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IMPLEMENTATION COMPLETION AND RESULTS REPORT

(IDA-49160/Grant-TF010214)

ON A

CREDIT

IN THE AMOUNT OF SDR 44.90 MILLION

(US\$70.00 MILLION EQUIVALENT)

AND A

GRANT

IN THE AMOUNT OF US\$14.25 MILLION

TO THE

REPUBLIC OF MOZAMBIQUE

FOR AN

MZ PROIRRI SUSTAINABLE IRRIGATION DEVELOPMENT

March 27, 2019

Water Global Practice
Africa Region

CURRENCY EQUIVALENTS

Exchange Rate Effective as of September 6, 2018

Currency Unit = New Mozambique Metical (MZN)

MZN 89.43 = US\$1

US\$1.44589 = SDR 1

FISCAL YEAR

January 1 – December 31

ABBREVIATIONS AND ACRONYMS

AGDPO	Agriculture Development Policy Operation
CARD	Coalition for Africa Rice Development Strategy
CPS	Country Partnership Strategy
DFID	Department for International Development
DNSA	National Directorate of Agricultural Services (<i>Direcção Nacional de Serviços Agrários</i>)
DUAT	Land Use Right (<i>Dereito de uso e Aproveitamento da Terra</i>)
EFA	Economic and Financial Analysis
EIRR	Economic Internal Rate of Return
ERRP	Emergency Resilient Recovery Project
ESMP	Environmental and Social Management Plan
FAO	Food and Agriculture Organization
FFSP	Fruit Fly Surveillance Plan
FM	Financial Management
GDP	Gross Domestic Product
GoM	Government of Mozambique
ICR	Implementation Completion Results and Report
IEG	Independent Evaluation Group
IFR	Interim Financial Report
INIR	National Irrigation Institute (<i>Instituto Nacional de Irrigação</i>)
IO	Irrigation Organization
IRRIGA	Smallholder Irrigated Agriculture and Market Access Project (<i>Projecto de Desenvolvimento de Irrigação de Pequena Escala e Acesso ao Mercado</i>)
ISR	Implementation Status and Results Report
M&E	Monitoring and Evaluation
MINAG	Ministry of Agriculture (<i>Ministério da Agricultura</i>)
MoU	Memorandum of Understanding
MTR	Midterm Review
NPV	Net Present Value
O&M	Operation and Maintenance
PA	Producer Association
PAD	Project Appraisal Document

PAPA	Food Production Action Plan (<i>Plano de Acção para Produção de Alimento</i>)
PCT	Project Coordination Team
PDO	Project Development Objective
PEDSA	Agriculture Sector Strategy (<i>Plano Estratégico de Desenvolvimento do Sector Agrário</i>)
PHRD	Policy and Human Resources Development
PNI	National Irrigation Program (<i>Programa Nacional de Irrigação</i>)
SCF	Standard Conversion Factor
TOR	Terms of Reference
WUA	Water User Association

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DATA SHEET

BASIC INFORMATION

Product Information

Project ID	Project Name
P107598	MZ PROIRRI Sustainable Irrigation Development
Country	Financing Instrument
Mozambique	Investment Project Financing
Original EA Category	Revised EA Category
Partial Assessment (B)	Partial Assessment (B)

Organizations

Borrower	Implementing Agency
Ministry of Economy and Finance	Instituto Nacional de Irrigacao

Project Development Objective (PDO)

Original PDO

Increase agricultural production marketed and raise farm level productivity in new or improved irrigation schemes in the Provinces of Sofala, Manica and Zambezia.



FINANCING

	Original Amount (US\$)	Revised Amount (US\$)	Actual Disbursed (US\$)
World Bank Financing			
IDA-49160	70,000,000	59,983,894	55,095,927
TF-10214	14,250,000	14,250,000	14,250,000
Total	84,250,000	74,233,894	69,345,927
Non-World Bank Financing			
Borrower/Recipient	0	0	0
Local Beneficiaries	7,900,000	7,900,000	1,200,000
Total	7,900,000	7,900,000	1,200,000
Total Project Cost	92,150,000	82,133,894	70,545,927

KEY DATES

Approval	Effectiveness	MTR Review	Original Closing	Actual Closing
17-Mar-2011	10-Dec-2011	17-Nov-2014	30-Jun-2017	28-Sep-2018

RESTRUCTURING AND/OR ADDITIONAL FINANCING

Date(s)	Amount Disbursed (US\$M)	Key Revisions
29-Aug-2012	4.04	Change in Financing Plan
21-Apr-2016	43.06	Change in Results Framework Change in Components and Cost Cancellation of Financing Change in Financing Plan Reallocation between Disbursement Categories Change in Institutional Arrangements
19-Jan-2017	54.69	Change in Loan Closing Date(s)
28-Jun-2018	55.10	Change in Loan Closing Date(s)

KEY RATINGS

Outcome	Bank Performance	M&E Quality
Moderately Unsatisfactory	Moderately Unsatisfactory	Substantial



RATINGS OF PROJECT PERFORMANCE IN ISRs

No.	Date ISR Archived	DO Rating	IP Rating	Actual Disbursements (US\$M)
01	21-Sep-2011	Moderately Satisfactory	Moderately Unsatisfactory	1.45
02	02-Jun-2012	Moderately Satisfactory	Moderately Satisfactory	2.16
03	31-Mar-2013	Moderately Unsatisfactory	Moderately Satisfactory	5.63
04	09-Jul-2013	Moderately Satisfactory	Moderately Satisfactory	8.88
05	20-Mar-2014	Moderately Satisfactory	Moderately Satisfactory	21.29
06	06-Jul-2014	Moderately Unsatisfactory	Moderately Satisfactory	21.29
07	06-Feb-2015	Moderately Satisfactory	Moderately Satisfactory	31.54
08	15-Oct-2015	Moderately Satisfactory	Moderately Unsatisfactory	43.27
09	26-May-2016	Moderately Satisfactory	Moderately Satisfactory	59.79
10	27-Dec-2016	Moderately Satisfactory	Moderately Satisfactory	65.19
11	22-Jun-2017	Moderately Satisfactory	Moderately Satisfactory	66.62
12	04-Jan-2018	Moderately Satisfactory	Moderately Satisfactory	68.62
13	05-Oct-2018	Moderately Satisfactory	Moderately Satisfactory	69.35

SECTORS AND THEMES

Sectors

Major Sector/Sector	(%)
Agriculture, Fishing and Forestry	93
Crops	16
Irrigation and Drainage	61
Public Administration - Agriculture, Fishing & Forestry	16



Industry, Trade and Services	7
Agricultural markets, commercialization and agri-business	7
Themes	
Major Theme/ Theme (Level 2)/ Theme (Level 3)	(%)
Private Sector Development	10
Public Private Partnerships	10
Finance	14
Finance for Development	14
Agriculture Finance	14
Urban and Rural Development	86
Rural Development	86
Rural Markets	23
Rural Infrastructure and service delivery	63

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I. PROJECT CONTEXT AND DEVELOPMENT OBJECTIVES

1. CONTEXT AT APPRAISAL

1. Mozambique experienced a sustained period of strong economic growth that started after the end of the civil war in 1992. The growth of the country's gross domestic product (GDP) from 1993 to 2009 averaged 8 percent. During the same period, agricultural growth was consistently above the New Partnership for Africa's Development's 6 percent growth target. These remarkable achievements in economic growth, notwithstanding, poverty which is disproportionately rural, remained a major challenge that is inextricably linked to agriculture and extreme weather events. The performance of the agriculture sector was characterized by low productivity because of multiple factors, including underinvestment in irrigation and new technology, low adoption rates of existing productivity-enhancing agricultural technologies, inadequate provision of agricultural services,¹ and limited access to financial services. While poverty had fallen, overall, more than half of the population still lived below the national poverty line. According to data from household surveys, the national poverty headcount fell from 69 percent to 54 percent from 1996 to 2003 but stagnated at around 55 percent of the population with rural poverty increasing to 57 percent, whereas urban poverty declined to 50 percent in 2008–2009. The increased poverty rates observed in Sofala and Manica, for example, was in part because of the harvest losses resulting from extreme weather events (droughts and floods).²

2. Increasing vulnerability to extreme weather events remains a significant barrier to inclusive growth. As much as 58 percent of the population, mostly involved in subsistence agriculture, and more than 37 percent of GDP are at risk of two or more weather hazards. Therefore, climate is likely to further exacerbate low productivity of major commodities. A climate change model developed for Mozambique as part of the preparation of the Strategic Program for Climate Resilience shows that the net average crop yield for the entire country is lower relative to baseline yield without climate change. It was estimated that climate change would lead to a 2–4 percent decrease in yields of major crops, with larger yield decreases especially in the central region. With increasing vulnerability and uncertainties of rainfed agriculture, access to water and irrigation would become an even more important determinant of land productivity, the stability of yields, and the adaptation to the effects of climate change.

3. In keeping with the new irrigation strategy adopted in 2010, the Government of Mozambique at the time of project appraisal pushed for increased use of irrigation to build a resilient production system and intensify agricultural practices for improved food security and broad-based economic growth. The project would help improve productivity by expanding access to irrigation and other complementary inputs such as improved technologies, seed, fertilizer, equipment, extension services, and capacity building and strengthening horizontal and vertical coordination among value chain actors. There is empirical evidence that coupling irrigation³ with improved seed and fertilizer raises output through higher yields and cropping intensity and stabilizes production, all of which contribute to lower poverty. Improved productivity is also a precondition for participation in the output market because beneficiaries would

¹ About 8 percent of agricultural exploitations received extension services in 2008 (*Trabalho de Inquérito Agrícola -TIA 2008*).

² Project Appraisal Document (PAD) page 1.

³ Irrigation systems help secure necessary soil moisture for efficient inorganic fertilizer use and improved seed varietal growth (Yilma and Berger. 2006. "Complementarity between Irrigation and Fertilizer Technologies - A Justification for Increased Irrigation Investment in the Less-Favored Areas of SSA." Contributed paper prepared for presentation at the International Association of Agricultural Economists Conference, Gold Coast, Australia, August 12–18, 2006).



generate marketable surplus. This was consistent with the World Bank's longstanding support to Mozambique in stimulating a more diversified and inclusive economic growth that is resilient to shocks. The Government would also benefit from the World Bank's global experience in irrigation development. Lastly, the project leveraged resources from the Japanese Policy and Human Resources Development (PHRD) Fund grant to support the rice business line in the context of the Coalition for Africa Rice Development Strategy (CARD).⁴

Theory of Change (Results Chain)

4. The project sought to promote market-oriented smallholder production by simultaneously facilitating the generation of marketable surplus through improved productivity and better market access, among others. Recognizing that access to irrigation raises output through higher yields and cropping intensity and stabilizes production, the project would rehabilitate the irrigation infrastructure identified and designed through a participatory approach jointly by the National Irrigation Institute (*Instituto Nacional de Irrigação*, INIR) and water user associations (WUAs) under Component 1. By improving the irrigation infrastructure, the project intended to increase the land area under irrigation thereby reducing uncertainties in rainfed agriculture. The project would address constraints faced by farmers in accessing complementary inputs and technologies including improved seed, fertilizers and agrochemicals, machinery, and extension services—all of which would contribute toward increased local production of rice and horticulture and reduce the dependency on food imports (especially for rice)—as envisioned in the country's Food Production Action Plan (PAPA). The project also sought to promote better integration of smallholder farmers with markets and access to services by strengthening both vertical (out-grower schemes) and horizontal coordination (farmers organization) and providing matching grants to build value chain links. These interventions will lower transaction costs and address constraints faced by individual farmers through collective action thereby contributing to income gain and rural poverty reduction. It will also ensure that smallholder farmers participate in the inclusive agribusiness and economic development along the Beira Corridor.

5. At the institutional level, the project will strengthen institutions (INIR, extension, service providers, and WUAs); promote participatory identification and design of schemes, including the enabling environment for overall management of the schemes such as service delivery, water allocation, and delivery to farmers' field; participatory planning; operation and maintenance (O&M) of irrigation infrastructure; and the collection of water user charges. This would be achieved by (a) the development of a National Irrigation Program (PNI) embedded in the Agriculture Sector Strategy (PEDSA) and in the post-compact investment programs under the country's Comprehensive Africa Agriculture Development Program agenda, (b) development of a legislation for the establishment of the WUA and capacitating them to perform the O&M responsibility, and (c) the establishment and strengthening of an agency with oversight of irrigation management. With delivery of adequate amount of water to the field by INIR, water availability would improve cropping intensity and coupled with other complementary inputs, the overall productivity of the crops grown would be ensured. The sustainability of which would depend on O&M cost recovery. The critical assumptions underlying the theory of change are the following: (a) water will be available at the right time for farmers to irrigate all year round; (b) improved seeds, fertilizers, and

⁴ CARD is an alliance between the Japanese Government and the Alliance for a Green Revolution in Africa in 2008. CARD is comprehensive initiative that supports the efforts of African countries aiming at doubling African rice production within 10 years. It also forms a consultative group of donors, research institutions, and other relevant organizations to work with rice-producing African countries



technologies will be available in right quantities and quality; (c) matching grants will relax credit constraints and nudge farmers to adopt improved technologies and management practices; (d) farmers will be willing to adopt collection action and capacity-building support to the WUAs will engender better O&M of the infrastructure; (e) vertical integration will promote greater market participation; (f) productivity improvement and the direct income benefits to farmers from obtaining irrigation will provide incentive for full cost recovery of the recurrent costs of the services provided; and (g) PNI will crowd in private investment and the newly created agency will manage the irrigation facility jointly with the WUAs.



Figure 1. Theory of Change

	Activities		Outputs		Outcomes		Impacts
Component 1	<ul style="list-style-type: none"> Develop, implement PNI Establish a national irrigation agency Adopt legislation, regulatory framework for WUAs, and management of irrigation sites Develop portfolio of irrigation investments Strengthen public/private extension services Implement national fruit fly surveillance plan (FFSP) Create and strengthen irrigation organizations (IOs) Establish producer associations (PAs) 	→	Technical assistance (TA) and training to Ministry of Agriculture (<i>Ministério da Agricultura, ex-MINAG</i>) to <ul style="list-style-type: none"> Strengthen its institutional and technical capacity for irrigation development Build farmers' irrigation capacity and implement a participatory process for planning, developing, and managing irrigated agriculture 	→	PDO 1. Increase agricultural production marketed <ul style="list-style-type: none"> Increased proportion of agriculture production sold PDO 2. Raise farm productivity in new or improved irrigation schemes <ul style="list-style-type: none"> Increased crop yield Increased cropping intensity in horticulture and rice-based irrigation systems 		Transform subsistence smallholders into market-led agricultural entrepreneurs, boosting productivity, improving food security, increasing farmer incomes, and reducing rural poverty.
Component 2	<ul style="list-style-type: none"> Rehabilitate/construct irrigation and drainage infrastructure and enabling infrastructure Implement safeguards instruments 	→	Rehabilitation, construction, and operationalization of <ul style="list-style-type: none"> 3,000 ha of medium-scale rice irrigation schemes 1,200 ha of value chains out-grower irrigation schemes 	→			
Component 3	Establish catalytic funding for beneficiaries through cost-sharing grant to support production (seeds and fertilizers) and post-harvest activities (farm machinery, greenhouse, product processing, storage, marketing, transport)	→	Catalytic funding to support production and post-harvest activities to promote value chain development	→			



2. PROJECT DEVELOPMENT OBJECTIVES

PDO

6. The Project Development Objective (PDO) of PROIRRI (Projecto de Desenvolvimento de Irrigação Sustentável) was to increase agricultural production marketed and raise farm productivity in new or improved irrigation schemes in the Provinces of Sofala, Manica, and Zambezia.

Project Beneficiaries

7. The project primary beneficiaries were 16,000 farmers spread across the Central Mozambique Provinces of Manica, Sofala, and Zambezia. The indirect beneficiaries were estimated to be 80,000.⁵

8. Other stakeholders who were expected to benefit from the project's capacity building were (a) 50 government officials at the central, provincial, and district levels; (b) 80–100 district extension staff; (c) 100 local service providers; (d) 100 value chain actors in storage, product transformation, and transport segments; and (e) training staff and students.

Key Expected Outcomes and Outcome Indicators

9. The expected development outcomes and key performance indicators as elaborated in the PAD's Annex 3 (Results Framework, Monitoring and Evaluation) are as follows:

1. **Outcome/Objective 1.** To increase agricultural production marketed. This outcome was to be measured by outcome indicator 'percentage increase in proportion of agriculture production sold' for rice and horticulture relative to the baseline.
2. **Outcome /Objective 2.** Raise farm productivity in new or improved irrigation schemes. The key performance indicators were:
 1. Average yield increases for rice; potato; and horticulture (tomatoes, onion, and cabbage) (ton/ha) and
 2. Average increase in cropping intensity for rice and horticulture (# of harvest/year).

3. COMPONENTS

Component 1: Institutional Capacity Development and Participatory Irrigation Management (Appraisal US\$17.1 million IDA Credit and US\$5.0 million PHRD; at Implementation Completion and Results Report [ICR] US\$9.51 million IDA Credit and US\$3.2 million PHRD Grant)

10. This component had two subcomponents: (a) enhancement of the enabling environment and building irrigation capacity and (b) participatory identification, planning, development, and management of irrigation schemes. Subcomponent 1 financed the (a) development and implementation of the PNI; (b)

⁵ There is a discrepancy in the PAD. While Section IIB correctly states the number of beneficiaries (16,000 direct and 80,000 indirect), the results framework in Annex 1 includes an incorrect breakdown of 16,000 households, 80,000 individuals, and 33 percent women.



establishment of a dedicated national irrigation agency (INIR), (c) preparation of a legislation for the WUAs and the transfer of O&M of schemes/management of irrigation sites; (d) development of a portfolio of follow-up investment operations in the irrigation subsector; (e) strengthening of public and private extension services; and (f) implementation of the national FFSP. Subcomponent 2 supported the (a) creation and/or strengthening of IOs and (b) establishment of PAs and facilitation of expanded access to a variety of improved production and post-harvest technologies, the development of savings and loans, and building PAs' and IOs' capacity in financial literacy and business management. The outputs of this component were intended to result in better planning and development of public irrigation infrastructure and increase in irrigation efficiency (O&M).

Component 2: Investments in Irrigation Systems and Support Infrastructure (Appraisal US\$41 million IDA Credit, US\$7.6 million PHRD Grant and US\$6.7 million from beneficiaries; at ICR US\$35.7 million IDA Credit and US\$9.4 million PHRD Grant)

11. This component financed (a) the rehabilitation/construction costs of eligible schemes and other immovable irrigation and drainage infrastructure (weir construction, main and secondary canal construction, scheme buildings, and so on); (b) the costs associated with the implementation of the safeguards instrument; and (c) provision of supportive infrastructure such as electricity, flood protection dykes, earth embankments, and connecting last mile road.

Component 3: Cost-sharing Grant for Market-led Production and Value Chain Development (Appraisal US\$4.8 million IDA Credit; US\$1.65 million PHRD Grant; beneficiaries' contribution US\$1.2 million; at ICR US\$2.76 million IDA Credit; US\$1.65 million PHRD Grant; beneficiaries' contribution US\$1.2 million)

12. This component supported the provision of financial resources, through a matching grant, to smallholder farmers and micro and small entrepreneurs (value chain actors) for the adoption of agricultural inputs and productive assets, on a demand-driven basis. The project grant would serve as the much-needed working capital to purchase better seeds and fertilizers and for post-harvest value addition activities. The grant was provided conditional on meeting clearly defined eligibility criteria (annex 2 of the PAD) and consisted of two windows. Window 1 was meant to cover production startup support such as seeds and fertilizer start-up kit. Window 2, on the other hand, would cover (a) equipment for example, farm machinery and greenhouse and (b) value chain development, for example, product processing, storage, marketing, and transportation.

Component 4: Project Management and Coordination (Appraisal US\$4.3million IDA Credit; at ICR US\$7.12 million)

13. This component financed the establishment and operation of a semi-integrated project coordination team (PCT) domiciled in MINAG/National Directorate of Agricultural Services (DNSA) and composed of recruited individual consultants (including for project management, procurement, and financial management [FM]) as well as technical specialists from the relevant central- and provincial-level directorates.



4. SIGNIFICANT CHANGES DURING IMPLEMENTATION (IF APPLICABLE)

Revised PDOs and Outcome Targets

14. The PDO of the project was not changed. However, when the project was restructured in April 2016, the outcome targets for PDO indicators 3 and 4 were revised to take into account the beneficiaries' own consumption in the output of rice and vegetables produced and match the outcome targets of beneficiaries with the reduced scope of project activities. Also, the target for outcome indicator 'increase in proportion of agriculture production sold' for the rice business line was reduced from 100 percent to 75 percent. Likewise, the number of direct was reduced from 16,000 to 6,000.

Revised PDO Indicators

15. The PDO indicators were also not revised. However, the formulation of sub indicator 2 for PDO 3 was changed from horticulture to vegetable producer as part of Level II restructuring carried out in 2016.

Revised Components

16. The original project components remained unchanged. However, the partial cancellation of IDA led to an adjustment in component allocation (Table 1). While fund allocations to Components 1 and 2 were reduced, allocation to Component 4 increased by about 61 percent, while that of Component 3 remained unchanged. Because of these adjustments, the scope of some activities was reduced, but most of the corresponding intermediate indicators were revised upwards as detailed in the following paragraphs.

Component 1 - Capacity Development and Participatory Irrigation Management

17. The amount allocated for this component was reduced from US\$17.10 million to US\$12.5 million and the target for 7 out of the 10 intermediate indicators for this component were revised as follows:

1. Number of Memoranda of Understanding (MoUs) signed with local agriculture institutions increased from 5 to 9.
2. Client training days were reduced from 19,660 to 7,400 proportionate to the reduced number of beneficiaries.
3. IOs supported by the project with at least 90 percent recovery of the O&M costs was reduced from 220 to 32 because the project only rehabilitated 32 schemes covering 3,000 ha. At appraisal, it was estimated that, on average, a scheme size would be 25 ha. However, the actual size of the schemes rehabilitated averaged 90–95 ha, thus reducing the overall number of schemes.
4. The target for indicator measuring the number of IOs established and operating—of which there are women in the management committee—was reduced from 220 to 32 schemes.
5. Number of technologies demonstrated in the project areas was increased from 5 to 9.



6. Smallholder producers, supported by the project, that market as a group was increased from 50 percent to 90 percent.
7. Target producers who are members of associations disaggregated by gender—this indicator was revised to increase the end target from 70 percent to 90 percent.

Component 2 - Investments in Irrigation Systems and Support Infrastructure

18. Total IDA allocation for this component was reduced from US\$41.00 million to US\$35.70 million. As a result, the corresponding targets for the intermediate indicators were adjusted as follows: (a) target for area equipped with irrigation and drainage infrastructure (by business line) and operational was reduced from 5,500 to 3,000 and (b) producers provided with irrigation and drainage services reduced from 15,800 to 5,000 given that only 3,000 ha was developed, and each beneficiary had on average a plot size of 1.6 ha compared to the appraisal estimate of 0.2–0.5 ha per beneficiary.

Component 3 - Cost-sharing Grant for Market-led Production and Value Chain Development

19. No changes were made to the fund allocated to this component. IDA was US\$4.8 million IDA Credit; and the PHRD Grant and beneficiaries' contribution were US\$1.65 million and US\$1.2 million respectively. The target for beneficiaries with subprojects approved (by grant window, business line, and gender) was revised from 8,000 to 5,000 beneficiaries.

Component 4 - Project Management and Coordination

20. The allocated amount increased from US\$4.3 million to US\$7.0 million because of cost overruns related to additional activities not envisaged at appraisal (Government ICR, paragraph 56). The additional activities included all preparatory work for the follow-on project, Smallholder Irrigated Agriculture and Market Access Project (IRRIGA). PROIRRI was used to fully fund all preparatory activities.

Table 1. Revised Allocation by Component, IDA Credit

Component Name	Original Allocation (US\$, millions)	Revised Restructuring (US\$, millions)	Remarks
Institutional Capacity Development and Participatory Irrigation Management	17.10	12.50	Revised
Investment in Irrigation Systems and Support Infrastructure	41.00	35.70	Revised
Cost-sharing Grant for Market-led Production and Value Chain Development	4.80	4.80	No Change
Project Management and Coordination	4.30	7.00	Revised
Unlocated	1.18	0	Revised
Project Preparation advance	1.62	0	Revised
Total:	70.00	60.00	

Other Changes



21. In addition to changing the outcome targets and revising allocation by component, other changes made during project implementation are described in the following paragraphs.

22. **Restructuring of the Financing Agreement.** The project was designed to be co-financed by the PHRD grant. However, the PHRD grant became available after the IDA Credit was approved by the Board. Following the approval of the PHRD, a restructuring was undertaken on May 21, 2012 and the Financing Agreement of the project was amended in August 29, 2012 to reflect the new PHRD fund that had become available and the financing percentage between IDA Credit and the PHRD grant. The restructuring also covered introduction of additional provisions to the National Competitive Bidding procedures and clarification of some aspects of the project that included changes to definition of key terms.

23. **Partial cancellation and reallocation of proceeds.** The second restructuring of the project, which was carried out in April 2016, included partial cancellation of the IDA Credit in the amount of US\$10 million equivalent (SDR 7,095,620) that was reallocated to the Emergency Resilient Recovery Project (ERRP) (P156559). The cancelled amount was used to leverage an additional US\$40 million IDA Credit to respond to the devastating flooding from January to March 2015. Resources reallocated to the ERRP were used to rehabilitate 700 ha in two irrigation schemes destroyed by the floods in the Zambezia Province as well as the construction of 15 km of roads and 18 km of electric power line connecting these schemes to the regional markets and the national grid, respectively. It also included the rehabilitation of 10.8 km of dykes out of a total of 35 km under rehabilitation to protect rehabilitated schemes from the impact of floods. The counterfactual scenario would have created a bigger negative impact on PROIRRI and the agriculture space. Other changes that accompanied the restructuring were the following:

1. Reallocation of IDA and PHRD grant among components and categories.
2. Revision of IDA Credit and PHRD financing percentages. IDA Financing percentage for the rice business line was increased from 34 percent to 50 percent and that of the PHRD decreased from 66 percent to 50 percent.
3. Revision of disbursement estimates to account for the delayed implementation and the cancelled amount.
4. Change of host institution for the PCT and redeployment of all staff of the Department of Hydraulics from the DNSA to the newly created INIR.
5. Replacement of the DNSA with INIR on the National Steering and Technical Committee extension of project closing date.

24. **Implementation and other delays, as well as safeguards compliance, necessitated no-cost extension of the project's closing dates twice.** The first extension was carried out in January 2017 and the closing date was extended for 12 months (from June 30, 2017, to June 29, 2018). The second extension of the closing date was done in June 2018 and was for three months (June 29, 2018, to September 28, 2018). The extension of closing was sought to

1. Complete the construction of irrigation schemes, which, on average, took 20 months from bidding to handing over of completed schemes to beneficiaries. As expected, rehabilitation of rice-based schemes took more time because of the relatively long cycle of the



development path (PAD paragraph 40)—about 25 months, followed by horticulture (22 months) and out-grower business lines (19 months);⁶

2. Conclude the implementation of training on the use and maintenance of the irrigation infrastructure; and
3. Implement remedial actions identified under the Environmental and Social Management Plans (ESMPs).

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

25. Four Level II restructurings were undertaken with the following rationale: (a) the first restructuring was because of the delayed approval of the PHRD grant and the need to change fund allocations and financing percentage; (b) the second restructuring involved partial cancellation of the IDA Credit to access US\$30 million from the crisis response grant window in response to the 2014 flood disaster that destroyed irrigation infrastructure; and (c) the third and the fourth restructurings were extension of closing date to provide additional time for completion of construction/rehabilitation works. These changes made during the lifetime of the project did not have implications on the theory of change because the project activities remained unchanged. However, the scope for some project activities were reduced, which only lowered the magnitude of gains that could have been achieved. For example, the amount of land to be equipped with irrigation infrastructure was reduced, but the result pathway remained as was initially appraised. The rationale for the partial cancellation of the IDA Credit in the amount of SDR 7,095,620 (US\$10 million equivalent) could be justified on the need to mitigate the impact of the 2014 floods and improve the response capacity of the Government of Mozambique (GoM) to disaster in the Zambezia and Nampula Provinces. The 2014 flood had a negative impact on the project implementation trajectory. The project sites were inaccessible because of the inundation of the areas by floods, which caused several months of delays to the rehabilitation works being carried out by PROIRRI. The ERRP (P156559) was meant to restore agricultural production and provide flood protection and water supply infrastructures that were climate proof and resilient to the disaster-affected provinces.

II. OUTCOME

RELEVANCE OF PDOs

Assessment of Relevance of PDOs and Rating: High

26. The objectives of the project remain highly relevant to the World Bank's assistance and partnership strategies designed to support the Poverty Reduction Strategy Paper; Strategy for Irrigation Development; and the current development priorities of the GoM elaborated in PAPA, PEDSA, and Agriculture Sector Investment Plan (*Programa Nacional De Investimento Do Sector Agrário*). The objectives of the project also align with the objectives of the GoM for growth and poverty reduction, which are outlined in the Five-year Plan of the Government for 2015–2019 (*Programa Quinquenal do Governo 2015–2019*). The plan emphasizes the need for achieving poverty reduction and inclusive growth. Achieving these would require improving agricultural productivity because of its strong impact on poverty

⁶ For instance, Nhamandembe (25 ha – out-growers), Piscina (56 ha - Horticulture), and Muche (74 ha - Horticulture) to 15 months from bidding to handover. Whereas for Namadembe the bid was launched in August 2013, construction was awarded in December 2013, construction was completed in September 2015, and it was handed over to beneficiaries in November 2015.



reduction. Admittedly, the country's inclusive growth prospects largely depend on agriculture which supports 80 percent of the population.

27. The objectives were consistent with the goals outlined in the Country Partnership Strategy (CPS) for FY12–FY15 (#104733-MZ) with two pillars directly linked to agriculture—Pillar 1 (Competitiveness and Employment) and Pillar 2 (Vulnerability and Resilience) and Pillar 3 linked to sustainable water management and broad-based growth. PROIRRI was identified in the CPS to contribute directly to the following objectives of the CPS: (a) an improved regulatory environment through development of legislation and regulatory framework for irrigation governance and management, (b) increased crop yields and overall productivity, (c) improved sustainable management of water resources, and (d) increased access to technologies and extension information. The objectives of the project remain relevant to the Systematic Country Diagnostic priorities and the Country Partnership Framework (CPF) for FY17–FY21 Focus Area I on promoting diversified growth and enhanced productivity and Objective 2, which is centered on improving agricultural growth.

28. The objectives of the Project were relevant to other programs included in the CPF of the World Bank. The project provided support that was complementary to the institutional and policy reforms under the Agriculture Development Policy Operation (AGDPO) series. Support from the World Bank's PROIRRI and other donors accelerated the issuance of certificates of delimitation to communities across the country and land use rights (*Dereito de Uso e Aproveitamento da Terra*, DUATs) to registered associations. Policy reforms related to irrigation management and DUAT were also covered.

29. The Project's objective of improving irrigation efficiency remains highly relevant in view of increasingly important efforts to make agriculture in Mozambique more resilient to the effects of climate change, as evidenced in the follow-on project, IRRGA. Because the objectives of PROIRRI were highly relevant at appraisal and remained relevant to the transformation agenda for agriculture, IRRGA would continue to focus on expanding irrigable areas⁷ and support beneficiaries to improve productivity and, at the same time, improve their access to both input and output markets.

ACHIEVEMENT OF PDOs (EFFICACY)

30. Achievement of the PDO was to be measured by the following outcome indicators, including (a) average crop yield (mt/ha); (b) average cropping intensity; (c) increase in proportion of agriculture production sold; and (d) direct project beneficiaries (of which is female and total number of households). The average targeted crop yield for tomato, potato, onion, and cabbage were met and surpassed while the average rice yield was substantially achieved—at 3 tons per ha, or 75 percent of the target. Similar pattern was observed for cropping intensity. The average cropping intensity for tomato, potato, onion, and cabbage were exactly achieved (average of two harvest per year), but rice remained at one harvest per year, against a target of 1.5 harvests per year. The proportion of agriculture production sold for vegetable producers was substantially achieved: 80 percent compared to 90 percent target, whereas for rice producers, only 57 percent of what was produced were sold against the 100 percent original target and the 75 percent revised target. The total number of beneficiaries was 6,779 compared the 16,000 originally targeted and to the 6,000 revised targets. The project surpassed the target for the proportion of women beneficiaries (52 percent against 33 percent target).

⁷ IRRGA will equip an additional 3,000 ha with irrigation infrastructure and will also cover schemes rehabilitated by PROIRRI.



Assessment of Achievement of Each Objective/Outcome

31. **Objective 1: Increasing the proportion of agricultural production sold.** The proportion of agricultural production sold for rice and horticulture business line was 57 percent for rice (compared to the original 100 percent and revised 75 percent targets) and 80 percent for horticulture (compared to 75 percent target). This increased level of commercialization was achieved because of Project interventions that reduced transaction cost or entry barriers to the market. The Project promoted collective action and vertical coordination that reduced transaction costs (access to market information and attractiveness of farmers group as out-grower) and improved economies of scale for beneficiaries who are members of an association and those who practiced group marketing. The Project's support to building market links through buyer's conference and out-growers helped match buyers' need with farmers' production, thereby contributing to increased proportion of produce sold. Compared to the 90 percent target, 100 percent of the targeted producers were members of an association and 80 percent of them sold their produce as a group. The level of commercialization was higher for horticulture than rice because horticulture is more likely to be produced for the market and be part of the out-grower contracts. For instance, in irrigation schemes where farmers were linked to vegetable buyers through outgrowing contracts, farmers harvested baby corn up to three times per year and the average use of irrigated areas was 72 percent.

32. Another precondition for participating in the output market is the generation of marketable surplus which would come from equitable access to water for irrigation through area equipped with irrigation and drainage services (2,588 ha) and other complementary productivity-enhancing technologies, that all together lead to yield increase through intensification. The institutional reform contributed to improved access to water which enabled intensification and yield improvement thereby contributing to generable of marketable surplus. Other factors that contributed to improved market access were (a) capacity strengthening of the district extension officers which help expand access of beneficiaries to market information, better agronomic practices, and advisory services⁸ and (b) adoption of post-harvest technologies that directly reduced post-harvest losses and improved product quality such as grading, use of scale, use of thresher in the case of rice and other supply chain, and transport logistics equipment such as the acquisition of trailer.⁹ Overall, project interventions that strengthened vertical coordination and social network/capital among beneficiaries contributed to improving the level of integration to the market.¹⁰

33. **Objective 2: The objective of raising farm-level productivity in new or improved irrigation schemes was to be measured by two indicators: (a) yield increase and (b) cropping intensity.** The target yield for horticultural crops (tomato, potato, onion, and cabbage) was achieved and exceeded and the reported yield of 3 tons per ha for rice was below the target of 4 tons per ha. Similarly, the target for the

⁸ In the Development Impact Evaluation (DIME) report, it was stated that PROIRRI association were visited more by extension staff and this was reflected in very high level of satisfaction with extension services (90 percent compared 70 percent target) among beneficiaries. There is also evidence that Sofala and Zambezia Provinces benefited from a large World Bank–Government of Mozambique investment to support the development of the extension network (IRRGA) and had adopted several sustainable land management practices (Florence Kondylisa, Valerie Mueller, and Jessica Zhuc. 2017. "Seeing is Believing? Evidence from an Extension Network Experiment." *Journal of Development Economics* 125: 1–20).

⁹ In a recent Independent Evaluation Group (IEG) performance assessment of the Poverty Reduction Strategy Credits 3–5, there was evidence of improved infrastructure and connectivity, which are key to reducing transaction costs for accessing fertilizer including access to improved technology through an extension network.

¹⁰ Farmers who sell a portion of their production are on average more productive than those who do not. World Bank. 2016. *Accelerating Poverty Reduction in Mozambique: Challenges and Opportunities*.



outcome indicator that measured cropping intensity was achieved except for the rice production system. The lower-than-expected performance of the rice-based system was because of delayed completion and handover of rice irrigation schemes, among others. The time for the rehabilitation of rice irrigation schemes was longer than the other two production systems and the first rice scheme was completed in August 2016; a year later than the time envisaged at appraisal. However, the horticulture irrigation schemes were completed two years (in April 2014) before the rice schemes were completed. There was a two-year completion lag for the horticulture irrigation schemes compared to the appraisal estimate. Other factors explaining the low performance of the rice irrigation scheme were (a) technical problems with the pumping system in two of the eight rice schemes; (b) inadequate fertilizer usage;¹¹ and (c) late completion of the schemes, which translate to low rate of utilization of available irrigation areas. In the 2018–2019 agricultural season, 44 percent of the total area was used by a rice-based system. The prospect of achieving higher yield and intensification of the rice-based system, including improved utilization and maintenance of irrigation schemes by beneficiaries, is high given that the new project, IRRIGA, will provide support to PROIRRI beneficiaries. The actual yield for cabbage was almost double the end-of-project target. This performance of the horticulture crops is related to higher-than-anticipated cropping intensity and utilization of irrigated areas (72 percent).

34. The improved farm-level productivity achieved was facilitated by the increased use of agricultural technologies promoted by the project such as the demonstration of proven agronomic practices and seeds multiplication conducted jointly with International Rice Research Institute and extension services of MASA through farmers field schools. In addition, access to irrigation water and other complementary inputs (for example, fertilizers) and extension services contributed to improving farm-level yield. Irrigation improved cropping intensity and stabilized the output and reduced risk of crop failure because of extreme weather events.¹² With respect to productivity-enhancing technologies, about US\$2.0 million was disbursed to support the purchase of fertilizers, seeds, and agrochemicals (Government ICR, paragraph 44).¹³ Beneficiaries also had good access to information and knowledge about how to use these inputs, as shown in their high level of satisfaction with extension agents (90 percent against a 70 percent target), higher-than-expected number of technologies demonstrated (14 compared 4), strengthened technical skills in water use efficiency, and very high level of adoption of technologies by producers in targeted irrigation schemes (100 percent level of achievement). The adoption of the WUA legislation, establishment of INIR and the implementation of the national irrigation program provided the right environment (policy and institution) for participatory management of water and irrigation infrastructure. This institutional support has resulted in: (i) expanding irrigation infrastructure managed by WUAs; (ii) improved water distribution to WUAs; and (iii) improved cost recovery and better service delivery for the schemes. All these directly contributed to the results.

¹¹ Farmers in the rice-based production system did not support the purchase fertilizers because most of the window 1 grant was concluded before the completion of the rice schemes and may explain part of the yield performance recorded for that crop. Overall, the yield for rice improved relative to baseline perhaps because the beneficiaries were getting inputs from out-growers or other means.

¹² Irrigation enables farmers to farm year-round and diversify their crops. This can increase food security and profitability by enabling farmers to grow a greater range and variety of commodities and benefit from seasonal price variations in the market. Cunguara, B., & Garrett, J. (2011). The agriculture sector in Mozambique: Situational analysis, constraints and opportunities for agricultural growth]. Retrieved from <http://fsg.afre.msu.edu/mozambique/RP73P.pdf>

¹³ In World Bank 2016, the adoption of at least one of these agricultural technologies is correlated with a 14.8 percent increase in average cereal equivalent yields.



35. Improved yield performance was indirectly influenced by guaranteed output market, better market power, and economies of scale associated with group formation (100 percent compared with 90 percent target); collective action (group marketing by 80 percent of beneficiaries compared with 90 percent); and building of market links (out-grower contract).¹⁴ Furthermore, access to mechanization and post-harvest technologies through the catalytic fund (window 2 of the matching grant that relaxed credit constraints) helped improve land productivity, reduced the amount of manual labor used (saved labor), and facilitated access to services which all together improved overall quality of the produce. All these significantly improved marketable surpluses and ensured better prices because of quality product and improved farm-level productivity. Beneficiaries participating in the output market are likely to generate cash income that can be invested in the purchase of inputs. Similarly, beneficiaries using improved seeds, fertilizers, and other complementary inputs would be able to generate marketable surplus beyond the household need. Other factors that may have contributed to the yield performance were the reforms supported by the AGDPO series that led to availability of seeds and fertilizers, and accelerated issuance of DUAT certificates to associations and communities (AGDPO series ICR, page 24). Long-term investment in agriculture and agribusiness is linked with security of tenure. When rights are secured, farmers invest more in their farms and productivity improves.

Split Evaluation

Pre-restructuring: *Rating (Modest)*

36. As noted above, the April 2016 restructuring reduced the target for the proportion of rice production sold from 100 percent to 75 percent. By the close of the project, only 57 percent was achieved, far below the appraisal estimate. Likewise, the number of beneficiaries reached against the original target of 16,000 was modest. Moreover, the scope of the activities was significantly reduced with respect to the area under irrigation (2,588 against original target of 5,500), project beneficiaries (6,770 against original target of 16,000), producers with irrigation and drainage services (6,619 against original target of 15,800) and strengthened IOs (29 against original target of 220). Given the reduction in the magnitude of gains due to cancellation of activities, as well as partial achievement of the two key objectives, efficacy is rated Modest for the pre-restructuring scenario.

Post-restructuring: *Rating (Substantial)*

37. As discussed earlier, with respect to the increase in proportion of agricultural production sold, only 57 percent out of the revised target of 75 percent for rice was met, whereas the target was exceeded for horticulture by 5 percentage points (that is, 80 percent compared to 75 percent). Similarly, the target for increase in crop yield and crop intensity was met except for rice. In summary, based on revised targets, the two objectives were substantially achieved, and the revised beneficiary target of 6,770 was surpassed. Efficacy for post-restructuring scenario is assessed as Substantial.

EFFICIENCY

Assessment of Efficiency and Rating

¹⁴ Access to credit is driven largely by Accumulated Savings and Credit Association (ASCA) and out-grower schemes (Financial Sector Deepening Trust Mozambique (FSDMoc) 2017)). The out-grower schemes provide a range of services including TA, credit, and extension services.



Rating: Modest

38. **Economic and financial efficiency.** The economic and financial analysis (EFA) conducted at appraisal anticipated a significant financial and economic profitability, with an economic internal rate of return of 16.8 percent and economic net present value of US\$12.30 million compared to completion EIRR estimate of 8.1 percent generating an ENPV of US\$13.70 million. A sensitivity analysis was conducted, and it shows that the ENPV turns negative if the same yields, same utilization rate of irrigation schemes and number of production cycles observed in the last agricultural season is replicated over the rest of the time horizon. The ENPV would also turn negative if the number of production cycles per year remain unchanged or if a 20-year time horizon is used. The differences in the EIRR is related to the assumptions used in the ex-post analysis. At completion the economic net present value (ENPV) was calculated using a discount rate of 5.5% which is much lower than the discount rate used at appraisal (12%). At completion, the economic situation the country was very different. More specifically, at appraisal Mozambique had a GDP real growth of 6.5%-7%, while at completion the GDP real growth was 3%. In addition, the discount rate at completion was chosen based on the new WB's guidance note issued in 2016¹⁵. Detailed description of the assumptions at appraisal and completion can be found in Table A4.1 in Annex 4.

39. To understand the differential impact of the different crops on the project ENPV and EIRR, an EFA was conducted by differentiating the costs and benefits due to rice versus the costs and benefits that are due to vegetables and sugarcane cultivation. By using a 5.5% discount rate and a 30-year time horizon, the results of this analysis show that ENPV of the rice scheme is negative (-US\$23.48 million), while that of horticulture and contract farming generated positive ENPV (US\$37.18 million) and the EIRR is 18.0%. The result is similar even if a 20-year time horizon is used since the ENPV of horticulture and contract farming would still be positive (US\$19.33 million) and the EIRR would be 16.1%. Similarly, horticulture and contract farming would still generate a positive ENPV (US\$1.16 million) if the actual yield and production pattern observed during the last agricultural season (i.e. with no improvements in yield and production cycles) over a conservative 20-year time horizon (EIRR: 6.7%) was used.

40. **Operational efficiency.** The project completed most of the planned activities except for the three schemes (Mziva, Acaboco, and Chiverano for a total area of 574 ha) that could not be completed because of cost overrun and time constraints. However, the project has already invested in these three incomplete irrigation schemes, which will be completed under IRRIGA. The project faced some budget-related challenges. US\$5 million was lost because of the depreciation of the SDR. In addition, the GoM requested the cancellation of US\$10 million for the emergency project. There were notable incidences of delays in implementation of key activities, particularly in the rice business line, which were because of frequent staff turnover, processing time for administrative court's approval for contract above \$1million, and contract management issue (absentees' contractor). Some of the other operational challenges were: (a) an 18-month delay after effectiveness in the recruitment of service providers who were meant to be at the frontline of project implementation; (b) delay in completing the O&M manual for the WUAs, (c) in adequate monitoring of safeguard compliance; and (d) lack of technical capacity within the PCT to review engineering design leading to cost escalation. For instance, it was envisaged, at appraisal, that 5,500 ha of irrigation under Component 2 would cost US\$46.8 million (US\$41.0 million from IDA and US\$7.6 million from PHRD). At completion, the project equipped 2,588 ha for a total expenditure of US\$45.1 million. Moreover, for Component 4 (Project Management and Coordination) the project expenses at completion

¹⁵ More specifically, the 5.5% discount rate was obtained by multiplying the forecasted real per capita GDP growth rate by an elasticity of marginal utility of consumption of two



were US\$7.5 million against an original allocation of US\$4.3 million; the cumulative effect of all these was a slower rate of converting project inputs to outputs.

JUSTIFICATION OF OVERALL OUTCOME RATING

41. The overall outcome rating is Moderately Unsatisfactory. Given the High Relevance, Modest Efficiency, and the split evaluation for Efficacy in which the pre-restructuring scenario is Modest while the post-restructuring is Substantial (and given that 62 percent was disbursed before restructuring), the Overall Outcome rating is Moderately Unsatisfactory (see Table 2).

Table 2. Split Evaluation

	Before Restructure	After Restructure
Relevance of Objective	High	
Efficacy (PDO)	Modest	Substantial
Efficiency	Modest	
Outcome ratings	MU	MS
Numerical value of Outcome ratings	3	4
Disbursement US\$	\$43.06	\$26.29
Disbursement %	62.10%	37.90%
Weighted value (numerical value x % disbursement)	1.86	1.52
Final outcome value	3.38	
Final outcome rating	MU	

*Note: Highly Unsatisfactory (1); Unsatisfactory (2); Moderately Unsatisfactory (3); Moderately Satisfactory (4); Satisfactory (5); Highly Satisfactory (6)

**Note: Total disbursement as of 02-18-19 is \$69.34 million

OTHER OUTCOMES AND IMPACTS (IF ANY)

Gender

42. PROIRRI has been able to contribute effectively to empowering women and closing gender gaps. The project interventions focused on areas where women face significant constraints in participating in economic activities, accessing productive asset and services, capacity building and knowledge, and decision-making process. The involvement of women in decision making in their association was remarkable. Because of project support, 29 percent of the association had women in their management committee compared to the 32 percent target. When compared to the counterfactual scenario, all of the association’s decision-making committee would have been male dominated. PROIRRI also enhanced gender equity in the distribution of matching grants (45 percent compared to the 33 percent target), capacity building (exactly achieved at 32 percent), and irrigation infrastructure to cover women plots adequately and expansion of women plots. The matching grant helped relax the liquidity constraint for women and improve time use because of access to mechanization and other labor-saving technologies. The project also improved assets acquisition for women and participation in economic activities. The



project also enhanced the decision-making power in terms of control and access to productive resources among women. The project's promotion of women's groups was a good lever to overcoming information asymmetries. Providing price information to producers in different markets helped change the awareness of horticultural producers in deciding what to produce and helped women connect more systematically with markets.

Institutional Strengthening

43. PROIRRI has contributed to improving the enabling environment and strengthening the capacity of institutions in managing irrigation through participatory methods. Also, the agency providing extension services was capacitated. The creation of INIR, preparation of legislation for WUAs, and development of a PNI laid a good foundation for a vibrant irrigation subsector. However, these types of institutional changes take time to be internalized. In addition, the support of activities leading to policy and institutional reforms under the AGDPO was another case in point. PROIRRI supported the DUAT's simplification process in addition to the agricultural inputs and irrigation reforms undertaken. The project's support to address the coordination problem in the value chain, the promotion of which cultivates a spirit of horizontal and vertical coordination, engendered a culture of collective action, thus building social capital that spills over into other forms of self-help initiatives and facilitates links with other government programs and financial institutions.

Mobilizing Private Sector Investment and Strengthening Vertical Integration

44. The Project has contributed to developing sustainable market links that serve the interest of smallholder farmers and private sector agribusinesses. As such, the beneficiaries now have an assured market which helps them make informed decisions of what to plant and for which markets. PROIRRI, through market links and contract farming particularly with the out-grower schemes, has mobilized private sector participation and investment effectively as there existed signed contract and business development agreements where such private sectors serve as off takers to the produce.

Poverty Reduction and Shared Prosperity

45. Although the project did not monitor poverty reduction per se, it contributed to poverty reduction and shared prosperity through the provision of access to irrigation water, which enabled farmers to plant all year-round taking advantage of the seasonal price variation. Access to irrigation helped smoothen income shock through stability in production and reduction in risk to crop failure. Similarly, associated technology adoption such as improved seed and fertilizer technologies and good agronomic practices as well as links to the market improved overall farm-level productivity which led to income gains. All members of the households with plots on PROIRRI irrigation scheme have been linked to the emerging prosperity in the Beira Agriculture Development Corridor throughout-grower contracts. In the out-grower scheme, member of the owners' households derived income from labor supply at different levels to generate an independent income for themselves.

Other Unintended Outcomes and Impacts

46. In many ways the project contributed to reducing the vulnerability of agricultural production to extreme weather events. Access to irrigation has helped improve the resilience of the production system. However, intensification is closely linked with increased use of fertilizers and chemicals. The good news is



that beneficiaries were satisfied with the extension services which would have covered capacity building on the use of inputs.

III. KEY FACTORS THAT AFFECTED IMPLEMENTATION AND OUTCOME

KEY FACTORS DURING PREPARATION

47. **Realism of PDO.** The PDOs were clear and realistic. They were to be achieved leveraging available technologies from Consultative Group for International Agricultural Research (CGIAR) centers such as International Rice Research Institute (IRRI) and International Water Management Institute (IWMI), local agricultural institutions, ongoing projects (BEIRA corridor project), and government agencies. MoUs were signed with local agricultural institutions (both national and international) and extension agencies to backstop service providers and/or directly assist WUAs and PAs.

48. **Readiness for implementation.** The terms of references (TORs) for the key staff in the project management units were prepared before project appraisal as were the TORs for the recruitment of service providers for the rice and horticulture business lines and the Capacity Development Component. The Procurement Plan for the first 18 months was defined and the safeguard documents prepared and disclosed.

49. **Integrated and participatory approach.** The project's integrated approach of combining rehabilitation of irrigation with production support, post-harvest management, extension services, and other supporting complementary input areas were instrumental to the result achieved. Similarly, the participatory approach used in the identification, planning, and rehabilitation of irrigation infrastructure jointly with beneficiaries was the right approach to promote participatory water resources management and was important for ownership and sustainability. Also, the idea of promoting diversification of the crop mix was excellent because it is a form of insurance against crop failure. Diversification in agricultural production, reduces the risks associated with crop failure: diseases, pests, extreme climate events, fluctuating market demand, and commodity prices.¹⁶ However, there were some shortcomings (a) too much emphasis on rice which translated to higher land allocation compared to more profitable crops, (b) ambitious and unrealistic EFA which assumed that benefits will accrue first year of the project, and (c) overly optimistic assumption about the capacity of the newly created INIR to procure and manage works contracts and WUA in the O&M of irrigation infrastructure.

50. **Simplicity of design.** Overall, the design of the project was simple with fewer components and indicators. Component activities were clearly linked to achieving the PDOs, although the plot size per beneficiary estimated at appraisal could have been larger to enjoy economies of scale. Even though the components of the project were not many, it appeared that Component 1 was overloaded with activities (fruit fly control and establishment of laboratory) including reforms that should have been taken up by budget support or Program for Results. It took longer to set up INIR and the WUAs, and reforms related to regulations on WUAs, land, irrigations, and so on were broader than the scope of the project.

51. **Adequacy of Risk assessment:** Risks were correctly identified, and mitigation measures were adequate. Virtually all risks relevant to the achievement of the PDO were identified during design.

¹⁶ Andre Machavaa, Etevaldo Cheveiaa, and Joaquim Faducoa. 2018. "Irrigation and Crop Diversification in the 25 de Setembro Irrigation Scheme, Mozambique." *International Journal of Water Resources Development* 33 (5): 705–724.



However, the risk of cost overrun, and escalation of costs were unforeseen. Although the delivery risk was rated High, it focused less on the technical aspect of quality of delivery. In addition, the design identified potential social and environments safeguard issues and proposed mitigation measures, but there was a missed opportunity in including a safeguard specialist and an irrigation engineer in the approved organogram for the PCT.

KEY FACTORS DURING IMPLEMENTATION

52. **Belated startup of project activity.** Although the project was approved in March 2011, it only became effective, nine months later, in December 2011. The delay was because of meeting the effectiveness condition. Following project effectiveness, additional delays were experienced. In the first two to three years of the project, delays were because of the lack of capacity from the implementing agency and delay in establishment of the PCT. Thereafter, came the flood that made the sites inaccessible for almost a year. The last set of delays which occurred toward the end of the project were related to contract management issues and the need for cancelling some contracts.

53. **Proactivity.** No doubt the project's learning curve was longer than anticipated, and the PCT was proactive in making up for lost time. As it was taking too long to hire service providers, the project hired three consultants who helped mobilize farmers and identify irrigation schemes to be rehabilitated as well as initiate the technical design ahead of the completion of the recruitment of the strategic service providers (Aide Memoire May 6–17, 2013, paragraph 4). This singular act tremendously pushed implementation forward.

54. **Phased approach.** The process of rehabilitation of irrigation schemes was phased and allowed the project team to learn about potential sites and easily prioritize and adapt to site-specific conditions.

55. **Site abandonment.** There were instances where the contractor totally abandoned sites and the project had to recruit a new contractor. This contributed to delay in project implementation.

Factors Outside Control of Government Agency

56. **Additional layers of approval for contract.** There were delays in recruiting strategic service providers, consulting firms, and contractors for the rehabilitation works, even though TORs needed to procure critical project activities were prepared at appraisal. On one hand, the process leading to securing approval from administrative court for contracts above US\$1 million was unusually long and was outside the control of the implementing agency. On the other hand, the initial tender suffered low competition which necessitated a repeat of the procurement process. The impact of all of these was delayed completion of irrigation schemes, low utilization of available irrigable land, and late accrual of benefit.

57. **Inundation of irrigation sites.** The 2014 floods also prevented access to the site for some months, thereby contributing to the delayed completion of the project. Although the idea to implement the project through service providers was commendable, the assumption that there was enough capacity for private service providers to implement the project activities was ambitious. It turned out that service providers lack requisite capacity to implement the project. As noted in the MTR Aide Memoire farmers were not sensitized about their responsibility to operate and maintain the facilities. The Project should have carried out an assessment of private sector capacity to deliver on such important task.



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

QUALITY OF MONITORING AND EVALUATION (M&E)

M&E Design

58. The design of the project Results Framework was adequate. The PDO indicators are clear, measurable, and directly linked to the two subthemes embedded in the PDO (market integration and productivity). The Results Framework outlined the frequency of data collection, data collection instruments, and responsibility for data collection. The disaggregation of some indicators was useful. The Results Framework adequately captures most of the expected project outputs and outcomes; in retrospect some indicators should have been defined differently. For example, lumping the matching grant indicator together for production and value chain risks the possibility of overlap. Similarly, in the case of the intermediate indicator that measures recovery of O&M, even though farmers are now more aware of their role in operating and maintaining the scheme, the end-of-project target proved to be ambitious. This highlights the difficulty of setting targets for indicators at appraisal, especially in cases involving innovative practices for which no benchmark values are available during the design stage. Understandably, the high target was based on the direct income benefit from irrigation without considering other socioeconomic characteristics, which may make repayment difficult.

M&E Implementation

59. M&E implementation was Moderate. Monitoring data on project activities, outputs, and outcomes were collected regularly, allowing the preparation of a progress report and population of the project Results Framework including the ISR. There were instances of delayed communication between service providers and M&E staff, and sometimes poor performance of M&E service provider collecting the needed data at the initial stage of the project. Over time, the PCT made numerous adjustments to the way it monitored progress of project activities in the field considering lessons learned from the start-up phase of the project. The M&E actions of project greatly benefited from the extensive capacity at the level of the PCT. The Project implemented a baseline survey and an end line survey. The project has promised to establish a Management Information System platform, though it was not clear if it was done or not.

M&E Utilization

60. During implementation, information from the project's M&E allowed the PCT, the World Bank supervision team, INIR, and the Government to monitor the status of individual subprojects and track implementation progress of the overall project. M&E information was instrumental to adjust the Results Framework during the 2016 restructuring. The M&E system was able to capture and document the beneficiary's current performance, which formed the basis of the adjustment, made, for example, about the time of the restructuring, the project has demonstrated 14 technologies. Likewise, information on the yield of horticulture guided the revision made to the indicators measuring their productivity and cropping intensity. In addition, the information from the PROIRRI M&E was used to provide evidence for the achievement of the AGDPO objectives. For example, cropping intensity data were used to assess the productivity improvement effect of the reforms implemented.

Justification of Overall Rating of Quality of M&E



61. The overall rating of quality of M&E is Substantial because the design was High, implementation was Moderate, and utilization High.

ENVIRONMENTAL, SOCIAL, AND FIDUCIARY COMPLIANCE

62. **Environmental safeguards.** PROIRRI was classified as Category B and triggered the Environmental Assessment (OP/BP 4.01), Natural Habitats (OP/BP 4.04), and Pest Management (OD/BP 4.09) Operational Safeguard policies. The potential direct impacts of the project on the environment were related mainly to ecological changes and degradation of irrigation land (salinization, waterlogging) because of civil works (rehabilitation of canals, land development), agricultural intensification that results in increased use of fertilizer and pesticides leading to groundwater pollution, and unregulated water abstraction that could result in groundwater mining. The client prepared an Environmental and Social Management Framework (ESMF), Integrated Pest Management Plan and Strategic Environmental and Social Assessment (SESA) containing standard methods and procedures (for site specific Environmental management Plans, EMPs), along with the institutional arrangements required for screening, implementing, and monitoring and evaluation of all selected irrigation sites, feeder roads and beneficiaries' sub-projects and their locations. Safeguard implementation were delegated to Provincial Environmental Directorates with a dedicated environmental focal person. In addition, the project developed and implemented detailed safeguard training and capacity building program for the WUAs, and other key actors. However, there were inconsistent monitoring of the implementation of the ESMPs, mainly because of the ineffective safeguards monitoring Ministry of Environmental Coordination (MICOA) and lack of safeguard staff in the PCT. The subproject's screening and subsequent site-specific instruments (ESMP) were not adequately implemented in schemes under constructions. Some remedial measures were identified but their implementation was not completed before project closing date. The remedial actions implemented were the recruitment of an environmental safeguard specialist to support the PCT and capacity building training on water management to beneficiaries and other stakeholders. Other remedial measures that were under implementation were soil erosion control, rehabilitation of access roads and desilting of the canal. The PCT partnered with GIZ to undertake training on the implementation ESMPs on areas developed with irrigation under PROIRRI. These training was provided during the extension period July to September 2018. Although there was demonstrated effort and commitment by the Government to implement the ESMPs mainly towards the end of the project, the Bank team recommended an independent environmental audit to be carried out to evaluate the implementation of remedial measures and ESMPs. At closing, a TOR for the audit was prepared and it is being implemented by the follow-up project IRRIGA.

63. **Social safeguards.** The project triggered the Physical Cultural Resources (OP/BP 4.36), and Involuntary Resettlement (OP/BP4.12), Operational Safeguard policies. The project prepared the ESMF and Resettlement Policy Framework (RPF) and Resettlement Action Plans (RAPs). Like the monitoring of social safeguard issues, a focal person was designated at the provincial level, but social safeguard specialist was restructured to support the PCT towards the end of the project. Compliance with social safeguards policies was also rated 'Moderately Unsatisfactory' at closing. There were issues related to inadequate observance of basic health and safety requirements in civil works work, although no injury was reported. Also, it was reported that the GRM was not properly but there were informal conflict mechanisms in place which were observed during supervision mission. These systems generally work through the associations and local agriculture offices. However, grievances were not registered and were not communicated to the Project Implementation Unit. The works in Acaboco were not completed before



the project closing date because it started much later than planned. As a result, the 600 beneficiaries of the schemes were temporarily relocated to another location 4.5 km away from the Acaboco site. An audit was also recommended to be conducted to assess the situation and ensure that compliance issues related to OP 4.12 will be adequately adhered to under IRRGA.

64. **Other safeguards.** Safety of Dams (OP/BP 4.37), and Projects on International Waters (OP/BP 7.50) operational safeguard policies were triggered. The construction or rehabilitation of any small dam, earth reservoir, or weir were in accordance with the Small Dams Guidelines, which include the provisions in the *Regulamento de Pequenas Barragens*¹⁷ and the generic guidelines in the FAO Technical Guide for Small Earth Dams (FAO, 2010). Also, because the project intervention could interfere with international watershed, the government sent a Riparian Notification to all countries concerned and did not receive any objection to the activities planned under the project¹⁸.

65. **Procurement.** The overall procurement rating for the agency was Moderately Satisfactory. A post-procurement review for FY18 and findings were generally satisfactory. However, there were procurement issues related to contract management and late procurement of service providers, which affected the pace of project implementation and the magnitude of results achieved. At least two contracts were cancelled because they could not be completed. There was also an impediment related to securing approval of the administrative court before the contract could be signed. Supervision missions and reports of the ex post procurement reviews consistently led to the preparation of action plans designed to strengthen procurement functions. No fraud or corruption issues were detected during implementation.

66. **Financial Management.** The overall FM rating for the project is Moderately Satisfactory. The project submitted the quarterly unaudited interim financial reports (IFRs) on a regular basis. However, the gap between commitment and available funds noticed during the last implementation support mission of the project indicated some problems with budget monitoring and implementation. At closing, there were no overdue IFRs and in general audit opinions were unqualified, except for the 2011 audit which was later resolved satisfactorily (Aide Memoire, May 2013, paragraph 7). Also, some compliance issues were identified:

- Difference between IFR and Client Connection regarding cumulative advances and cumulative expenditures reported which were discussed but not completed by the project
- Missing or incomplete documentation for some transactions such as receipts of goods and services, *guias de marcha*, delivery notes, and mission reports, among others
- Late submission of audited financial statements for the period ending December 2017

BANK PERFORMANCE

Quality at Entry

¹⁷ Decree #47/2009: *Regulamento de Pequenas Barragens*, approved by the Council of Ministers and published in the Official Journal I/40, October 7, 2009.

¹⁸ Notified countries: for the Pungoe and Buzi River basin: Zimbabwe; for the Zambezi River: Botswana, Malawi, Namibia, Tanzania, Zambia, and Zimbabwe.



67. The World Bank's performance in ensuring quality at entry was Moderately Satisfactory. The justification and the rationale for the World Bank's support were well grounded in sound analytics and the project directly addressed the Government's agricultural commercialization and inclusive development priorities at the time, and it was well aligned with the World Bank CPS. The approach of working through the WUAs in the management of the infrastructure was in line with the paradigm shift in irrigation management. Also, deliberate efforts to target women were equally relevant to the Mozambique context where inequality in access to productive asset, decision making, and participation in economic activities were prevalent. The project was designed based on lessons learned from other predecessor irrigation projects and in close coordination with the client and development partners using a broad-based stakeholder consultation. Relevant risks were adequately analyzed and addressed during project preparation. However, there were some shortcomings: (a) the design was overly optimistic about the capacity of service providers, WUAs, and INIR to deliver the project; (b) the design and adoption of the pump irrigation system did not factor in this low level of capacity which is evident in the inability of the WUAs to adequately operate and intensify their plots; (c) the assumption of benefit accrual in Year 1 for the horticulture-based irrigation system in the EFA was ambitious; and (c) non-recommendation of a safeguard specialist as part of the PCT was a quality at entry flaw given that irrigation rehabilitation is associated with a lot of safeguard risks identified during preparation. The team could have reflected more on better irrigation choices or options.

Quality of Supervision

68. The World Bank's performance during project implementation was Moderately Unsatisfactory. Throughout the lifetime of the project, the World Bank task teams carried out implementation support missions regularly. For these missions, the World Bank always mobilized key experts, comprising mainly World Bank staff but complemented as needed with external consultants, which consistently included a full complement of technical, fiduciary, and safeguards specialists. The World Bank supervision focused on development impact and the task team was proactive in restructuring the project and recommending cancellation of contracts that were not likely to be completed by project closing. The team was generally candid about rating and was open to report on issues faced by the project. However, the task team took too long to address compliance with environmental and safeguard issues, making the project close with a Moderately Unsatisfactory rating for safeguards.

Justification of Overall Rating of Bank Performance

69. The overall rating of the World Bank is Moderately Unsatisfactory because there were shortcomings in quality at entry and quality of supervision, which are related to overly optimistic assumptions of the capacity of beneficiaries and implementation agency in implementing the project and safeguard compliance issues including the need to strengthen engineering technical capacity within the PCT.

RISK TO DEVELOPMENT OUTCOME

70. The overall risk to development outcome is Substantial. Major risks to development outcome are related to the beneficiary's capacity to maintain the irrigation systems and recover the O&M cost and that of INIR to provide overall governance and equitably distribute water to farmers' field. Closely related to this was the late handing over of the operation manual and knowledge to farmers groups which elongated their learning horizon. However actualization of support to WUAs envisaged under the IRRIGA project



could contribute to the sustainability of outcomes after project closing, namely: (a) strengthened institutional capacity in the agricultural sector and within INIR for governance of irrigation infrastructure, (b) strengthened technical and managerial skills of producers and producer organizations in the use of improved inputs and production practices including O&M for the irrigation infrastructure, (c) improved access to productive infrastructure and other complementary inputs such as access to finance and supply chain logistics; and (d) increased collaboration among public and private sector actors. The follow-up project to PROIRRI would continue to provide financial, technical, and institutional support to the WUAs and INIR.

71. **Other risks.** The macroeconomic and weather risks remain potential threats to the sustainability of project outcomes. Although access to irrigation has demonstrated resilience in the face of adverse macroeconomic and weather shocks, the risk of flooding which can prevent access to the schemes or cause destruction to the embankment must be taken seriously. As noted during the MTR, one O&M problem detected was the need to protect the canal embankment/banks, particularly when the canal is high in relation to the fields. It could be observed that parts of the canal embankment are being eroded, deteriorated by cattle trampling, cultivation of fields too close to the canals, and crossing of the canals by people and cattle.

V. LESSONS AND RECOMMENDATIONS

72. **The key lessons from project implementation include the following:**

1. **Self-sustainability of WUAs.** Setting up of farmers organizations and ensuring its functionality takes time. Experience from India reviewed by the IEG, for example, indicates that it takes at least three years of continued financial, technical, and institutional support for the WUAs to reach an acceptable level of self-sustainability. Thereafter, support should always be available to the WUAs. To this end, permanent capacity needs to be built within INIR to monitor the WUAs and provide support and training as needed at any time. This has significant implications for future project design because shorter time frames for intervention are unlikely to result in effective institutions. This particular lesson has guided the design of the follow-on project
2. **Crop mix and rate of utilization of irrigated land is important for the overall economic viability of irrigation investment.** Allocating lands to a mix of high-value and staples crops is important for ensuring better returns on investment in irrigation. High-value crops are more profitable than staples such as rice and depending on how diversified the cropping pattern is will determine the value of EIRRs achieved at project closing. Also, low rate of utilization of areas quipped with irrigation and drainage services also has a direct impact on the profitability of irrigation infrastructure.
3. **Provision of Technical Assistance(TA) for budding organizations and right skill sets are critical for project delivery.** Although it took a while before the strategic service providers came on board, providing hands-on support through TA for new organizations can make a lot of difference in a context of weak implementation capacity. Similarly, the project suffered initial delays and cost escalations because of the lack of technical competence to review engineering design and ensuring compliance to safeguard issues. Technical reviews and



approval of engineering designs were not thoroughly done and resulted in cost escalation for scheme construction. In addition, no safeguards specialist was assigned to the PCT until late in project implementation, resulting in little oversight for safeguards compliance. The low capacity of INIR was another main reason for the low performance of the project on the efficiency criterion. In this context, TA for both INIR and PCT could have covered technical aspects important for achievement of the project objectives. Future projects should build capacities of INIR to cover the review of engineering design of irrigation schemes, supervision of construction, and contract management.

4. **Market-driven irrigation investment could drive smallholder commercialization.** Investments in irrigation infrastructure must be driven by market opportunities in addition to other considerations. The high cropping intensity among horticulture and out-growers production systems resulted from better integration of the producers with inputs and outputs markets compared to rice producers.



ANNEX 1. RESULTS FRAMEWORK AND KEY OUTPUTS

A. RESULTS INDICATORS

A.1 PDO Indicators

Objective/Outcome: Increase agricultural production and marketed and raise farm level productivity

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Average crop yield	Number	0.00 30-Jun-2011	0.00 12-Dec-2011	0.00	0.00 28-Sep-2018
Rice	Number	1.00 30-Jun-2011	4.00 12-Dec-2011		3.00 28-Sep-2018
Tomate	Number	10.00 30-Jun-2011	20.00 12-Dec-2011		25.00 28-Sep-2018
Potato	Number	15.00 30-Jun-2011	25.00 12-Dec-2011		30.00 28-Sep-2018
Onion	Number	10.00	15.00		20.00



		30-Jun-2011	12-Dec-2011		28-Sep-2018
Cabbage	Number	12.00	18.00		32.00
		30-Jun-2011	12-Dec-2011		28-Sep-2018
Comments (achievements against targets): With exception of rice the target yields were exceeded by at least 25 percent.					

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Average cropping intensity	Number	0.00	0.00	0.00	0.00
		30-Jun-2011	12-Dec-2011		28-Sep-2018
Rice based Systems	Number	1.00	1.50		1.00
		30-Jun-2011	12-Dec-2011		28-Sep-2018
Horticulture based systems	Number	1.00	2.00		2.00
		30-Jun-2011	12-Dec-2011		28-Sep-2018

Comments (achievements against targets): There average crop yield and intensity targets for rice were not achieved. The project achieved average yield on rice of 3 tons/ha compared to 4 tons/ha target. The crop intensity on rice was 1 compared to 1.5 target. These targets were not achieved due to late completion of construction of rice schemes. The first rice schemes were completed in August 2016 and this did not allow sufficient time to the service providers and strategic partners such as International Rice Research Institute (IRRI) to support the beneficiaries farmers to introduce new improved technologies and practices for rice. Compared to horticulture, the first irrigation schemes rehabilitated by the project were completed in April 2014 and this allowed time to provide adequate support services to beneficiaries after schemes were completed. As a result all target yields and intensity for horticulture were achieved and in some cases exceeded.



Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Increase in proportion of agriculture production sold	Percentage	0.00	0.00	0.00	0.00
		30-Jun-2011	12-Dec-2011		28-Sep-2018
Rice producers	Percentage	20.00	100.00	75.00	57.00
		15-Dec-2014	12-Dec-2011	12-Apr-2016	28-Sep-2018
Vegetable producers	Percentage	20.00	75.00		80.00
		15-Dec-2014	12-Dec-2011		28-Sep-2018

Comments (achievements against targets): The proportion of rice sales were at 57 percent, below the original project target of 100 and revised target of 75 percent. This indicator was affected by low levels of productivity on rice schemes. On horticulture (vegetable) based schemes, the proportion sold was 80 percent which exceeded the project target of 75 percent.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Direct project beneficiaries	Number	0.00	16000.00	6000.00	6779.00
		30-Jun-2011	12-Dec-2011	12-Apr-2016	18-Sep-2018
Female beneficiaries	Percentage	0.00	33.00	52.00	52.00
		30-Jun-2011	12-Dec-2011	12-Apr-2016	18-Sep-2018
Number of individuals	Number	0.00	80000.00		28126.00



		30-Jun-2011			18-Sep-2018
<p>Comments (achievements against targets): The original direct beneficiaries target was reduced from 16,000 households to 6,000 farmers due to reduced scope of the project. At the end the number of beneficiaries was 6,779 which exceeded the MTR target. In terms of female beneficiaries the project target was 33 percent at Appraisal and increased to 52 percent at MTR which was achieved. Note that the breakdown below includes 80,000 which should be "indirect beneficiaries" and not "individuals". Unfortunately, the target value was never formally revised to reflect the reduced scope and number of direct beneficiaries.</p>					

A.2 Intermediate Results Indicators

Component: Component - Institutional capacity development and participatory irrigation management

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
National Irrigation Program (PNI) drafted and submitted for approval to MINAG Technical Council	Text	No 01-Jun-2011	Yes 12-Dec-2011		Yes 28-Sep-2018
<p>Comments (achievements against targets): The National Irrigation Plan (PNI) setting priorities for the development of irrigation in the country for the next 25 years was approved by the Council of Ministers in December 2016</p>					

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
MoUs for improved training on irrigation development are under implementation with local agriculture	Number	0.00 01-Jun-2011	5.00 12-Dec-2011	9.00 12-Apr-2016	9.00 28-Sep-2018



institutions					
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Comments (achievements against targets): The Memorandum of Understanding were signed with the following training institutions: 1. Instituto Superior Politécnico de Manica; 2. Universidade Católica de Moçambique; 3. UEM- Faculdade de Agronomia; UNIZAMBEZE- Faculdade de Agronomia; 5 Instituto agrário de Boane; 6. Instituto Agrário de Ribau; 7. Escola Profissional de Caia; 8. Instituto Politécnico Armando Guebuza; and 9. Instituto Agrário de Mocuba.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Client days of training provided	Days	0.00	19660.00	7400.00	10065.00
		01-Jun-2011	12-Dec-2011	12-Apr-2016	28-Sep-2018
Client days of training provided (% women)	Percentage	0.00	33.00	0.00	52.00
		01-Jun-2011	12-Dec-2011	12-Apr-2016	28-Sep-2018

Comments (achievements against targets): The number of client days of training provided by the project was originally 19,660 and reduced to 7,400 at MTR. The project provided 10,065 days of training which was above the MTR target. The training provided by the project to farmers was critical to achieve the PDO indicators. Type of training provided included: (i) irrigation planning, (ii) irrigation farming, (iii) value chain improvement, (iv) participatory planning, irrigation and water management, v) construction and supervision of irrigation investments, vi) marketing and standards, and vii) monitoring and evaluation.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Irrigation Organizations supported by the project with at least 90% recovery of O&M costs	Number	0.00	220.00	33.00	29.00
		30-Jun-2011	12-Dec-2011	12-Apr-2016	28-Sep-2018



Comments (achievements against targets): The exact cost of the O&M cost are still to be determined. About 24 schemes were surveyed and it was found that on average each beneficiary is contributing with 340 meticaïs per year towards the O& M costs of the schemes.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Irrigation Organizations operating, with women in the management committee	Number	0.00	220.00	32.00	29.00
		30-Jun-2011	12-Dec-2011	12-Apr-2016	28-Sep-2018

Comments (achievements against targets): The original indicator was revised in 2016 to reflect the reduced scope of the project to cover only 32 irrigation schemes. At the end the project was only able to rehabilitate 29 schemes covering 2,588 ha.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Technologies demonstrated by the project in the project areas	Number	0.00	5.00	9.00	14.00
		30-Jun-2011	12-Dec-2011	12-Apr-2016	28-Sep-2018

Comments (achievements against targets): The technologies demonstrated by the project include: 1. Technological package for rice including land preparation, new varieties (Macassane and Musiva) and plant density and post harvesting conservation; 2. Use of power tillers for rice cultivation; 3. Use of gravity system for rice cultivation; 4. Introduction of new tomato varieties; 5. Improve seeds for cabbage; 6 production of baby corn, 7. production of chili; 8-Use of springer for horticulture; 9-Use of gravity systems for vegetables; 10. Introduction of sugar cane production package; (11) use of animal traction technologies (e.g. plowing) (12) new onion variety (13) new potato variety and (14) crop rotation between rice and horticulture

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised	Actual Achieved at
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				Target	Completion
Smallholder producers supported by the project that market as a group	Percentage	30.00	50.00		80.00
		30-Jun-2011	12-Dec-2011		28-Sep-2018

Comments (achievements against targets): Overall 80 percent of farmers marketed as group which is above the target of 50 percent.

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Targeted producers who are members of an association	Percentage	30.00	70.00	90.00	100.00
		30-Jun-2011	12-Dec-2011	12-Apr-2016	28-Sep-2018
Percentage of women	Percentage	30.00	70.00	50.00	55.00
		30-Jun-2011			28-Sep-2018

Comments (achievements against targets): All beneficiaries were members of the Water users association and the producer organizations

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Producers in targeted irrigation schemes adopting at least one new technology	Percentage	0.00	90.00		90.00
		30-Jun-2011	12-Dec-2011		28-Sep-2018

Comments (achievements against targets): Based on farmers surveyed over 90 percent of the farmers adopted at least one technology

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised	Actual Achieved at
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				Target	Completion
Targeted producers satisfied with extension services	Percentage	0.00	70.00	0.00	53.00
		30-Jun-2011	12-Dec-2011		

Comments (achievements against targets): Based on farmers surveyed only 53 percent of the farmers were satisfied with extension services.

Component: Investment in Irrigation systems and support Infrastructure

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Area equipped with irrigation & drainage infrastructure and operational	Hectare(Ha)	0.00	5500.00	3000.00	2588.00
		30-Jun-2011	12-Dec-2011	12-Apr-2016	28-Sep-2018
Rice Business Line	Hectare(Ha)	0.00	3000.00	1700.00	1175.00
		15-Dec-2014	12-Dec-2011	12-Apr-2016	28-Sep-2018
Horticulture Business Line	Hectare(Ha)	0.00	1300.00	800.00	887.00
		15-Dec-2014	12-Dec-2011	12-Apr-2016	28-Sep-2018

Comments (achievements against targets): Only 86 percent of the target was achieved. About

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Beneficiaries subprojects approved	Number	0.00	8000.00	5000.00	5664.00
		30-Jun-2011	12-Dec-2011	12-Apr-2016	28-Sep-2018



female beneficiaries	Percentage	0.00 30-Jun-2011	0.00 12-Dec-2011	52.00 12-Apr-2016	52.00 28-Sep-2018
Comments (achievements against targets):					

Indicator Name	Unit of Measure	Baseline	Original Target	Formally Revised Target	Actual Achieved at Completion
Producers provided with Irrigation and drainage services	Number	0.00 17-May-2011	6000.00 12-Dec-2011	5000.00 12-Apr-2016	6619.00 28-Sep-2018
Rice	Number	0.00 17-May-2011	6000.00 12-Dec-2011		2374.00 28-Sep-2018
Horticulture	Number	0.00 17-May-2016	6500.00 12-Dec-2011		1845.00 28-Sep-2018
Outgrowth	Number	1.00 17-May-2016	3300.00 12-Dec-2011		2400.00 28-Sep-2018

Comments (achievements against targets): This target was achieved. The project developed 2,588 hectares of irrigated land and benefitted 6,619 beneficiaries, which is above the 5,000 target at MTR.



B. KEY OUTPUTS BY COMPONENT

Objective/Outcome 1: Increase agricultural production marketed	
Outcome Indicators	1. Increase in proportion of agriculture production sold for rice and horticulture
Intermediate Results Indicators	1. Smallholder producers supported by the project that market as a group 2. Targeted producers who are members of an association (% women)
Key Outputs by Component (linked to the achievement of the Objective/Outcome 1)	1. 57 % of rice production sold by the farmers 2. 80 % of cultivated vegetables sold 3. 80 percent of the producers supported by the project market as a group (55 percent women) 4. All producers are members of an association 5. 10,065 client days of training provided (32 percent women participation)
Objective/Outcome 2: Raise farm productivity in new or improved irrigation schemes	
Outcome Indicators	1. Average yield increases for rice, potato, and horticulture (tomatoes, onion and cabbage) (ton/ha) 2. Average cropping intensity for rice and horticulture (# of harvest/year)
Intermediate Results Indicators	1. Technologies demonstrated by the project in the project areas 2. Producers in targeted irrigation schemes adopting at least one new technology 3. Targeted producers satisfied with extension services 4. Area equipped with irrigation & drainage infrastructure and operational 5. Producers provided with Irrigation and drainage services 6. Beneficiaries subprojects approved (female beneficiaries)
Key Outputs by Component (linked to the achievement of the Objective/Outcome 2)	1) Increase in crop yield of: (i) rice from 1 to 3 t/ha; (ii) tomato from 10 to 25 t/ha; (iii) Potato from 15 to 30 t/ha for Potato; (iv) Onion from 10 to 20 t/ha; (v) cabbage from 12 to 32 t/ha for cabbage



- 2) Increase in cropping intensity from 1 to 2 harvests per year for vegetables (horticulture)
- 3) Fourteen new technologies were demonstrated by the project (1. Technological package for rice including land preparation, new varieties (Macassane and Musiva) and plant density and post harvesting conservation; 2. Use of power tillers for rice cultivation; 3. Use of gravity system for rice cultivation; 4. Introduction of new tomato varieties; 5. Improve new seeds varieties for cabbage; 6 production of baby corn for export, 7. production of chili for export; 8-Use of sprinkler irrigation for horticulture; 9-Use of gravity systems for vegetables; 10. Introduction of sugar cane production package; (11) use of animal traction technologies (e.g. plowing); (12) introduction of new high yielding onion varieties; (13) introduction of new high yielding potato variety; and (14) crop rotation between rice and vegetables)
- 4) 60 percent of the producers were adopting at least one technology demonstrated by the project
- 5) 53 percent of the farmers satisfied with extension services
- 6). 2,588 ha of irrigation schemes equipped with irrigation and drainage infrastructure developed and operational
- 7). 6,619 producers provided with irrigation and drainage services
- 8). 5,664 beneficiaries' subprojects approved and implemented



ANNEX 2. BANK LENDING AND IMPLEMENTATION SUPPORT/SUPERVISION

A. TASK TEAM MEMBERS

Name	Role
Preparation	
Patrick Verissimo	Task Team Leader
Amos Malate	Procurement Analyst
Celia Faias	Team Assistant
Cheikh Sagna	Sr. Social Scientist
Eduardo Brito	Senior Counsel
Elvis Langa	Financial Management Specialist
Florence Kondylis	Economist
François Onimus	Senior Irrigation Specialist
Germaine Ethy	Program Assistant
Henry Bagazonzya	Sr. Financial Sector Specialist
Jose C. Janeiro	Sr. Finance Officer
Jutta Kern	Monitoring & Evaluation Specialist
Karen Brooks	Sector Manager
Luisa Matsinhe	Program Assistant
Martin van Nieuwkoop	Program Coordinator
Michael Morris	Program Coordinator
Pauline McPherson	Operations Officer
Pedro Arlindo	Agriculture Economist
Pieter Waalewijn	Irrigation Specialist
Renate Kloepfinger-Todd	Rural Finance Advisor
Suzanne Morris	Senior Finance Officer
Thandi Gxaba	Sr. Natural Resources Specialist



Supervision/ICR

Aniceto Timoteo Bila	Task Team Leader
Amos Martinho Malate	Procurement Specialist
Elvis Teodoro Bernado Langa	Financial Management Specialist
Mario Rizzolio	Team Member
Marietta Sahakyan	Team Member
Adibek Ghazaryan	Team Member
Maria Do Socorro Alves Da Cunha	Social Safeguards Specialist
Eldio Venancio Mapoissa	Team Member
Nuno Maria Brilha Vilela	Team Member
Paulo Jorge Temba Sithoe	Environmental Safeguards Specialist
Regassa Ensermu Namara	Team Member
Alfredo Ricardo Zunguze	Team Member
Celia A Dos Santos Faias	Team Member
Adriaan Laurentius Josephus van den Dries	Team Member
Odete Duarte Muximpua	Team Member
Clarisse Livia Isaias Nhabangue	Team Member
Pedro Arlindo	Team Member
Maria M. Iskandarani	Team Member
Germaine M. Ethy	Team Member
Marie Lolo Sow	Team Member
Norman Bentley Piccioni	Team Member
Giuseppe Fantozzi	Team Member
Maria Isabel Nhassengo-Massingue	Team Member
Mohinder S. Mudahar	Team Member

B. STAFF TIME AND COST



Stage of Project Cycle	Staff Time and Cost	
	No. of staff weeks	US\$ (including travel and consultant costs)
Preparation		
FY08	17.312	126,164.54
FY09	51.508	273,415.56
FY10	29.179	114,674.08
FY11	44.519	242,497.78
FY12	0	0.00
Total	142.52	756,751.96
Supervision/ICR		
FY12	27.592	128,181.94
FY13	33.686	159,370.89
FY14	27.229	155,281.30
FY15	22.870	156,275.24
FY16	29.145	233,734.20
FY17	34.826	310,448.46
FY18	28.415	351,793.38
FY19	10.041	165,754.09
Total	213.80	1,660,839.50



ANNEX 3. PROJECT COST BY COMPONENT

Components	Amount at Approval (US\$M)	Actual at Project Closing (US\$M)	Percentage of Approval (US\$M)
Institutional Capacity Development and Participatory Irrigation Management	22.10	12.71	57.50
Investment in Irrigation Systems and Support Infrastructure	55.30	45.10	81.55
Cost Sharing Grant for Market-led Production and Value Chain Development	7.65	5.61	73.33
Project Management and Coordination	4.30	7.12	165.50
Unlocated	1.18	0	0
Project Preparation Advance	1.62	0	0
Total	92.15	70.54	76.5

Table A3.1 Project actual cost by component and source of finance in US\$'000

Project components	IDA	PHRD	Beneficiaries	Total
Component 1-Institutional Capacity Development	9,513	3,200	0	12,713
Component 2- Investment in Irrigation Systems	35,700	9,400	0	45,100
Component 3- Cost Sharing Grant for production and value chain development	2,761	1,650	1,200	5,611
Project Management and Coordination	7,121	0	0	7,121
Unlocated	0	0	0	0
Project Preparation advance	0	0	0	0
Total	55,095	14,250	1,200	70,545



ANNEX 4. EFFICIENCY ANALYSIS

1. An economic and financial analysis of the project was undertaken to assess the economic soundness of the project and its likely impact of project interventions on beneficiaries. The financial analysis considers the estimated benefits from the point of view of individual farms, while the economic analysis considers the estimated incremental benefits and costs of the project investment to the society.
2. Tangible benefits provoked by the project included increased productivity and marketed production for farmers. This was achieved by: i) improved access to irrigation water, ii) adoption of new technologies by farmers, iii) better technical assistance services and iv) improved access to markets.
3. The project also generated several institutional benefits. The most important was the establishment of the National Irrigation Institute (INIR from its Portuguese acronym) under the Ministry of Agriculture and Food Security (MASA). INIR has full responsibility for irrigation development and is responsible for the National Irrigation Program (PNI), approved by the Council of Minister in December 2016. The PNI aims to add 212,500 Ha new area under irrigation in the next 25 years. Overall, the project contributed to the implementation of the National Irrigation Program (PNI) by establishing 2,588 hectares of irrigation schemes. It also laid the foundations for developing the irrigation system in the country.
4. In addition to farmers benefitting from matching grants, technical assistance and irrigation water, other categories of beneficiaries were farmers organizations (FOs), water user associations (WUAs), the National Directorate of Agriculture, and the National Extension Services and INIR.

Methodology and assumptions

5. Incremental costs and benefits analysis were performed by comparing a “with-project” scenario with a “without-project” scenario. The without-project scenario was done using the baseline yields and cropping patterns. During the first seven years of project implementation the with-project analysis is based on real costs and benefits. Following the project implementation period (ended in Year 7) it is assumed that farmers increase the cultivated land within irrigation schemes by 10% per year (until covering 100% of the irrigation schemes areas) and that the number of production cycles per year increase from 1 to 1.5 for rice¹⁹ (which was an original project target) and from 2 to 3 for all vegetables excluding baby corn (which is already harvested three times). The projected cash flow also envisages an improvement of the yields for the crops for which yields were most far from the technological frontier in Mozambique (namely rice, onion and sugarcane). The reasons for these improvements in yields are because at completion there are two important

¹⁹ This consists in planting rice in half of the area during the dry season and in the total plot area in the rainy season.



initiatives aimed at increasing yields. One is a joint initiative between the WB, the Ministry of Agriculture, AGRA (a US-incorporated non-for-profit organization), the Hubei Jinxiu African Agricultural Development Industry Strategic Alliance and Technoserve (a US-based NGO) to transfer China's rice productivity enhancing products and technology in Mozambique, to build irrigation and water management capacities and to promote the use of meccanization among smallholder rice farms. In addition, a new WB-funded project, named IRRGA, has been recently approved and it aims at supporting PROIRRI beneficiaries by providing technical assistance and matching grants.

6. Annual cash flows were estimated as the difference between the with-project and without-project net benefits for direct beneficiaries.
7. The economic analysis at completion used different parameters compared to the economic analysis conducted at appraisal. At completion the economic net present value (ENPV) was calculated using a discount rate of 5.5%. This is much lower than the discount rate used at appraisal (12%). Indeed, at completion the economic situation the country was very different. More specifically, at appraisal Mozambique had a GDP real growth of 6.5%-7%, while at completion the GDP real growth was 3%. In addition, the discount rate at completion was chosen following the new WB's guidance note issued in 2016. More specifically, the 5.5% discount rate was obtained by multiplying the forecasted real per capital GDP growth rate by an elasticity of marginal utility of consumption of two.
8. The EFA conducted at appraisal used a 20-year time horizon (including a 6-year project implementation period) However, given the time it took the project to complete investments on the ground, a 30-year time horizon (including seven years of project implementation) is considered more realistic. A 20-year time horizon was used in sensitivity analysis to allow for comparability of results with the EFA conducted at appraisal. Details of the ex-ante and ex-post EFA is presented in Table A4.1.



Table A4.1: assumptions used for EFA at completion and at appraisal

	Completion	Appraisal
Discount rate	5.5%	12.%
Time horizon	- 30 years - 20 years for sensitivity analysis Both the 20 and the 30-year times horizons include a 7-year implementation period	20 years (including a 6-year project implementation period)
Project costs	Costs for Component 1a excluded from the project cost	Costs for component 1a excluded from the project cost
Additional economic costs after project implementation period (including O&M of irrigation schemes)	US\$0.31 million/year	US\$0.65 million/year
Extension of rehabilitated irrigation schemes	Total: 2,588 Ha gross area (2,548 Ha net area), of which: - Rice: 1,175 Ha gross (1,137 Ha net) - Horticulture: 887 Ha gross (887 Ha net) - Outgrowing: 526 Ha gross (524 Ha net), of which: - Sugarcane: 60 Ha gross (58 Ha net) - Horticulture: 466 Ha gross (466 Ha net)	Total: 5,000 Ha, of which: - Rice 3,000 Ha - Horticulture: 800 Ha - Outgrowing: 1,200 Ha, of which: - Sugarcane: 600 Ha - Horticulture: 600 Ha
First year of the time horizon when incremental benefits of irrigation accrued	- Rice: year 5 - Horticulture: year 4 - Outgrowing sugarcane: year 5 - Outgrowing: year 3	- Rice: year 3 - Horticulture: year 1 - Outgrowing sugarcane: year 4 - Outgrowing horticulture: year 3
Cropping intensity	Rice schemes: 1 until yr 9 of the time horizon and 1.5 since yr 10 - Horticulture schemes: 2 until yr 9 of the time horizon and 2.85 since yr 10 - Outgrowing sugarcane: 1 - Outgrowing horticulture: 2.94	- Rice schemes: 2 - Horticulture schemes: 2.5 - Outgrowing sugarcane: 1 - Outgrowing horticulture: 2.5
Utilization of irrigation schemes	- Rice: 44% in year 7 - Horticulture: 41% in year 7 - Outgrowing sugarcane: 100% - Outgrowing horticulture: 47% (72% for the schemes including baby corns) in year 7 The utilization is assumed to reach 100% of the area by increasing 10% per year for all schemes	- Rice: 100% in year 3 - Horticulture: 50% in year 1, increasing 10% per year up to 90% in year 5 - Outgrowing sugarcane: 100% - Outgrowing horticulture: 50% in year 1, increasing by 10% per year up to 90% in year 5

9. The financial analysis was conducted at farm level by using the market prices collected during the completion mission and by the project end-line survey.

10. Whereas for the economic analysis, market prices were converted to shadow prices. A world price numeraire was used. The economic analysis ignores all transfer payments such as taxes, grants,



interests and principal repayment paid to or received from farmers. Conversion factors were calculated by using border parity prices and are reported in Table A4.2.

Table A4.2: Conversion factors

Item	Completion
Rice	0.79 (‡)
Maize	0.92 (†)
Fertilizers, plant protection chemicals and vegetable seeds	0.94
Gasoil	0.75
Agricultural mechanical operations	0.88
Irrigation works	1 (Ⓢ)
Standard conversion factor	0.99

‡: Derived by the MAFAP (FAO) Nominal rate of protection at farm gate for rice in Mozambique

† Derived by the MAFAP (FAO) Nominal rate of protection at farm gate for maize in Mozambique

Ⓢ From 2017 irrigation works are expected from VAT (Law 13/2016)

11. Financial project costs were converted to economic costs by reducing actual costs by the average value of taxation of each component.
12. The cost of unskilled labor hired for agricultural operation was valued by using the standard conversion factor (SCF). This is because agricultural labor is hired at peak work time, when the wage rate reflects the opportunity cost of labor. No allowance was made for family labor. This is because a whole farm budget approach was used. The family farm is the recipient of the incremental net benefit. Thus, the family remuneration is the net income stream. Including family labor as a cost would constitute double counting²⁰. A SCF was used for all items not listed in Table 2. The SCF is very close to 1. This is in line with the 2016 Mozambique Country Fact Sheet on Food and Agriculture Policy Trend conducted by FAO, which emphasizes that Mozambique has one of the most liberalized trade regimes in the region.
13. All project costs were included in the economic analysis, with the exclusion of costs for Sub-component 1a (this same procedure was applied at appraisal). This is because Sub-component 1a aimed at improving the institutional environment and at building capacities among relevant irrigation authorities. Related activities were important to build sustainability, but their effect cannot be quantified in monetary terms.

Results

14. Yields and gross margins per hectare at market price are included in Table A4.3 as estimated at completion. The table shows that vegetables and sugarcane are much more profitable than rice and the other staple crops like maize, beans and sweet potato.

Table A4.3: Yield and gross margin (at market price) per hectare per production cycle

Yields (Tons/Ha)	Gross margin (US\$/Ha) ²¹
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²⁰ See Gittinger J. P., (1982) *Economic Analysis of Agricultural Projects*. World Bank Institute. The John Hopkins University Press, Baltimore

²¹ Figures reported in the table are at market prices



	Without project	With project ²²		Without project	With project ²²	
		Yr 7	Yr 10		Yr 7	Yr 10
Baby corn	n/a	18.1	18.1	n/a	2,122	2,122
Beans	0.44	0.60	0.60	117	198	198
Cabbage	25	32	32	1,279	1,649	1,649
Maize	1.24	1.78	1.78	19	62	62
Onion	15	18	20	3,449	4,126	4,674
Rice	2.15	3.0	3.7	148	200	216
Sweet potato	1.25	1.25	1.25	115	115	115
Sugar cane	n/a	78	90	n/a	972	2,848
Tomato	16	25	25	2,659	2,659	2,659

15. Table A4.4 reports cropping mixes, net benefits and incremental net benefit (at market price) for each farming system. The results show that all considered farming system have a positive incremental net benefit. The higher incremental net benefits are accrued to the outgrowing and horticultural models.

²² Figures under the “with project” columns refer to 7th and 9th year of the project time horizon (the 7th year is also the last year of the project implementation period).



Table A4.4: financial analysis of farming systems

Rice farming system: 1 Ha						
Crop (Ha)	Without Project		With Project			
	Dry S.	Wet S.	Yr 7		Yr 10	
			Dry S.	Wet S.	Dry S.	Wet S.
Rice		0.50		1.0	0.50	1.0
Cabbage	0.01		0.01		0.01	
Tomato	0.01		0.01		0.01	
Sweet potato	0.04		0.04		0.04	
Bean	0.01		0.01		0.01	
Cultivated area (Ha)	0.06	0.50	0.06	1.00	0.56	1.00
Net benefits (US\$/Ha)	105		244		368	
Incr. net benefit (US\$/Ha)			121		227	
Horticulture outgrowing farming system: 1 Ha						
Crop (Ha)	Without Project		With Project			
	Dry S.	Wet S.	Yr 7		Yr 10	
			Dry S.	Wet S.	Dry S.	Wet S.
Baby corn			0.84 x 2	0.32	0.84 x 2	0.32
Beans		0.5	0.04	0.34	0.04	0.34
Cabbage	0.13		0.10	0.04	0.20	0.04
Onion	0.13		0.02		0.02	
Maize		0.50		0.30		0.30
Sweet potato	0.25					
Cultivated area (Ha)	0.50	1.00	1.84	1.00	1.94	1.00
Net benefits (US\$/Ha)	684		4,291		4,467	
Incr. net benefit (US\$/Ha)			3,589		3,764	
Horticulture farming system (non-outgrowing): 1 Ha						
Crop (Ha)	Without Project		With Project			
	Dry S.	Wet S.	Yr 7		Yr 10	
			Dry S.	Wet S.	Dry S.	Wet S.
Maize		0.63		0.58		0.58
Tomato	0.08	0.04	0.3	0.04	0.3 x 2	0.04
Cabbage	0.08	0.04	0.3	0.04	0.3 x 2	0.04
Onion	0.08	0.04	0.3	0.04	0.25 x 2	0.04
Beans		0.25	0.1	0.3	0.15	0.30
Sweet potato	0.25					
Cultivated area (Ha)	0.5	1	1	1	1.85	1.00
Net benefits (US\$/Ha)	979		3,519		5,491	
Incr. net benefit (US\$/Ha)			2,540		4,513	

16. The project faced significant budget cuts. US\$5 million were lost due to the depreciation of the SDR. In addition, the Government of Mozambique (GoM) cut US\$10 million and reallocated this



amount to non-project purposes. Moreover, following the hidden public debt issue, the local currency was suddenly devaluated in 2015-2016. In 2012 the exchange rate was 28 MZN/US\$. The average exchange rate was 40 MZN/US\$ in 2015 and 63 MZN/US\$ in 2016. The consequence was a reduction of the value the funds that were converted into the local currency during the depreciation period. These contextual circumstances were added up to cost overruns and an underestimation of irrigation costs at appraisal stage. The PAD envisaged the equipment of 5,500 hectares of irrigation while the total funds for Component 2 were US\$46.8 million (US\$ 41 from IDA and US\$7.6 from PHRD). At completion, the project equipped 2,588 hectares for a total expenditure of US\$45.1 million. Moreover, for Component 4 (management and coordination) the project expenses at completion were US\$7.5 million against an original allocation of US\$4.3 million

- 17. Significant delays affected the project implementation. The EFA conducted at appraisal envisaged that benefits of horticulture irrigation schemes accrued starting in Year 1 and the benefits of irrigated rice in Year 3. However, the first horticulture irrigation scheme (for the contract farming business line) was completed in April 2014 (in Year 3) and the first rice irrigation scheme was concluded in August 2016 (in Year 5). In this regard, contract management and low performance of service providers was widely acknowledged as a significant problem during the completion mission.
- 18. In the 2018/19 agricultural season the eight rice irrigated areas were sown only for 44% of their total area. This was caused both by technical problems with the pumping system in two schemes and by a low capacity of farmers to fully utilize available irrigation areas. In irrigation schemes where farmers were linked to vegetable buyers through outgrowing contracts farmers harvested baby corn up to three times per year and the average use of irrigated areas was 72%. Indeed, contract farming relaxed farmers constraints for access to agricultural inputs, thus enabling farmers to increase intensity of cultivation.
- 19. The EFA envisages an increase in the use of irrigation schemes by 10% per year, an increase of production cycles for vegetables and rice (see above for details) and of yields for rice, onion and sugarcane (see Table A4.2). The result ENPV is positive (US\$ 13.70 million) and an EIRR of 8.1%.
- 20. The sensitivity analysis shows that the ENPV turns negative if the same yields, use of irrigation schemes and number of production cycles observed in the 2018/19 agricultural season remain unchanged. The sensitivity analysis also shows that the ENPV would turn negative if the number of production cycles per year remains unchanged or if a 20-year time horizon is used (as at appraisal).

Table A4.5: Sensitivity analysis

Scenarios	EIRR (%)	NPV @5.5% (Million US\$)
Same yields, number of production cycles and use of irrigation schemes observed in the 2018/19 agr. Season (i.e. Business as Usual)	-0.5%	-19.3

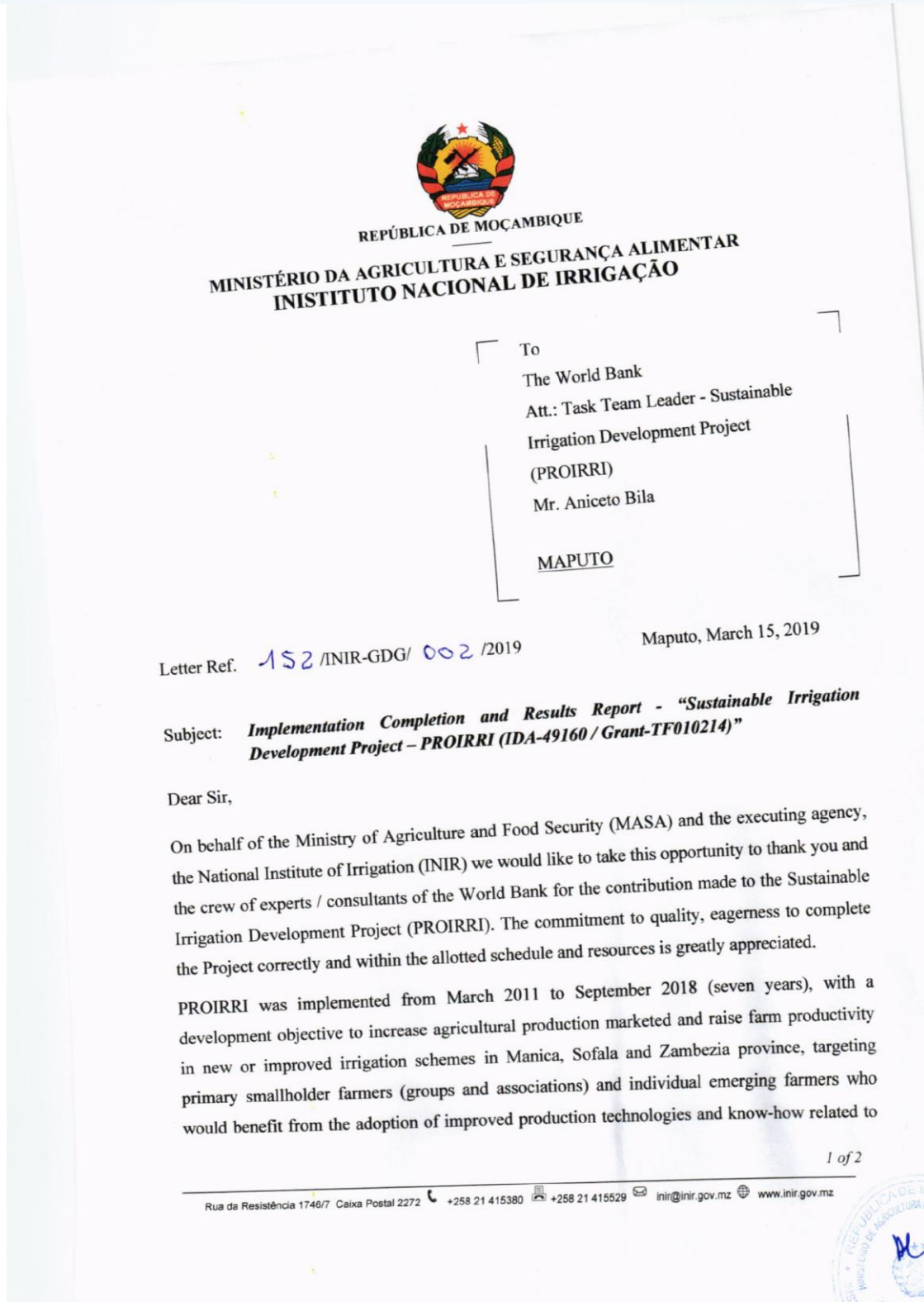


5% annual increase in the use of irrigation schemes up to 100% of the total areas	6.6	5.7
Number of production cycles per year unchanged	4.4	-4.6
Increase in the use of irrigation schemes up 80% of the total area	6.9	6.5
20-year time horizon (including 7 years of project implementation period)	4.3	-3.7

21. A large part of the rehabilitated irrigation areas (45%) are in low lands with clay soils and are consequently intended for rice cultivation. However, rice is much less profitable than the other crops promoted by the project like vegetables and sugarcane (see Table A4.2), especially if it is harvested only once per year. In this regard, the project was conceived on the idea that rice would have been harvested twice per year (which did not occur).
22. The project had three business lines: rice, horticulture and contract farming (which included horticulture and 60 hectares of sugarcane). In order to properly understand the importance of the different crops on the project ENPV and EIRR, an EFA was conducted by differentiating the costs and benefits due to rice versus the costs and benefits that are due to vegetables and sugarcane cultivation. For this comparative analysis, the costs of the components that could not be directly attributed to a specific business line (i.e. costs for Sub-component 1b and costs for Component 4) were proportionally allocated to the cost of irrigation schemes (which are directly linked to a business line) as reported in the list of contracted works. By using a 5.5% discount rate and a 30-year time horizon, the results of this analysis show that ENPV of the rice scheme is negative (-US\$23.48 million), while for horticulture and contract farming the ENPV is positive (US\$ 37.18 million) and the EIRR is 18.0%. The result is similar even if a 20-year time horizon is used since the ENPV of horticulture and contract farming would still be positive (US\$19.33 million) and the EIRR would be 16.1%. This comparative analysis also shows that for horticulture and contract farming, the ENPV would still be positive (US\$ 1.16 million) even when the same yields and production cycles observed during the last agricultural season was used (i.e. with no improvements in yield and production cycles) over a conservative 20-year time horizon (EIRR: 6.7%).



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





irrigation including other relevant enabling environment for overall management of the schemes and viability of the irrigated agriculture as described in the Project Appraisal Document (59590-MZ).

After reading the Implementation Completion and Results Report (ICR), we have made comments and suggestions, which will be shared in digital format, however, MASA-INIR agrees with the overall storyline and the ratings in the Bank ICR. Our perception is that the Project was a success because of the number of institutional capacity and benefits generated. The key lasting achievement in the institutional capacity is the establishment of INIR, the development of the National Irrigation Plan (2017-2042), and the approval of legal framework for the WUAs, which laid a good foundation for an active irrigation subsector. Other accomplishment is the expansion of infrastructure-irrigated land in about 2,588 hectares, which is now under production and farmers, can produce cash and staple crops throughout the year, and thus increase their income.

As Government we also acknowledge the fact that it is important to balance between long-term development goals and short-term Project indicators and targets. It would not be conceivable to achieve for example, the target of 5,500 hectares within a short period of time. There is a need to build upon the successes of the Project.

We also noticed that the Bank promoted an environment of dialogue and helped the Government to understand the Bank rules and procedures, and to keep focus on results. The key lesson is that the Project was designed under the assumption that the Government would have the necessary implementation capacity, including the use of service providers, but this was not really the case. The financial management, procurement and monitoring and evaluation, environmental and social safeguards represented a challenge at some point of Project implementation.

Thus, MASA-INIR endorses the ICR prepared by the Bank with hoping to closely continue working and get the due assistance from Bank for the effective implementation of the IRRIGA and other future projects.

Yours very truly,


The Director-General

Paiva Doge Alexandre Munguambe
(Assistente Universitário)

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ANNEX 6. BENEFICIARY ASSESSMENT

1. A beneficiary assessment was conducted on January 24 and 25, 2019, as part of the implementation completion mission in three irrigation schemes: one in Sofala Province (Muda Massequece) sugar cane out-growers and two in Manica Province (7 de Abril and Campo 4) both out-growers in vegetables. Because of the rain the mission was not able to reach areas under the rice business line. The beneficiary assessment was through structured questions. In addition, the beneficiary assessment solicited opinions and observations from the participants about various aspects of the project implementation and impact. A total of 52 beneficiary farmers (25 in Muda Massequece, 14 in 7 de Abril, and 13 in Campo 4) out of the total 22, or 40 percent, were women.
2. The beneficiaries' assessment of PROIRRI was conducted to ascertain the perception of the beneficiaries in key aspects of the project design and objectives, quality of the services delivered, and impact.
3. A summary of the discussions on the perceptions of the beneficiaries about the project design and objectives, factors that induced change, and areas that could have improved is presented below.

Project Design and Objectives

4. In all of the three project locations, more than half of the beneficiaries were aware and had high comprehension of the project design and objectives. They all informed that the project was designed to help them improve agriculture production and sales through provision of water for irrigation and that they would participate in all stages of the scheme design and construction. According to them this was a result of the principles of comprehensive engagement followed by the project and services providers that ensured participation of beneficiaries from the initial stages of project implementation. The beneficiaries were involved from the identification of the schemes and were consulted on scheme design and alternatives including the costs maintenance after project closes. This methodology created consensus building among beneficiaries, service providers, private sector actors, and the Government. In Muda Massequece, one of the beneficiaries informed that had they known that the process was serious as it was, they could have indicated more area to benefit from irrigation than they did. Although in Muda Massequece the beneficiaries were well informed they did not trust the authorities because they were informed that only 58 ha of a total of 100 ha would benefit from irrigation.
5. Most of the beneficiaries interviewed believe that the project achieved its objectives to help the farmers increase production and sales through provision of water. Most participants indicated that the project achieved the objectives through enabling them to improve yields, increase intensity of production, diversify crop production, provide links to markets, and increase income and thus pay school fees, purchase motorcycles, purchase association's tractor, build new houses, renovate houses, and acquire new land areas for expansion for cultivation.



Figure 5.1. Discussion with Beneficiaries in Muda Massequece, January 24, 2019



Source: A. Bila Pictures

Factors that Induced the Change and the Main Changes

6. According to beneficiaries, there are several factors that induced change and their performance. These include the provision of water for irrigation, support provided to organize farmers into PAs and water users, training in agronomic practices by service providers, and provision of matching grants to access inputs and improve links with the markets facilitated by the service providers.
7. In Muda Macequeesse, the beneficiaries reported that they had no water for irrigation and now have water in 58 ha. This has enabled them to grow sugarcane and the yield has been improving over the last two years. According to them, they harvested 67 tons in the first year and 90 tons in 2018–2019 and received about MZN 4 million (about US\$67,000) that was distributed equally among members. The market links have enabled them to save money for maintenance of the irrigation system when it is broken. In Muda Massequece, the beneficiaries reported major repair of the pump undertaken in December 2018. They indicated that this was possible because of the secure market that they had with the off taker. The repair would have not been possible without links with the private sector.



8. In Campo 4, the gravity fed-system reported that had only 8 ha before the project and the supply of water was irregular and with the project they have increased the irrigated area to 25 ha. Through training and provision of matching grants and improved links to the markets, they can now harvest baby corn thrice a year and have a secure market with Vanduzi under out-growers. They grow cabbage at least twice a year and the yield can reach as high as 25 tons per ha. They reported that because of water availability they can now produce in the off-season and have high returns of cabbage when cultivated during the dry season. The price could vary from MZN 3 to MZN 5 during the season and up to MZN 8 in the off-season.
9. In 7 de Abril, the irrigation gravity fed-system using sprinklers reported that because of project intervention, the irrigated area was increased by 29 ha. Related to factors that induced change in addition to water, they indicated that training and matching grants were critical to improve yield and increase crop intensity. They also reported multiple cropping of baby corn and cabbage and more income from cabbage in the off-season.

Areas that Could Have Improved

10. The project beneficiaries reported many benefits including improvement in their lives because of the project assistance. Some reported having built improved houses, changing from grass roof to metal, and purchasing motorcycles and small trucks, among other benefits. Overall, the beneficiaries reported that the time of consultation, design, and construction of schemes was very long and because of that, their interaction time with service providers after completion of the schemes was very limited. In addition, some indicated that they would like to have access to mechanization because of increased area. In 7 de Abril, they reported that the area developed with irrigation was smaller than they intended. They indicated that 39 ha and only 28 ha was rehabilitated and no clear explanation of the reduction of the size was provided.



ANNEX 7. SUPPORTING DOCUMENTS (IF ANY)

Project Documents

- Project Appraisal Document on a proposed credit in the amount of SDR 44.90 million (US\$70.0 million equivalent) and a proposed grant from PHRD
- Financing Agreement, August 2012
- Restructuring paper 2016, 2017, and 2018

Aide Memoires

- Implementation Support Mission, January 2011
- Implementation Support Mission, April 2012
- Implementation Support Mission, September 2012
- Implementation Support Mission, February 2013
- Implementation Support Mission, May 2013
- Implementation Support Mission, November 2013
- Implementation Support Mission, December 2014; Midterm review
- Implementation Support Mission, August 2015
- Implementation Support Mission, 2016
- Implementation Support Mission, 2016
- Implementation Support Mission, June 2017
- Implementation Support Mission, October 2017
- Implementation Support Mission, October 2018

ISRs

- Sequence 1–13

Documents from Borrower/Implementing Agency

- Government ICR 2018



- Final report

Other Documents

- AGDPO series ICR