

Land O'Lakes International Development Food for Progress 2016

Mozambique Expansion of Rural Cattle and Dairy Opportunities (MERCADO)

Baseline Assessment Report

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LIST OF ACRONYMS

AI	Artificial insemination
BTM	Banco Terra of Mozambique
CMT	California Mastitis Test
CLW	Community Livestock Worker
FFPr	Food for Progress
M&E	Monitoring and Evaluation
MERCADO	Mozambique Expansion of Rural Cattle and Dairy Opportunities
MCCs	Milk Collection Centers
NGO	Nongovernmental organization
PMP	Performance Management Plan
TOR	Terms of reference
USAID	U.S. Agency for International Development
USDA	U.S. Department of Agriculture

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EXECUTIVE SUMMARY

From 2016 to 2021, Land O'Lakes, leveraging United States Department of Agriculture (USDA) Food for Progress (FFPr) funding, will implement its third FFPr-funded project, Mozambique Expansion of Rural Cattle and Dairy Opportunities (MERCADO). Land O'Lakes will implement project activities in the dairy producing areas of the Beira Corridor, particularly the peri-urban areas of the cities of Chimoio (Manica Province) and Beira (Sofala Province). This report presents the results of a baseline assessment carried out by IMPAQ International, LLC (IMPAQ) on behalf of Land O'Lakes, before the MERCADO activities will begin.

In this baseline assessment, IMPAQ documents the current state of key dairy actors; analyzes gender issues, and offers recommendations to ensure the gender equity of MERCADO's impact; establishes project baseline values; provides recommendations for setting and refining project indicator targets; identifies potential strengths, weaknesses, opportunities, and threats to the project's implementation; proposes strategies to maximize strengths and mitigate challenges; and generates data to be used for comparative analysis throughout the life of the project.

IMPAQ used a mixed-methods approach to analyze the value chain, collecting qualitative and quantitative data from the larger population of dairy value chain actors within the Beira Corridor. IMPAQ's data collection instruments included a quantitative farmer survey (panel farm survey), semi-structured interviews, key informant interviews (KIIs), and focus-group discussions (FGDs). Between March 6 and 23, 2017, IMPAQ collected data from the following stakeholder groups:

- 450 farmers (182 female, 268 male)
- 6 farmer focus groups
- 5 aggregators (cooperatives and milk collection centers (MCCs))
- 5 processors
- 2 potential dairy breeders
- 15 paravets (1 female, 14 male)
- 2 potential feed and forage producers
- 1 financial institution
- 3 past Land O'Lakes student focus groups
- 9 other stakeholders (representatives of government, charitable, and donor-funded activities)
- 3 youth focus groups

The Beira Corridor's dairy value chain has, as its foundation, a contingent of small-scale household-based dairy farmers. Dairy production is largely a small-scale enterprise, where 93.69 percent of the dairy producers have only 1-3 cows. Four percent of dairy producers qualify as medium-scale producers and only two dairy producers operate on a large-scale, with a herd of more than 20 productive cows. Nearly all (99 percent) small-scale farms are households; the larger-scale farms often operate as organizations (schools or orphanages with dairy operations) or as commercial firms.

Despite having completed Land O'Lakes training certification program and having substantial knowledge about dairy production, husbandry, and management, many farmers do not follow the practices that Land O'Lakes prescribes to achieve the quality and quantity of milk that the market requires. Several critical factors lead farmers to disregard Land O'Lakes practices causing substandard results: constrained access to critical inputs, equipment, services, and infrastructure; limited finance to pay for needed equipment, inputs, and services; and inhibited incentives, i.e., low market prices for dairy, to drive dairy farmers to employ best practices.

IMPAQ found low productivity in quantity and quality at the farm level, due to low daily yields of milk, short lactation periods, and long calving intervals. Small-scale farmers' cows produced, on average, 7.7 liters per day in the dry season and 7.5 liters per day in the rainy season for an average of 7.6 liters per day across the year. Interestingly, medium-scale producers had lower rates of production. Large producers had slightly higher rates of production, at 8.4 liters per cow per day in the dry season and 10.3 liters per cow per day in the rainy season.

Low milk quality also constrains development of the dairy market system. Farmers utilized practices that optimize herd health and milk quality inconsistently. Milk rejections were common across all scales of producers: 48 percent of small-scale; 53 percent of medium-scale; and all large-scale producers experienced rejections, based on quality. While rejections happened less frequently to large-scale producers, they resulted in larger financial losses. Aggregators likewise inconsistently applied quality standards to eliminate sub-standard quality milk as it reaches the collection centers. As a result, processors reported significant quality problems, along with low volumes of milk, as major factors constraining their sales and operational efficiency.

Medium-scale farms typically performed the worst in terms of adherence to recommended practices, as well as productivity and quality considerations. Because one of MERCADO's important goals is to increase the scale of production and to develop a producer base of medium-scale farms that operate more professionally, productively, and profitably than the current base of small-scale farms, this is an urgent issue for Land O'Lakes to address. Careful investigation into the factors leading to the sub-optimal performance of medium-scale farms is necessary to design an effective strategy to increase the scale of production, while also meeting the project's objectives of uptake of improved practices for greater productivity and profitability.

The supply of inputs and services to support dairy production is heavily under-developed. There are no commercial breeders of dairy stock and virtually no local commercial availability of dairy-specific inputs and services such as feed and fodder, mastitis testing chemicals, artificial insemination services, and stainless steel receptacles for milk, to dairy producers. Financial investment is limited: there are few financial products and services available to value chain actors and there is a limited supply of viable actors who are able to access financial services. Most producers rely on Land O'Lakes for inputs, equipment, and services, while some larger producers arrange imports to meet their needs. The government plays an important role in basic livestock health services, such as testing and vaccination against diseases that present a public-health threat.

IMPAQ's inquiries into consumer demand focused on youth, who are slated to be the subjects of informational campaigns aimed at raising demand. Most youth already consumed dairy, and broadly appreciated milk's health benefits and its taste, although perceptions of the taste of yogurt

and cheese varied. Parents purchased milk from both informal sources (neighbors), as well as stores, and recognized informal purchases as being a budget option for poorer households. Youth consistently were interested in increasing their consumption of milk and dairy products.

The baseline assessment aimed in part to inform the project's evaluation questions relating to the project's relevance, impacts, effectiveness, efficiency, and sustainability. IMPAQ summarizes the preliminary observations below:

Project Relevance: MERCADO is oriented to directly support FFPr's strategic objectives and is well-suited and relevant to the realities and requirements of the Beira Corridor's dairy sector, particularly the need for development of a private sector-driven value chain that is technically and financially competitive and sustainable without excessive dependence on donor support.

Potential Impact: MERCADO should have a significant impact on the scale, technical and financial viability, and sustainability of the Beira Corridor dairy value chain. By continuing to explore alternative aggregation models, and to increase the capacity of aggregators such as cooperatives and MCCs to provide services to dairy producers, as well as to aggregate milk, the project offers a means to continue to support the involvement of smaller-scale producers in the market, even if its focus shifts away from direct facilitation of production at this scale.

Project Effectiveness: The project's targets and outcomes are based on careful and well-grounded consideration of the implementation environment and the capacity and needs of the dairy sectors' stakeholders. The baseline assessment suggests that the project has a high likelihood of meeting its key outcomes and targets. The project is highly ambitious in its intent to achieve a scale of production that will support a diversified processing industry. Failure to make progress in some areas will compromise progress in other areas, such as the project's overarching goal of establishing a competitive and sustainable private sector driven dairy industry.

Project Efficiency: Given that the project is only in start-up phase, IMPAQ did not have any preliminary observations on the efficiency of project implementation.

Sustainability of Project Activities and Benefits: The project's initiatives will, if effective, contribute to the development of a sustainable dairy industry by accomplishing the following: emphasizing larger-scale producers who have greater capacity to produce the quantity and quality of milk required for processing; creating a private sector-driven value chain to support this production; focusing on facilitation rather than direct provision of inputs and services; and developing alternative market outlets to offset the monopolistic influence of the largest processors.

The IMPAQ team made several recommendations in the areas of MERCADO project interventions, special studies, indicators, and targets. In the area of project interventions, IMPAQ recommends the following:

- Continue with overarching project approach, as currently designed
- Focus on increasing the volume of milk produced through increasing scale of production
- Emphasize availability and access to inputs, equipment, and services, and incentive to use those, over training activities to increase knowledge at the farm level

- Promote milk quality along the value chain
- Create incentives to invest in milk quality

IMPAQ also recommends that Land O'Lakes undertake several special studies in the areas of value chain economics, and medium-scale production practices and outcomes.

IMPAQ offers several recommendations on how to improve and refine several MERCADO performance indicators and related targets, which range from including additional actors, adjusting Meticaís to dollar exchange rates, and refining definitions. IMPAQ recommends adjustments to several life-of-project targets, based on baseline results.

1. INTRODUCTION

Since 2008, Land O’Lakes has played a leadership role in reviving the Mozambican dairy industry, leveraging the United States Department of Agriculture (USDA) Food for Progress (FFPr) funding to build a supply base and distribution system for domestically produced milk. In February 2017, Land O’Lakes selected IMPAQ International, LLC (IMPAQ) to conduct the baseline, midterm, and final evaluations of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (MERCADO). In this report, IMPAQ provides the baseline results of the MERCADO project.

In the following section, IMPAQ provides a background of the dairy sector in Mozambique describes the MERCADO project, and presents an overview of its theory of change. In Section 2, IMPAQ describes the baseline evaluation methodology and data sources, including evaluation objectives, questions, and instruments. In Section 3, IMPAQ summarizes the field work procedures, presents the evaluation sample, and details data collection challenges. In Section 4, IMPAQ presents results and findings. IMPAQ concludes the report in Section 5 by presenting an analysis of MERCADO’s strengths, weaknesses, opportunities, and threats. IMPAQ presents recommendations, based off the key findings, and the baseline evaluation’s conclusion in Section 5. The project’s Indicator Table, with finalized baseline values, is presented in Annex B.

Program Description

Mozambique historically had significant dairy production; however, after the country’s independence in 1975, a 16-year civil war caused the dairy industry to almost disappear. In 1973, Mozambique reached its peak number of dairy cows and milk production with 13,200 cows and 13,020,000 kg of milk produced. Currently, official statistics place the number of dairy cows at 2,209, 80.4 percent of which are in the provinces of Sofala and Manica (Beira Corridor).¹

Mozambique is nearly completely dependent on imports for milk and milk products because of the decline in number of dairy cows and poor management of dairy production. In 1992, the contribution of the national production to the total milk and dairy products consumed was 6 percent, a figure that, 20 years later, is largely unchanged at 6.4 percent.²

The Strategic Plan for Dairy Development in Mozambique and government interventions identify the Beira Corridor as a priority location in which to reestablish dairy production in the country and the potential for dairy production in Maputo, Zambezia, and Nampula provinces. The peri-urban areas of Beira and Chimoio cities, in which dairy production is now being re-established by Land O’Lakes, are the same areas in which dairy farms were concentrated previously.³

In 2008, Land O’Lakes began to develop the nascent dairy sector in Manica Province, Mozambique with the \$5.3 million Manica Smallholder Dairy Development Project (MSDDP), funded by USDA. Over a 42-month period, the program supported the rebuilding of the national dairy herd through the purchase, multiplication, and distribution of 513 improved breed dairy cattle. The program also trained more than 1,750 smallholder farmers in feed/fodder techniques,

¹ Land O’Lakes MERCADO Baseline, Midline, and Final Evaluation Terms of Reference (Updated); December 6, 2016; pg. 1.

² Ibid; pg. 1.

³ Ibid; pp. 1-2.

soil conservation, animal husbandry, and health, and established 3 producer-level cooperatives and milk collection centers (MCCs). Additionally, together with partner Tillers International, the project built local capacity of more than 4,000 farmers in animal traction to increase agricultural productivity.⁴

In September 2012, Land O’Lakes began another USDA funded program, Mozambique Dairy Development Program (MDDP), to intensify work in Manica and expand to Sofala and Maputo Provinces, with additional support to processors and input providers. Over 3 years, MDDP co-financed 229 improved breed dairy cattle with farmers, trained 5,084 farmers and students in improved animal husbandry practices, and established and trained 10 producer-level cooperatives and 10 MCCs in business and quality standards. Additionally, with Tillers International, the project built the capacity of another 14,384 farmers in animal traction.⁵

The USDA-supported MERCADO project is Land O’Lakes’ third Mozambican dairy sector development initiative. The five-year program began in October 2016 and seeks to address critical weaknesses that currently impede or threaten the competitiveness and sustainability within the dairy market system. MERCADO will use a private-sector-driven, market systems approach to attempt “to establish a commercial-oriented, sustainable and competitive dairy market system in Mozambique.” To do this, the project will work to increase dairy productivity and quality at the farm level to help meet unmet demand for fluid milk by the processing industry, while also promoting quality, efficiency, and business viability along the value chain.

To this end, MERCADO’s approach features the following important divergences from Land O’Lakes’ past dairy development projects in the area:

1. Focus on increasing the scale of production at the farm level by targeting farmers with the capacity and interest in increasing the size of their dairy herd to four cows or more;
2. Increased emphasis on milk quality beginning at the farm level but also along the value chain;
3. Increased emphasis on the development of technically and financially viable firms (and qualified workers and entrepreneurs to serve them) to support the dairy value chain including in input supply (feed, forage, and breeding in particular) as well as aggregation, processing, and distribution; and,
4. Focus on the development of the demand-side of the value chain through consumer education as well as creating alternative processing and marketing models to serve as alternatives to the two major dairy processors that currently account for the bulk of formal milk sales.

The dual emphases on farm-level productivity and value chain development correspond with strategic objectives of Increased Agricultural Productivity (FFPr SO1) and Expanded Trade of Agricultural Products (FFPr SO2) of the USDA’s FFPr initiative. In pursuit of these FFPr strategic objectives, MERCADO will undertake seven activities within three separate focus areas. These

⁴ Land O’Lakes MERCADO Baseline, Midline, and Final Evaluation Terms of Reference (Updated); December 6, 2016; pg. 2.

⁵ Ibid; pg. 2.

activities are summarized in Exhibit 1. (MERCADO’s Results Framework can be found at Annex C.) Project activities will be implemented in the dairy producing areas of the Beira Corridor, particularly the peri-urban areas of the cities of Chimoio (Manica Province) and Beira (Sofala Province).

Exhibit 1. List of MERCADO Project Activities

Activity Focus Area	Activity Description
Financial Services	1. Facilitate Investment in Dairy Herd Restocking
	2. Facilitate Investment in the Dairy Sector via Innovation Fund
Training	3. Improved Farm Practices
	4. Improved Post-Harvest Handling, Food Safety and Quality
Capacity Building	5. Agricultural Extension Agents/Services
	6. Aggregation and Value- Addition
	7. Promote Improved Policy and Regulatory Framework

Activity 1 – Financial Services: Facilitate Investment in Dairy Herd Restocking

Land O’Lakes will continue to restock the Mozambican dairy cattle herd by importing dairy cattle and establishing a Dairy Herd Fund (DHF) to enable enterprise-minded farmers to access capital to purchase both imported and local dairy cattle. Commercial breeders will also be able to access this fund to expand their dairy herds and to invest in appropriate reproduction techniques to reduce the need for imported cattle in Mozambique.

Land O’Lakes will use the DHF in a phased approach, starting with in-kind grants using a scaled match component. At the same time, Land O’Lakes will work with and build the capacity of financial institutions to develop appropriate loan products available to interested entrepreneurs to purchase cattle. Land O’Lakes will provide financial institutions a grant from the DHF to establish a pool of capital managed by the financial institutions that creates accessible loan products for farmers.

Activity 2 – Financial Services: Facilitate Investment in the Dairy Sector via Innovation Fund

Land O’Lakes will develop a Dairy Innovation Fund (DIF) that entrepreneurs, including input and service providers, producers, processors, and retailers, can access to finance equipment, infrastructure and other innovations to expand their businesses. Land O’Lakes will also identify entrepreneurs in input or service provision and link them to the DIF or financial institutions to access finance to develop and grow their enterprises.

Land O’Lakes will use the DIF in a phased approach, starting with in-kind grants using a scaled match component. At the same time, Land O’Lakes will work with and build the capacity of financial institutions to develop appropriate loan products available to interested entrepreneurs. Land O’Lakes will provide financial institutions a grant from the DHF to establish a pool of capital managed by the financial institutions that creates accessible loan products for entrepreneurs and businesses.

Activity 3 – Training: Improved Farm Practices

Land O'Lakes will build the capacity of dairy farmers to improve animal health, nutrition and farm business acumen to increase milk production and herd growth. Land O'Lakes will provide ongoing support and guidance to dairy farmers on improved feeding and use of appropriate technologies, including fodder production and animal nutrition. Additionally, Land O'Lakes will provide training to dairy farmers on husbandry, including topics such as breeding, mastitis control, hygiene and animal health. Land O'Lakes will also train farmers in farming as a business, including building capacity to access finance and facilitating linkages between farmers and technology, input and service providers.

Activity 4 – Training: Improved Post-Harvest Handling, Food Safety and Quality

Land O'Lakes will help improve post-harvest handling to decrease post-harvest loss, focusing on the cold-chain from production to retailers. Land O'Lakes will identify weaknesses in the cold chain to design appropriate training for farmers, cooperatives and processors on post-harvest handling, including topics such as hygiene, quality control, processing and awareness of zoonotic diseases like brucellosis and tuberculosis. Land O'Lakes will provide technical support to processors, who will provide training on post-harvest handling, food safety and quality to cooperatives. Land O'Lakes will also build capacity of cooperatives and processors to access finance to improve their post-harvest handling, food safety and quality.

Activity 5 - Capacity Building: Agricultural Extension Agents/Services

Land O'Lakes will work with educational institutions, processors, cooperatives, and other input providers to make dairy extension services available to farmers. Land O'Lakes will support educational institutions to build a cadre of professionals in the dairy sector, through activities such as integrating dairy into current livestock and veterinary curricula, setting up demonstration farms for training and facilitating dairy internships. Land O'Lakes will continue to support community livestock workers who are providing guidance and veterinary services to dairy and livestock farmers. Land O'Lakes will also facilitate linkages between the community livestock workers and private or government veterinary services. Through capacity building in accessing finance, Land O'Lakes will also support processors, cooperatives and other businesses interested in developing appropriate support services and inputs to farmers. Land O'Lakes will also support the establishment of local breeders to provide an in-country supply of dairy cattle. This support will build their dairy breeding skillsets and help breeders explore the effectiveness of various breeding technologies.

Activity 6 - Capacity Building: Aggregation and Value- Addition

Land O'Lakes will increase market access by supporting milk bulking and value addition in local businesses. Land O'Lakes will work with existing milk bulking businesses, such as cooperatives, to enhance growth and profitability. Land O'Lakes will also explore and implement alternative milk bulking models, such as working with dairy farmers, private businesses and processor-owned bulking facilities. Land O'Lakes will support these businesses to expand into areas such as cold chain management, processing and retail opportunities. These opportunities could include developing transport systems, purchasing processing equipment to process the milk on site, and creating milk kiosks to sell directly to customers. Land O'Lakes will also train youth on nutrition, food safety and dairy quality to promote consumption of dairy products. Land O'Lakes will also

facilitate a marketing campaign to stimulate alternative markets through promotion of locally produced milk products.

Activity 7 - Capacity Building: Promote Improved Policy and Regulatory Framework

Land O'Lakes and key dairy sector stakeholders, including dairy producers, cooperatives, processors, input and service providers, and private sector investors will work with the government to examine the current policy and regulatory framework in order to identify barriers to growth in the dairy industry and recommend effective solutions. Based on the results, Land O'Lakes will support capacity building and networking opportunities for key government staff and other stakeholders to increase their ability to strengthen the Mozambican dairy sector. Through a consultative process, Land O'Lakes will also facilitate the development of a private-sector-led representative body for the dairy sector to support the needs of the dairy industry, including helping them to develop their mission statement and strategy. The entity will engage the Government of Mozambique to advocate for reforms in the policy and regulatory framework to support growth and investment in the dairy sector.

MERCADO's Theory of Change

MERCADO's theory of change (see Annex A) links project activities and outputs with desired outcomes and project-level results. The causal logic underlying MERCADO's theory of change posits that facilitation of training, equipment, and inputs among dairy value chain actors will increase their know-how and productive capacity to produce and add value to quality milk products, while simultaneous improvements to the market (in particular, prices and market terms) will increase their motivation to do so. This will also lead to increases in the volume and quality of milk that is produced at the farm level and subsequently moves along the value chain. Together, increased volumes and quality of production will enable the emergence of a competitive, profitable, and sustainable dairy market system.

To improve the productivity of dairy cows, MERCADO will both improve the quality and availability of improved inputs, such as animal health services, extension services, feed and fodder, and dairy equipment, and improve the capacity of dairy farmer to care for their animals. To improve the input quality and availability, MERCADO will retrain paravets, trained in the previous projects to provide services to the dairy farmers. MERCADO will also continue to provide updated curricula and internships for students at local technical institutes that are interested in going into the dairy sector. The project will also work with agro-businesses and feed fodder producers, and other input providers to increase their capacity and facilitate access to finance to start and or grow their businesses.

To improve the capacity of the dairy farmers, MERCADO will support technical and farm management capacity building to dairy farmers to improve their dairy and farm practices. MERCADO will also facilitate farmers' access to improved inputs and services.

In combination with increases in productivity and quality at the farm-level, the project will provide training, capacity building, and financial services that will improve quality and productivity along the dairy value chain. Meanwhile, the project recognizes that, even in the face of unmet demand, dependence on relatively few large-scale commercial milk processors makes farmers and other value chain actors vulnerable to disadvantageous price and market conditions, and so seeks to

increase diversity and competition along the value chain by promoting the entry of new market actors particularly at the processing level, while also promoting appreciation, awareness, and demand for local milk among consumers.

2. BASELINE METHODOLOGY AND FIELD IMPLEMENTATION

Evaluation Methodology Overview

IMPAQ employed a market systems approach to analyze the market and formulate hypotheses about how MERCADO's interventions will contribute a sustainable private-sector dairy market system. Based on IMPAQ's understanding that MERCADO's activities involve nearly all actors in the dairy market in the Beira corridor, IMPAQ conducted the evaluation using a mixed-methods approach: IMPAQ collected qualitative or quantitative data from the larger population of dairy value chain actors. In a few limited cases, IMPAQ also used data from the previous Land O'Lakes dairy project's final evaluation (FEVAL) dataset as a data source.⁶ IMPAQ used a non-experimental design, administering a panel farm survey to collect quantitative data from all 524 MERCADO-identified farmers (the target was to complete surveys with 473 of the 524 farmers). While an experimental design would have been preferable for ensuring attribution, it was not possible for this evaluation to use a counterfactual, since the dairy industry in Mozambique is nascent and it is essential that the project work with all dairy producers and enterprises that are interested in participating.

IMPAQ used focus group discussions to collect qualitative information from groups of farmers, students, and youth. IMPAQ used key informant interviews and semi-structured surveys to collect qualitative and quantitative data from other stakeholders. In this section, IMPAQ outlines the evaluation's objectives and questions and discusses the data collection methodology, and the sources of and types of data collected. IMPAQ's MERCADO Baseline Scope of Work can be found at Annex D and IMPAQ's Baseline Inception Report can be found at Annex E.

Baseline Objectives and Questions

The baseline assessment had the following seven major objectives:

1. Document the current state of key dairy actors, including demographics, socioeconomic status, business finances, and dairy-related practices and technologies;
2. Analyze the gender constraints and opportunities and make recommendations to ensure that both sexes are equally able to participate and benefit from the project;
3. Establish the project's baseline values;
4. Provide recommendations for setting and refining targets for project indicators in accordance with the findings;
5. Identify potential strengths, weaknesses, opportunities, and threats to the project's implementation in the target areas;
6. Propose strategies to maximize strengths and mitigate challenges; and,

⁶ Given concerns about the length of the farmer survey, limiting it to an average running length of one hour per respondent, we excluded some questions from the baseline questionnaire. We replaced those questions with data from the FEVAL data set, where it was unlikely that there would be any related short-term changes to actual results. These included, for example, questions about farm-level infrastructure. We have referenced, in text, where we drew on this FEVAL data.

7. Generate data to use for comparative analysis across the life of the project to measure change.

IMPAQ intended these baseline assessment objectives to inform evaluation questions relating to the project's relevance, impacts, effectiveness, efficiency, sustainability, and gender equality and equity. Although it is not possible to present definitive findings with respect to these questions at baseline, IMPAQ presents preliminary observations in Section 3, with the exception of findings from the gender analysis, which are presented in a separate Baseline Gender Analysis Report. The Evaluation Questions are presented in Exhibit 2.

Exhibit 2. Evaluation Questions

Evaluation Criteria	Evaluation Question
<i>Relevance</i>	▪ Does the results framework, assumptions, program design and project activities meet the needs of the participants and local conditions in Mozambique’s Manica and Sofala Provinces?
	▪ How well aligned are MERCADO’s strategy and activities with the reality and development needs and potential of Mozambique’s dairy industry?
	▪ How well aligned are MERCADO’s strategy and activities with the development goals, objectives and strategies of USDA, the U.S. Government and the Mozambican Government?
<i>Impacts</i>	▪ What impacts are the project activities having on the program participants, both positive and negative, especially in relation to the expected results and strategic objectives?
	▪ How has the project-provided training impacted the knowledge and uptake of improved agricultural, farm management practices and post-harvest handling?
	▪ How has the use of improved practices affected agricultural productivity (measured through liters of milk per day, number of days of lactation, and calving interval for dairy and through yield for forage)?
	▪ To what extent has increased access to input suppliers affected the uptake of improved agricultural techniques, farm management practices, post-harvest handling, and use of improved infrastructure for farmers?
	▪ How has training in improved safety and quality affected the rate of rejection of milk at the aggregation level?
	▪ How have project activities influenced total value and quantity of milk and milk product sales?
	▪ How is value-capture distributed across different milk market system actors? What can be done to improve value capture and profitability of the actors?
	▪ To what extent has access to finance affected the growth of farmer dairy businesses?
	▪ To what extent has access to finance affected uptake of improved processing techniques, quality standards, and improved infrastructure for processors?
	▪ To what extent have the advocacy activities affected the policy and regulatory framework to support growth and investment in the dairy sector?
	▪ What internal and external factors have influenced the ability of the project to meet expected results and targets?
<i>Effectiveness</i>	▪ To what extent are the program targets and outcomes likely to be achieved by the end of the project?
	▪ What key successes should be replicated or key improvements should be made to the implementation to maximize the results?
<i>Efficiency</i>	▪ Were the resources and activities provided by the program carried out in a timely manner and with effective use of resources?
	▪ How well has the project been managed and M&E data used to make programmatic decisions?
<i>Sustainability</i>	▪ Which project activities and benefits are likely to be sustained or not sustained past the project lifespan, why?
	▪ What exit strategy has the project put into place to ensure the sustainability of the project outcomes?
<i>Gender Equality and Equity</i>	▪ How did the project address the constraints faced by women in the dairy sector?
	▪ What did the program do to ensure participation of both men and women?
	▪ What could the program have done better?
	▪ How did the outcomes of the project differ between men and women?
	▪ What could the project have done differently to ensure that equal benefits accrued to both women and men?

Data Collection Methods

IMPAQ collected quantitative data from farmers, aggregation and value-added facilities, processors, breeders, and financial institutions involved in dairy finance, but also complemented this data collection with qualitative data collection methods, using open-ended questions with all

respondents and FGDs with farmers. IMPAQ collected qualitative data from students and youth through FGDs, and from other stakeholders involved in the dairy sector or its development, such as provincial and district-level government employees supporting the livestock sector, MERCADO project staff, USDA staff, and representatives of projects funded by nongovernmental organizations (NGOs) and other donors, using semi-structured surveys.

Data Sources and Sampling

Exhibit 3 summarizes IMPAQ's sampling and data collection methods, proposed target numbers of respondents, and final completed surveys and/or focus group discussions. Following Exhibit 3 is a description of each respondent type, the sampling methodology for each stakeholder group, and a summary of the number and type of respondents from each group that the IMPAQ team completed.

Exhibit 3. Sampling and Data Collection Method

Stakeholder Type	Type of Data and Collection Method	Target Sample Size	Final Manica Respondents	Final Sofala Respondents	Total # of Respondents
Dairy Farmers	Quantitative: Panel farm survey	473	293 (132 female; 161 male)	157 (50 female; 107 male)	450 (182 female; 268 male)
	Qualitative: Focus group discussions	60	4 groups; 25 people (11 female; 14 male)	2 groups; 12 people (5 female; 7 male)	6 groups; 37 people (16 female; 21 male)
Aggregation & Value Addition Facilities (MCCs and Cooperatives)	Mixed-methods: Semi-structured survey	9	3	2	5
Processors	Mixed-methods: Semi-structured survey	8	2	3	5
(Potential) Dairy Breeders	Mixed-methods: Key informant interviews	2	3	N/A	2
Community Livestock Workers	Mixed-methods: Semi-structured survey	12	10 (0 female; 9 male)	5 (1 female; 4 male)	15 (1 female; 14 male)
(Potential) Feed and Forage Producers	Mixed-methods: Key informant interviews	3–4	3	N/A	2
Financial Institutions	Mixed-methods: Key informant interviews	2–3	1	N/A	1
Students (past)	Qualitative: Focus group discussions	30	2 groups; 12 people (4 female; 8 male)	1 group; 5 people (2 female; 3 male)	3 groups; 17 people (6 female; 11 male)
Other Stakeholders	Mixed-methods: Key informant interviews	10	6	3	9
Youth	Qualitative: Focus group discussions	30	2 groups; 17 people (8 female; 9 male)	1 group; 6 people (3 female; 3 male)	3 groups; 23 people (11 female; 12 male)

Dairy Farmers

IMPAQ collected data from all dairy farmers supported by Land O'Lakes in the previous dairy project in the MERCADO target provinces of Manica and Sofala, as of September 2016. These include small farms (1-3 cows), medium-sized farms (4-19 cows), and large farms (20 or more cows). The respondent was either the farmer him/herself, the person responsible for marketing the cow's milk (such as the farm manager), or someone else deemed to be responsible for the dairy cow(s). Land O'Lakes's previous dairy project ended in September 2016 with 524 dairy producers registered in the Beira corridor (comprising Manica and Sofala). IMPAQ used as its sample these producers, who, as of September 2016, had dairy herds (comprised of cows, heifers, or female calves) and produced milk in 2016. IMPAQ attempted to conduct quantitative surveys with the full population of farmers from this list, and did not sample from a larger population. IMPAQ's target sample size was 473 farmers; IMPAQ interviewed 450 farmers. IMPAQ also convened nine separate FGDs with farmers, both men and women in the same group. IMPAQ had 37 dairy farmers in the FGDs; its initial goal was 60 participants.

Aggregation & Value Addition Facilities (Cooperatives/Milk Collection Centers)

Aggregation and value addition facilities are physical locations that the Land O'Lakes dairy project previously established, where a majority of farmers aggregate and sell their milk. Milk is aggregated at milk collection centers (MCCs), which are operated either by cooperatives, processors, or in some cases, farmers. For data collection purposes, IMPAQ interviewed the president or manager of these entities. According to Land O'Lakes records, there are eight dairy farmer cooperatives, as well as a number of MCCs in the project area. IMPAQ interviewed five of nine identified respondents.

Processors

Companies and small individuals who are "micro-processors" process the milk into milk products, such as yogurt and cheese. There are two large-scale dairy processors in the Beira Corridor, and a number of smaller-scale and micro-processors. IMPAQ interviewed four current dairy processors, including two large-scale processors, one small-scale processor, and a micro-processor.

Dairy Breeders

At baseline, no commercial dairy breeders supplied the dairy sector. There are two firms involved in multiple operations along the dairy value chain that stated their intention to engage in commercial breeding operations. IMPAQ interviewed these two firms about their perspectives on the market for dairy cattle and their plans to engage in the market.

Paravets

Paravets are community livestock health workers who support farmers on diverse aspects of dairy production and dairy cattle husbandry, including breeding, nutrition, hygiene, health care, herd management, milking, and post-harvest handling of milk. They conduct regular site visits and are available for on-call services. According to Land O'Lakes records, there are 74 paravets trained by the previous Land O'Lakes dairy project; a small portion of them, 26, are still "active."⁷ IMPAQ

⁷ All Paravets in the sampling frame were trained by Land O'Lakes through the previous dairy projects. While they might still be working as a Paravet with dairy farmers, those considered "active" by Land O'Lakes are those who

interviewed active and non-active paravets, and conducted a random sample of approximately 20 percent of all active and non-active Land O'Lakes-trained paravets.

Feed and Forage Producers

At baseline, there were no commercial feed or forage producers supplying the dairy sector. Two firms involved in multiple operations along the dairy value chain, however, stated their intention to produce commercial feed and/or forage. IMPAQ interviewed these two firms about their perspectives on the feed and forage market and intentions to engage in that market.

Financial Institutions

Formal commercial banking institutions in Mozambique currently, or potentially may, work with Land O'Lakes to facilitate the connection between financial service providers and dairy actors. The Land O'Lakes staff identified three financial institutions that have worked with Land O'Lakes in the past on financial matters related to dairy farmers. IMPAQ interviewed one of the three financial institutions.

Students (past)

Students participated in previous Land O'Lakes-support dairy training and education programs in several post-secondary school programs in both urban and rural settings throughout the target areas. The MERCADO Provincial Coordinator contacted the schools that participated in the previous projects and asked them contact student participants to meet with the evaluation team. IMPAQ conducted FGDs with three targeted cohorts.

Other Stakeholders

A wide range of respondents were involved, in some way, with the past Land O'Lakes dairy projects and may be involved with the new MERCADO project, or have some other affiliation with the dairy sector. These respondents include MERCADO project staff, employees of government entities, private companies, and other donor-funded projects working in the dairy sector. IMPAQ successfully conducted interviews with a wide variety of stakeholders for the baseline evaluation.

Youth

For the purposes of the baseline, individuals between the ages of 15 to 22, who previously or currently attended three secondary schools in the target areas, participated in FGDs. The School Directors of each school helped IMPAQ to convene the FGDs in each school. The youth participants from two of the three schools were older, on average, than the youth from the school in Gondala. This is because these two focus groups had participated in an education program in previous years, conducted by Land O'Lakes, about dairy products and farming. IMPAQ completed the three target FGDs successfully.

work closely with the Cooperatives. Those considered “non-active” are those who work independently, not with the Cooperatives.

Data Collection Instruments

The data that IMPAQ reports in the following baseline report comes from surveys, stakeholder interviews, and focus group discussions that IMPAQ conducted. IMPAQ tailored data collection methods and instruments for each type of data source, to each stakeholder's expected involvement in the project or dairy sector, and to address overarching issues relating to the project and its activities in the sector. A copy of all MERCADO data collection instruments can be found in Annex F. Through the interviews, IMPAQ contextualized stakeholder's insights on the dairy sector as a whole. Land O'Lakes reviewed all instruments, which IMPAQ revised before finalizing and using them. IMPAQ initially drafted all data collection instruments in English; IMPAQ then translated them to Portuguese and into the local languages of Citewe/Chiute and Shona/Sena to enable data collection personnel to use the most appropriate language for each respondent.

Panel Farm Survey

IMPAQ developed a panel farm survey to collect data from all dairy farmers. The structured survey collected data on household socio-demographic characteristics and dairy activities, including production, sale, and consumption of milk. For those farmers who were no longer involved with dairy at the time of data collection, IMPAQ collected data on why they stopped working in dairy, as well as socio-economic data to enable characterizations of those who left dairy compared to those who remained. IMPAQ collected these data using the CPro/CSEntry program on portable Android-based tablets.⁸ IMPAQ captured and recorded GPS coordinates for a majority of farmers that completed interviews (this information will be included with all data sets given to Land O'Lakes).

Semi-Structured Interviews

IMPAQ's semi-structured survey collected basic business information and quantitative data on investment, production, and marketing activities. IMPAQ collected qualitative data using key informant interviews to obtain information on survey respondents' perspectives on the dairy value chain and their involvement with the project. IMPAQ administered and tailored these surveys and interviews to a variety of stakeholders: potential breeders; potential feed and forage providers; MCCs/cooperatives; processors; and financial institutions.

Key Informant Interviews

IMPAQ conducted KIIs with feed and forage producers, financial institutions, and other stakeholders, such as government representatives and representatives of donor- or NGO-funded projects. The KIIs included questions asking the respondents to characterize their background, current and anticipated role in the dairy value chain, perceptions of critical issues in dairy value chain development, viewpoints on MERCADO's strategy and planned activities, and other specific issues relevant to each type of respondent. IMPAQ used the qualitative data gathered from these interviews to contextualize stakeholders' insights on the dairy sector.

⁸ Due to significant programming challenges at the beginning of the data collection, enumerators used paper-based surveys for the first four days of data collection. After the tablets were operational, the enumerators inputted the data from the paper-based survey into the tablet, and then used only the tablets for data collection.

Focus Group Discussions

IMPAQ conducted FGDs with a sub-sample of farmers as well as youth and students. For farmers, the FGDs covered topics such as experiences as a dairy farmer, highlighting operations, successes, challenges; knowledge and use of standard practices; milk productivity and sales (frequency; pricing; transportation; cooperative sales and possible side selling); and experiences with the previous Land O'Lakes dairy project(s). For students, the FGDs assessed their understanding of and perspective on the potential for a career in the dairy industry; youth FGDs covered their perspectives on dairy, as consumers of milk and milk products.

Field Implementation

IMPAQ's local data collection team, led by the Fieldwork Manager and the Field Coordinator, organized and implemented field data collection under the supervision of the Evaluation Team Leader. They received support from the Monitoring and Evaluation Advisor, accompanied by the Gender Specialist, who conducted the baseline gender analysis. After Land O'Lakes approved the final Inception Report and data collection instruments, IMPAQ prepared logistics, finalized Enumerator Training planning, programmed data collection tablets, translated the survey into Portuguese and the two local languages of Citewe/Chiute (primarily for Manica province) and Shona/Sena (primarily for Sofala province), and planned data collection assignments and timing. IMPAQ conducted all data collection activities primarily in Portuguese or, where possible, in the local languages of Citewe/Chiute or Shona/Sena.

Before data collection began, the Evaluation Team Leader and the Monitoring and Evaluation Advisor traveled to Mozambique to participate in and oversee the enumerator training and pre-testing of the data collection instruments. The enumerator training and development of the data collection instruments also benefitted from the participation of the MERCADO M&E Manager, and two Land O'Lakes Extension Workers, who provided ad hoc input on nuanced technical issues that improved the quality of the instrument and enumerators' preparation for the field data collection.

The enumerator training took place from February 28 to March 4, 2017, in Chimoio, Manica Province. On the first day of the five-day training, the entire data collection team—15 enumerator trainees, IMPAQ staff, the Field Coordinator, and the Supervisors—traveled to two dairy farms in Gondola district to obtain insight into dairy farming to help orient their training on the data collection instruments.

The following four days of Enumerator Training consisted of sessions designed to introduce the enumerator team to the evaluation framework and implementation context (including a brief primer on the dairy production and marketing concepts reflected in the questionnaires). The training also included discussion and practice on how the enumerator introduces him/herself to the respondent, practicing in the languages of Portuguese, Chitewe/Chiute, Shona, Sena, and Ndau; a section-by-section review of data collection instruments, including how to translate certain dairy terminology into the local language; and in-class practical application using tablets.

On day three of the Enumerator Training, the IMPAQ team field tested the farmer survey. Meanwhile, the enumerator trainees broke into small groups and practiced the survey with each other. They noted any issues they found in questions, answers, wording, language issues, and so

forth. The team used this information on day four to finalize the Enumerator Training. On day four of the training, the IMPAQ team reviewed any revisions that resulted from the field testing and small-group practice sessions with the enumerators. The team also addressed any remaining questions and issues before commencing the field work. At the end of the Enumerator Training, from the 15 trainees, IMPAQ selected 12 to continue with the MERCADO baseline data collection activity.

The IMPAQ team collected data over a 17-day period from March 6 through March 23, 2017.⁹ The field team generally worked in two teams (but sometimes three, depending on the geographical disbursement of the farmers), with six enumerators each and one to two supervisors, who provided data quality control. The data collection team used three four-wheel-drive vehicles to travel. Because approximately 75 percent of the project's beneficiaries were located in Manica province, the data collection team began work in Manica province. On March 12, the entire team shifted their work to Sofala province. After the Sofala province work ended on March 17, the team returned to Manica province to finalize the remaining farmer surveys and to finalize the qualitative data collection.

Land O'Lakes staff were instrumental in connecting the IMPAQ team to nearly all of the respondents in the baseline. Two Land O'Lakes extension workers from each of the two provinces worked with the data collection team to locate and contact the farmers, Dairy Farmer Associations, and Community Livestock Workers. The Land O'Lakes Provincial Coordinators assisted the team with making the initial introductions and/or setting up interview dates and times with other respondents.

Implementation Challenges

IMPAQ discusses below the challenges that the team encountered during data collection that may have affected the number of respondents that the team reached or the outcomes of the data that the team collected.

Locating Farmers

The main challenge the team encountered, especially in Manica, was difficulty locating the individual farmers in a timely manner. Land O'Lakes provided two Extension Workers to assist the team in locating and approaching the farmers. However, with a team of 12 enumerators and 5 supervisors using 3 cars, the team quickly discovered that 2 extension workers were not enough. After IMPAQ met with MERCADO's Provincial Coordinator, both agreed that the data collection team would also work with the Dairy Cooperatives and Community Livestock Workers to locate the farmers. This change in data collection approach improved IMPAQ's data collection rates considerably. Another strategy the team began using in Sofala was to meet farmers at the Milk Collection Center, conduct the survey with them there, then accompany them to their farm to conduct the site visit portion of the survey.

Exhibits 4 and 5 present the response rate for farmers by district. IMPAQ was pleased given the initial challenges that IMPAQ achieved an almost 86 percent response rate, 4 percent short of the 90 percent goal.

⁹ Field data collection was originally scheduled to take place March 3-14, 2017.

Exhibit 4. Total Number of Farmer Surveys Attempted, by Province and District

District and Province	Sample	Attempted	Completed	Not Completed
Gondola District	148	148	133	15
Macate District	79	79	63	16
Vanduzi District	110	110	91	19
Sussundenga District	8	8	6	2
Total Manica	345	345	293	52
Beira District	106	106	93	13
Dondo District	73	73	64	9
Total Sofala	179	179	157	22
Total N	524	524	450	74
Total Percent	NA	100.0%	85.9%	14.1%

Exhibit 5. Total Number of Farmer Surveys Completed, by Province and District

District and Province	Farm Pop.	Farmers Surveyed			Percent of Pop. Surveyed	Percent of Total Surveys
		Total	Male	Female		
Gondola	148	135	69	66	91.22%	30.00%
Macate	79	63	38	25	79.75%	14.00%
Sussundenga	8	6	4	2	75.00%	1.33%
Vanduzi	110	89	50	39	80.91%	19.78%
Total Manica	345	293	161	132	84.93%	65.11%
Beira	106	85	57	28	80.19%	18.89%
Dondo	73	72	50	22	98.63%	16.00%
Total Sofala	179	157	107	50	87.71%	34.89%
Total	524	450	268	182	85.88%	NA

Exhibit 6: Completed Surveys by Farm Scale

Scale of Farm	Number of Farms	Percent of Total Farms Surveyed
Small (1-3 Cows)	297	66.89%
Medium (4-19 Cows)	18	4.05%
Large (20+ Cows)	2	0.45%
No Longer Have Dairy Cattle	127	28.60%

As illustrated in Exhibit 7 below, farmers primarily did not complete the surveys because the intended respondent farmer was absent (35 farms). IMPAQ's data collection team had a difficult time reaching 13 farms in Zembe 1 and Zembe 5 communities, Macate District, Manica province and some other farms, because the river water was too high to cross on foot or by four-wheel-drive vehicle. The team also was unable to locate 17 farms in Manica (15) and Sofala (2).

Exhibit 7. Reasons Why Farmers Did Not Complete Surveys

Reason	Absent	Sick	Changed	No Access	Not Found	Refuse	Abandoned	Unknown	Death
Number (N=74)	35	1	3	13	15	2	2	2	1
Percent	47.30%	1.40%	4.10%	17.60%	20.30%	2.70%	2.70%	2.70%	1.40%

IMPAQ was unable to convene nine focus farmer groups because there were not enough farmers in a close-enough-together geographical location who could meet at a mutually convenient time. Additionally, IMPAQ's target number of FGDs included at least one group with women dairy farmers in each location. Given the small number of female farmers who were located in the same general area, this proved impossible. In most cases, the number of men outweighed the women in the group. Therefore, IMPAQ conducted six focus groups, which included men and women in the same group.

Difficulties Interviewing All Aggregation & Value Addition Facilities (Cooperatives/Milk Collection Centers)

Due to timing issues, IMPAQ was unable to interview all eight Association or MCC presidents or managers, whom IMPAQ initially identified as the target respondents. In one case, the President was attending a funeral and in another case, the team could not locate the Association President. IMPAQ interviewed five of eight identified respondents.

Dairy Breeders

There are no dairy breeders operating on a commercial basis. IMPAQ identified two firms involved in multiple operations along the dairy value chain that intend to engage in commercial breeding operations. IMPAQ interviewed these two firms about their perspectives on the market for dairy cattle and their plans to engage in the market.

Sampling Community Livestock Workers

IMPAQ conducted a random sample of approximately 20 percent of all active and non-active Land O'Lakes-trained Paravets. However, due to logistical issues, the field team had to (successfully) substitute with those who were available.

Lack of Dairy Feed and Forage Producers

At baseline, there were no commercial feed or forage producers serving the dairy industry. While IMPAQ interviewed producers that may produce for the dairy sector in the future, IMPAQ attempted to contact Higest and Medimoc¹⁰ outlets in Sofala, but did not secure interviews. IMPAQ also attempted to set up an interview with some known producers in Maputo, but was also unsuccessful.

Unable to Interview All Financial Institutions

IMPAQ was unsuccessful in meeting with two of the three target financial institutions, Banco Oportunidade and GAPI. The two financial institutions agreed to answer the questionnaire by email, but neither complied.

¹⁰ Two large general livestock feed producers and sellers.

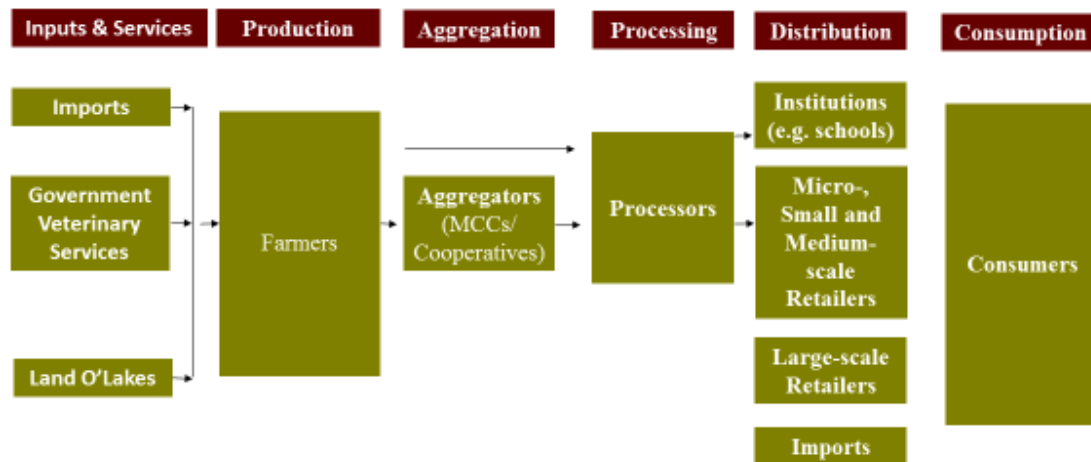
3. RESULTS AND FINDINGS

In this section, IMPAQ summarizes the Beira Corridor’s dairy value chain, and discusses farm-level dairy production, inputs and services to dairy production, post-farmgate value addition, and household demand for dairy.

Overview of the Beira Corridor Dairy Value Chain

Exhibit 8 graphically depicts the Beira Corridor value chain.

Exhibit 8. Beira Corridor Dairy Value Chain



In the Beira Corridor, there is virtually no commercial availability of dairy-specific inputs and services such as feed and fodder, mastitis testing chemicals, artificial insemination services, and stainless steel receptacles for milk, to dairy producers. Instead, most producers rely on Land O’Lakes for inputs, equipment, and services, while some larger producers arrange imports to meet their needs. The government plays an important role in basic livestock health services, such as testing for and vaccinating against diseases that present a public-health threat.

The Beira Corridor’s dairy value chain has, as its foundation, a contingent of small-scale household-based dairy farmers. A small number of medium and large-scale producers also operate as commercial enterprises or non-profit organizations.

Milk produced on dairy farms is retained for use at the farm (either human consumption or calves), sold informally, transferred to aggregators, or sold directly to processors. Most milk is processed by one of the two large processors working in the Beira Corridor, which operate well below their collective capacity of approximately 15,000 liters/day, or by one of the area’s microprocessors. Processed milk—in the form of pasteurized milk, yogurt, or cheese—is sold typically to itinerant traders, institutional buyers, or small-scale stores. The country’s largest supermarkets, Shoprite and Spar, do not carry Mozambique-processed milk products, relying instead on imported milk and milk products (mostly from South African producers and processors).

IMPAQ's inquiries into consumer demand focused on youth, the subjects of future informational campaigns intended to increase demand. Youth indicated that they already consume dairy. They expressed broad appreciation of the health benefits of milk, as well as its taste, although their perceptions of the taste of yogurt and cheese varied. Youth reported that their parents purchased milk from both informal sources (neighbors) and stores, and recognized informal purchases as being a budget option for poorer households. Youth consistently were interested in increasing their consumption of milk and dairy products.

Dairy Farm Attrition

Dairy farmers faced a multitude of challenging circumstances in 2016, the final year of the MDDP project, which serves as the main reference period for the MERCADO baseline. Security issues, drought, and loss of market led to significant attrition among dairy farmers. Indeed, 29 percent of the farmer respondents interviewed were no longer in operation or did not have cows, heifers, or female calves with the potential for future production (Exhibit 9). IMPAQ completed an abbreviated version of the survey with these farmers, which yielded insight into their characteristics and the factors that led them to leave production.

Exhibit 9: Number and Percentage of Farms that No Longer Have Dairy Cows

	Number of Farms	% of Total Farms
No longer have dairy cows	127	28.60%

As shown in 10 below, a significant portion of these producers (30 percent) reported losing their last cow prior to March 2016. While some of these losses extended as far back as 2010, the vast majority of the farmers, 71% had lost their final cow within the past year (since April 2016). The vast majority of these producers, 81percent, lost their herds through the death of the cattle rather than other factors such as sale, repossession, or transfer of the cattle (Exhibit 11).

Exhibit 10: When Last Cow was Lost

Month and year	Frequency	Percent
Prior to Mar-15	7	7%
Between Apr-15 and Mar-16	23	23%
Between Apr-16 and Mar-17	76	71%

Exhibit 11: How the Farmers Lost Their Cows

Variable	Frequency	Percent
Died	103	81%
Sold or transferred	7	6%
Other	14	11%
Repossessed	4	3%
Slaughtered	1	1%
TOTAL	129*	~100%

* One respondent answered both sold and died; one respondent answered both died and other.

Exhibit 12 illustrates that these farmers reported that the main reason for these losses was that they were unable to keep the cattle healthy. Among farmers who reported “other” reasons for the loss of their cows, the most common reasons cited were also related to animal health issues, including the animals eating foreign objects (plastic, wire, cord, nails, coins), death during delivery of calves, and unidentified sicknesses.

Exhibit 12: Reasons for the Loss of the Cow

Variable	Frequency	Percent
Couldn't keep them healthy	61	48%
Other	54	43%
Couldn't keep them fed	10	8%
Couldn't cover costs	4	3%
Couldn't access needed inputs	3	2%
Wasn't making any money	2	2%

Dairy Farm Characteristics and Activities

Results reported in the remainder of the Results section draw only on dairy producers with dairy herds; they exclude the 29 percent of dairy farmers discussed in the preceding section on attrition.

Characterization of Dairy Producers and their Herds

As shown in Exhibit 13, dairy production in the Beira Corridor is a small-scale enterprise: 93.69 percent of the dairy producers have only 1 to 3 cows. Four percent (18) of dairy producers qualify as medium-scale producers. Only 2 of the dairy producers (.45 percent) operate on a large-scale, defined as having a herd of more than 20 productive cows.

Exhibit 13. Distribution of Farms by Scale

Scale of Farm	Number of Farms	% of Farms
Small (1-3 Cows)	297	93.69%
Medium (4-19 Cows)	18	5.68%
Large (20+ Cows)	2	0.63%

As shown in Exhibit 14, the average small-scale herd has two dairy cattle, including one cow and, most frequently, a female calf but at times a bull or heifer. The average medium-scale herd has 16.5 cattle, including 7 cows, and the average large dairy herd has 26.5 cows, 14 heifers, and 3.5 calves. With the exception of the small-scale farmers, these herds include an arguably large number of bulls relative to the needs of the herd; while large producers' herds show a robust number of cows, heifers, and female calves (which represent future production potential).

Exhibit 14: Herd Composition

Type	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Bulls	0.279	2.722	2.5
Cows	1.067	7.389	26.5
Heifers	0.256	2.833	14
Female Calves	0.468	3.556	3.5
Total	2.071	16.5	46.5
N	297	18	2

Exhibit 15 below shows that nearly all (99 percent) small-scale farms are households; the larger-scale farms often operate as organizations (for example schools or orphanages with dairy operations) or as commercial firms. IMPAQ found that 17 percent of medium-scale farms are organizations (3 farms) and 22 percent are commercial firms (4 farms); there are no household production units among the large-scale farms that IMPAQ interviewed. The differentiation between household, organizational, and commercial producers has important implications, as it affects the professionalization and economics of production. For example, several organizations that IMPAQ interviewed were candid that, despite the potential for dairy to be a profitable operation, they were operating at a loss, but that it was not a matter of grave concern because of their generous donor base.

Exhibit 15. Distribution of Farms by Type

Farm Type	No Longer Farming	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)	Total
Household	98%	99%	61%	0%	97%
Organization	0%	0%	17%	50%	1%
Firm	2%	1%	22%	50%	2%
Total	100%	100%	100%	100%	100%
N	127	297	18	2	444

As shown in Exhibit 16, dairy farming is the primary source of income for 17 percent of farmers surveyed, and the secondary source of income for approximately 15 percent of farmers surveyed. The importance of dairy farming as a source of income increases with the scale of production; small-scale producers most commonly are primarily dependent on crop production for their incomes. In FGDs, farmers emphasized the importance of dairy for their household livelihoods, saying that the most positive aspect of dairy farming is the ability to provide for their families. Respondents use revenue from milk production to purchase household necessities and provide access to education for their children. Data from the 2016 Final Evaluation of the MDDP program¹¹ reveals that 90.1 percent of dairy producers are cooperative members; male-headed

¹¹ Limited data presented in the results is drawn from the 2016 MDDP Final Evaluation. IMPAQ incorporated data from the final evaluation as a means of limiting the length of the survey to under one hour, while also meeting Land O'Lakes' priorities of collecting a broad range of data from dairy farmers. Only data that was not expected to change in the interim between the MDPP Final Evaluation and the MERCADO baseline was used. Any use of this data is clearly documented in the report.

households represent 74.8 percent of the households with female-headed households representing 11.7 percent, and the remainder reporting no adult present in the household.

Exhibit 16. Dairy in Household Livelihoods

Primary Source of Income	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)	All Farms
Crop Production*	47.5%	11.1%	0.0%	45.11%
Dairy Farming	14.1%	61.1%	100.0%	17.35%
Government Employee	12.5%	5.6%	0.0%	11.99%
Private Sector Employee	7.1%	11.1%	0.0%	7.26%
Trade/Shopkeeper	6.1%	11.1%	0.0%	6.31%
Other Livestock	5.1%	0.0%	0.0%	4.73%
Other	7.8%	0.0%	0.0%	7.25%
N	297	18	2	317

*1/3 of these respondents listed dairy farming as their secondary source of income

Exhibit 17 shows the prevalence of training by Land O'Lakes among dairy farmers. Nearly all producers (93 percent and 94 percent of smallholders and medium-sized farmers, respectively) reported that two people working in their dairy enterprise had received a training certificate from Land O'Lakes. Among smallholder farmers, female adults held 75 percent of the training certificates, compared to only 66 percent held by male adults. Among medium and large-scale farmers, in contrast, farm employees most commonly were trained (59% and 100% respectively), while male adults were the second most commonly trained (47% and 100% respectively).

Exhibit 17. Farmer Training on Dairy Production, Post-Harvest Practices, and Management

Variable	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Training Certificate From Land O'Lakes	93%	94%	50%
N	295	18	2
Individuals Trained			
Primary Male Adult/Husband Trained	66%	47%	100%
Primary Female Adult/Wife Trained	75%	35%	0%
Employee Trained	8%	59%	100%
Other Family Member Trained	51%	59%	0%
N	275	17	1

Farmer Knowledge About Dairy Production, Post-Harvest Practices, and Financial Literacy

Under the project's theory of change, training to increase knowledge, in combination with increased productive capacity and better market opportunities, should increase the quantity and quality of milk produced. To establish baseline levels of farmers' knowledge, IMPAQ asked a series of questions about different production, husbandry, post-harvest, management practices, and financial literacy and scored responses on their adherence to Land O'Lakes training materials addressing the same practices. Results showed that farmer respondents had a high degree of

knowledge in most areas (Exhibit 18): greater than 80 percent of farmers accurately recited, without prompting, appropriate practices in response to each question testing their knowledge of themes relating to forage quality, breeding, dairy herd housing, and animal health topics. Seventy percent of all farmers surveyed reflected knowledge in every production area covered, with male producers slightly edging out female producers in their performance. Interestingly, small farmers had better levels of knowledge than medium and large-scale farmers, just over half of whom could accurately respond to all dairy production and husbandry questions. Farmers showed similarly high rates of basic financial literacy, with greater than 70 percent of those surveyed able to respond appropriately, including male and female producers, and small and medium-scale producers.

Exhibit 18: Technical and Financial Knowledge

Type				Percent
Trained dairy producers that can accurately recite all referenced improved dairy practices				
Male owner	Female owner	Small producers	Medium producers	Large producers
71.8%	68.2%	71.4%	55.6%	50.0%
N=188	N=129	N=297	N=18	N=2
Individual Practices				
Total				70.3%
Ways to improve pasture quality				83.3%
Advantages of artificial insemination				83.0%
Most important equipment in corral				83.0%
How to prevent or control mastitis				85.8%
Trained dairy producers that can demonstrate financial literacy				
Male owner	Female owner	Small producers	Medium producers	Large producers (n=2)
71.3%	70.7%	71.0%	77.8%	50.0%
N=188	N=129	N=297	N=18	N=2
Total				71.3%

Farmers' comfort with technical issues was also evident in focus group discussions: respondents freely identified and discussed important factors that increased the productivity of their cows, such as proper nutrition and hygiene.

Farmer Practices in Dairy Production, Post-Harvest Practices, and Management

Feed, forage, supplementation and water

Most dairy farmers practice a no-graze system (zero-grazing), where they keep their cow(s) in a corral and supply them with water, forage, and supplements (Exhibit 19). Small-scale producers had the highest prevalence of no-graze systems (97%), while 78 percent of medium-scale and 50 percent of large-scale producers used these systems. IMPAQ expected these declining percentages because the cost and difficulty of bringing adequate forage to a dairy herd increases with the size of that herd.

Exhibit 19. Type of Grazing System

Type Of Grazing	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
No Grazing	97%	78%	50%
Paddock Grazing	0%	6%	0%
Semi-Free Grazing	1%	0%	0%
Free Grazing	2%	17%	50%
N	295	18	2

Nearly all farmers reported giving their dairy cattle forage. While virtually all dairy farmers (96%, 100% and 50% of small, medium, and large-scale farmers, respectively) supplemented their cows with fresh-cut forage (including a variety of different species), the use of hay was less common, practiced by only 66 percent, 69 percent, and 50 percent of small, medium, and large-scale farmers respectively. Farmer used silage more infrequently: only 21 percent of small-scale farmers, 13 percent of medium-scale farmers, and no large-scale farmers reported using it. Small and medium-scale farmers reported spending an average of approximately 5,700 Meticaís (US\$80) annually on providing forage to each cow.

Exhibit 20. Dairy Farmers' Use of Forage

Forage	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Percent of Farmers Who Report Giving Their Cattle Forage	94%	89%	100%
N	297	18	2
If Yes, Types of Forage Given:			
Fresh	96%	100%	50%
Hay	66%	69%	50%
Silage	21%	13%	0%
N	279	16	2
Average Annual Expenditure on Forage Per Cow (Meticaís)	5680.6 (US\$80)	5750.0 (US\$80)	.

Dairy farmers depended most heavily on wild harvest of forage to meet their needs: less than one-quarter of those using forage reported that they actually cultivated it themselves, and an even smaller share (8 percent of small-scale farmers and 13 percent of medium-scale farmers) purchased it. Farmers reported cultivating a total of 506 hectares of forage (See Annex B, Indicator 11). Those farmers that produced forage reported relatively large areas cultivated, on average, 5.69 hectares per small farmer and 34 hectares per medium farmer. This implies that some farmers may use land other than their own to cultivate forage and that access to land is an important variable to consider in interventions designed for forage production. Most farmers relied on only one means of acquiring forage: for example, only 14 percent of farmers both cultivated their own forage and harvested it, 5 percent harvested and purchased forage, and only 2 percent cultivated their own and purchased it or acquired it through all three means. The farmer FGDs revealed that the recent drought has increased farmers' appreciation of forage; many respondents reported that they planted

drought resistant grass, such as elephant grass, which has a low water and nutrient requirement. They also prepared hay bales and fodder.

Exhibit 21. Sources of Forage

Source of Forage	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Own Cultivation	25%	19%	0%
If Own Cultivation, Average Hectares Per Farmer	5.69	34.00	.
Uncultivated Harvest	88%	75%	100%
Purchase	8%	13%	0%
N	279	16	2

The majority of farmers reported that they found it somewhat or very easy to access adequate forage, although this ease of access was lower among small-scale (only 55 percent) and medium-scale producers (69 percent) than large-scale producers. Perceptions of ease of access to forage did not differ substantially among farmers who cultivated versus relied on wild harvest of forage, but producers who purchased forage were far less likely to report that they found it easy to access adequate forage (only 29 percent of small-scale farmers and 0% of medium-scale farmers). This is an important result in that it validates MERCADO's objective of increasing the availability of forage for purchase to enhance dairy herd nutrition and productivity.

Exhibit 22. Ease of Access to Forage

Ease of Access to Adequate Forage	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Easy or Somewhat Easy for All Farmers	55%	69%	100%
Easy or Somewhat Easy for Those Who Cultivate	56%	67%	.
Easy or Somewhat Easy for Those Who Find	55%	75%	100%
Easy or Somewhat Easy for Those Who Purchase	29%	0%	.
N	279	16	2

In Exhibit 23, a large share of dairy farmers reported giving their dairy cattle supplements, ranging from 90 percent of small-scale producers to 100 percent of medium and large-scale producers. Salt and maize bran were the most common supplements provided. Annual per-cow expenditures on supplements ranged from just under 3,000 Meticaís for medium-scale producers to more than 8,500 Meticaís for large-scale producers. Exhibit 24 illustrates that slightly more than half of small and medium-scale farmers (55 percent and 56 percent, respectively) reported that they easily accessed adequate supplements for their cattle. Both large-scale producers reported that they easily accessed adequate supplements. Again, the results for small and medium-scale farmers validated

MERCADO's activities to increase the commercial provision of feed supplements to support dairy farming.

Exhibit 23. Use of Supplements

Type Of Supplement	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Give Cattle Supplements?	89%	100%	100%
N	297	18	2
Salt	89%	94%	100%
Molasses	23%	61%	100%
Corn Meal	93%	94%	100%
Wheat Bran	0%	17%	50%
Brewing Residues	2%	11%	0%
Industrial Feed Ration	30%	44%	50%
Mineral Blocks	12%	33%	50%
Dry Crop Residues	21%	17%	50%
Fresh Crop Residues	49%	33%	0%
Silage from Crop Residues	13%	6%	0%
Average Expenditure on Supplements Per Cow	4447.6	2937.4	8517.1
N	265	18	2

Exhibit 24. Ease of Access to Supplements

Easy Access to Adequate Supplements	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Easy or Very Easy	55%	56%	100%
Less than Easy	45%	44%	0%
N	217	16	2

Only 2 percent of small-scale producers reported having a continuous water supply for their cattle in the corrals, whereas 19 percent and 50 percent of medium and large-scale farmers did, respectively. For those that had to bring water manually to the cattle, the average amount brought per cow per day varied widely from 56.5 liters for small-scale producers, 16.2 liters for medium-scale producers, and 102 liters for large-scale producers. Twenty-two percent of small-scale producers reported having to pay an average of 785 Meticaís a year to provide water for each cow. No medium or large-scale producers had to pay to access water.

Exhibit 25. Type of Water Access

Type Of Water Access	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Continuous	2%	19%	50%
Brought in Manually	98%	81%	50%
N	254	16	2
If Brought Manually, Average Liters/Animal/Day	56.6	16.2	102.1
Pay for Access to Water	22%	0%	0%
Average Annual Water Expenditure Per Cow (Mts.)	785	.	.

Animal Health Practices

The frequency with which farmers regularly conducted animal health testing was higher for larger-scale farms than for small-scale producers: only 61 percent of small-scale producers reported testing their animals for health conditions such as brucellosis, tuberculosis, mastitis, and tick-borne diseases, whereas 83 percent of medium-scale and 100 percent of large-scale producers did. Small-scale producers relied most heavily on government technicians (34%), followed by commercial veterinarians (29%) and Land O'Lakes technicians for these testing services. In contrast, medium-scale producers relied on commercial veterinarians (36.4%), followed by government technicians and paravets (18% each). Finally, 100 percent of large-scale producers reported relying on commercial veterinarians for animal testing services.

Exhibit 26. Utilization and Service Providers for Animal Health Testing

Health Testing	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Easy to access health services for dairy cattle	33.9%	44.4%	50.0%
Conducted health testing	61.0%	83.3%	100.0%
N	295	18	2
If conducted, service provider used:			
Household member or employee	5.30%	9.10%	0.00%
Government technician	34.20%	18.20%	0.00%
Paravet	5.30%	18.20%	0.00%
Land O'Lakes	23.70%	9.10%	0.00%
Commercial veterinarian	29.00%	36.40%	100.00%
N	180	15	2

As with animal health testing, the frequency of vaccinations increased with the scale of production: 75, 83, and 100 percent of small, medium, and large-scale producers reported that they vaccinated their dairy cattle. Results on knowledge of dairy herd management, discussed earlier, show that producers had a high degree of knowledge about various topics in general (IMPAQ did not ask about vaccinations or testing specifically). In combination with the results showing that most dairy farmers found it difficult to access adequate animal health services, and that the government provided many of these services at no cost, these sub-optimal rates of testing and vaccination imply that availability and access, rather than intent, account for the shortfalls in application. Producers'

ability to access to government services is often limited by the fact that the government often offered services in a central location on a fixed schedule; it can be difficult for dairy farmers to bring their cows to that central location while still maintaining their milking schedule. There is also a disincentive to do so if the vaccination requires that animal's milk not be consumed for a set time after the vaccination. While government technicians are able to travel to the farm to carry out these services, they require that the farmer cover the cost of the technician's per diem and travel expenses. These costs can be onerous, especially if the farm is distant and requires the technicians to stay overnight while en route.

Exhibit 27. Frequency of Vaccinations and Vaccine Service Provider

Vaccinations	Small (1-3 cows)	Medium (4-19 cows)	Large (20+ cows)
Vaccinated cows	75%	83%	100%
N	295	18	2
Required vaccinations	100.0%	93.3%	100.0%
Foot and mouth vaccine	84.1%	86.7%	100.0%
Lump skin disease vaccine	11.4%	33.3%	0.0%
Brucellosis vaccine	7.7%	20.0%	0.0%
Anthrax vaccine	14.1%	26.7%	0.0%
Clostridium chauvoei vaccine	100.0%	93.3%	100.0%
Tuberculosis vaccine	10.9%	6.7%	0.0%
N	220	15	2
If vaccinated, service provider used			
Household member or employee	2.7%	6.7%	0.0%
Government technician	13.0%	0.0%	0.0%
Paravet	1.1%	13.3%	0.0%
Land O'Lakes	15.1%	0.0%	0.0%
Commercial veterinarian	66.5%	80.0%	100.0%
N	220	15	2

Farmers' adherence to other preventive animal health practices varied based on the scale of operations. For example, in interviews, farmers reported that only 57 percent of smallholder farmers treated their cattle for ticks, while 72 percent of medium-scale farmers and 100 percent of the large-scale farmers did. The number of farmers who followed the recommended practice of treating for ticks weekly was even smaller. While smallholder farmers relied heavily on government technicians for this service, medium and large-scale farmers relied on farm labor—either a family member or an employee—for this activity.

Exhibit 28. Frequency of and Service Provider for Tick Treatment

Tick Treatment	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Treated for ticks	56.9%	72.2%	100.0%
Treats Ticks Weekly	30.5%	50.0%	100.0%
N	295	18	2
If Treated, Service Provider Used:			
Household Member or Employee	28.0%	61.5%	100.0%
Government Technician	50.6%	15.4%	0.0%
Paravet	1.2%	7.7%	0.0%
Land O'Lakes	3.6%	0.0%	0.0%
Commercial Veterinarian	10.1%	5.4%	0.0%
N	168	13	2

Only 39 percent of small-scale farmers used antibiotics on lactating dairy cows within the previous year, compared to 61 percent of medium-scale farmers and all large-scale farmers. A relatively small share of those farmers (28%, 36%, and 0% for small, medium and large-scale farmers respectively) followed the practice of withdrawing milk from sale or human consumption after they administered antibiotics.

Exhibit 29. Use of Antibiotics and Withdrawal from Milk Sale

Use of Antibiotics and Withdrawal of Milk From Sale	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Used injectable antibiotics on lactating cows in the past 12 months	39%	61%	100%
N	295	18	2
Withdrew milk from sale or consumption after using injectable antibiotics in the past 12 months	28%	36%	0%
N	116	11	2

Farmers' adherence to proper mastitis testing procedures was also incomplete, particularly among small-scale farmers, only 19 percent of whom used the California Mastitis Test (CMT) to test for mastitis. In contrast, 73 percent of medium-scale farmers used the CMT for mastitis. Neither of the large-scale farmers reported using the CMT.

Exhibit 30. Type of Mastitis Testing Conducted and Ease of Replacing Testing Products

Type of Mastitis Test	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Does Not Test	20%	17%	0%
N	295	18	2
Visual Test	67%	40%	50%
Cup Test	32%	13%	50%
CMT Test	19%	73%	0%
Easy or very easy access to replacement CMT or cup tests?			
Yes	26%	64%	100%
N	236	15	2

Exhibit 31 summarizes results of questions about how dairy farmers breed their dairy cattle. Farmers reported relying very heavily on natural breeding, particularly small and medium-scale farmers; 61 percent of small-scale and 82 of medium-scale farmers used natural breeding. Only about one-third of small and medium-scale farmers used artificial insemination (AI). Land O'Lakes consistently was the most important AI service provider for these farms; commercial veterinarians were the second most important providers. Some medium-scale farms (20%) also used family or paid farm labor for AI activities.

Exhibit 31. Breeding Methods for Dairy Cattle

Breeding Practices	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Artificial Insemination (AI)	31%	33%	50%
N	294	18	2
Natural Breeding	61%	82%	50%
N	294	17	2
Cost of AI (Mts.)	44.64	62.50	0.00
N	84	4	1
Cost of Natural Breeding (Mts.)	169.38	40.71	0.00
N	178	14	1
If AI Practiced, Service Provider Used:			
Household Member or Employee	3.40%	20.00%	0.00%
Government Technician	12.40%	0.00%	0.00%
Paravet	0.00%	0.00%	0.00%
Land O'Lakes	69.70%	60.00%	0.00%
Commercial Veterinarian	13.50%	20.00%	100.00%
N	90	6	1

Both the quantitative survey and qualitative results emphasized farmers' difficulty in accessing breeding services. AI services were in particularly short supply. One farmer explained that one heifer had an extraordinarily long time between pregnancies because every time she went into heat, he failed to access the needed AI service because the service provider's schedule did not correspond with the cow's heat. Several medium and large-scale farms interviewed expressed that, if possible, they would like to gain access to AI equipment and training so that they could have

their own AI service on the farm. These same farms also expressed willingness to provide services to their neighboring farmers as well.

Access to adequate health services for dairy cattle was also constrained in general, with only 34 percent, 44 percent, and 50 percent of small, medium, and large-scale producers reporting that they could access the needed services easily.

Exhibit 32. Ease of Access to Dairy Cattle Health Services

Variable	Small (1-3 cows)	Medium (4-19 cows)	Large (20+ cows)
Easy to access health services for dairy cattle	34%	44%	50%
N	295	18	2

Qualitative interviews indicated that the medium and large-scale farmers that accessed needed health services sometimes did so by incorporating a service provider (e.g., a trained veterinarian) onto their farm staff.

Farm Management

In total, 81 farmers (51 men, 30 women) out of 244 respondents have applied improved farm management practices (i.e., governance, administration, or financial management) as a result of USDA assistance. IMPAQ verified during the farmers survey whether the farmers had accessible register books/registration records, which are listed below. If they had all four registries, then they were counted for Indicator 12.

- Daily Milk Production Records
- Milk Production Allocation Records
- Registration of Farm Transactions (Expenses and Revenue)
- Registration of Visits to the Farm

IMPAQ also reviewed the data from the FEVAL dataset, and found that 49 male farmers (35 percent) and 32 female farmers (39 percent) reported using a business plan.

Dairy Farm Equipment, Inputs, and Infrastructure

Exhibit 33 demonstrates that farmers reported that there was little use of improved dairy farm equipment, inputs, and infrastructure. This supports MERCADO's programming emphasis on increasing the availability of these inputs through commercial suppliers. For example, only 1 percent of small-scale farmers, 17 percent of medium-scale farmers, and 50 percent of large-scale farmers reported using a milking machine. Those that did use milking machines obtained them from Land O'Lakes or imports. Neither small nor large-scale farmers, and only 33 percent of medium-scale farmers, reported that they could easily replace the milking machine if they needed to.

Similarly, while most farmers used stainless steel buckets and cans for milk, they recognized that they were heavily dependent on Land O'Lakes if they needed to replace them. There was no alternative local source and relatively few respondents felt that they could easily obtain

replacements if they needed them. This particularly affects small-scale farmers, where a large majority, 87 percent, reported that they could not easily replace these items.

Exhibit 33. Use, Sources, and Ease of Access for On-Farm Dairy Equipment

	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Uses milking machine	1%	17%	50%
N	295	18	2
If Used, Potential Source for Replacement			
Land O'Lakes	100%	33%	0%
Imported	0%	0%	100%
Local Commercial Supplier	0%	33%	0%
Local Market	0%	0%	0%
Cooperative	0%	0%	0%
Easy or Very Easy Access to Replacements	0%	33%	0%
N	1	3	1
Uses Stainless Steel Buckets and Cans	89%	94%	100%
N	295	18	2
If Used, Potential Source for Replacement			
Land O'Lakes	39%	44%	0%
Imported	1%	11%	50%
Local Commercial Supplier	8%	17%	0%
Local Market	1%	6%	0%
Cooperative	26%	17%	50%
Other	24%	6%	0%
Easy or Very Easy Access to Replacements	13%	44%	50%
N	263	17	2

Farmers also reported that they had difficulties purchasing heifers for dairy production. Only 23 percent of small-scale producers, 17 percent of medium-scale producers, and 50 percent of large-scale producers said they could easily purchase a heifer for dairy production if they wanted to.

Exhibit 34. Ease of Purchasing Heifer

Variable	Small (1-3 cows)	Medium (4-19 cows)	Large (20+ cows)
Easy to purchase heifer for dairy production	23%	17%	50%
N	295	18	2

Dairy farmers made considerable use of paid employees to participate in their dairy operations, with a total of 460 employees across farm scale, and a heavy reliance on male employees (414) over female (46) reported (see Annex B, indicator 3).

Finance and Investments

Exhibit 35 summarizes results on dairy farmers' investments in their dairy enterprises, as well as their efforts to get credit to support their dairy activities. A significant number of farmers (26%, 56% and 100% of small, medium, and large-scale farmers) reported making investments to support their dairy operations within the past 12 months. The farmers financed these investments almost entirely with the farm's own resources. Small-scale farmers most commonly reported making investments to build or maintain their corral or other related infrastructure, or purchase feed, supplements, and, in some cases, bicycles. Medium and large-scale producers reported most frequently investing in farm equipment and infrastructure.

Consistent with self-financing, only 3 percent of small-scale farmers (9 in total), and no medium nor large-scale farmers, reported asking for credit from financial institutions to support their dairy operations.

Exhibit 35. Dairy Enterprise Investment

Variable	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Invested in Dairy Enterprise	26%	56%	100%
N	295	18	2
If Invested...			
Used Own Finance for Investments	95%	100%	100%
Used Informal Finance for Investments	3%	0%	0%
Used Formal Finance for Investments	3%	0%	0%
Used Grant Finance for Investments	0%	0%	0%
N	76	10	2
Asked for Credit	3%	0%	0%
Value of Credit Requested (Mts.)	63406.25	.	.
N	8	0	0
Credit Received	75%	.	.
Value of Credit Received	40041.67	.	.
N	6	0	0

Dairy Herd Productivity

The three most important indicators of dairy herd productivity are daily yields per cow, the length of the lactation period, and calving intervals. In the Beira Corridor, pure-bred dairy cows can produce as much as 25 liters of milk per day (and yields of 18 to 20 liters are not uncommon), and lactations periods of 300 or more days with annual calving also feasible. The farmer survey showed substantial room for improvement in these areas.

Productivity was only 8.78 liters per cow per day of lactation across all farmers surveyed; female producers, small producers, and large producers reported slightly above-average results (9.06 and 9.37 liters, respectively). Medium-scale producers performed well below average, reportedly yielding only 4.62 liters per cow per day.

Average lactation periods varied widely: they were lowest among female producers (250 days) and small producers (262 days), and reached 283 days on average for male producers. Medium-

scale producers reported exceedingly long lactation periods of 451 days; these results likely correlated with the long calving intervals also reported, as some farmers reported keeping their cows milking until they were bred again, rather than drying them off in anticipation of breeding. Overall, the average calving interval was 510 days and varied little among male, female, and small-scale producers. Medium-scale producers had the shortest calving intervals at 471 days, which again far exceeded the technically feasible and ideal target of annual calving. These extended calving periods were in part due to limited availability of breeding services, either AI or natural service.

Exhibit 36: Milk Output, Lactation Period, and Calving Period

Volume of milk output per day per cow during lactation (liters)				
Male owner	Female owner	Small producers	Medium producers	Large producers (n=2)
8.60	9.06	9.06	4.52	9.37
N=171	N=111	N=262	N=18	N=2
Overall Mean				8.78
Average number of days in lactation period				
Male owner	Female owner	Small producers	Medium producers (n=3)	Large producers (n=0)
283.21	249.62	261.83	451.42	.
N=60	N=43	N=99	N=4	N=0
Overall Mean				269.19
Average calving interval				
Male owner	Female owner	Small producers	Medium producers (n=2)	Large producers (n=0)
509.57	510.89	513.09	470.58	.
N=17	N=13	N=27	N=3	N=0
Overall Mean				510.16

Milk Production, Sales and Profitability

IMPAQ asked farmers about their daily milk production in the rainy and dry seasons. Exhibit 37 shows averages across the farm scales, as well as a total daily average for production across both seasons. As seen in Exhibit 37, small-scale farmers' cows produced, on average, 9.2 liters of milk per day in the dry season and 9.0 liters per day in the rainy season, for an average of 9.1 liters per day across the year. Interestingly, medium-scale producers had lower rates of production, as well as the unexpected result of lower productivity in the rainy season than the dry season, a result that is likely due to the small sample size. Large producers had slightly higher rates of production, at 8.4 liters per cow per day in the dry season and 10.3 liters per cow per day in the rainy season.

Exhibit 37. 2016 Dairy Production in Liters in Rainy and Dry Seasons

Variable	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Mean daily milk production per cow in dry season	9.2	4.9	8.4
Mean daily milk production per cow in rainy season	9.0	4.2	10.3
Annual mean daily milk production per cow	9.1	4.5	9.4
N	235	16	2

IMPAQ asked farmers how they allocated milk that they produced between different uses, including on-farm use (milk for human consumption, milk for calves), sales to cooperatives, informal sales, and sales to other types of buyers such as processors. Results in Exhibit 39 and Exhibit 40 show that farmers were relatively consistent in how they allocated milk across the rainy and dry seasons, with small-scale farmers retaining on average 42 percent of their milk, sending 55 percent to the cooperative/MCC, and selling on average 6 percent to local informal buyers.

Medium scale farmers retained a smaller share, only 31 percent, for their own uses, and sold nearly two-thirds (64%) to MCCs/Cooperatives. They sold 14 percent on average to local informal buyers, and 27 percent to “other” buyers including processors. Results for allocation of milk is not reported for large producers due to data quality issues.

In FGDs, IMPAQ asked farmers how they allocated the milk that they produced, and to describe their motivations for these decisions. Consistent with the survey results, most respondents sold their milk to the local cooperative, to a lesser extent within the local community. Respondents reported that an advantage of selling to the cooperative was the guarantee of a monthly income; however, the drawback was a lower price of milk. Respondents reported that the lower prices were offset, however, by services accessible through the cooperatives, such as access to credit, supplements, rations, and veterinary assistance.

Farmers reported aggregate annual sales (Indicators 1 and 2) of \$187,215.83, corresponding to 229.61MT of raw milk sales, across all farmer types. Most small producers reported very low sales earnings of an average of just under \$4 per small-scale farmer. IMPAQ recognizes that these values are much lower than expected. IMPAQ used the individual farmers’ volume and value recall data, collected through the farmer survey, to construct this indicator, as it was decided to be the most relevant data source for this purpose. Suggestions on methods by which more reliable data can be obtained for these indicators is provided in the Recommendations. These results are highly influenced by the fact that 20 percent of the farmers reported a zero value for sales and approximately 30 percent of farmers reported less than \$10 for annual sales in 2016. As discussed during key informant interviews with project personnel, 2016 was a particularly challenging year for the Beira Corridor’s dairy industry due to drought, insecurity, and the fact that several cooperatives ceased operations for at least some period of time due to technical and financial issues (such as equipment failures and rejection of milk by buyers due to quality issues). These issues are expected to have contributed to the low volume and value of sales reported.

The original baseline values calculated by MERCADO’s economic model for value of sales are nearly twice the amount calculated from the baseline data collection and about 17% more for volume of sales. This is likely because the baseline data collection did not collect data from every processor, producer, and MCC, whereas the economic model considered a sizeable number of data points based off projections calculated from the previous project’s full population of cows. The model was also built using then-current rates of cow productivity, lactation periods, and reported home consumption. The MERCADO team also employed educated assumptions related to how much milk goes to the formal sector and processing revenue in their economic modeling and considered data collection from breeders, such as average cow weight and their projections for sales over the last few years of the project. Therefore, because of these well-considered and

calculated data points used for the modeling, it could be said that the figures produced through the MERCADO economic modeling might be more accurate than those found in the baseline data collection. However, these value and volume of sales rates were calculated using data from the previous project. As we found from the IMPAQ baseline, there has been a sizeable attrition of dairy cattle since April 2016 (71% of farmers had lost their final cow since then); related value and volume of sales data and related targets will therefore be lower than initially calculated through the economic modeling.

Exhibit 38. Value and Volume of Milk Sales by Farmer Scale, 2016

	Value of Sales	Volume of Sales	N
Small producers	\$1,177.31	3.29MT	297
Medium producers	\$340.60	0.96MT	18
Large producers	\$175,101.92	225.36MT	3*
Total	\$187,215.83	229.61MT	318

*Baseline values for the volume and value of sales also include data from a large dairy producer, Clifton Meadow Farm. As directed by Land O'Lakes, Clifton Meadow Farm data is included only in these two indicators.

Exhibit 39. Milk Utilization and Sales as Percentage of Milk Production, Dry Season 2016

Variable	Small (1-3 Cows)	Medium (4-19 Cows)	Large* (20+ Cows)
Milk Retained for Consumption or Lost	42%	31%	.
Milk Sold to Cooperatives	55%	64%	.
Milk Sold Locally	6%	14%	.
Milk Sold to Other Buyers	3%	27%	.
N	295	18	2

*IMPAQ determined that the data reported by the large farms is invalid and incomplete.

Exhibit 40. Milk Utilization and Sales as a Percentage of Total Milk Production, Rainy Season 2016

Variable	Small (1-3 Cows)	Medium (4-19 Cows)	Large* (20+ Cows)
Milk Retained for Consumption Or Lost	41%	24%	.
Milk Sold to Cooperatives	57%	52%	.
Milk Sold Locally	6%	6%	.
Milk Sold to Other Sources	1%	13%	.
N	295	18	2

*IMPAQ determined that the data reported by the large farms is invalid and incomplete.

Finally, IMPAQ asked farmers about the frequency with which buyers rejected milk on quality grounds. Exhibit 41 shows that producers reported that milk rejections were common: the average small- or medium-scale producer experienced rejections, based on quality, six times in the course of a year. Rejections were less frequent for large-scale producers, but led to larger financial losses, as quality problems can lead to the loss of an entire 400- to 1000-liter tank.

Exhibit 41. Frequency of Rejected Milk in 2016

Variable	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Had Milk Rejected	48%	53%	100%
N	295	17	2
Number of Times Milk Was Rejected	6.3	6.4	2.0
Number of times milk was rejected	628.4%	644.4%	200.0%
Rejected due to mastitis	85.8%	60.0%	50.0%
Rejected due to boiled milk (leite fervido)	3.5%	0.0%	0.0%
Rejected for other reason	17.7%	50.0%	50.0%
N	141	10	2
Other Rejection Reasons		Frequency	Percent
Delayed delivery, milk rotted in transit		3	9.68%
Machine failure in the cooperative		1	3.23%
Electricity failure, no ability to conserve milk		1	3.23%
Fermented milk		9	29.03%
A lot of water in milk		6	19.35%
Low quality milk		3	9.68%
Smelled like smoke		1	3.23%
Faulty equipment		1	3.23%
Was the first milk after birth		1	3.23%
Rotten milk		1	3.23%
No fat, and pH		1	3.23%
Total		31	100.00%

In their responses to the farmer survey and through FGDs, dairy farmers commonly reflected that low prices in the market for milk and delayed payments presented significant challenges. Prices were particularly low in Manica province, where a buyer paid 16 Meticaís (22 cents) per liter and most farmers received only 13 Meticaís (18 cents) per liter after MCC/cooperative service fees were deducted. In FGDs, farmers explained that limited milk revenues made it difficult to provide necessary nutrition, supplements, and medicine for their cows, which in turn negatively affected their production. According to one respondent, “we have to do a lot of work to take care of animals with little yield in return.” These low returns also had a dynamic effect on the market: dairy farmers reduced the share of milk that they sold to formal buyers such as cooperatives and large processors, instead seeking out informal buyers who paid higher prices for retail purchases of milk. While the informal sales were financially attractive and beneficial to the farmers, they reduced the volume of milk flowing through the formal system, further exacerbating their technical inefficiencies and limiting the system’s capacity to get a firm financial standing.

Inputs and Services to Dairy Production

IMPAQ found that the supply of inputs and services to support dairy production is heavily under-developed. There are no commercial breeders of dairy stock, of feed or forage, or of dairy-specific equipment such as stainless steel pails and cans and milking machines.

Finance for Investment and Operational Capital

Farmers' difficulty in obtaining finance is a major constraint to investment and production at all levels of the value chain. Farmers reported in focus group discussions, that they have difficulty purchasing inputs and services for production. They also discussed the extremely low rates of credit solicitation and use (reflected previously in Exhibit 35). Likewise, other value chain players reported having serious difficulties obtaining credit for investment expenditures and operating capital.

In the past, Land O'Lakes worked with three financial institutions: GAPI; Banco Oportunidade; and Banco Terra of Mozambique. The one bank with which IMPAQ spoke reported that it did not "interact" with Land O'Lakes in the past on dairy projects.¹² However, IMPAQ understands that Land O'Lakes had several meetings with this bank and worked with it to link the bank with several farmers in 2015, and that plans exist for Land O'Lakes to enter into a formal agreement with this bank for MERCADO. IMPAQ assumes that this bank interpreted the concept of "interacting" with Land O'Lakes differently during the interview.

The bank reports that it is difficult for it to work with and provide financing to the dairy farmers because most are small-scale farmers who lack the assets or cash flow to guarantee a loan. "One or two cows is not a business." The bank works with no more than four of the larger-scale dairy actors that are also supported by Land O'Lakes, but they are significant operations that have assets.

The bank expressed an interest in working in the dairy sector, but also listed a number of challenges that the sector must overcome before it increases investment. For example, the dairy sector's limited value; insufficient support to the farmers for sick cows (they die, they do not get better); closing or dysfunctional associations (a potential avenue for investment); missing or unavailable infrastructure (refrigeration, distribution, collection); and difficulties investing in people as opposed to businesses (more expensive for the bank). If the bank was to invest in the sector, it likely would focus on the processing side. The bank stated that a system of loan guarantees or funds matching would provide incentives for the banks to pursue more clients from this sector.

Dairy Animals

IMPAQ interviewed two dairy producers, both of whom indicated interest in commercial breeding. They were still several years from such operations, however, as they first wanted to use their breeding resources to get their own dairy herds to their target sizes and were only willing to sell calves after their herds reached target size. These producers were interested in taking advantage of the efficiencies available by integrating breeding and milk production because they would breed their cows regardless to produce milk, and commercial production of cattle would require relatively little additional investment (mainly in acquiring quality genetic stock that would produce calves and heifers that would bring good prices). One interviewee estimated that a breeding-age heifer would market for 50,000-55,000 Meticaís (US\$700-770), and a pregnant heifer for 78,000 Meticaís (US\$1,092) (these estimates were based on the cost of rearing the heifers). Both potential breeders had a solid preference for using AI for re-production and stated that they would benefit from project assistance to acquire adequate farm-level equipment and semen to facilitate these activities.

¹² Interview question: Has your firm interacted at all with the Land O'Lakes dairy projects (including MERCADO project)?

Feed/Forage

The same firms that were potential commercial breeders also expressed interest in producing feed and/or forage commercially. One firm reported that it invested in a plant for feed production; however, the plant was not yet producing feed commercially because of inadequate electricity supplies, which resulted in the plant not running consistently. Additionally, the recent drought pushed up raw material prices too much for farmers to be able to afford the feed. The firms' first priorities were meeting the feed and forage needs of their own dairy herds, after which they were interested in commercial production for sales to neighboring farmers. Again, these operations would take advantage of production efficiencies as they could leverage the equipment they used for their own herds' feed and forage needs to produce additional at little incremental expense (only the cost of fuel and any additional equipment maintenance costs). The major challenge that these potential commercial feed and forage producers faced was access to equipment and finance to purchase it. One respondent stated that the firm was currently producing forage on 60 hectares, and would expand to 150 if adequate machinery became available.

Another potential source of forage would be large commercial firms that currently serve the poultry industry. While Land O'Lakes previously explored the possibility of bringing in feed through these large suppliers, their minimal volume requirements (in one case 30 tons) were nearly double the needs of Land O'Lakes' beneficiaries at that point, and the transaction did not occur. As the scale of Land O'Lakes' beneficiaries' production increases, it is likely that their feed requirements will increase to levels that will allow such acquisitions, implying that MERCADO should revisit the option of facilitating such acquisitions in the future.

Dairy Supplies and Equipment

The availability of equipment and supplies for dairy production was severely constrained, limiting production activities. For example, most small-scale producers were entirely dependent on Land O'Lakes for re-supply of any needed equipment and did not expect to pay for it. One producer stated simply "*Land O'Lakes é a mãe.*" ("Land O'Lakes is the mother" and repeatedly referenced Land O'Lakes as the source of any needed equipment or supplies. Other producers, particularly those operating at larger-scales, were frustrated by their difficulties accessing needed equipment and supplies. For example, one producer ordered CMT testing solution through a local agri-vet supplier, but required multiple follow-up efforts with the supplier over several months to actually get the product. While this producer preferred to source the input directly from Zimbabwe, the political situation there had made it infeasible to do so.

Animal Health Services

Livestock health services were not readily available; 50 percent of producers reported that they depended on either government service providers or Land O'Lakes for access to testing, vaccinations, medications, dips, and CMT testing resources. As reported in Exhibit 25, only a minority of producers reported that they could easily access the animal health services that they needed.

A contingent of paravets were trained by Land O'Lakes. Paravets provide their services on a volunteer basis, but can earn income from their activities through the sale of veterinary inputs such as medicines, although these earnings are curtailed by the low purchasing power of the farmers

they serve. Of 74 paravets, 26 were active. The range of the number of dairy producers that the paravets reported supporting varied widely, from as few as 3 to as many as 71. Demand for their services appeared to be relatively muted; some paravets reported that they provided services once a week while others said once or twice a month. In addition, many respondents said that producers called them by phone with questions. All of the paravets reported that they were able to meet the volume of demand for their services, despite the challenges. The most common challenge was the lack of appropriate medical equipment and supplies, while the second common challenge was lack of transportation to visit the producers. To tackle these challenges, respondents would like to receive financial support to purchase the proper medication, medical equipment, and transportation such as motorcycle.

When asked how MERCADO could help them to better support local dairy production, paravets most commonly asked for training. Other suggestions included support for improved collaboration between paravets and producers and financial support to purchase equipment, veterinary supplies, and transportation. Paravets expressed a desire for training on topics such as artificial insemination, birth, and post-partum care. Some respondents also sought more training on overall cow nutrition and care, which could ensure higher quality of milk. Likewise, a number of paravets expressed an interest in having refresher courses on topics that were covered during their previous Paravet training.

Dairy Entrepreneurs

Land O'Lakes worked with local educational institutions to establish training programs to develop capacity for professional work in the dairy sector. FGDs among students who had participated in these programs showed that the programs piqued the students' interest in a career in the dairy sector. All students reported that the information they received in the dairy training was useful and applied to their career fields, and that they appreciated the integration of theoretical and applied lessons. According to one student, the theoretical and practical training was "interrelated. We learned [why a] cow needs a [certain type] of medicine and then we practiced giving the vaccines." Another student agreed and explained, "whatever we learned [in the classroom], we are seeing out there [in the field]."

While all students reported that the theoretical and practical training was helpful, they stated that employment opportunities within the dairy sector were limited. Only a handful of the students are working in the dairy sector, and they all work for the school/mission where they did their dairy training. Several other students are still in school and the rest do not work in the sector. Many students attributed the lack of employment in the dairy sector to the limited number of large-scale dairy farmers and the large number of small businesses that had limited or no employment opportunities. As a result, the majority of students stated that it was easier to be self-employed in activities such as independent consulting to provide dairy farmers assistance and guidance on animal nutrition and milk production. Others said they would like to work for Land O'Lakes or another large-scale dairy farming operation. Students had mixed reactions when asked if they felt prepared for employment in the dairy sector. Some felt prepared while others felt they would like more training on specific areas such as sanitation, milk storage, and process methods.

Post-Farmgate Value Addition

Transport of Milk from Farm to Collection Centers

Small farmers responded to the survey that they transported milk most commonly by foot, with delivery time averaging 37.2 minutes. This fact has important implications not only for cost, but also for milk quality. Bacterial populations in milk double every 20 minutes at typical ambient temperatures. Considering the lack of cooling facilities on most farms, this extended transport time hurts milk quality by extending the time that the milk goes without cooling. Farmers recognized transport as an important constraint, as revealed in FGDs. Farmer focus group participants, particularly rural ones, reported that they generally transported their milk long distances on poor quality roads in a non-climate controlled environment via bicycle or on foot. They expressed particular concern about the implications of this for milk quality. To mitigate this issue, some farmers reported using their evening milking for personal use, because it is the smaller of the two milkings, and delivering their morning milking to the collection center. Other farmers reported that they boil the milk from the evening milking to kill bacteria in it. This method of milk preservation is frowned upon by major processors because it often imparts a smoky flavor to the milk, leading to rejections of milk for boiling when it is detected.

Exhibit 42. Milk Delivery Frequency and Transportation Mode

Variable	Small (1-3 Cows)	Medium (4-19 Cows)	Large (20+ Cows)
Delivery Frequency			
Once A Day	42%	61%	100%
Twice A Day Or More	58%	39%	0%
Delivery Transport			
On Foot	42%	17%	0%
Bicycle	32%	33%	0%
Motorized Transport	4%	22%	100%
Buyer Picks Up	0%	11%	0%
Paid Transport	15%	0%	0%
Other Transport	7%	17%	0%
N	295	18	2
Average Delivery Time in Minutes			
All Methods	37.7	29.8	22.5
On Foot	37.2	56.7	.
Bicycle	44.3	26.8	.
Motorized Transport	46.3	16.7	22.5
Buyer Picks Up	.	0	.
Paid Transport	31.2	.	.
Other Transport	15.2	41.7	.

Milk Aggregation

Milk is aggregated at milk collection centers (MCCs), which are operated either by cooperatives, processors, or in some cases, dairy producers, and schools. At the MCC, milk undergoes preliminary quality testing, although implementation of these tests is as yet incipient, particularly among the newest MCCs. At times, the tests are forgone or conducted only by subjective means such as taste or visual inspection of the milk. At baseline, few MCCs reported using standardized methods to test the quality of incoming milk.

Exhibit 43 summarizes baseline results for key performance indicators relating to MCC and cooperatives. In 2016, the baseline reference period, MCCs and cooperatives interviewed reported selling a total of 70.81 metric tons of milk, accruing revenue of \$10,662. The relatively low value and volume of sales across the aggregators¹³ that formed part of the baseline sample were a reflection, in part, of the fact that a number of MCCs were very new (one, for example, had only started accepting milk in October 2016) and not all project MCCs provided data. Additionally, some aggregators had experienced extended shut-downs due to financial issues relating to failed equipment and, in at least one case, milk rejections by the processors.

MCCs and cooperatives reported a total of 11 employees working in areas such as intake of fluid milk from suppliers, quality testing, and administration. Respondents did not report co-financing of improved market infrastructure during the baseline period, and adoption of established market standards was also not in place. There was also a lack of consistent adherence to improved practices such as proper cleaning of milk receptacles and storage units using appropriate cleaning agents, or use of financial products to support operational or investment expenditures. Finally, aggregator respondents reported a total of 3.45 cubic meters of cold storage capacity.

Exhibit 43. Key MCC/Cooperative Indicator Baselines

#	Performance Indicator	Baseline Value
1	Value of sales by project beneficiaries	\$10,662.48
2	Volume of commodities sold by project beneficiaries	70.81MT
3	Number of jobs attributed to USDA assistance	11
23	Number of sales agreements between input suppliers, cooperatives and processors	\$0.00
24	Number of dairy actors that finance improved market infrastructure	0
25	Number of producers, MCCs, and processors that adopt established standards	0
27	Total increase in installed storage capacity (dry or cold storage) as a result of USDA assistance	3.45 cubic meters (3,450 liters)
30	Number of private enterprises, producer organizations, water users' association, women's groups, trade and business association and community-based organizations (CBOs) that applied improved techniques and technologies as a result of USDA assistance	0

Milk Processing

Baseline values for key indicators are summarized in Exhibit 44, below, and discussed in the ensuing paragraphs. Processors collect milk from the collection centers or cooperatives after conducting their own initial quality testing. They then transport milk to their plants where it is subjected to further quality testing, offloaded into chilled tanks, and processed either into pasteurized fluid milk, yogurt, or cheese. Most milk is sold on a small-scale basis, for example by

¹³ An aggregator was defined as having met the established standard if it followed all three of the following practices: a) procedure-based sampling of all incoming milk deliveries; b) testing against pre-defined parameters relating to bacteria, water adulteration, fat, and anti-biotic residues; and c) acceptance decisions made on the basis of test results.

itinerant vendors selling from street carts, to local institutions (such as schools), or restaurants, and small shops. None of the processors interviewed sold dairy products to the country's larger supermarkets.

Processors cited a number of serious constraints limiting their operations and commercial viability. From an operations standpoint, processors cited the low volume of quality milk available as a major factor limiting the largest processors' scale of operations, which greatly reduced their operating efficiency. The limited volume of milk constrained processors' operating efficiency because it prohibited processors from operating at scale. The largest processors reported operating at between 24 percent and 36 percent of their capacity during 2016, and some cited significant financial losses as a result. The aggregate processor capacity utilization figure (Indicator 22), 26.82 percent, was calculated taking an average of processor capacity utilization weighted by each processor's total capacity. It, and other indicator values relating to processing, do not include AgroMaco's new 8,000 liter/day processing line, which was not yet on-line at the time of baseline data collection.

Low processing volume also is affiliated with low milk quality, as the dairy value chain is not yet developed to the point where it requires or rewards the production of high quality milk, or where it adequately preserves the quality of the milk as it moves along the value chain. The processors that IMPAQ interviewed were developing their own infrastructure and systems to monitor milk quality. Processors had not yet adopted a consistent set of quality standards for incoming milk (Indicator 25). Consequently, the types of problems that processors tested for and reported as the basis for rejecting incoming shipments of milk varied. For example, one processor reported using Lactoscan to test for fat content, water, protein, temperature, mastitis, and acidity, and cited a rejection rate of 30 percent for adulteration with water. In contrast, another processor reported testing a similar array of quality parameters but having little cause to reject milk (a specific figure was not provided in this case). Finally, a third processor reported basing quality analysis off of the South African milk standard, and reported having the most significant problems with bacteria counts, as well as problems of smoky flavor due to farmers' boiling milk. The actual rejection rate cited by this processor was very low because it counted only milk that was rejected after arrival at the plant, and did not include the milk that drivers never collected due to quality-based rejections at the collection centers. Processors reported being entirely dependent on domestic milk production for their processing needs; they reported that imported powder did not meet their technical requirements (except for one firm that used it on a limited basis as a stabilizer, accounting for less than 1 percent of his processing volume) and was also too costly.

Financial viability due to liquidity and credit constraints was another major factor affecting processors' performance. One of the country's largest processors reported carrying a large debt load that it had difficulty offsetting. It also reported that while the government and donors were willing to finance investments to increase its operating capacity, they did not provide support for operational costs, and credit for operational costs was unavailable. Another large processor reported that it faced net financial losses on a monthly basis largely due to low processing volume, and reflected that it was reaching a point where it needed to be able to demonstrate financial viability to its major stakeholders if they were to continue to support its operations.

Processors reported a total of \$1,039,973 in sales (1,335.7 MT of fluid milk) in 2016, with virtually all of that input (1.3M liters) coming from milk produced in Mozambique¹⁴. Processors reported rejecting a weighted average (based on total volume) of 1.7% of milk that they accepted. Processors were responsible for relatively limited employment, 84 employees (52 men, 32 women) spread among the three largest processors. In contrast with other value chain players that had little investment, processors reported significant investment in their processing facilities: one had installed a new 8,000 liter/day processing that (that was still to come on line) using grant co-financing, while another took a bank loan to finance approximately \$200,000 in processing line repairs and upgrades. These, as well as self-financed investment by a third processor, account for the uptake of adoption of improved post-production handling and use of improved techniques and technologies reported in Indicators 26 and 30, respectively. Only one processor had a formal sales agreement with a milk supplier; all others reported receiving milk from suppliers on the basis of ongoing informal agreements. Processors' cold storage facilities amounted to 20 cubic meters.

¹⁴ Sales data from producers, aggregators, and processors should logically be similar given that processors obtain nearly 100% of the fluid milk that they process from local suppliers. Discussion is made in the Recommendations of how discrepancies among these dairy value chain actors can be rectified for purposes of indicator calculations.

Exhibit 44. Key Processor Indicator Baselines

#	Performance Indicator	Baseline Value
1	Value of sales by project beneficiaries	\$1,039,973.13
2	Volume of commodities sold by project beneficiaries	1335.74MT
3	Number of jobs attributed to USDA assistance	84
15	Number of loans disbursed as a result of USDA assistance	1
16	Value of loans provided as a result of USDA assistance	\$200,000.00
19	Amount of milk processed in Mozambique from Mozambique produced fresh milk	1.3M liters
20	Total value of value-added products made from milk	\$1,035,581.12
21	Milk rejection rate of processors	1.7%
22	Percentage of processor capacity utilized in Mozambique	26.82%
23	Number of sales agreements between input suppliers, producers/cooperatives and processors	1
24	Number of dairy actors that finance improved market infrastructure	0
25	Number of producers, MCCs, and processors that adopt established standards	0
26	Number of producers, MCCs, and processors that adopt improved post-production handling	3
27	Total increase in installed storage capacity (dry or cold storage) as a result of USDA assistance	20 cubic meters
28	Number of dairy actors that finance improved post-harvest infrastructure	0
30	Number of private enterprises, producer organizations, water users' association, women's groups, trade and business association and community-based organizations (CBOs) that applied improved techniques and technologies as a result of USDA assistance	3
33	Number of individuals receiving financial services as a result of USDA assistance	2
35	Value of grants provided	\$0
39	Number of processors trained in improved post harvest handling techniques	0

Household Demand for Dairy

One of MERCADO's seven activities is intended to increase demand for domestically produced dairy products through educational and marketing campaigns aimed at youth and other consumers.

IMPAQ's FGDs with youth, who are slated to be the subjects of these campaigns, showed that most youth consumed dairy products, though the frequency of their consumption and their tastes varied. Some youth drank milk daily, while others only once a week; nevertheless, when asked if they wanted to drink more milk, all replied yes. When asked why, youth consistently referenced health as a key motivator, saying, for example, milk "replaces the vitamins that you lose through

activity.” Likewise, many youth respondents explained that the milk products give them energy and provide valuable vitamins. According to one respondent, “milk helps you grow.”

All youth respondents enjoyed the taste of milk, although several pointed out that the flavor of store bought boxed milk differed from fresh milk purchased from their neighbors. In the words of one youth, the neighbor’s milk “smells a little bit.” The youth had mixed views on both yogurt and cheese; some enjoyed it while others did not. Of the two milk products, youth preferred yogurt to cheese. Youth who did not like yogurt and cheese described the products similarly using adjectives such as “rotten” or “strong smelling.”

Youth respondents reported that their parents purchased milk or milk products from a variety of sources, including supermarkets such as Shoprite, small shops, and neighbors. Youth recognized that milk purchased from informal sources such as their neighbors was much cheaper compared to milk products sold in the shopping centers or small shops. According to one respondent, “if you don’t have much money, then you would buy [the neighbor’s cows] milk.” Nonetheless, when asked what type of people drink milk, youth respondents said “people who have money.” Examples included people of all ages such as teachers, construction workers, and farm workers.

Youth also had a sense of basic quality issues around dairy and dairy products. When asked how the youth knew if milk or a milk product was of poor quality, the respondents said they could tell by the poor taste, smell, and expiration date on the container. One respondent said that if mastitis was present during milking, then the milk was contaminated. All respondents said if they came across poor quality, or “bad,” milk or milk products, they threw the item away.

When asked how they had learned about milk, youth in Sofala reported not having any particular training, whereas youth in the Manica focus groups had received some training. Specifically, youth respondents from Manica, Vunduzi district had learned about milk or dairy products in school,¹⁵ saying that they had received a presentation about milk products, how they are collected and transported, and how to maintain milk quality through proper storage. One youth from Manica, Gondola district participated in a program that discussed the nutritional benefits of milk. When asked if there was anything the youth would have liked to learn more about when it comes to dairy products, youth respondents from all areas had a variety of suggestions that included learning more about milk products, transportation, and the production process.

¹⁵ Through the previous Land O’Lakes dairy project.

4. CONCLUSION AND RECOMMENDATIONS

In this baseline assessment, IMPAQ documents the current state of key dairy actors; analyzes gender issues, and offers recommendations to ensure the gender equity of MERCADO's impact; establishes project baseline values; provides recommendations for setting and refining project indicator targets; identifies potential strengths, weaknesses, opportunities, and threats to the project's implementation; proposes strategies to maximize strengths and mitigate challenges; and generates data to be used for comparative analysis throughout the life of the project.

The Beira Corridor's dairy value chain has, as its foundation, a contingent of small-scale household-based dairy farmers. Dairy production is largely a small-scale enterprise, where 93.69 percent of the dairy producers have only 1-3 cows. Four percent of dairy producers qualify as medium-scale producers and only two dairy producers operate on a large-scale, with a herd of more than 20 productive cows. Nearly all (99%) small-scale farms are households; the larger-scale farms often operate as organizations (schools or orphanages with dairy operations) or as commercial firms.

Synthesis of Major Analytical Results

IMPAQ's baseline results show that despite having completed Land O'Lakes training certification program and having substantial knowledge about dairy production, husbandry, and management, many farmers did not follow the practices that prescribed by Land O'Lakes to achieve the quality and quantity of milk that the market requires. Farmer survey and focus group results point to several critical factors leading to these substandard results: constrained access to critical inputs, equipment, services, and infrastructure; limited finance to pay for needed equipment, inputs, and services; and inhibited incentives, i.e., low market prices, to drive dairy farmers to employ best practices.

IMPAQ found that in addition to low productivity at the farm level, due to low daily yields of milk, short lactation periods, and long calving intervals, low milk quality also constrained development of the dairy market system. Farmers used practices that optimize herd health and milk quality inconsistently, and aggregators likewise were inconsistent in applying quality standards to eliminate sub-standard quality milk as it reached the collection centers. This led to "snowballing" of quality problems as contaminated milk was mixed with quality milk, leading at times to rejections of entire lots causing large financial losses and exacerbating production inefficiencies along the value chain. Processors reported significant quality problems, along with low volumes of milk, as major factors constraining their sales and operational efficiency.

Farm-level results revealed that medium-scale farms typically performed the worst in terms of adherence to recommended practices, as well as productivity and quality considerations. While this result is of interest in itself, it becomes an urgent matter for consideration in light of the fact that one of MERCADO's important thrusts is to increase the scale of production and to develop a producer base of medium-scale farms that can be operated more professionally, productively, and profitability than the current base of small-scale farms. It is an important result of this analysis that scale of production does not necessarily correlate with adherence to the practices and achievement of the outcomes that are sought. Land O'Lakes should investigate and identify the factors resulting in the sub-optimal performance of medium-scale farms to design a strategy to effectively increase

the scale of production while also meeting the project's objectives that farms integrate improved practices to increase their productivity and profitability.

IMPAQ's inquiries into consumer demand focused on youth, who are slated to be the subjects of informational campaigns aimed at raising demand. Most youth already consumed dairy, and broadly appreciated milk's health benefits and its taste, although perceptions of the taste of yogurt and cheese varied. Parents purchased milk from both informal sources (neighbors), as well as stores, and recognized informal purchases as being a budget option for poorer households. Youth consistently were interested in increasing their consumption of milk and dairy products.

Preliminary Findings

The baseline assessment aimed in part to inform the project's evaluation questions relating to the project's relevance, impacts, effectiveness, efficiency, and sustainability. IMPAQ's preliminary observations are below:

Project Relevance

Both independent analysis by IMPAQ's evaluation team and input from the project's stakeholders (including public and private sector representatives) support the assessment that, as designed, MERCADO is highly relevant to the needs and conditions of the Beira Corridor dairy sector. With its focus on increasing production and trade, as well as increasing household food security through income generation, MERCADO is also oriented to directly support FFPr's strategic objectives.

Meanwhile, the project is also, in its overarching themes, well suited to the realities and requirements of the Beira Corridor's dairy sector, particularly the need for development of a private sector-driven value chain that is technically and financially competitive and sustainable without excessive dependence on donor support.

Potential Impact

If successful, MERCADO should have a significant impact on the scale, technical and financial viability, and sustainability of the Beira Corridor dairy value chain. It is worth noting, however, that in shifting focus to producers that have the potential to produce at a larger scale of operations, distribution of impact will likely differ from the earlier Land O'Lakes project activities. Specifically, the project may have the effect of reducing the viability of smaller scale producers. Many of these producers operate at lower levels of profitability and with a tendency toward substandard practices and infrastructure, which imply their need for increased support if they are to continue to operate in the market. A smaller number of producers may receive significantly larger income benefits, even as a relatively large number of producers (who are not inclined or able to increase their sales) may see reduced income from milk production. The project offers a means to continue to support the involvement of smaller-scale producers in the market, even if the project's primary focus shifts from direct facilitation of production at this scale. The project could continue to explore alternative aggregation models, and to increase the capacity of aggregators such as cooperatives and MCCs to provide services to dairy producers, as well as to aggregate milk.

Another important issue is the interdependence between different types of value chain players—both vertically and horizontally related—and the likelihood that the project's impact on one type

of value chain player will either positively or negatively affect the success of related value chain players. With respect to vertically related value chain players, for example, if the project succeeds (or fails) in increasing the volume of milk coming from farms, then the efficiency of downstream value chain players who operate with significant economies of scale will likewise be directly affected. Similarly, issues with the quality of milk at each value chain stage will have a significant impact on operations further downstream, particularly considering the potential, at each successive stage of aggregation, for quality problems to be compounded, if problem shipments of milk are not excluded before bulking.

MERCADO's focus on developing alternative outlets for milk also presents the potential for negative interdependence among horizontally related value chain players too. Specifically, given the very low utilization of capacity of the largest processors and the fact that a new large-scale processing plant is soon to come on line, MERCADO's emphasis on developing alternative outlets for milk risks reducing availability of milk to the large processors. As a result, they will continue to struggle to reach the volume of production needed for financial viability.

Project Effectiveness

The project's targets and outcomes are based on careful and well-grounded consideration of the implementation environment and the capacity and needs of the dairy sectors' stakeholders. Individually considered, IMPAQ's baseline assessment suggests that the project has a high likelihood of meeting its key outcomes and targets.

That said, the project is highly ambitious in its intent to achieve a scale of production that will support a diversified processing industry. Realization of the project's objectives will require progress towards multiple milestones simultaneously. Failure to make progress in some areas will compromise progress in other areas, such as the project's overarching goal of establishing a competitive and sustainable private-sector driven dairy industry. For example, the current unmet demand for raw milk among the country's largest processors currently impedes their competitiveness and viability, and consequently their procurement of raw milk. Yet, the project is also seeking to promote the development of alternative market outlets for dairy to induce competition in the market. Large increases in production of raw fluid milk are needed to supply both types of suppliers. Without these increases in production, the viability of both types of suppliers could be compromised.

Project Efficiency

Given that the project is only in start-up phase, IMPAQ does not have any preliminary observations on the efficiency of the project's implementation.

Sustainability of Project Activities and Benefits

MERCADO's theory of change and the interventions that support it are heavily oriented to establishing a sustainable dairy industry. The project will contribute to the development of a sustainable dairy industry if the following activities are effective: emphasizing larger-scale producers that have greater capacity to produce the quantity and quality of milk required for processing; creating a private sector-driven value chain to support this production; focusing on facilitation rather than directly providing inputs and services; and developing alternative market outlets to offset the monopolistic influence of the largest processors.

Gender Equality and Equity

Please see the separate Baseline Gender Analysis for preliminary observations on this issue.

Dairy Market System's Strengths, Weaknesses, Opportunities, and Threats

MERCADO's theory of change posits that facilitating training, equipment, and inputs among dairy value chain actors will increase their knowledge and productive capacity to produce and add value to quality milk products, while simultaneous improvements to the market (in particular, prices and market terms) will increase their motivation to do so. Simultaneously increasing value chain actors' knowledge, productive capacity, and motivation will lead to increases in the volume and quality of milk that is produced at the farm level and subsequently moves along the value chain. Together, increases in the volume and quality of milk production will result in a competitive, profitable, and sustainable dairy market system. IMPAQ considers the project's strengths, weaknesses, opportunities, and threats relating to its efforts to develop the dairy market system and meet the project's overriding objectives, which it summarizes in Exhibit 45 and discusses in greater detail below.

The project faces several sizeable challenges with respect to creating a sustainable and competitive Mozambican dairy industry. These challenges include both current weaknesses of the dairy market system, as well as threats to its development.

First, the volumes of milk are too low for scale economies to be realized, particularly at the processing level. MERCADO has a range of strategies to overcome this constraint. Second, the quality of milk coming from farms is low, and tends to be further compromised as it moves along the value chain. Because milk is aggregated progressively, if poor quality milk is not detected and removed early, then successively large volumes of milk are compromised as the milk is bulked.

Meanwhile, the structure of the dairy value chain has significant weaknesses that are compounded by the low volume and quality of milk. There are two major milk processors, both of which operate well below capacity, and face substantial financial and operational constraints. These constraints both exacerbate and are exacerbated by the low volume and quality of milk coming from local dairy farmers. The project recognizes and is motivated by the large volume of unmet demand presented by these processors, even as it recognizes that their large scale and monopsonistic stature makes suppliers vulnerable to these buyers. A processor's unilateral move to reduce the price paid for milk from farmers several years ago; its more recent cessation of milk purchases from many suppliers (due to quality problems); and another's liquidity constraints (which have led to delays in making payments to farmers for milk) are emblematic of this vulnerability. In response to this particular challenge, MERCADO seeks to develop alternative outlets for milk by developing the processing capacities of smaller players in the market. To the extent that it succeeds in doing so, however, without substantially increasing the volume of quality milk availability in the market so that the requirements of both large *and* alternative processors can be met, the more it reduces the availability of milk to these processors, further reducing their efficiency and financial viability.

A final central challenge, related to those previously discussed, is that the poor market for milk has undermined farmers' motivation to invest in their milk production. There is a lack of concerted demand in the market to motivate the investments by farmers and other value chain players that will be needed to improve the volume and quality of milk moving through the value chain.

Exhibit 45. Dairy Market System's Strengths, Weaknesses, Opportunities, and Threats

Strengths	Weaknesses
▪ Land O'Lakes is strong in dairy, well-established in Mozambique, has strong relationships and partnerships with relevant players in the market, and credited for essentially having established the dairy industry. ▪ Land O'Lakes has a clear understanding of the technical issues and challenges facing dairy producers and other dairy value chain actors and a clear understanding of the overarching requirements to develop a sustainable and competitive dairy market. ▪ Dairy sector stakeholders in the non-governmental, government, and private-sector broadly support MERCADO's intent and overarching approach, and are willing to collaborate with Land O'Lakes to achieve its objectives.	▪ There is not a clear strategy to coordinate project investments along the dairy value chain to ensure that different demand centers do not compete with one another, further hurting the viability of milk processing. ▪ There is a lack of rigorous analysis of technical, financial, and economic viability of milk production and value addition, on which to base strategies to optimize investment in the value chain.
▪ The dairy value chain is essentially complete from the farm-level through consumption. There is adequate physical capacity for aggregation, storage, and processing of current volumes of milk as it moves along the value chain. ▪ There is strong un-met demand for fluid milk among existing dairy processors and an interest among end consumers in increasing their dairy consumption. ▪ There is a strong base of producers, most of whom have multiple years of experience in dairy. These producers have track records that can be assessed in identifying the best candidates for investment and up-scaling of production.	▪ An under-developed market for inputs, equipment, services, and finance constrain investment and productivity along the value chain. ▪ Low prices curtail investments to increase milk production. ▪ Producers do not invest at optimal levels in their milk production and do not adhere to recommended practices regarding dairy herd management, milk production, and post-harvest. This weakens the quantity and quality of milk available. Quality problems tend to be exacerbated when the milk is aggregated as it moves along the value chain. ▪ The dairy value chain, albeit largely complete, suffers from dis-economies of scale due to the low volume of milk available from the farm level. ▪ There is limited price incentive to motivate increased scale and professionalization of dairy production. ▪ Processors are not currently breaking even. Bringing in more processors will hurt finance at that level without necessarily increasing the prices that producers receive for their milk. ▪ Financial and economic viability of dairy value chain actors is low or unproven at various levels of the value chain and scales of production. Technical viability of value chain is unclear at certain nodes, particularly at production level; limited farm and transport resources and infrastructure combined with extended delivery times exacerbates milk quality problems.
Opportunities	Threats

Recommendations

IMPAQ presents recommendations below based on the baseline results and findings for MERCADO project interventions, special studies, indicators, and targets.

- **Project interventions**

- **Continue with overarching project approach, as currently designed:** The results of the baseline analysis largely support the project approach as currently designed, including its focus on increasing scale or production at the farm level; creating a market-based supply of inputs, equipment and services to support farm production; and upgrading aggregation and value addition activities to support the transmission of improved quality milk along the value chain. IMPAQ presents several additional recommendations to complement or shift the focus on some aspects of this approach below.
- **Focus on increasing the volume of milk produced by increasing scale of production:** This focus is already part of the MERCADO approach, and findings support the orientation towards larger producers. That said, additional inquiry into the reasons underlying medium-scale farms' relatively low adherence to recommended practices, and their poor results with respect to productivity and quality, bear further investigation (as discussed below) to ensure that the intervention's strategies also address these issues.
- **Emphasize availability and access to inputs, equipment, and services, and incentive to use those, over training activities, to increase knowledge at the farm level.** This recommendation builds on the result showing that farmers have substantial knowledge about dairy herd management and milk production, despite the fact that they do not consistently employ this knowledge by implementing recommended practices. IMPAQ recommends that MERCADO emphasize investments to increase farmers' technical capacity and motivation to apply recommended techniques, while maintaining and updating knowledge but not over-emphasizing it in project activities as lack of knowledge does not appear to be the major factor impeding progress towards desired results.
- **Promote milk quality along the value chain:** IMPAQ recommends aggressively investing in technical capacity building to enhance milk quality, as well as instituting and enforcing standardized testing to identify poor quality milk and withdraw it from the value chain at each major aggregation level, and particularly at the MCC/Cooperative level.
- **Create incentives to invest in milk quality:** The project should create price incentives for quality milk. Price incentives have several possible effects: increase the quality and quantity of milk production by providing farmers with greater incentives to invest in production; increase quantity of milk production; increase amount of milk sold by farmers that is accepted and purchased by the cooperative/MCCs; and increase amount of milk sales revenue to producers. For these incentives to work, all participants in the dairy value chain must be accountable, which would, among other things, require adequate milk quality testing at every step of the value chain. The AgResults initiative (www.agresults.org) offers an example of one innovation (currently being tested

through a series of pilot projects) to use temporary financial incentives for verified results to promote similar outcomes while enhancing market sustainability. Such incentives can be designed to function at low volumes of production and trade, thus helping to overcome the “chicken and egg” problem of low rewards for quality (and difficulty determining quality) inhibiting the production of quality milk which then further depresses willingness and ability to pay for quality.

- **Special Studies:** Given what IMPAQ has learned from the baseline analysis, IMPAQ recommends that Land O’Lakes undertake the following special studies to further knowledge in a particular area and/or create an evidence base to inform programmatic methods:
 - Value chain economics: A special study focused on the financial and economic aspects of dairy production and value addition, with analysis at different scales of production and under varying current and prospective aggregation models
 - Medium-scale production practices and outcomes: A special study further investigating baseline results that show that medium-scale farmers lag behind small and large-scale farmers in their adherence to recommended practices, and have poorer production and productivity outcomes as well. This study should seek to understand the reasons underlying these differential results, and devise strategies to mitigate them through project programming.
- **Indicator Revisions**
 - Indicator Names: 1 and 2: Calculating value of sales by project beneficiaries and volume of sales/commodities sold by project beneficiaries.
 - Recommendation: As discussed in the Results, there were significant discrepancies in volume and value of sales reported by producers, aggregators, and processors and found through the MERCADO team’s economic modeling. Given producers’ weak record keeping, which puts the producer-level results in question, IMPAQ recommends re-calculating the volume and value of sales on the basis of processor and MCC sales of all project-supported facilities (not just those captured through the baseline data collection). The producer values could be collected, but they should not be considered reliable data. Complete data from *all* MCC/Cooperative sales could be collected by project staff at start-up and also used as the basis of recalculation of the indicators’ baseline values. The MERCADO’s team previous economic modeling calculations could be used as a comparison or reference point, but the baseline findings should not be compared to these results, as they represent very different population sizes.
 - Recommendation: Given the volatility of the Mozambique Metical to the dollar, the value of sales should also be reported and monitored in Meticais, and the exchange rate should be clearly noted. This may provide a more precise understanding of not just the dollar value of the commodity, but also the value in local currency.
 - Recommendation: MERCADO may want to consider helping the processors and MCCs/Cooperatives invest in a mobile technology solution that would

enable the them to more accurately collect, aggregate, and report both the value and volume of sales data.

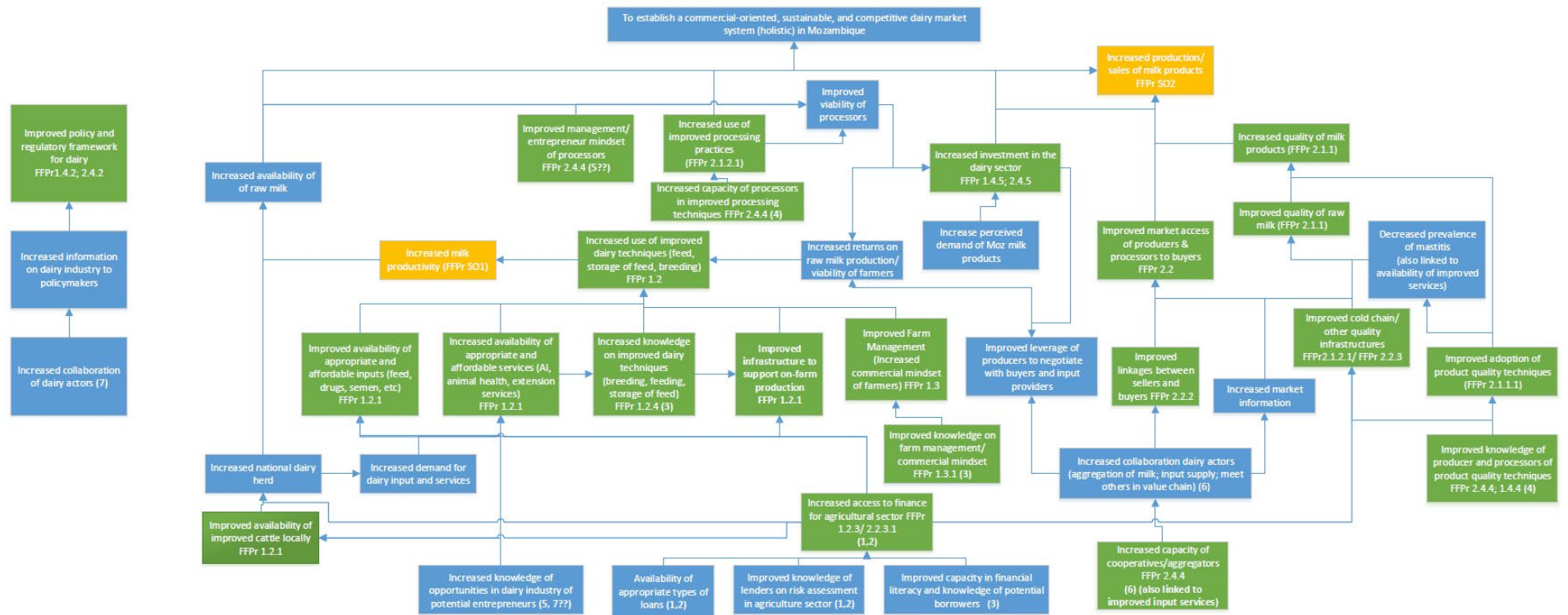
- Indicator Name: 11. Number of hectares under improved techniques or technologies as a result of USDA assistance.
 - Recommendation: Include production by commercial feed and forage producers, not just dairy farmers, in indicator definition.
- Indicator Name: 45. Regulatory body for the dairy industry created
 - Recommendation: Revise this indicator name and definition so that it counts creation of a stakeholder body that represents the dairy sector in regulatory and other concerns. The term “regulatory body” implies a body that will have legal sway over the dairy industry (i.e. the power to coerce) which appears to extend beyond the intent of the activity reflected in the indicator.
- Harmonize PIRS and PMP table indicators: In some cases, PIRS details on indicators do not correspond exactly to the PMP table indicator details. This may be a result of tailoring standard indicators to reflect project nuances, For example, Indicators 1 and 2 have disaggregations by type of commodity which is defined in the PIRS as including categories of “dairy products” or “livestock”, however the PMP disaggregations include yogurt and cheese. (In cases of discrepancies between PIRS definitions and PMP applications of indicators, IMPAQ utilized PIRS definitions as its default standard.). IMPAQ recommends harmonization across PIRS and the application of the indicators in the PMP is recommended.
- Disaggregations: “Type of Business” should refer to role of beneficiary within value chain (producer, breeder, processor, aggregator, etc.) whereas farm size should be referred to as “Producer scale” (small, medium, large)
- Exchange rate: Due to the relative volatility of the Meticaïs:Dollar exchange rate (which is currently set at 40:1 in the MERCADO PIRS), IMPAQ suggests updating the exchange rate to the current value of 70:1, and reviewing and revising periodically.
- **Refining Targets:** IMPAQ recommends that Land O’Lakes incorporate baseline values into the MERCADO economic model to refine project targets across the life of the project. IMPAQ also recommends Land O’Lakes review the following MERCADO indicator life-of-project (LOP) targets and ensure they are feasible, given baseline values:
 - Nos. 1 and 2, value of sales by project beneficiaries and volume of sales sold by project beneficiaries: Given the baseline result for value of sales is substantially lower than the baseline first established by the MERCADO team through their economic model, and due to the vast challenges to increasing milk production and sales and the large number of factors outside of project control (drought, security issues, and domestic financial woes), we recommend reducing the target LOP values for both value and volume of sales. Given the attrition rate of cattle after the initial baseline value was calculated, we recommend reducing the value of sales annual and life of project target by approximately 40% of the initial calculated baseline economic modeling. The life of target total for years 2016-2021 should be reduced from from \$29.5 million to \$17.3 million. Because the difference between baseline value of sales and the economic

modeling is relatively small (17%), yet considering how the most-recent attrition rate could affect the target, we recommend reducing this baseline value by 20%, to 18,320 MT.

- Nos. 1 and 2, value of sales by project beneficiaries and volume of sales sold by project beneficiaries: Please see recommendation above regarding indicator calculations. Additionally, we recommend that the MERCADO team re-calculate these projections and the targeting after Year 2 of project implementation, based on our previous recommendation on how to calculate these results; the midline evaluation team should also review the targeting re-calculations.
- No. 10, Number of individuals who have applied new techniques or technologies as a result of USDA assistance: If 315 farmers have already applied new technologies at baseline, given the planned consolidation of MERCADO in later years to larger farms, which will result in fewer farmers, having 350 farmers who have applied *improved* dairy techniques at the end of the project may be difficult.
- No. 15, Number of loans disbursed as a result of USDA assistance: The baseline number of loans disbursed is 6; while the LOP target is 60. Given the planned consolidation of MERCADO in later years to larger farms, which will result in fewer farmers, there may be a small number of farmers in the MERCADO project who would be available for loans. This lower number of farmers may not be offset by other actors in the dairy sector who may pursue loans, including input providers, processors, breeders, etc., because there are relatively few to begin with. Unless financial institutions are able to extend loans to small farmers, who lack the assets and capital to secure traditional loans, then these farmers will still be unable to procure loans. IMPAQ recommends possibly lowering this target value.
- No. 16, Value of loans provided as a result of USDA assistance: The baseline value of loans disbursed, \$3,432.14, is a fraction of the LOP target of \$1.2 million. Given the planned consolidation of MERCADO in later years to larger farms, which will result in fewer farmers, there may be a small number of farmers in the MERCADO project who would be available for loans, resulting in a relatively low overall value of loans disbursed. This low value may not be offset by other actors in the dairy sector who may pursue loans, including input providers, processors, breeders, etc., because there are relatively few to begin with. Unless financial institutions are able to extend loans to small farmers, who lack the assets and capital to secure traditional loans, then these farmers will still be unable to procure loans. IMPAQ recommends possibly lowering this target value.
- No. 18, Number of trained producers that can demonstrate financial literacy through response to a series of questions over the total number sampled. The current value is 71.3 percent. IMPAQ recommends possibly raising the baseline target from 75 percent to 80 percent.
- No. 24, Number of dairy sector actors including processors, retailers, and cooperatives that finance improved market infrastructure through a co-financed grant or thorough a bank loan. A target of one (1) person seems incredibly low, especially when the baseline is 90. IMPAQ recommends raising the target to a more realistic number, such as at least 50.

- No. 27, Total increase in installed storage capacity (dry or cold storage) as a result of USDA assistance: This target was intended to read 10,000 liters, or 10 cubic meters, not 10,000 cubic meters, as is the current target. IMPAQ recommends correcting this in project documents.
- No. 33, Number of individuals receiving financial services as a result of USDA assistance: The indicator definition only refers to loans, not a more broad package of financial services: "...count the number of individuals that access a loan from a financial institution ..." This definition needs to be revised to include other and all applicable financial services.

ANNEX A. MERCADO Theory of Change



ANNEX B. MERCADO Indicators

MERCADO Indicators				
#	Performance Indicator	Data Source	Baseline Value	Life of Project Target
1	Value of sales by project beneficiaries	Producers, Cooperatives, Processors	\$1,050,635.61	\$29.5 million
		Type of Business		
		Small producers	\$1,177.31	
		Medium producers	\$340.60	
		Large producers	\$175,101.92	
		MCC/Cooperatives	\$10,662.48	
		Processors	\$865,126.70	
		Breeders	\$0.00	
		Type of Commodity		
		Dairy products	\$1,050,635.61	
		Livestock (dairy cattle)	\$0.00	
2	Volume of commodities sold by project beneficiaries	Producers, Cooperatives, Processors	1406.56MT	22,900MT
		Type of Business		
		Small producers	3.29MT	
		Medium producers	0.96MT	
		Large producers	225.36MT	
		MCC/Cooperatives	70.81MT	
		Processors	1111.17MT	
		Breeders	0	
		Type of Commodity		
		Dairy products	1406.56MT	
		Livestock (dairy cattle)	0	
3	Number of jobs attributed to USDA assistance	Producers, Cooperatives, Processors	554*	600
		Producers	460	
		Male	414	
		Female	46	
		MCC/Cooperatives	83	
		Male	52	
		Female	31	
		Processors	11	
		Male	6	
		Female	5	
4	Number of individuals who have received short-term agricultural sector productivity or food security training as a	Producers, Cooperatives, Processors	0	6,000

	result of USDA assistance			
5	Total number of individuals benefiting directly from USDA-funded interventions	Participants; Grant recipients; financial institutions	0	10,000
6	Total number of individuals benefiting indirectly from USDA-funded interventions	Producers; radio station	0	92,000
7	Volume of milk output per cow per day during lactation for participating dairy farmers	Producers	8.78 liters	11
		Male owner	8.60 liters	
		Female owner	9.06 liters	
		Small producers	9.06 liters	
		Medium producers	4.62 liters	
		Large producers (n=2)	9.37 liters	
8	Average number of days in lactation period	Producers	269.19 days	290
		Male owner	283.21 days	
		Female owner	249.62 days	
		Small producers	261.83 days	
		Medium producers (n=3)	451.42 days	
		Large producers (n=0)	N/A	
9	Average calving interval	Producers	510.16 days	19 months (~570 days)
		Male owner	509.57 days	
		Female owner	510.89 days	
		Small producers	513.09 days	
		Medium producers (n=2)	497.06 days	
		Large producers (n=0)	N/A	
10	Number of individuals who have applied new techniques or technologies as a result of USDA assistance	Producers	315*	350
		Male owner	187	
		Female owner	128	
		Small producers	295	
		Medium producers	18	
		Large producers	2	
		Continuous water access	8	
		Milking machine	6	
		CMT mastitis test	56	
		Cup mastitis test	78	
		Visual mastitis test	165	
		Vaccinations	237	
		Steel receptacles	282	
		Withhold milk after antibiotics	36	
		Weekly tick control	101	

11	Number of hectares under improved techniques or technologies as a result of USDA assistance	Producers	506.3* hectares	600 hectares
		Male owner	402.9 hectares	
		Female owner	103.4 hectares	
12	Number of individuals who have applied improved farm management practices (i.e. governance, administration, or financial management) as a result of USDA assistance¹⁶	Producers	81*	105
		Male owner	51	
		Female owner	30	
		Small producers	75	
		Medium producers	5	
		Large producers (n=1)	1	
13	Percentage of dairy farmers that indicate ready access to key dairy inputs	Producers	13.3%*	80%
		Male owner	14.4%	
		Female owner	11.6%	
		Small producers	12.1%	
		Medium producers	27.8%	
		Large producers	50.0%	
		Supplements	55.7%	
		Forage	56.2%	
		Milking machine (n=5)	20.0%	
		Steel receptacles	17.6%	
		Mastitis test	31.9%	
		Heifers	22.9%	
		Health services for cattle	34.6%	
14	Percentage of dairy producers that have improved on-farm infrastructure	Producers	98.65%**	50%
		Male owner	8.6%	
		Female owner	11.0%	
		Small producers	9.6%	
		Medium producers (n=3)	0.0%	
		Large producers (n=0)	N/A	
		Tractor	1.4%**	
		Milk Machine	1.8%**	
		Milk Filter	74.3%**	
		Feeder	64.9%**	
		Corral with shade	77.4%**	
		Corral with ventilation	81.5%**	
		Corral with concrete material under the milking area	37.4%**	
		Corral with fodder recipient	69.4%**	
15		Financial Institutions	6*	60

¹⁶ IMPAQ used four variables to create this indicator: keeping a daily dairy production register; keeping a daily milk allocation register; keeping a farm transaction register (revenues and expenses); and keeping a register of farm visitors. The farmers were counted to have applied improved farm management only if they had all four of these types of record keeping.

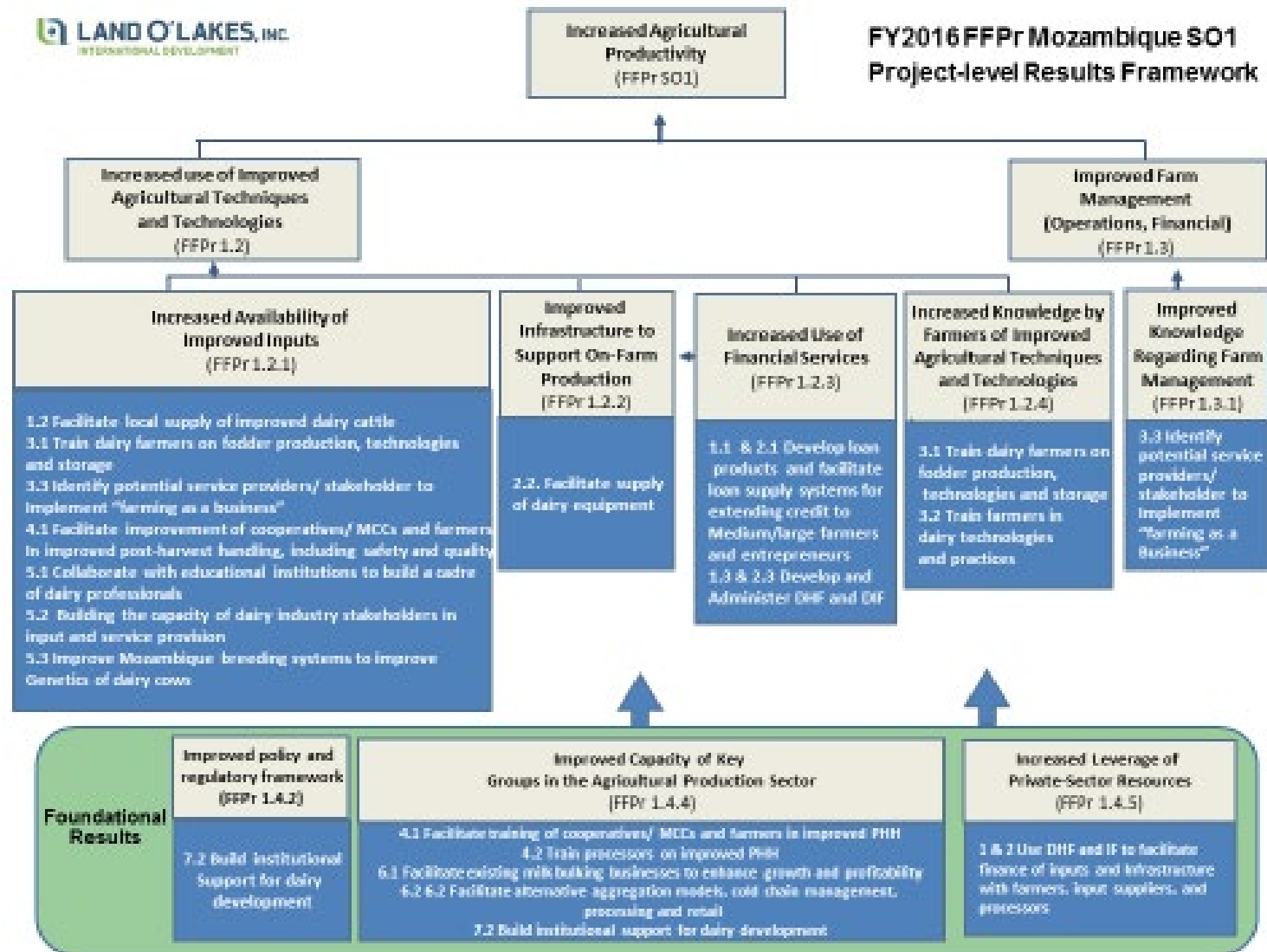
	Number of loans disbursed as a result of USDA assistance	Small producers	6	
		Medium producers	0	
		Large producers	0	
		MCC/Cooperatives	0	
		Processors	1	
		Breeders	0	
		Feed and forage provider	0	
16	Value of loans provided as a result of USDA assistance	Financial Institutions	\$3,432.14*	\$1.2 million
		Male owner	\$1,900.00	
		Female owner	\$1,532.14	
		Small producers	\$3,432.14	
		Medium producers	\$0.00	
		Large producers	\$0.00	
		MCC/Cooperatives	\$0.00	
		Processors	\$200,000.00	
		Breeders	\$0.00	
		Feed and forage provider	\$0.00	
17	Percentage of trained dairy producers that can accurately recite improved dairy practices	Producers	Can accurately recite all referenced practices: 81.1%	80%
		Male owner	71.8%	
		Female owner	68.2%	
		Small producers	71.4%	
		Medium producers	55.6%	
		Large producers (n=2)	50.0%	
		Ways to improve pasture quality	83.3%	
		Advantages of artificial insemination	83.0%	
		Most important equipment in corral	83.0%	
		How to prevent or control mastitis	85.8%	
18	Percentage of trained dairy producers that can demonstrate financial literacy	Producers	71.30%	75%
		Male owner	70.7%	
		Female owner	72.1%	
		Small producers	71.0%	
		Medium producers	77.8%	
		Large producers (n=2)	50.0%	
19	Amount of milk processed in Mozambique from Mozambique produced fresh milk	Processors	1.3 M liters	6.5M liters
20	Total value of value-added products made from milk	Processors	\$1,035,581.12	\$16,300,000

21	Milk rejection rate of processors	Processors	1.7%	1%
22	Percentage of processor capacity utilized in Mozambique	Processors	26.82%	50%
23	Number of sales agreements between input suppliers, producers/cooperatives and processors	Producers, Cooperatives, Processors	1	15
24	Number of dairy actors that finance improved market infrastructure	Producers, Cooperatives, Processors	0	1
		Small producers	0	
		Medium producers	0	
		Large producers	0	
		MCC/Cooperatives	0	
		Processors	0	
		Breeders	0	
25	Number of producers, MCCs, and processors that adopt established standards	Producers, Cooperatives, Processors	0	14
		Small producers	0	
		Medium producers	0	
		Large producers	0	
		MCC/Cooperatives	0	
		Processors	0	
		Breeders	0	
26	Number of producers, MCCs, and processors that adopt improved post-production handling	Producers, Cooperatives, Processors	7	16
		Small producers	0	
		Medium producers	0	
		Large producers	0	
		MCC/Cooperatives	4	
		Processors	3	
27	Total increase in installed storage capacity (dry or cold storage) as a result of USDA assistance	Producers, Cooperatives, Processors	26.80 cubic meters*	10 cubic meters
		Small producers	0.17 cubic meters	
		Medium producers	3.18 cubic meters	
		Large producers	0 cubic meters	
		MCC/Cooperatives	3.45 cubic meters	
		Processors	20 cubic meters	
28	Number of dairy actors that finance improved post-harvest infrastructure	Grant recipients; Financial Institutions	1*	25
		Producers, Cooperatives, Processors	90*	
		Small producers	76	
		Medium producers	10	
		Large producers	2	
		MCC/Cooperatives	0	

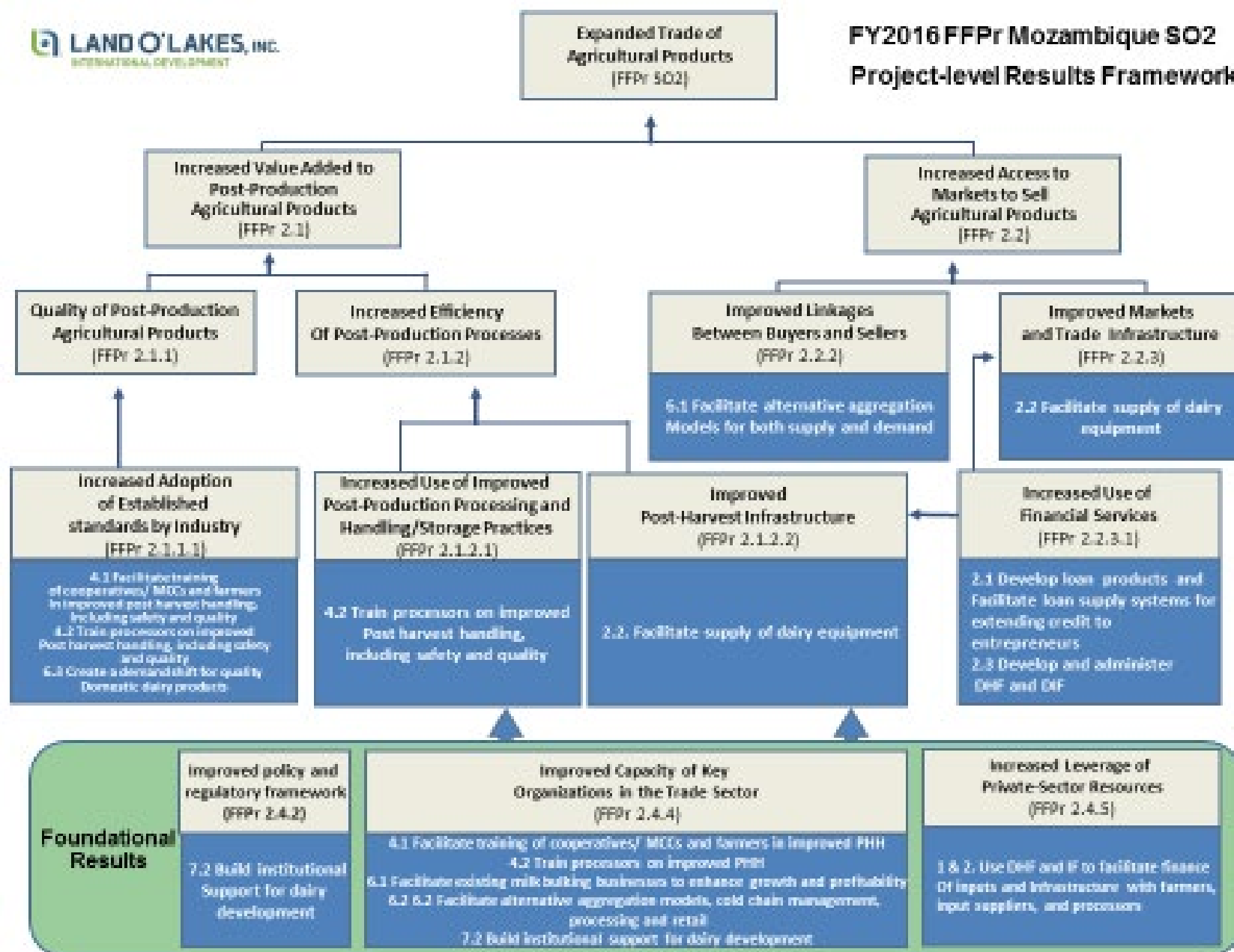
		Processors	2	
		Breeders	0	
29	Number of policies, regulations, and or administrative procedures in each of the following stages of development as a result of USDA assistance Stage 1: Analysis Stage 2: Public Debate Stage 3: Presented for legislation Stage 4: Approval Stage 5: Implementation	Policy expert; policy dialogue participants	0	5
30	Number of private enterprises, producer organizations, water users' association, women's groups, trade and business association and community-based organizations (CBOs) that applied improved techniques and technologies as a result of USDA assistance	Cooperatives, Processors, Breeders, Feed and Forage Providers	3	27
		Pasteurization	3	
		MCC/Cooperatives	0	
		Processors	3	
		Use of new financial product	0	
		Breeders	0	
		Feed and forage provider	0	
		Cooperatives	0	
		Processor	0	
		New dairy formulas	0	
		Certified and tested feed	0	
31	Value of new public and private sector investment leveraged by USDA assistance	Financial institutions, producers, processors, input suppliers, breeders, etc.	0	\$1.5 million
32	Number of public-private partnerships formed as a result of USDA assistance	Financial institutions; STTA; grant recipients; education institutions	0	20
33	Number of individuals receiving financial services as a result of USDA assistance	Producers, Cooperatives, Processors, Financial Institutions	4*	175
		Small producers	2	
		Medium producers	0	
		Large producers	0	
		MCC/Cooperatives	0	
		Processors	2	
34	Number of new loan products developed to	Producers, Cooperatives, Processors, Financial Institutions	0	1

	target the dairy industry			
35	Value of grants provided	Producers, Cooperatives, Processors	\$0.00	\$3.7 million
		Small producers	\$0.00	
		Medium producers	\$0.00	
		Large producers	\$0.00	
		MCC/Cooperatives	\$0.00	
		Processors	\$0.00	
36	Number of producers trained in improved agriculture productivity	Producers	0	13,750
37	Number of producers trained in improved farm management	Producers	0	9,750
38	Number of producers trained in improved post-harvest handling techniques	Producers	0	150
39	Number of processors trained in improved post harvest handling techniques	Processors	0	2
40	Number of individuals trained in input provision in the milk value chain	Education institution/ Input Provider	0	9,910
41	Number of individuals reached with dairy demand campaign	Radio station; project staff	0	32,000
42	Number of individuals trained in nutrition and food quality	Youth	0	3,000
43	Number of cooperatives trained in business and marketing	Cooperatives	0	10
44	Number of alternative aggregation models piloted	Project staff	0	2
45	Regulatory body for the dairy industry created	Regulatory body members	0	Yes
* Indicator value is 0 at baseline. Actual baseline values have been provided as a point of reference for Land O'Lakes.				
** Indicator calculated with data from FEVAL dataset.				

ANNEX C. Results Framework



FY2016 FFP Mozambique SO2 Project-level Results Framework



ANNEX D. MERCADO Statement of Work

1. Introduction and Justification

This contract is to hire an external evaluation firm to conduct the baseline, midterm evaluation, and final evaluation and baseline gender analysis of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (MERCADO) Food for Progress Project. MERCADO is a \$20.5 million project, funded by the United States Department of Agriculture (USDA) and implemented by Land O'Lakes International Development (Land O'Lakes) from October 1, 2016 – September 30, 2021. The project is implemented in Manica and Sofala Provinces of Mozambique with the aim to establish a commercial-oriented, sustainable, and competitive dairy market system in Mozambique through reaching USDA's priority objectives of increasing agricultural productivity and expanding trade of agricultural products.

The baseline and gender analysis will set the baseline values for key indicators and facilitate an understanding of the current context for which the project will be implemented, while the, midterm evaluation and final evaluation will examine the results of the program, and provide recommendations for improvements to the project or future similar projects. Externally developed baseline, midterm and final evaluation reports are required by the donor, USDA, in the project contract. This document describes the background of the project, the scope of work that the evaluation contractor will implement, and the timeline for conducting the scope of work.

2. Background

Country Context

Mozambique has a great potential for dairy production, but following independence in 1975, a 16-year civil war caused the dairy industry to virtually disappear. Historically, the peak in number of dairy cows and milk production was in 1973 with 13,200 cows and 13,020,000 kg of milk produced. Currently, the official statistics place the number of dairy cows at 2,209, of which the provinces of Sofala and Manica (Beira Corridor) comprise 80.4%.

The decrease in number of dairy cows, together with poor management has made the country completely dependent on imports for milk and milk products. In 1992, the contribution of the national production to the total milk and dairy products consumed was 6%, a figure that has remained without major changes 20 years later at 6.4%.

The Strategic Plan for Dairy Development in Mozambique and government interventions so far indicate the Beira Corridor as a priority for the re-establishment of dairy production in the country and the potential for dairy production in Maputo, Zambezia and Nampula. The peri-urban areas of Beira and Chimoio cities, where dairy production is now being re-established by Land O'Lakes, are the same areas where dairy farms have been concentrated previously.

Previous Projects

In 2008, Land O'Lakes began work to develop the nascent dairy sector in Manica Province, Mozambique with the \$5.3 million Manica Smallholder Dairy Development Project (MSDDP),

funded by USDA. Over a forty-two month period, the program supported the rebuilding of the national dairy herd through the purchase, multiplication and distribution of 513 improved breed dairy cattle. The program also trained more than 1,750 smallholder dairy farmers in feed/fodder techniques, soil conservation and animal husbandry and health, and established 3 producer-level cooperatives and milk collection centers. Additionally, together with partner, Tiller's International, the project built local capacity of over 4,000 farmers in animal traction to increase agricultural productivity.

In September 2012, Land O'Lakes began another USDA funded program, Mozambique Dairy Development Program (MDDP), to intensify their work in Manica and expand to Sofala and Maputo Provinces, with additional support to processors and input providers. Over 3 years, MDDP co-financed 229 improved breed dairy cattle with farmers, trained 5,084 farmers and students in improved animal husbandry practices, and established and trained 10 producer-level cooperatives and 10 milk collection centers in business and quality standards. Additionally, with Tillers International, the project built the capacity of another 14,384 farmers in animal traction.

Current Project Description

The MERCADO program will take a private sector-driven, market systems approach to transforming Mozambique's dairy sector in Manica and Sofala provinces, so that it is more competitive locally, regionally and nationally. The program will continue to build the capacity of dairy producers, cooperatives, and processors to improve their productivity, as well as their milk quality and business practices. It will expand dairy input service delivery, including extension services, animal health services, and feed and fodder. It will also facilitate access to finance to purchase livestock, production and trade infrastructure, promote private investment in the dairy sector, and strengthen linkages between buyers and sellers. Specifically, the project will focus on seven main activities:

Activity 1 – Financial Services: Facilitate Investment in Dairy Herd Restocking

Land O'Lakes will continue to restock the Mozambican dairy cattle herd by importing dairy cattle and establishing a Dairy Herd Fund (DHF) to enable enterprise-minded farmers to access capital to purchase both imported and local dairy cattle. Commercial breeders will also be able to access this fund to expand their dairy herds and to invest in appropriate reproduction techniques to reduce the need for imported cattle in Mozambique.

Land O'Lakes will use the DHF in a phased approach, starting with in-kind grants using a scaled match component. At the same time, Land O'Lakes will work with and build the capacity of financial institutions to develop appropriate loan products available to interested entrepreneurs to purchase cattle. Land O'Lakes will provide financial institutions a grant from the DHF to establish a pool of capital managed by the financial institutions that creates accessible loan products for farmers.

Activity 2 – Financial Services: Facilitate Investment in the Dairy Sector via Innovation Fund

Land O'Lakes will develop a Dairy Innovation Fund (DIF) that entrepreneurs, including input and service providers, producers, processors, and retailers, can access to finance equipment, infrastructure and other innovations to expand their businesses. Land O'Lakes will also identify entrepreneurs in input or service provision and link them to the DIF or financial institutions to access finance to develop and grow their enterprises.

Land O'Lakes will use the DIF in a phased approach, starting with in-kind grants using a scaled match component. At the same time, Land O'Lakes will work with and build the capacity of financial institutions to develop appropriate loan products available to interested entrepreneurs. Land O'Lakes will provide financial institutions a grant from the DHF to establish a pool of capital managed by the financial institutions that creates accessible loan products for entrepreneurs and businesses.

Activity 3 – Training: Improved Farm Practices

Land O'Lakes will build the capacity of dairy farmers to improve animal health, nutrition and farm business acumen to increase milk production and herd growth. Land O'Lakes will provide on-going support and guidance to dairy farmers on improved feeding and use of appropriate technologies, including fodder production and animal nutrition. Additionally, Land O'Lakes will provide training to dairy farmers on husbandry, including topics such as breeding, mastitis control, hygiene and animal health. Land O'Lakes will also train farmers in farming as a business, including building capacity to access finance and facilitating linkages between farmers and technology, input and service providers.

Activity 4 – Training: Improved Post-Harvest Handling, Food Safety and Quality

Land O'Lakes will help improve post-harvest handling to decrease post-harvest loss, focusing on the cold-chain from production to retailers. Land O'Lakes will identify weaknesses in the cold chain to design appropriate training for farmers, cooperatives and processors on post-harvest handling, including topics such as hygiene, quality control, processing and awareness of zoonotic diseases like brucellosis and tuberculosis. Land O'Lakes will provide technical support to processors, who will provide training on post-harvest handling, food safety and quality to cooperatives. Land O'Lakes will also build capacity of cooperatives and processors to access finance to improve their post-harvest handling, food safety and quality.

Activity 5 - Capacity Building: Agricultural Extension Agents/Services

Land O'Lakes will work with educational institutions, processors, cooperatives, and other input providers to make dairy extension services available to farmers. Land O'Lakes will support educational institutions to build a cadre of professionals in the dairy sector, through activities such as integrating dairy into current livestock and veterinary curricula, setting up demonstration farms for training and facilitating dairy internships. Land O'Lakes will continue to support community livestock workers who are providing guidance and veterinary services to dairy and livestock farmers. Land O'Lakes will also facilitate linkages between the community livestock workers and private or government veterinary services. Through capacity building in accessing finance, Land O'Lakes will also support processors, cooperatives and other businesses interested in developing appropriate support services and inputs to farmers. Land O'Lakes will also support the establishment of local breeders to provide an in-country supply of dairy cattle. This support will build their dairy breeding skillsets and help breeders explore the effectiveness of various breeding technologies.

Activity 6 - Capacity Building: Aggregation and Value- Addition

Land O'Lakes will increase market access by supporting milk bulking and value addition in local businesses. Land O'Lakes will work with existing milk bulking businesses, such as cooperatives, to enhance growth and profitability. Land O'Lakes will also explore and implement alternative milk bulking models, such as working with dairy farmers, private businesses and processor-owned bulking facilities. Land O'Lakes will support these businesses to expand into areas such as cold chain management, processing and retail opportunities. These opportunities could include developing transport systems,

purchasing processing equipment to process the milk on site, and creating milk kiosks to sell directly to customers. Land O'Lakes will also train youth on nutrition, food safety and dairy quality to promote consumption of dairy products. Land O'Lakes will also facilitate a marketing campaign to stimulate alternative markets through promotion of locally produced milk products.

Activity 7 - Capacity Building: Promote Improved Policy and Regulatory Framework

Land O'Lakes and key dairy sector stakeholders, including dairy producers, cooperatives, processors, input and service providers, and private sector investors will work with the government to examine the current policy and regulatory framework in order to identify barriers to growth in the dairy industry and recommend effective solutions. Based on the results, Land O'Lakes will support capacity building and networking opportunities for key government staff and other stakeholders to increase their ability to strengthen the Mozambican dairy sector. Through a consultative process, Land O'Lakes will also facilitate the development of a private-sector-led representative body for the dairy sector to support the needs of the dairy industry, including helping them to develop their mission statement and strategy. The entity will engage the Government of Mozambique to advocate for reforms in the policy and regulatory framework to support growth and investment in the dairy sector.

3. Evaluation Methodology

Purpose and Objectives of the Evaluation

The purpose of the baseline, midterm evaluation and final evaluation are to analyze and document the extent to which the program has achieved its goals and objectives and to explain any deviations from the plan. Concurrent with the baseline, the evaluation contractor will also conduct a separate gender analysis. While separate gender analyses will not be part of the midterm and final evaluations, data will always be analyzed through a gendered lens and be reported appropriately. Specific objectives for each evaluation are listed below:

Baseline Objectives

The baseline evaluation will:

- Document the current state of key dairy actors, including demographics, socioeconomic status, businesses finances, and dairy-related practices and technologies;
- Analyze the gender constraints and opportunities and make recommendations to ensure that both sexes are equally able to participate and benefit from the project;
- Establish the project baseline values;
- Provide recommendations for setting and refining targets for project indicators in accordance with the findings;
- Identify potential strengths, weaknesses, opportunities and threats to project implementation in the target areas;
- Propose strategies to maximize strengths and mitigate challenges; and
- Generate data to be used for comparative analysis across the life of the project to measure change.

Midterm Evaluation Objectives

The mid-term evaluation will:

- Assess the relevance of the project strategy and approach as well as the validity of assumptions made during project design;
- Measure progress from baseline, including the effectiveness and efficiency of interventions in achieving established targets;
- Assess how women and men have benefited differently from the project;
- Document lessons learned, challenges and unanticipated effects;
- Identify enablers and constraints to progress (both internal and external factors) that have supported or limited success of the project;
- Assess sustainability efforts to date;
- Provide recommendations for necessary corrections to strengthen project performance, efficiency and sustainability; and
- Provide recommendations for areas of focus for the final evaluation, including reviewing and strengthening data collection systems and metrics in preparation for the final evaluation.

Final Evaluation Objectives

The final evaluation will:

- Assess whether the project has achieved the expected results as outlined in the results frameworks;
- Assess the relevance, effectiveness, efficiency, impact and sustainability of project activities;
- Measure progress from baseline and midterm and assess attribution to the extent possible;
- Assess how women and men have benefited differently from the project;
- Identify lessons learned through the duration of the project with an emphasis on identifying key strategies, methodologies and factors that contributed to and/or inhibited success, focusing on areas that could be applied to similar programming; and,
- Draw conclusions and provide recommendations to Land O'Lakes, USDA, project participants, project partners and other stakeholders including the Government of Mozambique, and USDA Washington to strengthen future or similar projects.

Evaluation Questions

The table below identifies the overarching questions that will be addressed by the evaluation.

Evaluation Criteria	Evaluation Question	Data Collection Method	Data Source
<i>Relevance</i>	Does the results framework, assumptions, program design and project activities meet the needs of the participants and local conditions in Mozambique's Manica and Sofala Provinces?	Panel Survey Focus Groups Semi-Structured Surveys Key Informant Interviews Review of M&E Data	Dairy Farmers Value Chain Actors Program Staff Other Stakeholders
	How well aligned are MERCADO's strategy and activities with the reality and development needs and potential of Mozambique's dairy industry?	Panel Survey Focus Groups Semi-Structured Surveys Key Informant Interviews Review of M&E Data	Dairy Farmers Value Chain Actors Program Staff Other Stakeholders
	How well aligned are MERCADO's strategy and activities with the development goals, objectives and strategies of USDA, the U.S. Government and the Mozambican Government?	Key Informant Interviews	Other Stakeholders
<i>Impacts</i>	What impacts are the project activities having on the program participants, both positive and negative, especially in relation to the expected results and strategic objectives? How has the project-provided training impacted the knowledge and uptake of improved agricultural, farm management practices and post-harvest handling? How has the use of improved practices affected agricultural productivity (measured through liters of milk per day, number of days of lactation, and calving interval for dairy and through yield for forage)? To what extent has increased access to input suppliers affected the uptake of improved agricultural techniques, farm management	Panel Survey Focus Groups Semi-Structured Surveys Key Informant Interviews Value Chain Analysis Review of M&E Data	Dairy Farmers Students Value Chain Actors Program Staff Other Stakeholders

Evaluation Criteria	Evaluation Question	Data Collection Method	Data Source
	practices, post-harvest handling, and use of improved infrastructure for farmers? How has training in improved safety and quality affected the rate of rejection of milk at the aggregation level? How have project activities influenced total value and quantity of milk and milk product sales? How is value-capture distributed across different milk market system actors? What can be done to improve value capture and profitability of the actors? To what extent has access to finance affected the growth of farmer dairy businesses? To what extent has access to finance affected uptake of improved processing techniques, quality standards, and improved infrastructure for processors? To what extent have the advocacy activities affected the policy and regulatory framework to support growth and investment in the dairy sector?		
	What internal and external factors have influenced the ability of the project to meet expected results and targets?	Key Informant Interviews Value Chain Analysis	Dairy Farmers Students Value Chain Actors Program Staff Other Stakeholders
<i>Effectiveness</i>	To what extent are the program targets and outcomes likely to be achieved by the end of the project?	Key Informant Interviews Review of M&E Data	Program Staff Project M&E Data Other local data
	What key successes should be replicated or key improvements should be made to the implementation to maximize the results?	Panel Survey Focus Groups Semi-Structured Survey	Dairy Farmers Students Value Chain Actors Program Staff

Evaluation Criteria	Evaluation Question	Data Collection Method	Data Source
		Key Informant Interviews	Other Stakeholders
<i>Efficiency</i>	Were the resources and activities provided by the program carried out in a timely manner and with effective use of resources?	Panel Survey Focus Groups Semi-Structured Survey Key Informant Interviews	Dairy Farmers Students Value Chain Actors Program Staff Other Stakeholders
	How well has the project been managed and M&E data used to make programmatic decisions?	Semi-Structured Surveys Key Informant Interviews Review of M&E Data	Program Staff Other Stakeholders
<i>Sustainability</i>	Which project activities and benefits are likely to be sustained or not sustained past the project lifespan, why?	Panel Survey Focus Groups Semi-Structured Survey Key Informant Interviews Review of M&E Data	Dairy Farmers Students Value Chain Actors Program Staff Other Stakeholders
	What exit strategy has the project put into place to ensure the sustainability of the project outcomes?	Key Informant Interviews	Program Staff Other Stakeholders
<i>Gender Equality and Equity</i>	How did the project address the constraints faced by women in the dairy sector?	Panel Survey Focus Groups Semi-Structured Survey Key Informant Interviews Review of M&E Data	Dairy Farmers Students Value Chain Actors Program staff Other Stakeholders
	What did the program do to ensure participation of both men and women? What could the program have done better?	Panel Survey Focus Groups Semi-Structured Survey Key Informant Interviews	Dairy Farmers Students Value Chain Actors Program Staff Other Stakeholders

Evaluation Criteria	Evaluation Question	Data Collection Method	Data Source
	How did the outcomes of the project differ between men and women? What could the project have done differently to ensure that equal benefits accrued to both women and men?	Panel Survey Focus Groups Semi-Structured Survey Key Informant Interviews Review of M&E Data	Dairy Farmers Students Value Chain Actors Other Stakeholders

4. Scope of Work

The contractor will conduct a mixed-method, participatory baseline, midterm evaluation and final evaluation and a baseline gender analysis of the MERCADO project, including leading the methodology design, data collection, analysis and interpretation of the data with consultation and input from Land O'Lakes project and headquarters staff. The contractor will report to the project Chief of Party and other Land O'Lakes staff as decided by the Chief of Party. The following activities will be carried out by the contractor:

Phone Calls with USDA: Conduct an introductory in-person meeting or phone call with USDA prior to conducting fieldwork for each of the baseline, midterm and final evaluations. If requested by USDA, conduct an in-person meeting or phone call with USDA after the draft report is completed to share key findings from the baseline, midterm and final evaluations.

Review of Documents: Undertake review of the MERCADO program documents, previous Mozambique program documents, and other relevant documents that are available at the time, including, but not limited to, the following:

- Project agreement with USDA including the MERCADO scope of work
- MERCADO Evaluation Plan
- MERCADO Performance Management Plan (PMP)
- MERCADO Internal Performance Monitoring, Evaluation and Learning Plan (PMELP)
- Semi-Annual and Annual Data collected internally (at Midterm and Final Evaluation)
- Monitoring data (at Midterm and Final Evaluation)
- Baseline report & data collection tools (at Midterm and Final Evaluation)
- Midterm report & data collection tools (at Final Evaluation)
- Special Studies conducted throughout implementation (at Midterm and Final Evaluation)
- Semi-annual reports submitted by Land O'Lakes to USDA (at Midterm and Final Evaluation)
- Final Evaluations of the two previous Mozambique Dairy Programs
- Any other program documents which will enable the evaluator to get acquainted with the project progress

- Relevant Government of Mozambique reports and documents for background information and establishing the socio-economic and political context in which MERCADO occurred

Development/refinement of methodology and data collection tools: The evaluator, in close collaboration with the Land O'Lakes, will do the following:

- Develop/revise a methodology to carry throughout the three evaluations, including a sampling frame, sampling technique and sample sizes for both quantitative and qualitative surveys.
- Develop/revise data collection tools for both quantitative and qualitative data collection, including tools for gender analysis at baseline. Surveys should be comparable throughout the three studies to ensure comparability of data over time, but additional questions should be added or tools created at midterm and final evaluations to explore participation in the project activities, and to achieve the evaluation objectives and answer the evaluation questions, described above.
- Based upon a reading of the program documents, propose any additional topics or issues for analysis prior to conducting each evaluation.
- Develop and submit an inception report that includes all of the above for review and approval by Land O'Lakes.

Field Data Collection

- Plan and coordinate the necessary logistics to collect the data in accordance with the selected methodology.
- Pre-test, edit, translate, finalize and reproduce the survey instruments.
- Train and orient enumerators and data collection team.
- Apply strong quality control practices for field data collection
- Take pictures of the process
- Carry out the fieldwork using own transportation, including:

Stakeholder Type	Population Size	Data Collection Method	Target Sample Size
<i>Dairy Farmers</i>	525	Panel data survey	Baseline: 473 Midterm: 449 Final: 427
		Focus group discussions	Baseline: 60 Midterm: 60 Final: 60

Stakeholder Type	Population Size	Data Collection Method	Target Sample Size
<i>Aggregation & Value Addition Facilities</i>	9 cooperatives	Semi-structured survey	Baseline: 9 Midterm: 9 Endline: 9
<i>Processors</i>	8	Semi-structured survey	Baseline: 8 Midterm: 8 Endline: 8
<i>Dairy Breeders</i>	2	Key informant interviews	Baseline: 2 Midterm: 2 Endline: 2
<i>Community Livestock Workers</i>	124	Semi-structured survey	Baseline: 12 Midterm: 12 Endline: 12
<i>Feed and Forage Producers</i>	3–4	Key informant interviews	Baseline: 3–4 Midterm: 3-4 Endline: 3-4
<i>Financial Institutions</i>	2–3	Key informant interviews	Baseline: 2–3 Midterm: 2-3 Endline: 2-3
<i>Students (past)</i>	870	Focus group discussions	Baseline: 30
<i>Students (MERCADO)</i>	5300	Focus group discussions	Midterm: 30 Final: 30
<i>Other Stakeholders</i>	TBD	Key informant interviews	Baseline: 10 Midterm: 10 Endline: 10
<i>Youth</i>	3,000	Focus group discussions	Baseline: 30 Midterm: 30 Final: 30

Data entry, analysis and reporting

- Enter, clean, synthesize, analyze, and interpret data from both the quantitative surveys and the qualitative protocols using approved statistical packages, disaggregating data for indicators as in the PMP.
- Prepare a draft baseline/midterm/final evaluation report, including a separate gender analysis report at baseline, addressing the objectives and questions of this evaluation outlined above and recommendations on the overall Land O'Lakes/FFPr MERCADO project for implementation or potential similar future project for review by Land O'Lakes staff and stakeholders.
- Develop a PowerPoint presentation of evaluation findings, present and submit to Land O'Lakes and stakeholders.
- Prepare a final baseline/midterm/final evaluation report and baseline gender analysis report that includes revisions based on feedback on the draft report and presentation.
- Prepare and submit data sets and transcripts/notes with relevant documentation to Land O'Lakes

5. Timeframe

The anticipated timeline for each of the baseline, midterm and final evaluations are detailed below, contingent on approvals from Land O'Lakes and USDA.

Baseline Assessment & Gender Analysis

Task	Responsible	Due Date
Review of relevant documents to prepare for inception meeting	Evaluator	February 13 – 14, 2017
Inception meeting with Land O'Lakes to discuss protocol, methodology, sampling, tools and timeline	Evaluator and Land O'Lakes staff	February 15, 2017
Develop an inception report and data collection tools	Evaluator	February 15 – 21, 2017
Inception report and tools due to Land O'Lakes	Evaluator	February 21, 2017
<i>Land O'Lakes reviews report and tools and provides feedback, comments and suggestions to evaluator</i>	<i>Land O'Lakes</i>	<i>February 22 – 24, 2017</i>
Prepare for field work	Evaluator	February 22 – 24, 2017
Finalize tools based on Land O'Lakes Feedback	Evaluator	February 24 – 27, 2017
Enumerator training, pretesting, and data collection	Evaluator	February 27 – March 14, 2017
Data entry, cleaning, analysis and report writing	Evaluator	March 15 – April 7, 2017
Draft Baseline report & Gender Analysis Reports submitted to Land O'Lakes	Evaluator	April 7, 2017
Presentation of Baseline and Gender Analysis findings to Land O'Lakes	Evaluator	April 11, 2017
<i>Land O'Lakes reviews draft final report and provides evaluator with comments and suggestions for revisions</i>	<i>Land O'Lakes</i>	<i>April 10 – 13, 2017</i>
Finalize report based on Land O'Lakes feedback and prepare all deliverables	Evaluator	April 14 – 19, 2017
All Final Deliverables Due (Final baseline report, Gender Analysis report, clean data, photos, and PPT presentation)	Evaluator	April 19, 2017

Midterm Evaluation

Task	Responsible	Due Date
Review of relevant documents to prepare for inception meeting	Evaluator	February 11 – 14, 2019
Inception meeting with Land O'Lakes to discuss protocol, methodology, sampling, tools and timeline	Evaluator and Land O'Lakes staff	February 14, 2019
Develop an inception report and develop/update data collection tools	Evaluator	February 15 – 22, 2019
Inception report and tools due to Land O'Lakes	Evaluator	February 22, 2019
<i>Land O'Lakes reviews report and tools and provides feedback, comments and suggestions to evaluator</i>	<i>Land O'Lakes</i>	<i>February 25 – 27, 2019</i>
Prepare for field work	Evaluator	February 25 – 27, 2019
Finalize tools based on Land O'Lakes Feedback	Evaluator	February 28 – March 1, 2019
Enumerator training, pretesting, and data collection	Evaluator	March 4 – 20, 2019
Data entry, cleaning, analysis and report writing	Evaluator	March 21 – April 11, 2019
Draft midterm report submitted to Land O'Lakes	Evaluator	April 11, 2019
Presentation of evaluation findings to Land O'Lakes	Evaluator	April 15, 2019
<i>Land O'Lakes reviews draft midterm report and provides evaluator with comments and suggestions for revisions</i>	<i>Land O'Lakes</i>	<i>April 12 – 17, 2019</i>
Finalize report based on Land O'Lakes feedback and prepare all deliverables	Evaluator	April 18 – 22, 2019
All Final Deliverables Due (Final midterm report, clean data, photos, and PPT presentation)	Evaluator	April 22, 2019

Final Evaluation

Task	Responsible	Due Date
Review of relevant documents to prepare for inception meeting	Evaluator	April 5 – 8, 2021
Inception meeting with Land O'Lakes to discuss protocol, methodology, sampling, tools and timeline	Evaluator and Land O'Lakes staff	April 8, 2021
Develop an inception report and develop/ update data collection tools	Evaluator	April 9 – 16, 2021
Inception report and tools due to Land O'Lakes	Evaluator	April 16, 2021
<i>Land O'Lakes reviews report and tools and provides feedback, comments and suggestions to evaluator</i>	<i>Land O'Lakes</i>	<i>April 19 – 21, 2021</i>
Prepare for field work	Evaluator	April 19 – 21, 2021
Finalize tools based on Land O'Lakes feedback	Evaluator	April 22 – 23, 2021
Enumerator training, pretesting, and data collection	Evaluator	April 26 – May 12, 2021
Data entry, cleaning, analysis and report writing	Evaluator	May 13 – June 2, 2021
Draft Final Evaluation Report submitted to Land O'Lakes	Evaluator	June 2, 2021
Presentation of evaluation findings to Land O'Lakes	Evaluator	June 7, 2021
<i>Land O'Lakes reviews draft evaluation report and provides evaluator with comments and suggestions for revisions</i>	<i>Land O'Lakes</i>	<i>June 3 – 8, 2021</i>
Finalize report based on Land O'Lakes feedback and prepare all deliverables	Evaluator	June 9 – 11, 2021

All Final Deliverables Due (Final Evaluation report, clean data, photos, and PPT presentation)	Evaluator	June 11, 2021
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1. Required Deliverables

For each of the baseline, MTE, and FE, the deliverables under this contract are listed below. This table indicates the due dates for the deliverable for the baseline & Gender Analysis (GA), midterm and final evaluations.

Deliverable	Description	Due Dates
<i>Contract Award</i>	- Contract signature and award/modification (if necessary) - Kick-off meetings (at midterm and final)	Baseline & Gender Analysis: Feb. 13, 2017 Midterm: February 11, 2019 Final: April 5, 2021
<i>Submission of inception report and tools</i>	The Inception Report will include and describe the following: - Understanding of the project based on project documents and literature review - Finalized methodology including detailed sampling plan and field procedures - Quality control measures - Communication protocol - Finalized timeline (activities, responsible party, outputs, and timing) - Draft Data collection tools	Baseline & Gender Analysis: Feb 21, 2017 Midterm: February 22, 2019 Final: April 16, 2021
<i>Draft reports¹⁷ (baseline, gender analysis, midterm, final)</i>	The reports will be submitted in English addressing all the evaluation objectives and questions listed in the scope of work. The baseline gender analysis will be a separate report.	Baseline: April 7, 2017 Gender Analysis: April 7, 2017 Midterm: April 11, 2019 Final: June 2, 2021
<i>PowerPoint Presentation</i>	Presentation will include an abbreviated list of evaluation findings that can be presented to relevant internal and external stakeholders	Baseline: April 11, 2017 Gender Analysis: April 11, 2017 Midterm: April 15, 2019 Final: June 7, 2021
<i>Final version of the reports (Baseline, gender analysis, midterm, final)</i>	Electronic copy of the report will be submitted in English in both Microsoft- Word and PDF version. Report should include the following sections: - Acknowledgements - List of Acronyms and abbreviations - Table of Contents - Executive Summary (including key findings)	Baseline: April 19, 2017 Gender Analysis: April 19, 2017 Midterm: April 22, 2019 Final: June 11, 2021

¹⁷ Please note that a draft report that does not meet Land O'Lakes' expectations in terms of quality and content will not be accepted.

Deliverable	Description	Due Dates
	9. Background (Program description and purpose) 10. Methodology and Implementation 11. Results and Findings (in accordance with the objectives) 12. Recommendations 13. Annex: Table of key program indicators with updated values in comparison to baseline values (for the midterm and final evaluations) 14. Annex: Results Frameworks 15. Annex: Scope of Work for the evaluation 16. Annex: Inception Report for the evaluation 17. Annex: Survey Instruments: questionnaire(s), survey(s), interview protocol(s), focus group discussion protocol(s)	
Final Data Collection Tools	Electronic copies of all clean and final English-version of data collection tools (to be included as annex of reports)	Baseline & Gender Analysis: April 19, 2017 Midterm: April 22, 2019 Final: June 11, 2021
Final Cleaned Data	Clean and final English versions of: - quantitative data sets in Microsoft-Excel or any other utilized format (SPSS, STATA, etc.) - qualitative transcripts, field and interview notes, complete list of key informant interviews and FGDs in Microsoft-Word document	Baseline & Gender Analysis: April 19, 2017 Midterm: April 22, 2019 Final: June 11, 2021
High-Quality Photos	10-15 high-quality pictures of the process	Baseline & Gender Analysis: April 19, 2017 Midterm: April 22, 2019 Final: June 11, 2021

2. Payment Schedule

Land O'Lakes will pay the contract price for services accepted as complying with service contract requirements in twelve installments as follows:

Installment	Amount	Deliverables	Timeline
Baseline Assessment & Gender Analysis			
First	\$18,717.67 (10% of baseline)	Contract Signature	Contract signature February 13, 2017
Second	\$46,794.17	- Desk Review conducted, - Inception meeting held	Submission of inception report and tools

Installment	Amount	Deliverables	Timeline
	(25% of baseline)	Inception report submitted with all of the data collection tools as attachments	February 21, 2017
Third	\$65,511.85 (35% of baseline)	- Data collected in the target areas, - Data entry, cleaning, analysis completed - Baseline and gender analysis reports drafted	Submission of draft baseline and gender analysis reports April 7, 2017
Fourth	\$56,153.00 (30% of baseline)	Final baseline and gender analysis reports submitted along with remainder of deliverables	Approval of Final baseline and gender analysis reports April 19, 2017
Midterm Evaluation			
Fifth	\$17,012.96 (10% of midterm)	- Modification finalized - Kickoff meeting held	Kickoff meeting held February 11, 2019
Sixth	\$42,532.41 (25% of midterm)	- Desk Review conducted, - Inception Meeting Held - Inception report submitted with all of the data collection tools as attachments	Submission of inception report and tools February 22, 2019
Seventh	\$59,545.37 (35% of midterm)	- Data collected in the target areas, - Data entry, cleaning, analysis completed - Midterm evaluation report drafted	Submission of draft midterm evaluation report April 11, 2019
Eighth	\$51,038.88 (30% of midterm)	Final Midterm evaluation report submitted along with remainder of deliverables	Approval of Final midterm report April 22, 2019
Final Evaluation			
Ninth	\$19,269.28 (10% of final)	- Modification finalized - Kick-off meeting held	Kickoff meeting held April 5, 2021
Tenth	\$48,173.21 (25% of final)	- Desk Review conducted, - Inception Meeting Held - Inception report submitted with all of the data collection tools as attachments	Submission of inception report and tools April 16, 2021
Eleventh	\$67,442.49 (35% of final)	- Data collected in the target areas, - Data entry, cleaning, analysis completed - Final evaluation report drafted	Submission of final evaluation report June 2, 2021
Twelfth	\$57,807.84	Final evaluation report submitted along with remainder of deliverables	Approval of final evaluation report

Installment	Amount	Deliverables	Timeline
	(30% of final)		June 11, 2021

ANNEX E. Inception Report

1. Introduction

This Inception Report introduces the theory, methods, and tools that will guide IMPAQ International's evaluation of Land O'Lakes' MERCADO dairy sector development project in Mozambique.

We begin the report by presenting a summary overview of the project, its objectives, and theory of change based on our review of documents and discussions with Land O'Lakes staff involved with the project. We next present our evaluation methodology including a detailed sampling plan, field procedures, quality control measures, and our communication protocol. We then present the timeline of activities and outputs, as well as who is responsible for each. We present draft data collection tools in Annex D.

2. Project Background

Since 2008, Land O'Lakes has led the revival of the Mozambican dairy industry, leveraging USDA-supported Food for Progress funding to build a supply base and distribution system for domestically produced milk. These efforts have facilitated capacity building, market linkages, and finance that are essential to sustain the development of a socially inclusive yet market-driven industry. Land O'Lakes is implementing MERCADO in peri-urban areas of Manica and Sofala provinces along the Beira Corridor.

MERCADO is Land O'Lakes' third Mozambican dairy sector development initiative, and uses a private-sector-driven, market systems approach in pursuit of its overarching goal "to establish a commercial-oriented, sustainable and competitive dairy market system in Mozambique." As a Food for Progress (FFPr) initiative of the U.S. Department of Agriculture (USDA), and its activities have been structured to directly support FFPr's strategic objectives of Increased Agricultural Productivity (FFPr SO1) and Expanded Trade of Agricultural Products (FFPr SO2).

MERCADO's theory of change (see Annex A) links project activities and outputs with desired outcomes and project-level results.

To do this, the project will work to increase dairy productivity and quality at the farm level to help meet unmet demand for fluid milk by the processing industry; while also promoting quality, efficiency, and business viability along the value chain.

To improve the productivity of milk, the project will build the capacity of input providers, such as animal health workers, extension services, feed providers, agribusinesses, breeders etc to be able to improve their businesses and access finance, as well as training to students in dairy services to enable more entrepreneurs to begin providing dairy input services. The project will also support technical and farm management capacity building to dairy farmers to improve their dairy and farm practices. Improved practices combined with access to improved inputs and services will increase productivity of the dairy cows.

In combination with increases in productivity and quality at the farm-level, the project will provide training, capacity building, and financial services that will improve quality and productivity along the dairy value chain. Meanwhile, the project recognizes that, even in the face of unmet demand, dependence on relatively few large-scale commercial milk processors makes farmers and other value chain actors vulnerable to disadvantageous price and market conditions, and so seeks to increase diversity and competition along the value chain by promoting the entry of new market actors particularly at the processing level, while also promoting appreciation, awareness, and demand for local milk among consumers.

MERCADO will undertake seven activities within three separate focus areas. These activity areas encompass the provision of financial services, training, and capacity building of farmers, extension workers and input and service providers, post-farmgate value chain actors, and to improve the policy and regulatory framework. These activities, detailed in the contract scope of work, are summarized in Exhibit 1 and presented in detail in Annex B.

Exhibit 1. List of MERCADO Project Activities

Activity Focus Area	Activity Description
Financial Services	1. Facilitate Investment in Dairy Herd Restocking
	2. Facilitate Investment in the Dairy Sector via Innovation Fund
Training	3. Improved Farm Practices
	4. Improved Post-Harvest Handling, Food Safety and Quality
Capacity Building	5. Agricultural Extension Agents/Services
	6. Aggregation and Value- Addition
	7. Promote Improved Policy and Regulatory Framework

1.2 Evaluation Objectives

The evaluation has seven objectives, as detailed in the terms of reference. These are to:

- Document the current state of key dairy actors, including demographics, socioeconomic status, businesses finances, and dairy-related practices and technologies;
- Analyze the gender constraints and opportunities and make recommendations to ensure that both sexes are equally able to participate and benefit from the project;
- Establish the project baseline values;
- Provide recommendations for setting and refining targets for project indicators in accordance with the findings;
- Identify potential strengths, weaknesses, opportunities and threats to project implementation in the target areas;
- Propose strategies to maximize strengths and mitigate challenges; and
- Generate data to be used for comparative analysis across the life of the project to measure change.

In pursuing our evaluation objectives, we will answer an array of specific evaluation questions relating to the project's relevance, impacts, effectiveness, efficiency, sustainability, and gender equality and equity. The Evaluation Questions and their attendant data collection method and data sources are presented in Annex C. At baseline, we will provide current values for our indicators and contextualizing data points, as well as preliminary discussions based on our research, that will guide our evaluation activities throughout the project period as well as be used to refine the project approach.

2. Methodology

The IMPAQ team will employ a market systems approach to meet the evaluation objectives and answer the evaluation questions presented in the previous section. This approach will frame the evaluations through the lens of Mozambique's dairy market system, considering how MERCADO's interventions contribute to the development of a sustainable private-sector driven dairy market system. As an organizing framework, market systems analysis looks at the underlying conditions affecting the market (for example, the scale and nature of dairy product demand, the supply base, and the policy environment) and how these conditions, in

combination with project activities, influence the strategies of dairy market stakeholders and the emergence of a sustainable local market-driven dairy industry. IMPAQ will use this approach to tie together its inquiries at each level of the value chain into a broad picture of MERCADO's relevance, impact, effectiveness, and efficiency and to examine the sustainability and equity of the project's activities and impact.

Based on our understanding that MERCADO's activities involve nearly all dairy market actors in the Beira corridor, we will organize the evaluations using a mixed-methods approach that will assess each of the seven activities across the dairy value chain. The baseline evaluation will establish a strong basis for the midterm and final evaluations by providing comprehensive documentation of the Beira corridor's dairy market system. It will characterize the market actors, including input and service providers, farmers, aggregators, processors, and major retail and institutional buyers and distributors of dairy products; outline essential elements of their activities; and map the Beira corridor's dairy market system structure, using a value chain framework. Our baseline report will evaluate the project's theory of change within the context of the dairy value chain. The report will develop hypotheses about the project's relevance, impact, efficiency, sustainability, and gender equality and equity considerations that will guide the midterm and final evaluations.

3.1 Sampling Plan

Exhibit 2 summarizes our sampling and data collection strategy, proposed target numbers of respondents, and how the data will be collected. All data collection activities will be conducted in Portuguese or, where possible, in the local language of Citewe or Shona. We will conduct quantitative surveys with the full population of farmers, aggregation and value-added facilities (MCCs and cooperatives), processors, dairy breeders, and financial institutions involved in dairy finance. In addition, we will draw samples of input and service providers (including community livestock workers and feed and forage providers) and of students.

We will complement the quantitative data with qualitative data collected from farmers, community-health workers, students, and youth, selected to ensure representation of different scales of production (for farmers), gender, and location. We will collect qualitative data from all aggregation and value-added facilities, processors, breeders, and financial institutions involved in dairy finance. We will also collect qualitative data from other stakeholders involved in the dairy sector or its development, such as government representatives, university professors working in animal health, and representatives of projects funded by nongovernmental organizations (NGOs) and other donors.

Exhibit 2. Sampling and Data Collection

Stakeholder Type	Population Size	Data Collection Method	Target Sample Size	Lead Data Collector*
Dairy Farmers	524	Panel data survey	Baseline: 472 (assumes 90% response rate)	Enumerators
		Focus group discussions	Baseline: 60	MERCADO Evaluation Team; Facilitators
Aggregation & Value Addition Facilities	9 cooperatives	Semi-structured survey	Baseline: 9	Enumerators
Processors	8	Semi-structured survey	Baseline: 8	Enumerators

Stakeholder Type	Population Size	Data Collection Method	Target Sample Size	Lead Data Collector*
Dairy Breeders	2	Key informant interviews	Baseline: 2	MERCADO Evaluation Team
Community Livestock Workers	124	Semi-structured survey	Baseline: 12	Enumerators
Feed and Forage Producers	3–4	Key informant interviews	Baseline: 3–4	MERCADO Evaluation Team
Financial Institutions	2–3	Key informant interviews	Baseline: 2–3	MERCADO Evaluation Team
Students (past)	870	Focus group discussions	Baseline: 30	MERCADO Evaluation Team, Facilitators
Other Stakeholders	TBD	Key informant interviews	Baseline: 10	MERCADO Evaluation Team; Enumerators
Youth	3,000	Focus group discussions	Baseline: 30	MERCADO Evaluation Team, Facilitators
Female dairy farmers	TBD	Focus group discussions	Baseline: 30	MERCADO Evaluation Team, Facilitators
Gender-knowledgeable value chain participants and organization	TBD	Key informant interviews	Baseline: 10	MERCADO Evaluation Team

* Enumerators will focus primarily on the Farmers Panel Data Survey and then other quantitative data collection activities. The Facilitators, a separate cohort of the evaluation team, will conduct only the qualitative data collection activities. The MERCADO Evaluation Team will work with the Facilitators to decide who will lead each qualitative data collection activity and the most appropriate language to use.

3.2 Data Collection Methods

Focus Group Discussion Themes

- Dairy activities
- Successes and challenges
- Plans for future work in dairy agriculture
- Involvement in, and experiences with, Land O'Lakes projects including MERCADO

IMPAQ will use consistent methods and instruments for each type of project stakeholder across baseline, midterm, and final data collection to generate consistent data and insights over the life of the project. Please see Annex D for a list of all data collection instruments. We will tailor all interviews and data collection instruments to each stakeholder type's involvement in the project or dairy sector and will address overarching issues relating to the project and its activities in the sector. The interviews will also help contextualize stakeholder insights on the dairy sector as a whole. If appropriate, we will use components of data collection instruments validated in previous Mozambique program(s). We will discuss with Land O'Lakes personnel any modifications needed in later data collection instruments to maximize data quality and account for changes in project implementation. All data collection instruments will be designed initially

in English; they will then be translated to Portuguese and, where possible, the local languages of Shona and Citewe. Data collection personnel will use the most appropriate language for each respondent.

We will collect data from **farmers** using a structured survey applied to the entire population identified in the TOR, collecting data on household socio-demographic characteristics and dairy activities including production, sale, and consumption of milk. The farm household survey will also include questions on intra-household distribution of roles and responsibilities in dairy production, allowing nuanced analysis of gender dynamics over the life of the project. For those farmers who are no longer involved with dairy at the time of data collection, we will collect data on why they stopped working in dairy, as well as socio-economic data to enable characterizations of those who leave dairying compared to those who continue. IMPAQ will conduct focus group discussions with a sub-sample of farmers, including at least one group with women dairy farmers in each location. The focus groups will include discussion of how participation in dairy markets has affected intra-household gender dynamics, including participation of women in productive activities, distribution of the benefits of dairy activity in the household, and women's involvement and influence in household decision making.

Data collection for **breeders, feed and forage providers, aggregation and value-addition facilities (including cooperatives), processors, and community livestock workers** will use semi-structured surveys that IMPAQ will tailor to each type of stakeholder. Each semi-structured survey will include a component to collect basic business information; a quantitative component to collect data on investment, production, and marketing activities; and a qualitative component using key informant interviews to obtain information on respondents' perspective on the dairy value chain and their involvement with the project.

We will collect data from both **student** cohorts using focus group discussion to gauge students' understanding of and perspective on the potential for a career in the dairy industry. We will also use focus group discussions to collect data from **youth**, to understand their perspective on dairy as consumers of milk and milk products.

We will conduct key informant interviews with **feed and forage producers, financial institutions, and other stakeholders** such as government representatives, university professors working in animal health, and representatives of donor- or NGO-funded projects.

3.3 Approach to Gender and the Baseline Gender Analysis

Our baseline gender analysis will both complement and inform the previously described baseline activities. We will conduct our baseline gender analysis concurrent with the above-described data collection from farmers, value chain actors, and other stakeholders. The baseline gender analysis will be led by a Gender Specialist, supported by the Team Lead. It will have the following objectives, with the aim of informing the gender-related evaluation questions presented in the box below:

- Detail gender roles along the dairy value chain and characterize female participants and their dairy activities, from input supply through production, value addition, and marketing.
- Analyze factors that will influence the success of efforts to include and benefit women by involving them in the dairy market system.
- Identify areas where women are particularly well-positioned to benefit from work in the dairy sector and recommend strategies and activities that can be incorporated into the MERCADO work plan to enhance gender equality and equity.

Gender-Specific Evaluation Themes

- How did the project address the constraints faced by women in the dairy sector?
- What did the program do to ensure participation of both men and women? What could the program have done better?
- How did the outcomes of the project differ between men and women? What could the project have done differently to ensure that equal benefits accrued to both women and men
- Recommendations to ensure that both sexes are equally able to participate and benefit from the project

The MERCADO baseline gender analysis will build on the foundation of the gender analysis of Land O'Lakes' previous dairy project, the Manica Smallholder Dairy Development Program (MSDDP) by Johnson et al (2015)¹⁸. Salient results from this analysis included the following:

- Women perform the bulk of the day-to-day work in dairy, and value their participation in dairy, but the benefits that they accrue are not as clear. They do not retain a share of dairy income proportional to the work they perform, however they do see their families benefit from increasing nutrition and incomes and see some benefit of increased status in the household due to participation in project trainings that increase their knowledge and competence;
- Traditional patriarchal norms prevail and concepts of ownership and control of cows tend to accrue to the household head (whether male or female), but within this reality, women benefit from increased status with the family when they are directly involved in project trainings and capacity building activities;
- Women value milk for home consumption and tend to use income from milk to meet their families' immediate needs. Women also tend to perform relatively better than men on tasks relating to hygiene and milk quality.

Building on these results, the gender analysis fieldwork will utilize key informant interviews along the dairy value chain and focus group discussions with women farmers in order to develop insight into the roles and responsibilities of men and women in dairy production and value addition. The gender analysis will also focus on intra-household distribution of roles and responsibilities at the farm level. It will examine household-level roles in decision making about dairy activities and control over milk output and revenue from sales. We will explore the perspectives of women and men about participation in the project and about the dairy market and related value chains. Using the results of the gender analysis, we will advise Land O'Lakes on how to structure MERCADO activities to promote equality and equity in gender-based outcomes. In particular, our background research has led to the identification of the following themes that will receive particular focus during the gender baseline analysis:

¹⁸ Johnson, N., J. Njuki, E. Waithanji, M. Nhambeto, M. Rogers, E Hutchinson Kruger (2015) *The Gendered Impacts of Agricultural Asset Transfer Projects: Lessons from the Manica Smallholder Dairy Development Program*. Gender, Technology and Development 19(2) 145-180.

- Dairy in the context of men's and women's overall household responsibilities and livelihoods, challenges to increasing women's participation in dairy given time, resource, and cultural constraints, among others; and potential means to alleviate these constraints
- Training and capacity building priorities of women dairy participants, and opportunities to target project interventions to incorporate women and make them more visible and influential participants in the dairy market system
- Differing perspectives of men and women regarding the role of dairy in the household economy (for example, for home consumption or sale), and implications of these for household dairy activities and MERCADO interventions
- Possible implications of MERCADO's emphasis on increasing scale of dairy production on women's involvement in dairy production given their relative disadvantages with respect to time and investment resources, and opportunities to offset these potential disadvantages through project activities

The gender analysis report will also draw on the results of the quantitative farmer survey, and other qualitative inquiries to characterize dairy value chain participants and activities by gender, and to help characterize the overarching results of the gender activities. Other themes will be identified and explored through the course of the field work, and incorporated into the gender analysis report.

3.4 Field Procedures

IMPAQ's local data collection team will organize and implement field data collection operations under the supervision a Team Leader. The team will receive support from an M&E advisor, accompanied by a gender specialist, who will conduct the baseline gender analysis. Following approval of the inception report and data collection instruments by Land O'Lakes at the end of week 2, we will transmit the English-language instruments and protocols to our data collection team to initiate logistical preparations.

Following revision and approval of the final inception report and data collection instruments by Land O'Lakes in week 3, IMPAQ will (1) transmit the final, approved instruments and protocols to the data collection team for translation into Portuguese, Shona, and Citewe; (2) program the tablet computers to be used for data collection; and (3) troubleshoot all instruments.

The MERCADO Evaluation Team will travel to Mozambique to participate in and oversee the enumerator training and pre-testing of the data collection instruments during week 3 Enumerator training, which will take place in Chimoio, will consist of sessions designed to introduce the enumerator team to the evaluation framework and implementation context (including a brief primer on the dairy production and marketing concepts reflected in the questionnaires), followed by section-by-section review of data collection instruments and in-class practical application using tablets. Next will come field testing of the instruments and protocols, followed by a final in-class session during which enumerators will have an opportunity to address any remaining questions and will be informed of any changes to the instruments or protocols that have resulted from the pre-testing.

Our local data collection partner will use two teams of five quantitative enumerators and one qualitative interviewer. The teams will conduct data collection over a 10-day period beginning late in week 3 through the early part of week 5 of the contract. Each team will have a supervisor who will provide data quality control (described in the next section); each team will also have two vehicles to ensure timely movement in the face of any residual effects of the rainy season.

Because approximately 75 percent of project beneficiaries are in Manica province, both teams will collect data in Manica during the first five days. During the second five days, one team will transfer to Sofala

province while the other completes data collection in Manica. The Team Leader will lead general oversight of field data collection and will conduct key informant interviews with select value chain respondents. The M&E advisor will conduct data collection and provide oversight, consulting with the Team Leader to ensure a consistent technical approach and coordination. The M&E advisor will also lead data quality oversight.

As detailed in Section 2.3 above, we will conduct our baseline gender analysis concurrent with the above-described data collection from farmers, value chain actors, and other stakeholders. In addition to specialized gender-oriented inquiries, we will also employ a gender-sensitive approach throughout our baseline activities. We will:

- Ensure that evaluation questions ask specifically about gender inclusiveness, if appropriate
- Disaggregate all data by sex, analyze for gender differences, and report on the findings
- Keep survey and interview work sensitive to women's schedules and availability to participate
- Separate focus groups by sex, depending on the topic, cultural norms, and contextual issues

3.5 Quality Control Measures

Evidence-quality data is critical to successful evaluations. The M&E advisor will lead data quality oversight activities for the MERCADO baseline. The IMPAQ team will use its extensive data collection, management, and validation experience to ensure that the data collected are evidence-quality. We will also leverage our established and strong working relationship with the data collection team to proactively identify and address any data quality issues that arise during implementation. We have designed our evaluation approach to incorporate multiple measures that will ensure the relevance, reliability, integrity, and accuracy of data we collect. Exhibit 3 outlines our methods for data collection quality control.

Exhibit 3. Methods for Data Collection Quality Control

Quality Controls	IMPAQ Activities
Programming Controls	Include check-box options for electronic data collection instruments to standardize responses. Provide minimum and maximum values for numeric values. These safeguards will reduce the likelihood of data entry errors.
Regular Data Transmission	Transmit data daily (when possible) to our Washington-based research analyst to allow timely identification and remediation of any data errors or concerns with questionnaire implementation.
Recording of Qualitative Interviews	Record interview responses, create verbatim transcripts of the interviews, and develop qualitative interview summaries using a standardized template to ensure accurate representation of responses and viewpoints.
Data Quality Checks	Work with local team supervisors to lead and conduct field data quality and secondary data quality checks throughout data collection. The team supervisors will conduct data quality checks with 10% of the farmers interviewed during the previous day, using mobile phones to call and ask for farmers to repeat their responses on a limited number of the survey questions. These responses will be compared with the survey responses and used to identify problem areas where additional verification and/or remedial training of enumerators is needed. In addition to making spot checks on enumerators and facilitators, the supervisors will meet with the data collection team at the end of each day to review any data quality issues and discuss how to resolve them. At the beginning of baseline start-up, quantitative data will be sent to IMPAQ staff on days two and five for review of any data quality issues and will advise accordingly. The data collection team has wireless modems to transmit data by Internet data if a wi-fi upload is not available.

Oversight of field data collection will involve frequent and open communication between members of the IMPAQ team and the data collection team (with which IMPAQ already has a strong working relationship), so that we collaboratively identify and mitigate any issues as they arise.

3.6 Communication Protocol

IMPAQ's baseline evaluation team understands that effective communication with Land O'Lakes Mozambique, DC, and the headquarters offices and the highest level of quality assurance and quality control of all work products and technical deliverables are paramount. IMPAQ's management of the baseline data evaluation and gender analysis will be enhanced by effective, regular communication with Land O'Lakes. IMPAQ's "no surprises" policy—which all project managers are required to follow to keep clients regularly and consistently informed about project progress, challenges, solutions, and concerns, ensures that Land O'Lakes will always be fully informed of all relevant project activities and immediately consulted when guidance is needed. The benefit of this policy is that the IMPAQ team and Land O'Lakes will be partners in critical decision making and problem resolution in all matters. Below are the communication roles and reporting processes that each baseline evaluation team member will have throughout the baseline data collection process:

Exhibit 4. Communication Roles and Reporting Processes

Title	Communication Role
M&E Advisor	▪ Main Point of Contact between baseline evaluation team and Land O'Lakes. ▪ All official communication will be between the advisor and Land O'Lakes. ▪ During field work: Check in on a regular basis, via email and phone, when able, with Land O'Lakes staff ▪ Coordinate logistics with Fieldwork Manager. ▪ During fieldwork: communicate, in-person and by phone, with Field Team, including Fieldwork Manager, Supervisors, and enumerators to conduct data quality checks.
Evaluation Team Leader	▪ Main Technical Point of Contact between IMPAQ and Field Team, including Fieldwork Manager, Supervisors, and, if necessary, enumerators, in-person and by phone. ▪ Communicate with Land O'Lakes staff on technical issues via email and/or phone.
Gender Specialist	▪ Lead all communication with the Field Team regarding respondent groups for data collection scheduling, location, and other logistics.
Fieldwork Manager	▪ Communicate regularly with Land O'Lakes Mozambique staff and extension workers on logistical issues via email, in-person (especially with extension workers), and/or phone. ▪ Lead communication with respondent groups for data collection scheduling, location, and other logistics. ▪ During field work: communicate with the Team Leader and M&E advisor on a daily basis, in-person and by phone (audio and text), on technical and logistical issues.
Field Supervisors	▪ Daily check-ins with Field Manager by phone (audio and text). ▪ Assist with communication with respondent groups for data collection scheduling, location, and other logistics. ▪ Communicate on a regular basis with Team Leader by phone (audio and text) regarding data quality checks and issues.
Field Enumerators	▪ Daily in-person check-ins with Field Supervisors. ▪ Periodic in-person check-ins and discussions with Field Manager, Team Leader, M&E Advisor regarding data quality check and issues.

Reporting

The MERCADO Evaluation Team will report to Land O'Lakes, through an emailed memorandum, throughout the field work, on the following dates and topics:

- Thursday, March 2, 2017: Summary of Enumerator Training and Finalized Data Collection Plan

- Wednesday, March 8, 2017: Report-out of Manica Data Collection activities
- Wednesday, March 15: Report-out of Sofala Data Collection activities

This report will be sent to Land O'Lakes local staff and Land O'Lakes Headquarters. The MERCADO Evaluation Team will also report-in on a regular basis to the Land O'Lakes staff by email if any issues of note arise.

In addition to collecting the Farmers Survey data via tablet, the Field Enumerators who are assisting with other data collection will be required to submit all of their notes and summarized findings to the MERCADO Evaluation Team for periodic quality checks and review. They will also submit these documents at the end of data collection for data analysis.

The MERCADO Evaluation Field Team will send all Farmers Survey data to IMPAQ after day 3, day 6, and at the end of data collection for review by IMPAQ for quality. They will also be responsible for sending final non-survey notes, reports, and summaries to IMPAQ staff at the end of the data collection. The MERCADO Evaluation Field Team will be responsible for sending all draft and final deliverables to Land O'Lakes according to the contract's deliverables schedule.

3.7 Timeline (activities, responsible party, outputs, and timing)

Exhibit 5 illustrates the anticipated timeline and responsible entity for the baseline evaluation, contingent on approvals from Land O'Lakes and USDA.

Exhibit 5. Baseline Evaluation and Gender Analysis Timeline

Task	Responsible	Due Date
Review of relevant documents to prepare for inception meeting	Evaluator	February 13 – 14, 2017
Inception meeting with Land O'Lakes to discuss protocol, methodology, sampling, tools and timeline	Evaluator and Land O'Lakes staff	February 15, 2017
Develop an inception report and data collection tools	Evaluator	February 15 – 21, 2017
Inception report and tools due to Land O'Lakes	Evaluator	February 21, 2017
<i>Land O'Lakes reviews report and tools and provides feedback, comments and suggestions to evaluator</i>	<i>Land O'Lakes</i>	<i>February 22 – 24, 2017</i>
Prepare for field work	Evaluator	February 22 – 24, 2017
Revise tools based on Land O'Lakes Feedback	Evaluator	February 24 – 27, 2017
Pre-testing and finalization of data collection instruments	Evaluator	February 27 – 28, 2017
Enumerator training, pretesting, and data collection	Evaluator	February 28 – March 14, 2017
Data entry, cleaning, analysis and report writing	Evaluator	March 15 – April 7, 2017
Draft Baseline report & Gender Analysis Reports submitted to Land O'Lakes	Evaluator	April 7, 2017
Presentation of Baseline and Gender Analysis findings to Land O'Lakes	Evaluator	April 11, 2017
<i>Land O'Lakes reviews draft final report and provides evaluator with comments and suggestions for revisions</i>	<i>Land O'Lakes</i>	<i>April 10 – 13, 2017</i>
Finalize report based on Land O'Lakes feedback and prepare all deliverables	Evaluator	April 14 – 19, 2017
All Final Deliverables Due (Final baseline report, Gender Analysis report, clean data, photos, and PPT presentation)	Evaluator	April 19, 2017

Exhibit 6 below presents the timeline of the fieldwork tasks that will be implemented between February 27 and March 15, 2017.

Exhibit 6. Baseline Evaluation Fieldwork Timeline

	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Wed	Thu	Fri	Sat	Sun	Mon	Tue	Fri
	27.02	28.02	1.03	2.03	3.03	4.03	5.03	6.03	7.03	8.03	9.03	10.03	11.03	12.03	13.03	14.03	15.03
IMPAQ team arrives Chimoio																	
Training Preparation																	
Train, Pilot, Test, Finalize																	
Fieldwork in Chimoio																	
Gender Analysis																	
Travel from Chimoio to Beira																	
Fieldwork in Beira																	
IMPAQ team departs Beira																	

ANNEX F. Data Collection Instruments - Questionnaires, Surveys, Interview Protocols, and Focus Group Discussion Protocols

This section contains a list of questionnaires, surveys, interview and focus group discussion protocols used to inform the MERCADO Baseline Report.

- B1. Farmer Survey**
- B2. Farmer Focus Group Discussion Guide**
- B3. MCC/Cooperative Semi-Structured Survey**
- B4. Processor Semi-Structured Survey**
- B5. Breeder Key Informant Interview Guide**
- B6. Community Livestock Worker Semi-Structured Survey**
- B7. Input (Feed and Forage) Supplier Questionnaire**
- B8. Financial Institutions Key Informant Interview Protocol**
- B9. Student Focus Group Discussion Guide**
- B10. Youth Focus Group Discussion Guide**
- B11. Other Stakeholder Key Informant Interview Guide**

F1. Farmer Survey

Section	Question	Response
Introduction	Hello, my name is ____ and I am part of a team hired by Land O'Lakes to conduct a survey of dairy production. May I speak with one of the heads of household, preferably someone who has participated in dairy production on your farm? Informed consent: With your permission, I would like to ask you questions about your household and dairy activities. This will improve our understanding of dairy activities in the area and the households that work in dairy, helping Land O'Lakes to better support the sector. This study will be conducted with all dairy producers in the area. Your answers will be kept confidential, and will not be used for any purpose other than to inform a project intended to help develop the dairy sector. The interview should last about 45 minutes. Participation is voluntary and you can choose not to take part. We are conducting this survey as an independent entity, and so you can feel free to be open and honest with us in your responses. Neither your participation nor your responses will affect your ability to receive Land O'Lakes assistance now or in the future.	
Comprehension	Do you have any questions about any of the things I have just said?	
Voluntary Agreement	Are you willing to participate in this interview?	If yes, continue to 1.4 If no, thank respondent for his/her time and conclude interview.
Location	Province	
	District	
	Community	
	Respondent number (from list)	
	Contact information (cell phone)	
	HH name	
	GPS coordinates	Latitude
		Longitude
Survey Outcome	Survey outcome: 1st attempt	Survey initiated
		Survey declined
		No appropriate respondent available

		Requested additional information
		Arranged to return (specify):
	Survey outcome: 2nd attempt	Survey initiated
		Survey declined
		No appropriate respondent available

	HH characteristics		
Section	Questions	Options	Response
Respondent characteristics	1.1.1 Name of respondent		
	1.1.2 Gender of respondent	Male/Female	
	1.1.3 Respondent age		
	1.1.4 Respondent's relationship to HH head (select one)	Self	
		Spouse	
		Daughter	
		Son	
		Relative living in the house	
		Farm labor	
		Other. Specify:	
	1.1.5 Respondent's educational background-- highest level of schooling completed (select one)	First grade primary (1st - 5th class)	
		Second grade primary (6th - 7th class)	
		First grade secondary (7th - 10th class)	

	HH characteristics		
Section	Questions	Options	Response
		Second grade secondary (11th - 12th class)	
		Technical - Professional school	
		College/university	
		Didn't complete any grade	
		No schooling	
Household structure	1.2.1 How many people usually live within this household including visitors that have been here for 6 months or more? (Enumerator, be sure that the respondent includes him/her self as well as any children that have not yet been named or registered)		
Household resources (PPI)	1.3.1 What is the main material of the floor of the residence (excluding kitchen and bathrooms)?	Uncovered, or other	
		Granite, cement, or mosaic/tile	
		Packed earth	
		Wood/parquet	
		Marble	
	1.3.2 What is the main material of the walls of the residence?	Reeds/sticks/bamboo/palm	
		Wood or metal sheets	
		Tin/cardboard/paper/sacks	
		Adobe blocks	
		Wattle and daub	
		Cement blocks	
		Bricks	
		Other. Specify:	
	1.3.3 What toilet arrangement does the	None	

	HH characteristics		
Section	Questions	Options	Response
	household use in its residence?		
		Latrine of any kind	
		Toilet connected to a septic tank	
		Other. Specify:	
	1.3.4 What is the main source of energy for lighting in the residence?	Firewood, or batteries	
		LPG, oil/paraffin/kerosene; or candles	
		Electricity, generator, or solar panel	
		Other.	
	1.3.5 Does the household have a non-electric or electric clothes iron?	Yes	
		No	
	1.3.6 Does the household have a clock (wall, wrist or pocket)?	Yes	
		No	
	1.3.7 Does the household have a radio, stereo system, or cassette player?	No	
		Radio only	
		Stereo system or cassette player or digital music (regardless of radio)	
Income sources & Food security	1.5.1 From which of the following activities does your household obtain income? (Choose all that apply)	(check all that apply)	Please rank the top 5 of these in order (1 most important, 5 least important)

	HH characteristics		
Section	Questions	Options	Response
	dairy farming		
	other livestock/beef fattening, rearing livestock		
	crop production		
	fisheries,		
	government employee		
	private sector employment		
	daily labor		
	trade/shopkeeper		
	social support		
	forest products		
	Other (specify)		
	Do you still have reserves from your 2016 food production?		
	If no, in what month did you exhaust these reserves?		
	Currently, how many meals do you eat per day?		

2. Background and current dairy											
Questions	Response										
2.1 Do you or anyone in your household currently own, or have you ever owned, any dairy cows? (select one only)	Yes, currently										
	Currently no, but previously did										
	Never owned										
If household has never owned dairy cattle: Thank respondent and conclude interview											
If currently own or previously owned, continue to 2.2:											
2.2 When did you begin dairy farming? (Year)											
2.3 What was the maximum number of dairy cattle that you have ever owned??											
2.4 Other than Land O’Lakes, have you previously worked with any project supporting the dairy industry?	Yes/No										
If yes, which?	Belgian / Livestock Development Project										
	German DGRV										
	Mozambican government distribution of dairy cattle										
If currently own, continue to 2.6, if previously owned, continue to 2.7										-	
										-	
2.6 How many dairy cattle does your household own/raise?		Dairy breed	Crossbreed								
	Bulls										
	Cows										

								Is she currently producing milk? (if yes, skip to 2.6.2)	If no, when did she last stop producing milk?		
	Heifers										
	Female calves										
Enumerators, ask the following questions only for farmers with less than 10 cows. For farms with more than 10 cows, skip this section and move to Question 2.7											
	2.51	2.52	2.53	2.54	2.55	2.56	2.57	2.58	2.59	2.6	2.61
Please tell me about the cows in your herd--if you have more than 3 cows in your herd, please tell me about only 4 cows of your choice.	Is this cow a dairy breed, crossbreed, or traditional breed?	When was the first time that this cow gave birth (while she was under your responsibility)?		How many times has she been pregnant (while under your responsibility)?	When did she last calve?			Is she currently producing milk? (if yes, skip to 2.6.2)	If no, when did she last stop producing milk?		
	Purebred/crossbreed	Month	Year		Day	Month	Year	Yes/No	Day	Month	Year
Cow 1											
Cow 2											

Cow 3											
(Then continue to next module - module 3)											
For producers with 10 or more cows:											
How many days per year do your cows produce milk on average?											
How many days pass between calves for your cows? (i.e. what is the calving interval?)											
If previously had cattle (but no longer)											
When did you lose your last cow?	Month										
	Year										
2.8 What happened to the dairy cattle you owned? (Choose all that apply)	Sold or transferred to someone else										
	Deceased										
	Slaughtered										
	Repossessed										
	Other (specify)										
2.9 Why did you stop keeping dairy cattle? (Choose all that apply)	Couldn't keep them healthy										
	Couldn't keep them fed										
	Couldn't cover their costs										
	Couldn't access needed inputs										
	Wasn't making money off of them										
	Other (specify)										

If you had the opportunity, would you keep dairy cattle again?	Yes/No										
Enumerator, if respondent does not currently have dairy cattle, thank respondent and conclude interview											

	Production Practices	
Section	Questions	Response
Feeding practices		
Grazing	Do you graze your dairy cattle?	Yes/No (If "no" proceed to 4.2)
	If yes, what grazing system do you follow for your dairy cattle?	Free grazing
		Partial grazing
		Paddock grazing
	How long does it take you to get your cattle to pasture? (minutes)	
	How easy or difficult or difficult is it for you to access adequate grazing for your dairy cattle?	
		Very easy
		Somewhat easy
		Neither easy nor difficult
		Somewhat difficult
		Very difficult
	Do you pay for access to grazing?	Yes/No
	If yes, what was the cost over the past 12 months?	
Supplementation	Did you provide supplements to your dairy cattle over the last 12 months?	Yes/No
	If yes, What type of supplement did you use? (Choose as many as apply)	Salt
		Molasses
		Maize bran
		Wheat bran
		Beer residue
		Ration/Industrial feed

	Production Practices	
		Mineral blocks
		Crop residues stored
		Crop residues fresh
		Crop residues silage
	How easy or difficult is it for you to access adequate supplementation for your dairy cattle?	
		Very easy
		Somewhat easy
		Neither easy nor difficult
		Somewhat difficult
		Very difficult
	Approximately how much did you spend on supplementation over the past 12 months?	
Fodder and Forage	Did you use forage to feed your cattle over the last 12 months?	Yes/No (if not, continue to 3.6)
	If yes, in what form did you use the forage? (check all that apply)	Fresh
		Hay
		Silage
	Where did you get the forage over the last 12 months? (check all that apply)	Own production
		Grazing area
		Purchased
	If purchased, who supplied it?	
	If purchased, what was your approximate expenditures on forage over the past 12 months?	
	If own production, please indicate the total land area that you grew forage (in ha).	
	How easy or difficult is it for you to access adequate fodder and forage for your dairy cattle?	

	Production Practices	
		Very easy
		Somewhat easy
		Neither easy nor difficult
		Somewhat difficult
		Very difficult
Water	How do your dairy cattle access water while housed?	They have continuous access to a water source
		Bring water to cattle
	If less than continuous access, how many times do they bring the water to cattle, or water to cattle?	
	Do you pay for access to water for your dairy cattle?	Yes/No
	If yes, what was your approximate expenditure over the past 12 months?	
Housing	Where are your cattle kept?	Corral
		Veranda
		Under a tree
Milking practices	Do you milk by machine or by hand?	Machine
		By hand
	If milk by machine, ask	
	Where did you acquire your milking machine?	
		Land O'Lakes
		Agricultural or veterinary input supply store
		Local market
		Cooperative
		Other (specify)
	If you needed a new milking machine, where could you get one?	

	Production Practices	
		Land O'Lakes
		Agricultural or veterinary input supply store
		Local market
		Cooperative
		Doesn't know
		Other (specify)
	How easy or difficult would it be for you to access?	
		Very easy
		Somewhat easy
		Neither easy nor difficult
		Somewhat difficult
		Very difficult
	Do you inspect for mastitis before milking?	Yes/No
	If yes, how do you test for mastitis (select all that apply)	
		Visual inspection of the udder for inflammation
		Visual inspection of milk using strip cup
		CMT test
	If you need to get a new strip cup or CMT kits where can you get them? (select all that apply?)--prompt for multiple responses	
		Land O'Lakes
		Agricultural or veterinary input supply store
		Local market
		Cooperative

	Production Practices	
		Doesn't know
		Other (specify)
	How much would it cost?	
	Cost for strip cup	
	Cost for CMT kit	
	How easy or difficult is it to access more ...when you need them?	
		Very easy
		Somewhat easy
		Neither easy nor difficult
		Somewhat difficult
		Very difficult
	Do you use stainless steel buckets for your milking?	
		No (continua ate 3.976)
		Baldas de leite só
		Bilhas de leite só
		Both
	If you need more, where can you get them from?	Land O'Lakes
		Agricultural or veterinary input supply store
		Local market
		Cooperative
		Doesn't know
		Other (specify)
	What would they cost?	
	How easy or difficult is it to access more ...when you need them?	
		Very easy

	Production Practices	
		Somewhat easy
		Neither easy nor difficult
		Somewhat difficult
		Very difficult
	During high season, how many times a day do you deliver milk to your buyer(s)?	
	How do you transport milk to your buyer(s)	Walking
		Bicycle
		Motorcycle
		Buyer picks it up
		Paid transport
		Other
	How far are you from where you deliver milk (km)?	
	How long does it take you to arrive at the delivery location? (minutes)	
	If you pay to have your milk transported to the buyer, approximately how much did you spend in the past 12 months?	

Animal Health Services				
Questions	Response			
Did you or an animal health provider test any of your cattle for any disease in the last 12 months?	Yes/No			
	If Yes, for what diseases were your cattle tested? (check all that apply)	Who conducted the testing?	What was the cost of testing?	Was the cost per animal or for the whole herd?

Animal Health Services				
	☐ Brucellosis			
	☐ Tuberculosis			
	☐ Mastitis			
	Tick-borne diseases			
	☐ Other:			
Did you vaccinate your cattle against any diseases in the past 12 months?	Yes/No			
	4.6.4 If Yes, for what disease was the vaccination done? (check all that apply)	Who vaccinated the animals?	What was the cost of vaccination?	Was the cost per animal or for the whole herd?
	Nao sabem--sao vacunacoes obrigatoria			
	☐ Foot and mouth disease			
	☐ Tick-borne diseases (e.g. Lump skin disease)			
	☐ Brucellosis			
	☐ Anthrax			
	<i>Carbonculo hematico</i>			
	Carbunculo sintomatico			
	Tuberculosis (TB)			
Did you treat your cattle against ticks in the last 12 months?	If Yes, how many days ago was the last time you treated your cattle against ticks?	Who applied the treatment?	What was the cost of application?	Was the cost per animal or for the whole herd?
Yes/No				

Animal Health Services				
Did your cattle have wounds or sickness over the past 12 months	Yes/No			
If yes, what health problems did your cattle have over the past 12 months? (check)	Check all that apply	Who treated the cattle most of the time? (see list)	What was the cost per occurrence	Was the cost per animal or for the whole herd?
☐ Mastitis				
☐ Wounds				
☐ Conjunctivitis				
Tick-borne diseases (heartwater, readwater, anaplasmosis)				
☐ Diarrhea				
☐ Other: _____				
Were any of your lactating cows treated with injectable antibiotics in the last 12 months?	Yes/No			
If yes, did you withhold their milk from human consumption or sale following treatment?	Yes/No			
Reproduction	What type of breeding methods have you used for your cows and heifers over the past 12 months (choose all that apply)	Who provided the service? (for natural service, include "community bull" and "own bull" among options)	What was the cost of breeding using that method?	Was the cost per animal or for the whole herd?
	Artificial insemination			

Animal Health Services				
	Natural breeding			
	If you wanted to buy a heifer for dairy production, how easy or difficult would it be?			
		Very easy		
		Somewhat easy		
		Neither easy nor difficult		
		Somewhat difficult		
		Very difficult		
	In general, how easy or difficult is it to access health services for your dairy cattle?			
		Very easy		
		Somewhat easy		
		Neither easy nor difficult		
		Somewhat difficult		
		Very difficult		

6. Training and knowledge		
Questions		
6.1	6.2	6.3
6. 1 Has anyone in your household or a farm employee received a certificate of training in dairy management from Land O'Lakes?	6.2 If yes, who in the household received instruction? First person to receive instruction	6.3 If yes, who in the household received instruction? Second person to receive instruction
	Husband	Husband
Yes	Wife	Wife
No	Farm employee	Farm employee

	Other household adult male	Other household adult male
	Other household adult female	Other household adult female
	Other (specify)	Other (specify)
		None other (only one person was trained)

Knowledge questions

Enumerator, ask the respondent: "If you were to be asked to advise a person who wanted to begin to produce milk, what would you tell them about:..."

Ways to improve pasture quality (ask for 2)

Control harmful weeds

Fertilize the field with potassium one per year (for sandy soil)

Rotate between grass and legumes

Fence the field to keep undesired animals from entering

Harvest the pasture

Other (specify)

Other (specify)

Advantages of artificial insemination (ask for 2)

No need to have access to a bull

No risk of transmission of sickness

The calves will have predictable/known genetic material

Ability to decide when the cows will become pregnant

Is it less expensive to buy semen than to maintain a bull

Ability to select from bulls worldwide, on the basis of characteristics that you want for your herd

Other (specify)

Other (specify)

Wait data or information you would need to estimate the profitability of your dairy enterprise (ask for 2)

Revenue/Income

Expenditures/Expenses

Other (specify)

Other (specify)

The most important equipment to have in your corral

Feed trough

Water trough

Roof for shade

Cement floor in milking area

Dry floor/ground

Other (specify)

Other (specify)

Other (specify)

Other (specify)

How to prevent or control mastitis (ask for 3)

Disinfect the udder and teats before milking

Maintain milking equipment clean and in good condition

Wash hands before and after milking each cow

Feed cows immediately after milking them, and ensure that they have access to clean water

Treat mastitis using veterinary products

Keep cows that frequently suffer mastitis distant from those that don't

Milk cows with mastitis after the other cows

Keep the cows as clean as possible

Give "dry cow therapy" to dry cows

Keep the corral and lugar de paricao clean

Other (specify)

Other (specify)

Other (specify)

5. Labor, roles and responsibilities						
Questions	Response					
In 2016, how many of the following types of employees did you have:		Male	Female			
	Full time permanent					
	Part-time permanent					
	Full time seasonal					
	Part-time seasonal					
If they have employees: On average, how many hours a week does a part-time employee work?						
If they have employees: On average how many weeks of the year does a seasonal employee work?						
Who is primarily responsible for performing the following activities		Male adult in family	Female adult I family	Male children	Female children	Paid worker
	Production of forage (seeding and planting)					
	Cleaning the corral					
	Construction of corral					
	Purchase of dairy inputs (feed and medicine)					
	Milking cows					
	Maintenance of corral					
	Cutting and carrying forage to corral					
	Chopping forage at corral					
	Transport of water for animals					

5. Labor, roles and responsibilities						
Questions	Response					
	Transport of milk to the MCC or cooperative					
	Bring cattle to pasture or water					
	Basic medical treatment of the animals (wounds, conjunctivitis)					
	Estrus detection					
	Cleaning of dairy utensils					
	Record keeping					
	Receiving money at the MCC or cooperative					
5.5 Who makes the final decision about the following activities?		Male head of household	Female head of household	Male children	Female children	Paid worker
	Allocation of revenue from the milk sales					
	Distribution of dairy activities (cutting grass, cleaning the corral, feeding the animals,)					
	Age at which the child starts school					
	Whether to buy a dairy cow					
	Whether to purchase inputs or equipment for dairy					
	Distribution of household activities					
	How to spend crop income					

7. Production, disposition and revenue

Questions	Response
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Enumerator ask: Now I have some quesitons about the milk you produce and what you do with it. It might be easier to answer these questions making reference to your record book. Would you bring?

May I take pictures of your most current records?

Yes/no

Enumerator: Is respondent able to show current pages of:

Daily milk production

Yes/no

Allocation of milk produced

Yes/no

Farm transactions (expenses and receipts)

Yes/no

Farm visits

Yes/no

		Dry season (May to October) (liters)	Rainy season (November to April) (liters)	What was the value of the sale?	Indicate if value is total or per liter
How much milk did your cows produce on a daily basis during:					
How did you distribute the milk produced in each milking among the following different uses? (Liters)	Home consumption				
	Milk loss (spoilage, etc.)				
	Milk given to calves				
	Milk sold to MCC/coop				Total/per liter
	Milk sold locally (neighbor, transient buyer, etc.)				Total/per liter

		Dry season (May to October) (liters)	Rainy season (November to April) (liters)	What was the value of the sale?	Indicate if value is total or per liter
	Other (specify)				Total/per liter
Enumerator: Total the milk allocations over uses and ensure that it equals the total amount of milk produced for that milking.	Total				
Do you receive any inputs or services from any buyer(s)?	Yes/No				
If yes, which buyer(s) (check all that apply)	MCC/Coop				
	local buyer				
	Processor				
	Other (specify)				
What specific services do you receive from the buyer(s)? (select all that apply)					
a. Feeds and feeding supplements					
b. Medicines					
c. Veterinary assistance					
d. Milk test					
e. Artificial Insemination					
f. Village bull					
g. Milking utensils					
h. Continuing training					
i. Other (specify):					

		Dry season (May to October) (liters)	Rainy season (November to April) (liters)	What was the value of the sale?	Indicate if value is total or per liter
7.7.1 Have you had any milk refused by a buyer in the past 12 months?	Yes/No				
If no, continue to 7.8.1					
If yes, how many times?					
7.7.2 If yes, for what reasons?	Mastitis				
	Boiled milk/leite fervido				
	outro (specify)				

8. Finance and Investments		
Questions		Response
If farm has a bulk tank for milk, what is its capacity? (liters)		
8.1 Did your household make any investments in your dairy enterprise over the past 12 months?		Yes/No
	If no, continue to 8.2	
	8.1.1 What investments?	
	8.1.2 What was the cost?	
	8.1.3 What was the source of finance? (select all that apply)	Self-financed
		Informal (family, neighbors, friends)
		Formal loan (bank)
		Grant
8.2 Did your household request or receive credit for any production costs over the past 12 months?		Yes/No
	If no, continue to 8.3	
	8.2.1 Who did you request from?	
	8.2.2 How much did you request?	
	8.2.3 Did you receive credit?	Yes/No
	8.2.4 How much?	

	8.2.5 What was the purpose of the credit?	
	8.2.6 What was the interest rate? (%)	
	How long was allocated for repayment?	

We have come to the end of our questions. Thank you very much for your participation.

Before I go, may we visit the corral?

Enumerator: Indicate the condition of the corral per the following elements. Take 1-5 photos of the different features of the corral.

Accumulation of manure	Yes/No
Existence of shade	Yes/No
Ventilation	Yes/No
DConcrete material under the milking area	Yes/No
EClean and fresh water ad libidum	Yes/No
Existence of fodder recipient	Yes/No
Dryness of the corral area	Yes/No

Over the next few days, you might receive a call to verify some of the responses you gave. This is part of our quality control process for the survey. Are you willing to receive a brief call for this purpose? Yes/No

F2. Farmer Focus Group Discussion Guide

February-March 2017

Name of Province:	☐ Manica	☐ Sofala
District:		
Date and time of FGD:	Date:	Time:
Location of FGD:		
GPS Coordinates	Latitude:	Longitude:
Number of Participants:	Female:	Male:
Names of Facilitators:		

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, a US-based research company. Joining me is _____, who works for _____. Land O'Lakes International Development has contracted IMPAQ to carry out a baseline data collection/evaluation in preparation of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (called MERCADO) project. Today, I would like to ask you questions about your experience with or thoughts about the dairy industry in Mozambique. Our goal is to capture a wide range of viewpoints that can usefully inform Land O'Lakes dairy activities in Mozambique.

We're interested in learning about your experiences as dairy farmers, including what you like about being a dairy farmer, what you don't like, and what you think your prospects are for dairy farming going forward, and what you think will help you succeed in the industry.

Throughout the discussion today, there is no wrong answer but there might be differing points of view. Please feel free to share your opinions and your experiences, even if it differs from what others have said. Everything you say here today will be confidential between us and our project. Your names or other identifying information will not be used in any of our reports.

The discussion will be approximately 45 or 50 minutes.

Permission Question:

Before we begin, do you have any questions about the purpose of the evaluation or what will happen to the information? If it's ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do I have your permission to conduct this interview? Yes ☐ No ☐

Do I have your permission to record this interview? Yes ☐ No ☐

(If yes, turn on the recorder and record respondent's consent. If they say no, then proceed with the interview without recording it.) If at any point you want me to turn off the recorder, please let me know and I'll be happy to comply.

Great. Let's get started, then.

Name	M/F	Age	Phone Number

Question	Answer
1. To begin, would each of you please introduce yourself, and tell me a little bit about yourself as a farmer and dairy farmer—what you farm, and when and how you began dairy farming.	
2. Do you feel as if you have been successful as a dairy farmer?	
a. Why or why not?	
3. Now I have questions about different aspects of dairy farming, and training you might have received on specific practices.	
a. We'll discuss different aspects of dairy production and marketing, and for each I'd like to hear what you consider to be "good practices" in this area, how you learned about this, to what extent you follow/employ this "good practice" and why or why not. Before we move on to each new topic, I'd like to know what training or assistance you feel would be most helpful for you in this area.	
b. Please note, that while I'm interested in learning about each of your individual perspectives, I'm also interested in learning through any discussion you might have with one another around these topics. • Feed practices for dairy cows including grazing, forage, supplementation, and water • Hygiene and milk quality • Appropriate housing for dairy cows • Herd health—prevention, identification, and management of pests and diseases • Breeding of dairy cattle • Milking practices	

• Farm management and record keeping	
4. What are the most important factors that determine productivity of your dairy cows? How do you think you do in these areas? (In addition to any of the areas listed above, ask about calving intervals, lactation periods, and production levels in particular.)	
5. Now, all these issues considered, I'd like you to discuss as a group and share with me what are the most challenging issues that you face as dairy farmers, and what your priorities would be to address those issues?	
6. What do you think has been good about dairy farming, and what has been challenging or difficult?	
7. Let's talk now about how you use milk—whether it is for home consumption or sale, and if you sell it, who you choose to sell to.	
a. Let's start with each of you telling me about how you view producing milk for home consumption or sale—how important is each?	
b. Do you think your spouse would agree? How do you think s/he might answer this question differently?	
8. Where do you usually sell your milk? Is it common for people to sell to both the MCC/ cooperative and other buyers too, like neighbors? What are the pros and cons of different types of buyers?	
a. What do you like about being part of a cooperative? What do you dislike? Are there services or other benefits that you would like to see the cooperative provide?	
b. Is transport an issue in your decisions about who to sell to? How do you transport milk to the cooperative, and why do you choose to do it that way. What issues are there, if any, around transport?	
c. What would you most like to see from a buyer, in addition to a good price for your milk?	
9. Now I have a question about the recent drought. How has it affected your dairy activities? What strategies did you use to preserve your herds during this time?	
10. Looking forward, what would you like to do with your dairy operations? Are any of you thinking of expanding? Of selling your dairy cows to focus on	

other activities? What influences these different considerations?	
11. Overall, do you see dairy as a good market to be in? Why or why not?	
12. Finally, I'd like to hear a little bit about your experience with the Land O'Lakes dairy projects that you've participated in. What benefits have you received through this participation? What has been most helpful? What do you think could have been done differently or better?	
13. Those are all of my questions for this discussion. Do you have any issues that you'd like to discuss or bring to my attention?	

*****THANK YOU FOR YOU TIME AND SUCCESSFUL DISCUSSION*****

F3. MCC/Cooperative Semi-Structured Survey

Interviewer name			
Interview date			
Interview time			
Respondent name			
Respondent position/title			
Cooperative name			
Cooperative location			
GPS coordinates: Latitude			
GPS coordinates: Longitude			
Province:		☐ Manica	☐ Sofala
District:			

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, a US-based research company. Joining me is _____, who works for _____. Land O'Lakes International Development has contracted IMPAQ International to carry out a baseline data collection/evaluation in preparation of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (called MERCADO) project. Today, I would like to ask you questions about your experience with or thoughts about the dairy industry in Mozambique. Our goal is to capture a wide range of viewpoints that can usefully inform Land O'Lakes dairy activities in Mozambique. The interview will be approximately one hour.

Permission Question:

Before we begin, do you have any questions about the purpose of the evaluation or what will happen to the information? If it's ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do I have your permission to conduct this interview? Yes No

Do I have your permission to record this interview? Yes No

(If yes, turn on the recorder and record respondent's consent to tape. If they say no, then proceed with the interview without recording it.)

If at any point you want me to turn off the tape recorder, please let me know and I'll be happy to comply.

Section		Question		Answer
	1			
		Does the cooperative do any quality testing on incoming milk?		Yes/No
		If yes, what does it test for? (select all that apply)		
		Water adulteration		
		What are the test paramaters		
		Do you test all deliveries, randomly, or on an ad hoc basis?		
		Bacteria		
		What are the test paramaters		
		Do you test all deliveries, randomly, or on an ad hoc basis?		
		Butter and fat content		
		What are the test paramaters		
		Do you test all deliveries, randomly, or on an ad hoc basis?		
		Antibiotic residue		
		What are the test paramaters		
		Do you test all deliveries, randomly, or on an ad hoc basis?		
Sales and Receipts				
		What was the cooperative's total value of sales in 2016?		
		What was the total volume of sales (in liters) in 2016?		
		Does the cooperative have an agreement with a buyer/processor?		
		If yes, how many agreements?		
		If yes, please specify		
Equipment and facilities	6.1	Please describe the major equipment and facilities that the cooperative possesses that are currently in working order		
		MCC		Has?
				Capacity
				Value
				In what year installed?
	6.2	Bulk milk tank		Has?
				Capacity
				Value
				In what year installed?

	6.3	Pasteurizer		Has?
				Capacity
				Value
				In what year installed?
	6.4	Chilling system		Has?
				Capacity
				Value
				In what year installed?
	6.5	Bulk fridge retails		Has?
				Capacity
				Value
				In what year installed?
	6.6	Value-adding technology		Has?
	6.7	...	...	Capacity
				Value
	6.8			In what year installed?
	6.9	Staffing		
	7.1	In 2016, how many of the following types of employees did you have:		
	7.2		Full time permanent	Total
				Men
				Women
	7.3		Part-time permanent	Total
				Men
				Women
			Full-time seasonal	Total
				Men
				Women
	7.4		Part-time seasonal	Total
				Men
				Women
	7.5	On average, how many hours a week does a part-time employee work?		

	7.6	On average how many months of the year does a seasonal employee work?		
Finance and investments	8.1	Did your cooperative make any investments in your dairy enterprise in 2016?		
	8.2	What investments?		
	8.3	What was the cost?		
	8.4	How was it financed (by % contribution)		
	8.5	Self-financed		
		Informal (family, neighbors, friends)		
		Formal loan (bank)		
	8.6	Grant		
		Other (specify)		
	8.7	Did the cooperative request or receive credit for any production costs over the past 12 months?	Yes/No	
			<i>1st Loan</i>	<i>2nd Loan</i>
	8.8	Who did you request from?		
	8.9	How much?		
		Did you receive credit?	<i>Yes/No</i>	<i>Yes/No</i>
		How much?		
		What was the purpose of the credit?		
		What was the interest rate?		
		What time was allocated for repayment?		

What support would be beneficial to the cooperative to receive from MERCADO or a similar program?

What is the price paid to farmers

What is the price received from processors?

What records does the cooperative/MCC keep?

Does the MCC/cooperative do a monthly cash-flow statement?

If yes, it is possible to provide a copy of the last year? Obs: Fill in the the table below.

	Qty	Unit Price
Incomes:		
1. Milk sold to processor		
2. Other		
Operating expenses:		
Milk paid to farmers		
Salaries		
Milk tests		

Communications		
Transport		
Water		
Electricity		
Utensils (<1 year useful life)		
Utensils (>1 useful year) 1		
Cleaning and disinfection products		
Office consumables		
Other consumables		
Maintenance and repairs		
Operating cash-flow		

F4. Processor Semi-Structured Survey

Name of Interviewer(s):			
Date and Time of Interview:		Date:	Time:
Name and Title/Position of Respondent(s):			
Location:			GIS Coordinates:
Province:		☐ Manica ☐ Sofala	
District:			

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, a US-based research company. Joining me is _____, who works for _____. Land O'Lakes International Development has contracted IMPAQ International to carry out a baseline data collection/evaluation in preparation of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (called MERCADO) project. Today, I would like to ask you questions about your experience with or thoughts about the dairy industry in Mozambique. Our goal is to capture a wide range of viewpoints that can usefully inform Land O'Lakes dairy activities in Mozambique.

The interview will be approximately one hour.

Permission Question:

Before we begin, do you have any questions about the purpose of the evaluation or what will happen to the information? If it's ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do I have your permission to conduct this interview? Yes No

Do I have your permission to record this interview? Yes No

(If yes, turn on the recorder and record respondent's consent to tape. If they say no, then proceed with the interview without recording it.) If at any point you want me to turn off the tape recorder, please let me know and I'll be happy to comply.

Great. Let's get started, then.

Section				
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Firm and respondent identifying information	1.1	Firm name		
	1.2	Province		
	1.3	District		
	1.4	Community		
	1.5	GPS latitude		
	1.6	GPS longitude		
	1.7	Respondent name		
	1.8	Contact information		
	1.9	Position in firm		
Background on firm and its work in dairy	2.1	Please provide a brief background on the firm and its work with dairy		
	2.2	Year of inception		
	2.3	Motivation for start-up		
	2.4	Major evolutions in management structure, markets, services, etc.		
	2.5	When and how did you begin work with Land O'Lakes (or its dairy projects)?		
	2.6	Year began work with LoL/MERCADO		
	2.7	Motivation for work with LoL/MERCADO		
	2.8	Major evolutions in nature or scale of work with LoL/MERCADO		

		For 2016, ...		
Procurement	3.1	What was the total volume of milk that the firm obtained from farmers?		
	3.2	How does that volume relate to your processing capacity? (%)		

	3.3	How much of your supply (%) comes from		%	Number of suppliers	Price paid		Agreement with supplier(s)?
	3.4		Imported powder					
	3.5		Smallholder farmers					Services to suppliers
	3.6		Commercial farmers					
	3.7		firms					

	3.8		Other types of suppliers (specify)					
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	3.6		Commercial farmers
	3.7		firms
	3.8		Other types of suppliers (specify)
	3.9	What type of milk supply/supplier do you prefer? Why?	
	4	What are the pros and cons of different types of milk supply/suppliers?	
	4.1	Does the firm do any quality testing on incoming milk?	
	4.2	If yes, what does it test for? (select all that apply)	
	4.3		Water adulteration
			Bacteria
			Butter and fat content
			Antibiotic residue
		Are these tests applied on	
			All milk deliveries
			Random basis
			Ad hoc/judgment basis
			Price
			Quality
		Does the firm adjust the price paid to farmers on the basis of any quality parameters (e.g. percent fat)	
		Approximately what % of incoming milk did the firm reject on quality grounds in 2016?	
		What challenges, if any, does the firm face in procurement?	
		How has the firm tried to address these challenges? What has worked, what has not?	
		What does the firm think will be necessary to successfully tackle these challenges?	
Processing	4.1	What processing and value-addition activities does the firm undertake with the milk? (Select all that apply)	

	4.2		Pasteurization		
	4.3		Homogenization		
	4.4		Packaging		
	4.5		Other (specify)		
	4.6		Other (specify)		
	4.7		Packaging		
	4.8		Other (specify)		
			Other (specify)		
		What challenges, if any, does the firm face in processing			
		How has the firm tried to address these challenges? What has worked, what has not?			
		What does the firm think will be necessary to successfully tackle these challenges?			
Sales and revenue	5.1	Does the firm sell milk in any form other than as fluid milk sold in bulk? What share do these products occupy of total sales? Is the share of sales increasing or decreasing?			
	5.2		Specify product	Share of sales	Share trend (+, ~, -)
	5.3	Product 1			
	5.4	Product 2			
	5.5	Product 3			
	5.6	Product 4			
	5.7	Product 5			
	5.8				
	5.9	In 2016, what types of buyers has the firm sold to, what share			

		of sales did each account for, and how are they trending?			
			Specify buyer/type	Share of sales	Share trend (+, ~, -)
		Buyer 1:			
		Buyer 2:			
		Buyer 3:			
		Buyer 4:			
		Buyer 5:			
		Did the firm obtain revenue from sales of anything other than milk/milk products?			
		If yes, please specify			
		What challenges, if any, does the firm face in marketing milk and milk products			
		How has the firm tried to address these challenges? What has worked, what has not?			
		What does the firm think will be necessary to successfully tackle these challenges?			
Equipment and facilities	6.1	Please describe the major equipment and facilities that the firm possesses that are currently in working order	Item	Number	Capacity
	6.2		Bulk milk tank		
	6.3		Pasteurizer		
	6.4		Chilling system		
	6.5		Bulk fridge retails		
	6.6		Value-adding technology		
	6.7		...		

	6.8				
	6.9				
Staffing	7.1	In 2016, how many of the following types of employees did you have:	Male	Female	
	7.2	Full time permanent			
	7.3	Part-time permanent			
	7.4	Seasonal			
	7.5	On average, how many hours a week does a part-time employee work?			
	7.6	On average how many months of the year does a seasonal employee work?			
	7.7	What staffing challenges, if any, does the firm face?			
	7.8	How has the firm tried to address these challenges? What has worked, what has not?			
	7.9	What does the firm think will be necessary to successfully tackle these challenges?			
Finance and investments	8.1	Did your firm make any investments in your dairy enterprise in 2016?			
	8.2	For each investment, ask	What investments?	What was the cost?	How was it financed (by % contribution)
	8.3				Self-financed
	8.4				Informal (family, neighbor

					s, friends)
	8.5				Formal loan (bank)
	8.6				Grant
	8.7	Did the firm request or receive credit for any production costs over the past 12 months?			
	8.8	If yes,	Who did you request from?		
	8.9		How much?		
			Did you receive credit?		
			How much?		
			What was the purpose of the credit?		
			What was the interest rate?		
			What time was allocated for repayment?		
		What financing challenges, if any, does the firm face?			
		How has the firm tried to address these challenges? What has worked, what has not?			
		What does the firm think will be necessary to successfully tackle these challenges?			
Management of the firm		How is the firm managed?			
			<i>(Insert questions specific to management areas that MERCADO hopes to influence)</i>		

		What training have firm management and staff received?			
			<i>(Insert topics specific to training areas that MERCADO hopes to address)</i>		
		What management challenges, if any, does the firm face?			
			How has the firm tried to address these challenges? What has worked, what has not?		
			What does the firm think will be necessary to successfully tackle these challenges?		
		<i>Insert knowledge questions</i>			

Training	With respect to training, ...		What training did firm management and staff receive in 2016? (check)	How many were trained?	What entity provided the training ?	What training would be beneficial to receive? (check)
		Milk bulking and cooling				
		Hygiene and disinfection				
		Quality control				
		Record keeping				
		Financial management				
		Other (specify)				
	What services do you offer your members					
		Feed				

		Veterinary inputs (vaccinations , medicines, etc.)				
		Veterinary services				
		Milk quality tests				
		Milking utensils				
		artificial insemination				
		village bull				
		training				
		milk collection				
		other (specify)				
	Do you have any further observations, thoughts to share, or questions before we conclude the interview ?					

Reflections on work in the dairy industry, and work with Land O'Lakes & MERCADO	Overall, how do you think that the firm is faring?	
	What are the firms prospects in the near future?	
		What will be necessary for it to be successful?
	Are any major strategy, management, or operations changes planned?	
		Please describe
	What has been the firm's experiences working with the Land O'Lakes in general, and with MERCADO specifically?	

	What areas has Land O'Lakes or project support been most helpful?	
	What areas could support be more helpful?	
		What should be changed, specifically?
	Based on your knowledge of Land O'Lakes dairy activities, are there areas that you feel they should be working or not working, or working differently?	
	Do you have any further observations, thoughts to share, or questions before we conclude the interview?	

Does the firm have an agreement with any supplier(s)?

What records does the firm/MCC keep?

SECTION H. BUSINESS MANAGEMENT

45. Who is responsible for the firm management decisions?

The MCC?

52. Did the manager receive training in business management or other related topics.

If yes, what areas or topics were covered in the training

Does the firm have a business plan?

What is its implementation status?

Not yet being implemented, partial, full

Does the firm have by-laws?

Does the firm have by-laws?

52. The MCC/bulking point does a monthly cash-flow statement?

If yes, it is possible to provide a copy of the last year?
Obs: Fill in the the table below.

53. What kind of records do the MCC/bulking point keep?

Qty	Unit Price	Total Value 2016
-----	------------	------------------

Incomes:

1. Milk sold to
processor

2. Other

Operating expenses:

Milk paid to farmers

Salaries

Milk tests

Communications

Transport

Water

Electricity

Utensils (<1 year useful life)

Utensils (>1 useful year) 1

Cleaning and disinfection
products

Office consumables

Other consumables

Maintenance and
repairs

Operating cash-flow

What support would be beneficial to the firm to receive from MERCADO or a similar program?

F5. Breeder Key Informant Interview Guide

Name of Interviewer(s):		
Date and Time of Interview:	Date:	Time:
Name of Firm and Contact Information	Name:	Contact Information:
Name and Title/Position of Respondent(s):		
Location:		GIS Coordinates:
Province:	☐ Manica ☐ Sofala	
District:		

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, a US-based research company. Joining me is _____, who works for _____. Land O'Lakes International Development has contracted IMPAQ International to carry out a baseline data collection/evaluation in preparation of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (called MERCADO) project. Today, I would like to ask you questions about your experience with or thoughts about the dairy industry in Mozambique. Our goal is to capture a wide range of viewpoints that can usefully inform Land O'Lakes dairy activities in Mozambique.

The interview will be approximately one hour.

Permission Question:

Before we begin, do you have any questions about the purpose of the evaluation or what will happen to the information? If it's ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do I have your permission to conduct this interview? Yes No

Do I have your permission to record this interview? Yes No

(If yes, turn on the recorder and record respondent's consent to tape. If they say no, then proceed with the interview without recording it.) If at any point you want me to turn off the tape recorder, please let me know and I'll be happy to comply.

Great. Let's get started, then.

Section	Question_1	Question_2	Answer
Background on firm and its work in dairy	Please provide a brief background on the firm and its work with dairy		
	<i>Include</i>		
	Year of inception		
	Motivation for start-up		
	Major evolutions in management structure, markets, services, etc.		
	When and how did you begin work with Land O'Lakes (or its current or past dairy projects)?		
	<i>Include</i>		
	Year began work with MERCADO		
	Motivation for work with MERCADO		
	Major evolutions in nature or scale of work with MERCADO		
Procurement and production	How many dairy cows do you currently have for breeding purposes?	Dairy breed	
		Cross Breed	
	When and how did you obtain those cows?		
	Do you use a bull or AI for breeding?		

	<i>(Insert questions about production practices of interest to MERCADO)</i>		
	What challenges, if any, does the firm face in obtaining genetics and breeding stock? (describe)	How has the firm tried to address these challenges? What has worked, what has not?	
		What does the firm think will be necessary to successfully tackle these challenges?	
	What challenges, if any, does the firm face in producing dairy cows (describe)	How has the firm tried to address these challenges? What has worked, what has not?	
		What does the firm think will be necessary to successfully tackle these challenges?	
Sales and revenue	In 2016, what were your sales of	Unbred heifers	
		Bred heifers	
		Cows	
	Who are your main buyers?		
	What prices do you receive for your stock from different buyers?	Unbred heifers	
		Bred heifers	
		Cows	
	Did the firm obtain revenue from sales of anything other than dairy cows/heifers?	Yes/No	
	If yes, please specify		
	What challenges, if any, does the firm face in marketing dairy stock? (describe)		

	How has the firm tried to address these challenges? What has worked, what has not?		
	What does the firm think will be necessary to successfully tackle these challenges?		
			Item 1
Equipment, facilities and staffing	Please describe the major equipment and facilities that the firm possesses	Item	
		Capacity	
		Number	
		Currently in working order?	
		How many of each of the following does the firm own, that is in working order?	
		<i>Obtain list of major equipment from Land O'Lakes to insert into matrix (focus on equipment/facilities that MERCADO is likely to try to help establish)</i>	
		Does the firm have any specific plans to invest in new facilities or equipment in the coming year?	Yes/No
		If yes, please describe	
	In 2016, how many of the following types of employees did you have:	Male	Female
	Full time permanent		
	Part-time permanent		
	Seasonal		

	On average, how many hours a week does a part-time employee work?		
	On average how many months of the year does a seasonal employee work?		
	What staffing challenges, if any, does the firm face? (describe)		
	How has the firm tried to address these challenges? What has worked, what has not?		
	What does the firm think will be necessary to successfully tackle these challenges?		
Finance and investments	Did your firm make any investments in your dairy enterprise over the past 12 months?	Yes/No	
	For each investment, ask	What investments?	(insert drop down list of options)
		What was the cost?	
		What was the source of finance? (%)	Self-financed
			Informal (family, neighbors, friends)
			Formal loan (bank)
			Grant
		Other (specify)	

	Did the firm request or receive credit for any production costs over the past 12 months?	Who did you request from?	
		How much?	
		Did you receive credit?	
		How much?	
		What was the purpose of the credit?	
		What was the interest rate?	
		What time was allocated for repayment?	
Management of the firm	What financing challenges, if any, does the firm face? (describe)	How has the firm tried to address these challenges? What has worked, what has not?	
		What does the firm think will be necessary to successfully tackle these challenges?	
	How is the firm managed?		
		<i>(Insert questions specific to management areas that MERCADO hopes to influence)</i>	
	What training have firm management and staff received?		
		<i>(Insert topics specific to training areas that MERCADO hopes to address)</i>	
	What management challenges, if any, does the firm face? (describe)		
	How has the firm tried to address these challenges? What has worked, what has not?		
	What does the firm think will be necessary to		

	successfully tackle these challenges?		
	<i>Insert knowledge questions</i>		
Reflections on work in the dairy industry, and work with Land O'Lakes & MERCADO	Overall, how do you think that the firm is faring?		
	What are the firms prospects in the near future?		
	What will be necessary for it to be successful?		
	Are any major strategy, management, or operations changes planned?		
	Please describe		
	What has been the firm's experiences working with the Land O'Lakes in general, and with MERCADO specifically?		
	What areas has Land O'Lakes or project support been most helpful?		
	What are areas that Land O'Lakes, through its MERCADO project, could help the firm succeed in this market?		
Do you have any further observations, thoughts to share, or questions before we conclude the interview?			

F6. Community Livestock Worker Semi-Structured Survey

Name of Interviewer(s):		
Date and Time of Interview:	Date:	Time:
Name and Title/Position of Respondent(s):		
Location:		GIS Coordinates:
Province:	☐ Manica ☐ Sofala	
District:		

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, a US-based research company. Joining me is _____, who works for _____. Land O’Lakes International Development has contracted IMPAQ International to carry out a baseline data collection/evaluation in preparation of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (called MERCADO) project. Today, I would like to ask you questions about your experience with or thoughts about the dairy industry in Mozambique. Our goal is to capture a wide range of viewpoints that can usefully inform Land O’Lakes dairy activities in Mozambique.

The interview will be approximately 45 minutes.

Permission Question:

Before we begin, do you have any questions about the purpose of the evaluation or what will happen to the information? If it’s ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do I have your permission to conduct this interview? Yes No

Do I have your permission to record this interview? Yes No

(If yes, turn on the recorder and record respondent’s consent to tape. If they say no, then proceed with the interview without recording it.) *If at any point you want me to turn off the tape recorder, please let me know and I’ll be happy to comply.*

Great. Let’s get started, then.

Section	Question_1	Response
Background on CLW	Please tell me briefly about your work as a CLW	
	<i>Include</i>	
	Year began	
	Motivation to work as a CLW	
	Training received for this work	
CLW support to dairy	Tell me about your work, if any, to support dairy as a CLW	
	Who are your clients?	
	What specific services do you provide?	
	How are you compensated for your services?	
	When and how did you begin work with Land O'Lakes (or its dairy projects)?	
	<i>Include</i>	
	Year began	
	Motivation	
	What type of support (financial, training, other) have you received to date from Land O'Lakes or one of its dairy projects?	
	Do you have clients seek services that you cannot provide? Please describe	
	What challenges, if any, do you face in providing services to support dairy, specifically? (describe)	
	How have you tried to address these challenges? What has worked, what has not?	
	What do you think will be necessary to successfully tackle these challenges?	

	Are there any areas of training, in particular, that you feel would help you better support dairy as a CLW? Describe	
	Are there other areas where you feel that support would help you better support dairy as a CLW? Describe	
Reflections on work in the dairy industry, and work with Land O'Lakes & MERCADO	Overall, what do you think are the strengths and weaknesses of the local dairy industry?	
	Do you think that it is, or could become, a viable industry?	
	What would best help the dairy industry succeed?	
	Overall, how do you think you are doing at supporting dairy as a CLW?	
	What changes would you like to make to this work?	
	What will be needed for those changes to pay off?	
	What has been your experience working with the Land O'Lakes in general, and with its dairy projects, like MERCADO, specifically?	
	What areas has Land O'Lakes or project support been most helpful?	
	What are areas that Land O'Lakes, through its MERCADO project, could help the firm succeed in this market?	
	Do you have any further observations, thoughts to share, or questions before we conclude the interview?	

F7. Input (Feed and Forage) Supplier Questionnaire

Name of Interviewer(s):			
Date and Time of Interview:		Date:	Time:
Name and Title/Position of Respondent(s):			
Name of Supplier Company:			
Location:			GIS Coordinates:
Province:		☐ Manica ☐ Sofala	
District:			

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, a US-based research company. Joining me is _____, who works for _____. Land O'Lakes International Development has contracted IMPAQ International to carry out a baseline data collection/evaluation in preparation of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (called MERCADO) project. Today, I would like to ask you questions about your experience with or thoughts about the dairy industry in Mozambique. Our goal is to capture a wide range of viewpoints that can usefully inform Land O'Lakes dairy activities in Mozambique.

The interview will be approximately one hour.

Permission Question:

Before we begin, do you have any questions about the purpose of the evaluation or what will happen to the information? If it's ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do I have your permission to conduct this interview? Yes No

Do I have your permission to record this interview? Yes No

(If yes, turn on the recorder and record respondent's consent to tape. If they say no, then proceed with the interview without recording it.) If at any point you want me to turn off the tape recorder, please let me know and I'll be happy to comply.

Great. Let's get started, then.

Section		Question		Response			
Firm and respondent identifying information		Firm name					
		Province					
		District					
		Community					
		GPS coordinates	Latitude				
	Longitude						
Background on firm and its work in dairy		Respondent name					
		Contact information					
		Position in firm					
		Please provide a brief background on the firm and its work with feed and forage. Include:	Year of inception				
			Motivation for start-up				
			Major evolutions in management structure, markets, services, etc.				
		When and how did you begin work with Land O'Lakes (or its dairy projects)? Include:	Year began work with MERCADO				
			Motivation for work with MERCADO				
			Major evolutions in nature or scale of work with MERCADO				
	All questions relate to the feed/forage aspect of the firm						
	Did you produce	Yes/No					

		feed/forage in 2016?					
		If yes, what did you produce?	Fresh				
			Hay				
			Silage	What other types of feed/forage products?			
			Ration				
			Other (specify)				
		How do you source/produce those feed and/or forage products?					
		Where do you source the inputs you need to produce those?					
		<i>(Insert questions about production practices of interest to MERCADO)</i>					
		<i>(Insert questions about training received on production practices of interest to MERCADO)</i>					
		What are your major costs in production?					
		Have you estimated what	Yes/No				

	the ratio is between your costs and sales price?					
	If yes, what is it?					
	What challenges, if any, does the firm face in obtaining needed inputs? (describe)					
	How has the firm tried to address these challenges? What has worked, what has not?					
	What does the firm think will be necessary to successfully tackle these challenges?					
	What production challenges, if any, does the firm face? (describe)					
	How has the firm tried to address these challenges? What has worked, what has not?					
	What does the firm think will be necessary to successfully					

		tackle these challenges?					
Sales and revenue		In 2016, what were your sales of different feed/forage products? Who are your main buyers and what prices do you receive?	Identify product	Volume of sales	Value of sales	Main buyers	Prices received
		Product					
		Product					
		Product					
		How do your different buyers transport the product?					
		Did the firm obtain revenue from sales of anything dairy-related products or services other than feed and forage products?					
		If yes, please specify					
		What challenges, if any, does the firm face in marketing feed and forage products to dairy? (describe)					

		How has the firm tried to address these challenges? What has worked, what has not?					
		What does the firm think will be necessary to successfully tackle these challenges?					
		Approximately what share of your sales come from sales of products to the dairy industry?					
Equipment, facilities and staffing		Please describe the major equipment and facilities that the firm possesses	Item				
			Number				
			Capacity				
			<i>Obtain list of major equipment from Land O'Lakes to insert into matrix (focus on equipment/facilities that MERCADO is likely to try to help establish)</i>				
			Currently in Working Order?				
			How many of each of the following does the firm own, that				

		is in working order?				
	Does the firm have any specific plans to invest in new facilities or equipment in the coming year that will allow them to increase their dairy-related activity?	Yes/No				
		If yes, please describe.				
7.1	In 2016, how many of the following types of employees did you have:	Male	Female			
7.2	Full time permanent					
7.3	Part-time permanent					
7.4	Seasonal					
7.5	On average, how many hours a week does a part-time employee work?					
7.6	On average how many months of the year does a seasonal employee work?					
	What staffing challenges, if any, does the					

		firm face? (describe)					
		How has the firm tried to address these challenges? What has worked, what has not?					
		What does the firm think will be necessary to successfully tackle these challenges?					
Finance and investments		Did your firm make any investments in your dairy enterprise over the past 12 months? For each investment, ask					
		What investments?	(insert drop down list of options)				
		What was the cost?					
		What was the source of finance?	Self-financed				
			Informal (family, neighbors, friends)				
			Formal loan (bank)				
			Grant				
			Other (specify)				
		Did the firm request or receive credit for any production costs over the	Who did you request from?				
			How much?				
			Did you receive credit?				
			How much?				

		past 12 months?	What was the purpose of the credit?				
			What was the interest rate?				
			What time was allocated for repayment?				
		What financing challenges, if any, does the firm face? (describe)					
		How has the firm tried to address these challenges? What has worked, what has not?					
		What does the firm think will be necessary to successfully tackle these challenges?					
Management of the firm		How is the firm managed?					
		<i>(Insert questions specific to management areas that MERCADO hopes to influence)</i>					
		What training have firm management					

		and staff received?					
		<i>(Insert topics specific to training areas that MERCADO hopes to address)</i>					
		What management challenges, if any, does the firm face? (describe)					
		How has the firm tried to address these challenges? What has worked, what has not?					
		What does the firm think will be necessary to successfully tackle these challenges?					
		<i>Insert knowledge questions</i>					
Reflections on work in the dairy industry, and work with Land O'Lakes & MERCADO		Overall, how do you think that the firm is faring?					
		What are the firms prospects in the near future?					
		What will be necessary for it					

	to be successful?					
	Are any major strategy, management, or operations changes planned? Please describe					
	What has been your experience working with the Land O'Lakes in general, and with its dairy projects, like MERCADO, specifically?					
	What areas has Land O'Lakes or project support been most helpful?					
	What are areas that Land O'Lakes, through its MERCADO project, could help the firm succeed in this market?					
	Do you have any further observations, thoughts to share, or questions before we conclude the interview?					

F8. Financial Institutions Key Informant Interview Protocol

February-March 2017

Name of Interviewer:	
Date and time of interview:	
Name and Title/Position of Respondent(s):	
Name of Financial Institution	☐ BTM ☐ Banco Oportunidade ☐ GAPI
Province:	☐ Manica ☐ Sofala ☐ Maputo
District:	
GIS Coordinates:	

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, a US-based research company. Joining me is _____, who works for _____. Land O'Lakes International Development has contracted IMPAQ to carry out a baseline data collection/evaluation in preparation of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (called MERCADO) project. Today, I would like to ask you questions about your experience with or thoughts about the dairy industry in Mozambique. Our goal is to capture a wide range of viewpoints that can usefully inform Land O'Lakes dairy activities in Mozambique.

The interview will be approximately 45 minutes.

Permission Question:

Before we begin, do you have any questions about the purpose of the evaluation or what will happen to the information? If it's ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do I have your permission to conduct this interview? Yes ☐ *No* ☐

Do I have your permission to record this interview? Yes ☐ *No* ☐

(If yes, turn on the recorder and record respondent's consent to tape. If they say no, then proceed with the interview without recording it.) *If at any point you want me to turn off the tape recorder, please let me know and I'll be happy to comply.*

Great. Let's get started, then.

I. BACKGROUND INFORMATION

QUESTION	ANSWER
1. Please provide a brief background on your firm.	
2. Does your firm offer any financial services to the agricultural sector? Please describe	
3. What are your terms on loans to the agricultural sector? E.g. duration and interest rate	
4. How would you characterize your clients who utilize your agricultural financial services?	
5. Are you familiar or involved with Mozambique's dairy industry at all? Please describe your level of understanding or involvement	

II. LOANS

QUESTION	ANSWER
6. Does your firm offer any financial services, such as loans, to the dairy industry in Mozambique? Please describe	
a. What financial products do you currently have available to individuals working in the dairy industry? How long have they been available? (Indicator 2)	
b. In the past year: How many individuals have received financial services for work in dairy? (Indicator 1)	
c. In the past year: How many loans, and of what total value, have you disbursed to individuals working in dairy? (Indicators 15, 16)	
1. Please describe what sorts of businesses have received those loans.	
2. To your knowledge, have any of those loans been made to women, or women-owned/controlled businesses?	

III. WORKING WITH LAND O'LAKES, DAIRY, AND MERCADO

QUESTION	ANSWER
7. Has your firm interacted at all with the Land O'Lakes dairy projects (including MERCADO project)?	
a. What has that interaction consisted of?	
b. Have there been any actions taken yet (such as internal discussions about offering financial services to the dairy sector) as a result?	
8. Do you think that the dairy industry is a viable area for your firm to work in? Why or why not?	
a. If you were to work in the dairy industry at all, what sort of services do you think you'd be most likely to provide, and to whom?	
b. What would you look for in dairy industry clientele (i.e. what requirements/characteristics of clientele)?	
9. MERCADO, a new Land O'Lakes project that has the objective of helping to develop Mozambique's dairy sector, is looking for opportunities to help banks provide finance to the dairy sector. How could MERCADO help to support your firm's involvement in providing financial services to the dairy industry?	
10. Do you have any further observations on your firm's potential for involvement in the dairy industry, or on MERCADO?	

THANK YOU FOR YOU TIME AND SUCCESSFUL DISCUSSION

F9. Student Focus Group Discussion Guide

February-March 2017

Name of Province:	☐ Manica	☐ Sofala
District:		
Date and time of FGD:	Date:	Time:
GPS Coordinates	Latitude:	Longitude:
School Represented		
Number of Participants:	Female:	Male:
Names of Facilitators:		

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, a US-based research company. Joining me is _____, who works for _____. Land O'Lakes International Development has contracted IMPAQ International to carry out a baseline data collection/evaluation in preparation of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (called MERCADO) project. Today, I would like to ask you questions about your experience with or thoughts about the dairy industry in Mozambique. Our goal is to capture a wide range of viewpoints that can usefully inform Land O'Lakes dairy activities in Mozambique.

The discussion will be approximately 45 or 50 minutes.

Permission Question:

Before we begin, do you have any questions about the purpose of the evaluation or what will happen to the information? If it's ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do I have your permission to conduct this interview? Yes ☐ No ☐

Do I have your permission to record this interview? Yes ☐ No ☐

(If yes, turn on the recorder and record respondent's consent. If they say no, then proceed with the interview without recording it.) If at any point you want me to turn off the recorder, please let me know and I'll be happy to comply.

Great. Let's get started, then.

Name	M/F	Age	Phone Number	School Attended

Question	Answer
1. To begin, would you please tell me about your training in agriculture (i.e. your area of focus in technical school), and why you chose it?	
2. What have you done, or what do you hope to do, with that training upon graduation?	
3. Do any of you remember receiving any sort of training about dairy while in school?	
a. For example about dairy production practices, opportunities in the dairy sector, or any background or history on the dairy sector here in Mozambique?	
b. Please tell me generally what you remember learning.	
4. Have any of you lived or worked on a dairy farm, or any sort of a dairy enterprise, either before school or since?	
a. Please tell me about that. What was it like?	
b. What did you like or dislike about it?	
5. Do any of you remember receiving any sort of training about dairy or milk while in school?	
a. For example about dairy production practices, opportunities in the dairy sector, or any background or history on the dairy sector here in Mozambique?	
b. Please tell me generally what you remember learning.	
6. With respect to dairy production, what specifically do you remember being instructed on? (If necessary, prompt with examples such as feed practices, genetics and reproduction, housing, health management, etc.)	

7. Was your instruction in dairy limited to classroom experience, or did you also have some sort of practical instruction?	
a. Please describe any practical discussion—e.g. demonstration farm, internship, etc.	
b. How did the classroom and practical discussion relate to one another? What were your experiences with each?	
c. What do you feel was most effective about the practical versus classroom instruction?	
8. Do you feel that what you learned was useful?	
a. Was the way it was presented effective?	
b. What could have been done to make this a better learning experience?	
9. What did you learn about with respect to the dairy sector as an area of opportunity for employment or entrepreneurship?	
a. Do you see dairy as an attractive sector to work in?	
b. Why or why not?	
c. What would be most attractive about it?	
d. What is least attractive?	
10. Were you left with unanswered questions about prospects for work in the dairy sector?	
a. Were you left wanting to know more?	
b. What would you have liked to learn that you didn't?	
11. Would you like to make use of your training in dairy? Why or why not?	
12. Have you considered, or are you considered, a career in a field related to dairy? Why or why not?	
13. If you could work in the dairy sector, what work would you like to do? For whom?	
14. Do you know of any employment opportunities currently available in the dairy industry? Tell me about these—are they of interest?	
15. Did you receive any instruction about the health or nutritional benefits of milk?	

a. What do you remember about this instruction?	
16. Do you have any further comments or observations on dairy, either from a farming, employment or entrepreneurial perspective?	

F10. Youth Focus Group Discussion Guide

February-March 2017

Name of Province:	☐ Manica	☐ Sofala
District:		
Date and Time of FGD:	Date:	Time:
Location of Site:		GIS Coordinates:
School Represented		GIS Coordinates:
Number of Participants:	Female: _____ Male: _____	
Names of Facilitators:		

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, an American research company. Joining me is _____, who works for _____. Land O'Lakes International Development has hired IMPAQ to talk to you today about your thoughts about and experiences with dairy products like milk, cheese, yogurt, etc. Our goal is to capture a wide range of viewpoints that can help Land O'Lakes dairy activities in Mozambique.

Throughout the discussion today, there is no wrong answer but there might be differing points of view. Please feel free to share your opinions and your experiences, even if it differs from what others have said. Everything you say here today will be confidential between us and our project. Your names or other identifying information will not be used in any of our reports.

This discussion will take approximately an hour of your time.

Permission Question:

Before we begin, do you have any questions about the purpose of today's discussion or what will happen to the information? If it's ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do we have PARENT'S Permission to conduct this discussion? Yes ☐ No ☐

Do I have your permission to conduct this interview? Yes ☐ No ☐

Do I have your permission to record this interview? Yes ☐ No ☐

(If yes, turn on the recorder and record respondent's consent. If they say no, then proceed with the interview without recording it.) If at any point you want me to turn off the recorder, please let me know and I'll be happy to comply.

Great. Let's get started, then.

PARTICIPANTS:

FIRST Name (Only)	M/F	Age

Question	Answer
1. Do you or any of your family members frequently consume cow's milk, or milk products like yogurt or cheese? Why or why not?	
a. What type of products are these?	
2. Where do you or your parents buy these dairy products from?	
3. Do you like the taste of milk? What do you like or dislike?	
4. Do you like the taste of yogurt? What do you like/dislike?	
5. What about cheese? What do you like or dislike about cheese?	
6. Do you think that milk and milk products are good/healthy to consume? Why or why not?	
7. How do you know if a dairy product isn't of good quality or isn't "fresh"? [Gently probe: What does it smell like? What does it look like? (looking for things like mold, smells "sour", etc.)]	
a. What do you do with the product? [do they think it will be okay, it's just a little bad; do they throw it away?]	
b. Have you experienced this a lot?	
c. What type(s) of product(s) does this happen with frequently?	
d. Do you know why these products "go bad"? [looking for things like not kept cold, sitting in the hot sun, local products not reliable]	
8. Do you want to drink more milk? If so, why? If not, why not?	
9. What type of people drink milk? [We are thinking about whether people think just babies or wealthy people drink milk]	
10. Do you think drinking more milk would be good or bad for you?	
11. Have you ever learned anything in school about milk or dairy products? What have you learned?	

12. What did you think of what you learned in school about milk or dairy products—did it make you want to buy more? a. Or did you ask your parents to buy more? b. Did it affect which milk products you would buy, or where you'd buy them from?	
13. Have any of you participated in any training or education programs about nutrition, food safety, and/or dairy/dairy quality?	
a. For those who answered “yes”, which programs did you participate in?	
b. What did you learn from it?/ What was the most important thing you learned from it?	
c. How could the instruction have been more helpful/meaningful?	
d. Was there anything that you would have liked to learn about dairy/dairy quality that you didn't?	

*****THANK YOU FOR YOU TIME AND SUCCESSFUL DISCUSSION*****

F11. Other Stakeholder Key Informant Interview Guide

Name of Interviewer(s):		
Date and Time of Interview:	Date:	Time:
Name and Title/Position of Respondent(s):		
Name of Entity:		
Location:		GIS Coordinates:
Province:	☐ Manica ☐ Sofala	
District:		

INTRODUCTION:

Thank you for taking the time today to meet with me/us. I work for IMPAQ International, a US-based research company. Joining me is _____, who works for _____. Land O'Lakes International Development has contracted IMPAQ International to carry out a baseline data collection/evaluation in preparation of the Mozambique Expansion of Rural Cattle and Dairy Opportunities (called MERCADO) project. Today, I would like to ask you questions about your experience with or thoughts about the dairy industry in Mozambique. Our goal is to capture a wide range of viewpoints that can usefully inform Land O'Lakes dairy activities in Mozambique.

The interview will be approximately one hour.

Permission Question:

Before we begin, do you have any questions about the purpose of the evaluation or what will happen to the information? If it's ok, I would like to audio record the interview for note-taking accuracy. The only people who will have access to the recordings and interview notes are project researchers, who have taken a strict oath of confidentiality.

Do I have your permission to conduct this interview?

Yes No

Do I have your permission to record this interview?

Yes No

(If yes, turn on the recorder and record respondent's consent to tape. If they say no, then proceed with the interview without recording it.) If at any point you want me to turn off the tape recorder, please let me know and I'll be happy to comply.

Great. Let's get started, then.

Section	Question	Answer
Organization and respondent identifying information		
	Organization name	
	Province	
	District	
	Community	
	GPS coordinates	
	Latitude	
	Longitude	
	Respondent name	
	Contact information	
	Position in Organization	

Background on organization and its work in dairy	Please tell me about your organization and what it does	
	How is your organization involved with the dairy sector? Please describe	
	Please tell me about your own background/involvement with Mozambique's dairy industry	

Perspective on Mozambique's dairy industry	Do you feel that Mozambique's dairy industry is currently viable, or has the potential to be viable?	
	What are its biggest strengths?	

	What are its biggest weaknesses?	
	What is needed in order for the dairy industry to succeed?	
	How should organizations such as yours and Land O'Lakes best help the dairy industry in Mozambique?	
	What do you think a viable dairy industry would look like in Mozambique--who would you see producing, adding value to, marketing, and consuming milk and milk products?	

Perspective on Land O'Lakes and MERCADO	Are you familiar with Land O'Lakes' work in the dairy sector in Mozambique? What do you know about it?	
	Are you familiar with Land O'Lakes' MERCADO project? What do you know about it?	
	What has been the organization's experiences working with the Land O'Lakes in general, and with MERCADO specifically?	
	What areas has Land O'Lakes or project support been most successful?	
	What areas could support be more helpful?	
	What should be changed, specifically?	
	Based on your knowledge of Land O'Lakes dairy activities, are there areas that you feel they should be working or not working, or working differently? (Describe)	
	What changes do you recommend, if any?	

Conclusion	Do you have any further observations, thoughts to share, or questions before we conclude the interview?	
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