



Final Evaluation Report

Independent Evaluation Services in Support of the
Cabo Verde Watershed Management and Agriculture
Support (WMAS) Project



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ACRONYMS

ANAS	Agência Nacional de Água e Saneamento (National Water and Sanitation Agency)
CAIXA	Caixa Económica de Cabo Verde
CBWMP	Community-based Water Management Plan
CDA	Community Development Association
ERR	Economic Rate of Return
FAO	Food and Agriculture Organization
GDP	Gross Domestic Product
GoCV	Government of Cabo Verde
HVA	High-Value Agriculture
INE	Instituto Nacional de Estatística (National Institute of Statistics)
INGRH	Instituto Nacional de Gestão de Recursos Hídricos (National Institute of Water Resources Management)
IPG	Investment Policy Guidelines
IRB	Institutional Review Board
ITT	Indicators Tracking Tables
MAA	Ministério da Agricultura e Ambiente (Ministry of Agriculture and Environment)
MADRRM	Ministério do Ambiente Desenvolvimento Rural e Recursos Marinhos (Ministry of Environment, Rural Development and Marine Resources)
MCC	Millennium Challenge Corporation
MCA	Millennium Challenge Account
MCA-CV I	Millennium Challenge Account for Cabo Verde Compact I
MFIs	Microfinance Institutions
OMCV	Organização das Mulheres de Cabo Verde
PHC	Postharvest Center
REC	Rural Extension Center
USGS	United States Geological Survey
WMAS	Watershed Management and Agriculture Support



EXECUTIVE SUMMARY

The objective of this assignment was to conduct a post-Compact independent evaluation of the Watershed Management and Agriculture Support (WMAS) Project under the Millennium Challenge Corporation's (MCC's) first Compact in Cabo Verde. The WMAS Project was designed to increase agricultural productivity through transition to high-value agriculture (HVA) using drip irrigation in three watershed areas: Santo Antão, São Nicolau, and Fogo Islands. The project had three activities: (i) Water Management and Soil Conservation; (ii) Agribusiness Development Services; and (iii) Access to Credit. During the Compact, 28 reservoirs and 48 different types of dikes (torrential control, catchment, and small dikes) were constructed to capture and store water. One postharvest center was built in Santo Antão, and three rural extension centers were rehabilitated. In addition, 549 farmers were provided training on agribusiness marketing. A total of USD 450,000 was made available to the loan recipients by Caixa Económica de Cabo Verde (CAIXA) through four participating microfinance institutions (MFIs).

The evaluation aimed to assess project design, implementation, and outcomes to draw lessons from each of these aspects. The assessment of project design involved evaluating whether the project was adequately designed to achieve the expected outcomes. The project implementation component assessed whether the intervention was carried out as planned and adhered to the design. For outcomes, the evaluation included an assessment of project effectiveness and sustainability. The evaluation followed a mixed-methods approach using quantitative and qualitative data. The quantitative component consisted mainly of analysis of data in the Indicator Tracking Table (ITT), provided by the Millennium Challenge Account (MCA) Cabo Verde and MCC, and survey data collected from 125 farmers and traders. The qualitative component included literature review and analysis of stakeholder interviews conducted during the fieldwork. The evaluation was conducted in Santo Antão and Fogo.

The project's design is in line with academic literature and aligns with the government's priorities. Academic literature shows strong causal relationship between drip irrigation and its impact on farmers' income through increase in high-value crop production, improved productivity, reduced labor costs, and water savings, among others. The WMAS Project Logic demonstrates the causal pathway of drip irrigation maximizing the quantity of water available for agricultural production, as found in existing literature on the topic. The design also aligns with the government's priorities on water availability for economic development as indicated in the National Action Plan for Environment for 2004–2014. The WMAS Project was relevant for the country's development priorities, which put a great deal of emphasis on the mobilization of existing water resources and the construction of infrastructure to increase water availability and to reduce water losses in agriculture.

However, the project design did not take into account the economy's growth structure and the appropriateness of its land for productive agriculture to achieve maximum benefits. The growth potential of the agricultural sector is relatively lower than the growth



potential of other sectors. The country's growth is primarily driven by the service sector and tourism is a major contributor to this sector. The soil is not suitable for agriculture as it is poor in organic matter with low fertility and low water retention capacity. High prevalence of micro-farms limits the scope of economies of scale. Agricultural productivity is low due to low fertile soil and erratic rain patterns. High costs of production and marketing discouraged farmers not only from producing high-value crops but also from exporting the commodities to other islands. Similarly, there was only one training curriculum for all three islands, which did not address island-specific needs. Risks associated with drought were not assessed adequately enough to be integrated into the design and sustainability of the project.

All infrastructure activities were concluded before the end of the Compact, but the sequencing of the construction and quality control was inadequate in some cases. The work included construction of infrastructure for water mobilization (catchment dikes, boreholes, etc.), storage (reservoirs capable of storing 200/500/1,000 cubic meters ($[m^3]$ of water), and distribution (distribution systems) in the intervention areas. Infrastructure activities included construction of a total of 28 reservoirs and 48 dikes; one fully equipped postharvest center (PHC); and rehabilitation of three rural extension centers (RECs). However, some reservoirs were made before the boreholes were in place. Although farmers had already bought drip irrigation equipment, they could not use drip irrigation to produce enough to take to the postharvest center or to export. Some of the built reservoirs had leakages caused by poor construction. The 2015 storm resulted in silted-up catchment dikes and reservoir connection pipes Fogo. Weak technical and financial capacity of the MAA has reportedly affected the supervision and maintenance of the built infrastructure, and so its sustainability. The mobile storage units in the postharvest center were very small, which proved to be inefficient and were, therefore, never used.

The training program under the agribusiness activity increased skills and knowledge of extension workers and farmers, but it was reported to be inadequate in achieving expected impacts. The training covered several topics related to the project, including access to credit, agronomy, marketing, postharvest technology, and irrigation. About 51 extension workers and 550 farmers were trained during project implementation. However, the training program under the agribusiness activity was reported to be insufficient for the extension workers and farmers. Survey data show that 22 percent of the trained farmers reported they would expect improvement in content, 64 percent reported they would expect improvement in the duration of the training, and 16 percent reported the need for improving language issues. Similarly, for participating MFIs, the training program did not provide the requisite operational-level training for loan underwriting. As a result, MFI staff were not adequately trained on agricultural loan appraisal to objectively assess the merits of each loan application.

Access to credit enabled farmers to adopt drip irrigation, and about half of the farmers were satisfied with the loan product; however, a majority of farmers ended up using the loan for other purposes. A total of 225 loans with an overall value of 498,671.10 CVE were provided to farmers by the participant MFIs to enable farmers to



buy drip irrigation equipment. About half of the loan recipients (50 percent) were satisfied with the financial products they received. The customer satisfaction was driven more by the quick loan approval and disbursement as reported by 65 percent loan recipients compared to terms or interest rates reported by 22 percent loan recipients. However, only 18 percent of the loan recipients applied for loans for the purpose of purchasing drip irrigation equipment. The majority of the farmers whose loans were approved ended up using the loan for other purposes, such as to pay for labor (33 percent) and to purchase inputs (21 percent).

Whereas the WMAS Project introduced drip irrigation technology in the islands and built farmers' capacity to enable them to migrate to HVA, project outcomes on improving production methods, productivity, and crop cycles did not meet expectations. Overall, about 106 farmers were found to have applied improved techniques. Only 24 percent of the surveyed farmers reported adopting drip irrigation. The share of farmers who adopted drip irrigation was 29 percent in Fogo and 22 percent in Santo Antão. The average yearly crop cycles before and after the project were 1.39 and 1.36, respectively, which indicates that the project had no impact on the crop cycle. Average agricultural productivity significantly dropped to 62227 kg/ha in the last agricultural year from 183209 kilogram/hectare (kg/ha) during the pre-project period due mainly to a severe drought last year (2017). About 39 percent of farmers reported an increase in agricultural sales and income. The average reported agricultural sales in the last agricultural year (397102 CVE) were greater than the average pre-project agricultural sales (169931 CVE). Similarly, median agricultural income was higher in the last agricultural year (100000 CVE) than the pre-project period (80000 CVE). However, 55 percent of farmers reported that their sales and income declined in the post-project period. In addition, the project did not have a significant impact on agricultural exports, which were primarily affected by high transaction costs.

The prospects for sustainability of project outcomes are mixed across different project activities. The agricultural training component of the project is found to be sustainable as MAA continued to provide training even after the project had ended. The majority of Santo Antão's reservoirs are more compatible with traditional irrigation than with drip irrigation. The borehole built in Santo Antão has remained nonoperational due to farmers' unwillingness to pay for the electricity. None of Fogo's reservoirs are currently in operation, largely due to damages—as yet unrepaired—from the 2015 hurricane. Some reservoirs, however, are nonoperational due to construction issues. Lack of water availability due to recurrent droughts affect the use of spring-fed reservoirs. The PHC in Santo Antão is operating significantly below capacity due to its inconvenient location, insufficient number of baskets (package), perceived high cost partly due to high energy costs and lack of reliable maritime transportation, and lack of awareness among farmers. The MFIs' lending activity has also not been widely sustainable because of high non-repayment rates. Sustainability of project outcomes has been affected mainly by lack of maintenance, farmers' unwillingness to pay for infrastructure use, and adverse weather conditions.



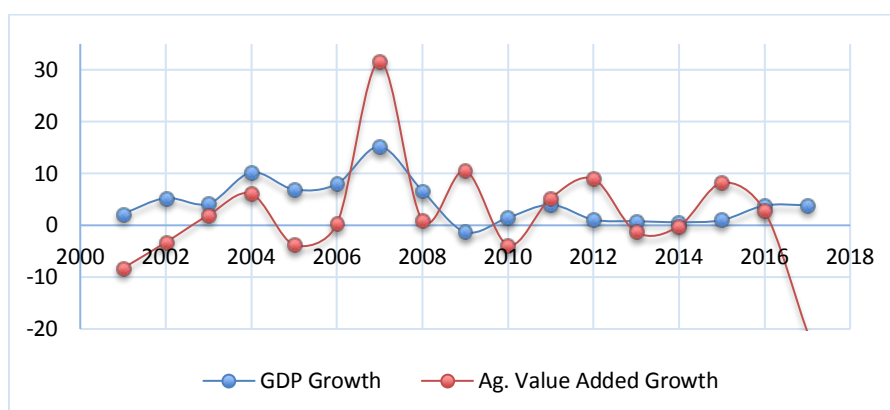
Several lessons can be drawn from the WMAS Project implementation. A more rigorous analysis of project feasibility and prospects should have been carried out prior to the project's design, to assess the extent to which the geography and land of Cabo Verde were conducive to agricultural activity. The analysis should also have incorporated an in-depth assessment of the market potential for high-value crops. A proper risk assessment exercise should have been performed prior to the design and implementation of the project. The risk of drought might have been mitigated by the installation of more boreholes and stricter enforcement of the water payment policy to ensure their continuous operation. In addition, the risk of maritime connectivity to Sal and Boa Vista should also have been considered. Loan non-repayment risks should have been addressed in the project design by introducing a consequential risk-sharing mechanism that would affect the MFIs' portfolio or other similar measures. More civil engineers in construction management might have been necessary to oversee the entire construction process to minimize construction quality issues. A proper value chain analysis would have helped in assessing all costs to be incurred by the farmers and whether it would be feasible to produce and market elsewhere. A more sustained capacity-building activity for MFIs would have been required to enhance their ability to evaluate loan applications objectively and coherently.



1. INTRODUCTION

The Cabo Verde archipelago is a middle-income country with a GDP per capita of about USD 3,209 as of 2017. Cabo Verde has experienced positive economic growth in the past decade, with an average growth rate of about 2.2 percent. The country's growth is driven primarily by the service sector, while the contribution of the agriculture sector to GDP is limited. Agriculture accounted for about 6.4 percent of GDP in 2017, compared to 18.6 percent for the industry sector and 61 percent for the service sector. However, the agriculture sector accounts for about 13.4 percent of the total employment, while the service sector accounts for about 65 percent. Agriculture's low share of GDP stems from low productivity in the sector. Since 2011, agriculture has been growing at a 2 percent growth rate on average, compared to a 6 percent growth rate between 2005 and 2010.¹

Figure 1: Annual Growth Rate in GDP and Agriculture Value Added



Source: World Development Indicators, 2018.

Agriculture development in Cabo Verde is primarily constrained by its fragile ecosystem. The country is characterized by a rugged and volcanic terrain. The improvement of agricultural production in Cabo Verde is hampered by the lack of arable land—as only about 10 percent of the land is suitable for crop production—and by the lack of water.² Rainfall in Cabo Verde is erratic, with a short rainy season between August and October, during which the country experiences torrential downpours.³ About 20 to 53 percent of rainfall is lost through runoff.⁴ Thus, productivity in the agricultural sector remains low. The otherwise arid climate reduces the potential for agriculture. Moreover, Cabo Verde is vulnerable to climate changes, rising sea levels, and natural disasters, which all affect the agriculture sector.⁵

¹ World Bank (2018). World Development Indicators.

² Ministry of Finance and Planning (2004). “Growth and Poverty Reduction Strategy Paper.”

³ A. Barbosa (1998). “Wastewater Management in Cabo Verde.” Invited Paper, United Nations Environment Programme.

⁴ M. S. Bosa. (2015). “Water Institutions and Management in Cabo Verde.” *Water* 7 (6), 2641–55.

⁵ Ministry of Environment and Agriculture, Cabo Verde (2007). National Adaptation Programme of Action on Climate Change.



Agriculture in Cabo Verde is dominated by microfarms with average farm sizes of 1.0 to 1.5 hectares (ha). This is further distributed within families, resulting in even smaller areas of cultivation. About 93 percent of all crops are dry land crops, and only 7 percent of the total crops are cultivated in irrigated land. A large number of farmers are landless, and the land tenure system in Cabo Verde mainly includes leasing and partnership. Approximately 70 to 85 percent of the farmers do not produce enough to meet their own consumption needs. Inadequate farming practices, steep gradients, surface runoff, and wind result in soil erosion, which further hampers agriculture. Limited access to market and to credit also affects agricultural production.⁶

The three islands under review for this evaluation, Santo Antão, São Nicolau, and Fogo, vary substantially from each other with respect to socioeconomic and geographic conditions. Santo Antão has a geographic area of 779 square kilometers (sq. km) with a population of 48,761 and is the second-largest island in the country. São Nicolau covers an area of 388 sq. km and has 12,940 inhabitants. Fogo has an area of 476 sq. km and a population of about 40,000. Population density is highest in Fogo, followed by Santo Antão and then by São Nicolau. About 8,800 ha in Santo Antão, 5,900 ha in Fogo, and only 2,000 ha in São Nicolau are arable land. Poverty incidence is higher in Santo Antão and Fogo compared to in São Nicolau. Furthermore, whereas much of the transport infrastructure in the country is in good condition, infrastructure connecting the islands is poor. As a result, access to markets for producers on these islands poses a significant problem.

The soil and water quality varies across islands. Soils in Cabo Verde are of volcanic origin, coarse, rocky, and low in organic matter.⁷ Therefore, the soil is not well-suited for agriculture. Further, soil use differs by islands. For instance, in Santo Antão the soil is good for agroforestry, while in São Nicolau it is good for dry agriculture, and in Fogo, for irrigated agriculture.⁸ Furthermore, groundwater quality also varies across islands. The Paúl Basin in Santo Antão receives on average 700 millimeters (mm) of rainfall annually, followed by 600 mm in Fogo's Mosteiros Basin, and 330 mm rainfall in São Nicolau's Fajã Basin. The aquifers in Paúl and Mosteiros Basins are more susceptible to contamination from agriculture and septic waste than is the case for the Fajã Basin.⁹

MCC signed a five-year Compact with the Government of Cabo Verde in July 2005 with the aim of enhancing economic growth and poverty reduction in the country. The Millennium Challenge Account—Cabo Verde I (MCA-CV I) was responsible for the overall management of the Compact's implementation under the direction of the National Coordination, established by the Government of Cabo Verde (GoCV). The MCA-CV I

⁶ Ministry of Finance and Planning (2004). "Growth and Poverty Reduction Strategy Paper."

⁷ I. Baptista, L. Fleskens, C. Ritsema, A. Querido, J. Tavares, A. D. Ferreira, ... and A. Varela (2015). Soil and Water Conservation Strategies in Cabo Verde (Cabo Verde in Portuguese) and Their Impacts on Livelihoods: An Overview from the Ribeira Seca Watershed. *Land* 4 (1), 22–44.

⁸ Sociedade Caboverdiana de Zoologia (2012). The Cabo Verde Islands.

⁹ V. M. Heilweil, S. B. Gingerich, L. N. Plummer, and I. M. Verstraeten (2010). *Groundwater Resources of Mosteiros Basin, Island of Fogo, Cabo Verde, West Africa* (No. 2010-3069). US Geological Survey.



included three projects: (i) Watershed Management and Agriculture Support (WMAS), (ii) Infrastructure, and (iii) Private Sector Development (PSD). The Compact ended in October 2010.

The WMAS Project was designed to increase agricultural productivity in three specific watershed areas through three key activities: (i) Water management and soil conservation (i.e., building reservoirs and small dams, boreholes, etc.); (ii) Agribusiness development services (i.e., training on drip irrigation, packing sheds, quality control centers, and other technical assistance); and (iii) Access to credit (i.e., training about loans, specifically for farmers to adopt drip irrigation). Two main activities were undertaken under the Agribusiness Development Services Activity. One was the construction of Postharvest Centers (PHCs) and Rural Extension Centers (RECs), and the second was providing training to farmers. The three intervention areas included Paúl (Island of Santo Antão), Fajã (Island of São Nicolau), and Mosteiros (Island of Fogo). Potential beneficiaries for this project included actors along the supply chain, including farmers, farm laborers, micro- and small-sized agribusiness, providers, users of transportation and distribution services, as well as farmer-based organizations. Table 1 below presents the value of planned investment in each of the three activities.

Figure 2: WMAS Project Activities



Source: Cabo Verde Monitoring and Evaluation Plan, 2010.

Table 1: Multi-Year Financial Plan Summary – Watershed Management and Agricultural Support

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
Watershed Management and Soil Conservation Activity	1,561,405	2,035,513	1,829,973	1,037,145	336,214	6,800,249
Agribusiness Development Services Activity	1,278,311	1,503,576	665,603	84,383	66,508	3,598,380
Credit Activity	0	145,000	145,000	105,000	55,000	450,000
Total	2,839,715	3,684,089	2,640,576	1,226,528	457,722	10,848,630

Source: Compact Closure Report (2010).



The project aimed to improve the existing irrigation water storage systems and to facilitate the growth of farmers through the transition to high-value agriculture. The goal was to assist farmers in overcoming constraints to accessing growing market opportunities for high-value-added crops like fruits and vegetables as well as horticulture for both domestic and local tourist markets. Project investments focused on increasing the capture, storage, and distribution of rain-fed, spring-fed, and well-fed water resources; thus, enabling farmers to irrigate their fields and increase agricultural productivity. Increases in irrigated land and water supply reliability were intended to facilitate a shift from low-value rain-fed subsistence agriculture (corn and beans) to high-value horticultural and fruit crops.

This study was carried out to conduct an independent evaluation of the Cabo Verde Watershed Management and Agriculture Support (WMAS) Project. The objective of this evaluation is to measure the impact of the project activities attributable to the WMAS Project. In particular, the evaluation investigates how adoption of drip irrigation technology, access to credit, and conversion from traditional crop subsistence level farming to high-value horticultural and fruit crops has impacted household incomes of participating farmers. The evaluation follows a theory-based approach of evaluation, which involves the review of the project design, implementation, outcome, and lessons learned. The evaluation report is structured in seven chapters. Following the Introduction, Chapter 2 describes the project logic and evaluation methodology. Chapters 3, 4, and 5 discuss each of the three project activities under the Watershed Management & Agriculture Support Project, their design, and implementation aspects. Chapter 6 presents the findings of the project's outcome analysis. Chapter 7 presents the synthesis of the evaluation and discusses the lessons learned.

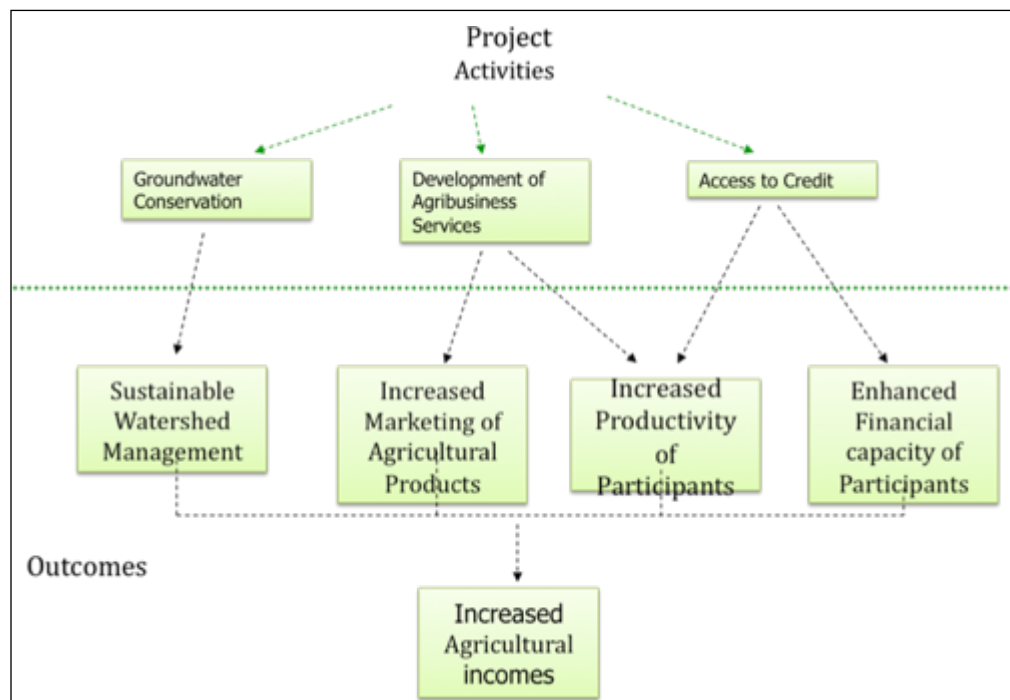


2. PROJECT LOGIC AND EVALUATION DESIGN

2.1. PROJECT LOGIC

Overall, WMAS Project investments focused on enhancing agricultural income through transition to high-value crops. This goal was to be achieved by increasing the capture, storage, and distribution of spring-fed, borehole-fed, and rain-fed water resources, thus enabling farmers to irrigate their fields and increase high-value agricultural production. The main medium-term objective (outcome) of the WMAS Project was to increase water availability, soil retention and conservation, and agriculture productivity, capacity, and value from the horticulture and fruit production made possible by the investments in watershed management. The three project activities were interconnected, and the project outcomes depended on the complementarity among the activities.

Figure 3: Compact Results Chain



Source: MCA-CVI.

According to the WMAS Project logic, more efficient use of water in the selected project sites would have the potential to transform the agriculture sector and replace large volumes of imports with domestically grown products. Because of low domestic production, food products constitute about 30 percent of Cabo Verde's merchandise imports.¹⁰ As discussed earlier, availability of irrigation water is a critical issue in Cabo Verde because of its erratic rainfall, which adversely affects agricultural production and forces the country to rely on imports to meet domestic consumption. This overreliance on

¹⁰ World Bank. World Development Indicators (2018)



foreign agricultural imports could be reduced by replacing the imported agricultural products with increased amounts of homegrown products by expanding the availability of water for irrigation and land quality. In this regard, the project put a special emphasis on soil conservation and watershed management activities, which—as documented in the literature—have positive impacts on the environment and on combating land degradation and desertification.

Table 2: Watershed Management and Agriculture Support Project Logic

Activities	Outputs	Outcome	Medium-term outcomes	Impact
Watershed Management & Soil Conservation	<ul style="list-style-type: none"> Number of reservoirs constructed USD value of irrigation construction contracts signed 	<ul style="list-style-type: none"> Volume of available water Tons of solid material retained through soil conservation infrastructure Hectares under improved or new irrigation Number of farmers who have applied new techniques 	<ul style="list-style-type: none"> Sustainable watershed management Increase agriculture productivity Increase agriculture capacity Increase financial capacity of participants 	<ul style="list-style-type: none"> 8,591 beneficiaries of the project Increase in income after 5 years and 10 years.
Agribusiness Development Services	<ul style="list-style-type: none"> Number of farmers trained Number of farmers who have applied new techniques Volume of water saved due to adoption of drip irrigation Number of units of infrastructure built (i.e., postharvest centers, extension centers) 	<ul style="list-style-type: none"> Increase agricultural productivity in the intervention zones <ul style="list-style-type: none"> Productivity (Horticulture (ton /ha) Value added for farms Number of crop cycles Better access to credit to improve agriculture activities 	<ul style="list-style-type: none"> Increase in farm profit Increase in farm wages 	
Access to Credit	<ul style="list-style-type: none"> Number of loans disbursed 			

Source: A2F Consulting.

The WMAS Project also aimed to facilitate the transition to higher-value crops to improve farmers' income and reduce rural poverty. Improving the consistency of supply and the market quality of high-value horticulture products for the domestic market were also important considerations in the design of the WMAS Project. Particular attention was paid to horticultural crops as opposed to high-value products from sugarcane (i.e.,



alcoholic beverages), coffee, and milk (i.e., specialty cheeses), due to their potential market opportunities. The project intended to develop value-added fruit and vegetable products, which have niche market opportunities domestically or internationally (i.e., organically produced, special appellations, gift packs, etc.).

The WMAS Results Chain emphasizes the complementary nature of project activities, especially in islands where the full package of activities was implemented. In these areas, an increase in water availability through construction of reservoirs for water storage and access to affordable and well-managed drip irrigation equipment would enable farmers to invest in the production of high-value crops, whereas the training and agribusiness activities would enable these farmers to better understand and meet market requirements for these crops. The loan component of the WMAS Project activity would further enhance the ability of farmers to adopt the new approach and eventually migrate to practice high-value agriculture (HVA) and benefit from higher prices through improved access to postharvest infrastructure. Together, these activities were intended to increase agriculture productivity, agriculture capacity, and agriculture profitability to ultimately increase household incomes and reduce poverty.

Table 3: Target Beneficiaries

Beneficiaries	Santo Antão (Paúl)	São Nicolau (Fajã)	Fogo (Mosteiros)	Total
Number of farmers expected to gain increased access to water and credit to install drip irrigation	229	59	49	337
Number of people expected to be impacted directly by drip irrigation activities	1,145	295	245	1,685
Number of farm households on the islands expected to receive benefits from the agriculture development services	6,789	513	1,289	8,591
Number of people in farm households on the islands	31,769	9,222	28,691	69,689
Total number of people on the islands	48,761	12,940	37,798	99,499

Source: Cabo Verde Monitoring and Evaluation Plan, 2010.

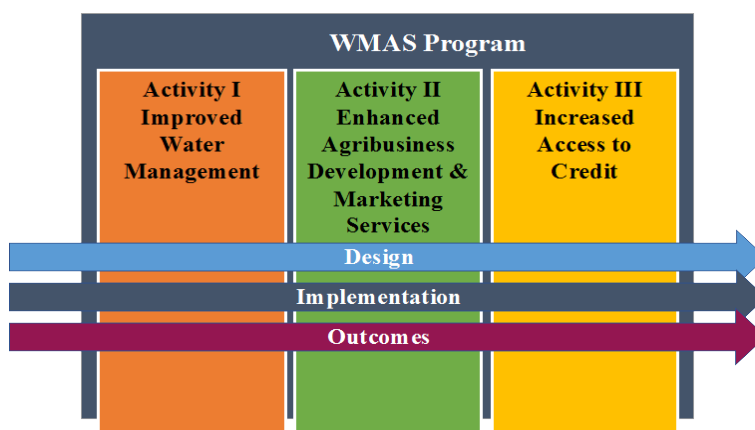


2.2. EVALUATION DESIGN

2.2.1. Overall Approach

A theory-based approach was employed to conduct the post-Compact evaluation of the WMAS Project. This approach examines the entire project causal chain or logical framework, from inputs to outputs, and outcomes to possible impacts, to explore how and whether inputs were correctly designed to lead to the expected goals. The theory-based approach was used to assess the effect of a program in a way that accounts for both the underlying causal mechanisms and implementation processes. The objective was to obtain information not only on what works and what does not, but also on how and why the project succeeded or failed based on rigorous academic evidence.

Figure 4: Proposed Evaluation Framework



With respect to project design, the Evaluator assessed whether the project was adequately designed to achieve the expected outcomes. To this end, the Evaluator took a holistic approach with a focus on relevancy and the need/demand for project activities. The Evaluator reviewed related literature to pinpoint any conceptual shortcoming in the causal chain; for example, institutional/organizational aspects that may have influenced project outcome. In this context, economic rate of return (ERR) calculations were reviewed, underlying assumptions were examined to assess whether these remained valid during the Compact period or if unpredicted events violated ERR assumptions. The Evaluator looked at any perceived risks and any mitigation strategies put in place to manage those risks, as well as whether contextual factors were considered.

With respect to project implementation, the Evaluator assessed overall adherence to the design. It assessed whether the intervention was carried out as planned, and in the same way everywhere within one island and across islands. From this perspective, the Evaluator examined several factors, in particular the quality of the construction, procurement procedures, supervision, choice of regions, environmental conditions, and the role of different entities and their coordination in the implementation process, as well as follow-up procedures. The Evaluator also assessed the quality of the training program and of technical assistance, the reasons for implementation delays, factors that influenced the performance of different project participants during project implementation, etc.

With respect to project outcomes, the Evaluator evaluated whether the expected results were achieved (i.e., effectiveness), and whether these results have been sustainable during the post-Compact period (i.e., sustainability). The collected data



included a large volume of administrative information on all the project activities during the mission. Primary data were also collected through surveys of project participants, such as farmers and traders, to gain an informed insight into the outcomes. The evaluation assessed how the three activities under the WMAS Project interacted with each other along with contextual factors to achieve the Compact's goal to capture a complete picture of the project's performance. The performance assessment was designed to consolidate findings, while accounting for the links and interrelationships between each project activity. Moreover, lessons were drawn from the overall project evaluation.

The issue of attribution was addressed through contribution analysis. The attribution issue for the WMAS Project was heightened by the lack of baseline data that would incorporate a valid counterfactual. For instance, 229 farmers in Santo Antão, 59 farmers in São Nicolau and 49 farmers in Fogo were expected to gain increased access to water and credit to install drip irrigation. The contribution analysis addressed causal inference by looking for consistency of outcomes with the program theory while assessing/ruling out alternative explanations.¹¹ The notion of contribution stems from the view that an intervention works alongside contextual factors to produce the observed outcomes. The attribution question can therefore be equivalent to asking what difference the program makes in bringing about the observed outcomes, and whether the program played any catalytic role that resulted in a specific outcome.

The performance evaluation followed a mixed-methods approach, combining quantitative and qualitative data. The quantitative component consists mainly of analysis of secondary data collected from national surveys, Performance Indicator Tables, available documents on the project activities, data provided by MCA–CV I and MCC, and survey data collected from farmers and traders. The qualitative component includes the literature review and the analysis of stakeholder interviews conducted during the fieldwork.

¹¹ John Mayne (2001). "Addressing Attribution through Contribution Analysis: Using Performance Measures Sensibly." *Canadian Journal of Program Evaluation* 16 (1): 1–24.



2.2.2. Evaluation Questions

The main evaluation questions for each activity are divided into two components as per the evaluation framework.

Table 4: Evaluation Questions on the Water Management and Soil Conservation Activity

Focus	Research questions	Indicators
Effectiveness	<ul style="list-style-type: none"> To what extent has productivity of farmers (Ton/Ha) increased in the treated areas (Mosteiros and Paúl) as the result of the infrastructure? Did the new water infrastructure allow farmers to have at least two crop seasons? To what extent have farmers migrated to cash crop products? Are farmers producing only at subsistence level, or are they producing at a larger scale? Are farmers in treated areas aware of postharvest centers; do they use them? Do they export to other islands (Sal and Boa Vista)? If yes, how often do they do it? If not, why? Are farmers satisfied with the drip irrigation? 	<ul style="list-style-type: none"> Number of farmers who adopted drip irrigation Number of households that benefited from the program Total population of each island Other interventions or development programs (if any) that were underway during this activity Quantity of infrastructure constructed Quality of infrastructure constructed
Sustainability	<ul style="list-style-type: none"> Is the new infrastructure currently functional and used by the farmers? If yes, is the amount of water sufficient for their needs? And do they receive it in a timely manner? Did farmers pay and are they still paying for the received water and services? What are the responsible entities for managing (Operating & Maintenance) the water management services? Are the systems being repaired and maintained properly when necessary? 	

Source: A2F Consulting.



Table 5: Evaluation Questions on the Agribusiness Development Services Activity

Focus	Research questions	Considerations
Effectiveness	<ul style="list-style-type: none"> How do farmers in the treated areas sell their agricultural products? Do they sell in local markets or in organized markets? Are farmers in treated areas aware of postharvest centers; do they use them? Do they export to other islands (Sal and Boa Vista)? If yes, how often? If not, why? Did the implemented training programs lead to widespread adoption of new irrigation practices and resorted to new marketing strategies? All farmers were chosen for training, if not, what were the criteria? What was the timeline and frequency of such training programs? Did farmers at the time of training already adopt the new irrigation practices? Was there any spillover effect? If so, to what extent, and did it reach other communities? 	<ul style="list-style-type: none"> Role of communications and administrative procedures and processes in helping or hindering the implementation Level of interest from those beneficiaries, who adopted new irrigation systems in participating in training programs (compared to those who already had) Number of farmers receiving training Efficiency and timeliness of the programs Challenges encountered by beneficiaries participating in the program
Sustainability	<ul style="list-style-type: none"> Is the PHC currently functional and used by the farmers and traders? In the post-Compact period, do farmers receive any extension services from the MAA, for example, on how to operate and maintain drip irrigation systems? Are extension centers currently operating? In the post-Compact period, do farmers apply agribusiness and marketing practices that were taught over the course of the Compact? 	

Source: A2F Consulting



Table 6: Evaluation Questions on the Access to Credit Activity

Focus	Research questions	Considerations
Effectiveness	<ul style="list-style-type: none">• What were the criteria for acquiring microcredit?• Did they receive the credit needed to adopt new methods of water management and irrigation?• Did farmers use the credit for the intended purposes?• What was the overall experience of beneficiaries with these financial products?	<ul style="list-style-type: none">• USD value of agricultural and rural loan• Volume and number of loans disbursed• Number of farmers who received credit
Sustainability	<ul style="list-style-type: none">• In the post-Compact period, are financial institutions still lending money to farmers?• What is the current reimbursement rate? Are there more farmers applying for credit for drip irrigation purposes?• What are these funds used for?• What has been the effect of this component on participating MFIs.	

Source: A2F Consulting

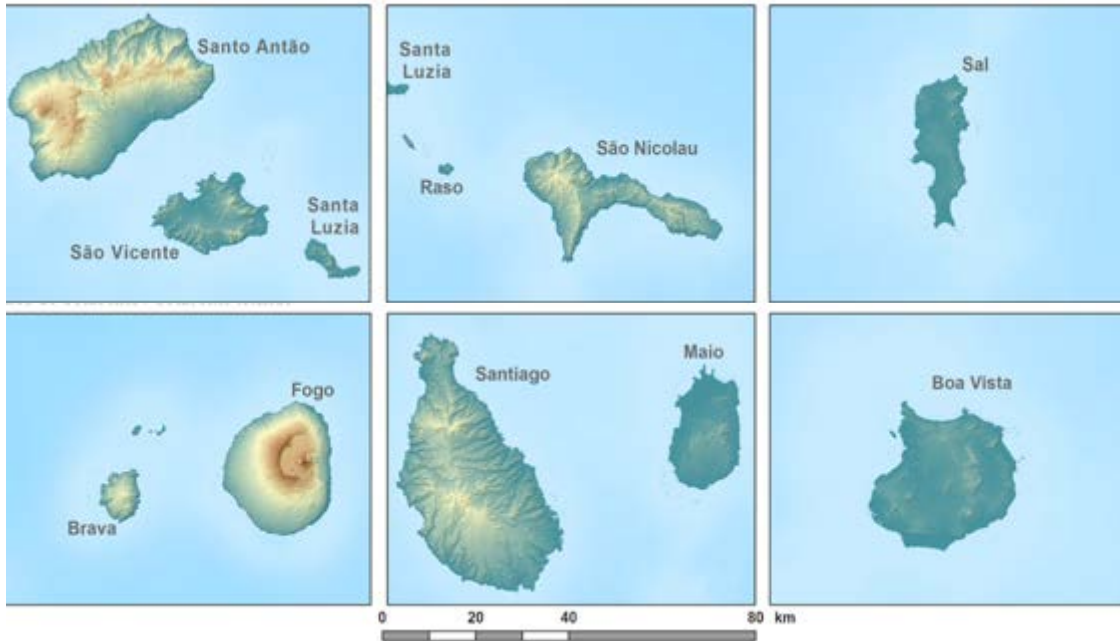
2.2.3. Study Sample and Coverage

Fogo and Santo Antão were selected as target islands for this evaluation. The selection of the target islands under this option was done through close consultation with MCC counterparts. All three islands (i.e., Santo Antão, São Nicolau, and Fogo) vary substantially from each other with respect to socioeconomic and geographic conditions. Among the three islands, Santo Antão (Paúl) has the largest number of both direct and indirect beneficiaries. However, with pine forests and lush valleys, its geographical climate is rather different from that of the other two islands. Fogo and São Nicolau on the other hand, share more similarities, both in terms of geographical features and in the scope of implemented activities. Therefore, the following criteria were used to select the study islands:

- Performance—islands where the program was “most successful”
- Ease of mobility within the island
- Scale of WMAS program interventions—islands in which the scale of the intervention was largest
- Distribution of benefits—diverse set of beneficiaries
- Distribution of project benefit streams
- Extent of equal access for women and other vulnerable groups to the project and its benefits
- Type of high-value crop produced
- Percentage of farmers with a drip irrigation system installed on their farm.



Figure 5: Cabo Verde Topography



Source: United States Geological Survey.

The sample of farmers comprised 100 farmers in Santo Antão and 25 farmers in Fogo. There are about 229 and 49 direct potential beneficiaries in Paúl and Mosteiros, respectively. Collecting data on 100 farmers in Paúl, and collecting the same on 25 farmers in Mosteiros provides a representative picture of the project performance in those areas. The sample also included 11 traders, 9 from Santo Antão and 2 from Fogo. The survey covered farm households operating in the treatment areas. The sample was drawn from a list of potential beneficiaries held by the local offices of the MAA in Mosteiros and Paúl and from CAIXA. All farms were small scale.

The required sample size was calculated for different scenarios of confidence interval and margin of error using the equation below. The number of farmers has been fairly small within each island. Therefore, the following formula was used for the purpose of cross validation to ensure the proposed sample size lies within an acceptable range, and results from the survey can be generalized to the whole population of beneficiaries.

$$n_s = \frac{Def f * (z^2) * p(1-p) / e^2}{1 + \left(z^2 * \frac{p(1-p)}{e^2 N} \right)}, \text{ where}$$



Table 7: Parameters Used in Calculation of the Required Sample Size

Parameters	Remarks
n_s	Sample size
$z = 1.96$	Statistic corresponding to the level of confidence (1.96 for 95% confidence interval)
$Deff = 1$	Design effect will only be present in cluster sampling. For this survey it will be considered 1.
$P = 50\%$	Estimate for selected key outcome indicator to be measured in the survey, we assumed the conservative measure of 50%
E	Margin of error (4% and 5%)
N	Total number of beneficiaries $N=229$ and 49

All calculations were carried out using the conservative estimate of 50 percent for key outcome indicators of the study. This number yields the most conservative sample size. The majority of indicators were in the form of proportions, which to a great extent would simplify the task of sample size calculations. As the variance of proportion is bounded (i.e., $P*[p-1]$), assuming the maximum variance (0.5) would therefore ensure the minimum level of precision. Also, marginal error rates of 5 percent as well as a 95 percent confidence interval were used. The design effect was set at 1. These parameters would ensure accuracy and representation of the final results based on acceptable statistical standards.

In addition, semi-structured interviews were conducted with stakeholders involved in the three WMAS Project activities, and project sites were visited. This included interviews with MCC and former MCA-CV I staff; delegates and extension officers of the MAA and the INGRH; other associations; Postharvest Center (PHC) staff; and CAIXA and the participating microfinance institutions and their staff. In addition, the A2F team visited a number of project sites in Santa Antão and Fogo. This included in Santo Antão (i) six reservoirs located in Dragoeiro, Lombo Vermelho, Rocha Grande, Vicente, Pedra das Moças, and Fajã das Pombas; (ii) two boreholes and two piezometers located in Rocha Grande and Vicente; (iii) REC of Rocha Grande; and (iv) PHC in Porto Novo; and in Fogo (i) six reservoirs located in Monte Barro, Pai António (Boca de Curral), Matinho, Relva and Achada Grande, Atalaia Baixo, Atalaia (Achada Maurício); (ii) REC of Ribeira Ilhéu; and (iii) PHC in São Filipe.



2.2.4. Data Collection Tools and Methods

Table 8: Data Collection Tools

Data Source	Method	Key areas of focus
Farmers	Structured survey	<ul style="list-style-type: none"> • Outcomes <ul style="list-style-type: none"> ○ Adoption of drip irrigation ○ Conversion to cash crops ○ Number of crop cycles ○ Use of extension center ○ Use of PHC ○ Productivity ○ Agribusiness and marketing activities ○ Employment ○ Water availability ○ Use of credit • Sustainability
Associations	Semi-structured interviews	<ul style="list-style-type: none"> • Design, implementation, sustainability of the project, postharvest centers, extension centers • Implementation and status of the infrastructure and equipment • Maintenance • Perceived success and challenges • Perception of sustainability
Delegates	Semi-structured interviews	<ul style="list-style-type: none"> • Design, implementation, sustainability of the project, postharvest centers, extension centers • Implementation and status of the infrastructure and equipment • Maintenance • Perceived success and challenges • Perception of sustainability
Traders/Intermediaries; Foreign and domestic buyers; Exporters	Semi-structured interviews	<ul style="list-style-type: none"> • Use of postharvest centers • Changes in quantity and quality of produce, and prices • Changes in type of buyers and ability to meet buyer needs • Awareness and perception of Cabo Verdean agriculture products • Changes in regulatory environment and certification process. • Changes in the quantity, type, season, and



		destination of exports <ul style="list-style-type: none"> • Remaining barriers to export • Interaction with the project beneficiaries, particularly the recipients of the agribusiness, training, and marketing activities
Watershed management infrastructure and facilities, as well as drip irrigation equipment	Observation	<ul style="list-style-type: none"> • Operability • Sustainability • Maintenance • Management
Microfinance Institutions and Fund Management Staff (CAIXA)	Semi-structured interviews	<ul style="list-style-type: none"> • Sustainability

Source: A2F Consulting

2.2.5. Data Limitations

There was no baseline data on farmers and agribusinesses in the ITT. As a result, the evaluation relied on survey data on outcome indicators such as agricultural production, sales, income, etc. In addition, data were missing for some indicators such as the number of crop cycles. Data on some of the indicators were not tracked during the project, including for productivity and value added for farms. Secondary data were found to be limited. For such indicators, ex-ante and ex-post data were collected from farmers based on their estimates and memory.

Collecting data from farmers in the post-Compact period may have also incurred recall bias, as it can be harder for the beneficiaries to remember details, especially quantitative information. Therefore, quantitative data were complemented with qualitative data, as well as with information collected through document review and stakeholder interviews. For the indicators in ITT, actual values were benchmarked against targets in 2010. From the survey data, outcomes at farmers' level were compared against those in the pre-WMAS period.

Drought severely affected agricultural production in the reference period, which affected the analysis to some extent. The survey was designed to collect data for the pre-WMAS period and for the last agricultural year (2017) for comparison purposes. However, due to drought, several farmers reported negligible agricultural production. In those cases, making a comparable discussion was challenging. Therefore, the survey also included qualitative questions such as whether farmers' income/sales increased, whether they were satisfied with the loan, and whether training was helpful, etc.



3. WATER MANAGEMENT AND SOIL CONSERVATION ACTIVITY

3.1. DESCRIPTION OF THE PROJECT ACTIVITY

The infrastructure building component of the project was targeted to improve the compensation irrigation system through the construction of dikes and reservoirs to retain and store irrigation water. Retention and torrential correction dikes and reservoirs were built with the aim of recharging water tables, slowing erosion, capturing water, and providing a reliable source of rain-fed, spring-fed, and borehole-fed irrigation water storage with distribution systems directed into the farm gates. This reliable source of irrigation water was expected to enable the farmers to transition from subsistence on low-value crop production to high-value crop production. This would facilitate the adoption of drip irrigation, which is a more efficient form of irrigation in terms of water application precision and reduction of loss and wastage of irrigation water.

Figure 6: Images from A2F's Site Visit to Achada Grande System (1–4); Monte Barro System (5, 6); Boca de Curral System (7, 8) Fogo



Source: A2F Consulting.

Over the course of three years (2007 to 2010), 28 reservoirs and 48 different types of dikes (torrential control, catchment and small dikes) were constructed to capture water, recharge water tables, and decrease soil erosion. Reservoirs were intended to supply a reliable source of rain-fed, spring-fed, and well-fed water for drip irrigation to 111.2 hectares serving 337 farmers in three of the four islands with the highest agricultural potential for contributing to national food security.¹² Twelve 1,000 cubic meter (m³) reservoirs, five 500 m³ reservoirs, and eleven 200 m³ reservoirs were built. In Figure 6 and Figure 7, pictures from a number of these sites are displayed. These pictures were taken during the Evaluator's inception mission to Cabo Verde. Figure 6 shows a 1,000 m³ and a

¹² Cabo Verde—Watershed Management and Agriculture Support Report.
<https://data.mcc.gov/evaluations/index.php/catalog/154/study-description>.



500 m³ rain-fed reservoir with associated mirror type rain catchment, along with a lower filtration dike in the island of Fogo. Figure 7 shows a 1,000 m³ spring-fed reservoir located in Paúl, Santo Antão.

Figure 7: Images from A2F's Site Visits to Paúl



Source: A2F Consulting.

The types of new infrastructure in Santo Antão and Fogo differed due to the type of available water sources in the two islands. For instance, spring-fed water is relatively plentiful in the Paúl basin. Since springs provide a considerable flow of water throughout the year, the focus of the MCC activity was the rehabilitation of the dilapidated infrastructure to help with the management and prevention of water loss as well as to increase awareness among the farmers. In contrast, since Fogo usually gets the highest amount of average rainfall among all the islands, the infrastructure work there focused on upland rain-fed water systems.

3.2. ASSESSING DESIGN

The choice of locations to build the infrastructure in Santo Antão and Fogo was not based on a rigorous analysis. The primary objective of building infrastructure was to improve irrigation for transition to high-value agriculture, which would ultimately lead to increased incomes for farmers. However, increasing production may not always lead to increase in income, as that is also contingent on the demand for the product and its marketability. Fogo and Santo Antão each contribute less than 10 percent of the total number of tourists arriving in Cabo Verde; thus, the domestic market potential for horticultural products on these islands was limited, given the small population size and the limited tourism sector. Limited interisland connectivity also affects marketing potential. Reliable Maritime transportation could have been assessed as a potential risk. This is important as majority of the tourist (about 77%) stayed in the islands of Sal and Boa Vista.



Reliable maritime transportation could have been an important factor to respond to the increasing tourists' demand. Moreover, the soil in Santo Antão is best suited for forestry and livestock production and not for horticulture production. MAA determined the location of the sites on which the infrastructure (reservoirs, dikes, dams, etc.) were built within each island.

Drought was not listed as a risk in the Monitoring and Evaluation (M&E) Plan; thus, no mitigation plan was developed. Cabo Verde is severely prone to recurrent droughts, which is a historical phenomenon and can lead to a modification of microclimates, desertification, torrential rains, and volcanic eruptions as recorded on the island of Fogo in 2015.¹³ Despite this, drought was not factored into the design of the infrastructure activity and, therefore, no necessary mitigation plan was developed. During droughts, the lack of adequate mitigation measures led to a significantly reduced supply of water in the newly built reservoirs, which affected water availability for irrigation. The most recent drought occurred in 2017, when lack of precipitation adversely affected the irrigation prospect as well as the agricultural production of farmers in Santo Antão and Fogo. As evidenced by the survey, about 99 percent of the farmers considered drought as the greatest challenge to their agricultural production in 2017.

3.3. ASSESSING IMPLEMENTATION

Table 9: Activity Outputs

#	Indicators	Output	Target	% of Completion
1	Number of reservoirs constructed	28	28	100.0
2	USD value of irrigation construction contracts signed	USD 4.60 million (disbursed)	USD 5.04 million (signed)	91.2

Source:ITT.

There were some delays at the beginning of infrastructure construction in Fogo, and it was anticipated that the construction would extend beyond the end of the Compact timeframe. The watershed infrastructure, (as mentioned in the Community-based Water Management Plans [CBWMPs] for each island and basin, created in April 2007) was meant to be constructed within the stipulated period of the Compact, which ended in October 2010. The work on lots 46 and 52 in Fogo, each consisting of the construction of 1,000 m³ reservoirs, was expected to be completed after the Compact period.

¹³ In the last 277 years, Cabo Verde endured at least 97 years of droughts of which 14 lasted three years or more^a and between 1980 and 2002, there have been at least four droughts. (a. Source: B. Baker (2006). "Cabo Verde: The Most Democratic Nation in Africa? *The Journal of Modern African Studies* 44 (4): 493–511. doi:10.1017/S0022278X06002060 EM-DAT: The Emergency Events Database—Université Catholique de Louvain (UCL)—CRED, D. Guha-Sapir - www.emdat.be, Brussels, Belgium).



However, all infrastructure activities were concluded before the Compact termination. The work undertaken in the three watersheds (Mosteiros, Paúl, and Fajã) consisted of constructing infrastructure for water mobilization (catchment dikes, boreholes, etc.), storage (reservoirs capable of storing 200/500/1,000 [m³] of water), and distribution (distribution systems). The list of watershed infrastructure that was to be built in Santo Antão and Fogo, including their completion levels, is shown in Table 9 below.

Table 10: Complete List of Watershed Infrastructure in Santo Antão and Fogo

Description of the infrastructure	Quantity (Actual)		Target	Percent of completion
	St. Antão	Fogo		
Small dikes	—	43	43	100
Torrential Control Dikes	15	6	21	100
Catchment Dikes	12	5	17	100
Borehole	1 borehole and 2 piezometers	—	3	100
Pump station	1	—	1	100
1,000 m ³ Reservoir	1	5	6	100
500 m ³ Reservoir	1	2	3	100
200 m ³ Reservoir	11	—	11	100
Water distribution systems	13	—	13	100
PHCs	1	—	1	100

Source: Compact Closure Report (2010).

Adjustments had to be made to the original plans due to groundwater quality in the islands, which in turn resulted in deviations in the number of boreholes constructed. A United States Geological Survey (USGS) evaluation of salt water intrusion into groundwater in Mosteiros identified salinity in the observation and production wells of the coastal plain. Accordingly, the plan to construct boreholes in Fogo was terminated. However, the Ribeira Paúl Basin did not have any such intrusion problem and had more abundant groundwater resources than the other two basins. Therefore, a borehole was constructed in Santo Antão (according to Paúl Delegates) to feed a 200 m³ reservoir in Rocha Grande and a 500 m³ reservoir in Pedra das Moças. Additionally a pump station was installed in a preexisting borehole to feed a 1,000 m³ reservoir in Fajã das Pombas. However, the pump was never activated because of budgetary constraints resulting from the depreciation of the USD against the local currency.¹⁴

The sequencing of infrastructure construction was inadequate in some cases, and this affected the effectiveness of the infrastructure investment. For instance, the 500 m³ reservoir in Pedra das Moças, Paúl, was built two years before the borehole was even installed and could not be filled with groundwater. The reservoir was empty for two years as there was no other source of water to fill it with. This indicates improper planning of building infrastructure. Since the connection from the borehole to the reservoir was done toward the end of the Compact, farmers refrained from using drip irrigation for a long time in this area.

¹⁴ Compact Completion Report (November 2010).



Some of the new infrastructure, particularly the water reservoirs, suffered from construction quality issues. A number of reservoirs are currently found to be nonoperational due to poor construction quality. The major construction issues affecting the built infrastructure might be because of the quality of mortar used, inadequate proportioning of sand and other materials, a poor cement coat, and inadequate waterproofing and foundations, etc. Quality concerns were more ubiquitous in Fogo than in Santo Antão. Unlike in Santo Antão, a very common issue in Fogo was silted-up catchment dikes and reservoir connection pipes as an aftermath of the 2015 storm. A few other reservoirs were also subject to faulty structural designs, causing them to lose water in a very time span, such as for the one in Pedra das Moças (Santo Antão). This indicates a lack of adequate supervision during construction. Reportedly, the GoCV is in the process of allocating CVE 8 million solely to repair infrastructure in the three islands. Another structural design concern was the overdimensionality of several reservoirs.¹⁵

Insufficient supervision might be attributable to MAA's limited resources. MAA has limited human resources on the ground, inadequate technical capacities, and limited knowledge of the construction process. At the time of construction, MAA was the entity directly responsible for supervising the ongoing projects. However, reportedly only one person was assigned to supervise all ongoing projects within each island. The road conditions and state of transportation systems were not very conducive to frequent visits to the construction areas, which were generally located in the mountains. Although personnel were deployed to supervise construction, the construction process was not always aligned with the original design.

Community Development Associations (CDAs) could not participate in the first construction procurement process as they could not meet the procurement requirements. CDAs are small groups of local people who are frequently procured by the government and some institutions like the Food and Agriculture Organization (FAO) for small construction projects because of their intimate knowledge of the relevant regions and their construction experience. These associations were also interested in implementing the infrastructure component of the WMAS Project. However, they did not have in-house engineers and would only hire engineers if needed. Therefore, the procurement process did not allow them to play a major role during the first implementation phase of the WMAS Project with the exception of a few small-scale infrastructure projects. There were some efforts to prepare associations to participate in the procurement process, but due to time constraints, these efforts did not lead to significant results. Therefore, the majority of infrastructure projects were implemented by construction companies based in Praia or even in Portugal. However, the CDAs were trained and participated later in the procurement process in the construction of smaller works, which they had the expertise/capacity to implement. A specific bidding document was prepared for such small works.

¹⁵ Overdimensionality is less of a problem since it could be advantageous in the event of a flood, as oversized reservoirs could retain water and thus prevent soil runoff and land degradation. In fact, Fogo experienced floods in 2015, which if not for 1,000 m³ reservoirs, most likely would have led to severe damage to the local residents of the island.



The water associations, which were locally known as Management Unity and formed with members of the Community Development Associations, were responsible for operating and maintaining the built infrastructure under the WMAS Project—the associations were later disbanded. At the end of the Compact, the associations were entrusted with maintaining the infrastructure. However, because of the migration of their main members over time, the water associations were left with limited manpower. It should be noted, however, that the water associations were working fine as long as INGRH was involved in the project. When INGRH discontinued its involvement, the water associations also disbanded. The MAA then took over and is currently considered the owner of the new infrastructure as part of the WMAS Project. Therefore, the MAA is also the main entity in charge of maintaining the entire infrastructure, and has staff conducting regular (monthly) visits. Technicians are assigned by MAA to report on small issues with respect to the infrastructure within roughly a week time. Budget approval remains a fundamental issue for maintenance. The pictures below illustrate the issue of poor maintenance.

Figure 8: Images from A2F's Site Visits (a) Mosteiros, Atalaia and (b) Paúl, Vicente, Rocha Grande, and Lombo Vemelho

(a)



(b)



Source: A2F Consulting.



4. AGRIBUSINESS DEVELOPMENT SERVICES

4.1. DESCRIPTION OF THE PROJECT ACTIVITY

4.1.1. Postharvest Centers and Extension Centers

During the Compact period, only one PHC was built under the WMAS Project and is located in Porto Novo, Santo Antão. After the end of the Compact, two more postharvest centers were constructed in the Island of Fogo (São Filipe) and in the island of Santiago (São Lourenço dos Órgãos). These centers were funded by the GoCV, however, the blueprint and the list of equipment were provided as part of the Compact. These PHCs were built to provide grading, packaging, cooling, and inspection services to farmer households. The center in Santo Antão supplies chlorine for pools and provides certification for the products to be exported to São Vicente, Sal, and Boa Vista, of which only the last two require certificates. In Fogo, the center's sole focus is on packaging, cooling, and storing facilities. Figure 9 and Figure 10 show a few pictures of these centers in Santo Antão and Fogo, respectively.

Figure 9: Postharvest Center Images, Porto Novo (Santo Antão)



Source: A2F Consulting.

The Rural Extension Centers (REC) were expanded, rehabilitated and equipped (in both Santo Antão and Fogo) as part of the second activity in the first Compact. The center aimed to provide training to farmers on modern and environmentally sustainable agricultural practices. The training would include courses in (1) drip irrigation and environmentally sustainable agricultural practices (e.g., proper soil conservation and land cultivation); (2) the proper use, application, and storage of fertilizers, pesticides, herbicides, and fungicides; (3) integrated pest management, where relevant; (4) vegetable and fruit production; (5) on-farm water management; and (6) downstream marketing. Self-education and independent research under the supervision of the MAA officers were adopted as the main approach for these RECs. To this end, these centers were equipped



with computers and internet so that farmers could educate themselves according to their own needs in a variety of issues. In this way, they could also build on the training they received earlier as a part of the second activity.

Figure 10: Rural Extension Center Images, Mosteiros



Source: A2F Consulting.

4.1.2. Training Component

In particular, the training component was intended to provide the farmers with the technical know-how to improve their productivity and businesses. The outreach efforts as a part of this component involved training on issues like agribusiness development and marketing techniques. The training also involved educating the farmers on issues like drip irrigation and high-value agriculture. Other aspects included the strengthening of agricultural extension services, provision of training and cooling, packaging, and services to farmers and other agents along the value chain. According to the CBWMP reports, for each island there were a number of planned outreach activities that were to take place before and after the watershed infrastructure system was to become operational. These covered a range of aspects, as shown in Table 10.

Table 11 : Outreach Efforts before and after System Operation

Outreach Topics before System Operation	Outreach Topics after System Operation
System purpose, benefits, user requirements (e.g., conversion to drip irrigation, cost to use water, etc.) location and construction details	System operation reporting
CBWMP implementation details	Water resource monitoring reporting
WRMP implementation details	Drip irrigation and other innovative and efficient agricultural technology transfer
The real cost of water (water as an economic resource)	Water conservation and efficiency
Drip irrigation technology	Water resource protection
Water conservation and efficiency	Agricultural extension activities related to irrigation, cash-crop production, growing, harvesting, storage, marketing, and exporting.



Water resource protection	Management, operation, maintenance of water systems
Agricultural extension activities related to irrigation, cash-crop production, growing, harvesting, storage, marketing, and exporting.	Community improvement and social program outreach
Management, operation, maintenance of water systems	—

Source: CBWMP Reports, Paúl, Fajã, Mosteiros (2007).

Note: — = Not available; CBWMP = Community-based Water Management Plan; WRMP = water Resource Monitoring Plan

Training programs at the extension centers were carried out by Agland Investment Services, a California-based company providing agriculture services. The focus of the Agland training program was on sustainable agricultural practices for development. The training program consisted of five major modules: namely, irrigation, agronomics, postharvest technology, agribusiness and marketing, and access to credit. Agland was the responsible entity for designing, organizing, monitoring, and evaluating all the training processes. Agland also provided assistance to the MADRRM to help equip the extension agents and farmers with the appropriate knowledge and skills from field-to-market.

The entire training took place through two modules. The first module consisted of training of trainers, during which extension agents from the three watersheds were trained to train farmers in aforementioned areas. During this module, extension agents also participated in several field trips and international congresses to enrich their experience and to become acquainted with the most modern developments in agricultural techniques in Europe and in the rest of the world. A total of 51 extension workers attended the workshops (14-Fogo, 15-São Nicolau, 22-Santo Antão). During the workshops, a total of 47 growers attended the field demonstration days (25-Fogo, 0-São Nicolau, 22-Santo Antão).

In the second module, the farmer training was performed by extension workers under the supervision of the Agland team. There were up to 20 participants per class, and each class was about two hours in length. Classes took place either in the Extension Center or at the farms. The training sessions paid particular attention to learning by doing and providing hands-on experience to the farmers. Technical and field research-based training was provided to farmers and extension agents through the outreach activities of the WMAS Project. Improvements in agricultural extension centers and farm demonstration sites were carried out. Efforts were also oriented toward building capacity for export requirements.

At the end of the training, Agland devised some strategies to assess participants' retention of the takeaways from the training as well as feedback on the training. According to the Agland report, these assessments took into account farmers' literacy levels. They included oral and written questions, used drawings and pictures and sticks of different colors for different quality indicators, and shared experiences and knowledge. Finally, drip irrigation equipment was distributed free of charge among top students in each class. Several students in each class were also sponsored on a lottery basis for one-week



travel to Spain for additional training and exposure to the latest technologies and practices in the field.

Several other local and national entities were involved in the provision of training and outreach programs targeted at program participants. A Water Management Commission was created to resolve conflicts and guarantee a fair water distribution. This committee consisted of the Paúl Council (Câmara Municipal de Paúl)—the traditional mediator of conflicts related to the use of water in Santo Antão; and the ANAS—responsible for the management of water resources; the MAA and the MADRRM—responsible for irrigation water management; and the presidents of community development associations in the areas covered by the project.

4.2. ASSESSING DESIGN

4.2.1. Design of the Postharvest Center and Extension Center

The rationale of the second component of the WMAS Project was to help farmers reach their potential and to meet the market demand domestically by providing them with proper training and other services. The farmers were mainly small-scale producers who needed substantive support to improve their crop production and marketing practices. Therefore, the project aimed to provide them with technical assistance with respect to extension services, agribusiness, and postharvesting services.

The decision to construct a postharvest center was a well-informed one as the PHC could potentially mitigate postharvest losses and issues with millipede infestation. At the outset of the Compact, it was reported that postharvest losses of all agricultural crops are high due to a lack of infrastructure for preserving crop quality. Reportedly, significant postharvest losses occur due to rough handling of the products, fungal and bacterial decay, insect feeding, and adverse product quality changes under high temperature storage. Also, the lack of cooling and cold storage for perishable agriculture products were major constraints to the development of the agriculture sector. Furthermore, a several decades-old quarantine imposed by the MAA, which prevents the legal movement of vegetables and fruits to other islands with the exception of neighboring São Vicente, posed a serious constraint to the development of the horticulture sector in Santo Antão. The quarantine was established to prevent the spread of millipedes (*Spinotarsus Caboverdus*) to other islands, particularly those with significant impacts on agriculture production. Since 2010, following the lifting of the embargo for Sal and Boa Vista, traders are allowed to export crops to these islands after having their products certified.

The impact of limited means of transportation between islands on crop transportation costs was not considered in the design, particularly in the ERR analysis. The transport infrastructure between the islands is inadequate for exporting agricultural produce. For instance, there is no ferry connection to Boa Vista, and there is one trip a week to Sal from São Vicente. It takes approximately one day to go to Sal from Porto Novo. Moreover, there are only two ferries from Porto Novo to São Vicente (two trips in the morning and two trips in the evening), from where there is good connectivity to other islands. The limited



connectivity leads to huge costs for the farmers. The financial model used for ERR analysis included input costs for fuel, land rent, and maintenance, etc. However, transaction costs were not modeled in the ERR analysis.

4.2.2 Design of Training Component

A posttraining evaluation identified the additional training needs of the extension workers, indicating that a proper need assessment was not conducted prior to the training. An ideal and efficient method for delivering effective training would be to conduct a need assessment prior to actual training and to tailor or customize the training materials to the needs of the target population. In a postneed assessment of the trainers, they reported several further needs, including more training sessions, practical demonstrations, audio-visuals, training manuals, other methods to teach adults, etc. The results of the evaluation show that the training materials were not sufficient.

Needs specific to target areas and populations were not adequately integrated in the training program. Soil and water quality, agricultural practices, irrigation methods, and market infrastructures vary across islands. These differences were not reflected in the training program, as an identical training program was implemented in all the project islands. Agland itself reported that responding to specific needs was a challenge, as this would have required designing a different training plan for each site. Moreover, the issue of land ownership and farmers' high illiteracy rate affected farmers' participation. Farmers who did not own their lands at the time of training usually did not show a great interest in participating in the training program or applying the new methods, including drip irrigation, to the land on which they were working. In addition, the widely diverging literacy levels of farmers inhibited a homogenous understanding of the training components among them.

The overall duration of the training program was deemed insufficient. Agents who were trained as "trainers" overall showed very satisfactory perception of the entire program. However, they noted that the time allocated to each session (two hours) was inadequate. They highlighted the need for longer sessions to successfully cover all the materials. Two hours per session proved to be insufficient for them to obtain an in-depth understanding of topics such as drip installation, agronomics, pest management, postharvest techniques, marketing, business management, and accessing credit. This in turn would also adversely affect the farmers, who would be trained by the inadequately trained extension workers.



4.3. ASSESSING IMPLEMENTATION

Table 12: Activity Outputs

#	Indicators		Output	Target	% of Completion
1	Number of farmers trained		549	800	68.6
2	Number of farmers that have applied new techniques		106	480	22.1
3	Volume of water saved due to adoption of drip irrigation		—	—	—
4	Number of infrastructure units built (i.e., postharvest centers, extension centers)	PHCs	3	3	100.0
		ECs	3	3	100.0

Source: Compact Closure Plan (2010) & ITT.

Note: — = Not available; PHC = Postharvest center; EC = Extension center.

4.3.1 PHC and EC Infrastructure

Originally, the plan was to build three PHCs, one in each island. However, due to a shortage of funds, only the PHC in Porto Novo (Santo Antão) was built and equipped during the Compact period. The potential costs of building and equipping the PHCs in the three islands were significantly higher than the initial budget allocated. Therefore, it was decided that available funds be prioritized to build the one with the highest priority. Due to the urgency of addressing the issue of the millipede plague in Santo Antão, the decision was taken to allocate the limited MCC funds to build and equip the postharvest center in Santo Antão first. This decision was based on the assumption that due to the export embargo on the island, farmers did not have adequate incentives to increase their production or adopt new agricultural methods to boost their productivity. The idea was that a postharvest center with the facility to clean and treat crops against millipede infestation should be able to reverse this and encourage farmers to increase productivity.

Technical assistance, such as construction blue prints as well as the list of equipment and processes, was provided to the MAA to build the other two PHCs at a later date. The GoCV, after the end of the Compact, built and equipped three more postharvest centers in the islands of Fogo, São Nicolau, and Santiago. After the Compact ended, all activities were expected to be supervised by the MAA until its final acceptance. All activities funded under the Agribusiness Activity that were terminated by August 2010 are summarized in Table 13.



Table 13: Agribusiness Activity Plans and Execution under the WMAS MCA-CV I Compact

Description of activity	Planned originally in the Compact	After rescoping	Executed
Rehabilitation and equipment of rural extension centers	3	3	3
Construction of postharvest centers	3	1	1
Agribusiness technical assistance	—		—
Demonstration farms	n.a.	57	57

Source: Source: Compact Closure Plan (2010) & ITT

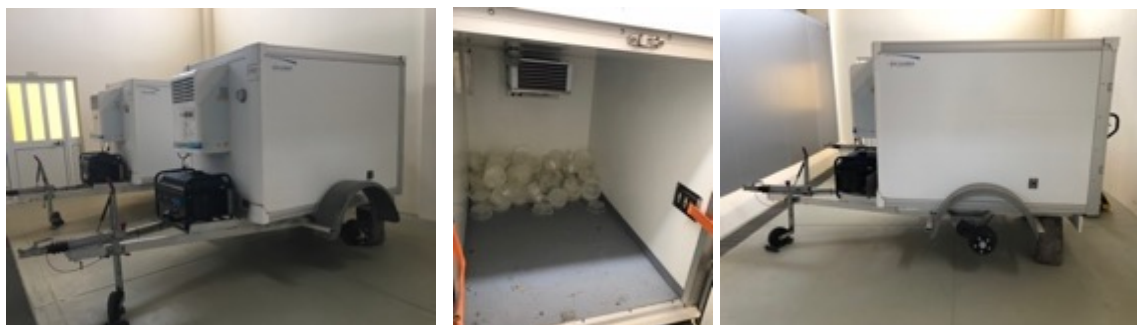
Note: — = Not available; n.a. = Not applicable.

The location of the PHC in Santo Antão was not optimal from the farmers' access and transportation perspective. The mountainous nature of the island of Santo Antão limited the finding of construction sites that could serve all or most farmers. As a result, it was decided that the PHC should be built near the port location, where the products could be brought for packaging and certification. The PHC was built in Porto Novo, while the drip irrigation project site is far from it. However, due to the long distance and lack of adequate transportation (interislands), farmers were reluctant to come to the PHC. Bringing their agricultural produce to the PHC added a high cost for the farmers and consumed a substantial amount of their time. Transportation costs and the opportunity cost of time made PHC use cumbersome for the farmers.

The design of mobile storage units was found to be inadequate. For instance, the size of the mobile storage units at the only PHC in Santo Antão is a critical limitation in the efficient transportation of agricultural produce. The mobile storage units are meant for collecting produces from farmers and bringing those to the PHC for cleaning, sorting, packaging, and storage purposes, as well as to transport marketable produce to the ports. However, there are only two mobile storage units in the PHC, and their size is very small (approximate height = 1.5 meters [m] and width = 2 meters). Due to the tiny size, multiple trips would be necessary to bring crops from even a single farmer to the PHC for postharvest cleaning and sorting, which clearly demonstrates inefficiencies in terms of transportation cost and time. As a result, these mobile storage units have never been used. The images of the two mobile storage units are displayed Figure 11.



Figure 11: Mobile Storage Units



Source: A2F Consulting.

4.3.2 Training Implementation

The project did not meet its target in term of number of training participants. During the training program, approximately 201 farmers were trained in the island of Fogo, and approximately 156 farmers were trained in the island of Santo Antão. The project met about 80 percent of its target set at the outset in Fogo, and about 48 percent in Santo Antão.

Table 14: Number of Farmers Trained in Drip Irrigation In Fogo and Santo Antão

Indicators	Fogo			Santo Antão		
	Actual	Target	Completion (%)	Actual	Target	Completion (%)
Number of farmers trained in drip irrigation	201	250	80.4	156	325	48.0

Source: ITT.

The lack of familiarity of the Agland staff with the Cabo Verdean context affected the quality of the training program. During the implementation of the first Compact, Agland's initial team deployed for the training of the trainers were not only unfamiliar with the Cabo Verdean context, but also did not include Portuguese speakers. This, to a great extent limited their ability to communicate directly with the extension workers initially. Furthermore, limited interisland connectivity generated difficulties in terms of the Agland team's timely communication and adherence to travel plans, which reportedly affected the overall satisfaction and performance of the training program. For example, canceled flights to São Nicolau shortened the workshop there, while early rains made it difficult to reach farmers in all three islands who were preparing and planting fields.



5. ACCESS TO CREDIT

5.1 DESCRIPTION OF THE PROJECT ACTIVITY

The credit component was intended to provide farmers with sustainable access to financial resources to enhance their access to inputs necessary for improved technology in irrigation and for agricultural practices in general. This activity was complementary to the provision of watershed infrastructure and the technical training, which was planned to provide the necessary technological basis for improvements in agricultural productivity through the transition from low-value to high-value production of fruits, horticultural crops, and so forth.

Under the Compact, a total of USD 450,000 was made available to the loan recipients by Caixa Económica de Cabo Verde (CAIXA) through four participating microfinance institutions (MFIs). These institutions were Organização das Mulheres de Cabo Verde (OMCV), ASDIS Microfinancas, Morabi, and Sol de Fogo.¹⁶ These four participating microfinance institutions (MFIs) provided 209 farmers and/or agribusinesses with USD 584,829 in rural loans at competitive market rates. Financial incentives (i.e., 10 percent discounts for each timely payment) were offered to farmers and/or agribusinesses that provided timely and/or early loan repayment.

MCA-CV I signed a credit line agreement with CAIXA, one of the largest banks in Cabo Verde, to act as the refinancing agent for the MFIs. The purpose of the credit line was to provide funds to partnering microfinance institutions that provided loans for drip irrigation equipment, agricultural inputs, and/or agribusiness expansion in watershed areas. CAIXA's role was to review the loan proposals sent by the MFIs and disburse the approved funds. CAIXA disbursed the funding to MFIs in two separate tranches. In Tranche 1, CAIXA disbursed USD 200,000 in August 2008 and in Tranche 2 it disbursed USD 250,000 in June 2009.

Technical assistance was provided by Planet Finance to participating microfinance institutions. In particular, two-week-long trainings focused on improving the operational capabilities of the MFIs to help them cope with the demand for rural agricultural credit to finance drip irrigation, working capital, and agribusiness investment in the three watershed intervention zones. Upon completion of the Compact, these support activities were assigned to the stakeholders and monitored by MADRRM/local delegations and ANAS.

5.2. ASSESSING DESIGN

The selected participating microfinance institutions (MFIs) were not specialized in operational lending, which undermined the possibility of sustainable finance. The selected MFIs were actually not licensed financial institutions, but nongovernmental

¹⁶ Initially AMUSA was supposed to be included in the list of the MFIs receiving the MCC fund. However, due to a car accident involving one of their credit agents in charge of implementing the credit activity, AMUSA backed out as it failed to find a timely replacement for the credit agent.



organizations (NGOs).¹⁷ They were selected based on their involvement in micro, small and medium enterprises (MSME) finance. Even though they are involved in microfinance activities, their knowledge in operational lending is limited. Lending operations, particularly in the agricultural sector, require a specific set of skills and expertise, which the NGOs might not have. Moreover, these NGOs are small and rely heavily on government or donor funding, which raises the critical issue of sustainable lending. Since those MFIs focus mainly on social and economic development issues and are not profit-making institutions, they are not strategic about making profits for financial or operational sustainability. Once the Compact ended, several MFIs stopped lending to the farmers due to loan repayment problems and due to lack of sustainable finance.¹⁸

The MFIs' lack of specialized skills in agricultural lending was overlooked while designing the MFI capacity-building activity. The MFIs have neither dedicated agriculture lending departments, nor loan officers specialized in agriculture lending. The four MFIs, which in collaboration with CAIXA provided credits to farmers, received only a two-week training with respect to the different aspects of agriculture financing. This capacity-building activity was insufficient, as loan officer training requires significant on-the-job coaching for a period of at least six months to a year following classroom training. Accordingly, MFI staff were not adequately trained on loan appraisal to be able to properly assess the merits of each loan application based on the various characteristics of the farmers, such as their yearly incomes, agricultural sales, or assets owned that could potentially be used as collateral, etc. In fact, the eligibility criteria that the MFIs used in loan appraisal were, for instance, based on generic indicators of financial soundness and profitability. The borrowers' interest in the agricultural sector and previous involvement in it were only marginally taken into account.

The loan product was not tailored to the needs of farmers and to the specific nature of the agriculture sector. The average annual percentage rate (APR) charged by the MFIs on MCC loans was 15%. This APR was as much as 9 percentage points lower than the one charged on other loans. However, the loan repayment schedule was not designed in a manner conducive to minimizing risks. In general, farmers can repay loans when their agribusinesses realize revenues from the invested capital, which generally happens only after harvests. Findings from the farmer survey show that 42 percent of borrowers of the MFIs had started making monthly repayments on their loans within a span of only one month after the loan was disbursed. However, the process of taking a loan to realizing agricultural income took a considerable amount of time. Unsurprisingly, 25 percent of the borrowers whose loan repayment schedules started as early as one month after disbursement failed to repay on time.

¹⁷ All these MFIs are now seeking to establish microfinance institutions that are licensed and supervised by the Central Bank.

¹⁸ In January 2019, a new regulation entered into force for MFIs to separate social functions from the microfinance ones. These institutions will now operate differently, with a business model, and will have facilitated access to funds. However, it should be noted that a regulatory reform alone is not sufficient to transform the situation. It is a process that requires institutional strengthening and take years to accomplish.



Most importantly, the design of the “Access to Credit Activity” did not include a particularly effective risk mitigation mechanism. CAIXA was contracted only as an “agent” bank with “no skin in the game.” It earned a 2 percent fee on disbursements, irrespective of how these loans performed. An incentive mechanism was put in place for MFIs, which allowed well-performing MFIs to have their outstanding loans with CAIXA converted into grants at the end of the Compact. The performance criteria were a portfolio at risk over 90 days at 5 percent or less, and the progress made in implementing best practices in microfinance to improve operational sustainability. A more effective setting would have been to tie the portfolio quality criteria to the 30 days arrears, as microfinance loans require tighter monitoring, and 90 days represents a long time without taking action. While well intentioned, the conversion into grants also undermines sustainability goals, as it drastically reduces at once the financial discipline imposed on participating noncommercial institutions, that is, the selected MFIs. This feature is particularly problematic, given that a significant portion of the loan portfolio had terms extending beyond the Compact end date.

5.3. ASSESSING IMPLEMENTATION

Table 15: Activity Outputs

#	Indicators	Output	Target	% of Completion
1	Number of loans disbursed	225	240	94

Source:ITT.

One of the five selected MFIs—those that met the eligibility criteria to provide credit to farmers—did not participate in the access to credit activity. Due to a motorcycle accident involving one of their credit agents in charge of implementing the credit activity, AMUSA dropped out of the participation at a later period, as they failed to find a timely replacement. However, no replacement for AMUSA was selected to be included in the Access to Credit Activity’s portfolio. Therefore, CAIXA continued with the other four MFIs.

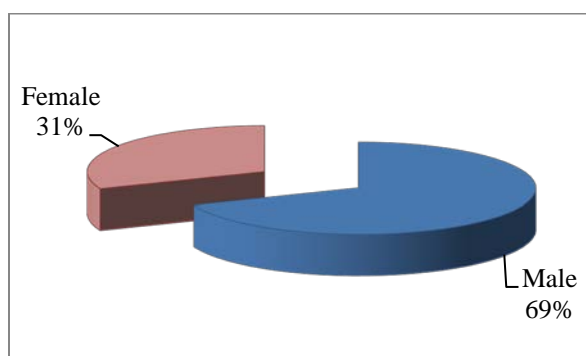
The participating MFIs disbursed higher amounts than their regular loans without adequate training. The average disbursed amount was CVE 227,000, which was higher than the average of the participant MFIs. For instance, the average value of non-MCC loans disbursed by Morabi and OMCV was CVE 85,000. In contrast, the average value of MCC loans disbursed by these institutions was higher by 300 percent. This change took place in those institutions without proper preparation in terms of capacity building to enable loan officers to do a proper evaluation for such large amounts.

A total of 225 loans with an overall value of 498,671.10 CVE were made by the participant MFIs, which reached 94 percent of the targeted number of credit recipients (240). Male credit recipients represented 69 percent and female credit recipients represented 31 percent of all credit recipients of the MCC project’s Access to Credit



activity. The majority of loans were disbursed for agricultural activities (78 percent) and the rest were for agribusiness (22 percent). As of October 2010, the MFIs repaid CAIXA 26 percent of the total value of loans disbursed. All participating MFIs except OMCV received cash grants from CAIXA and were no longer required to repay the outstanding loans in their portfolio (see Table 15).

Figure 12: Loan Disbursement by Gender



Source: CAIXA

Table 16: Grants to MFIs

MFI	Grant in cash	Portfolio outstanding	Total received	Date transferred
ASDIS	4,261,501.00	8,505,882.00	12,767,383.00	12/2/10
Morabi	2,963,852.00	8,686,404.00	11,650,256.00	12/7/10
Soldifogo	5,417,912.00	4,783,790.00	10,201,702.00	12/21/10
TOTAL	12,643,265.00	21,976,076.00	34,619,341.00	

Source: CAIXA

Of the four participant MFIs, the only one that was poorly performing at the end of the Compact was OMCV.¹⁹ By the end of September 2010, the four MFIs had an active portfolio of 31,974,602 CVE and 182 outstanding clients. Nonperforming loans for more than 90 days constituted the largest share (47 percent) of the total value of loans in arrears. About 47 percent of nonperforming loans over 30 days were attributable to OMCV. Similarly, OMCV had the highest percentages of nonperforming loans, which were late by 30 to 90 days (43 percent) and over 90 days (47 percent). OMCV was therefore deemed a “poor performing MFI” and lost its access to funding from CAIXA.

¹⁹ According to the Credit Line Disposition Plan, poor performing MFIs are those that (i) have portfolios at risk over 90 days above 5 percent; and (ii) are doing poorly in terms of their institutional sustainability indicators.



Table 17: Loan Portfolio of Participant MFIs, September 30, 2010

MFI	Active portfolio	Outstanding clients	Nonperforming loan (NPL) late by 30 days	Nonperforming loan (NPL) late by 30–90 days	Nonperforming loan (NPL) late by over 90 days	Nonperforming loan (NPL) ratio (%)	% of loan repaid by the borrowers
ASDIS	8,505,882	59	118,859	177,887	502,049	5.90	93.24
Morabi	8,686,404	34	42,771	78,785	360	0.00	98.00
OMCV	9,998,526	46	309,425	349,528	621,083	6.21	76.20
Soldifogo	4,783,790	43	186,660	201,701	192,907	4.03	95.00
TOTAL	31,974,602	182	657,715	807,901	1,316,399	4.04	90.61

Source: CAIXA

The loan approval process had several weak points that made it vulnerable to integrity and transparency problems. Although MFIs were in charge of disbursing the loans to the farmers, their involvement in the borrower selection process was suboptimal. The MAA pre-selected potential borrowers, who were later approved for loans by the MFIs. CAIXA, the fund management entity through which the money was channeled to the MFIs, was also not actively involved in the loan approval process at the applicant level. CAIXA was, however, involved in the preparation and the control and evaluation of the selected MFIs. Regulations and all procedures were developed by CAIXA and the MFIs. CAIXA reviewed each MFI's portfolio before approving the next tranche. However, it was not involved in the loan approval process at the applicant level. The criteria used by the MAA to select potential credit recipients were not communicated clearly. Therefore, some selection bias was suspected. OMCV reported that out of the 33 borrowers they served under MCA-CV I, only 40 percent would meet eligibility criteria for the loan had they not been preselected by the Ministry. Yet, they approved most, if not all, of the potential credit recipients in the list provided by the MAA.

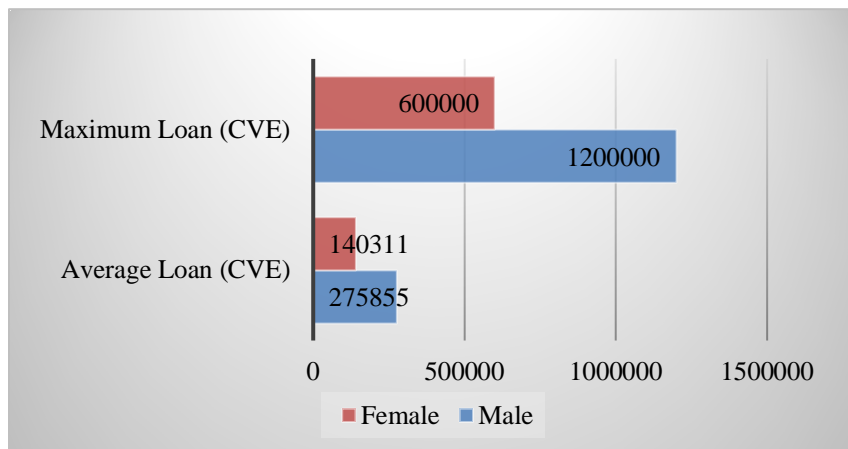
The MFIs' loan disbursement process was reportedly not accompanied by a rigorous verification of the borrowers' eligibility. A list of preselected potential loan recipients was handed by MAA to each MFI. However, the MFIs did not carefully verify the applicants' eligibility for the loans. In some cases, multiple loans were disbursed to one household (e.g., to the husband and wife separately). This was a problem particularly in Santo Antônio, where both Morabi and OMCV operated simultaneously. Initially, Morabi was not operating in Santo Antônio; however, once it did, a number of cases involving loan duplication reportedly emerged. Several households apparently obtained loans separately from both Morabi and OMCV.

Accordingly, the overall loan approval rate was very high, and the majority of the loans had two years of maturity. According to the survey conducted, 94 percent of the farmers' applications for MCC loans were approved. This approval rate was higher for Fogo (100 percent) than for Santo Antônio (93 percent). The approval rate was also higher for males (95 percent) than for females (88 percent). The only reason mentioned by the farmers for the rejection of loans was lack of collateral or a guarantor (4 percent). The approved loans had one, two, or three years of maturity, cumulatively representing 76



percent of all loans. More precisely, 20 percent of the loans had a one-year maturity, 39 percent had two-year maturity, and 17 percent had three-year maturity. The average APR, as already noted earlier, was about 15 percent. For the most part, these loans had a monthly repayment schedule in place, as indicated by 98 percent of the borrowers surveyed.

Figure 13: Loan Size by Gender



Male loan applicants received loans of higher values than female applicants. The average amount of loan per application approved was 256,088 CVE (USD 2,658), and the maximum amount of loan disbursed was 1,200,000 CVE (USD 12,450). These amounts varied substantially across male and female loan recipients. The average loan size for males was 275,855 CVE, while for women it was 140,311 CVE. By the same token, the maximum loan that a male applicant received was for 1,200,000 CVE, while the maximum a female received was only half of that. Bigger loan sizes for male borrowers could be attributable to their larger ownerships of land. According to the survey, the average size of land owned by male farmers is 5.5 times higher than the average size of land owned by female farmers.



6. OUTCOME ANALYSIS

Table 18: Outcomes

Outcome indicators	Actual	Target	Target achieved (%)
Volume of available water	311,784.39 m ³	465,800 m ³	66.9
Tons of solid material retained through soil conservation infrastructure	41,835.25	25,552	163.7
Hectares under improved or new irrigation	13	111.2	11.4
Number of farmers that have applied improved techniques	106	480	20.8
Number of crop cycles	1.36*	2	68

Source: WMAS ITT, M&E MCA-CV I.

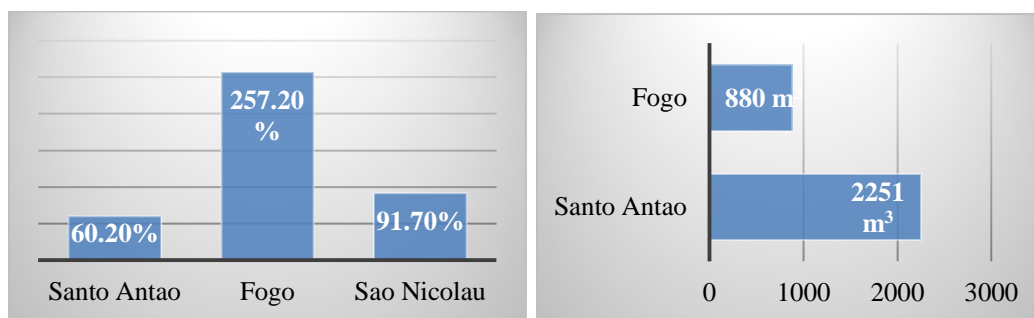
* Marked ones are from our survey.

6.1 IMPROVEMENT IN PRODUCTION METHODS

The overall volume of available water achieved 67 percent of the specified target as reported in the ITT. By the end of the Compact in 2010, the highest target achievement rate for the volume of available water was in Fogo (257 percent), followed by 91 percent in São Nicolau and 60 percent in Santo Antão. Only 14% of the surveyed farmers reported an improvement in irrigation due to an increased availability of water after the implementation of the project. On the other hand, 82% of the surveyed farmers reported scarcity of water for irrigation. The scarcity of irrigation water is more severe in Santo Antão than in Fogo, as indicated by the island-wise statistic. Approximately 90 percent of the farmers in Santo Antão specified this problem as a hindrance to irrigation, as opposed to 52 percent in Fogo. It is important to emphasize that the issue of irrigation water unavailability is inseparably related first, to recurrent episodes of drought in Cabo Verde, and second, to the inadequate number of boreholes installed. As previously noted, the only borehole in Santo Antão feeds only two reservoirs: (i) Rocha Grande and (ii) Pedra das Moças; the rest of the reservoirs are spring fed, and consequentially susceptible to periodic dry spells. In Fogo, there is only one borehole.



Figure 14: (a) Target Achievement Rate of Volume of Available Water, and (b) Average Demand for Irrigation Water



(a) Source: WMAS-IT (2019).
(b) Source: AEF Survey (2018).

The drip irrigation method was not as widely adopted as expected. Only 24% of all surveyed farmers had adopted drip irrigation. Of those who owned drip irrigation equipment, 95 percent adopted drip irrigation. The survey further indicates that the drip irrigation adoption rate is slightly higher in Fogo (29 percent) than in Santo Antão (22 percent). Many farmers in Paúl were not prepared to migrate to and adopt the new techniques. They simply continued to use traditional methods of irrigation using rainwater, running groundwater, or the water captured and stored in reservoirs built as part of the WMAS Project, without realizing the benefits of drip irrigation. The survey reveals that for irrigation purposes, most farmers rely on rainwater (83 percent) or reservoirs fed mainly by rain or spring (41 percent). A minority of the farmers use private provider (2 percent) and own water sources, such as wells or ponds (12 percent).

The majority of farmers who were members of some farmers' group or organization adopted drip irrigation systems. Overall, 59 percent of the group members implemented drip irrigation. Disaggregation at the island level reveals that the adoption rate by group members was higher in Santo Antão (75 percent) than in Fogo (44 percent). Furthermore, farmers' group members constituted about 37 percent of the total number of drip irrigation farmers. This percentage was higher for farmers in Fogo (57 percent) than in Santo Antão (30 percent). These relatively high percentages suggest that farmers' groups play an important role in deciding the use of drip irrigation, which reflects the well-known economic theory about peer group effects.



Farmers who adopted drip irrigation had completed at least primary education.

About 59 percent of the farmers who adopted drip irrigation had completed primary school education and 26 percent had some secondary education (see Figure 15). This implies that a minimum level of education was necessary to appreciate the effectiveness of the modern irrigation technology. Farmers who never attended school ended up not adopting the drip irrigation system. When the analysis is disaggregated at the island level as in Figure 16, similar patterns emerge.

Figure 15: Educational Attainments of Farmers Who Adopted Drip Irrigation

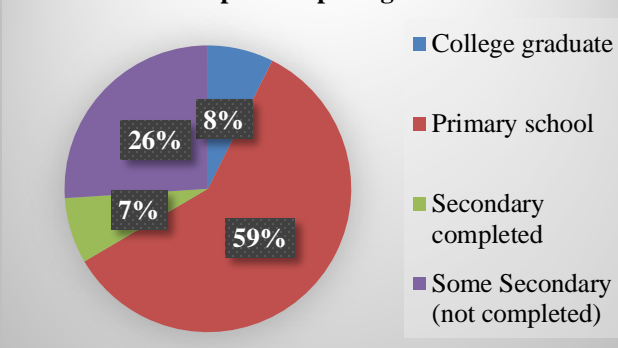
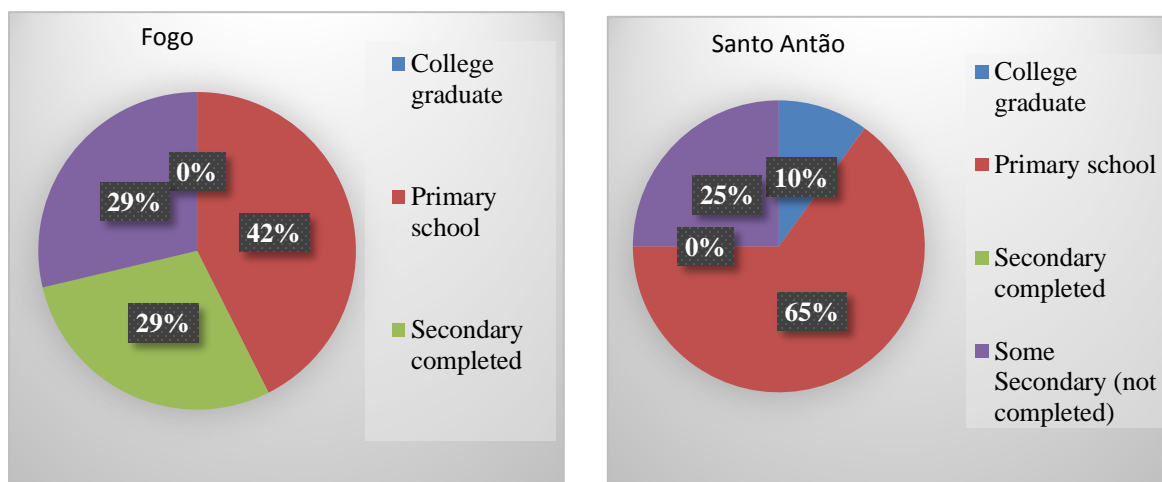


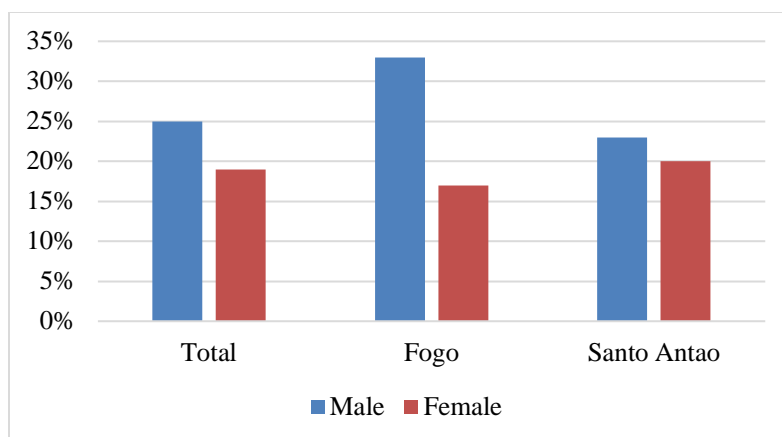
Figure 16: Educational Attainments of Farmers Who Adopted Drip Irrigation, Disaggregated by Islands



On the other hand, operational capacity and gender of the farmer did not play a significant role in the adoption of drip irrigation. While in the full sample, 96 percent of the drip irrigation adopters are the primary farm operators, and 85 percent of the nonadopters are also primary farm operators. Therefore, being a primary farm operator is not a deciding factor for opting for drip irrigation despite the fact that the majority of the drip irrigation adopters are the primary operators of the farm. By the same token, the gender differential did not have a significant impact on the adoption of drip irrigation. Males represented 82 percent of the surveyed farmers, while females represented 18 percent. However, 25 percent of males adopted drip irrigation, whereas among females, 19 percent did. In Fogo, a slightly higher percentage of males (33 percent) adopted drip irrigation, as compared to females (17 percent).

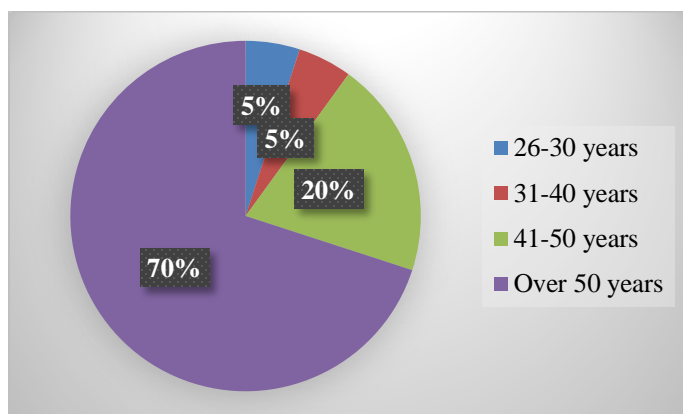


Figure 17: Drip Irrigation Adoption by Gender



The age of farmers seems to play a role in the adoption of drip irrigation. Most of the farmers who adopted drip irrigation were more than 50 years old. Overall the survey indicates that 70 percent of the adopters belonged to the age group “over 50,” which also represented about 51 percent of the full sample. The rate of adoption of drip irrigation is relatively low for the age band 41 to 50 years (20 percent) in light of the fact that 38 percent of the full sample is represented by this group. Younger farmers seem to have the lowest adoption rate. Only 5 percent of farmers aged between 26 and 30 years, and 5 percent of farmers aged between 31 and 40 adopted drip irrigation.

Figure 18: Adoption of Drip Irrigation by Age Groups



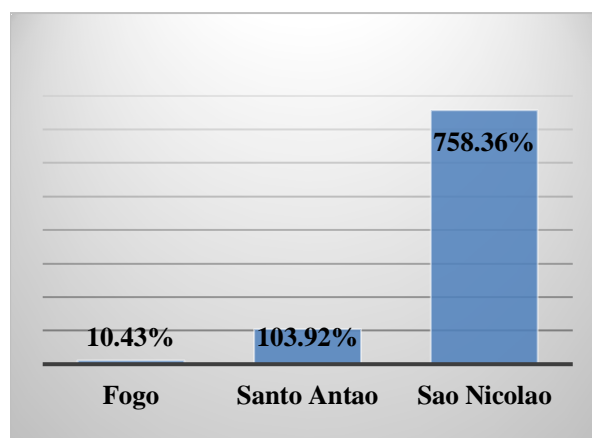
The majority of farmers (78 percent) indicated that they required more water than was available for irrigation purposes. This need was emphasized by a greater percentage of farmers in Santo Antão (83 percent) than in Fogo (58 percent). Across the two islands, the average additional irrigation water required by the farmers was 2,036 m³. This average was mainly driven by the mean demand of 2,251 m³ of water by the Santo Antão farmers, while the mean demand of Fogo farmers was 880 m³. Most farmers (86 percent) reported that irrigation did not improve after the implementation of the project.



6.2 PRODUCTIVITY IMPROVEMENT AND TRANSITION TO HVA

The project led to increased fertility by reducing soil erosion through the retention of soil material. Tons of solid material retained through soil conservation infrastructure, such as torrential correction dikes, not only met the target, but also attained an overall target fulfillment rate above 150 percent. With respect to tons of solid material retained through soil conservation infrastructure, São Nicolau exhibited the best performance in terms of completion rate (758 percent). While Santo Antão has also managed to fulfill the target, Fogo achieved just 10 percent of the specified target.

Figure 19: Tons of Solid Material Retained through Soil Conservation



Source: ITT

Box 1: Drip Irrigation and Agricultural Production in Cabo Verde During Pre-Compact Period

At the outset of the Compact, there were about 34 hectares (ha) of diversified drip-irrigated vegetable production in Santo Antão, in addition to canal-irrigated crop production. Bananas are the leading fruit crop and the most profitable; however, they require supplemental water to produce an economic yield. Potatoes are the leading vegetable produced in the higher elevations. The MCA-CV I Project is slated to add 50 ha of new irrigated horticultural crops, all in the Paúl Valley. The water source for the majority of new irrigated cropland is proposed to come from catchment reservoirs filled by rainwater. The specific areas and farmer clients/beneficiaries have not been selected, although the selection criteria for receiving water has been defined and is similar in all three MCA-CV I Project islands.

A wide range of temperate, subtropical, and tropical fruit crops are produced on Fogo, including apples, pears, quince, peaches, figs, persimmon, citrus, mangoes, guavas, papayas, and bananas. In addition numerous cool- and warm-season vegetable crops are grown. Potatoes are the leading vegetable produced in the higher elevations, followed by a diversity of other cool-season vegetables like cabbage, carrots, cauliflower, lettuce, etc. The most common warm-season vegetables produced in the lower elevations are sweet potato, cassava, tomato, pepper, cucumber, zucchini, eggplant, squash, etc.

In 2007 there were about 24 ha of drip-irrigated fruit and vegetable production in Fogo. The WMAS Project was intended to add 30 ha of new irrigated horticultural crops, all in the Mosteiros area. Of these 30 total ha, 18 ha was designed to be fed with water from collection dams and reservoirs, while 12 ha were set to receive water from wells.



The increase in the amount of land cultivated with improved or new irrigation techniques was less than expected. According to the WMAS ITT, by the end of the compact in 2010, in Mosteiros, only 5.6 hectares of lands were under an improved or new irrigation system, which constituted only 23% of the target. This percentage is even lower for Paúl, where only 4 hectares of land were under improved or new irrigation, which constituted about 7.3% of the target. In total, about 13 hectares of land were cultivated using drip irrigation, which was merely 12% of the specified target. This low achievement rate is clearly related to the low rate of drip irrigation adoption.

Table 19: Drip Irrigation, Crop Cycles and Hectares under New Irrigation

Indicators	Fogo			Santo Antônio		
	Actual	Target	Completion (%)	Actual	Target	Completion (%)
Number of farmers adopting drip irrigation	49	48	98	33	229	14.4
Number of crop cycles	1.25*	1.5	83.3	1.39*	3	46.3
Hectares under improved or new irrigation	5.6	24.3	23	4.2	57.5	6.4

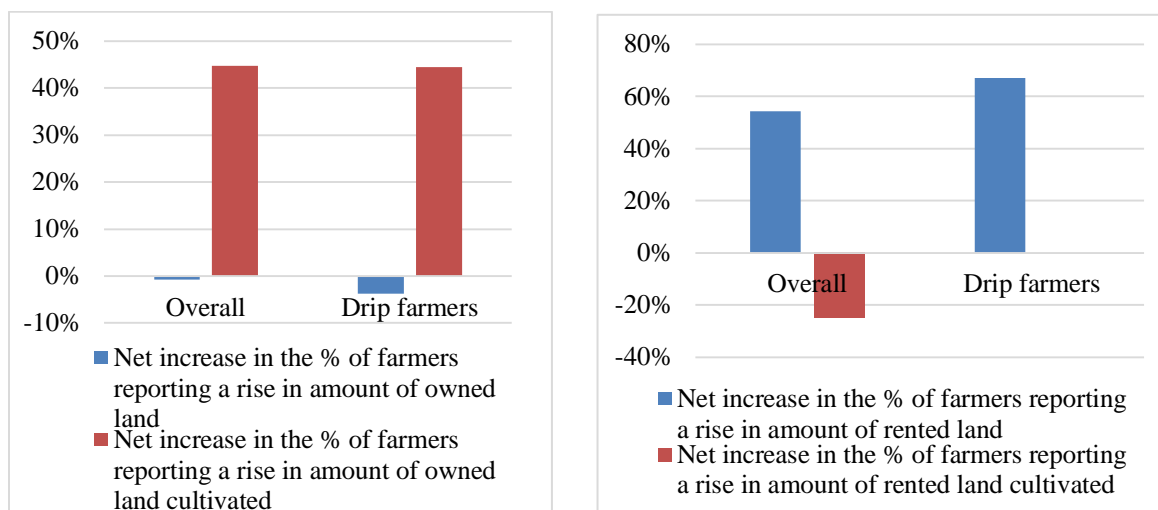
Source: WMAS ITT, M&E MCA-CV I.

* Indicates survey.

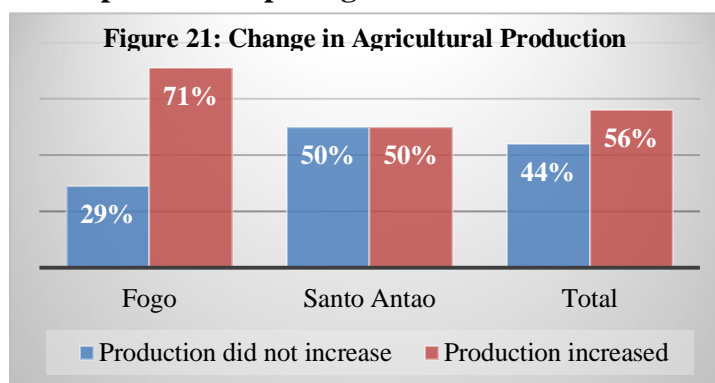
Results show that about half of surveyed farmers who own land reported an increase in land under cultivation after the WMAS Project. In fact, 49 percent of surveyed farmers reported that they increased cultivation of the lands they owned, while only 4 percent of farmers reported a decrease in cultivation of the lands they owned. These percentages are similar for farmers who use drip irrigation. The rest of the farmers (51 percent) reported no change in cultivation of the lands they owned. In contrast, 38 percent of the farmers who rented lands reported an increase in the cultivation of lands, whereas 62 percent reported a decrease in the cultivation of rented lands. However, the majority of the farmers (57 percent) reported an increase in the rental of lands, while 40 percent indicated no change. The former percentage is greater for those who used drip irrigation (67 percent); 33 percent of the drip-irrigating farmers reported no change in rental of lands.



Figure 20 : Change in Agricultural Land Ownership, Rental, and Cultivation



For the majority of farmers, the adoption of drip irrigation led to an increase in agricultural production. Of the farmers who adopted drip irrigation, 56 percent indicated that there was a rise in production following the installation and use of drip-irrigation systems on their lands. Five out of seven from Fogo reported an increase in production, and 10 out of 20 from Santo Antão reported an increase in production.



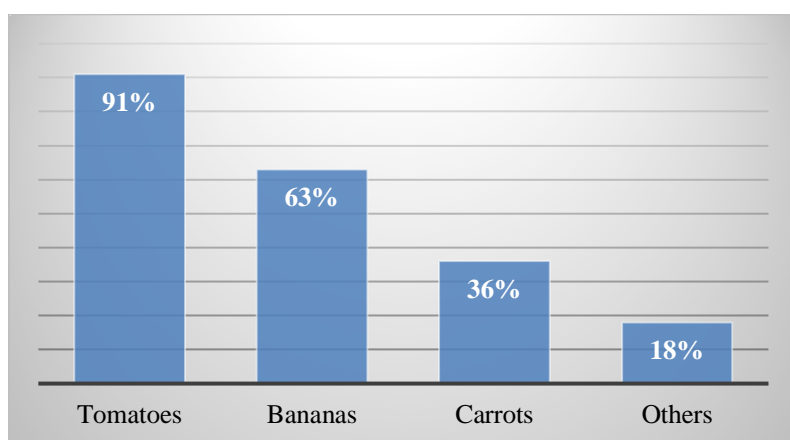
Agricultural productivity was substantially lower in the last agricultural year in comparison with the preproject period. Before the project started, the average agricultural productivity was 183,209 kg/ha, which dropped significantly to 62,227 kg/ha in the last agricultural year. In Fogo, in the preproject period, the average agricultural productivity was 803,142 kg/ha, which declined to 250,373 kg/ha in the last agricultural year. This decline was less in magnitude for Santo Antão, where agricultural productivity declined from 12,194 kg/ha in the preproject period to 9,722 kg/ha in the last agricultural year. The decline in agricultural productivity is mainly due to the severe drought scenario in the last year.

Among the farmers who adopted drip irrigation, about 41 percent reported producing high-value crops (for e.g., tomatoes, carrots, bananas) since the adoption of the modern irrigation method. A higher percentage of drip-irrigation adopting farmers produced high-value crops in Fogo (57 percent) than in Santo Antão (35 percent). Across



islands, the most commonly produced high-value crops using drip irrigation were tomatoes, harvested by 91 percent of the surveyed farmers, followed by bananas (67 percent), carrots (36 percent), and other crops (27 percent). It was noted that farmers at the outset of the project started to adopt new methods and drip irrigation and migrate to higher-value agriculture products. However, over the past few years, the cultivation of such products has seen a sharp decline. Last year production was very small, mostly because of the very low level of precipitation on the island in 2017. According to the survey, 99 percent of farmers indicated low precipitation as one of the greatest challenges to agricultural production in the last agricultural year. As a result, the average harvest in the last agricultural year was 894 kg, which was substantially lower than the average in the preproject period (2,260 kg).

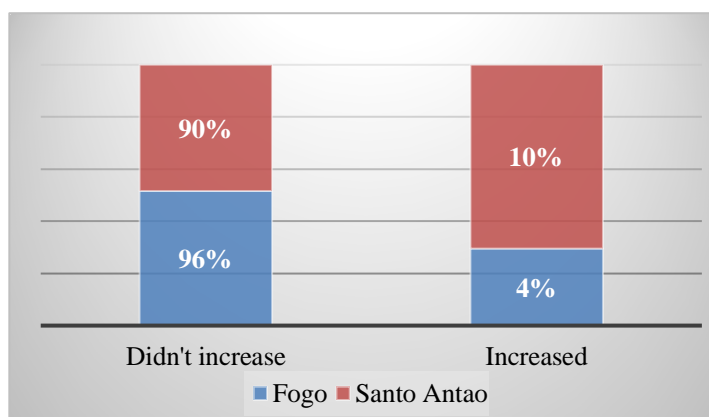
Figure 22: Share of Farmers (Who Adopted Drip Irrigation) Producing High-Value Crops



The project did not have a significant impact on the number of crop cycles in the long run in either of the two islands, Santo Antão and Fogo. Crop cycles largely depend on availability of irrigation water, which is

scarce in Cabo Verde. The WMAS Project was intended to increase water availability and thereby improve crop cycles. The average crop cycles before and after the project were 1.39 and 1.36, respectively, suggesting virtually no change. About 91 percent of the farmers surveyed reported no increase in their crop cycles since the implementation of the project. The percentages for Santo Antão and Fogo are 90 percent and 96 percent, respectively. Nonincremental crop

Figure 23: Change in Crop Cycle





cycles could be attributed to the lack of improvement in water availability for irrigation after project implementation.

6.3 INCOME AND EMPLOYMENT

In the postproject period, although agricultural sales declined for the majority of farmers, average agricultural sales increased. According to the survey, 39 percent of the farmers' yearly agricultural sales increased from an average value of 169,931 CVE in the preproject period to 397,102 CVE in the postproject period. On the other hand, 55 percent of the farmers saw a decline in yearly sales from an average value of 165,873 CVE in the preproject period to 73,810 CVE in the postproject period. The remaining 6 percent experienced no change in their sales. These percentages remain very similar when only drip-irrigating farmers are examined. Sales increased for 41 percent of the drip-irrigating farmers, while sales decreased for 55 percent of the drip-irrigating farmers. There was no change in agricultural sales for the remaining 4 percent. However, the average agricultural sales in the last agricultural year reported (212,917 CVE) was greater than the average preproject agricultural sales (176,114 CVE).

Similar to agricultural sales in the postproject period (i.e., the last agricultural year) while the majority of farmers reported a decline in agricultural income, the overall median agricultural income increased. According to the survey, the median²⁰ agricultural income increased from 80,000 CVE in the preproject period to 100,000 CVE in the last agricultural year. For the group of farmers who experienced a decrease in agricultural income, the median agricultural incomes in the preproject period and the last agricultural year were 120,000 CVE and 50,000 CVE, respectively. On the other hand, for the farmers who experienced an increase in agricultural income, the median agricultural incomes in the preproject period and the last agricultural year were 85,000 CVE and 120,000 CVE, respectively. The survey further shows that agricultural income increased for 39 percent of all surveyed farmers following the implementation of the project, while for an even greater percentage (55 percent) of the farmers, there was a decrease in agricultural incomes. Figure 25 presents a comparative analysis of change in agricultural incomes across islands, which shows that more farmers in Santo Antão (43 percent) experienced an increase in their agricultural incomes than in Fogo (25 percent).

²⁰ The choice of median over average is driven mainly by the existence of some outliers in the data.



Figure 24: Change in Agricultural Income

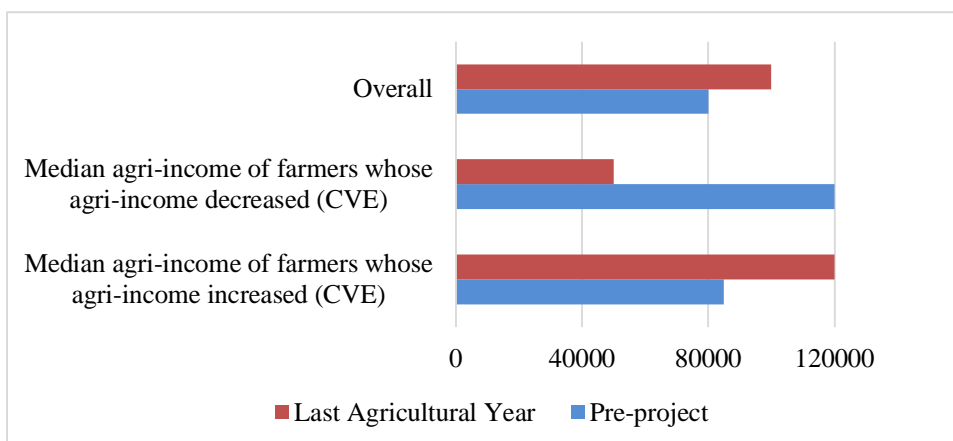
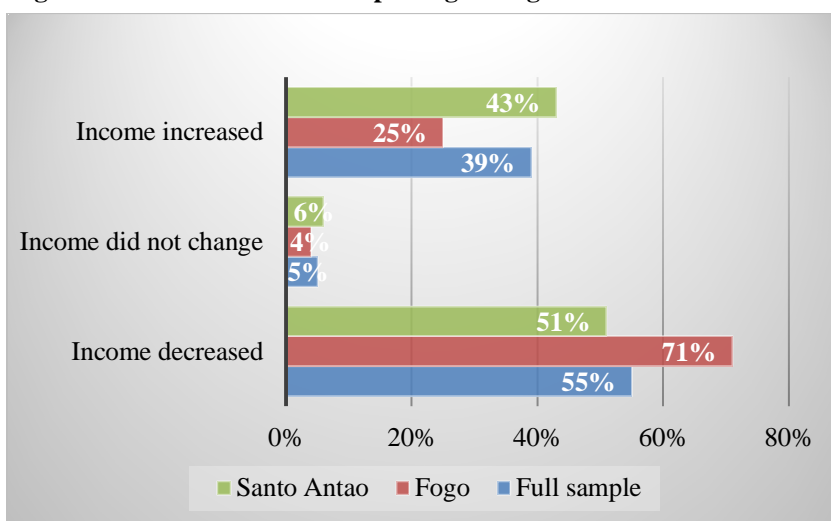


Figure 25: Share of Farmers Reporting Change in Income



About 42 percent of loan recipients reported a growth in their businesses. About 42 percent of the surveyed farmers obtained MCC-funded loans. Of these loan recipients, 42 percent enjoyed growth in their businesses. The highest percentages of farmers reporting business growth after receiving credit are borrowers of Soldifogo (57 percent). The lowest percentages are those who obtained loans from OMCV (33 percent). As shown in Figure 27, a higher percentage of female credit recipients (71 percent) reported achieving business growth than male credit recipients (63 percent). This result is consistent with a common finding in the literature that women make better use of small loans than men do. Similar to the farmers, the majority of surveyed traders (64 percent) also experienced business growth after receiving MCC credit.



Figure 26: Business Growth of Farmers after Receiving MCC Loans

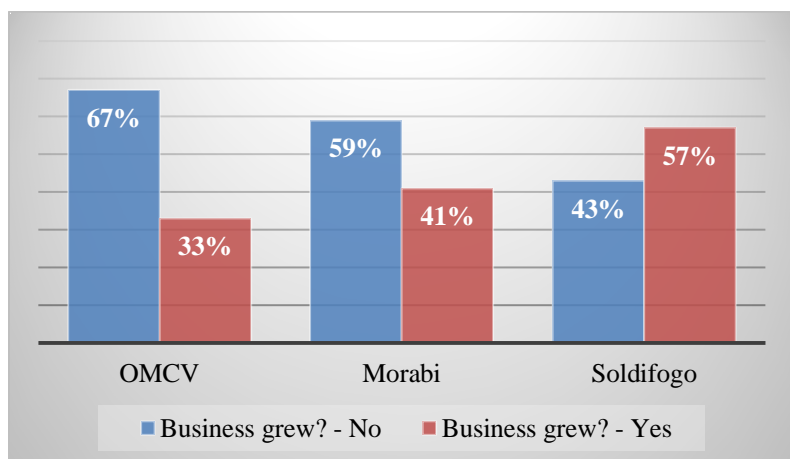
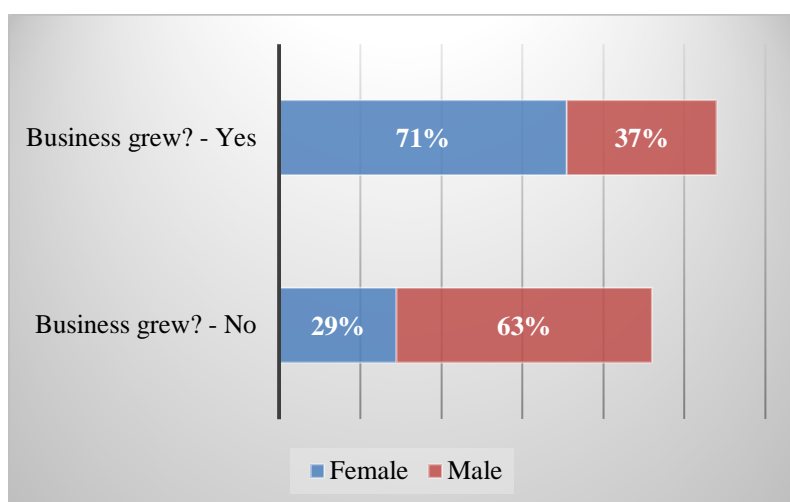


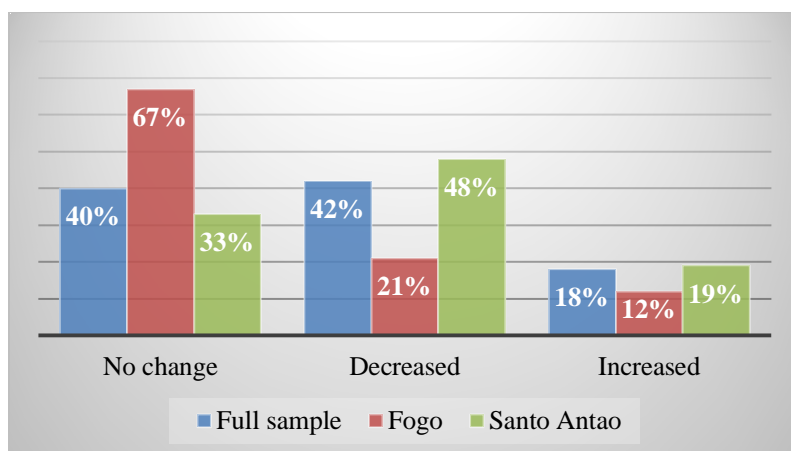
Figure 27: Business Growth after Receiving MCC Loans (Female vs. Male Comparison)



The WMAS Project has not resulted in any significant increase in agricultural employment. In the preproject period, each farmer household employed on average about eight agricultural workers, which included family members as well as paid full-time and seasonal workers. Currently, the average number of workers employed is 7.45. In Fogo, the average number of workers employed in both the preproject and postproject periods is 15. In Santo Antão, the average number of workers employed in the preproject period is 6.32 and in the postproject period is 5.44. As displayed in Figure 28, about 40 percent of the farmers saw no change in employment, while 42 percent reported a decline in employment during the same period. Only 18 percent of the surveyed farmers have experienced a rise in employment after the project. For Fogo, the latter percentage is 12 percent, while for Santo Antão it is 19 percent. These percentages are significantly lower than the percentages for farmers who reported either a decrease or no change in agricultural employment.



Figure 28: Change in Employment between Preproject and Postproject Period



The impact of the project on exports was minimal although farmers on average sold most of their produce in the last agricultural year. A majority of farmers (57 percent) reported that there was no change in their export volume. Only 14 percent reported an increase, while an even higher percentage of farmers, 29 percent, reported a decrease in their exports compared to the preproject period. Overall, farmers sold 79 percent of their total harvests. This percentage was higher in Santo Antão (82 percent) than in Fogo (58 percent). Agricultural training did not have any significant impact on these percentages. Farmers who attended the Agland training sold 77 percent of their harvests, while the farmers who did not attend the training also sold a similar percentage of their harvests (80 percent). Since no farmers used PHCs for storing their crops, a relationship between PHC use and sales could not be established.

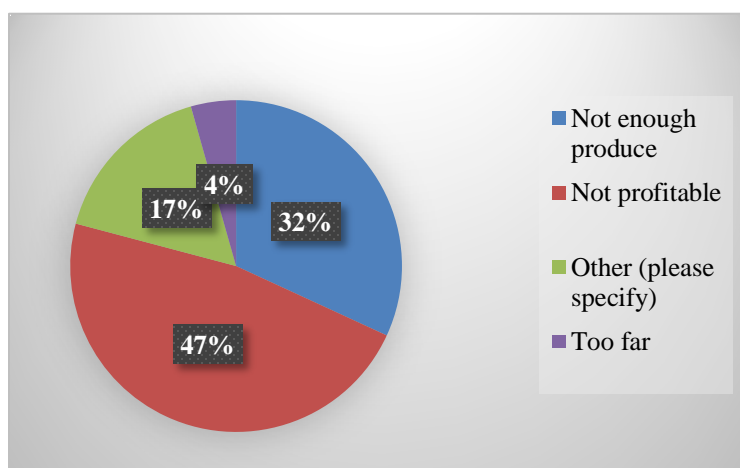
The majority of farmers sell their produce in the village market, while most traders sell to other islands. According to the survey, 70.48 percent of farmers sell in the village market, while 39.00 percent sell at farm gates, and only 9.00 percent farmers sell their produce to other islands. Among farmers, 79 percent indicated that they sell the majority of their products directly to consumers, while 50 percent sell to traders and 46 percent to retailers. In contrast to farmers, a greater percentage of surveyed traders sell to other islands (45 percent), while the percentage selling in the village market (27 percent) is much lower than it is for farmers. The survey also reveals that 45 percent of traders mostly sell varieties of potatoes. The average amount that the traders trade in an agricultural year is 1,909 kg at an average market price of 233 CVE per kg.

The modest increase in exports could be partially attributed to the fact that prices in other islands are already much lower than for the produce from Santo Antão or Fogo. For example, bananas cost 50 CVE per kg in Santo Antão. But once it reaches Sal, the cost accumulates such that the price rises to 200 CVE per kg, whereas the locally grown bananas are sold at 175 to 180 CVE per kg. Therefore, farmers from Santo Antão or Fogo do not have a competitive advantage in exporting to those other islands, given the high costs associated with exporting and transporting produce. This is further confirmed by the



survey, which indicates that 47.25 percent of farmers did not export because of limited profitability.

Figure 29: Reasons for Not Exporting



Exports from Santo Antão were also affected by previous issues with millipede pest infestations. Officially, a 25-year embargo on interisland agricultural exports from Santo Antão was lifted due to the MCC-funded millipede pest-control research, as well as to training for 31 phyto- and zoo-sanitary inspectors. However, even after the ban lift, traders from other islands remain circumspect about agricultural crops from Santo Antão. This affects the prospect of crop exports from Santo Antão to other islands except São Vicente.

The project did not lead to a significant increase in net benefit to the farmers. The various costs that farmers in Cabo Verde incur include agricultural input costs, transportation costs, agricultural land taxes, etc. Survey results show that the average cost of production per kg prior to the implementation of the project was 23.50 CVE, while in the last agricultural year, this figure amounted to 26.00 CVE. The average values of harvests per kg before the project took place and in the last agricultural year were respectively, 54.33 CVE and 56.79 CVE. On an average, the net benefit per unit of agricultural production (i.e., average harvest value per kg minus average agricultural expenses per kg) before the project was 30.83 CVE, whereas in the last year it was 30.79 CVE. The latter two figures indicate that average net benefit per kg of production remained almost the same in the last agricultural year as in the preproject period.



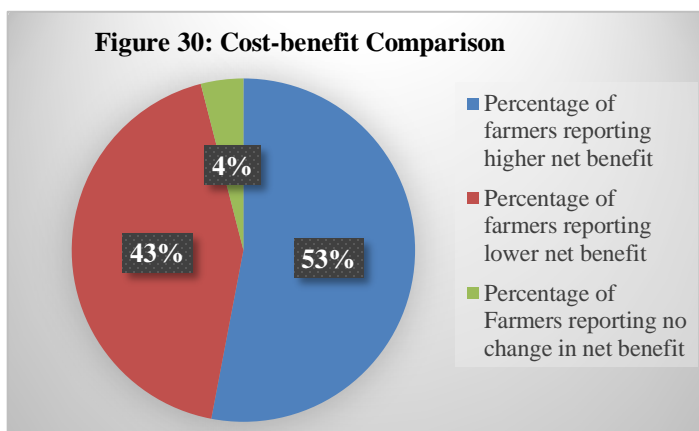
Table 20: Net Benefits from the Project

	Disaggregated expenses (CVE per kg)	Preproject (CVE per kg)	Last agricultural year, 2017 (CVE per kg)
Average agricultural expenses	Irrigation water	0.38	1.55
	Distribution services	0.02	0.10
	Cold storage and rental payments	0.00	0.00
	Transportation costs	1.75	4.68
	Postharvest activities	0.36	1.03
	Marketing costs	0.78	0.00
	Repayments of loan principal and interest for agricultural loans	0.00	0.05
	Other taxes related to agricultural production or sales	0.00	0.00
	Rental payments to landowners for agricultural loans	0.01	0.02
	Agricultural land taxes	1.96	6.16
	Equipment for drip irrigation	3.53	1.73
	Equipment for sprinklers	0.00	0.00
	Expenses associated with connecting to irrigation	0.01	0.45
	Greenhouse construction and maintenance	0.00	0.00
	Cold storage construction and maintenance	0.00	0.00
	Other storage and physical/infrastructure improvements for farms	0.00	0.00
	Agricultural land purchases	0.17	0.00
	Agricultural equipment purchases	0.21	0.38
	Other farm consumables (including tools, spare parts, and fuel)	0.06	0.17
	<i>Overall</i>	23.50	26.00
Average value of harvest		54.33	56.79
Net benefit		30.83	30.79

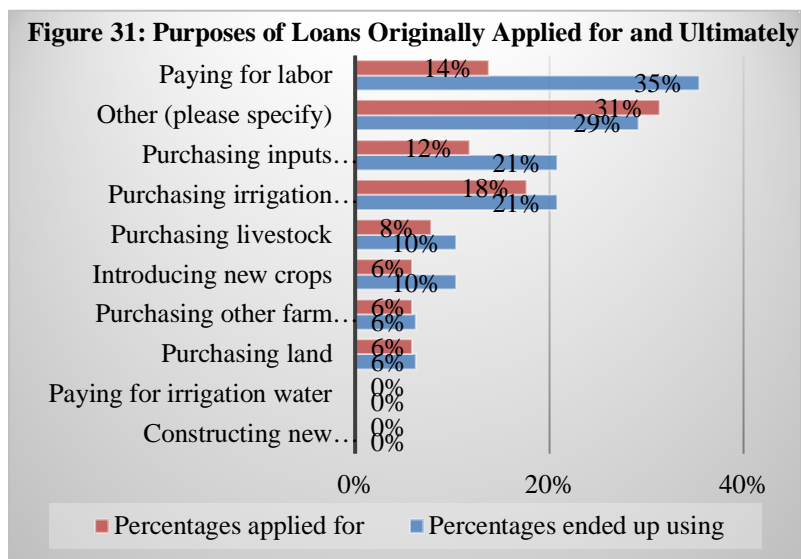
Source: A2F Calculation using Survey Data.



The majority of farmers reported a decrease in net benefits during the last agricultural year compared to the preproject period. The survey reveals that in comparison with the preproject period, in the last agricultural year 53 percent of the farmers' net benefit was lower, while 43 percent of the farmers' net benefit was higher than during the preproject period. Only 4 percent of the farmers had no change in their net benefits from agricultural productions. Figure 30 displays this cost-benefit comparison. Furthermore, of the farmers who experienced an increase in net benefit, only 16 percent adopted drip irrigation, and 65 percent did not attend the Agland training. The survey also shows that a majority of MCC loan recipients (56 percent) had an increase in net benefit, while 40 percent had a decrease in net benefit; the rest (4 percent) had no change.



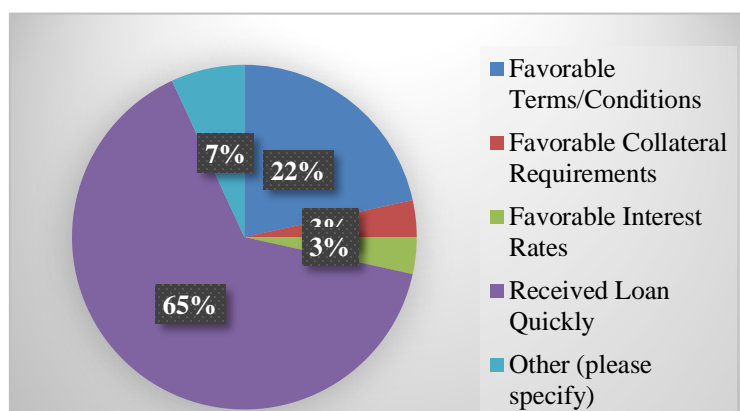
Only 18 percent of the loan recipients applied for loans for the purpose of purchasing drip-irrigation equipment. Figure 31 shows that the majority of farmers whose loans were approved ended up using them to pay for labor (33 percent), although only 14 percent of farmers originally borrowed for this purpose. Similarly, the percentages of farmers applying for loans with a view originally to purchase inputs and livestock and introduce crops were respectively 12 percent, 8 percent, and 6 percent, whereas eventually the percentages of farmers who ended up using the loan for these purposes were much higher and were 21 percent, 10 percent, and 11 percent, respectively.





About half of the loan recipients (50 percent) were satisfied with the financial products they received. More than any other reason—including favorable terms or interest rates—customer satisfaction was driven by the quick loan approval and disbursement. Among loan recipients, 65 percent mentioned quick loan disbursement as the main reason for satisfaction with MCC credits, while 22 percent mentioned favorable terms and conditions. However, 43 percent of borrowers who had previously borrowed from other financial institutions were less satisfied with respect to the terms and conditions of the loans disbursed under the Compact than with those of the non-Compact loans.²¹ Nevertheless, these existing customers were largely satisfied with the quick disbursement of MCC-funded loans, as indicated by 71 percent of them.

Figure 32: Reasons for Satisfaction with Credit



6.4 ON PROJECT SUSTAINABILITY

6.4.1 Infrastructure Sustainability

Santo Antônio's water management infrastructure fares better than Fogo's. The reservoirs, catchment dikes, and torrential correction dikes in Santo Antônio are for the most part still operational in the post-Compact period, which overall indicates sustainability, while the ones in Fogo are largely nonoperational. Of the 14 reservoirs built in Santo Antônio, 13 are working, while 100 percent of both the water catchment dikes (15 in total) and torrential dikes (12 in total) are fully operational. The only type of infrastructure that has failed to be operational in Santo Antônio is the borehole, due to the unwillingness of Rocha Grande's farmers to pay for the electricity it consumes.

Table 21: Water Management Infrastructure in Santo Antônio

Infrastructure	Operational	Nonoperational
Reservoir	13	1
Water catchment dike	15	0
Torrential dike	12	0
Borehole	0	1
Total	40 (95%)	2 (5%)

Source: A2F Site Visits & Stakeholder Interviews

²¹ Non-MCC loans include 45 percent commercial bank loans and 55 percent from other microfinance institutions.



Table 22: Water Management Infrastructure in Fogo

Infrastructure	Operational	Nonoperational
Reservoir	1	6
Water catchment dike	0	5
Torrential dike	25	0
Total	26 (70%)	11 (30%)

Source: A2F Site Visits & Stakeholder Interviews

The borehole in Santo Antão is currently nonoperational. The 500 m³ reservoir of Pedra das Moças never worked. Initially there were only two farmers producing mainly sugar cane and some fruits (papayas and bananas) who subscribed to the borehole service (Rocha Grande reservoir). However, the cost of electricity use was very high (about 40,000 CVE per person per month). Since the borehole requires electricity to run, most farmers were not willing to pay for it. The farmers' unwillingness to pay is a result of both their financial inability as well as the reservoir's alternative access to spring water, which is available for free. Since the GoCV also refused to pay for the electricity consumed by the borehole, this ultimately rendered the only borehole in Santo Antão nonoperational and deprived the reservoir in Rocha Grande of the supply of groundwater. The only region in Santo Antão where farmers would have been willing to pay for the borehole's service was Pedra das Moças since there, there is no other alternative. However, the reservoir serving that region is nonoperational due to structural issues.

The majority of reservoirs in Santo Antão are now working with traditional irrigation systems. Due to the low demand for drip irrigation, in the post-Compact period, the infrastructure previously built with MCC funds has mostly been catering to the traditional irrigation system except for three reservoirs. One of those exceptions is a spring-fed 200 m³ reservoir located in Recanto/Figueiral, which supplies water to 5 percent of the plots that have drip irrigation and to the rest for traditional irrigation systems. The spring-fed 200 m³ reservoir located in Dragoeiro is the only reservoir used solely by farmers who have implemented drip-irrigation systems (10 percent of the plots). The 1,000 m³ reservoir located in Fajã das Pombas utilizes a slightly higher fraction of its capacity (20 percent) to cater to drip irrigation. It has also been reported that some infrastructure has been subjected to vandalism. A combination of scarce rainfall and dysfunctional infrastructure on the ground led most farmers who had originally adopted drip irrigation and purchased the necessary equipment, to take the equipment off their fields to preserve it from sun.

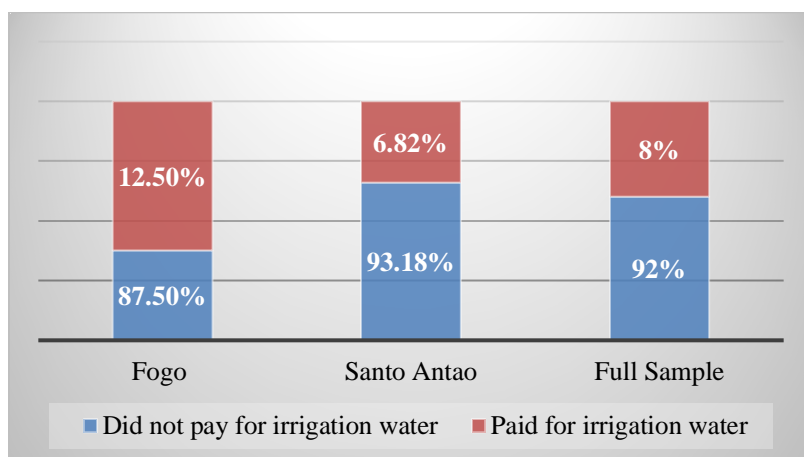
While in Santo Antão the majority of water management infrastructure (reservoirs, catchment dikes, and torrential correction dikes) is still operational with traditional irrigation systems, in Fogo it is just the opposite scenario. Only one of the seven reservoirs built in Fogo is currently working. This 1,000 m³ reservoir was rehabilitated by the MAA in 2016 after it had experienced structural issues negatively impacting its ability to hold water. The main reasons for the nonoperation of these reservoirs include water catchment dikes and pipes connecting them to reservoirs being silted up by heavy rain, an absence of connections from the dikes to the reservoir at the outset of construction, and connection pipe destruction caused by fire. Similar to the reservoirs, water catchment dikes



and torrential correction dikes in Mosteiros, Fogo, also became nonoperational due to being silted up. In contrast, 93 percent of the reservoirs in Santo Antão are currently functioning and are mostly catering to traditional irrigation systems. Because of the theft of connection pipes, the only reservoir that provided 100 percent drip irrigation in Santo Antão reverted to providing traditional irrigation.

In both islands, lack of willingness to pay for water was one of the major reasons affecting the sustainability of the built infrastructure. Thus, infrastructure is not being maintained regularly, as maintenance relies on funds collected from the water payment. According to the survey, 92 percent of farmers did not pay for the irrigation water they used. One of the main reasons farmers cited for not paying for irrigation water was that there was not enough water; 29 percent of farmers confirmed this to be the case. Additionally, farmers relied more on rainwater as a freely available substitute for the pay-for irrigation water. In fact, 83 percent of the surveyed farmers used rainwater for irrigation. It should be noted here that the percentage of farmers paying for irrigation water was slightly higher in Fogo (13 percent) than in Santo Antão (7 percent).

Figure 33: Irrigation Water Payment



Nonetheless, the GoCV has been planning to construct new reservoirs and rehabilitate some reservoirs built under the WMAS Project. Under the Emergency Program for Mitigation of Drought and Bad Agricultural Year, the GoCV integrated the maintenance of infrastructure constructed under the WMAS Project. For instance, the GoCV is planning to construct a new reservoir in Pedra das Moças, instead of rehabilitating the 500 m³ reservoir that has already been rehabilitated twice, but was unsuccessful. The reservoir that will substitute for the Pedra das Moças MCC Reservoir will be only 150 m³, that is, much smaller than the MCC reservoir (i.e., 500 m³). Yet, the government plans to equip the borehole in Rocha Grande, under the same program, with solar panels to reduce energy costs and feed the new 150 m³ reservoir in Pedra das Moças and the MCC 200 m³ reservoir in Rocha Grande. In addition, the government plans to undertake other



rehabilitation/construction work in the WMAS intervention area, such as (i) “lavadas²²” maintenance in Figueiral, Lombo Comprido, Paúl, Cabo de Ribeira e Tabuleiro-Covão, and Rocha Grande; and (ii) lavada construction in Figueiral; (iii) Matinho reservoirs constructed under WMAS Project, including a connection to bring water from the Spring of Spia. The activities are expected to benefit Cutelo Alto and Monte Barro localities. In addition, the government plans to subsidize water for irrigation in some localities of Mosteiros. About 36 percent of the approved budget under the mitigation plan has been proposed for water management activities.

Table 23: GoCV 2018/19 Planned Investment in the WMAS Intervention Area

Municipality	Water management	Total municipality/island	% of total
Santo Antão	87,638,742	181,502,993	48.29
Paúl	22,887,858	34,516,642	66.31
Fogo	29,400,000	136,391,953	21.56
Mosteiros	4,200,000	27,550,062	15.24
São Nicolau	11,328,850	47,848,122	23.68
Ribeira Brava	6,228,850	27,856,585	22.36

Source: BO, I Série, nº 73, Resolução n.º 140/2017, Programa de Emergência para Mitigação da Seca e do Mau Ano Agrícola 2017/1, page 9.

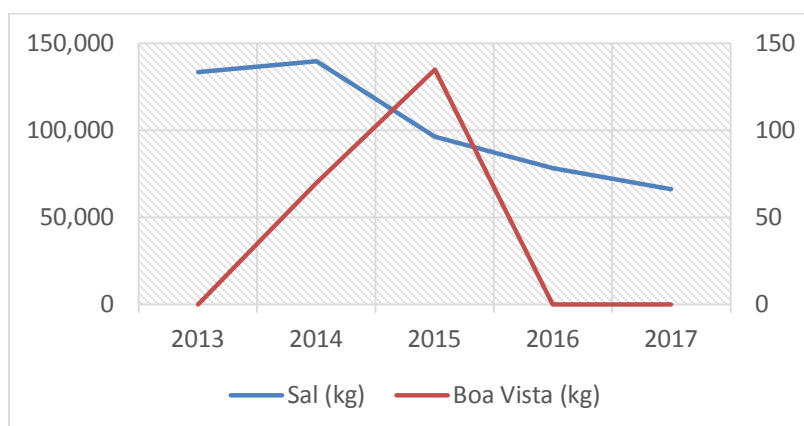
The PHCs are working significantly below their operational capacity due to a lack of demand. The PHC in Santo Antão, open only on Mondays and Tuesdays (and sometimes on Wednesday), has been used only by nine traders so far, while the PHC in Fogo is not being used at all at present due to budgetary issues. The PHC in Fogo has been used only a few times in the past and only for training purposes. The cold storage facilities in the Santo Antão PHC have also remained nonoperational for the entire time due to lack of electricity. As a result, 68 percent of the farmers surveyed mentioned this nonoperationality as the main reason for not storing their crops in the PHC. Data collected by Porto Novo’s MAA delegation show that since 2013 (when the center became operational), a total of 513,851 kg of different kinds of crops were treated and exported to the islands of Sal and Boa Vista—as shown in Figure 34 below—which is significantly below the center’s operational capacity. Moreover, over the past few years, the quantity of crops treated in the center and exported to Sal and Boa Vista has been declining, as seen in Figure 34.²³

²² The traditional infrastructure to connect the spring to the reservoir or to the plots where there is no pipes.

²³ It was mentioned during the review process that there were plans to consider potential privatization of the center post-compact. However, such privatization plans were not mentioned by the stakeholders interviewed in the course of the evaluation nor did the evaluator find anything in writing to confirm it.



Figure 34: Crop Exports to Sal and Boa Vista Treated in the PHC, Santo Antão



Source: Porto Novo's MAA delegation

The relatively high cost of service at the PHC is a major factor farmers' decision to use of PHCs. The high cost of service is mainly due to the high cost of electricity. As per the information collected from the delegation of Porto Novo, the PHC is not connected to Electra (public electricity network) because of the high electricity usage bill, which typically hovers around 1 million CVE. Therefore, the PHC utilizes the generator when needed. With regard to treatment and packaging costs (including a certificate), the cost depends not only on the quantity (kg) but also on the type of crop. The typical treatment cost is 2.5 CVE per kg, while the crate rental rate is 25 CVE and 50 CVE for small and large packages, respectively. The cost of treatment makes the price of final products more expensive compared to products imported from other islands, such as Santiago. Interviews with traders revealed that the average cost for a round trip to Sal is approximately 24 CVE per kg of product.

Table 24: Average Transaction Cost for Traders, Santo Antão

	Description	Average cost (CVE)	Comments
Way to Sal with crops	Basket rental (PHC)	2,500	for 50 baskets
	Crop treatment (PHC)	2,500	for 1,000 kg of crops
	Transport from home => Santo Antão Port (car)	1,158	one way cost for +/- 1,000 kg of crops
	Transport from Santo Antão Port => PHC (car)	350	one way cost for +/- 1,000 kg of crops
	Transport from PHC => Santo Antão Port (car)	383	one way cost for +/- 1,000 kg of crops
	Transport from Santo Antão => São Vicente (boat)	2,500	for 50 basket of crops
	Transport from Santo Antão => São Vicente (boat)	800	per person/trader
	Transport from São Vicente => Sal (boat)	5,417	for 50 baskets



	Description	Average cost (CVE)	Comments
	Transport from São Vicente => Sal (boat)	3,000	per trader
	Payment to the Port Management Company (Enapor) for the space occupied in the boat from São Vicente => Sal (boat)	1,000	per m ³ space
	Transport Sal Port => Sal Home (car)	717	one way cost for +/- 1,000 kg of crops
Way back with empty baskets	Transport from Sal Home => Sal Port (car)	617	for 50 baskets
	Transport Sal => São Vicente (boat)	2,667	for 50 baskets
	Transport Sal => São Vicente (boat)	3,000	per person/trader
	Transport São Vicente => Santo Antão (boat)	1,000	for 50 baskets
	Transport from São Vicente => Santo Antão (boat)	800	per trader
	Transport from Santo Antão Port => PHC (car)	483	for 50 baskets

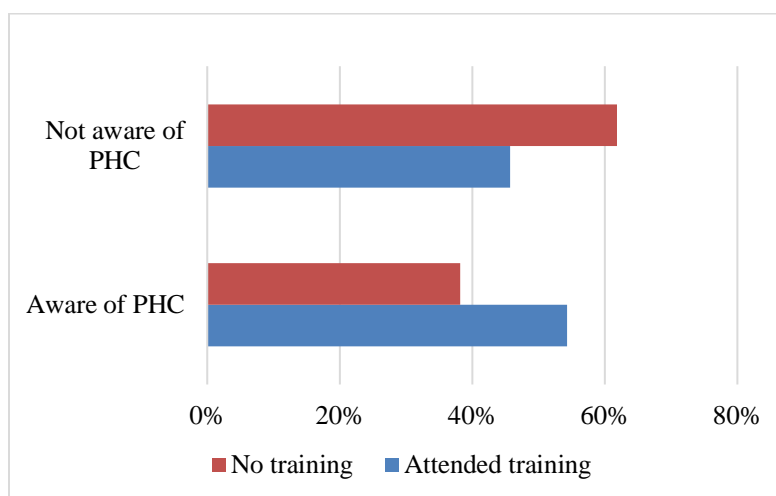
Source: Trader Survey

Another factor contributing to the lack of demand for PHCs is their location. The PHC in Santo Antão was established in the industrial zone called Água Doce, which is on the outskirts of the city called Porto Novo. This turned out to be far from the port, making it both costlier and more cumbersome for farmers to transport their processed or cleaned crops. More expensive transportation to the port increased the unit service costs that the farmers would already incur at the PHC. On June 2017, the GoCV announced it would address this problem by moving the PHC closer to its port facilities, but this commitment is yet to be fulfilled. In addition, lack of reliable maritime transportation affected export to other islands.

A majority of farmers are currently unaware of the PHC in Santo Antão and of the services it offers. Although the PHC was inaugurated in October 15, 2010, 56 percent of the farmers surveyed in Santo Antão acknowledged that they were unaware of the PHC and the services it offered. This proportion is quite sizable, given that it has already been eight years since the PHC was initiated. It indicates that not much effort was exerted in the post-Compact period to inform the farmers of the existence and usefulness of the PHC in Santo Antão. Also, as construction of the PHC was completed almost two years after Agland's training of farmers had taken place, the training participants did not get a chance to learn about the PHC. Only 54 percent of the training participants in Santo Antão mentioned that they knew about the PHC. This percentage is, however, higher than for those farmers who did not attend the training.



Figure 35: Awareness about PHC



The Rural Extension Center (REC) of Mosteiros, Fogo, operated for a short time before completely shutting down in 2012. During the A2F team visits, it was revealed by the delegates in Fogo that the REC of Mosteiros had been closed since 2012 upon the migration of its main officer. Due to MAA's poor technical and financial capacity, the center has not been relaunched since then. This is mainly because of unavailability of appropriate technicians and lack of financial resources to send a candidate to Santiago Island for a year of training. Due to a long period of nonoperation, the REC's current state is dilapidated, requiring repair and maintenance, as shown in Figure 36.



Figure 36: Rural Extension Center, Ribeira de Ilhéu, Fogo



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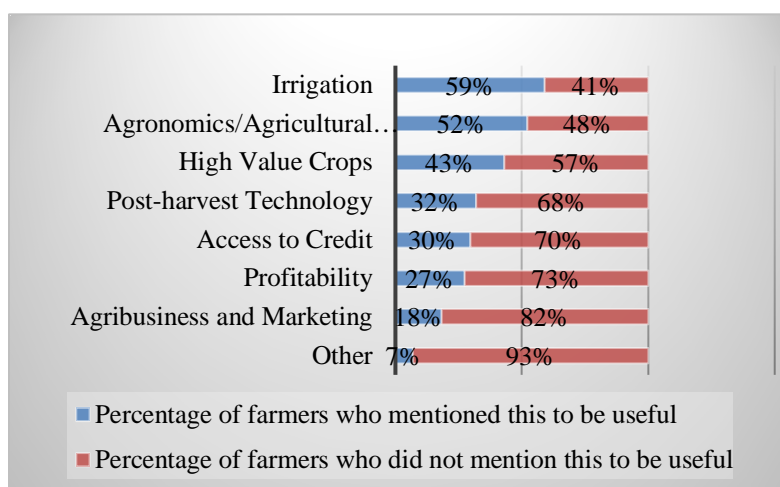
Source: A2F Consulting.



6.4.2 Sustainability of the Training Program

About half of the trained farmers still use the agribusiness and marketing practices they learned through the training; however, a more targeted training might have increased its overall effectiveness. The survey revealed that 39 percent of surveyed farmers attended the training program, of which 78 percent were from Santo Antão and the rest from Fogo. Among the top three training programs cited by the farmers as useful were irrigation, agricultural practice/agroeconomics, and high-value crops (see Figure 37). During project implementation, the training program was successful in terms of enhancing agricultural business growth. Approximately 49 percent of the farmers still apply the agribusiness and marketing practices that were taught during the training. Nevertheless, the duration of the training program was rather short, which might have limited its effectiveness. This is evident from our survey, which indicates that 64 percent of the farmers were discontent with the training's duration. This discontent was expressed by a higher percentage of farmers in Santo Antão (60 percent) than in Fogo (50 percent).

Figure 37 : Most Useful Training Programs



MAA continued providing training after the Compact ended. This was possible because the training provided by Agland to extension agents from MAA increased the technical capacity of the MAA staff. This has enabled MAA to provide continuous training for farmers upon their request. In fact, 42 percent of the surveyed farmers confirmed the access to follow-up coaching. One PHC agent had received a one-and-a-half-year long training in Phytosanitary Inspection, while a total of another 30 people attended similar trainings at Cabo Verde University, all of which were funded by MCC. This in the long run should benefit the farmers, who would need to ensure the quality of the crops they produce for export.

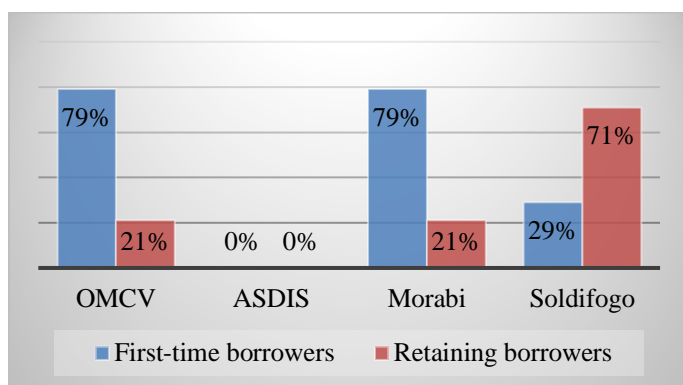


6.4.3 MFIs' Sustainability

While the loan repayment rate was satisfactory during the Compact, the MFIs had a rather low borrower retention rate. The ultimate repayment rate could not be established as loans were converted into grants to the MFIs, and they were not willing to share these statistics with the evaluation team. Interviews with Morabi however suggest that their ultimate repayment rate was around 70 percent. Only about 50 percent of the program clients remain with the institution. OMCV indicated that only 7 of the 33 program clients in Santa Antão repaid their loan, and these clients then discontinued their activities because the prices of their horticulture produce were not attractive, no extension services were available, there was no water for drip irrigation, etc. The survey results suggest that only 8 percent of borrowers reapplied for loans to the same MFIs from where they had obtained their MCC loans. Some of the borrowers who did not reapply for loans went out of business.

The majority of borrowers of the MFIs were first-time borrowers of these institutions. Survey results show that more than 74 percent of credit recipients were first-time borrowers of these four MFIs. The rest were existing customers of the MFIs who applied for MCC loans when they became available. Figure 38 presents the first-time vs. existing borrower composition for each MFI that participated in the MCC project. As the figure shows, Soldifogo was an exception in the sense that the majority of its borrowers (71 percent) under the MCC project were existing customers.²⁴ In addition to increasing the number of customers served during the project implementation period, some MFIs also managed to expand their operations to areas previously not served. For example, Morabi initiated its lending activity in Santo Antão only after MCC's project had started to be implemented. Before that, Morabi operated only in Santiago.

Figure 38: First-time Borrowers of MFIs



These outcomes highlight the inadequacy of the risk mitigation mechanisms in the project design. The performance criteria were too loose to ensure adequate risk management. While well-intentioned, the conversion into grants of loan resources while

²⁴ The percentages corresponding to ASDIS are 0 because ASDIS did not operate in the islands we surveyed. It operates only in São Nicolau.



most of the portfolio was still outstanding reduced the pressure for financial discipline for participating MFIs—which were mainly NGOs and thus themselves not driven by profit. The MFIs also lacked experience in best practices of loan recovery in agricultural credit since they were not specialized agricultural lending institutions. The weak loan appraisal process exacerbated “bad lending,” which contributed to loan nonrepayments. By design, the MFIs would have been able to use their own liquidity to maintain good portfolio numbers during the Compact and thereby secure access to the grant irrespective of the quality of the underlying portfolio. Nevertheless, MFIs are still using the management and Information System (MIS) provided to them during the project implementation.

6.5. ECONOMIC RATE OF RETURN (ERR)

The expected project outcomes relied on critical assumptions that affected overall project performance. The economic rates of return from the WMAS Project was expected to be 3 to 13 percent. The assumptions that were made during the project design were as follows:

- Drip irrigation will be installed on approximately 111.2 hectares with about 337 farmers adopting drip irrigation
- Farmers on irrigated land will grow high-value horticultural crops and will cultivate, on average, two crop cycles per year
- Real prices remain constant
- Sufficient market exists to absorb increased farm production

However, only 100 farmers adopted drip irrigation—meeting about 30 percent of the project expectation. The project design assumed that all the targeted farmers would adopt drip irrigation. It also assumed that all the targeted farmers would successfully receive the loan to finance the purchase of drip irrigation equipment and would also receive required trainings to successfully implement the adopted method. This assumption was not met at the end of the Compact. About 98 percent of the targeted farmers in Fogo adopted drip irrigation, while 33 out of 229 (14.4 percent) in Santo Antão and 19 out of 59 farmers (32.2 percent) in São Nicolau adopted drip irrigation. Also, presently the number of farmers who adopted drip irrigation is expected to be even lower than in 2010. Infrastructure delay (e.g., construction of borehole) led to a lack of water availability, so farmers could not adopt drip irrigation despite obtaining loans.

The assumption that all farmers on irrigated land will engage in horticulture and cultivate twice a year did not hold. For instance, about 41 percent of the surveyed drip irrigation farmers reported transitioning to high-value agriculture. However, the project did not have any impact on the crop cycles. Survey results show that 91 percent of surveyed farmers reported no increase in their crop cycles since implementation of the project. Results also show that 90 percent of surveyed farmers in Santo Antão and 96 percent in Fogo reported no improvement in their crop cycles. The assumption did not hold true due



to a number of factors but mainly because of external weather conditions and lack of rain, which limited water availability.

The demand for agricultural commodities produced in Santo Antão and Fogo remained limited due to a declining population and high prices. Market demand is primarily driven by the tourism industry in Cabo Verde, which was growing during the Compact period. As a result, export demand for agricultural commodities was growing. Domestic demand, however, might have been decreasing due to reduced population in Santo Antão and Fogo. For instance, Fogo's population size declined from 2,706 in 2006 to 2,395 in 2011. Similarly, Santo Antão's population declined from 47,170 in 2006 to 44,104 in 2010. In addition, because of high transaction costs (due to weak transportation and interconnectivity), the prices of the commodities produced in Fogo and Santo Antão were high, even higher than the imported commodities from the European Union (EU). As a result, the demand remained low for agricultural commodities produced in Fogo and Santo Antão. Moreover, due to the millipede issue in Santa Antão, the demand for agricultural produce remained low in export markets.

The financial model used to calculate ERR did not consider transaction costs in the cost-benefit analysis. For instance, the model used cost of production as a function of annual production costs (including water and labor), which are comprised of input costs, fuel, land rent, and maintenance, etc. Primarily, the financial model used the agricultural production costs and revenue from sales to calculate profit and net income. However, only increasing production may not necessarily lead to increase in farmers' income. There are other external factors, such as access to market, market mechanisms, as well as market infrastructure, that influence profits. The marketing costs were also not included in the cost-benefit analysis. Due to inefficient market infrastructure, transaction costs were high, which reduced profitability from increased production and farmers' perception on profitability.



6.6. SUMMARY FEEDBACK ON EVALUATION QUESTIONS

#	Evaluation question	Evaluation finding
Water Management and Soil Conservation Activity		
Effectiveness	To what extent has productivity of farmers (Ton/ha) increased in the treated areas (Mosteiros and Paúl) as the result of the infrastructure?	Before the project started, the average agricultural productivity was 183,209 kg/ha, which significantly dropped to 62,227 kg/ha in the last agricultural year. However, the decline is mainly due to severe drought last year.
	Did the new water infrastructure allow farmers to have at least two crop seasons?	The average crop cycles before and after the project were, respectively, 1.39 and 1.36, suggesting no change.
	To what extent have farmers migrated to cash crops products?	Among the farmers who adopted drip irrigation, about 41 percent reported to have been producing high-value crops (e.g., tomatoes, carrots, bananas) since the adoption of the modern irrigation methods. It was noted that farmers at the outset of the project started to adopt new methods and drip irrigation and migrate to higher-value agriculture products. However, over the past few years, the cultivation of such products has seen a sharp decline.
	Are farmers producing only at subsistence level, or are they producing at a larger scale?	The majority of farmers are producing at subsistence level.
	Are farmers in treated areas aware of postharvest centers, do they use them? Do they export to other islands (Sal and Boa Vista)? If yes, how often do they do it? If not, why not?	<p>A majority of the farmers are currently unaware of the PHC in Santo Antão and the services it provides. About 56 percent of the farmers surveyed in Santo Antão acknowledged that they were unaware of the PHC and the services it offered.</p> <p>Only 14 percent reported an increase, while an even higher percentage of farmers, 29 percent reported a decrease in their exports compared to the preproject period. Farmers from Santo Antão or Fogo do not have a competitive advantage in terms of exporting to those other islands, given the high costs associated with exporting and transporting produce.</p>
	Are farmers satisfied with drip irrigation?	Overall satisfaction rate was low. Survey results show that, of the farmers who adopted drip irrigation, only 13 percent were satisfied with the water volume, 18 percent were satisfied with the water



		quality, 13 percent of the drip irrigators were satisfied with the timely water delivery, 9 percent were satisfied with the cost of the water from MCC's drip irrigation, and only 6 percent were satisfied with the services (billing, ordering, etc.) of the providers.
Sustainability	Is the new infrastructure currently functional and used by the farmers? If yes, is the amount of water sufficient for their needs? And do they receive it in a timely manner?	The reservoirs, catchment dikes, and torrential correction dikes in Santo Antão are for the most part still operational in the post-Compact period, while the ones in Fogo are mostly nonoperational. About 78 percent of farmers indicated that they required more water than is available for irrigation purposes. Across the two islands, the average additional irrigation water required by the farmers was 2,036 m ³ .
	Did farmers pay and are they still paying for the received water and services?	Farmers did not pay for the water because of insufficient water (particularly in Fogo), lack of willingness to pay (particularly for spring-fed reservoirs). About 92 percent of the surveyed farmers did not pay for the irrigation water they used.
	What are the responsible entities for managing (Operating & Maintenance) the water management services?	The MAA is the responsible entity for supervising and maintaining the built infrastructure.
	Are the systems being repaired and maintained properly when necessary?	The infrastructure is not being maintained regularly as maintenance relies on funds collected from the water payment. Lack of willingness to pay for water was one of the major reasons affecting the sustainability of the built infrastructure.
Agribusiness Development Services Activity		
Effectiveness	How do farmers in the treated areas sell their agricultural products? Do they sell in local markets or in organized markets?	Majority of the farmers sell their produces in the village market. Survey results show that 70.48 percent of the farmers sell in the village market, while 39 percent sell at farm gates. and only 9 percent of farmers sell their agricultural produce to other islands.
	Are farmers in treated areas aware of postharvest centers; do they use them? Do they export to other islands (Sal and Boa Vista)? If yes, how often? If not, why not?	A majority of the farmers are currently unaware of the PHC in Santo Antão and its services. About 56 percent of the farmers surveyed in Santo Antão acknowledged that they were unaware of the PHC and the services it offered.



		Only 9 percent of the farmers sell their produce to other islands. Farmers from Santo Antão or Fogo do not have a competitive advantage in terms of exporting to those other islands, given the high costs associated with exporting and transporting produce.
	Did the implemented training programs lead to widespread adoption of new irrigation practices and to new marketing strategies?	The drip irrigation method was not as widely adopted as expected. Among all the surveyed farmers in Santo Antão and Fogo, only 24 percent adopted drip irrigation.
	All farmers were chosen for training; if not, what were the criteria?	Not all farmers were chosen for training. There were no specific criteria for their selection. The presidents of the associations in the area selected the farmers.
	What was the timeline and frequency of such training programs? Did farmers at the time of training already adopt the new irrigation practices?	The training took place in Mosteiros from July 8, 2008, to July 29, 2009, and in Paúl from July 12, 2008, to July 10, 2009. There were 25 training sessions in Paúl and 16 sessions in Mosteiros. The duration of each session was 2 hours.
	Was there any spillover effect? If so, to what extent, and did it reach other communities?	There does not seem to have any spillover effect.
Sustainability	Is the PHC currently functional and used by the farmers and traders?	The PHC in Santo Antão is currently functional; however, it is working significantly below its operational capacity due to a lack of demand.
	In the post-Compact period, do farmers receive any extension services from the MAA, for example, on how to operate and maintain drip-irrigation systems? Are extension centers currently operating?	In the post-Compact period, farmers received training from the MAA, for example, on how to operate and maintain drip-irrigation systems? The rural extension center (REC) of Mosteiros, Fogo operated for a short span of time before completely shutting down in 2012 due to the migration of its main officer. Due to poor technical and financial capacity of the MAA, the center has not been relaunched since then. This is mainly because there are no appropriate technicians and insufficient financial resources to send a candidate to Santiago Island for a year of training. Due to a long period of nonoperation, the REC's current state is poor, requiring repair and maintenance.



	In the post-Compact period, do farmers apply agribusiness and marketing practices that were taught over the course of the Compact?	Farmers still apply agribusiness and marketing practices that were taught during the training, as indicated by 49 percent of the farmers.
Access to Credit Activity		
Effectiveness	What were the criteria for acquiring microcredit?	In the first place, the ministry confirms (declares) that the farmer has a land plot in the intervention area. The farmer must show the declaration form to the MFIs to apply for a loan. The farmers need to show required documents to MFIs, including proof of incomes and a guarantor.
	Did they receive the credit needed to adopt new methods of water management and irrigation?	Only 18 percent of the loan recipients applied for loans for the purpose of purchasing drip-irrigation equipment.
	Did farmers use the credit for the intended purposes?	The majority of the farmers whose loans were approved ended up using them to pay for labor (33 percent) and purchasing inputs (21 percent).
	What was the overall experience of beneficiaries with these financial products?	About half of the loan recipients (50 percent) were satisfied with the financial products they received. More than anything, such as favorable terms or interest rates, the customer satisfaction was driven by the quick loan approval and disbursement. Among loan recipients, 65 percent mentioned quick loan disbursement as the main reason of satisfaction with MCC credits, while 22 percent cited favorable terms and conditions.
Sustainability	In the post-Compact period, are the financial institutions still lending money to farmers?	Although the MFIs are still lending to farmers, lending for drip irrigation is limited. The participating MFIs had a rather low borrower retention rate. The survey results suggest that only 8 percent of borrowers reapplied for loans to the same MFIs from where they had obtained their MCC loans.
	What is the current reimbursement rate? Are there more farmers applying for credit for drip-irrigation purposes?	The loan repayment rate was satisfactory during the Compact. However, the ultimate repayment rate could not be established, as loans were converted into grants to the MFIs, and MFIs were not willing to share these statistics with the evaluation team. Interviews with Morabi suggest that its ultimate repayment rate was around 70 percent. OMCV indicated that only 7 of the



		33 program clients (21 percent) in Santa Antão repaid their loan.
	What are these funds used for?	The funds are used for general agricultural activities.
	What has been the effect of this component on participating MFIs.	The impact on the MFIs has not been sustainable.



7. EVALUATION SYNTHESIS AND LESSONS LEARNED

7.1. ON OVERALL PROJECT DESIGN

The project design aligns with the existing academic literature, which demonstrates the importance of drip irrigation for maximizing the quantity of water available for crops, livestock, and human consumption. Drip irrigation is linked to poverty reduction through increased crop production and increased farm income (Karlberg et al. 2007; Jha et al. 2016; Taylor et al. 2014). For instance, Karlberg et al. (2007)²⁵ provide evidence of increases in tomato yield in South Africa from drip irrigation, using saline water. Jha et al. (2016)²⁶ show that in comparison to furrow irrigation systems, drip irrigation leads to improved productivity for fodder crops and higher economic security for smallholder farmers in Nepal. Drip irrigation has been found to reduce labor requirements for cultivation in India; this is because the water is supplied to the crops directly, which reduces labor cost (Narayanamoorthy 2004).²⁷ Drip irrigation reduces the cost of production and increases productivity. Data from experimental plots in India show that drip irrigation, in comparison to furrow irrigation, increases the productivity of vegetable crops by 40 percent (Narayanamoorthy 2005).²⁸ Taylor et al. (2014) report that drip irrigation adoption in California leads to a total annual value of water savings and additional income from the yield effect ranging between USD 313 million and USD 1.13 billion, with an average of USD 748 million.

The design also seems relevant to the government's priorities as indicated in the National Action Plan for Environment for 2004–2014.²⁹ The lack of adequate and uniformly distributed rainfall is a serious production constraint and negatively impacts crop yield and market quality. The Action Plan identified limited availability of water suitable for home consumption and economic development activities as one of the prioritized environmental problems. The Action Plan states that since 1960, rainfall has decreased in the country, about 20 percent of rainwater is lost through soil erosion, some 67 percent through evaporation, and the remaining 13 percent is available for groundwater recharges. Moreover, only about 10 percent of the land area is arable, of which 95 percent is being used for rain-fed agriculture and the remaining 5 percent for irrigated crops. Therefore, the highest priority was given to the mobilization of water resources, the construction of infrastructure to increase access to clean and good quality drinking water, and the reduction

²⁵ L. Karlberg, J. Rockström, J. G. Annandale, and J. M. Steyn (2007). "Low-Cost Drip Irrigation—A Suitable Technology for Southern Africa? An Example with Tomatoes Using Saline Irrigation Water." *Agricultural Water Management*, 89 (1): 59–70.

²⁶ A. K. Jha, R. Malla, M. Sharma, J. Panthi, T. Lakhanka, N. Y. Krakauer, S. M. Pradhanang, P. Dahal, and M. L. Shrestha (2016). "Impact of Irrigation Method on Water Use Efficiency and Productivity of Fodder Crops in Nepal." *Climate* 4 (1): 4.

²⁷ A. Narayanamoorthy (2004). "Impact Assessment of Drip Irrigation in India: The Case of Sugarcane." *Development Policy Review* 22 (4): 443–62.

²⁸ A. Narayanamoorthy (2005). "Efficiency of Irrigation: A Case of Drip Irrigation." Occasional Paper No. 45. Mumbai, India: National Bank for Agriculture and Rural Development (NABARD), Department of Economic Analysis and Research.

²⁹ PANAII-sintese-final_Segundo Plano de Acção Nacional para o Ambiente, 2004.



of water losses in agriculture. In this context, the WMAS Project seems to be aligned with the country's development priorities in the sector.

However, the design did not consider the country's overall growth dynamics and agriculture suitability to bring optimal benefits. As discussed earlier, agriculture accounted for only about 6.4 percent of GDP in 2017, as opposed to the 18.6 percent contribution by the industry sector and 61 percent by the service sector (WDI 2018). The country depends primarily on growth in the service sector, which is primarily driven by tourism. Although the selected islands are the major contributors of agricultural production, the agricultural growth potential is relatively lower than the growth of other sectors. Moreover, the majority of soils in Cabo Verde are low in organic matter and not very suitable for agriculture.³⁰ The soil exhibits low fertility, medium texture, and degradation. Soil is mainly of volcanic origin, generally shallow with low water retention capacity, which is not well-suited for agriculture.³¹ Furthermore, agriculture in Cabo Verde is dominated by microfarms, which undermines the scope of increasing economies of scale. Quality of soil, irregular rain patterns, and recurrent droughts do not encourage agricultural productivity growth in the country.³²

Although the selection of islands was done after several rounds of assessments, it was partially aligned with the Compact's ultimate goal of increasing agricultural production, marketing, and income. Moreover, the soil in Santo Antão is more suitable for agroforestry and livestock production. Reberia de Paúl has favorable climate conditions; however, domestic demand is limited due to the small population size and limited tourism activities. The tourism sector is characterized by small locally owned guesthouses with no plans for resort hotels or mass tourism development projects. The tourist arrivals to Santo Antão comprise less than 10 percent of the national total. Therefore, the domestic market potential for horticultural products on the island of Santo Antão is limited, as in Fogo. On the other hand, due to strong competition from the EU's imports, the export potential of these islands is also limited. All these factors affected the project's impact on increasing income.

The construction of the postharvest center was relevant for the mitigation of postharvest losses and issues with the millipede infestation; however, the high transaction costs were not adequately analyzed through a rigorous value chain analysis. The project did not conduct a proper value chain analysis to assess the potential benefits from increasing agribusiness activities. Therefore, the project impact on exports was found to be limited. Distance of project sites from the port and the PHCs, lack of adequate transportation systems, and limited interconnectivity among islands led to high transaction costs. The average preproject transportation cost was around 4,000 CVE. Together with average land taxes (approximately 8,000 CVE), and average agricultural

³⁰ Ministry of Finance and Planning Growth (2004). *Poverty Reduction Strategy Paper*.

³¹ I. Baptista, L. Fleskens, C. Ritsema, A. Querido, J. Tavares, A. D. Ferreira, ... and A. Varela (2015). "Soil and Water Conservation Strategies in Cabo Verde (Cabo Verde in Portuguese) and Their Impacts on Livelihoods: An Overview from the Ribeira Seca Watershed. *Land* 4 (1), 22–44.

³² Ministry of Finance and Planning Growth (2004). *Poverty Reduction Strategy Paper*.



equipment purchases (474 CVE), the average transportation cost constituted about 30 percent of the average total agricultural expenses in the preproject period. Adoption of drip irrigation, necessitating installation of the necessary equipment, added further costs. These costs in turn cumulatively led to high prices of the agricultural commodities compared to market prices. As a result, farmers were not able to sell their products in the market at profitable rates. This discouraged farmers from producing high-value crops as well as from exporting the commodities to other islands. A proper value chain analysis would have been useful to identify constraints and challenges across the value chain, which the project might have taken into account in the design.

Similarly, the training program was designed to educate farmers in agribusiness and marketing practices in the target islands, but it failed to address island-specific needs.

A need assessment of the potential trainers (extension workers) was done after the training, during which the extension workers reported many other training needs along with the need for a greater amount of training. Moreover, the soil, water availability, agricultural practices, and crops are different in Santo Antão and Fogo. However, the training program was designed to be the same for all the project islands. As a result, the program did not take into account island-specific needs.

Some risks were not adequately assessed to be integrated into the design and sustainability of the project.

For instance, the risks of drought were not addressed in the design of the program. Cabo Verde is very prone to drought, which can severely restrict water availability for irrigation and, thereby affect agricultural production. Several drought situations occurred in Cabo Verde during and after the Compact, the most recent one happened in 2017. As a result, the reservoirs, especially the rain-fed ones remained empty. In addition, the risk of interisland transportation was not addressed in the design. Limited inter-island connectivity is a well-known issue which significantly affects marketing of agricultural products in other islands. These risks were not addressed in the project design, and therefore no mitigation measures, such as alternative sources of water for drought and transportation infrastructure for connectivity issue, were incorporated.

7.2. ON OVERALL PROJECT IMPLEMENTATION

All infrastructure activities were concluded before the Compact termination, but quality control was not sufficient in some cases.

A total of 28 reservoirs, 48 dikes, and one fully equipped PHC were constructed. Three RECs were also rehabilitated. However, quality issues were found in some areas. The major issues found in water reservoirs were related to structural problems that may have been caused by the poor quality of mortar used, inadequate proportions of sand and other materials, poor cement coats, bad or nonexistent waterproofing, and foundation issues, etc. As a result, the built reservoirs could not hold water for long due to leakages. This indicates that there was lack of adequate supervision during construction. In Fogo, the common issue found was silted-up catchment dikes and reservoir connection pipes from the 2015 storm. Similarly, many reservoirs were too big to hold small amounts of water. Moreover, the size of the PHC seems to be large



as only a few traders are currently using them. By contrast, the mobile storage units in the postharvest center were very small, which proved to be inefficient and were, therefore, never used. It would have required several trips to bring agricultural commodities from one farmer alone.

The three project activities were supposed to complement each other to garner the best benefits from the project; however, the sequencing of the infrastructure construction did not align with other project activities. For instance, some reservoirs were made before the boreholes were in place and, therefore, could not provide water immediately to farmers who had bought drip irrigation equipment. In some cases, due to faulty construction, the reservoirs could not hold water. As a result, despite buying drip irrigation equipment and getting a loan, the farmers were not able to use the infrastructure services. In addition, the PHC operated at a substantially lower capacity than what it was built for. The PHC was constructed to provide postharvest services to promote exports to other islands. However, since many farmers could not use drip irrigation, they did not produce enough to take their production to the postharvest center.

The project also assumed adoption of irrigation water tariffs on the fixed costs by the ANAS to ensure sustainability of the project. As part of the compact and WMAS Project, the GoCV was working on implementing a new water pricing policy/tariff on farmers. MCC provided technical assistance to the GoCV by hiring experts/consultants to determine the precise rate based on the willingness of farmers to pay, as well as natural resource constraints, among other factors. During meetings with the MCC stakeholders, it was noted that the tariffs adopted by the GoCV were much lower than the rate proposed. Yet, even the low rate seems not to have been implemented or executed in practice since then. Pricing irrigation water based on the amount of water used, is a useful means for achieving allocation of irrigation water to farmers to ensure sustainable and efficient use of water. The will for implementing such pricing policies seems, however, to be weak, and there is extreme fear of causing disturbances within local communities, as they view water as their right.

MAA has shown weak technical and financial capacity to sustain the project. For the WMAS Project to be sustainable, particularly with respect to the infrastructure and capacity-building component, it largely relied on the technical and financial capacity of the MAA. MAA is the owner and entity responsible for supervising and maintaining the built infrastructure. Also, with respect to the second activity, the project tried to strengthen the technical capacity of the MAA to ensure sustainability of the training component. For instance, as part of the capacity-building component, MAA agents were trained (training of trainers' method) and rural extension centers (RECs) were either built or rehabilitated and equipped. However, the REC of Fogo is currently closed due to lack of funding to hire qualified personnel to keep the center open.

Capacity-building programs provided a great deal of knowledge and skills to the project-implementing entities and to farmers on agribusiness and marketing activities, but were reported to be insufficient to produce the expected impacts.



Several topics were covered in the training program related to drip irrigation, agricultural production, and marketing in separate sessions. These topics were crucial for the project as well as for the trainers, who later trained the farmers. Nonetheless, the training program was not sufficient as reported by the extension workers. Each session ran for only two hours. Also, findings from the survey revealed that of the trained farmers, 22 percent reported that they would expect improvement in content, 64 percent reported that they would expect improvement in the duration of the training, and 16 percent reported the need for improving language issues. Similarly, a two-week training was provided to participating MFIs on different aspects of agriculture financing. The training, however, did not include sufficient training at the operational level, especially in regard to agricultural loan underwriting.



7.3. ON OVERALL PROJECT OUTCOMES

The project's impact on improving production methods did not meet expectations. Only 24 percent of the surveyed farmers reported to have adopted drip irrigation. A slightly higher percentage of farmers in Fogo (29 percent) adopted this modern irrigation technique than did farmers in Santo Antão (22 percent). The overall volume of available water did not increase as much as expected. By the end of the Compact, it only achieved 67 percent of the specified target, although in Fogo the target achievement rate was highly satisfactory (257 percent). Post-Compact, 78 percent of the farmers indicated that they would have required more water for irrigation. The average demand for water was 2,035 m³. Survey results further showed that 82 percent of the farmers confirmed the scarcity of water for irrigation. Scarcity of irrigation water is more severe in Santo Antão than in Fogo. Due to inadequate volume of water, the project also did not lead to a widespread adoption of drip irrigation.

Education and membership in a farmer group were found to be important deciding factors in the adoption of drip irrigation, while operational capacity and gender of the farmer had a negligible impact. The survey indicates that the farmers, who had adopted drip irrigation had completed at least primary school education. It further shows that 37 percent of the surveyed farmers who adopted drip irrigation belonged to a farmer group or association. The percentage of farmers who were primary farm operators did not show any significant differential likelihood of adopting drip irrigation compared to the ones who were nonprimary farm operators. The percentage of male farmers who adopted drip irrigation was slightly higher (25 percent) than the percentage of female farmers who adopted drip irrigation (19 percent). This implies gender did not have any significant impact on adopting drip irrigation.

The project's impacts on improvement in productivity and transition to high-value agriculture have been mixed. The target fulfillment rate was merely 23 percent with respect to the size of lands under improved or new irrigation systems by the end of the Compact. Also, the project did not improve the number of farming cycles in the long run as reported by 91 percent of the surveyed farmers. The survey further indicates that the average number of crop cycles in both islands is 1.36, while the target was 2. However, 49 percent of the farmers who owned land, reported an increase in cultivation of land after the project. Also, a majority of the drip irrigating farmers (56 percent) indicated that there was a rise in production after adopting drip irrigation. In addition, 41 percent of the surveyed farmers who adopted drip irrigation, experienced an increase in production of high-value crops. The most commonly produced high-value crops using drip irrigation were tomatoes, bananas, and carrots.

While some farmers reported an increase in agricultural sales and income, the majority reported a decline in agricultural sales and income in the postproject period. Both, the percentage of surveyed farmers who reported a postproject increase in agricultural sales, and the percentage of surveyed farmers who reported a postproject increase in agricultural incomes, were about 39 percent. However, about 55 percent of



surveyed farmers experienced a decrease in sales (55 percent) and an equal percentage experienced decrease in income. In contrast, the average agricultural sales in the last agricultural year reported (397,102 CVE) was greater than the average preproject agricultural sales (169,931 CVE). Similarly, with respect to median agricultural income, it was higher in the last agricultural year (100,000 CVE) than in the preproject period (80,000 CVE). Comparing costs and revenue before and after the WMAS Project revealed that the average net benefit per kg from agricultural production was around 30 CVE, both, in the preproject period and in the last agricultural year, indicating no improvement in average net benefits.

While many farmers reported business growth after the project, the project could not improve agricultural employment or exports. 42 percent of the loan recipients enjoyed business growth, while the percentage of traders who enjoyed business growth was even higher (64 percent). In terms of business growth, a higher percentage of female farmers (71 percent) reported an increase compared to male farmers (63 percent). However, agricultural employment did not change much after the project. The average number of total workers employed by each farmer household has been around 8, both, pre- and postproject. Similarly, exports did not grow much after the project, as only 14 percent of the farmers reported an increase, while 29 percent reported a decrease. The rest of the farmers (57 percent) reported no change in exports volume.

In terms of sustainability, the project's performance is found to be mixed. While all but one of the reservoirs in Santo Antão is still in operation, it mainly caters to traditional irrigation rather than drip irrigation. Also, the newly built, MCC-funded borehole in Santo Antão has remained nonoperational partly because of farmers' unwillingness to pay for the electricity. In Fogo, none of the reservoirs are currently in operation, mostly because of extensive damage caused by the hurricane in 2015. The PHC in Santo Antão is operating significantly below its capacity for several reasons, including its inconvenient location, small mobile units, insufficient number of baskets (package), cost, and lack of awareness among many farmers. High non-repayment at the loan recipient level as well as lack of loan recovery plans affected MFIs' lending for drip irrigation equipment. However, the Agland training programs have proved to be sustainable, as MAA continued providing training even after the project.



7.4. LESSONS LEARNED

A rigorous analysis of project feasibility and prospects should have been carried out prior to project design. The analysis should have focused on assessing to what extent the geography and land of Cabo Verde were conducive to agricultural activity. This analysis should have included soil tests in every project site to determine fertility and suitability for the envisioned crops. A soil test would have provided useful information on the soil's acidity level (i.e., pH level) as well as the levels of micronutrients, which are necessary to ensure fertility, such as nitrogen, potassium, phosphorus, copper, zinc, iron, and manganese. A careful analysis of this information could have shed light on the suitability of the Cabo Verdean rocky soil for agriculture (see box 2 below). The analysis should have also incorporated an in-depth assessment of the market potential for high-value crops. This assessment might have indicated a limited market for high-value crops in Cabo Verde, a factor that has severely undermined the potential benefits of the WMAS Project. In view of these circumstances, a thorough analysis of the Cabo Verdean context would not only have helped make a better-informed decision about the massive-scale agricultural investment, but also might have revealed alternative viable investment opportunities in other sectors, such as tourism or fishing, to spur income and economic growth.

Box 2: Soil Characteristics in Cabo Verde

“The [Cabo Verdean] soils are mainly inceptisols and entisols on basaltic substrate, are steep, low in OM [organic matter], generally with low fertility, medium texture and exhibit marked symptoms of degradation (i.e., hills and gullies).” *Source: FAO (2013). The Status of Soils Resources, Needs and Priorities for Sustainable Management in Cabo Verde.*

That inceptisols lack important micronutrients such as potassium and calcium, is supported by scientific studies: “Itisols (Acrisols) and Inceptisols (Cambisols) formed in these materials can be considered of moderate fertility but most commonly deficient in potassium and calcium.” *Source: S. W. Buol, in [Reference Module in Earth Systems and Environmental Sciences](#), 2013*

A proper risk assessment exercise should have been performed prior to the design and implementation of the project. Although Cabo Verde is disposed to recurrent drought, no effective mitigation measures were considered in the project design to ensure continuous availability of water in the reservoirs—which is dependent largely on the level of rainfall. The risk of drought might have been mitigated by installation of more boreholes and stricter enforcement of the water payment policy to ensure the boreholes' continuous operations. Maritime transportation connectivity should have been considered as a risk or as part of the overall feasibility study. By the same token, loan nonrepayment risks should have been addressed in the project design by, for instance, introducing a consequential risk-sharing mechanism that would affect the MFIs' portfolio. This would have incentivized the participant MFIs to enforce stricter loan approval criteria as well as to exert sincere loan recovery endeavors. Thereby, loan recovery could have been maximized, and MFI lending sustainability would have been strengthened.



Careful attention should have been paid while hiring and monitoring third-party contractors who built the watershed management infrastructures such as reservoirs and dikes. According to the project design, Community Development Associations (CDAs) were supposed to construct the MCC-funded water management infrastructure. To facilitate the implementation of this plan, the project design also included training of the CDAs on how to participate in the bidding/procurement process. However, ultimately, the CDAs did not participate in the bidding/procurement process because they were not qualified to do so, signifying the need for further training. A thorough training program ensuring the involvement of all the potential CDAs prior to project implementation would ensure that local construction experts participate in the project. Also, relevant construction experiences of the third-party contractors who were hired in place of the CDAs, should have been carefully assessed. In addition, more civil engineers/experts in construction management should have been employed to oversee the entire construction process. All these measures should have helped minimize issues related to the quality of construction.

A comprehensive value chain analysis would have been beneficial before embarking on the project. Several aspects associated with farmers' costs should have been taken into account. These include additional transportation costs due to the distance from the port to the project site and the postharvest center, limited interisland connectivity and poor overall transportation within the islands. All these factors resulted in high transaction costs and, hence, prices for Santo Antão and Fogo's agricultural produce that were uncompetitive. A proper value chain analysis would have helped decide on a more suitable location for the PHC, which would have been easily accessible to the farmers, from the perspective of both cost and convenience. This would have allowed the farmers to charge a more competitive price for their exported produce.

Outreach and sensitization program could have possibly helped raise awareness not only on the improvements on the millipede issues but also on the benefits of drip irrigation and post-harvest infrastructure. Farmer's lack of awareness was observed in several areas. For instance, several farmers were not aware about the post-harvest center. Due to the millipede issue in Santa Antão, the demand for agricultural produce remained low in export markets. Traders still circumspect on the Santo Antão produce even after the ban lift. Awareness programs could have helped address these issues to some extent. Also, the project could have organized regular campaigns to raise awareness among farmers of the importance of paying for water and electricity for uninterrupted service of the boreholes and the reservoirs.

Finally, the project should have incorporated a more sustained capacity-building activity. As discussed earlier, the participant MFIs received inadequate training with respect to different aspects of agricultural lending, especially loan appraisal. Intensive capacity-building efforts at different levels combined with change management activities were required to impact financial institutions' attitude toward agricultural lending and their ability to evaluate loan applications objectively and coherently. This could have enhanced the sustainability of MFIs' agricultural lending activities. Besides this, at a policy level, the water associations should have been properly motivated and made aware that they were



integral—through regular meetings of association members—to the project’s sustainability. This could have yielded a well-regulated and properly enforced irrigation water payment policy, which was entirely absent during the period of project implementation.



ANNEX 1: SUMMARY STATISTICS TABLES

Table 25: Share of Farmers Who adopted Drip Irrigation

Island	Number of farmers adopted drip irrigation (Frequency)	Share of farmers adopted drip irrigation
Santo Antao	20	22.22%
Fogo	7	29.17%
Total	27	23.68%

Table 26: Irrigation Water Source Used by Farmers (%)

Water Source	Number of farmers using irrigation water (Frequency)	Share of farmers
Own water Source	14	12.28%
Rainfall	95	83.33%
Private Provider	2	1.75%
MAA/ MCC Reservoirs	47	41.23%
Others	18	15.79%

Table 27: Farmer Group and Drip Irrigation Adoption

Island	Number of farmers who belonged a farmer's group and also adopted drip irrigation	Share of farmers who belonged a farmer's group and also adopted drip irrigation
Fogo	4	44.44%
Santo Antao	6	75%
Total	10	58.82%



Table 28: Education Level of the Farmers who Adopted Drip Irrigation

Education level	Island			
	Fogo		Santo Antao	
	Number of farmers who adopted drip irrigation (Frequency)	Percentage of farmers who adopted drip irrigation	Number of farmers who adopted drip irrigation (Frequency)	Percentage of farmers who adopted drip irrigation
College graduate	0	0%	2	10%
Did not attend school	0	0%	0	0
Primary school	3	42.86%	13	65%
Secondary completed	2	29%	0	0%
Some college (not completed)	0	0%	0	0%
Some secondary (not completed)	2	28.57%	5	25%
Total	7	6.14%	20	17.5%

Table 29: Gender of Farmers Who Adopted Drip Irrigation

Gender	Number of farmers who adopted drip irrigation (Frequency)	Percentage of farmers who adopted drip irrigation
Male	23	85.19%
Female	4	14.81%
Total	27	23.68%

Table 30: Age Ranges of Farmers Who Adopted Drip Irrigation

Age	Number of farmers who adopted drip irrigation	Percentages of farmers who adopted drip irrigation
26-30 years	1	3.7%
31-40 years	2	7.41%
41-50 years	5	18.52%
Over 50 years	19	70.37%
Total	27	23.68%

Table 31: Share of Farmers Who Reported a Need for More Water for Irrigation

Island	Number of farmers who reported a need for more water for irrigation	Percentage of farmers who reported a need for more water for irrigation
Fogo	14	58.33%
Santo Antao	75	83.33%
Total	89	78.07%

**Table 32: Share of Farmers Who Reported that Irrigation Improved Since 2005**

Number of farmers who reported that irrigation improved since 2005 (Frequency)	Percentage of farmers who reported that irrigation improved since 2005
16	14.04%

Table 33: Increase in Production Since Adopting Drip Irrigation

Island	Number of farmers who reported an ncrease in production since adopting drip irrigation	Percentage of farmers who reported an ncrease in production since adopting drip irrigation
Fogo	5	71.43%
Santo Antao	10	50%
Total	15	55.56%

Table 34: Share of Drip Irrigating Farmers Producing High Value Crops

Island	Number of drip irrigating farmers producing high-value crops (Frequency)	Share of of drip irrigating farmers producing high-value crops
Fogo	4	57.14%
Santo Antao	7	35%
Total	11	40.74%

Table 35: Greatest Challenges to Agricultural Production One Year Before the Survey

Greatest challenge	Number of farmers reported (Frequency)	Percentage of farmers reported
Droughts	113	99.12
Flood	0	0%
Pests	57	50%

Table 36: Change in Crop Cycle After Project

Island	Number of farmers who experienced no crop cycle improvement after the project (Frequency)	Share of farmers who experienced no crop cycle improvement after the project
Santo Antao	81	90%
Fogo	23	96%
Total	104	91.23%



Table 37: Change in Sales After the Project

Sales change	Number of farmers reporting change in sales after the project (Frequency)	Percentage of of farmers reporting change in sales after the project
Decreased	63	55.26
No Change	7	6.14
Increased	44	38.6
Total	114	100

Table 38: Changes in Sales for Drip Irrigating Farmers After the Project

Sales Change	Number of drip irrigating farmers reporting change in sales after the project (Frequency)	Percentage of drip irrigating farmers reporting change in sales after the project
Decreased	15	55.56
No change	1	3.7
Increased	11	40.74

Table 39: Change in Income After the Project

Income Change	Number of farmers reporting change in income after the project (Frequency)	Percentage of farmers reporting change in income after the project
Decreased	63	55.26%
No change	6	5.26%
Increased	45	39.47%

Table 40: Change in Income After the Project (by Island)

Income Change	Island			
	Fogo		Santo Antao	
	Number of farmers	Share of farmers	Number of farmers	Share of farmers
Income decreased	17	70.83%	46	51.11%
No change	1	4.17%	5	5.56%
Income increased	6	25%	39	43.33%



Table 41: Median Agricultural Income of Farmers

	Median agricultural income in the pre-project Period	Median agricultural income in the Last Agricultural Year (2017)
For farmers who experienced a decline in income	120,000 CVE	50,000 CVE
For farmers who experienced an increase in income	85,000 CVE	120,000 CVE
Overall	80,000 CVE	100,000 CVE

Table 42: Business Growth After Obtaining Credit

MFIs	Number of farmers reporting business growth after obtaining credit	Percentage of farmers reporting business growth after obtaining credit
OMCV	4	33%
Morabi	13	40.62%
Soldifogo	4	57.14%
Overall	20	41.67%

Table 43: Gender of Farmers Reporting Business Growth After Obtaining Credit

Female farmers reporting business growth after obtaining credit		Male farmers reporting business growth after obtaining credit	
Frequency	Percentage	Frequency	Percentage
5	71.43%	56	36.59%

Table 44: Change in Employment After the Project

	Overall		Fogo		Santo Antao	
Change in Employment	Number of farmers reporting change in employment after the project (Frequency)	Percentage of farmers reporting change in employment after the project	Number of farmers reporting change in employment after the project (Frequency)	Percentage of farmers reporting change in employment after the project	Number of farmers reporting change in employment after the project (Frequency)	Percentage of farmers reporting change in employment after the project
Decreased	48	42%	43	21%	43	48%
No Change	46	40%	30	67%	30	33%
Increased	20	18%	17	12%	17	19%



Table 45: Change in Export After the Project

Change in Export	Number of farmers reporting change in export after the project (Frequency)	Percentage of farmers reporting change in export after the project
Decreased	4	28.57%
Increased	2	14.29%
No Change	8	57.14%
Total	14	100%

Table 46: Reasons for Not Exporting

Reason for Not Exporting	Number of farmers reporting reasons for not exporting (Frequency)	Percent of farmers reporting reasons for not exporting
Not enough produce	29	31.87%
Not profitable	43	47.25%
Other (please specify)	15	16.48%
Too far	4	4.40%

Table 47: Share of Farmers Selling in Different Markets

Market	Number of farmers selling (Frequency)	Percentage of farmers selling
Farmgate	41	39%
Village Market	74	70.48%
Regional Market	13	12.38%
Another Market	8	7.62%
Another Island	9	8.57%

Table 48: Share of Farmers Paying for Irrigation Water

Number of farmers paying for irrigation water	Percent of farmers paying for irrigation water
9	8.04%
112	100%

Table 49: Irrigation Water Sources Used by Farmers

Irrigation Water Source	No. of Farmers Using	Percentage of Farmers Using
Own water	14	12.28%
Rainwater	95	83.33%



Table 50: Main Reason for Farmers Not Storing in a Post-Harvest Center

Reason	No. of farmers reporting	Percentage of farmers reporting
Not Functional	82	71.93%
Other Reasons	41	35.96%

Table 51: Share of Farmers Attending and Still Applying Lessons from Agricultural Training from Agland Investment

Variable	No. of Farmers	Percentage of Farmers
Attended Training	45	39.47%
Still apply the agribusiness and marketing practices Learned from the Training	11	48.89%

Table 52: Share of Farmers Who Considered Agland Training to Be of Help to their Business

Island	Number of farmers who considered Agland Training to be helpful	Percentage of farmers who considered Agland Training to be helpful
Santo Antao	29	82.86%
Fogo	8	80%
Total	37	82.22%

Table 53: Share of Farmers Reporting Changes in Profit

Change in profit	Number of farmers reporting change in profit	Percentage of farmers reporting change in profit
Decreased	60	52.63%
No change	5	4.39%
Increased	49	42.98%
Total	114	100%

Table 54: Main Purposes for Loan Application

Loan application reason	Number of farmers (Frequency)	Percentage of farmers
Introducing new crops	3	5.88%
Paying for labor	7	13.73%
Purchasing inputs (fertilizer/pestici..	6	11.76%
Purchasing irrigation equipment	9	17.65%
Purchasing land	3	5.88%



Purchasing livestock	4	7.84%
Purchasing other farm equipment	3	5.88%
Other (please specify)	16	31.37%
Total	51	100%

Table 55: Share of Farmers Who Were Already a Customer of the MFI Before Applying for the MCC Loan

Number of farmers who were already an MFI customer (Frequency)	Percentage of farmers who were already an MFI customer
13	25.49%



ANNEX 2: LITERATURE REVIEW

Water Management and Soil Conservation

Agriculture is becoming increasingly dependent on technology, which can raise productivity under resource constraints. Water is an important input in the agricultural sector and is also a scarce resource in many parts of the world. Water scarcity and increasing costs of water procurement have led to extensive research and development in the field of water efficient technologies. An important contribution in this domain has been the introduction of drip irrigation. This technology keeps the plant roots moist through targeted watering at the plant roots and reduces water wastage and, thereby, farmer irrigation costs. Drip irrigation spread from Israel, where it was first implemented, to other areas like Australia, North America, and South Africa by the late 1960s (DiGennaro 2010).

The literature suggests that drip irrigation has a significant impact on water-use efficiency, while at the same time increasing productivity and farmer income. Evidence of reduction in water use and a rise in water-use efficiency from use of drip irrigation has been documented in many dry and arid regions of the world. Jha et al. (2016) show that drip irrigation reduces water use by 73 percent in off-monsoon dry periods in different elevations in Nepal. Results from Tamil Nadu, India (Kumar and Palanisami 2010) suggest that adoption of drip irrigation leads to a 51 percent rise in crop production per unit of water. Evidence from other research in India shows that water-use efficiency increases up to 100 percent in a properly designed and managed drip irrigation system (INCID 1994; Sivanappan 1994). Studies from sub-Saharan African countries like Zimbabwe (50 percent water efficiency) (Maisiri et al. 2005) and South Africa (Karlberg et al. 2007) provide evidence of water-use efficiency percentage rise due to low-cost drip irrigation systems. In the North China Plains, where soil salinity is a hindrance to agricultural production, drip irrigation has been shown to increase water-use efficiency for vegetable crops like tomatoes (Wan et al. 2007).

In addition to water-use efficiency, drip irrigation also leads to a rise in productivity, as suggested by literature. Jha et al. (2016) show that in comparison to furrow irrigation systems, drip irrigation leads to improved productivity for fodder crops and higher economic security of smallholder farmers in Nepal. Karlberg et al. (2007) provide evidence of increase in tomato yields in South Africa from drip irrigation, using saline water. Drip irrigation has reduced labor requirements for cultivation in India; this is because the water is supplied to the crops directly, reducing labor cost (Narayanamoorthy 2004). These advantages of drip irrigation reduce the cost of production and increase productivity. Data from experimental plots in India show that drip irrigation, in comparison to furrow irrigation, increases the productivity of vegetable crops by 40 percent (Narayanamoorthy 2005). Higher vegetable yields have been linked to drip irrigation in the Mustafakemalpasa region in western Turkey, where water is a limiting factor in agricultural production. DiGennaro (2010) reports that irrigation is linked to poverty reduction through increased crop production and, thereby, higher farming income.



Advanced irrigation technology can be costly, but there is ample evidence in favor of the economic benefits of drip irrigation in general, and low-cost drip irrigation in developing nations, with increased productivity and household income as a direct outcome. Adequate water supply to crops increases the production available for household consumption and for sale. In the United States, drip irrigation has been adopted in many regions, and has been especially important in the arid western states, where water is a scarce resource. Taylor et al. (2014) report that drip irrigation adoption in California is responsible for total annual value of water savings and additional income from the yield effect, ranging between USD 313 million and USD 1.13 billion, with an average of USD 748 million. Therefore, drip irrigation has a significant impact on farmer productivity and farmer household income, both, in developing and developed countries. This can have a significant impact on other social factors like female empowerment, especially in the developing world with smallholder farms and family farms. This effect has been observed by Upadhyay et al. (2005) in western Nepal, where drip irrigation leads to higher income and empowerment among rural female vegetable growers, who adopted drip irrigation.

Research has also shown many success stories of commercialization of agriculture. Partap (1995) reports that conversion from traditional to cash crops, like apples and vegetables, has led to improvement in income, consumption patterns, education, and other social and welfare services (Verma and Partap 1992). A similar experience has been observed (Partap 1995) among the poor farmers in Ningnan County located in the eastern Himalayan region of China, through government commercialization of agriculture, and fruit and other cash crop farming. According to Mehta (2009), diversification toward horticultural crops and shifts in favor of fruits and vegetables have been cited as a viable option to stabilize and raise farming income, enhance agricultural growth, and increase employment opportunities in India, as also suggested by Vyas (1996), Joshi (2005), and BIRTHAL et al. (2007). Mbora et al. (2008) provide evidence of improvement in income levels among Kenyan farmers who have shifted from subsistence to profit farming in fruits and nuts production. Other low-income and medium-income countries in Latin America and Asia have also experienced economic growth and greater export income from fruit, nut, and horticulture production (Diop and Jaffee 2005).

There is as much growing evidence on the difference in impact on farmers' production and consumption between large- versus small-scale irrigation schemes, as determined by the area of land they cover. While schemes of any size provide access to irrigation, large-scale irrigation schemes can lead to greater improvements in farming outcomes by increasing market integration and increasing the dispersion of agricultural knowledge or technology, as a larger number of farmers are brought together (Lipton et al 2003). Smaller-scale irrigation schemes, however, may require lower participation costs for farmers and provide them with more influence over the management of the scheme (Dillon 2010). Dillon (2010) assessed the differences in household production and consumption among those with access to small-scale (covering 50 hectares or less) and large-scale (covering more than 300 hectares, in this study specifically) irrigation infrastructure to examine whether the scale of an irrigation project increases household welfare in Mali. Using propensity score matching, he found that small-scale irrigation has



a larger effect on agricultural production and agricultural income than large-scale irrigation, but large-scale irrigation has a larger effect on consumption per capita. In Senegal, Sakurai (2015) compared the impact of large-scale (which covers, on average, 761 hectares) versus small-scale (which covers, on average, 27 hectares) irrigation schemes in the Senegal River Valley and found that farmers in large-scale irrigation schemes achieved significantly higher yields and profits than those in small-scale irrigation schemes.

In addition to improving productivity and water-use efficiency, water management can help reduce soil erosion. Changes in climatic conditions around the globe are likely to exacerbate soil erosion due to reduction in forest cover as well as increased intensity and frequency of storms. Soil and water conservation, however, can help mitigate these risks and, at the same time, generate numerous environmental and economic benefits. The positive impacts of water management on soil conservation have been well documented in the literature. These benefits include improving water-use efficiency, boosting productivity, enhancing food security, and contributing to poverty alleviation (Abdulai and Huffman 2014).

Bhattacharyya et al. (2016) stress the need to mainstream the problem of soil erosion into water management programs. To date, water management programs have focused primarily on resource conservation and productivity enhancement of agricultural lands. Bhattacharyya et al. emphasize the need to increase the involvement of elected institutions and to support community-led efforts to link watershed institutions to other institutions, such as credit sectors and input delivery systems. Drawing upon evidence from an impact analysis of watershed management programs in India, the authors advocate a holistic approach to soil and water conservation. This study found that watershed management programs helped reduce runoff by between 9 and 24 percent and soil loss by a mean of 72 percent (Bhattacharyya et al. 2016). They also reported improvements in crop productivity, which increased by a mean of 28 percent, and crop diversification, which grew by a mean increase of 22 percent. Most notably, the mean annual income per family among program participants increased by 43 percent (Bhattacharyya et al. 2016). Similarly, a study of rice farmers in Ghana conducted by Abdulai and Huffman (2014) finds that adoption of soil and water conservation technology increased rice yields by 24 percent and net return by 16 percent. These findings suggest that soil and water conservation programs can contribute significantly to productivity, increases in farmer incomes, and poverty alleviation.

The empirical literature on the adoption and diffusion of soil and water conservation technology and its impact on farm outcomes is robust (Bravo-Ureta et al. 2006; Posthumus et al. 2010; Kassie et al. 2011; Amare et al. 2012). In their study on the impact of soil conservation on farm income in Central America, Bravo-Ureta et al. (2006) used a two-stage least squares method and found that the adoption of agroforestry systems was positively associated with farm income. One limitation of this investigation, however, was that it was unable to compare the behavior of adopters of soil conservation measures to nonadopters, due to self-selection. Using a propensity score matching approach, Kassie



et al. (2011) reported that the adoption of improved groundnut varieties significantly increased crop income in Uganda. A drawback of this method is the implication that once observable characteristics are controlled for, technology adoption is random and uncorrelated with the outcome variables.

Despite evidence that soil fertility and water management practices contribute to improving productivity and food security, research shows that implementation of these practices is constrained by a variety of social and economic forces. Abdulai and Huffman (2014) investigate the factors that affect farmers' decisions to adopt soil and water conservation technology in sub-Saharan Africa, and how these decisions impact productivity. Their study of rice farmers in northern Ghana finds that farmers' education, capital and labor constraints, social networks and extension contacts, and farm soil conditions are the main determinants of technology adoption. They also reported that the adoption of field ridging technology significantly increases rice yields and net returns, yet, despite efforts to encourage use of this technology, the adoption rate is quite low.

The above findings are confirmed by an investigation of smallholder farmers in the semi-arid areas of eastern Kenya by Mutuku et al. (2014), which reports that since technology is labor-intensive, farmers with lower labor endowments tend to face greater barriers to adoption. This study also revealed that other factors most affecting farmers' adoption of soil and water management technologies included group membership, inaccessible credit services, gender, age, and access to agricultural extension services (Mutuku et al. 2014). Additional constraints identified by the authors included the cost of inputs and access to farm machines, access to information, and output markets. To address these challenges, Mutuku et al. maintain that policy makers should seek to improve access to information, increase the availability of affordable credit facilities and farm machines, and focus on labor and input-output markets for enhanced farm productivity and livelihoods of smallholder farmers.

Agribusiness Development Services

The subactivities under the agribusiness development activity were expected to increase farmers' knowledge of high-value agriculture, the adoption of which would lead to increased productivity and income. Literature also shows evidence of the impact of high-value agriculture on farmers' income. Partap (1995) reports that conversion from traditional to cash crops, like apples and vegetables, has led to improvements in income, consumption patterns, and other social and welfare services (Verma and Partap 1992). Mbora et al. (2008) provides evidence of improvement in income levels among Kenyan farmers who have shifted from subsistence to profit farming in fruits and nuts production. Other low-income and medium-income countries in Latin America and Asia have also experienced economic growth and greater export income from fruit and nut and horticulture production (Diop and Jaffee 2005). According to Mehta (2009), diversification toward horticultural crops and area shift in favor of fruits and vegetables has been stated as a viable option to stabilize and raise farming income, enhance agricultural growth, and



increase employment opportunities in India, as also suggested by Vyas (1996), Joshi (2005), and BIRTHAL et al. (2007).

Studies indicate that regulatory environments have the potential to either enable or constrain agribusiness development. Literature on this topic has sought to assess the current regulatory environments across countries and advance good regulatory practices. The World Bank (2017) finds that agribusiness-friendly regulations are more common among higher-income and urbanized countries; however, a few low-income countries, such as Tanzania, stand out as exceptions. To encourage agribusiness, the World Bank advocates introducing regulations to promote quality control and nondiscrimination, increased access to information, and more efficient administration procedures.

Farmers' training, postharvest technical assistance, especially technical assistance to various market participants to strengthen the linkages between farmers and markets, and other related activities, are found to be effective in increasing market opportunities for small-scale farmers. Measuring performance metrics in regard to the provision of agricultural training programs has been the main focus of the literature and previous evaluations (Waddington et al. 2010). While to date, the number of rigorous evaluations of agricultural training programs has been limited, studies have reported mixed results (IEG 2011). For example, Kabir and Uphoff (2007) reported a positive and large spillover effect of agriculture training programs. They found that immediately after training, only one-third of the farmers in a village adopted the new techniques. The majority in the village adopted the new techniques only three years after the implementation of the training program. On the other hand, Feder et al. (2014) found no sign of concrete increase in either crop yields or in farmers' income levels. Nonetheless, they reported an increase in farmers' know-how. Farmer training programs in Ghana, Pakistan, and Nigeria produced similar results.

In their study of a capacity-building program for farmers in Ghana, Osei et al. (2013) found that participants shared their knowledge of enhanced production practices with other farmers and farmworkers, indicating a multiplier effect of the program. The results of this research were in line with the findings of Khatam et al. (2013) about the impact of Farmers Field Schools (FFS) on empowerment and well-being of farmers in Pakistan. The majority of farmers in this program confirmed that their increased knowledge had resulted in reduced use of pesticides. Similarly, Khushk et al. (2016) reported moderate levels of improvement in capacity building, self-esteem, and self-efficacy among farmers in Pakistan after they participated in a crop maximization project. It appears that the level of complexity of the training material also plays an important role in effectiveness of the entire program and materialization of the benefits in terms of income and crop yields. Cerdán-Infantes et al. (2008) also reported similar results in Argentina.

In addition to technical assistance to farmers, another key subactivity included training programs for extension agents and microfinance institutions. While the literature on technical assistance to microfinance institutions is limited, the World Bank's 2014 study on the microfinance institutions in Latin America that have successfully



implemented agricultural lending operations, generates several relevant insights. This study found that introducing agricultural lending in a microfinance institution requires careful planning, preparation, and adaptation of systems. Thus, technical assistance to microfinance institutions should focus on adjusting product terms, improving information systems to properly collect data and analyze agricultural loans, and exploring ways of improving the client's profitability (World Bank 2014). However, given the knowledge gaps on the impact of training programs for microfinance institutions, further research is warranted on the viability of long-term lending to smallholders, value chain financing, alternative delivery channels, and the role of government and donor guarantee plans.

MCC-funded evaluations to date have contributed significantly to the body of literature relating to this area. To date, there have been five completed evaluations of agricultural training programs in Armenia, El Salvador, Ghana, Honduras, and Nicaragua. Similar to existing findings in the literature, results have been mixed. Overall, it seems safe to assume that impact of agricultural training programs is likely to vary substantially based on the nature and location of the specific program. In addition to agricultural training programs, research on impact of agribusiness activities as well as of market opportunities has been limited. Therefore, the results are still not concrete and mostly generate mixed signals. For instance, in the Postharvest, Processing, and Marketing Project in Armenia, small and medium firms and producers were trained in food processing technologies, food safety, quality standards, financial analysis, and developing commercial linkages. Fortson et al. (2013) describes that the majority of farmers realized improvement in outcome indicators including productivity, sale, and profits.³³

Access to Credit

Research has shown that improving access to credit is key to encouraging agricultural development. Farmers need working capital, seasonal loans, and medium- to long-term credit to finance production, harvest, storage, and transport. The literature also indicates that farmers require access to payment services to expand their operations (World Bank 2017). Furthermore, enhancing farmers' access to credit can contribute to poverty reduction. Financing agricultural production activities, however, presents numerous challenges, which are well documented in the literature. Given that agricultural production activities are seasonal and weather-dependent, agricultural loans tend to be riskier and more expensive than traditional business loans in urban areas (World Bank 2017). Another challenge to obtaining loans is that farmers often lack adequate collateral. Alvarez de la Campa reports that 78 percent of the capital stock of business in developing countries is in the form of moveable assets, such as machinery or equipment, yet most financial institutions are reluctant to accept these assets as collateral (2011). Furthermore, CGAP (Consultative Group to Assist the Poor) maintains that there is a lack of understanding regarding the financial needs of those requiring agricultural finance, other than the fact that demand far outweighs supply (2018).

³³ The reported results have been based on simple descriptive statistics, as opposed to any rigorous impact or performance evaluation design.



In response to these challenges, Meyer (2011) stresses the need to better understand the demand for and use of agricultural credit to develop effective products, institutions, market infrastructure, and policies. He then discusses the use of “smart” or “market-friendly” subsidy approaches, such as matching grants, credit guarantee funds, warehouse receipts, micro-insurance, etc. Similarly, the World Bank underscores the importance of adapting regulations to allow for innovation in the design and implementation of financial services (2017). It also advocates for developing stronger legal frameworks to improve access to financial services. Hollinger (2011) describes an innovative approach that combines elements of microlending and conventional agricultural lending into a specialized loan package. These loans allow for flexible disbursement and repayment schedules around the seasonal nature of agriculture, such as grace periods, irregular payments, or bullet repayments. They also include flexible collateral requirements, in which a borrower could use land, farm equipment, or even livestock. Cohen (2010) advocates more focus on financial education, among other things, as a way to ready the unbanked (people without access to conventional banking services) to enter the formal financial system.

Few rigorous impact evaluations of rural finance programs can be found in the literature. Donor institutions and aid agencies increasingly need to ascertain whether spent funds worked well to achieve the targets, and how to encourage and facilitate best practices in the provision of agricultural and rural finance. This calls for rigorous conceptual base studies to test the feasibility of institutions, services, and the targeted population (Nagarajan et al, 2005). However, knowledge about achieving the targets of such initiatives is limited due to the lack of proper evaluations. Yaron, Benjamin, and Charitonenko (1998) discuss the issues inherent in evaluating the performance of rural financial intermediaries, as it is difficult to predict behavior of borrowers in the absence of a program. It is also extremely difficult to isolate the effect of the program from external factors. Their proposed method of evaluation is based on the success of the program in areas of outreach, as measured by an index that factors market penetration, demographics of clients, quality of services, and self-sustainability measured by an index of subsidy dependence.

However, recently there has been increasing demand to measure the effectiveness of rural finance projects. This is because most development organizations currently focus and report only on their output rather than on outcomes, and because there is scant evidence to show the true contribution of programs. In the last decade, there has been tremendous use of quantitative impact evaluations of program interventions in development projects. Some economists argue that randomized control methodologies should be central to impact evaluation practices. However, randomization is rarely possible in less developed countries, and sometimes it increases the difficulty of understanding the complex environment in which development projects are implemented.