laid out the basis for the nation-wide adoption of *Twigire Muhinzi*, a



homegrown extension model for crop farmers<sup>10</sup>. Land husbandry technologies continued to be expanded under the successive agricultural strategies, while many lessons learned through the Project were internalized. Rwanda is planning to establish a regional center of leadership in land husbandry under the Bank-funded Eastern and Central Africa Agriculture Transformation Project (ECAAT, P162416).

33.The Project’s Theory of Change remained highly relevant for the World Bank engagement in Rwanda’s agriculture at closing. The Country Partnership Strategy (CPS), FY14-18, rested on three themes<sup>11</sup>, and agriculture was a key focus sector under the second theme. The CPS was explicit in stating that intensifying agricultural productivity would remain central in the IDA program, and that investments would equally facilitate transition to more commercial farming practices. These were, in fact, the twin development objectives of the Project, to which it contributed through promoting better management of natural resources, strengthening agri-food value chains, and improving farmers’ practices, knowledge and skills. At the same time, the CPF channeled IFC focus towards improving advisory services on horticulture in Rwanda and agri-business investments, thus complementing and reinforcing the effects of Project interventions. The Project itself contributed directly and substantially to three of the CPS outcomes under Theme 2: (i) improved agriculture productivity and sustainability; (ii) improved access of rural/small farmers to inputs, financing and markets; and (iii) improved agriculture value chains/linkages. Through its investments in feeder roads, the Project also contributed towards a fourth CPS outcome, i.e. improved rural roads conditions and connectivity to market centers.

## B. ACHIEVEMENT OF PDOs (EFFICACY)

### Assessment of Achievement of Each Objective/Outcome (Rating: Substantial)

34.The Project fully achieved its development objectives of increasing productivity and commercialization of hillside agriculture in its target areas; all four PDO indicators exceeded their targets (see Table 1), even after factoring in the several upward revisions of the target values.

Table 1: Summary of the main Project results (PDO level indicators)

PDO indicator	Unit of measure	Baseline	Target	End-of-project value	End-of-project value increase relative to target (% or p.p.)
Agricultural productivity in non-irrigated areas	US\$/ha	469	2,500	3,471	39%
Agricultural productivity in irrigated areas	US\$/ha	492	2,800	5,639	101%
Commercialization of crop production <sup>12</sup>	%	35	70	80.6	10.6 p.p.
Direct beneficiaries	number	-	120,000	310,058	158%

35.Agricultural productivity in non-irrigated areas increased thanks to improvements in soil quality (through delivering land husbandry techniques), improvements in soil fertility (through complementary technology such as

<sup>10</sup> This extension model combines the Farmer Field School and Farmer Promoter approaches, while also relying on the involvement of agriculture committees at all levels (village, cell, sector, district and MINAGRI/RAB). One of its central features is farmer-to-farmer extension, relying on trained lead farmers to serve as extension agents within their communities.

<sup>11</sup> Theme 1: Accelerating economic growth, Theme 2: Improving the productivity and incomes of the poor through rural development and social protection, and Theme 3: Accountable governance

<sup>12</sup> This indicator is measured as total crops sold over total amount of crops produced



use of improved seeds and composting), as well as increases in farmers' capacity and knowledge. Sediment load dropped in the Project area<sup>13</sup> from 54 tons/ha annually in 2011 to 2.6 tons/ha annually in 2016. This was due to radical terraces developed on 18,383 ha, other soil conservation measures applied on another 3,265 ha, and 58,855 farmers (44.4 percent of which women) trained. Relevant literature<sup>14</sup> shows that radical terraces can directly lead to various environmental benefits and dramatic yield increases, as they help minimize soil and nutrient loss and improve water conservation. Indeed, between 2009 and 2018 (Season A<sup>15</sup>), crop yields have increased greatly in the Project area, e.g.: 2.6 times for maize, to reach 4 tons/ha, 3.8 times for climbing beans, to reach 3 tons/ha, 7.5 times for wheat, to reach 3 tons/ha and 8.3 times for Irish potatoes, to reach 25 tons/ha. National averages between 2009 and 2016, all seasons combined, remained at about 2 tons/ha for both maize and wheat, and 11.5 tons/ha for Irish potatoes. See Box 1 and Annex 6 for beneficiary testimonies.

**Box 1: Beneficiary testimony - Mr. Theoneste Nizeyimana**

Productivity gains transformed many beneficiaries' lives. Mr. Theoneste Nizeyimana is one of these beneficiaries. Before the Project, he was harvesting 1 ton of onions off one hectare of land; now, he can collect 7-10 tons. "I thank LWH for transforming my life and shaping my future. I am so happy because the project taught me better farming practices which increased my yields (...). My family's living condition has greatly improved; my children are in school, and now I can hope for a better future".

Source: MINAGRI

36. Land husbandry works, together with the extensive community mobilization and farmer organization efforts, kick-started sustainable and inter-linked virtuous cycles, leading to better on- and off-farm incomes (see *video* and Annex 6). Farmers organized in 3,270 self-help groups (SHGs) and 200 zones engaged in voluntary land consolidation, triggering economies of scale in production and increased market transactions. Farmers' earnings from their employment in terracing work were delivered through bank accounts, often opened for the purpose (56,880 farmers, of which 41 percent women, opened Bank accounts under the Project); together with sensitization on financial savings and the development of 40 farmer-led Savings and Credit Cooperatives (SACCOs), these helped improve financial literacy and credit access among project beneficiaries; 92 percent of men and 89 percent of women had access to formal financial services at Project closing. Compost-making, originally linked to soil restoration efforts in terraces, proved a profitable off-farm income generating activity, some of which is now being financed through credit systems developed with Project assistance. With higher incomes, several farmers purchased livestock, thus diversifying their assets, incomes and/or nutrition; livestock also benefited from improved fodder varieties introduced through the project and contributed manure into composting.

37. *Agricultural productivity in irrigated areas* started being recorded in the Results Framework mid-2014, after the completion of the first irrigation schemes financed by the Project. Besides the general factors explaining productivity gains in the non-irrigated Project areas, there are some specific to the areas that received irrigation: (i) irrigation allowed beneficiary farmers to gain one growing season per year (Season C), and reclaim Season B in

<sup>13</sup> The measurements refer to only a subset of the Project sites, observed between 2011 (when the baseline was established) and 2016.

<sup>14</sup> See Wei, W. et al.: *Global synthesis of the classifications, distributions, benefits and issues of terracing*; Earth-Science Reviews 159 (2016) 388–403 ([https://www.srs.fs.usda.gov/pubs/ja/2016/ja\\_2016\\_sun\\_010.pdf](https://www.srs.fs.usda.gov/pubs/ja/2016/ja_2016_sun_010.pdf)) for a literature overview.

<sup>15</sup> There are three agricultural seasons in Rwanda: season A (October to January), season B (February to May), and season C (June to September).



years when precipitation was insufficient; (ii) it encouraged farmers to switch to high value even if water-thirsty crops (e.g. horticulture); and (iii) it also allowed farmers to cash in on the higher off-season market prices.

38. The Project developed 2,555 ha of land for irrigation<sup>16</sup>, thus making water available to 8,671 farmers (of which 48 percent women), organized in 7 water user associations (WUAs). However, the construction work at Muyanza, the largest site, with a gross command area of 1,100 ha, was completed in June 2018; that means that its impacts will only start kicking in after 2018 Season C and were not captured at the time when the ICR was prepared. Finalization of the Rwamagana site in early 2018 led to results manifesting at the tail end of the Project life and likely continuing to unfold past its completion; this did not prevent the Project from fully achieving its targets. Community mobilization and capacity building (859 WUA members trained) were critical for instilling changes in practices and behaviors that would result in better water access and higher returns on the land.

39. *Commercialization of crop production in target areas* increased, allowing project beneficiaries to break away from traditional subsistence agriculture (see Box 2 and Annex 6). As shown, productivity gains and switch to higher-value crops allowed farmers to gain a marketable surplus, but it took holistic value chain interventions to bring the produce to the market. Project investments in post-harvest facilities<sup>17</sup> made 46,630 tons of post-harvest handling capacity available to farmers; this infrastructure facilitated product aggregation and quality preservation or enhancement, which likely led to reduced post-harvest losses<sup>18</sup>, and to increased marketability. Farmers' cooperatives set up through the Project sold produce through these post-harvest facilities, and 20 cooperatives out of 27 saw their net revenues increase by more than 50 percent relative to baseline. Building farmers' business and financial skills also contributed to increased sales, and 6,293 men and 5,148 women received specialized training.

**Box 2: Beneficiary testimony - Ms. Alphonsine Nyirabarera**

“Our land was unproductive and barren; we only survived on maize and wheat because that is where we managed to get yields. But after the transformation of our land by LWH, we immediately cultivated Irish potatoes and the harvest was amazing (...). I used to harvest 100 kilograms of Irish potatoes, which did not satisfy my family. Life was very challenging at the time because I had no income to sustain my family. After harvesting 3 tons of Irish potatoes, I sold part of the produce and got money to buy new clothes for my family, fertilizers and three sheep”.

Source: MINAGRI

40. Equally important, the Project successfully fostered linkages<sup>19</sup> between organized smallholders, traders and exporters, such as East Africa Commodity Exchange (EAX), Rwanda Grain and Cereals Corporation (RGCC), Nature Fresh Fruit and others; availability of post-harvest and irrigation infrastructure were notable catalysts of agribusiness presence. The downstream value chain partners reportedly supported smallholders through provision of knowledge (e.g. correct pesticide application), financing or technology. At the same time, through its post-harvest interventions, the Project helped control product quality (e.g. moisture level and aflatoxin contamination in maize). The Kigali packhouse, built with Project support and the only packhouse in Rwanda, was instrumental for

<sup>16</sup> These were distributed across seven sites throughout the country: Karongi-12, Karongi-13, Nyanza-23, Kayonza-4, Rwamagana-34, Gatisbo-8, and Muyanza; dams were developed on four of these sites, namely Nyanza-23, Kayonza-4, Rwamagana-34, and Muyanza, while the other sites relied on diversion weirs.

<sup>17</sup> 42 storage centers, 45 drying shelters, 4 banana collection centers, 10 horticulture collection centers with charcoal and 10 collection centers with cold chain

<sup>18</sup> The Project did not track post-harvest losses as such.

<sup>19</sup> Some of these were actual private-public partnerships. For instance, warehouses are government-owned, but EAX is managing them and successfully linking up with local farmers.



linking horticulture producers to export markets, with a focus on the European market. The facility allows for the sorting, washing, grading and packing of vegetables before their shipment, and is in the process of receiving certification through follow-on Government action. Despite these achievements, there were some deficiencies, such as incomplete post-harvest capacity utilization<sup>20</sup> and varying degrees of cooperative maturity levels; also, 10 of the collection centers funded from Government resources were still getting completed at Project closing.

41. Still, the World Bank Development Impact Evaluation Unit (DIME) conclusively proved that the strong impacts recorded were directly attributable to the Project. The underlying evaluation work was the fruit of a long-term partnership between the LWH project team (SPIU), MINAGRI and DIME. DIME evaluated the project impacts using a non-experimental difference-in-difference strategy, and, jointly with the SPIU collected data from 600 households over 6 years. The evaluation concluded that “households in LWH project sites witness large and statistically significant impacts on agricultural production indicators that can directly be attributed to project interventions”. For instance: (i) the value of harvests in the project households was 36 percent higher than in the control group in 2017 Season A, and 60 percent higher in Season B; (ii) commercialization of Project households was 50 percent higher than in the non-project households in 2017 Season A; (iii) households in LWH sites reported higher access to services (such as extension), technologies and inputs; and (iv) LWH beneficiaries saw drastically improved food security outcomes, based on the composite food consumption score methodology, than the comparison group.

42. Similarly, a separate DIME-led evaluation of Impacts and Sustainability of Irrigation, covering three of the irrigation sites<sup>21</sup>, revealed positive impacts attributable to the Project. Thus, farmers just inside the command area were 6.8 percentage points more likely to cultivate than those outside the command area; at the same time, farmers who were able to cultivate in the dry season (Season C) also saw an increase in revenue of 38,806-85,624 RWF (about US\$ 45-100 equivalent) per hectare relative to the comparison group. The evaluation concluded that the overall impact of irrigation was equivalent to a 20 percent increase in annual household income.

#### **Justification of Overall Efficacy Rating**

43. 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 construction of some of its irrigation and post-harvest infrastructures, which did not allow the full extent of the Project outcomes to be revealed at the time of the ICR.

### **C. EFFICIENCY**

#### **Assessment of Efficiency and Rating (Rating: Substantial)**

44. The economic and financial analysis conducted at appraisal anticipated strong financial and economic profitability, with a financial rate of return of 28 percent, and an economic rate of return of 29 percent. The analysis approached all project components and activities as an integrated package, and considered three broad categories of benefits: (i) on-site private benefits within the project area coming from direct income increase, avoidance of yield or income loss without project, food security, risk reduction, increased employment, and securing long-term income opportunities; (ii) downstream public benefits in the form of externalities such as

<sup>20</sup> Agribusiness partners reported that a few of the storage facilities in the remote areas were not fully operational.

<sup>21</sup> Karongi-12, Karongi-13 and Nyanza-23



sediment load reduction and its associated cost, savings from avoiding sediment load removal costs and from reduction of irrigation capital costs; and (iii) global public benefits in the form of carbon sequestration.

45. The ex-post analysis at closing attempted to follow the original analysis but had to consider changes in the Project's geographic coverage (18,383<sup>22</sup> hectares across 13 districts, compared to 4,822 hectares across 6 districts), number of beneficiaries (69,363 households, compared to 5-6,000 households), costs and cropping systems, all of which have occurred since appraisal. While the focus at appraisal was on coffee and plantain for irrigated crops, and on traditional rainfed crops, the ex-post analysis considered instead six farm models<sup>23</sup> that attempted to capture the benefits of the Project from rainfed cereal farming, particularly maize, across Seasons A and B, to more commercialized crops such as climbing beans and Irish potatoes and to fruit and vegetable production<sup>24</sup> in irrigated Season C. The ex-post analysis was not able to factor in benefits from associated livestock production or from composting. On this basis, the economic internal rate of return (EIRR) at closing was calculated at 55 percent, and the net present value (NPV) at USD 351 million, over a 20-year period, with a social discount rate of 8.4 percent. The financial internal rate of return (FIRR) was calculated at 53 percent, the NPV at USD 221 million and the benefit to cost ratio at 2.76, using a financial discount rate of 12 percent, over a 20-year period.

46. The Project also generated large positive environmental benefits, as measured by the CO<sub>2</sub> emissions reductions using the EX-ACT tool. Total emissions reductions equaled 427,674 tons over a 20-year period. Environmental benefits as a percentage of total benefits equaled 21 percent, 60 percent and 75 percent for market, low and high shadow prices, respectively. These figures are in line with portfolio averages and regional targets of the World Bank. The EIRR returns a value of 110 percent when using the market price of carbon. Due to the high value return, an EIRR does not register for the low and high shadow prices. The NPV increases from USD 351 million without environmental benefits to USD 480 million, USD 945 million and USD 1.508 billion when using the market, low and high shadow prices of carbon.

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

47. The overall outcome rating is Satisfactory, based on the above assessments of:

- Relevance of Objectives (Rating: High);
- Efficacy of Achieving Objectives (Rating: Substantial);
- Efficiency (Rating: Substantial).

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

##### **Gender**

48. The Project had a strong focus on and succeeded in ensuring balanced gender representation across its activities. Out of a total of 310,058 project beneficiaries, overall, about 50 percent were women. Gender-disaggregated indicators in the Project Results Framework showed that women reached high levels of access to

---

<sup>22</sup> Subject to terracing; this does not include forested areas or grass

<sup>23</sup> Model 1: Maize and climbing beans, Model 2: Potato and climbing beans, Model 3: Domestic vegetables, Model 4: Domestic fruit, Model 5: Export vegetables and Model 6: Export Fruit

<sup>24</sup> E.g. chilli, tree tomato, passion fruit, avocado and watermelon





project-financed activities, such as rural finance, land husbandry or irrigation and got empowered (see Box 3), albeit they may have lagged a few percentage points behind male participation. Raising gender awareness was also a key aspect of the capacity building activities under the Project; for instance, gender balance had dedicated training modules under many Project activities focused on developing farmers' organizations.

**Box 3: Beneficiary testimony - Ms. Adrea Nyiramihare**

She walks with confidence – after all she has more than RWF 5 million in her savings account, certainly an above average savings for a rural farmer. Adrea Nyiramihare is 42 years old. The medium-height young mother portrays the image of a new breed of Rwandan successful woman farmers: “We are planning to start-up businesses in this area because we are registering too much produce. Initially I had no account because I had no money to save but now I have more than RWF 5 million in my account in a SACCO (...) It is satisfying when you have something to show for your hard work”.

Source: MINAGRI

### Institutional Strengthening

49. Institutional strengthening was a core focus for the Project at many levels, from the several types of farmers' organizations, i.e. SHGs, cooperatives and WUAs, to local authorities as well as MINAGRI and its public services or agencies with mandates relevant to achieving the Project's outcomes. Significant success was achieved, as follows:

50. *SHGs, zones, and cooperatives*: Grassroots level mobilization and organization of project beneficiaries proved a *sine qua non* condition for achieving the results intended. The Project set a model for the country by mobilizing 69,363 previously unorganized farmers (of which about 40 percent women) into SHGs and eventually into zones and cooperatives. The participatory bottom up approach of group formation, along with dedicated capacity building efforts, laid out the basis for the nation-wide adoption of the *Twigire Muhinzi* extension model. The farmer institutions supported by the project showed that 100 percent of the cooperatives and 85 percent of the SHGs demonstrated, at project closure, their overall capacity and capability to move forward on their own.

51. *MINAGRI – public services*: The Project helped strengthen the skills and knowledge base of staff of MINAGRI and its agencies (RAB etc.) in several priority areas. 21 Ministry and agency staff obtained master's degrees in India in various specialties relevant to the Project: horticulture, agri-business, irrigation, harvest handling, commercialization and market exchange, as well as rural banking and ICT in Agriculture. Building the capacity of public extension services was a key factor to the success of *Twigire Muhinzi*, a pluralistic extension model. Equally important, the positive experience with radical terracing turned Rwanda into a role model for other countries in the region (e.g. Kenya, Burundi, Ethiopia, Madagascar, etc.), while also prompting it to become a center of leadership on land husbandry under the ECAAT framework.

### Mobilizing Private Sector Financing

52. The Project was effective in developing partnerships with agribusinesses, in some cases building public-private partnerships. For instance, MINAGRI signed agreements with some national and international investors, to promote essential oils and high value horticulture crops in the project sites. Contract farming with cooperatives developed under the Project was one of the two approaches that these investors used to secure these crops (the other one was to produce them themselves on leased land). Through contract farming, smallholders benefited from increased access to financing, technology or knowledge, provided directly by their business partners.

53. The Project also succeeded in mobilizing considerable savings from its beneficiaries, both individuals and cooperatives, which were deposited with SACCOs. The volume of individual savings grew by 81 percent annually



after 2011, to reach nearly US\$ 1,000,000 cumulatively by Project closing. These savings enabled beneficiaries to leverage additional resources through loans from the financial institutions partnering with the Project.

### **Poverty Reduction and Shared Prosperity**

54. With the Project targeting subsistence smallholders, it contributed directly to the World Bank's twin goals of ending extreme poverty and boosting shared prosperity in a sustainable manner. The DIME evaluation revealed the positive impact that the Project had on beneficiaries' incomes, as the treatment households had consistently higher incomes than comparison households. At the same time, the Project proved important in curtailing food insecurity amongst its beneficiaries. The same evaluation also showed that the Project households generally had lower propensity of severe or moderate food insecurity than their non-beneficiary counterparts.

### **Other Unintended Outcomes and Impacts**

55. Composting, as a business: While it was originally needed in many LWH sites to help increase soil organic matter and, thereby, recover soil fertility and improve soil water holding capacity, composting also proved to be a lucrative business. The Project compost making module also included training of entrepreneurs who were interested in making this a business. As a result, composting generated important off-farm income mainly for the unemployed youth and/or landless members of the community. For instance, at the close of Season B 2017, 205 farmer groups collected a total income of RWF 224,670,896 (equivalent of about US\$ 260,000) for 9,832 tons of compost sold to the Project or neighborhood farmers.

56. Catalyzing private investment: The irrigation and post-harvest infrastructure that the Project developed was key for attracting agribusiness partners in the Project areas. Irrigation paved the way for growing higher value crops, and for reducing exposure to weather and climate risks; consolidation of farmed land, in this context, also created the premise for more efficiency. Post-harvest infrastructure, together with the development of farmers' organizations, helped aggregate produce and improve its quality. The horticulture packhouse (see paragraph 40) developed at the National Agriculture Export Development Board (NAEB) attracted and supported exporters of horticulture products; these exporters procured from Project beneficiaries, thus helping them earn more than RWF 500 million for crops like bullet chilli, bird eye, hot pepper, snow peas, French beans and sugar snaps. The combination of all these factors, together with the SPIU's active promotion and reach-out to value chain actors, created a favorable environment for large private sector representatives to partner with smallholders and with the Government (see paragraph 52).

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

### **A. KEY FACTORS DURING PREPARATION**

57. Clear articulation with Government objectives and strong Government ownership: Under the SWAp, which is a precursor to the aid effectiveness principles laid out in the Paris Declaration (2005), the Project committed to financing a part of the Government's sectoral strategy; as such, the LWH program had been designed and already piloted by the Government, and the Project built on and financed part of this program.

58. Adequate design choices: The Project relied on a clearly articulated theory of change that remained relevant throughout the entire Project implementation period. The components were clearly defined, and





well-articulated together. The strong emphasis on a market-driven approach, anchored in value chain and market potential studies, was essential for the effective targeting of the future Project activities.

59. Background studies and lessons learned: The Project successfully incorporated lessons learned from international experience and previous operations in Rwanda. Specifically, regarding watershed management, the Project design recognized and reflected the importance of multidisciplinary teams and participatory approaches. A strong involvement of stakeholders was key for ensuring the needed levels of ownership and uptake among the communities of Project beneficiaries. Early investment in capacity building, both at beneficiary level and at implementing agency level, was another lesson that was effectively integrated into the Project design. Selective background studies were also important to close knowledge gaps at the time of Project preparation and help the Project fulfil some of its critical assumptions (see paragraph 8); this was relevant for understanding the market potential of the new, high value crops in Rwanda that the Project would support, and thus facilitate the subsequent targeting of Project activities.

60. Safeguards: The project was anticipated to have potential adverse environmental and social impacts. The project was rated environmental assessment Category B in accordance to the World Bank Policy on Environmental Assessment (OP4.01). The project triggered the following policies and prepared the corresponding policy instruments; Environmental Assessment (OP/BP 4.01); Natural Habitats (OP/BP 4.04); Forests (OP/BP 4.36); Pest Management (OP 4.09); Physical Cultural Resources (OP/BP 4.11); Involuntary Resettlement (OP/BP 4.12); Safety of Dams (OP/BP 4.37); and Projects on International Waterways (OP/BP 7.50). An Environment and Social Management Framework (ESMF); Pest Management Plan (PMP) and Resettlement Policy Framework (RPF) were prepared and disclosed both in-country and in the Bank. The ESMF was adopted because the precise location of project implementation sites was not known. The ESMF and RPF established a mechanism to determine and assess future potential environmental and social impacts of the planned activities under the proposed Project.

## **B. KEY FACTORS DURING IMPLEMENTATION**

61. Additional resources and other development partners: True to its sector-wide approach and capitalizing on the clear Government strategic vision for the sector, the Project leveraged another US\$ 106.07 million, thus quadrupling its original commitment. It also attracted new development partners, i.e. GAFSP donors, USAID and CIDA. This allowed it to increase its scope and outreach, as shown by various indicators: the number of direct beneficiaries grew from about 5,000-6,000 households<sup>25</sup> to 310,058, the area developed for irrigation expanded from 900 ha to 2,555 ha, while the area of land protected against soil erosion went up from 4,822 ha<sup>26</sup> to 21,648 ha. The Project thereby gained a wide outreach (13 districts out of 30) and was able to demonstrate results across a diverse range of agri-climatic and socio-economic conditions.

62. Full engagement and good coordination of Government and the Project implementing agency: The merger of the LWH and RSSP PIUs, finalized in 2012, ensured administrative efficiency and synergies between two projects similar in scope and complementary in geographic coverage. The resulting SPIU team

---

<sup>25</sup> As estimated in the original economic and financial analysis in the PAD, which would translate into at least 10,000-15,000 adult beneficiaries.

<sup>26</sup> Assumed in the original economic and financial analysis.



became more flexible and adaptable to evolving Project implementation needs, while also more effective in developing and retaining experienced staff members. The SPIU had adequate capacity to ensure the implementation of environmental and social safeguards policy instruments. The SPIU environmental and social safeguards staff provided technical oversight and ensured effective EMP and RAP implementation; and overall project compliance with Bank policies.

63. Higher costs of hillside irrigation than initially anticipated (shortage of USD 13.53 million): These were caused by an underestimation of actual costs during project preparation, escalation of material costs and limited competition for civil works and triggered a financial reallocation between components following the midterm review. In the absence of operational pilot sites, not all aspects and implications were fully understood during project preparation.

64. Delays in some of the irrigation civil works: These were due to: (i) changes in design during construction for unforeseen site conditions; (ii) insufficient equipment and lack of financial capacity of contractors; (iii) back load of sub-components B2 and B3; and (iv) various procurement difficulties (e.g. heavy procurement load for the existing SPIU staff; low response from potential bidders, partly due to low domestic capacity; poor performance of one of the contractors and need to re-procure).

65. Factors external to the Project did not significantly affect implementation. The macroeconomic framework in Rwanda was relatively stable and fiscal management predictable, without impact on counterpart funding. The country enjoyed political stability during the implementation timeframe; any changes that occurred in the composition of senior- and middle-management of MINAGRI did not affect the coherence of project implementation; handovers were smooth and well-handled. The drought and erratic rainfall patterns that struck the East of the country in 2016, however, impacted the Project households in the affected areas to some degree. Yet, as the DIME impact evaluation has shown, the Project beneficiaries proved greater resilience than the control group and recovered faster in the following year.

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

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

#### **M&E Design**

66. The M&E design was facilitated by a clear theory of change, and well-defined impact pathways. With these, indicators and baselines were set so that the assumptions underlying them could be continually tested and the Project's contributions checked for alignment and plausibility. As mentioned in paragraph 15, several baseline and target levels were adjusted at various points in time, due to data collection needs (for baselines that were not available at appraisal) and due to increases in Project scope and financing (for targets).

67. The M&E system for the Project was designed to be fully embedded into the MINAGRI M&E system. The development objective and intermediary result indicators in the Project results framework (except for those on rural finance) were drawn from the Common Framework for Engagement (CFE) for the whole Government of Rwanda



LWH Program. This ensured that contributions from the Project and from other interventions were coherently measured and assessed towards the achievement of Rwanda's sectoral objectives as defined under its SWAp.

68. The M&E system was set up for effective data collection. The SPIU relied on a small M&E team at the center, supported by several M&E assistants placed at the district level in the districts where the Project was active. A participatory M&E system was established at the base integrating farmers in the self-help groups, the zonal level and the cooperative level. Data thus collected was aggregated and analyzed at the central level and also fed into the activities of MINAGRI's Directorate General for Planning. Furthermore, the Project foresaw and developed a Geographic Information System based on a Dynamic Information Framework (GIS-DIF) to facilitate project monitoring, decision-making and reporting.

### **M&E Implementation**

69. The monitoring of progress across all Project components was detailed and timely, as shown by the Bank's supervision reports. The methodology used for indicator definition and data collection was robust and consistent. The indicators and their definitions were kept virtually unchanged throughout the implementation period (except for some minor changes as per paragraphs 15 and 22), thus generating solid time series and reliable comparisons across Project beneficiaries and sites. Beneficiary surveys were extensively used (biannually, for several indicators).

70. The Project developed a rich database of geo-referenced numeric and digital information (e.g. photos, video documentaries) of the before, during and after situation on various aspects of the Project in each project site, see Annex 7 for some examples. The analysis of this data has mainly been for compliance and accountability to report against the routine results framework and other MINAGRI reporting requirements.

71. Partnership with DIME and ensuing impact evaluations added much value to the M&E implementation process. Early in the Project implementation (2011), the SPIU, MINAGRI, and DIME entered a long-term partnership to design an impact evaluation process that would capture the Project's results. There was merit in the initiative being launched early, as it facilitated adequate longitudinal data collection across both treatment and control groups and allowed demonstrating the impacts attributable to the Project and how they evolved over time.

### **M&E Utilization**

72. A performance-oriented culture laid the ground for an effective use of the Project's results framework. Rwanda is home to the *imihigo* system (performance contract rooted in pre-colonial practice) that has entrenched a tradition of results and monitoring and evaluation (M&E) around the execution of plans. The Project monitoring, evaluation, learning and impact assessment process was therefore developed to help promote a "learning and evaluative culture", in line with the Result Based Performance Management (RBM) Policy for the Rwandan Public Service, and particularly with the *imihigo* system, the sector-wide approach and results-based budgeting. Some elements of the process were prescribed by program governance bodies, including the carrying out of baselines, use of participatory approaches, forward and backward reporting mechanisms, data integration, independent impact assessments, and periodic joint evaluations through the Implementation Support Missions (ISM) of the Bank, for example.

73. The information generated by the Project's M&E system was routinely used for operational decisions throughout Project implementation; it was also readily available for review and action during World Bank missions.



The GIS-DIF system allowed for spatial data analysis and visualization to measure impacts, particularly of land husbandry activities, and was also used to make project implementation decisions such as those regarding delineation of project site sub-watersheds or water catchment boundaries.

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

74. The overall rating of the M&E system is deemed **Substantial**, as some moderate shortcomings were observed. While the Project collected vast amounts of information, some of which above and beyond the confines of the Project results framework, the data was not always used to inform policy decisions at MINAGRI level, and, in some cases, there was duplication in data collection between MINAGRI and SPIU.

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

#### *Environmental compliance*

75. The Project was a Category B as it was anticipated not to have significant, large scale or irreversible negative environmental and social impacts. The project triggered Environmental Assessment (OP/BP 4.01); Natural Habitats (OP/BP 4.04); Forests (OP/BP 4.36); Pest Management (OP 4.09); Physical Cultural Resources (OP/BP 4.11); Safety of Dams (OP/BP 4.37); and Projects on International Waterways (OP/BP 7.50). An Environmental and Social Management Framework (ESMF); and Pest Management Plan (PMP) were prepared in this respect. The ESMF was received by the Bank on 08/06/2009; disclosed in country on 08/12/2009; and submitted to InfoShop on 08/13/2009. The PMP was received by the Bank on 08/04/2009; disclosed in country on 08/07/2009; and submitted to InfoShop on 08/10/2009.

76. The use of a Framework was required for this Project because it was not possible to ascertain the precise location of the subprojects prior to project appraisal. The ESMF outlined a screening and review process, which provided guidance on how to assess potential negative environmental and social impacts and propose appropriate mitigation measures. The ESMF also provided recommendations to be considered, on when subproject specific EIAs or EMPs would be needed. Following the guidance of the Bank cleared ESMF, the project prepared an Environmental Management Plan (EMP) for each of the 8 subprojects. These ESMP were cleared by the Rwanda Development Board (RDB) environmental compliance unit and disclosed in-country.

77. During implementation, the Project had two fatalities. The first was in July 2016 and involved a contractor's staff falling in spillway foundation pit; the second occurred in November 2017 and involved a boy who drowned in a dam reservoir. The first case was noted as being the result of ineffective safety measures around excavated areas in the site. The contractor enhanced safety measures around the site to prevent more accidents. The victim in the first case was insured and the family received compensation from both the insurance company and the contractor. The family of the drowning victim received money from MINAGRI to assist in burial arrangements. The SPIU, in response to these fatalities, adopted several recommendations to prevent future accidents, one of which included undertaking an environmental, health and safety audit of all project dam sites. The audit is intended to propose measures and actions to prevent accidents during the operation of these infrastructure.

#### *Social compliance*

78. The project triggered policy on Involuntary Resettlement (OP/BP 4.12). The project prepared and disclosed a Resettlement Policy Framework (RPF) prior to project appraisal. The RPF was received by the Bank on 07/09/2009;



disclosed in country on 08/07/2009; and submitted to InfoShop on 08/10/2009. The use of a Frameworks was required for this project because it was not possible to ascertain the precise location of the subprojects prior to project appraisal. The ESMF outlined a screening and review process, which provided guidance on how to assess potential negative environmental and social impacts and propose appropriate mitigation measures. The ESMF also provided recommendations to be considered, on when subproject specific EIAs or EMPs would be needed.

79. This instrument was also updated and cleared in October 2013 to meet the Bank's requirements for additional financing. Triggering the resettlement policy required the preparation of resettlement instruments, such as the Resettlement Action Plan (RAP), or the abbreviated resettlement action plan (ARAP). In response to this, the Project prepared six RAPs for sites with irrigation activities, namely Karongi-12 and Karongi-13, Nyanza-23, Gatsibo-8, Rwamagana-34, Kayonza-4 and Muyanza. The reports were submitted to the Bank, reviewed, cleared and disclosed locally and on the Bank's external website.

80. Though RAPs were developed for 6 sites with irrigation component, the compensation was extended to sites without irrigation component to pay for marginal land acquired for post-harvest infrastructures in form of willing seller and willing buyer. The sites with only post-harvest infrastructures were Nyamagabe, Ngoma 22, Rutsiro A and B, Rwamagana 35, Gicumbi, Nyabihu, Ngororero, and Gakenke.

81. There were 2,135 Project Affected Households (PAHs), of which 117 required relocation and were resettled in Project constructed houses. The total amount of compensation used for PAHs was over RWF 1.41 billion (or USD 1.6 million). The PAHs were compensated as per RAP before the start of civil works and 1,288 PAHs were offered employment opportunities during the terracing phase, as one of the livelihood restoration measures<sup>27</sup>. All PAHs were compensated according to Rwanda's expropriation law no. 32/2015 of 11/06/2015; in case of discrepancy on entitlement between the expropriation law and the Bank's OP.4.12, the Bank policy was applied.

82. The Project offered equal opportunities for men and women, and youth. For gender, the project ensured that for any compensation to be made, the land titles and the bank accounts were issued in the names of both spouses as per the Rwandan law requirements.

83. The Project established and operationalized 15 Grievance Redress Committees (GRCs) in all subproject sites. A GRC was made up of 5-7 members<sup>28</sup>. Common grievances recorded included: (i) beneficiaries who claimed compensation but had not been affected; (ii) Project Affected Persons (PAPs) who claimed compensation of assets after the cutoff date; (iii) inactive or missing bank accounts, which delayed compensation; (iv) conflicts over neighboring plots among neighbors; (v) successions, divorces and other family issues impacting ownership of assets; (vi) disagreement over resettlement/compensation value between the PAP and independent evaluator; (vii) lack of land titles, which delayed both compensation and construction works; and (viii) complaints about offsite impacts like soil erosion, runoffs, dust, etc. All grievances under this Project were resolved; SPIU is holding proper records of all the grievances received and their resolutions.

---

<sup>27</sup> Other livelihood restoration measures included access to agricultural inputs, training in compost making and financial literacy.

<sup>28</sup> i.e. President, vice president, Gender representative, Village leader, Cell executive secretary, project representative and contractor or consultant representatives



*Fiduciary compliance*

84. Financial management: The project FM compliance has improved from moderately satisfactory the first two years to consistently satisfactory up to the project closure. Good quality financial reports and audit reports have been prepared and submitted timely to the World Bank with unqualified audit opinion on financial statement. The project disbursement performance was satisfactory and contributes to the portfolio disbursement performance. The good FM performance was mainly driven by an internal control environment characterized by low level of corruption, effective enforcement of PFM and FM rules and adequate FM staffing.

85. Procurement: In general, procurement was carried out in accordance with agreed procedures. The SPIU complied with the Bank's procurement rules and regulations throughout with support from the Bank procurement specialist. During the first few years of the Project, there were issues of delays in completion of design studies which had impact on planned construction works. In addition, non-responsive bids due to lack of capacity of local contractors to carry out dams and irrigation contracts, lack of realistic procurement plan, low efficiency of internal tender committee and inadequate contract monitoring function were problems encountered during the first few years of the project implementation. Nevertheless, the SPIU and Bank team re-enforced implementation supervision support and hands-on support and could turn around the project performance. The SPIU implemented Bank recommendations at each stage of the ISM and performance of procurement function improved a lot starting mid-2015. Even though, the procurement performance was downgraded from Satisfactory (S) to Moderately Satisfactory (MS) from 2017 on, due to understaffing of the procurement unit, this had little impact on procurement performance of the Project as other projects under the SPIU were closing and the existing staffs were able to manage the workload.

86. Procurement plans were prepared and updated timely during project implementation. Regarding the use of STEP, the SPIU has used STEP effectively for procurement planning and activities transaction. In addition, the SPIU completed uploading all the tenders in the STEP system by the end of the Project's grace period.

## **C. BANK PERFORMANCE**

### **Quality at Entry**

87. The quality at entry is rated **Satisfactory**. As noted, the Project had a robust design, well aligned with the Government and Bank priorities, anchored in a sound theory of change, and thoroughly informed by previous lessons learned and additional studies commissioned for the purpose. As such, the Project was an integral part of a high-priority government program, PSTA II, and helped scale up LWH activities successfully piloted by the Government. However, the Project did face some shortcomings regarding an overly optimistic planning of the land husbandry and water harvesting and irrigation works, the latter particularly in a context of low national capacity affecting both the public and the private sector. Better foresight on these aspects could have avoided some of the delays and cost overruns encountered during implementation. The institutional arrangements were solid and clear; the FM system was adequately designed with clear identification of risk and effective mitigating measures. Project risks were well identified and clearly understood.

### **Quality of Supervision**

88. The quality at of supervision is rated **Satisfactory**. The Bank missions were regular, benefited from sufficient resources and mobilized adequate expertise to assess progress along all Project components and activities, including the specific





aspects related to the implementation of environmental and social safeguards. The frequent combination of the Project supervision missions with the supervision of RSSP3 facilitated efficiency gains and synergies between the two projects. Project midterm review brought into focus adaptations of the approach for some project activities, which were necessary for effectively achieving the Project development objectives. This concerns specifically the rebalancing of the L, H and activities depending on site-specific factors (see paragraph 18). The FM system was adequate throughout implementation and the quality of financial reports has substantially improved. The long outstanding unreconciled payables and amounts due to the DA have been addressed. The very low turnover of the FM staff has helped build and maintain capacity with the SAs, which impacted positively the project FM rating. The implementation status reports (ISRs) and aide-memoires provide candid and accurate assessments of the Project implementation progress and of the issues requiring attention at the time.

#### Justification of Overall Rating of Bank Performance

89. The Bank performance is rated **Satisfactory**. While, overall, the design was robust and supervision effective, there were some shortcomings regarding the timely completion of water management activities. These required extending the Project closing date and prevented the full scope of irrigation benefits from manifesting during the lifetime of the Project (see paragraph 38). Also, some of the farmer organizations (WUAs, cooperatives) still need further capacity building (see paragraphs 40 and 91), beyond Project completion. These issues are recognized and planned to be addressed both through Government programs<sup>29</sup> and the follow-up GAFSP-financed operation Sustainable Agriculture Intensification and Food Security Project (SAIP, P164520) approved in September 2018.

#### D. RISK TO DEVELOPMENT OUTCOME

90. The risk that the development outcomes achieved by closing will not be maintained is **low**. The Project achieved good results in terms of ensuring the financial sustainability of many of its farmers' organizations (see paragraph 50). This was, in part, thanks to positioning Project activities well to respond to market signals (see paragraph 8) and, in part, thanks to establishing good partnerships between farmers, public services, such as extension, and other agri-business actors, such as traders or microfinance institutions (see paragraphs 40 and 52). Marketing infrastructures were handed over in full to farmers' cooperatives, which, as mentioned, show adequate levels of maturity. The water harvesting and irrigation infrastructures were subject to tripartite handover arrangements, involving WUAs, districts and RAB; these arrangements were signed in October 2018. There is continued Government focus on strengthening and scaling up achievements so far, and mitigating some of the perceived risks to sustainability, both through own resources, and with the help of development partners, during the implementation of PSTA IV).

91. However, efforts to continue building WUA capacity will need to continue. The Project built critical water management capacity among farmers from a very low level. Without it, the economic benefits of irrigation, which are tangible, could not have been reached. The 7 WUAs that were set up, one for each Project irrigation scheme, received training and assistance to become empowered to ensure ownership and long-term sustainable operation and maintenance (O&M) of irrigation infrastructure. Given the limited availability of third-party O&M service providers in Rwanda, the Project also opted to provide direct initial O&M support to the schemes through site engineers and WUA operating technicians. Through these, the

<sup>29</sup> Such as the Small-Scale Irrigation Technology Development Program, SSIT, set up in 2014.



Project laid a solid foundation to support the desired expansion of the country's irrigated area, as laid out in PSTA IV, but capacity building efforts and technical assistance will need to continue. At Project completion, WUAs were facing some challenges regarding their technical and financial capacity to ensure proper O&M of their irrigation infrastructure, especially while member farmers were still slow to adopt irrigation or pay their water fees. Monitoring data indicated that water fee collection rates were at 66.5 percent at closing. As per paragraph 89, both Government program and SAIP will focus on addressing this priority.

## V. LESSONS AND RECOMMENDATIONS

92. Several lessons were derived from the Project and considered in the design and implementation of the follow-up Government sector strategy (PSTA IV), while also remaining relevant beyond the Rwandan agriculture context.

93. Flexibility in landscape approaches: The Project proved that site specific conditions were critical for determining what type of land husbandry package should be applied. The initial model of implementing all three components of L (land husbandry), W (water harvesting dam) and H (hillside irrigation) did not universally meet the needs of all sites. Flexibility had to be therefore introduced to ensure cost-effectiveness and technical soundness.

94. Whole value chain interventions, and public-private partnership for sustainable results: Addressing value chain segments and actors consistently and systematically from inputs to market was essential for ensuring the smooth operation of the entire system and for laying the foundation for effective linkages between all value chain participants. In this context, building formal, public-private partnerships with business actors proved essential for sustainability. As shown, Project investments such as those in marketing and irrigation infrastructure turned into catalysts for agri-business investment and development of partnerships with smallholders. New value chain partnerships leveraged transmission of knowledge, financing and technology from agribusinesses to farmers, thereby effectively demonstrating the merits of the Government's new commitment of turning from a market-actor into a market-enabler.

95. Effective cooperation between Government and development partners: As shown, using the SWAp, anchoring the Project in a sound government program (PSTA), and demonstrating its potential for achieving results early (through a Government-led pilot, see paragraph 4) created the right premise for attracting development partners around shared goals and using harmonized approaches. Furthermore, the willingness of the Government of Rwanda to fill the financing gap caused by the unfavorable exchange rate developments (see paragraph 24) was essential for the Project to remain on track and achieve its targets.

96. Building good governance systems: The Project was important for strengthening key governance systems, such as FM and M&E. The stability of FM staffing played a key role in building and maintaining capacity within the SPIU and improve the FM rating. The capacity built has effectively supported the preparation and implementation of other World Bank financed projects. The Project M&E system was strong and fully embedded in the Government's M&E system for agriculture, leading to effective transfer of information and facilitating the scaling up of lessons learned and good practice on a national level.





97. Early and wide community involvement: The Government's hillside intensification objectives could not have been successfully achieved without the strong ownership and engagement of farmers in production and marketing activities. Both Project design and implementation recognized this and spent important resources to ensure that beneficiaries were sensitized, mobilized, consulted, advised and trained, as appropriate. Consequently, beneficiaries became fully invested in the Project activities and achieving results; moreover, several turned into drivers of change, by sharing their positive experience and acquired knowledge. Reliance on training of trainers and farmer-led knowledge sharing laid the foundation for the Project's success and for the national scale-up of agriculture extension and training services.

98. Involvement of local leaders (village leaders and GRC leaders): it was key in the resolution of conflicts over plots among neighbors, land owners and owner of assets on that land, as well as in the resolution of inter-family issues over ownership of assets or of social issues, such as the proper management/use of compensation funds received by some displaced PAPs.



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

**A. RESULTS INDICATORS**

**A.1 PDO Indicators**

**Objective/Outcome:** Increase productivity of hillside agriculture in target areas

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Productivity of target irrigated command area (\$/ha)	Amount(USD)	492.00 01-Sep-2009	1700.00 30-Jun-2014	2800.00 29-Jun-2018	5639.00 29-Jun-2018
Direct project beneficiaries (individual) of which female (beneficiaries)	Number	0.00 01-Sep-2009	105000.00	120000.00	310058.00 29-Jun-2018
Female direct project beneficiaries	Number	0.00	52000.00	55000.00	150985.00
		01-Sep-2009	30-Jun-2017	29-Jun-2018	29-Jun-2018

**Comments (achievements against targets):** Baseline value was updated in 2013, following survey reflecting site-specific conditions; the baseline presented in the PAD was based on national average.



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Productivity of targeted non-irrigated hillside (\$/ha)	Amount(USD)	469.00	1400.00	2500.00	3471.00
		01-Sep-2009	30-Jun-2014	29-Jun-2018	29-Jun-2018

**Comments (achievements against targets):** Baseline value was updated in 2013, following survey reflecting site-specific conditions; the baseline presented in the PAD was based on national average.

**Objective/Outcome:** Increase commercialization of hillside agriculture in target areas

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
share of commercialized products from target areas (%)	Percentage	35.00	60.00	70.00	80.60
		01-Sep-2009	30-Jun-2014	29-Jun-2018	29-Jun-2018

**Comments (achievements against targets):**

## A.2 Intermediate Results Indicators

**Component:** Capacity Development and Institutional Strengthening for Hillside Intensification

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Number of cooperatives	Number	0.00	10.00	15.00	20.00



which have increased their net revenues by 50% relative to the baseline		22-Dec-2009	31-Dec-2015	29-Jun-2018	29-Jun-2018
---	--	-------------	-------------	-------------	-------------

**Comments (achievements against targets):** The original PAD indicator measured the increased revenues (%) made by cooperatives in Project areas; this indicator was revised following the 2013 Project restructuring.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Proportion of male Farmers in Project area using improved farm methods	Percentage	30.00	90.00	90.00	93.00
		01-Sep-2009	30-Jun-2014	30-Jun-2017	29-Jun-2018
Proportion of female farmers in project area using improved farm methods	Percentage	25.00	90.00	90.00	89.50
		01-Sep-2009	30-Jun-2014	29-Jun-2018	29-Jun-2018

**Comments (achievements against targets):**

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Female Adult Population in project area using the services of formal financial institutions	Percentage	17.60	36.00	85.00	89.10
		01-Sep-2009	30-Jun-2014	29-Jun-2018	29-Jun-2018

**Comments (achievements against targets):**



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Male adult population in project areas using services of formal financial institutions	Percentage	22.00 01-Sep-2009	40.00 30-Jun-2014	90.00 29-Jun-2018	92.30 29-Jun-2018
<b>Comments (achievements against targets):</b>					
Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Participating Financial Institutions (PFI) using new products	Number	0.00 01-Sep-2009	12.00 30-Jun-2014	25.00 29-Jun-2018	45.00 29-Jun-2018
<b>Comments (achievements against targets):</b>					
Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Cooperatives and their Self Help Groups (SHG) ranked and graded high (A and B)	Percentage	0.00 31-Dec-2012	80.00 31-Dec-2015	80.00 29-Jun-2018	100.00 29-Jun-2018
<b>Comments (achievements against targets):</b> Indicator introduced following the 2013 Project restructuring.					



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Households with acceptable food consumption	Percentage	71.00	83.00	85.00	83.00
		31-Dec-2012	31-Dec-2015	29-Jun-2018	29-Jun-2018
Kitchen gardens constructed	Number	3975.00	15000.00	19000.00	54783.00
		31-Dec-2012	31-Dec-2015	29-Jun-2018	29-Jun-2018

**Comments (achievements against targets):** Indicator introduced following the 2013 Project restructuring.

**Component:** Infrastructure for Hillside Intensification

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Cost Recovery Ratio for operation and maintenance of WUA in project area	Percentage	0.00	40.00	40.00	66.30
		23-Nov-2009	30-Jun-2014	29-Jun-2018	29-Jun-2018

**Comments (achievements against targets):**

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Land protected against soil erosion in project areas	Percentage	26.00	80.00	90.00	108.00
		01-Sep-2009	30-Jun-2014	29-Jun-2018	29-Jun-2018



**Comments (achievements against targets):** The national level baseline used in the PAD was 45% and target was 80%, which represented a 35% point increase. When the baseline for the Project was completed after appraisal, the average baseline for the project sites was 26% land protected against soil erosion.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Area developed for Irrigation in project	Hectare(Ha)	0.00	900.00	2368.00	2555.00
		01-Sep-2009	30-Jun-2014	29-Jun-2018	29-Jun-2018

**Comments (achievements against targets):**

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Reduced sediment yield (volume or weight per unit area of catchment (T/ha/yr) in the project areas	Percentage	0.00	50.00	50.00	89.00
		31-Dec-2009	31-Dec-2015	29-Jun-2018	29-Jun-2018

**Comments (achievements against targets):** The original indicator (PAD) measured reduced annual soil loss in target areas; this was changed to the current indicator following the 2013 Project restructuring.



**B. KEY OUTPUTS BY COMPONENT**

Objective/Outcome 1: Increase productivity of hillside agriculture in target areas	
Outcome Indicators	<ol style="list-style-type: none"> <li>1. Productivity of targeted irrigated command area (dollars/ha)</li> <li>2. Productivity of targeted non-irrigated hillsides (dollars/ha)</li> </ol>
Intermediate Results Indicators	<ol style="list-style-type: none"> <li>1. Area developed for irrigation in the Project</li> <li>2. Cost recovery ratio for the operation and maintenance of WUAs in Project area</li> <li>3. Land protected against soil erosion in project areas</li> <li>4. Proportion of (male/female) farmers in the Project area using improved farm methods</li> <li>5. Reduced sediment yield (volume or weight per unit area of catchment (tons/ha/year) in the Project areas</li> <li>6. Cooperatives and their Self Help Groups (SHG) ranked and graded high (A and B)</li> <li>7. (Male/female) adult population in project area using the services of formal financial institutions</li> <li>8. Participating Financial Institutions (PFI) using new products</li> <li>9. Percentage of households with acceptable food consumption</li> </ol>
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	<p><u>Component A:</u></p> <ol style="list-style-type: none"> <li>1. 27 cooperatives and 3,270 SHGs established, with 62,678 members (47 percent women)</li> <li>2. 16,967 farmers (37 percent women) trained on group formation and structures</li> <li>3. 4,541 lead farmers trained on IPM, application of compost and fertilizers</li> <li>4. 56,880 farmers (41 percent women) opened bank accounts</li> </ol>





	<p>5. 4 new financial products developed (farm production credit, harvest credit, value chain production credit, value chain agro-dealer credit)</p> <p>6. 54,783 Kitchen gardens established</p> <p><u>Component B:</u></p> <p>7. 7 WUAs set up, with 8,671 members (48 percent women)</p> <p>8. 859 WUA members trained in WUA management and irrigation</p> <p>9. Radical terraces developed on 18,383 ha</p> <p>10. Other soil conservation measures applied on another 3,265 ha</p> <p>11. 58,855 farmers (44.4 percent women), 276 district and sector technicians, 113 professionals from MINAGRI, MINERENA, REMA and RAB staff trained on land husbandry technologies</p> <p>12. 2,270 lead farmers (43.2 percent women) trained on management and maintenance of land husbandry infrastructures</p>
<b>Objective/Outcome 2: Increase commercialization of hillside agriculture in target areas</b>	
Outcome Indicators	1. Share of commercialized crops from target areas (percentage) in the total crop production
Intermediate Results Indicators	<p>1. Number of cooperatives which have increased their net revenues by 50 percent relative to the baseline</p> <p>2. Cooperatives and their Self Help Groups (SHG) ranked and graded high (A and B)</p> <p>3. Percentage of households with acceptable food consumption</p> <p>4. (Male/female) adult population in project area using the services of formal financial institutions</p> <p>5. Participating Financial Institutions (PFI) using new products</p>
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	<p><u>Component A:</u></p> <p>1. 27 cooperatives and 3,270 SHGs established, with 62,678 members (47 percent women)</p>



2. 16,967 farmers (37 percent women) trained on group formation and structures
3. Post-harvest facilities developed, as follows: 42 storages facilities; 45 drying shelters; 4 collection centers for banana; 10 horticulture collection centers including charcoal coolers; and 147 temporary drying facilities.
4. 3,103 farmers (40 percent women) trained on horticulture production and marketing
5. 6,795 farmers (40 percent women) trained on post-harvest handling
6. 1,821 farmers (43 percent women) trained on marketing principles
7. 4 new financial products developed (farm production credit, harvest credit, value chain production credit, value chain agro-dealer credit)
8. 54,783 Kitchen gardens established

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

<b>Name</b>	<b>Role</b>
<b>Preparation</b>	
Lorraine Ronchi	Task Team Leader
Christine Cornelius	Program Coordinator
Alassane Sow	Lead operations Officer
IJsbrand de Jong	Sr. Irrigation Specialist
Valens Mwumvaneza	Agriculture and Rural Development Specialist
Wendao Cao	Rural Development Specialist
Catherine Ragasa	Economist
Christophe Ravry	Sr. Agribusiness Specialist
Renate Kloepfinger-Todd	Rural Finance Adviser
Ann Rennie	Lead Financial Specialist
Michael Marx	Rural Finance Specialist
Martin Fodor	Sr. Environmental Specialist
Mary Bitekerezo	Sr. Social Specialist
Diego Garrido Martin	Monitoring and Evaluation Specialist
Johannes Widmann	Country Officer
Chantal Kajangwe	Procurement Analyst
Marie-Louise Ah-Kee	Procurement Analyst
Otieno Ayany	Financial Management Specialist
Mohammed Taqi Sharif	Institutional Specialist
Sameena Dost	Sr. Counsel
Aissatou Diallo	Finance Officer
Yasmine Umutoni	Team Assistant
Patrice Sade	Team Assistant



Marie-Claudine Fundi	Language Program Assistant
<b>Supervision/ICR</b>	
Winston Dawes, Aimee Marie Ange Mpambara	Task Team Leader(s)
Mulugeta Dinka	Procurement Specialist(s)
Enagnon Ernest Eric Adda	Financial Management Specialist
Mohammad Imtiaz Akhtar Alvi	Team Member (Farmers' Organizations and Rural Finance)
Belinda Mutesi	Team Member (Program Assistant)
Tizikara Clesensio	Team Member (M&E Specialist)
Hayalsew Yilma	Team Member (Irrigation Specialist)
Bodomalala Sehenoarisoa Rabarijohn	Team Member (Program Assistant)
George Bob Nkulanga	Social Safeguards Specialist
Emmanuel Muligirwa	Environmental Safeguards Specialist
Irina Schuman	Lead Author, ICR
Renjit Cheroor Sukurman	Agri-business Specialist
Erkan Ozcelik	Economist
Ismail Oudra	Irrigation Engineer

**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>		
FY09	40.321	218,587.68
FY10	44.089	241,011.45
<b>Total</b>	<b>84.41</b>	<b>459,599.13</b>
<b>Supervision/ICR</b>		



FY10	11.350	75,762.34
FY11	40.376	175,849.22
FY12	24.230	117,824.76
FY13	24.087	151,276.47
FY14	21.963	137,696.54
FY15	23.790	150,516.96
FY16	19.648	105,568.63
FY17	33.596	120,368.43
FY18	23.359	131,688.51
FY19	12.129	78,261.20
<b>Total</b>	<b>234.53</b>	<b>1,244,813.06</b>

---



**ANNEX 3. PROJECT COST BY COMPONENT**

<b>Components</b>	<b>Amount at Approval (US\$M)</b>	<b>Actual at Project Closing (US\$M)</b>	<b>Percentage of Approval (US\$M)</b>
Component A: Capacity Development and Institutional Strengthening for Hillside Intensification	13.85	19.47	140.6%
Component B: Infrastructure for Hillside Intensification	20.75	102.08	492.0%
Component C: Implementation Through SWAp Structure	10.47	13.72	131.0%
<b>Total</b>	<b>45.07</b>	<b>135.23</b>	<b>300.0%</b>



ANNEX 4. EFFICIENCY ANALYSIS

1. This annex assesses the efficiency of the Project, by providing an ex-post economic and financial analysis (EFA) of related investments for 69,363 direct beneficiary households on 18,000 hectares of hillside areas, across 13 districts. By using the data on project outputs and outcomes, the EFA aims to determine whether the costs involved in achieving the project were reasonable in comparison with the benefits.<sup>30</sup> The analysis also looks at whether there is significant deviation from the original analysis, whether benefits are equitable, for on-farm and off-farm investments of the project, while considering changes to the project during implementation. The analysis benefited from the DIME reports, M&E reports, field visits and SPIU data.

2. Pre-investment. The *ex-ante* EFA at appraisal assessed the economic and financial aspects of all project activities bundled together, without distinguishing between the specific effects of each component activities. It focused on defining the expected key benefits, as follows: (i) on-site private benefits, (ii) downstream public benefits and (iii) global public benefits. A planned total of 4,822 hectares formed a part of the intervention area under the project, including 944 hectares of irrigated land, across 6 districts, with the participation of approximately 5,000-6,000 households. A total budget of USD 45 million spread equally across the targeted area would equate to around USD 9,300 per hectare.

3. The on-site private benefits included:

- (i) Increased value of production in non-irrigated areas;
- (ii) Increased diversification and increased value of increase in value of production in irrigated areas;
- (iii) Increased income from trees, shrubs, and grass grown in downstream reservoir protection areas;
- (iv) Avoided yield loss due to soil fertility degradation and spoil erosion;
- (v) Increased value of livestock production
- (vi) Increased employment opportunities
- (vii) Improved access to water.

4. Downstream public benefits included: (i) savings from the cost of sediment load removal and (ii) the reduction of capital cost of irrigation schemes. Global public benefits included carbon sequestration. Project costs at pre-appraisal totalled US\$45 million for a four-year period, inclusive of counterpart financing. The budget spread across the three components, as follows:

Components/Sub-Components	USD (million)	Percentage
A: Capacity Development and Institutional Strengthening for Hillside Intensification	13.85	31%
A1: Strengthening Farmer Organizations		
A2: Extension		

<sup>30</sup> The analysis does not however attempt a 'value for money' analysis since it would need more data on actual costs to compare with estimated costs at the sub-component and activity level.



Components/Sub-Components	USD (million)	Percentage
A3: Marketing and Finance		
A4: Institutional Strengthening and Capacity Building (MINAGRI+)		
B: Infrastructure for Hillside Intensification	20.75	46%
B1: Land Husbandry Infrastructure		
B2: Water Harvesting Infrastructure		
B3: Irrigation Infrastructure		
C: Implementation through Ministerial SWAp Structure.	10.47	23%
Total	45.07	100%

5. For Component B, the estimated lifespan for infrastructure investments was 25 years and 50 years for soil conservation measures, including radical terraces. After the project-end in year 5, the project assumed the government covering the maintenance and repair costs of the installations and used figures for the last year of the project as equal to the continued costs. The discount rate was 12 percent, as used to calculate the NPV and the financial and economic internal rate of return (FIRR/EIRR). The expected economic NPV for the entire project was US\$463 million over 50 years, and the economic EIRR was 29 percent.

6. Post-investment. After the project became effective in 2010, additional financing, from 2011 to 2014, increased the total project budget to US\$ 140.8 million.<sup>31</sup> The project closed on 29 June 2018, after the World Bank granted a 21-month extension to the previous closing date of 19 September 2016.

7. The ICRR team, at the time of the ICRR mission, received information from the original EFA at appraisal that included a guideline on the EFA, an explanation of the analysis and an annex in support of the PAD (without the excel modelling tables). The focus of the analysis at appraisal was, in any case, on coffee and plantain for irrigated crops, not the main crops that received support from the Project during implementation. Such a scenario is common in the case of value chain projects that find it difficult to predict the crops that remain in favour with the farmer during implementation.<sup>32</sup> Based on the data collected from the SPIU, past reports from implementation, the analysis builds also on the information gathered through the field visit aspect of the mission and interviews with farmers, farmer groups and organizations and local and project officials.

8. **Outcomes:** A key objective of the project was to increase the productivity of targeted areas (USD/ha) - of non-irrigated hillsides and irrigated areas – and to increase the commercialization of those areas. Improvements in productivity were expected to come from increases in yields, increases in cropping intensity and a shift to higher-value crops, while greater commercial integration with markets would increase valorisation of farmer produce. Land husbandry interventions such as radical and traditional terracing, silt traps, green cover coupled with improved farming methods benefiting from composting, improved seeds, water harvesting and new irrigation schemes all contributed to improved yields. In certain (irrigated) areas, the extension of the cropping season through irrigation contributed to

<sup>31</sup> Excluding government and local community contributions

<sup>32</sup> The team did not receive estimated costs of the project by component/sub-component at appraisal to compare with actual costs.





increasing the cropping intensity, while perennial tree crops and vegetables have increased the shift towards higher-value crops.

9. While the EFA at appraisal did not specifically analyze activities under component A - related to training and capacity building, farmer organisations and related water user associations (WUA) - such organisations have benefited from the project, as have SACCOs (Savings and Credit Cooperative Organisation). The Project has increased the flow of funds through WUAs (introduced to operate and maintain water schemes) for the collection of water fees and the transfer of funds for employment through the SACCO after the introduction of hillside irrigation. While the costs register under some form of capacity building under component A, the benefits are captured under the analysis for component B.

10. Farming seasons: there are three in Rwanda, named A, B and C, and spanning as follows:

- Season A, from September to February,
- Season B, from March to June and
- Season C, from July to September.

11. Season A and B are rainfed, while Season C is characterised as dry or a 'lean' period. According to the DIME end-line report, the impact of the project on commercialization was greatest in Season A, while the impact on harvest value was more significant in Season B, when compared to the control group and between seasons. The cropping pattern and cropping intensity of the crops at the farm level analysis reflects this in the modelling. Season C is characterized by irrigated farming since it coincides with the Rwanda 'dry' season.

12. Farm models: In total, six farm models attempt to capture the benefits of the Project from rainfed cereal farming across Seasons A and B to fruit and vegetable production in irrigated Season C. Data provided by the SPIU from the M&E system covers the period 2011-2018. The timing of the yield improvements suggests they originate primarily from radical and traditional terracing, and only secondarily from irrigation, since most of the water schemes entered completion during or after 2017. Additional benefits of the project include changes in the cropping pattern, signifying a shift from cereal crops (e.g. maize) to more commercial crops (e.g. Irish potato and beans) and irrigated crops (e.g. chilli, tree tomato, passion fruit, avocado and watermelon), made possible by the introduction of Season C.

13. Out of the 18,000 ha defined under the cultivated land of the Project, the majority is rainfed – roughly 14,000 ha. Improvements in productivity related to yield increases derive mainly from (radical and traditional) terracing, attributed to the retention of fertilizer and manure on flatter farmland, as well as a reduction in the loss of soil, and the use of improved seeds. To capture representative improvements by the project several crops were chosen based on the area cultivated and type - whether staple or cash crop - to arrive at the net incremental benefit of interventions. Key indicators to determine efficiency and performance are the FIRR at the crop level, NPV and BCR at the farm and project levels.

14. Financial Analysis. The crops analyzed include wheat, maize, soybean, climbing bean, potato, tomato, onion, chilli (bird-eye), chilli (hot pepper), bush bean, watermelon, sweet pepper, papaya, tree tomato, avocado and passion fruit. Some of these crops are grouped to represent typical farm-level activity, whether rainfed or irrigated, and to represent increases in cropping intensity and extension of



the agricultural season to include Season C. The analysis used parameters based on information from the SPIU and national statistics, as follows:

15. Crop Models. The financial analysis, for a small selection, of crop models included in the farm models are as follows:
  - Maize. A staple crop widely grown on rainfed, hillside areas of Rwanda, benefited greatly from terracing that led to significant improvements in yield, from 1.5 tons to 2.8 tons per hectare, during the years 2014 to 2017. The average yield figures are from the SPIU's M&E system. The analysis of maize per hectare finds that the FIRR is 22%, NPV is USD 285, the BCR is 1.38, and switching values are -28 percent for benefits and 38 percent for costs, discounted over a 20-year period.
  - Climbing beans. The commercial nature of this crop as both a nutritious supplement to family far diets and a cash crop makes it a common feature. The FIRR is 45 percent, NPV is USD 493, the BCR is 1.20, and switching values are -17 percent for benefits and 20 percent for costs.
  - Potato. The SPIU suggested that through terracing, potato experienced one of the highest increases in yields, from an average of 2 tons to 20 tons per hectare. While this figure changes invariably, the analysis used the baseline figure of 3 tons per hectare and 17 tons per hectare from the M&E tables. With this, the analysis found that for potato the FIRR is incalculable, NPV is in excess of USD 20,000, the BCR is 2.17, and switching values are -54 percent for benefits and 117 percent for costs. While the use of conservative figures in the FAO stat are possible as a baseline, the analysis attempts to remain consistent with the use of source data by referring to the baseline figures of 2009 and the M&E data gathered by the SPIU team. The high NPV value is unusual among the traditional rainfed crops and is testimony to the impact of terracing on productivity without the introduction of water and considered exceptional in this case.
  - Tomato. The improved availability of water through harvesting and the extension of the seasons appears to have emboldened farmers to undertake cultivation of tomato in the project area. While this is for still a small area of the project, since irrigation arrived later in the project, after terracing, there remains a strong case for soft fruits, such as tomato, with proximity to markets. While the FIRR returns a high figure, the NPV is records a modest figure of USD 394, the BCR at 1.24, and switching values are -19 percent for benefits and 24 percent for costs.
16. In general, the availability of water in Season C allows for the cultivation of irrigated, high-value crops. The higher NPV of these crops indicates the transformational nature of the project and captured in the farm models, where the cropping pattern changes. The table below summaries the preliminary data for the crop models.



Crop Models Summary Table

	Yields (kg/ha)			Gross revenue (USD/ha)			Benefits/ Costs	
	WOP	WP	Incram.	WOP	WP	Incram.	NPV @ 0.12 WP	WP
Wheat	400	800	100%	118	235	100%	-1	0.36
Maize	1,500	2,550	70%	494	840	70%	313	1.41
C.bean	800	1,500	88%	376	706	88%	221	1.16
Potato	3,000	17,000	467%	706	4,000	467%	14,142	2.01
Tomato	10,000	12,000	20%	2,353	2,824	20%	-92	1.22
Onion	8,000	9,500	19%	3,294	3,912	19%	103	3.96
W.melon	4,000	4,500	13%	4,706	5,294	13%	1,528	3.65
Chilli BE	9,750	10,000	3%	6,882	7,059	3%	686	3.08
B. bean	600	1,700	183%	212	600	183%	321	0.89
Soybean	600	1,500	150%	212	529	150%	1	1.01
Chilli HP	9,500	9,750	3%	6,706	6,882	3%	1,158	3.04
S.pepper	24,000	25,000	4%	8,471	8,824	4%	428	8.85
Papaya	12,000	16,000	33%	2,824	3,765	33%	374	3.08
T.tomato	14,500	17,000	17%	8,529	10,000	17%	471	3.39
Avocado	22,000	25,000	14%	5,176	5,882	14%	1,267	6.22
P.fruit	12,250	15,000	22%	8,647	10,588	22%	449	3.69

Source: SPIU, field visits and SAIP project document.

17. Farm models: The farm models capture the soft skills development of extension and the hardware benefits of new farming practices - both introduced by the project, including not only radical and traditional terracing but also other improvements in seedbed preparation, optimum seeding time, weed control and appropriate seeding rates.

18. Note: For irrigated crops, the ‘without-project’ base scenario does not include irrigation, since its introduction was a big part of the ‘with-project’ scenario that enabled certain farmers to change track from less valuable annual crops to perennial tree crops, after the cost, difficulty and risk of (not) bringing water to the field was effectively reduced. Instead, the cropping pattern captures and marks the transformational change where the farmer breaks from past practices. Taking this line of analysis moderates the level of change within the crop by factoring in the introduction of water and the improved farming practices only. While this may significantly reduce the level of benefits for some farmers, it also maintains a realistic scenario for those farmers already engaged in perennial or tree crops with the previously difficult access to water.

19. The ‘without-project’ base scenario is a snapshot of the current situation and does not assume the possibility a decline in productivity due to any lack of adaptive capabilities to climate change. This scenario is a real possibility as climate resilient strains and practices are utilised by fewer farmers than the ‘with-project’ scenario.

20. All farm models assume an area under cultivation of 0.3 hectares in the without and with project scenarios. While the cropping pattern element factors in an immediate change to crop harvested, the ‘learning curve’ at the crop budget level moderates the rate of change. The preliminary figures need further

21. Below is a summary table of the farm models using (financial data):



Farm Models Summary Table

	Net production value <sup>1</sup>			Total outflows			Cash-flow Before Labour			Return per hectare		
	WOP	WP	Incr.	WOP	WP	Incr.	WOP	WP	Incr.	WOP	WP	Incr.
<b>Model 1</b>	235	417	78%	191	333	74%	101	145	42%	338	482	42%
<b>Model 2</b>	292	1,271	335%	402	659	64%	-64	661	1133%	-213	2,205	1133%
<b>Model 3</b>	3,812	4,201	10%	945	1,361	44%	2,990	3,004	0%	9,965	10,013	0%
<b>Model 4</b>	1,097	1,569	43%	249	533	114%	860	1,059	23%	2,868	3,530	23%
<b>Model 5</b>	3,726	3,926	5%	1,451	1,500	3%	2,366	2,520	7%	7,887	8,402	7%
<b>Model 6</b>	128	1,271	893%	416	792	91%	1,710	1,714	0%	5,699	5,713	0%

	Return on family labour-day			Cash-flow after financing			Benefits/costs ratio		NPV @ 12%	
	WOP	WP	Incr.	WOP	WP	Incr.	WOP	WP	Before financing	With financing
<b>Model 1</b>	0	0	74%	44	84	91%	1.2	1.3	47	252
<b>Model 2</b>	-1	4	848%	-110	612	656%	0.7	1.9	3,709	4,138
<b>Model 3</b>	11	10	-5%	2,867	2,839	-1%	4.0	3.1	-107	702
<b>Model 4</b>	4	4	7%	848	1,036	22%	4.4	2.9	1,374	1,666
<b>Model 5</b>	13	14	3%	2,275	2,426	7%	2.6	2.6	527	1,868
<b>Model 6</b>	7	7	-6%	1,669	2,426	45%	0.3	1.6	-32	361

Source: SPIU, field visits and SAIP project document. Prices are constant 2018 market prices.

Note: Model 1: Maize and climbing beans, Model 2: Potato and climbing beans, Model 3: Domestic vegetable, Model 4: Domestic fruit, Model 5: Export vegetable and Model 6: Export Fruit

22. Efficiency. Project efficiency is a measure of how economically project resources are converted into results and is therefore related directly to economic analysis. In the case of the LWH, project efficiency was measured by attempting to assess: i) targets reached, ii) time taken for completion compared to time planned, iii) actual costs vs. those planned iv) actual cost of reaching each beneficiary and v) realization of economic outcomes estimated at appraisal.

23. The Project achieved and exceeded several quantitative and qualitative targets set in the results framework. The total number of hectares affected by land husbandry reached 21,648 ha, exceeding the original target of 19,940 ha, of which around 3,200 ha used ditches and forest technologies. In turn, terrace embankment protection with grasses and agroforestry trees was carried out on 8,261 ha and 7,342 ha, over an original target of 7,139 ha and 6,696 ha, respectively.

24. These changes to the landscape through terracing are reflected in yield improvement for rainfed crops which experienced substantial increases in yield per hectare. The analysis recognizes these substantial increases, yet in certain areas the figures are moderated in line with information from national statistics of Rwanda and not just information from the SPIU. In the case of potato, an average increase from 3 tons to 17 tons is used, instead of the purported 20-25 tons, for maize an increase from 1.5 tons to 2.6 tons is used instead of 4 tons. These increases are line with the anticipated increases at design that foresaw increases of 30 percent for traditional annual crops. Assuming that the terraces are well maintained, these changes will remain intergenerational, allowing for cost recovery and substantial value for money over a 20-year plus period, using a 20 percent adoption rate. The economic analysis uses the agricultural data to determine whether the returns are efficient. The EIRR is calculated at 55 percent, the NPV at USD 351 million and the BCR at 3.17, over a 20-year period, with a social discount rate of 8.4 percent. In this sense, the Project can be seen to offer value for money and as cost efficient. In turn, the FIRR was also calculated at 53 percent, the NPV at USD 221 million and the BCR at 2.76, using a financial discount rate of 12 percent, over a 20-year period.



25. Distribution analysis. The project generated large positive environmental benefits, as measured by the CO2 emissions reductions using the EX-ACT tool. Total emissions reductions equalled 427,674 tons over a twenty-year period. Environmental benefits as a percentage of total benefits equalled 21 percent, 60 percent and 75 percent for market, low and high shadow prices, respectively. These figures are in line with portfolio averages and regional targets of the World Bank. The EIRR returns a value of 110 percent when using the market price of carbon. Due to the high value return, an EIRR does not register for the low and high shadow prices. The NPV increases from USD 351 million without environmental benefits, to USD 480 million, USD 945 million and USD 1.508 billion when using the market, low and high shadow prices of carbon.

#### Environmental co-Benefits using EX-ACT tool

	<u>Market</u>	<u>Low</u>	<u>High</u>
NPV w ENV Benefits (USD)	480	945	1,508
EIRR w ENV Benefits (%)	110.4%	n.a.	n.a.
NPVb	654	1,119	1,682
NPVc	162	162	162
BCR ratio	4.05	6.93	10.41
Switching values - benefit	-75%	-86%	-90%
Switching values - cost	305%	593%	941%
ENV Benefits as a percentage of total	20.6%	59.7%	74.7%

26. Sensitivity analysis. The sensitivity analysis assessed the impact of the main risks for the project results and the adverse situations that may arise in terms of benefits and costs, without environmental benefits. The analysis reveals that even in the most severe scenario, where costs increase by 20 percent, benefits and prices both decrease by 20 percent, the EIRR maintains a positive return, above the 8.4 percent social cost of capital, at 27 percent, the NPV at USD 91 million and BCR at 1.43.

27. The analysis also tested for an increase in the social discount rate, to arrive at the break-even point of the project. The project NPV remains positive up to a point where SDR is 27.4 percent, suggesting robust results.

<u>Scenario</u>	<u>EIRR (%)</u>	<u>NPV</u> <u>(USD million)</u>	<u>BCR</u>
1. Base case	55	351	3.17
2. Costs overrun by 10%	51	327	2.77
3. Cost overrun by 20%	48	303	2.45
4. Decrease in benefits by 10%	51	299	2.85
5. Decrease in benefits by 20%	47	248	2.54
6. Both 3 and 5 occur	39	201	1.96
7. Scenario 3, 5 and prices decline by 20%	27	91	1.43
8. Scenario 7, plus increase in social discount rate to 20%	27	19	1.19
9. Scenario 7, plus increase in social discount rate to 27.4%	27	0	1.00



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

### *Comments from Borrower, conveyed by Mr. Patrick Karangwa, Director General of RAB*

We thank the World Bank team for the excellent ICR, which generally reflects our own perceptions of the project implementation. We want also to take this opportunity to thank the World Bank task team for the inestimable technical support from the time of LWH design, during implementation and at closing. The very good results of the Project are also to a significant extent fruits of the very good collaboration between the Bank and the implementation team, MINAGRI and RAB.

The ICR outlines a number of lessons derived from the Project, which were all very important and had a significant impact on the Project implementation and informed other policy decisions. We note for instance, the farmer-based extension approach through their Self-Help Groups which has transformed trained lead farmers into change agents who are influencing their community members not only in adopting good agriculture practices, but also in farming and marketing while organized in collective organizations. This approach, together with the land consolidation facilitated by LWH investments in irrigation and land husbandry development, has facilitated the increase of productivity and marketing of produce for the beneficiary farmers.

We note however areas that need to be adjusted to reflect the reality and the context. On page 16, footnote 19; it is said that “the agribusiness partners reported that a few of the storage facilities in the remote areas were not operational”. We suggest the last part be changed and say; “...were not fully operational”.

On page 21 and 22, about the quality of Monitoring and Evaluation, the ICR does not provide the rating of M&E quality at design, implementation and utilization although the overall rating is provided later on page 23. We would like to suggest that the rating be also provided for the M&E quality at the three different stages to understand better the origin of the substantial overall rating.

Finally, on page 25, paragraph 87; it is mentioned that there are still contracts uploaded in STEP but which fall short to cover all activities up to completion. We would like to inform that all tenders had all been documented up to completion stage in the STEP system by the end of the Project’s grace period.

These comments, and other small ones, mostly typos, were shown in the attached ICR version.

We thank you again for your continued cooperation.

### *Comments from USAID (co-financier), conveyed by Ms. Amy Beeler, Director of the Economic Growth Office, USAID Rwanda*

The ag team has reviewed the report and comments are extremely positive. The team found it very impressive that targets were achieved and over achieved [...].

Thank you for sharing this with us and again, the team felt the report and the results were commendable.



## ANNEX 6. BORROWER'S IMPLEMENTATION COMPLETION REPORT – A SELECTION OF SUCCESS STORIES

The Borrower ICRR was finalized in June 2018. For length considerations, it cannot be reproduced entirely in this Annex. What follows is a selection of Project success stories presented in the Borrower ICRR; these were edited for brevity and clarity.

### Box 4: Sustainability of farmer organizations: self-help groups

The Project helped its farmer beneficiaries record an increase in their crop production and productivity, leading to improved livelihoods and financial savings.

As a matter of evidence, success stories have been documented, as the case of Mrs. Mukagasangwa Merciane, see pictures below.

She is a 56 years old widow, living in Mugomero Village, Nyamiyaga cell, Kageyo sector, Gicumbi District. Since she was born, Mrs. Mukagasangwa had never slept on a mattress; this changed when the SHG she belonged to bought her one.

Their “Ibyiringiro” SHG has 14 members, including 9 women, all farming 2 ha of land. For many years, before the project intervention, Mrs. Mukagasangwa, like many other farmers, depended on traditional subsistence agriculture with poor yields, leading to widespread poverty and poor standards of life.

After the Project started, Mrs. Mukagasangwa’s life changed significantly: *“Life has never been the same since LWH started land husbandry works in our area. I am so happy because the Project has taught me better farming practices, which increased my yields. We have been organized in self-help groups, which have boosted my confidence. Before the project intervention in our area, I was living a poor life, because I had no income to sustain my family. I was mixing Irish potatoes, beans, yams, cassava and maize on 10 ares<sup>33</sup> and the yield was very low, and it couldn’t even satisfy my family. The little money I got from working for rich people in the area was used for buying food after finishing the little produce from my garden. Prior to project intervention, I used to harvest 100 kilograms of beans on 10 ares, but now I harvest 350 kilograms. We have enough food at home; we eat, and surplus is taken to markets. I no longer sleep on a hungry stomach. My family’s living condition has greatly improved, and now I can hope for a better future. I have bought two cows from the money I got from selling my produce. Even the moral advice I get from colleagues in Ibyiringiro self-help group plays a key role in social and economic wellbeing of my family”*, she said.

Most of the project beneficiaries recognized that their livelihood has changed like Mrs. Mukagasangwa did, and that they can now afford a decent standard of living (including access to electricity and clean piped water) since they have acquired hands-on experience by practicing good Agricultural Practices aiming at sustainable agricultural production. Apart from increasing agricultural production, most of these farmers were able to acquire Frisian cows that can cost each around RWF 300,000-400,000. Others have started piggeries and poultry businesses.

<sup>33</sup> 1 are is 0.01 ha





**Box 5: Sustainability of natural resource management through land husbandry and better agricultural practices**

LWH agricultural extension strategies focused on increasing production of crops by providing farmers with training, information, and access to balanced inputs, improved seed varieties and services. The project extension services model enabled farmers to acquire improved varieties of seed, fertilizers and other inputs, combined with targeted subsidies, to achieve higher yields.

Gicumbi site is one of the LWH intervention sites in the Northern Province, which lies in the sectors of Byumba, Kageyo, Mutete and Kisaro of the Rulindo District. It covers 700 ha of rain-fed agriculture. The site has engaged about 18,338 beneficiaries, of which 38 percent are women.

Before its development, this site was characterized by severe soil erosion and uncultivated area due to its hilly landscape; farmers were suffering from chronic poverty due to unproductive land and poor agricultural practices.

The Project introduced land husbandry terracing works that enabled farmers sustain cultivation and productivity on steep slopes; as a result, soil erosion reduced significantly, while marginal and unproductive lands turned back into productive crop fields, following the application of improved agricultural techniques, and of organic and inorganic fertilizers. Thanks to this, as well as to training and extension on sustainable agricultural technologies, post-harvest handling, marketing, business planning, compost making, tree nursery maintenance and financial saving, beneficiary farmers boosted their crop production and became able to supply surplus production to the local markets.

Interviews conducted onsite revealed how farmers' livelihoods have changed: *"Life has never been the same since LWH started land husbandry works in our area. I am expecting great yield this season because the project taught us better farming practices. We have applied fertilizers and improved seed varieties and the yield will be amazing"* said Florence Nyirahakizimana, one of the farmer project beneficiaries at the Gicumbi site.

Jean Claude Sekamana, another farmer at Gicumbi site, added: *"We were lucky to have LWH in our area. Traditional subsistence agriculture had affected our standards of living because we have been producing less than what our families would consume. This season I am expecting to harvest 600*





*kilograms of beans on 20 ares because the project taught us how to increase our yields by applying improved agricultural inputs”.*

Like many other farmers at the Gicumbi site, Mr. Theoneste Uwimana, a 42-year-old young man, was living a poor life until the Project introduced improved farming methods and better land management techniques. He learned to use improved seed varieties and apply fertilizers in his field, and his crop yields increased significantly.

Mr. Theoneste Uwimana recognized that his life changed dramatically after the Project intervened in his area. The financial income generated from the higher yields allowed him to study and graduate with a Bachelor of Science Degree in Rural Development at IPB Gicumbi (Polytechnic Institute of Byumba). With the help received from agriculture extension, he was able to increase his maize production to 4 tons, on the 2 ha he cultivated, and sell part of his output for RWF 800,000. He stated: *“We were equipped with numerous trainings to make better use of our land. We were taught how to make quality composts, which has been a lucrative business, and we generated higher incomes from compost. I made compost worth RWF 4,800,000, which enabled me to pay my tuition fees, as I was still a student at the university of IPB Gicumbi, doing rural development”.* Apart from crop farming, he is also involved in pig, cattle and poultry rearing.



(a) Gicumbi LWH project intervention site

(b) Cattle zero grazing at Uwimana’s farm

**Box 6: Increased savings through SACCOs**

Mrs. Adria Nyiramihare, a successful woman farmer in Bitega village, Murehe cell, Muyumbu sector, Rwamagana District, said that she has now more than RWF 5 million in her savings account at her SACCO. In her view, land husbandry technologies transformed her life after she received training on how to make her land more productive. She said: *“Initially I rejected LWH’s idea of terracing my land, because I thought the Project was going to destroy my crops; I couldn’t believe what they told us about better agricultural practices. I participated in the land husbandry works by constructing terraces with my fellow farmers and we were paid for the work done. It’s after a short period of time that I realized that the Project was a dream come true and a life saver in our area. Previously, none of my fellow farmers in the area had bank accounts, but now they opened accounts in SACCO, where we save incomes from the crop production sold. Members of our SHG are planning to start-up a new business activity in this area thanks to our increased crop production”.*



**ANNEX 7. THE PROJECT IN PICTURES<sup>34</sup>**

**1: Land husbandry – before, during and after radical terracing**



**2: Compost making**



<sup>34</sup> Courtesy of SPIU





**3: Farmers engaged in sustainable farming practices**



**4: The horticulture packhouse in Kigali**







**5: Kitchen gardens**



**6: Water harvesting infrastructure**





**7: The Muyanza model village houses with water, electricity, waste management and improved roads<sup>35</sup>**



<sup>35</sup> Built for some of the PAHs





## ANNEX 8. SUPPORTING DOCUMENTS

1. Country Assistance Strategy for the Republic of Rwanda for FY09-12, IDA, IFC, MIGA, August 7, 2008.
2. Country Partnership Strategy for the Republic of Rwanda for the Period FY14-18, IDA, IFC, MIGA, May 1, 2014.
3. Implementation Completion Report for the Land Husbandry, Water Harvesting and Hillside Irrigation (LWH) Project, Final Report, MINAGRI, June 2018.
4. Land Husbandry, Water Harvesting and Hillside Irrigation Project, Impact Evaluation Endline Report, World Bank Development Impact Evaluation Unit, June 22, 2018.
5. Land Husbandry, Water Harvesting and Hillside Irrigation Project, Impacts and Sustainability of Irrigation, World Bank Development Impact Evaluation Unit, April 2018.
6. National Agriculture Policy, Ministry of Agriculture and Animal Resources, July 2018.
7. Rwanda Vision 2020 (Revised 2012), Republic of Rwanda, 2012.
8. Rwanda Vision 2020, Ministry of Finance and Economic Planning, 2008.
9. Strategic Plan for Agriculture Transformation 4 (PSTA-4) 2018-2024, Presentation by Ministry of Agriculture and Animal Resources, 2017.
10. Strategic Plan for the Transformation of Agriculture in Rwanda – Phase II, Final Report, Ministry of Agriculture and Animal Resources, February 2009.
11. The Rwanda We Want: Towards Vision 2050, presentation by Claver Gatete, Minister of Finance and Economic Planning, Rwanda National Dialogue Presentation, December 16, 2016