

FY 13 Food for Progress Bangladesh Dairy

Enhancement Program (BDEP) Final Evaluation



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Acronyms

AI	Artificial Insemination
AIV	Artificial Insemination Volunteers
BAU	Bangladesh Agricultural University
BDEP	Bangladesh Dairy Enhancement Program
BDT	Bangladesh Taka
CMR	Calf Milk Replacer
CMT	California Mastitis Test
DDO	Dairy Development Officers
DLS	Department of Livestock Services
DRS	Dairy Recording System
FAO	Food and Agriculture Organization
FAS	Food Agriculture Services
FGD	Focus Groups Discussions
FMD	Foot and Mouth Disease
KII	Key Informant Interviews
LILO	Low Input, Low Output
LOL	Land O'Lakes
MAB	Mini Agribusiness
MCC	Milk Collection Center
NGO	Non-Governmental Organization
SHD	Small Holder Dairy
USDA	United States Department of Agriculture
WFM	Whole Farm Management

1. Executive Summary

Project Background

Land O'Lakes' Bangladesh Dairy Enhancement Program (BDEP) has been a 42-month dairy project, implemented in Khulna and Rajshahi Divisions of Bangladesh, with the major aims of increasing agricultural productivity and expanding trade of agricultural products in the dairy sector, primarily on small holder dairy farms. It is a \$7.1 million project funded by United States Department of Agriculture (USDA) Food Agriculture Services (FAS) Food for Progress program to achieve sustainable dairy farming while building profitable linkages between farmers and input suppliers on the production side, and with the processors on the marketing side.

Project Design & Implementation

BDEP was implemented through three interrelated components:

Component 1: Infrastructure & Dairy Industry Activities

The first component focused on expanding dairy company infrastructure to better reach farmers. BDEP partnered with three established dairy companies. All three expanded their milk collection and chilling infrastructure, and hired the Dairy Development Officers (DDOs), to provide advisory services to dairy farmers. Through the project, the dairy company partners co-financed 80 new Milk Collection Centers (MCCs) in the dairy farmers' communities, established or expanded four milk collection hubs, and purchased 12 chilled road tankers.

Component 2: Dairy Farmer Training

The second component focused on building capacity of farmers and extension agents in whole farm management (WFM). Due to the lack of practical expertise in animal husbandry and dairy farm management in Bangladesh, BDEP took a sequential approach to training farmers. First, BDEP field staff were trained during feed trials conducted to determine the best concentrate mix for the Bangladesh context (to inform Component 3) and the improved practices that would be promoted by the project. Then the BDEP staff trained the dairy company staff, DDOs, in an expanded feed trial. Finally, the DDOs provided one on one on-farm training to the farmers delivering milk to the processor MCCs. By the end of the project, 80 DDOs and 10,140 farmers were trained in whole farm management through over 24,000 on-farm training sessions.

Component 3: Mini-Agribusinesses

The third component was designed to improve the availability of improved animal nutrition inputs to dairy farmers. To do this, the project provided start-up financing (\$311,936 total), initial input inventory, and capacity building to 110 entrepreneurs to establish small-scale commercial agribusinesses at the local level around the 80 MCCs that could provide necessary inputs, including improved fodder crops, a superior quality concentrate blend for the local context, and other goods and services.

The three components worked together to reach BDEP's twin goals of 1) increasing the productivity of dairy farming in Bangladesh and 2) increasing trade in milk dairy products. To achieve the first goal, farmers needed to be trained (Component 2) to overcome the key factors that limit productivity today, namely the provision of adequate nutrition. However, to invest in their dairy farm, they need access to ready markets through the expansion of dairy company infrastructure to the local areas (Component 1), and they need access to improved nutrition inputs (Component 3). The expansion of dairy infrastructure also leads to meeting the second goal of expanded trade, as more milk is not coming into the formal sector. Additionally, by partnering with the dairy companies to implement the expansion and extension services, the project promoted the long-term sustainability of the project activities.

It is important to note that this project design is a revision from the original. It was not until April 2016 that official approval was received for the redesign, halfway through the project period.

Evaluation Methodology

The purpose of the final evaluation was to assess the appropriateness of the program approach, effectiveness of the implementation in achieving expected results, and project sustainability.

The final evaluation used a non-experimental mixed methods design. Quantitative data was collected through a farm-level survey of a random sample of farmer participant households. Qualitative data was collected through focus group discussions with participant and non-participant farmers, and key informant interviews with processors, MABs, DDOs, project staff, and other stakeholders. The evaluation team also used monitoring data from the Dairy Recording System (DRS), a tablet-based data collection system at farm level, and document review to confirm reported information. To show project performance, information from the final evaluation was compared to the baseline assessment or retrospective responses of the final evaluation respondents as appropriate.

Key Findings

- ***Dramatic increase in adoption rates for improved farm management practices:*** All (100%) of the farmers surveyed had implemented at least 50% of the recommended practices for the project, as compared to none (0%) before the project. For example, more farmers now provide green fodder to cows (99% versus 60%), farmers now provide cows 24-hour access to water (99% versus 4%), and farmers provide water separately from feed (98% versus 4%).
- ***Improvements in young stock management:*** Many more farmers now feed colostrum (90% versus 65%) and do this within an hour of birth (97% versus 66%). In addition, more farmers now feed calf milk replacer (CMR) (38% versus 0%), maize powder and solid feeds during calf rearing (63% versus 5%) and practice early weaning (59% versus 14%).
- ***Milk Production increased substantially:*** The farmers that worked with the project saw large improvements in milk production in both local and cross bred cows, improving from 1.89 to 3.9 liters for local cows and 5.5 to 11.8 liters for cross bred cows.
- ***Increase in prices received for milk:*** The establishment of village MCCs meant that farmers could supply milk directly rather than through middlemen. In turn this meant that farmers were paid more for their milk, and could be paid for their milk fat content. These changes resulted in an increase in the reported prices for milk to BDT 42 per kg from around BDT 34 per kg previously, depending on the buyer.
- ***Sales revenue of farmers increased:*** Increases in milk production, plus the increase in the price achieved for milk when selling to the new MCCs have resulted in sales revenue per day per farm increasing to BDT 1270 from BDT 691.
- ***Partnering with dairy companies was successful:*** Dairy company involvement has resulted in \$3.5 million of co-investment, 80 new village MCCs established in the target areas, and 80 DDOs providing advisory services. Partner dairy companies plan to continue utilizing the MCCs and DDOs, as they have seen large, positive effects on their finances.

- ***MABs are profitable.*** A total of 110 MABs were established and trained in fodder production and concentrate blending. In the peak month of March 2017, MABs made an average profit of BDT 15,780 or about \$200. For comparison purposes, a monthly salary of BDT 10,000 is considered good in these regions.
- ***Difficulty placing women in key dairy positions.*** While the on-farm nature of the training allowed more women to be trained on whole farm management, it was more difficult to recruit women to be DDOs and start MABs. None of the DDOs were women, and only 3 women became MABs. BDEP notes that female candidates were actively sought, but few were found.

Key Conclusions

BDEP has followed an integrated approach to dairy development, with three sections of the value chain implemented in close proximity. The success of each component drives success in the other two components. The three component approach creates the opportunity for each market participant to focus: dairy companies on the handling, processing and marketing of milk and dairy products, dairy farmers on better dairy farming, and MABs on the supply of better nutrition.

The close involvement of dairy companies is an important feature of BDEP. Their participation has resulted in significant private sector capital investment, allowing BDEP to surpass the target number of MCCs. Dairy company ownership and management of MCCs is highly sustainable. Dairy company management of MCCs facilitates the payment to farmers based on individual fat content, a necessary step to incentivize farmers to invest time and effort in improving their farming systems. Locating advisory services within dairy companies is the only practical and sustainable approach to on-going farmer training. Location of MCCs within or nearby milk producing villages has enabled much better milk quality to be maintained, owing to much shorter times between milking and chilling.

BDEP's approach of using only on-farm training has proven very successful, with high adoption rates, improvement in animal welfare, improved animal health with lower treatment cost, better fertility and higher milk production. On-farm training has also allowed BDEP and its dairy company partners to provide effective training directly to female farmers. The article published by Food and Agriculture Organization (FAO) Feedipedia, co-authored the project management and a member of the Evaluation team, and attached as Annex 4 to this Evaluation Report, notes the role of tradition in impeding progress in the dairy sectors of Bangladesh and other countries. On-farm training has proven capable of breaking down the barriers caused by adherence to traditional practices.

The MAB component is an innovative concept which has proven very effective, with all MABs being profitable and many set to expand in the future out of their own resources. MABs are delivering much better quality nutrition to farmer customers at prices which represent great value compared to rice straw and other less well formulated concentrates. While farmers who use MAB products are very enthusiastic, penetration remains low, so there is plenty of room for additional growth.

The final evaluation finds that the project approach is highly sustainable. Farmers will continue to implement the enhanced farm management practices as demonstrated by BDEP because this provides better profit. MABs will continue to function as MABs, as their businesses are profitable. Dairy companies will continue to procure milk from the new MCCs as they have invested significant sums of their own in that infrastructure which generates higher milk volumes and better milk quality. Dairy companies will continue to invest in the new advisory services as they contribute to the higher milk volumes and superior milk quality.

Key Recommendations for Future Programing

- A project duration of three years is not sufficient for a dairy development project.
- Animal nutrition is an important component of dairy development that should be focused on in more development projects.
- On-farm in-depth training is necessary to breakdown the traditional practices which have a negative impact on productivity.
- Incentives for higher fat content are needed to drive improved practices.
- Dairy company involvement should be the aim of all dairy development projects.
- In many developing dairy sectors, dairy companies will provide the best home for advisory services. Sustainability is achieved through real farmer training being able to drive higher milk volumes and better milk quality.
- Need for project components to be very integrated and in the same target areas to achieve results.
- Development projects should have less indicators to focus on the results that matter.
- Projects that focus on depth of training are much more effective than those that focus on scale.
- Agreements with donors should allow for learning and adaptation in the project implementation.

2. Project Background

Bangladesh's Dairy Industry

It is important to appreciate the status of the dairy industry in Bangladesh prior to the project to understand the BDEP approach and impact. The dairy industry of the two target regions of Rajshahi and Khulna were very different. Rajshahi region was more developed, as milk processors were there for more than 30 years before the project. Therefore, there were more private sector service providers available, and more farmers had crossbred cows. Across the regions, only 23% of farmers had crossbred cows.

According to the BDEP baseline survey, conducted in 2014, most dairy farmers did not utilize improved practices to care for their cattle. Dairy farmers had little idea about how to feed their cattle, with 91% of farmers feeding grass and 92% feeding straw, and only 35% chopping before feeding it. Most farmers offered water only 2 or 3 times a day for an average of 36 liters per cow per day and generally mixed the water with the feed. The cows were kept inside sheds with brick or concrete floors and continually tied up. Many cows had injuries particularly on their back legs, which often turned into abscesses due to poor shed hygiene. Milk production was fairly low, with local cows producing 1.6 liters per day and crossbreds producing 5.8 liters per day.

There was also a serious shortage of services from the formal sector of the Department of Livestock Services (DLS). To fill this gap, Paravets¹ provided simple and basic services to the farmers, often including Artificial Insemination (AI). Service providers in both regions were poor in advising services on animal husbandry and farm management. They provided little, if any, advice on feeding and water management, and if they did, it was often incorrect. Their principle aim was to treat sick animals and vaccinate them for Foot and Mouth Disease (FMD). The vaccines they collected from the DLS were often impotent due to poor storage conditions.

Supply of inputs also had some challenges. Feed companies often adulterated the concentrate ingredients with saw dust, brick dust and sand. Veterinarian supply shops often sold lower quality drugs at cheaper price which in turn became more expensive because of the need to retreat the stock. The source and quality of semen for AI was unknown, and often farmers returned to bulls for natural mating (43% of households) instead of AI (63% of households) that took multiple tries to be successful. Seed merchants often supplied seeds in the names of hybrid fodder but with potential forage yields far below expectations. In summary, the farmers themselves suffered because of the lack of understanding of animal husbandry and farm management within the industry and the inadequate government services which could crowd out more effective service providers. The farmers also did not know that higher quality and better value inputs could be available, and accordingly did not demand them.

Milk marketing was mainly done through middlemen, or *goalas*. Nearly two-thirds (61%) of farmers sold their milk to goalas, while 23% sold it to milk processors. The remainder sold it to neighbors, stalls or local markets. There was limited access to formal milk processors in these regions, and thus the goalas bought raw milk directly from the farmers at lower prices to then sell to the formal market. A fifth of the time (20%) goalas milked the cows on the farms from which they purchased milk, which increased the likelihood of spreading mastitis across farms. The baseline survey also found that very few farmers in Khulna were even aware of the correct milking procedures.

¹ Some Paravets are junior DLS staff, but most are self-employed business people who make a margin on sales to farmers. They have only limited knowledge of animal health issues and no knowledge of animal husbandry and farm management.

Bangladesh Dairy Enhancement Program

Land O'Lakes' Bangladesh Dairy Enhancement Program (BDEP) was a 42-month dairy project, implemented in Khulna and Rajshahi Divisions of Bangladesh, with the major goals of increasing agricultural productivity and expanding trade of agricultural products in the dairy sector, primarily on small holder dairy (SHD) farms. It was a \$7.1 million project funded by United States Department of Agriculture (USDA) Food Agriculture Services (FAS) Food for Progress program to achieve sustainable dairy farming while building profitable linkages between farmers and input suppliers on the production side, and with the processors on the marketing side.

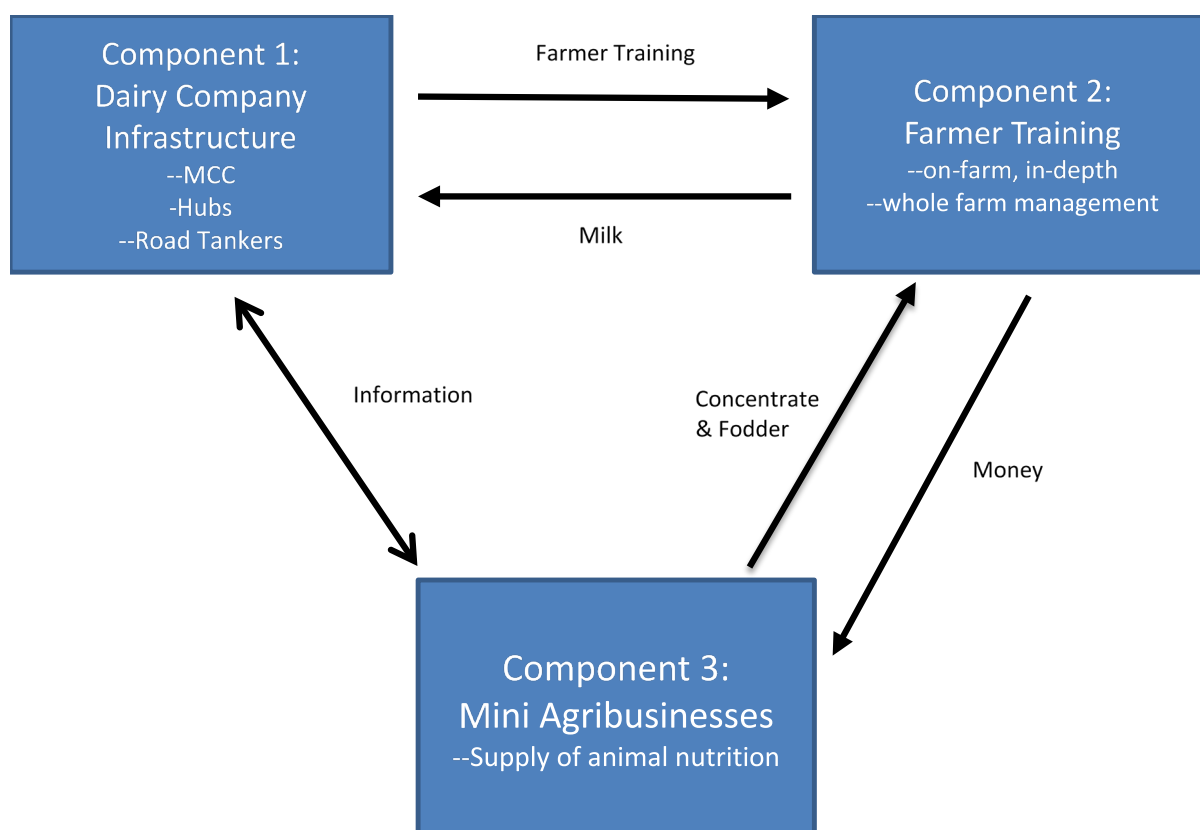
Project Design

To achieve the above goals, BDEP implemented a three-component design, revised from the original proposal with approval by USDA in April 2016. The three components included:

1. Dairy Company Infrastructure
2. Farmer Training
3. Mini-Agribusinesses

The below figure visually represents how the components fit together, and each are discussed below in more detail

Figure 2.1 BDEP Design



Dairy Company Infrastructure. BDEP co-invested in milk procurement and chilling infrastructure with 3 dairy company partners. This infrastructure included 80 milk chilling centers (MCCs) located within or nearby to villages with good levels of milk production, 7 road tankers, digital milk testing equipment, and depending on logistical needs, 3 milk collection hubs².

This component was the keystone of the project, as it created a steady formal market for farmers to deliver milk. Farmers need a consistent formal market to invest in improved practices taught to them through farmer training (Component 2), and to purchase improved nutrition made available through the mini-agribusinesses (Component 3).

Responsibility for the establishment of the MCCs and supporting infrastructure was given to dairy company partners, along with staffing, management, and maintenance. This is their main business, and thus they are in the best position to lead the infrastructure expansion and staffing. This enabled BDEP to focus on the greatest need of the dairy sector of Bangladesh, enhancing the productivity of the farming sector.

Farmer Training. To achieve significantly higher levels of dairy productivity, traditional dairying practices had to change. As a requirement of BDEP's co-investment in infrastructure in Component 1, the partner dairy companies co-invested in advisory services staff, or Dairy Development Officers (DDOs) to provide training to farmers. The aspiration was that as more milk and better quality milk flowed through the MCCs to the dairy company partners, they could afford to continue to employ the DDOs after the project ended.

Due to lack of practical expertise in animal husbandry and dairy farm management in Bangladesh, BDEP took a sequential approach to training farmers. First, BDEP field staff were trained during feed trials conducted to determine the best concentrate mix for the Bangladesh context (to inform Component 3) and the improved practices that would be promoted by the project. Second, the BDEP staff trained the dairy company DDOs in an expanded feed trial. Finally, the DDOs provided training to the farmers that delivered milk to their MCCs.

The training provided was in-depth, on farm, one-on-one training from the DDOs to the farmers. This allowed each DDO to tailor the training to specific needs of the farmer and the lifecycle of the cows on their farm. The farmers required an elevated level of support given the massive change in practices that was being asked of them. Accordingly, BDEP and its partners conducted on-farm training programs to demonstrate how enhanced farm management practices increase farm profit through higher milk production, higher fat content, better fertility and lower veterinary treatment costs. The project has developed and demonstrated how, through improving these cow and herd WFM practices, they can be made to work in practical terms for smallholder farmers. The findings of on-farm trials were documented in BDEP literature with large posters displayed at MAB shops and MCCs, as the project's recommended practices.

The specific training topics promoted by the project, which together make up the BDEP whole farm management (WFM) approach, are as follows:

- Separate feed and drinking water
- Provide clean drinking water for 24 hours each day
- Chop the fodder
- Feed quality green fodder
- Make and feed silage during periods of fodder shortages

² The milk from a number of MCCs can be transported to a larger hub for further aggregation, allowing the use of a larger road tanker for the journey from the hub to the processing plant.

- Provide concentrates that are specifically formulated and nutritionally balanced for milking cows, for example MAB /BDEP formulations
- Offer rock salt to provide additional minerals
- Improve cow housing ensuring adequate ventilation
- Pay close attention to milking hygiene and ensure complete milk harvesting
- Practice early weaning
- Ensure daily bathing with a hose, the hotter the day, the more frequent the bathing
- Provide colostrum to each new born calf, ensuring it has been consumed
- Provide calf milk replacer (CMR) rather than whole milk to milk-fed calves
- Practice good calf management
- Encourage the development of the weaned heifer's udder through optimum feeding and stock management
- Encourage the development of the rumen in young stock through optimum feeding management
- Practice the principles of good farm cleanliness to ensure clean floors and stock with no evidence of lameness and dirty coats
- Ensure good cow comfort through the provision of rubber mats or sand beds and good ventilation, preferably with electric fans
- Routinely monitor the animal's live weight and body condition
- In preparing land for forage production, incorporate compost into the soil

Mini-Agribusinesses: The need for much enhanced dairy nutrition was an important part of the training offered through Component 2. However, there were not places where the farmers could buy sources of better nutrition. To solve this issue, BDEP established mini agribusinesses in the target regions to blend concentrate locally, and offer products such as rock salt, de-worming tablets, rubber mats, California Mastitis Test (CMT) and kits, Calf Milk Replacer (CMR) and local production of good quality, high protein fodder crops, especially immature maize green chop.

BDEP selected MABs based on the criteria: enthusiasm; willingness to work themselves on fodder production and concentrate blending; willingness to co-invest; there was a bias towards selecting younger people, under-employed or unemployed people and females. The MABs were then provided with start-up financing and capacity building in business management, production of fodder and blending of concentrate, as well as exposure to WFM so they could provide some advice to the farmers when they sold the goods. The MABs were also given an initial input inventory, including ingredients for concentrate, a small water pump for irrigation for fodder cultivation, transport van, fodder chopper, pH meter, weighing balance, grass seed, CMR, maize powder, CMT kits and finance support so they could lease land for fodder production.

In some instances, where two MABs were located close together, the project promoted one MAB to produce and sell concentrate and fodder, while the second would focus on fodder production and sales only. The focus on building up MABs at the local level was to promote quality and sustainability, both of the MABs that have a self-interest to produce and promote high quality goods, and the farmers that can focus on their dairying practices and don't have to worry about growing, producing or sourcing their own inputs.

The Philosophies and Guiding Principles of BDEP

To help achieve the above, the program management has developed a number of philosophies to guide BDEP as it leads development of the dairy sector of Bangladesh. These are:

- Human development must come before cow development
- The smallholder cannot be taken to the formal market; rather the formal market must come to the smallholder
- Don't look for off-farm solutions to on-farm problems
- Focus is vital

- If farmers are to change entrenched traditional practices, they need to see how to do this with their own eyes, in local settings
- Specialization is a feature of modern economies, and should be applied in developing dairy economies just as in developed economies
- Farmers need the consistency of the formal market if they are to grow
- Evolution and development comes from thinking not things

Management considers that in the Bangladesh situation, with the almost total lack of practical skills and experience in animal husbandry, animal nutrition and farm management, philosophy one on the subjects of human capital development is fundamental. For more internal purposes, BDEP also has a set of Guiding Principles, these being:

- We are passionate about dairy
- We are passionate about the role dairy can play in development of rural areas
- We display honesty, integrity and professionalism in all dealings, internal and external
- We are one project, one team
- We treat people with respect, from the poorest farmer to the senior businessman or official, and from cleaner to the Chief of Party
- We will overcome barriers to success
- We have the courage of our convictions
- We will make a difference
- We are a learning organization.

3. Evaluation Methodology and Implementation

Methodology

The purpose of the final evaluation was to assess the appropriateness of the program approach, effectiveness of the implementation in achieving expected results, and sustainability of the program activities and outcomes. Specifically, the final evaluation was to meet the following objectives:

- Assess the appropriateness of the strategies employed by Land O'Lakes in the program given the Bangladesh context, including the perspectives of private sector input providers, and smallholder farmers.
- Understand the degree to which the project has met its projects goals, objectives, outcomes and targets and explain deviations using an evidence based approach;
- Provide an objective description of the overall sustainability of the project activities and outcomes
- Assess how women and men have benefited differently;
- Identify key strengths and weaknesses of the program;
- Identify key challenges, lessons learned and recommendations for future programing.

Key evaluation questions can be found in the full scope of work in annex 3.

The final evaluation used a non-experimental mixed methods approach. Quantitative data was collected through a farm-level survey of a random sample of farmer participant households. Qualitative data was collected through Focus Groups Discussions (FGDs) with participant and non-participant farmers, and Key Informant Interviews (KIIs) with processors, MABs, DDOs, project staff, and other stakeholders. The evaluation team also used monitoring data from the Dairy Recording System (DRS), a tablet based data collection system, and document review to confirm reported information and draw conclusions.

The final evaluation tools were made as similar as possible to the baseline tools to allow for comparison between the cross section of farmers interviewed at final evaluation and those at baseline. However, the baseline did not collect much data on detailed dairy husbandry practices promoted by the project. In those instances where there was not a good comparison with the baseline, retrospective questions were asked to understand dairy farmer practices before and after the project. You will see comparison to both the baseline and the retrospective questions in the findings in the next section.

Evaluation Team

The evaluation was conducted between April and June 2017. Land O'Lakes hired both an evaluation team from Bangladesh Agricultural University (BAU), and an international dairy expert. BAU was responsible for designing the evaluation methodology, sampling strategy, data collection tool, collecting the farmer data and conducting the preliminary data analysis and report writing. The international dairy expert provided expert input into the data collection tools, conducted KIIs, and adding nuance and conclusions to the report.

Implementation

Prior to formal field work, the international dairy expert conducted preliminary field visits to Khulna and Rajshahi Divisions and the evaluation team lead to Rajshahi Division to better understand traditional dairy farming practices prior to BDEP interventions and the BDEP approach. In addition, he had discussions with feed trial farmers, low input, low output (LILO) farmers, a partner dairy company's Artificial Insemination Volunteers (AIV) as well as farmers trained by dairy company DDOs, farmers trained by AIVs, and demonstration farmers. These initial on farm visits allowed for

review, comment and subsequent evolution of the farm survey with dairy farmers, structured interviews with processors, advisory service staff, MCC managers and MABs. This ensured that the necessary dairy data was collected in a rigorous way to be able to draw conclusions from the statistical analyses and to meet the evaluation objectives and answer the evaluation's key questions.

Formal field work was conducted from 30 April to 8 May, 2017. The BAU team led a team of 11 enumerators. During data collection, the team started in Rajshahi region and split into three teams to interview individuals from different locations around the region, and then moved to Khulna region. The enumerators conducted the farm surveys, while the team leader along with the members conducted the farmer FGDs and some KIIs with MABs.

The international dairy expert attended the first few days of farmer data collection in each region, and also conducted KIIs with processor leadership, project staff, MABs, MCC staff, and USDA staff. During some of these interviews, he was joined by the team leader and members from BAU.

The field work began with a three-day training from 27 – 29 April, 2017, where the BAU Team, international dairy expert, and Land O'Lakes staff trained the enumerators on proper procedures and the data collection tools. Significant time was put in by the international dairy expert to ensure that the enumerators understood dairy concepts and could ask the right questions of the dairy farmers during the farm survey. Throughout the data collection, the evaluation team reviewed data collection tools and had debrief meetings with the enumerators to ensure the quality of the data.

The below tables show the number of farmer surveys, FGDs, KIIs planned, and how many were carried out in the different regions.

Table 3.1: Number of farm surveys planned and conduct in different Upazilas under different districts

Divisions	Districts	Sample planned ³	Upazila	Sample interviewed ⁴	% of total sample interviewed
Rajshahi	Pabna	53	Bera	12	3.05
			Santhia	21	5.33
			Faridpur	23	5.84
	Sub-total	53		56	
	Sirajganj	132	Shahjadpur	118	29.95
			Ullahpara	20	5.08
	Sub-total	132		138	
Khulna	Khulna	32	Dumuria	25	6.35
			Paikgachha	9	2.28
	Sub-total	32		34	
	Satkhira	63	Tala	67	17.01
	Sub-total	63		67	
	Jhenaidah	24	Kaliganj	25	6.35
	Sub-total	24		25	
	Jessore	70	Keshobpur	45	11.42
			Sharsha	29	7.36
	Sub-total	70		74	
	Total	376		394	100.00

Table 3.2: Number and type of Focus Group Discussions conducted⁵

Division	District	Upazilla	Type of the FGD
Rajshahi	Sirajganj	Shahjadpur	Farmer Beneficiaries
	Sirajganj	Shahjadpur	Farmer Beneficiaries
	Sirajganj	Shahjadpur	Women Farmer Beneficiaries
	Sirajganj	Shahjadpur	Farmer Non-Beneficiaries
	Sirajganj	Ullahpara	Farmer Beneficiaries
	Pabna	Faridpur	Farmer Beneficiaries
Khulna	Khulna	Dumuria	Farmer Beneficiaries
	Satkhira	Tala	Farmer Beneficiaries
	Satkhira	Sadar	Artificial Insemination Volunteers (AIV)
	Satkhira	Sadar	Farmer Beneficiaries
	Satkhira	Tala	Farmer Non- Beneficiaries

³ The chosen sample size was determined using a 95% significance level with a 5% confidence interval and maintain the proportionate sampling strategy to select the required number of sample from each district, while strived to cover the broadest practical geographic scope within the project zones of activity

⁴ The size of sample interviewed was higher than the planned but deviation was less than 1 percent in each individual district level because of efficient and productive time management and unavailability of the selected respondents in time. The response rate was almost a hundred percent as DDOs were efficient to communicate and locate the beneficiary farmers.

⁵ The team conducted 11 FGD against the 10 that were planned: 8 with farmer beneficiaries, 2 with farmer non-beneficiaries, and one with Artificial Insemination Volunteers.

Table 3.3: Number of key informant interviews with different types of respondents

Type of Stakeholder	Number
BDEP senior management	1
BDEP technical staff	3
BDEP Team Leaders	2
Milk processing technical staff	3
Milk processing senior management	3
USDA	1
BAU Professor	1
MAB	14
Total	30

Evaluation Challenges

- The farm survey sample selected on a random basis ended up with smaller number of farmers with local breed cows than expected.
- Farm survey generated a huge amount of data – 260,000 data points, which took a great deal more time to analyze than expected and budgeted.
- The number of evaluators had to be increased beyond budget to be able to cover the territory and number of farmers.
- Considerable effort had to be made to ensure that survey responses were recorded consistently and that survey questions were delivering clear answers able to be analyzed statistically.
- The field survey team was impacted by the monsoon and other climate factors. During the field work in Rajshahi Division, heavy rainfall, thunderstorm and consequently electricity disruptions impacted the team. The team leader and team members had to work all the evening and night and some days without having dinner. Muddy road condition due to heavy rainfall also caused a lot of disruption and sometimes the team was in severe risk. Apart from that, both in Rajshahi and Khulna division, day time temperature was very high, sometimes as high as 37-39 degree Celsius with very high humidity.
- While distances may not be great, travel times were very long due to poor road conditions and traffic.

4. Findings

4.1 Component 1: Infrastructure & Dairy Industry Activities

Summary of Component

This component was the center of the project, which focused on working with dairy company partners to increase milk entering the formal value chain and overall trade. For dairy farmers to invest in using improved practices in dairying (Component 2) using the quality inputs available (Component 3), they need a consistent and reliable market close to home. To build this market, the project partnered with three established dairy companies. All three expanded their milk collection and chilling infrastructure, and hired Dairy Development Officers (DDOs) to provide advisory services to dairy farmers (Component 2). Through the project, the dairy company partners co-financed 80 new Milk Collection Centers (MCCs) in the dairy farmers' communities (against a target of 55), established or expanded four milk collection hubs (against a target of three), and purchased 12 chilled road tankers (against a target of 7).

To understand the change due to Component 1 of the project, the evaluation utilized dairy company reports, financial records, and interviews with dairy company management.

Appropriateness of the Component

The Evaluation team considers the design of Component 1 to be highly appropriate. Consistent markets are needed for farmers to make investments in their businesses, and it is most appropriate for the dairy businesses to be the ones to invest and manage expanded market infrastructure, as it is their core business.

Evidence from sources such as Operation Flood demonstrates that if farmers are to invest in improving or increasing the scale of their farms, they need the consistency of the formal market. If farmers increase milk production without linkages to the formal market and its ability to remove milk from dairy villages, it is probable that much of the benefit of any increase will flow to middlemen who purchase milk for the informal market. The establishment of new MCCs is a pre-condition of enhancing the local dairy sectors of Khulna and Rajshahi divisions.

Perhaps the novelty which BDEP has brought to infrastructure establishment is the close integration of dairy companies in this Component. To achieve scale given limited project funding, BDEP required co-investment from its dairy company partners. Without dairy company co-investment, the project would have been well short of the funding required to meet targets with respect to MCC establishment and associated logistics (milk collection hubs and road tankers). In addition to funding, dairy company responsibility for MCC management drives sustainability.

Dairy company management confirmed in their key informant interviews in the final evaluation their satisfaction with the new MCCs, the volume and quality of the milk procured through the new infrastructure, and their intention to keep all MCCs operating after the end of the project. The additional milk and the quality of this milk assists the companies to meet their strategic objectives with respect to sales growth and the introduction of new products.

The involvement of dairy companies in infrastructure establishment and management reflects the situation of dairy industries in developed dairy economies. Management of milk processing equipment, processing of milk and dairy products, and the marketing of these products are their core businesses. The concurrence of dairy company management with the project approach in terms of support to build necessary milk procurement and chilling infrastructure is natural and aligned with the market.

Dairy Development Officers

The dairy company partners engaged 80 DDOs, who received training from BDEP staff at feed trial locations, and then continued to be supported by BDEP field staff once active in the field. DDOs then trained farmers supplying milk to the new MCCs to encourage supply. One DDO was engaged per MCC, and was based at an MCC rather than at any field office. They were expected to be on-farm all of their working day, apart from some shorter periods spent at MCCs during milk delivery.

The DDOs were all young people. BDEP staff were involved in the recruitment of these DDOs, interviewing over 200 candidates over the project period. All candidates had demonstrated some interest by paying to attend the one-month residential course, the Dairy Academy of one of the partner Dairy Companies, in which they received some preliminary information on dairy farming and milk handling.

It is important to note that none of the 80 DDOs are female. DDOs, however, needed to be able to move around from village to village, to ride a motorcycle and to be relocated if desired by the employer. These criteria made it very difficult for women to be employed as a DDO.

Infrastructure Established

As detailed in Table 4.1.1, BDEP worked with dairy company partners to establish milk collection and chilling infrastructure throughout the project areas, including 80 MCCs and 4 Milk Collection Hubs completed between June 2016 and May 2017 to bring milk collection closer to the local dairying communities. It is noted that there were no MCCs in these communities prior to the project. Farmers could sell only to local markets, neighbors or middlemen. Some middlemen went on to sell to dairy companies, but there was no linkage to the formal market with all its benefits: consistent offtake, payment by individual fat content, increasing the supply of milk to the formal market, and improvement in milk quality owing to much reduced time between milking and chilling. The MCCs and Hubs established a total of 193 tons of new milk chilling capacity including 133 tons for MCCs and 60 tons for milk collection hubs, against a target of 150 tons in total. BDEP was able to overachieve relative to its targets on infrastructure due to dairy company co-investment.

Table 4.1.1. Reach of new MCCs, Hubs

<i>Partner</i>	<i>Division</i>	<i>Hubs</i>	<i>MCCs</i>
Dairy Partner	Khulna	0	20
Dairy Partner	Rajshahi	3	40
Dairy Partner	Khulna & Rajshahi	1	20
Total		4	80

Timing of MCC establishment

As noted earlier in the report, BDEP suffered from delays throughout the project life, and MCC establishment was also implemented behind schedule. Table 4.1.2 shows the timing of MCC establishment by partner.

In the case of on partner dairy company, KIIs with company management through the final evaluation revealed that the reason for the significant gap between establishment of the first nine and the remaining MCCs is due to their lack of experience in procuring milk directly from farmers (as opposed to buying from middlemen), and wanting to see whether the model introduced by BDEP would be successful.

MCC establishment and operation occurred well into the project due to delays in approval in the updated project approach and time to work with partner dairy companies to agree to the design. Given that the MCCs were the starting point for trainings to dairy farmers to improve their practices (Component 2), it also highlights the immense amount of work done by BDEP in the last 10 months of the project period to achieve results.

Table 4.1.2 Number of MCCs established by month and partner

Month	Partner		
	Project Partner 1	Project Partner 2	Project Partner 3
June 2016	9		
August 2016			14
September 2016		7	
October 2016		13	2
November 2016			15
December 2016			1
January 2017			6
February 2017			1
May 2017			1
June 2017	6		
August 2017	5 ⁶		
Total	20	20	40

In addition to establishing new milk infrastructure, BDEP also promoted the use of improved milk quality equipment in the MCCs, including digital milk testing equipment. Thirty of the 80 new MCCs (all 20 Project Partner 2 MCCs and 10 of 40 of Project Partner 3 Dairy MCCs) were equipped with digital milk testing equipment, which is novel in the Bangladesh context. Previous development projects had implemented digital fat testing by middlemen, without any chilling facility, but this has not been that effective, as these individuals were not capable of maintaining full operational status of the equipment.

MCC Staff Training

Dairy companies led the training of their staff to manage the MCCs. For Project Partner 1, BDEP staff provided input into operating manuals for the MCCs that formed part of the training. Table 4.1.3 shows the number of MCC staff trained by the dairy company partners.

Table 4.1.3: Number of MCC staff training sessions

Training Topic	Achievement	Target
Milk quality and record keeping systems	108	55
Number of training sessions on milk quality and record keeping	10	6
Milk hygiene and handling	108	55
Number of training sessions on milk hygiene and handling	19	6

Source: Project Records, Dairy Company reports.

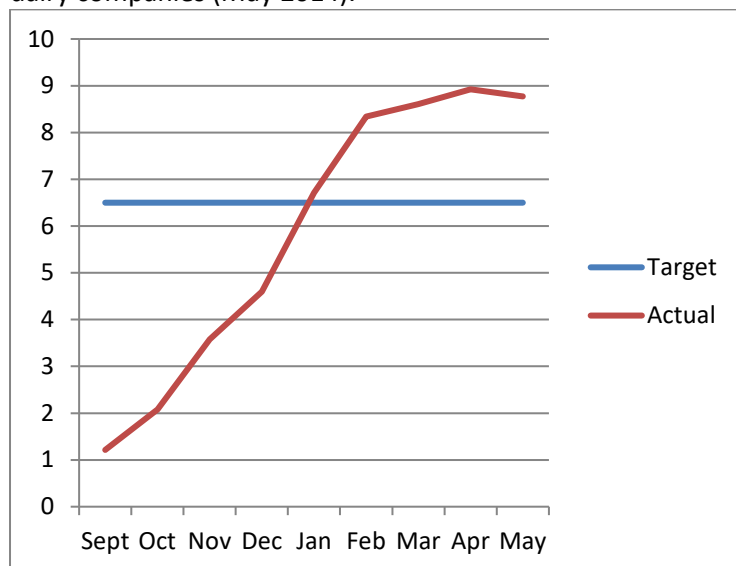
Dairy Company Milk Collection & Sales

The investment in milk receiving and chilling infrastructure has enabled additional market linkages to be created between BDEP's three dairy company partners and local farmers. The resulting flow of milk has enabled BDEP's partners and beneficiaries to boost internal trade within Bangladesh. Prior to the project, the baseline found that the formal dairy sector was receiving 600,000 liters of milk

⁶ Operation of the last 5 Project Partner 1 MCCs has been delayed due to the monsoon. Project Partner 1 advises that they will start after the end of the monsoon season.

per day. Between February and May 2017, when 75 MCCs were functioning, milk procurement through the new MCCs totaled 6.239 million liters. When compared to the baseline figure over the same period of time, this is 8.67% more than was being procured at baseline. If you account the operating of all MCCs established from June 2016 until May 2017, the total milk procured through the new MCCs was 9.652 million liters.

Figure 4.1.1: Change in monthly milk volume received by the partner dairy companies between September 2016 and May 2017, as a percentage of the baseline of 600 tons per day collected by all dairy companies (May 2014).



Source: Reports from 3 Project Partners.

Incremental sales achieved by dairy company partners is calculated by the value of milk procured through the new MCCs, at BDT 40 per kg, plus a 32% margin for dairy company operations. It is expected that the use of 32% as a margin considerably understates the sales achieved from the additional milk. With this calculation, the incremental sales achieved by dairy company partners were BDT 504.867 million, or \$6.514 million at an exchange rate of BDT 77.5 = \$US1.

One of BDEP's targets was to seek a 5% reduction in the average production cost per unit of dairy products. However, dairy company partners have refused to provide information about their costs. In addition, this indicator is not actually a good measure for the success of a dairy company for a few reasons:

- At an MCC level, older more established MCCs run closer to capacity as milk is procured from goalas. The new MCCs could receive milk from goalas as well, but this is opposite to the strategic intent of the project, so it should be expected to have slightly higher costs
- Across any given company, the main driver of processing costs will be product mix – it costs more to manufacture milk powder than UHT milk, and more to produce UHT milk compared to pasteurized milk, so the costs will fluctuate based on the product mix the company decides to utilize.
- New products, also a target for this project, are likely to start off small in volume, and indeed they may be added value products. Both scenarios will tend to result in higher production costs.
- The impact of product mix or new product development makes no difference to farmers, hence this target does not drive dairy development on-farm, where the greatest need and the greatest contribution of BDEP was made.

Dairy Company Product Development & Certification

There was a target for new product introduction by dairy companies of five new downstream products. From dairy company records, eight new products were introduced.

All dairy companies must, under Bangladesh law, have their products assessed and certified by Bangladesh Standards and Testing Institute (BSTI). All three processors have the necessary certificates for local requirements (target was three processors). None of the processors report any exports, and accordingly have no need for certification. They are unable to meet this target in terms of any official certificate.

Impact of Infrastructure

Having closer access to the formal market through well-managed MCCs has benefited both farmers and the dairy companies.

The number of farms delivering milk directly to the new milk chilling infrastructure is 7,625. The farm survey found that 1.9 household members were being trained per farm, so in terms of household members supplying the new MCCs, a much higher total could be recorded. Moreover, the MCCs do not yet function at full capacity, so there is room to continue to increase the number of farmers that provide milk to the MCCs in the future. The project estimates that 1 ton of new MCC capacity would provide access to about 100 farms. Assuming that farmers deliver on average of ten liters per day and there is only one collection from the MCCs by road tanker per day, the MCCs could support 13,300 farms.

Farmers that deliver to the MCCs note that they now can deliver milk directly to the formal market, and not through goalas, which provides more money for them. Additionally, the established MCCs now pay farmers by the fat content of their *individual* milk, which encourages farmers to invest in better nutrition for the cow. If milk is not analyzed on an individual farmer basis, the gains in better nutrition will be shared among neighboring farmers or middlemen also supplying milk. This has increased the farm gate price for farmers investing in improved nutrition to an average of BDT 40 (source: dairy company payment records) per liter, as compared to BDT 33 per liter before the project. Based on this increase, the project has increased the margin achieved by the farmers as compared to end-product prices. The project had a target of achieving a margin between farmgate price and end-product prices of 50%. The retail price for one project partners' pasteurized milk is BDT 60 per liter, so the farmer receives 66.7% of the final price against a target of 50%. Another project partner sells its pasteurized milk for BDT 65 per liter, a margin of 61.5%.

In addition to the farmer impact, the dairy companies mentioned the ways that they also benefit from the expansion of the MCCs. Dairy companies now receive increased milk deliveries in these new areas, and the milk is of better quality since they are paying for fat content. This has increased dairy companies' sales and profits, as noted above, and has enabled them to fund the advisory service staff (Component 2) sustainably.

Sustainability

This Component was designed to promote sustainability, and the final evaluation finds this Component highly sustainable. The dairy companies made the decisions on location of the new MCCs, and number of hubs and road tankers needed to support them so that the roll out of this Component fit within their existing business plans. Dairy companies have co-invested just under \$3.5 million to the project, including contributions to infrastructure and infrastructure operations. The companies have already seen a large increase in their revenues based on this investment. Through KIIs during the final evaluation, dairy company management have confirmed their intention to maintain operation of the new MCCs and associated logistical infrastructure.

4.2 Component 2: Dairy Farmer Training

Summary of Component

The project provided co-financing to 3 processors to both expand their infrastructure to farmers (Component 1) and to hire staff, the Dairy Development Officers (DDOs), to provide advisory services to the dairy farmers. Due to the lack of practical expertise in animal husbandry and dairy farm management in Bangladesh, BDEP took a sequential approach to this Component. Firstly, BDEP field staff was trained during feed trials conducted to determine the best concentrate mix for the Bangladesh context (to inform Component 3) and the improved practices that would be promoted by the project. Then the BDEP staff trained the DDOs in an expanded feed trial. Finally, the DDOs provided one on one on farm training to the farmers delivering milk to the processor MCCs. By the end of the project, 80 DDO and 10,140 farmers were trained in whole farm management through over 24,000 on-farm training sessions.

To assess the dairy farmer training component, the evaluation conducted 394 farm surveys with a random sample of dairy farmer participants. The survey asked about their demographics, agricultural practices, dairy productivity, sales, and access to finance. The evaluation also conducted 11 FGDs with participants and non-participant dairy farmers, and administered KIIs with processor management and DDOs to better understand why some changes in practices occurred or did not occur through the course of the project.

To understand the change due to the project, the findings from the final evaluation are compared to that of the baseline, conducted with a sample of the population of dairy farmers in the target regions. However, the baseline survey was not perfectly comparable to the final evaluation survey, especially for dairy husbandry practices. In these instances, the final evaluation asked the respondents to recall their status before they started participating in the project.

Appropriateness of the Component

The evaluation team find both the approach and the content of this component very appropriate to the context. As discussed in the introduction, Bangladesh farmers typically utilize traditional methods of cattle husbandry, which doesn't provide the optimal nutrition and care of cattle and results in low milk yields. Thus, there was a need to train farmers on improved practices that could increase productivity.

The approach to training, using on-farm one on one training to farmers has allowed in-depth and practical training to take place, as opposed to other dairy development projects which focus on classroom training and are generally not as effective. The strong links between the cadre of DDOs and BDEP field staff has allowed adaptive management to occur, as experience and knowledge of animal husbandry and dairy farm management grew, the lessons were spread through the ranks of DDOs and on to farmers.

BDEP management explained that there were several options for "housing" advisory services:

- Within the Department of Livestock Services.
- Within Universities.
- Within Bangladesh Livestock Research Institute.
- Within local NGOs.
- Within dairy companies.

BDEP was never designed to be an institutional reform project, and had ambitious targets for farmer training and milk production increases. These targets could never have been achieved if a very lengthy institutional reform process (BDEP estimated that it could take more than ten years and

likely would require generational change). This means that the first three options above were not realistic. By definition, building skills within local NGOs is not sustainable unless a donor will commit to funding for at least ten years so that advisory service staff could continue to deploy their knowledge and experience for an extended period. This means that dairy companies were the only logical “homes” for advisory services, and this aligns well with project targets for increasing trade, the volume of milk and other more “commercial” targets.

Demographics of Survey

The dairy farmer participants interviewed for the final evaluation were mostly male (74%), the majority were between 26 and 45 (63%) and 50% had some primary education. Most households worked in agriculture. However, only about one-third indicated dairying was their main source of income, a third said crop farming and the rest indicated other livestock or non-farming businesses. About half (51.3%) of total respondents indicated that dairying was their second main source of income⁷. About 60% of farmers were in the small farm size (0.5 to 2.5 acres) category.

Table 4.2.1 below provides more detailed information on demographics of farmers interviewed at baseline and final evaluation. Both studies were done as random samples in the same Divisions, where the baseline was a population-based sample of dairy farmers that met the participant selection criteria, and the final evaluation was a sample of the project participants. As you can see below, it is difficult to compare the populations interviewed at the baseline and final evaluation since the baseline did not collect as much demographic information. The final evaluation population had more males, slightly less education and slightly more land. Less of an emphasis was on crop production for the final evaluation households, although that could have been a result of the project activities.

⁷ The survey asked about main three sources of income, therefore it is plausible that the respondents have more than three income sources

Table 4.2.1: Demographic information of survey respondents

	Baseline	Final Evaluation
	n = 639	n = 394
<i>Sex of respondent</i>		
Male	53%	74%
Female	47%	26%
<i>Sex of household head</i>		
Male	NA	95%
Female	NA	5%
<i>Age (Years)</i>		
18-25	NA	10%
26-35	NA	32%
36-45	NA	31%
46-60	NA	23%
61+	NA	5%
<i>Education Level</i>		
No Education	12%	27%
Some Primary	40%	27%
Primary	10%	23%
High School	18%	9%
Secondary School Certificates	9%	6%
Secondary School	5%	7%
University	5%	0.3%
<i>Income Source</i>		
Dairy Production	NA	35%
Crop Production	60%	31%
Other Livestock	79% (including dairy)	10%
Aquaculture	NA	5%
Day Laboring	NA	3%
Public service	NA	2%
Employee	NA	2%
Own Business	NA	10%
Other	NA	2%
<i>Farm Size</i>		
0 to 0.5 acres	46.8%	28.4%
0.5 to 2.5 acres	40.4%	57.6%
2.5 – 7.5 acres	11.4%	13.7%
7.5+ acres	1.4%	0.3%

Dairy Herds

Table 4.2.2 below reports that average size of the cattle herds at the baseline and final evaluation. Respondents from the final evaluation had an average heard size of 5.1 cattle, as compared to 4.8 cattle before participating in the project and 3.6 cattle for the baseline sample. The average number of female cattle remained about constant, but those that were actually producing milk increased between baseline and final evaluation. It is important to note that the percentage crossbred cattle is far different between the baseline and final evaluation population. However, this is not attributable to the project given that the final evaluation farmers indicated having a similar percentage before the project. However, an admittedly small number of surveyed farmers (14) from the final evaluation did not possess any cross-bred cows, it is interesting that among those 14 farmers, 7 (50%) have moved from local only to cross-bred cows after BDEP involvement.

Table 4.2.2. Herd Composition

Status of cattle in the herd	Baseline (N=639)	Final Evaluation (N = 394)	
		Before	Present
Average Herd Size	3.6	4.8	5.1
Average Number of Cows	1.8	2.5	2.4
Average Number of Heifers	1.1	0.5	0.5
Average Number of Calves	NA	1.5	1.6
Average Number of Bulls	0.8	0.6	0.5
Percentage of Crossbred	32% (N=2,332)	94.7% (N = 2,036)	95.0% (N = 1,992)

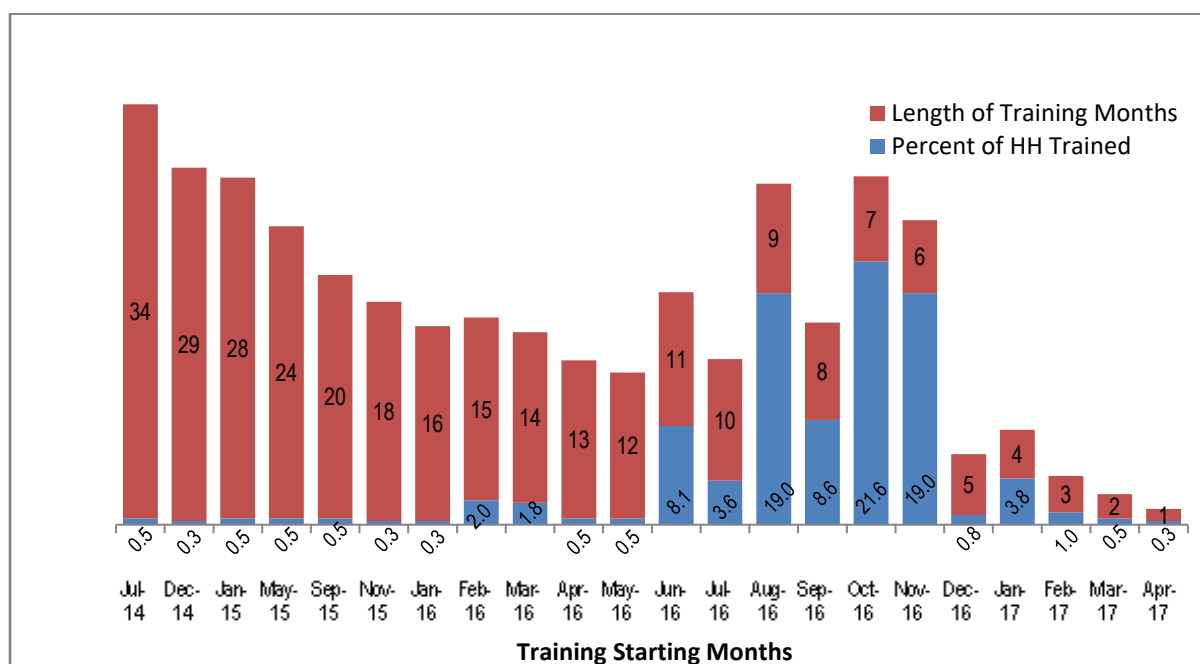
Participation in Training

As mentioned above, the project provided completely on-farm training, which is unique and non-traditional training in Bangladesh. This training approach was liked by farmers because it provides hands-on experience, can be tailored to their needs, and can involve training of multiple family members without getting in the way of their other activities. On-farm training also has social aspects in terms of farmer encouragement.

All respondents in the final evaluation had received project training - 98% from Dairy Development Officers (DDO), 17% from Artificial Insemination Volunteers (AIVs)⁸ and 79% from other Land O'Lakes staff. Training started in July 2014 and lasted through April 2017, but most respondents did not receive the full 34 months of training, as training started at different times as new MCCs were established. Respondents received training for an average of 8 months through the project, from a maximum of 34 months for 0.5% of the farmers, to a minimum of 1 month for 0.03% of the farmers. Figure 4.2.1 below shows the percentage of farmers that received different number of months of training.

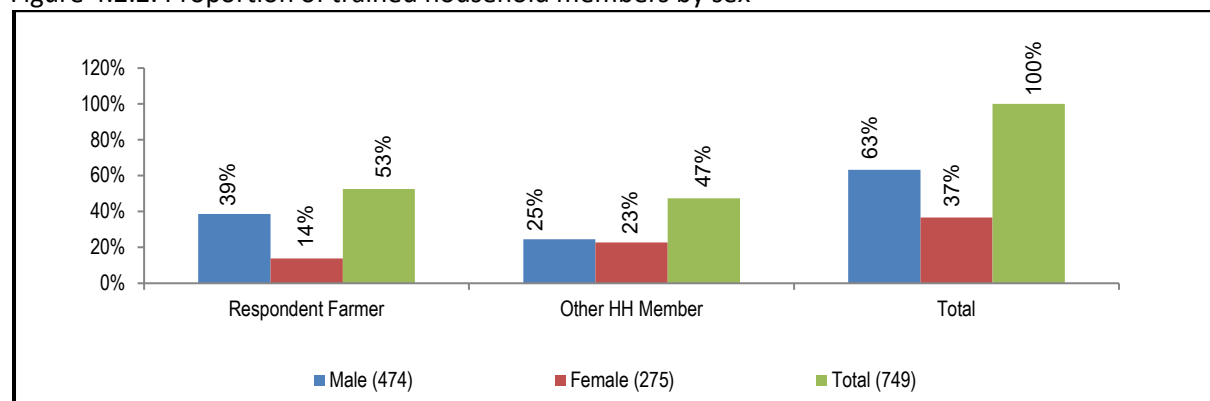
⁸ One partner operates a commercial artificial insemination business. At the local level, much of the artificial insemination is undertaken by AIVs. They are described by the partner as volunteers as they get no salary from, but they receive training and have access to semen, which they sell to local farmers at a margin, as well as receiving a fee for the insemination service. Owing to strong local contacts, in the last few months of BDEP proposed that selected AIVs received support to establish model farms as per the BDEP implementation, and in turn to train and support their local farmers to implement the BDEP approach.

Figure 4.2.1: Percentage of respondent began training each month, and number of months trained



From the 394 HHs which were surveyed, a total of 749 HH members were trained. That is, 1.9 HH members from each HH were trained on average. Figure 4.2.2 shows that out of 749 trained HH members, 53% were respondents and 47% were other family members (non-respondents, as only one respondent per farm was sought for evaluation purposes). Among the 749 trained HH members, 63% of them were male and 37% female.

Figure 4.2.2. Proportion of trained household members by sex



All 394 respondent HHs received training on water and nutrition, disease management, calf rearing, and cow shed and ventilation management.

Dairying Practices

The project promoted whole farm management practices. Broadly these cover water and nutrition, disease management, whole farm management, fodder cultivation and processing and record keeping⁹. All of those farms interviewed applied at least one of these practices after participation in the project, which had not been practiced prior to the project. When extrapolated to the entire population, 10,140 farmers out of 10,140 trained have improved at least one of their practices. This was far above the target of 80% applying improved practices. The evaluation team notes that the standard of farmers applying only one new practice to be recorded as meeting the relevant target is very low when it comes from shifting from traditional to more productive practices. In fact, 100% of those interviewed actually applied half or more of the improved practices promoted by the project.

The farmers from the FGDs provided positive feedback on the topics provided. They specifically liked learning more about concentrate feed, CMR, mixing feed and fodder, providing feed and water separately. They indicated that since they have changed cow shed design, water management, and timely feeding, they are seeing much higher milk production from their cows.

Nutrition

The project promoted feeding cattle an appropriate amount of balanced diet that includes chopped green fodder, specifically maize, and formulated concentrates, and the provision of a consistent supply of water separately from the feed. Table 4.2.3 below shows the percentage of respondents that fed their cattle different feed before and after the project.

Use of green fodder increased substantially from 60% to nearly all farmers (99%), and the amount given increased from 56.6 kg to 91.3 kg over the herd. While most did not chop the green fodder previously (4%), while nearly all do so now (93%). Chopping fodder makes it easier for the cattle to digest. The majority of farmers utilize maize green crop or napier grass. BDEP introduced the maize green-chop to the community for the first time, and it has had a drastic uptake. Approximately 50% of surveyed farmers said they purchased green feed from an MAB as compared to 2% before the project¹⁰. It is interesting, however, that the provision of other types of green fodder has also increased along with the main MAB fodder. Maize and napier were the favored two forages when farmers were asked which type of forage they grow.

The use of formulated concentrate has also increased drastically from 5% before the project to nearly all of the farmers (96%) currently. Farmers provided over three times the amount to their herd after the project as well. Close to all of these farmers (95%) say they buy concentrate from an MAB, while 3.5% of farmers said they blend their own. Of the 14 farmers undertaking their own blending, 13 say they use the BDEP formulation. The corollary of the increase in the use of formulated concentrate is the decrease in the use of ingredients that are generally a part of concentrate including the bran, oil cake, and molasses.

⁹ Most important whole farm management practices include: **Nutrition** - clean water 24 hours a day, concentrates, green fodder, chopped fodder; **Animal Health** - CMT test and mastitis prevention, other disease management, regular health check-up, vaccination and deworming, **Cow Comfort** - farm cleanliness, bathing, cow shed ventilation and temperature, water and feed troughs, checking body condition scoring and body weight measurement, milking hygiene and complete milking; **Reproduction & Calf management** - heat detection and insemination, weaning and calf rearing, milk replacers for calf, feeding of colostrum; **Record Keeping** – production records, income and expense records; **Fodder cultivation & Processing**: Soil conditioning, types/characteristics & qualities of green fodder, preparation and using compost for fodder cultivation, silage making.

¹⁰ Since the MABs were introduced by the project, this is not actually possible, but it could be that these farmers were purchasing from someone in the community prior to the project.

The project introduced the use of rock salt to provide to cattle for licking. Nearly two-thirds (61%) of the farmers now utilize rock salt as compared to none before. Rock salt is a good source of different types of minerals. Calves were observed to lick soil, and cows were observed licking concrete from the cattle shed when they did not have rock salt in the feed and they lacked minerals. Cows are often seen drinking the urine from other cows; it is not known whether this reflects the lack of water they are offered on traditional farms, or whether they are seeking minerals from the urine.

Table 4.2.3: Nutrition and feeding before and after intervention.

Ingredients of diet	Baseline (n = 639)	Final Evaluation (n = 394)			
		Before		After	
		Percentage of respondents fed cows	Total quantity / day / herd (Kg)	Percentage respondents fed cows	Total quantity / day / herd (Kg)
Straw	94.4%	96.7%	30.2	89.3%	22.5
Green Fodder	90.3%	60.2%	56.6	98.7%	91.3
Silage Fodder	0.0%	1.0%	9.4	4.3%	30.5
Formulated Concentrate	18.3%	5.1%	3.9	95.2%	14.5
Boiled Rice	0.0%	27.2%	2.4	1.3%	2.1
Wheat Bran	72.8%	84.0%	7.6	10.7%	12.7
Pulse Bran	0.0%	59.9%	4.4	7.9%	6.3
Rice Bran/ Polish	58.4%	66.0%	4.1	6.9%	3.8
Oil Cake	69.6%	76.1%	2.3	11.2%	4.0
Molasses	1.7%	15.7%	1.2	4.6%	0.8
Mineral pre-mix	0.0%	6.4%	1.05	2.5%	01.0
Rock Salt	0.0%	0%	0	60.9%	0.2
Other	NA	22.1%	0.91	11.9%	4.4

The way farmers provide water to cattle also drastically changed after the project intervention. Table 4.2.4 below shows that nearly all of the respondents provide a 24 hour supply of water (99% versus 5% before the project) in a separate water trough (99% versus 4% before the project) and provide water separately from feed (98% versus 4% before the project). Baseline data shows that about 8% farmers did not mix water with feed but they did not have any separate installed water trough rather they used pots. Besides, farmers surveyed for the baseline provided water three times per day on average. Cows in Bangladesh are not offered sufficient water for metabolic needs, sweating and milk production; BDEP trained farmers have rectified this, which is an animal welfare issue as well as being a production related factor. Separate water and feed troughs reduces problems associated with fermentation of feed, and allows the farmer to judge when more water is needed. BDEP notes that cows cannot tell the farmer when they are thirsty so it is essential for water to be available constantly.

Table 4.2.4 : Water provision practices by respondent farmers.

Water provision techniques	Baseline (n = 639)	Final Evaluation (n = 394)	
		Before	After
Separate feed and water	7.6%	4.3%	98.5%
Separate installed water trough	0%	5.6%	98.9%
Provide 24 hour clean water	0%	5.3%	98.7%

The project promoted providing cattle an appropriate diet. The amount of ration fed to cows should be aligned with body weight, yet body weight estimation is hardly practiced in Bangladesh. Farmers also need to understand body condition and the need for cows to show good condition (without being too well-fed or fat). The impact of the project on these fundamental aspects of animal nutrition is demonstrated in the following table:

Table 4.2.5: Use of body weight and condition.

Parameter	Baseline (n = 639)	Final Evaluation (n = 394)	
		Before Intervention (%)	After Intervention (%)
Use cow body-weight for feed estimation	NA	3%	95%
Use body score condition for feed estimation	NA	2%	83%

Calf Rearing

The project promoted changes in calf rearing, including feeding colostrum to calves within an hour of birth, early weaning, feeding calf milk replacer (CMR), and providing maize powder or solid feeds for rumen development.

The BDEP training has led to many dramatic improvements for all of the promoted practices. Compared to before the intervention, many more farmers now feed colostrum (90% versus 65%) and within an hour of birth (97% versus 66%). In addition, now some farmers feed CMR to their calves (38% versus 0%), feed maize powder and solid feeds during milk rearing (63% versus 5%) and practice early weaning (59% versus 14%). Early weaning means that the calf no longer takes milk from their mother after less than 3 months (37% versus 1%) or from 3 to 6 months (20% versus 12%) and certainly not older than 6 months of age (43% versus 86%). Farmers now realize that CMR is cheaper than fresh milk (42% versus 0.2%).

It is noted that healthy calves are the future of the herd, and BDEP interventions are resulting in healthier and bigger calves being weaned earlier than is the norm. The latter is good for the calves and boosts profitability.

Table 4.2.6. Percent of farmers that implement calf rearing practices

Calf Rearing Practices	Baseline (n = 639)	Final Evaluation (n = 394)	
		Before Intervention (%)	After Intervention (%)
Feeding of colostrum to calves	NA	65%	90%
Feeding of CMR to calves	NA	0%	38%
Practice of early weaning of calves	NA	14%	59%
Provision of maize powder/solid feeds to calves	NA	5%	63%
Offer colostrum within an hour of birth	NA	66%	97%
Offer colostrum between 1 hour and 2 hour of birth	NA	30%	2%
Offer colostrum after more than 2 hours of birth	NA	2%	0%
Compared to whole milk, would CMR be:			
Cheaper	NA	0.2%	42%
Similar price	NA	0.2%	5%
More expensive	NA	0%	1%
Don't know	NA	99%	51%
Age at weaning			
Less than 3 months	NA	1%	37%
3 to 6 months	NA	12%	20%
After 6 months	NA	86%	43%

Reproductive Management

As a result of training and the greater availability of semen from dairy company partners, more farmers use AI (97% versus 38%) rather to bulls (22% versus 81%). When asked what breeding technique they used the last time, 93% of the farmers used AI while only 7% used bulls.

Over two-thirds of the farmers indicated that they did not have any problems with breeding, as compared to only 3% prior to the training. Of those who had problems, failure of conception was reported by 10%, as compared to 23% before the project. However, the number of attempts to breed cows did not greatly decrease from three times. This is a surprise to BDEP staff whose field experience suggests a much reduced problem with repeat breeding. There may be a timing issue as well, with cows entering the program in considerable undernourished states. There are many factors impacting cow fertility making it more difficult to completely solve common problems such as repeat breeding. To date, BDEP has concentrated on feeding and shed management while in the future, other dairy specialists may have to look more closely at things like semen quality and insemination techniques.

Table 4.2.7. Percentage of farmers undertaking certain reproductive management practices before and after BDEP intervention.

Reproductive management practices	Baseline (n = 639)	Final Evaluation (n = 394)	
		Before Intervention	After Intervention
<i>Means of breeding</i>			
Artificial insemination	69%	38%	97%
Bulls	44%	81%	22%
<i>Major problems in breeding of cows</i>			
Cost	21%	10%	5%
Missing heat detection	23%	15%	6%
Lack of availability of AI/bulls	6%	16%	3%
Failure of conception / Several AI attempts	63%	23%	10%
No oestrus	28%	18%	5%
Sick/weak animals	15%	10%	4%
No problem	4%	3%	67%
<i>Number of attempts made to breed cows last time</i>			
1 Time	NA	1%	1%
2 Times	NA	15%	12%
3 Times	NA	55%	57%
4 Times	NA	28%	28%

With regards to heifer rearing, the training had dramatic impacts. Heifers now show heat at earlier ages, with 56% showing it at 15 to 18 months of age compared to previously 58% not showing heat until 18 to 24 months of age prior to the training. This has led to heifers calving down at a younger age with 55% calving between 24 and 27 months after training compared to 54% not calving down until 28 to 30 months of age before the training.

The results from the training have also benefited mature cows with shorter times to their first heat after calving and fewer days open. Now 73% show first heat after 1 or 2 months post calving compared to 49% not showing it until 2 to 3 months post calving prior to the on-farm training. This has led to a dramatic reduction in “days open” or days between calving and conception. Now 70% of the cows will conceive within 2 to 3 months of calving, compared to 69% not conceiving until 3 or more months prior to the training program. Such changes will drive much better profitability.

Much of the improved heifer and mature cow reproductive performance could be attributed to improved feeding management. Higher feed nutrient (energy and protein) intakes will result in more rapid heifer growth rates and a faster re-establishment of normal hormonal activity in newly calved down cows. Higher feed nutrient intakes can be the result of higher feed quality and greater appetites. Improvements in quality of nutrition was discussed above, and we will discuss improvements in cow comfort below that could help to improve appetites by making the cow more comfortable during the heat of the day.

Table 4.2.8 : Findings related to fertility.

Table 12.13 : Findings related to fertility.			
	Baseline	Final Evaluation (n = 389)	
		Before Intervention	After Intervention
Average age heifers showed first heat : Baseline - n = 609			
<15 months	1%	1%	29%
15-18 months	1%	12%	56%
18-24 months	11%	58%	13%
>24 months	29%	28%	2%
Gap between calving & first heat : Baseline - n = 807 [Multi-response]			
<1 month	2%	1%	29%
1-2 months	24%	15%	55%
2-3 months	75%	49%	13%
Don't Know			
No. of days between calving and conception			
<2 months	NA	0.5%	22%
2-3 months	NA	30%	70%
>3 months	NA	69%	9%

Cow Comfort

The project promoted many practices to make the cattle more comfortable, and thus increase appetite, growth, and ultimately productivity. BDEP promoted improved cowsheds that had good ventilation, and even fans, keeping the cows untied so they could move around to more comfortable positions, providing cows with rubber mats or sand beds to lie on, bathing the cows twice a day to cool them down, and keeping the cow sheds clean.

As indicated in Table 4.2.9 below, farmers greatly improved their implementation of cow comfort practices. Nearly all farmers had good ventilation in their cowshed (99% versus 37%), with some even installing fans (38% versus 5%). Nearly two-thirds of farms kept their cows untied for 12 or more hours a day (61% versus 37%), although there is still work to be done on this practice. Cows are routinely bathed by most farmers (93% versus 41%), and some are provided with rubber mats or sand beds to lie on (60% versus 5%). Nearly all farmers now clean their cowshed at least twice a day (93% versus 19%).

Table 4.2.9. Percentage of farmers implementing cow comfort

Cow comfort parameters	Baseline (n = 639)	Final Evaluation (n = 394)	
		Before Intervention	After Intervention
Good ventilation in the cowshed	NA	37%	99%
Use of fans in the cowshed	NA	5%	38%
Keep cows untied for 12 hours or more in a day	NA	37% ¹¹	61%
Cleaning of cowshed at least twice each day	70%	19%	93%
Use rubber mats or sand beds for cow to lie on	50% [Earthen floor]	5%	60%
Daily Bathing	NA	41%	93%

Animal Health

BDEP emphasized improved dairy management that could keep cows healthy in the first place, and thus reduce cost of treatment. Prevention, however, is an important part of successful dairy farming, hence BDEP's whole farm management approach included the promotion of regular vaccination (with superior Foot and Mouth Disease vaccine) and de-worming. BDEP also introduced the California Mastitis Test for early detection of mastitis, and better milking and farm management practices to mitigate the spread of this disease.

It is found that the practices of vaccination and de-worming have increased to a very large extent after intervention (99%) compared to before intervention (22% and 39%) and baseline (31% and 15%). The use of CMT increased to 79% from 2% of before intervention, and was unknown at the baseline. The practice of hygienic and complete milking also increased modestly from 5% to 14%, however, it is unclear whether the respondents really understood the question asked of them.

Table 4.2.10 : Percentage of farmers that have applied improved disease management techniques.

Improved disease management techniques	Baseline (n = 639)	Final Evaluation (n = 394)	
		Before Intervention	After Intervention
Vaccination	31%	22%	99%
Regular De-worming	15%	39%	99%
Practice California Mastitis prevention	NA	2%	79%
Practice hygienic & complete milking	NA	5%	14%

Milk Productivity

BDEP focused on improving farming dairy practices, as that would lead to the improved productivity of the cows, both in terms of reproduction and milk production. The new animal husbandry and farm management practices introduced by BDEP have resulted in increases in milk production which greatly surpassed the project targets. The Figure 4.2.3 and 4.2.4 below show the average daily production for crossbreds and local cows, as compared to the baseline, midterm, and farmer retrospective. The average milk production for crossbreds doubled from 5.5 liters per day at baseline to 11.8 liters per day at the final evaluation, greatly surpassing the 6.9 liters per day target. The average milk production for local cows also doubled from 1.9 liters per day at baseline to 3.9 liters per day at the final evaluation, more than the 2.8 liters per day target. It is noted that the "farmer retrospective" for cross-bred cows, as reported by survey respondents, is 22.9% higher than the average milk production found in the original Baseline survey conducted in 2014.

¹¹ BDEP staff disagree with this finding, as their experience in the field was such that nearly all farmers kept their cows tied up for nearly 24 hours a day prior to the project.

Figure 4.2.3. Average Daily Milk Production (Liters) for Crossbreds

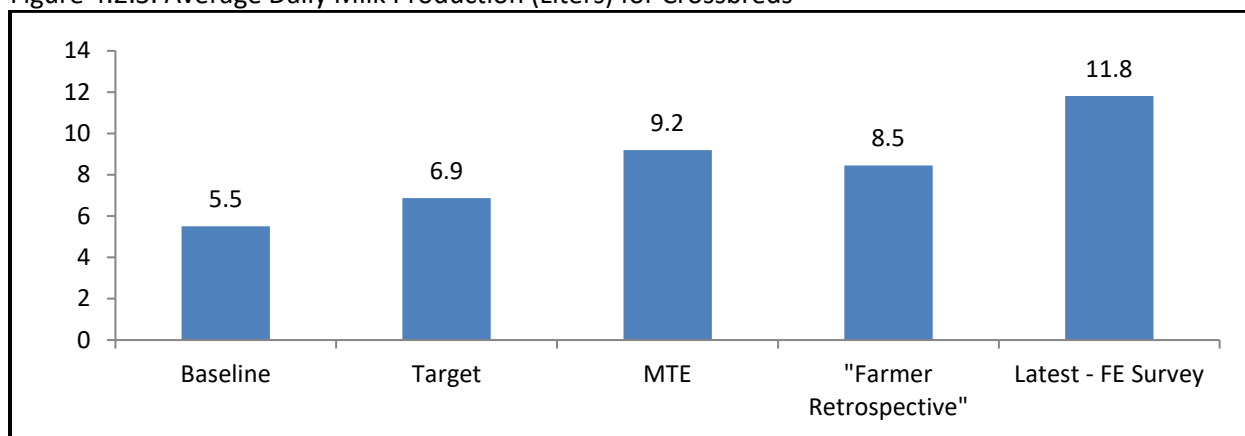


Figure 4.2.4. Average Daily Milk Production (Liters) for Local Breeds

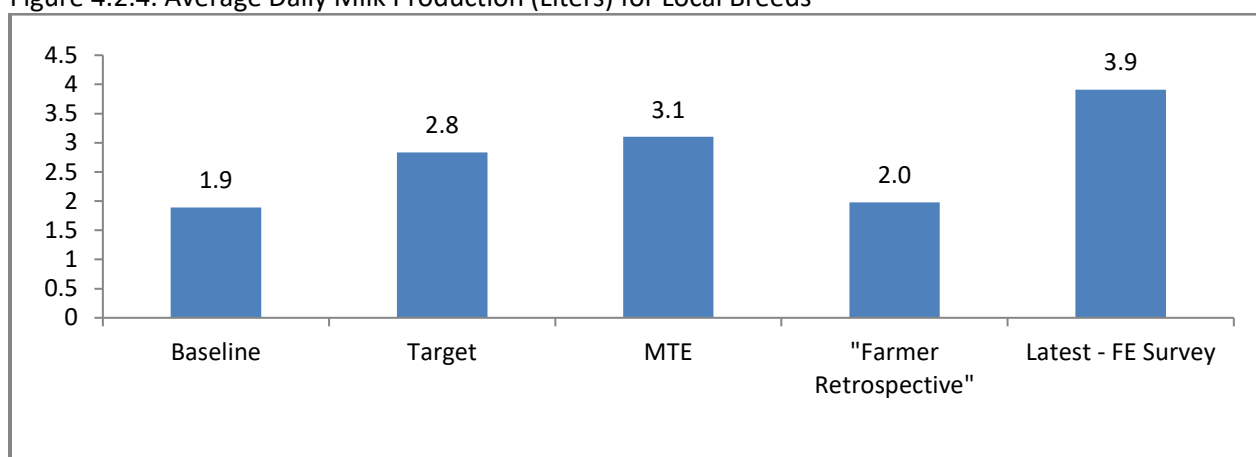


Table 4.2.11: Percentage Increases in Milk Production¹²

Comparison	Target v "Official Baseline"	MTE v "Official Baseline"	"Farmer Retrospective" v "Official Baseline"	Final Evaluation v "Official Baseline"	Final Evaluation v "Farmer Retrospective"
Cross-breds	25%	67%	22.9%	114.9%	39.9%
Local-breds	50%	64%	4.8%	106.9%	97.5%

Milk Sales & Marketing

The installation of new MCCs by the project partners has greatly increased the access of farmers to the formal market (as discussed in Component 1 above). Table 4.2.12 below indicates where the respondents sell their milk at baseline, and after their participation in the project. As you can see, while only about 38% sold their milk to a processor or directly to a market, now nearly all farmers are selling their milk to one of our partners. The use of middlemen (goalas) decreased from 55% to only 1%. This is a substantial improvement for the farmers, as they are now receiving end market prices, rather than selling at a lower rate to the goalas who then mark up to price to sell to the market.

¹² The difference between the baseline/farmer retrospective and the productivity found at the final evaluation are statistically significant.

Table 4.2.12: Distribution of farmers according to milk buyers and region.

Name of buyer of milk	Baseline			Final Evaluation		
	Khulna (n=248)	Rajshahi (n=202)	Total (n=450)	Khulna (n=200)	Rajshahi (n=194)	Total (n=394)
Partner Processor	0.4%	22%	10%	98%	98%	98%
Goala / Middlemen	77%	28%	55%	2.0%	-	1.0%
Neighbor / Relative / Farmgate	19%	9%	15%	-	-	-
Other (Milk Vita, Local Market, Tea Stall, Sweet Shop)	14%	46%	28%	-	2%	1%

Table 4.2.13 below shows the change in price that the farmers received from selling directly to the processors. Respondents reported receiving an average of about BDT 42 per liter of milk from the partner processors, while they were receiving about BDT 32-34 per liter of milk from the goala before the intervention or at baseline. There was also an increase of price received from the processor before and after the project, which is likely a result of the partner processors starting to price their milk according to the milk fat content, rather than a flat rate for all milk delivered. The average milkfat of the milk delivered by the respondents the day before the interview was 4.6%. Unfortunately, this value was not taken at baseline to compare, however 4.6% is a good fat content which will allow good farm profitability. BDEP staff advise that 3.9-4.1% is at the higher end of fat contents found in areas where BDEP is not active.

Table 4.2.13 : Comparison of milk prices by period and buyer type¹³.

Buyer of Milk	Baseline	Final Evaluation		
	Average price (BDT/Liter)	Average typical price before intervention (BDT/Liter)	Average typical price since intervention (BDT/Liter)	Average price day before interview (BDT/Liter)
Processor/MCC	36.8 (n=46)	34.38 (n=31)	41.70 (n=360)	42.05 (n=350)
Goala / Middlemen	32.1 (n=247)	33.86 (n=235)	35.25 (n=20)	31.71 (n=16)
Neighbours / farmgate	36.9 (n=66)	37.40 (n=30)	39.3 (n=18)	37.96 (n=27)
Others	38.1 (n=128)	37.14 (n=98)	37.91 (n=23)	36.60 (n=27)

Based on the responses about the amount of milk and prices received for milk sold yesterday, on average after the training, and on average before the training, the evaluation team was able to estimate the sales revenue of the farmers. As detailed in Table 4.2.14, revenue per day has increased significantly since participating in the project, from BDT 691/day before the project to BDT 997/day after the project. The recipients even received BDT 1270/day on the day before the interview. It is important to note, as described earlier in this section, the number of cows owned by the respondent household remained essentially the same throughout the project, and thus the increase in revenue is not due to more cows on the farm producing milk, but existing cows producing more milk and selling

¹³ Sample size does not add up to 394 because farmers can sell to multiple sources at the same time

at a high rate. When asked directly in the household survey, 99% of the farmers indicated that utilizing the improved practices was increasing their revenue.

Table 4.2.14: Average sales revenue (BDT/Farm/day)

	Average sales revenue (BDT/farm/day)
Yesterday (n=368)	1270
Since receiving training (n=386)	997
Before intervention (n=317)	691

Farmers in the FGDs supported these findings. They all have seen a large increase in the amount of milk they are able to sell, and the price they received for their milk. However, selling to the partner processors is not without challenges. Some focus group discussion members complained about electricity cuts at the MCCs, which causes the MCC to not accept milk in the morning, evening or for the full day because their chiller is not working. Others noted that some processors only collect milk once per day, and so they have to find a buyer for the remainder of their milk.

Access to Finance

While not a major focus of the project, BDEP helped facilitate linkages between financial institutions and the farmers through the partner dairy companies. Some of the improved practices promoted by the project, including improved housing and the installation of feed and water troughs would require some funding. Working through the dairy companies to lend to the most productive dairy farmers builds more sustainability into the financial relationship. During the project period, 4 banks have together made 341 loans to farmers receiving training in improved productivity. The target for the number was 450, so achievement was 76%.

The household surveys provided some more insight into the farmer's access to finance. Of those interviewed, 10% have taken out a loan since starting with the project. The average loan was BDT 96,000 and 70% of those that took out loans used a microfinance or formal lender. All but 2 individuals that took out a loan (94%) were using it to invest in their dairy business.

Gender Issues

BDEP addressed the needs of female farmers through its on-farm training model. BDEP considered this to be critical given the need to support farmers in the major changes associated with moving away from traditional practices. Often, female farmers cannot participate in classroom training, especially if this is not located within their own village (and very often even if in the same village). But by coming to the farms, rather than taking farmers to classrooms, not only have more productive practices been introduced and demonstrated to farmers, the training has been made accessible to the women of dairying. In addition, as men are often away from the dairy farm, undertaking other agricultural pursuits or paid labor, female farmers were a very important channel for BDEP training. As mentioned above, 37% of those trained were women.

Focus group discussions with women indicated that utilizing the BDEP approach decreased the time spent on dairy activities. They mentioned that the time saved from the dairy cattle rearing is now used for taking care of family and some recreation with family members.

According to the traditional Bangladesh socio-cultural pattern, women are not considered well suited for decision making. This stereotypical view of women is hindering dairy development. As shown in Table 4.2.15 below, participation in the project brought modest improvements in women participating in decision making for dairy cattle rearing, milking, milk selling and type of expenditure. The percentage of households where women are involved in joint decision-making has increased. The increase in joint decision making ranged from 10% on reproductive matters, to 23% on growing

fodder. Individual decision-making, with women acting independently, did not increase after the training.

Table-4.2.15: Decision-making and roles for men and women in dairy farming.

Questions	Baseline (n = 639)			Final Evaluation (n = 394)					
				Before Intervention			After Intervention		
	Woman	Man	Both	Woman	Man	Both	Woman	Man	Both
Decision taker for:									
Buying /growing fodder/ input	4%	23%	44%	6%	48%	46%	6%	37%	57%
Preventative care for cows	NA	NA	NA	7%	48%	45%	7%	40%	53%
Getting medical care for cows	4%	18%	50%	6%	49%	45%	6%	40%	54%
Reproduction	NA	NA	NA	6%	46%	48%	6%	38%	55%
Selling cows	NA	NA	NA	7%	47%	46%	6%	40%	54%
Selling milk	6%	11%	57%	7%	48%	45%	7%	41%	52%
Spending on breed improvement / Expanding the farm	4%	18%	52%	6%	44%	49%	6%	36%	58%
HH activities done by:									
Cow feeding	49%	NA	NA	16%	37%	47%	15%	26%	58%
Maintenance of shelter	42%	NA	NA	19%	35%	46%	18%	22%	61%
Bathing cows	NA	NA	NA	13%	45%	41%	13%	34%	53%
Milking cows	NA	NA	NA	15%	53%	32%	15%	50%	35%
Selling milk / taking milk to MCC	25%	NA	NA	10%	78%	12%	10%	75%	16%

It should be noted that of the three demonstration farms managed by individuals, one is managed by a woman. At one of the others, the wife of the registered owner plays a significant role in farm management.

Sustainability

This Final Evaluation finds the impact of BDEP on farming practices to be highly sustainable. Farmers are more productive and profitable. The improved health and condition of their cows is self-evident. Fertility is improved and milk production is up, while costs are down, especially in Rajshahi where the feeding of high quantities of concentrate was common before BDEP. Farmers are seeking to extend the size of their herds, and others are joining the sector after seeing the results of the BDEP approach.

Nearly all respondents of the household survey (99%) were planning to continue investing their dairy farms in the future including increasing their herd size, improving their cow sheds, increasing the size of dairy farms, and increasing the area they grow fodder.

In FGDs, it was found that more farmers wanted to join the training and were seeking to repay loans taken from goalas. This would enable them to sell milk to the new MCCs and then receive the training from the DDOs. Farmers indicated that they all plan to continue implementing the practices supported by the project.

Anecdotally, BDEP staff have commented to the evaluation team that even after the project has ended, farmers continue to undertake the BDEP Implementation with open sheds, sand beds and the provision of separate water and improved nutrition.

4.3 Component 3: Mini Agribusinesses

Summary of Component

The third component was designed to improve the availability of improved animal nutrition inputs to dairy farmers. To do this, the project provided start-up financing (\$311,936 total), initial input inventory,¹⁴ and capacity building to 110 entrepreneurs to establish small-scale commercial agribusinesses at the local level around the 80 MCCs that could provide necessary inputs, including improved fodder crops, a superior quality concentrate blend for the local context, and other goods and services. Their capacity building included business management, production of fodder and blending of concentrate, as well as exposure to whole farm management so they could provide some advice to the farmers when they sold the goods. The blend of concentrate was determined by feed trials conducted at the beginning of the project. In some instances, where two MABs were located close together, the project promoted one MAB to produce and sell concentrate and fodder, while the second would focus on fodder production and sales only. The focus on building up MABs at the local level was to promote quality and sustainability, both of the MABs that have a self-interest to produce and promote high quality goods. Farmers can focus on their dairying practices and don't have to worry about growing, producing or sourcing their own inputs.

To assess the success of this component, the final evaluation utilized monthly sales data provided to the project from the MABs in addition to key informant interviews with 14 of the MABs. The 394 farm surveys conducted with participant farmers, and 11 Focus group discussions with participant farmers also provided insight into their use of the MABs.

Profile of MABs

Based on the monitoring data, the MABs supported by the project consisted of 107 male and 3 female entrepreneurs with an average age of 30. The MABs interviewed¹⁵ had been in business from between 6 and 18 months, averaging 10 months. They each served an average of 4 villages, and 21 clients. The highest number of clients reported was 47.

The project encouraged women to be good entrepreneurs and hence recruited three progressive women to be MABs. If women provide services to the dairy farmers, several other women can easily take part due to socio-cultural norms and farmers become more attractive and interested. Perhaps greater effort could have been made to try to identify additional females interested in this vocation. BDEP notes, however, that female candidates were actively sought, but few were found.

Sourcing of Inputs

According to the KIIs, the MABs now feel comfortable sourcing their own inputs. While the project provided an initial input inventory, the MABs have sourced their raw materials for the concentrate mixes and other items from local markets for an extended period, ensuring they are well versed in the need to purchase ingredients of good nutritive value. MABs indicate that BDEP's training has made them appreciate the quality of the raw materials needed for good concentrate blending and seed for fodder crop production. Some MABs indicated that on occasion it can be more difficult to source the necessary ingredients, such as rock salt. In the case of fodder shortages, some MABs indicated that they sometimes purchase fodder from other MABs to sell onto their own clients if their own crop is not ready. Shortages of rock salt reflect problems at border crossings, but we

¹⁴ Purchase of ingredients for 1,000kg of concentrate, a small water pump for irrigation for fodder cultivation, transport van (rickshaw), fodder chopper, pH meter, weighing balance, grass seeds, calf milk replacer (CMR), maize powder (to feed to milk-fed calves), California Mastitis Test (CMT) kits, and finance support so they could lease land for fodder production

¹⁵ While the 14 KIIs is not statistically significant to extrapolate the findings to all MABs, it still gives a sense of the type of individuals and the scale of their business.

understand that American Dairy Ltd is now importing larger volumes of rock salt as both a commercial activity and as a service to the dairy farmers of Bangladesh (to be sold through MABs).

Promotion of Services

All MABs interviewed are comfortable promoting their services in their local area. They generally use door to door visits to farmers, while some have provided small quantities of concentrates to farmers to demonstrate the nutritional benefits. The most successful at this have grown their business significantly. Working with BDEP has also provided knowledge on more productive farm management practices, and thus they now feel comfortable providing feeding and herd management advice when they sell the goods which provides a more holistic product to the farmers. Where MABs or their families have their own dairy farm, many have modified these to the full BDEP implementation, which will provide a model to demonstrate the benefits of better nutrition and other factors to neighboring farmers.

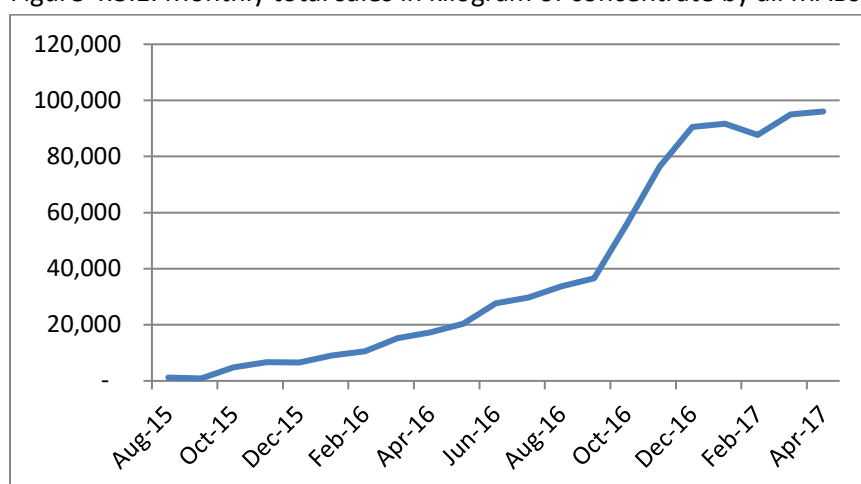
When asked if their businesses were profitable and whether they wanted to expand their clientele numbers and sales, all 14 MAB entrepreneurs, very enthusiastically agreed that their businesses were profitable and increasing the customer base was their current key objective.

Product Sales

MABs state that the most popular products they sell are formulated concentrates (using the BDEP recipe), chopped maize green-chop and silage, CMR and rock salt. Sales of concentrate can vary by season, with more being sold in the wet season, and less in the dry season when cows may spend time outside the farm grazing on other crops. MABs have seen that once farmers see the benefit of early weaning of calves, extra milk yields or reduced days from calving to first heat in milking cows fed the MAB concentrates and quality forages, they are very likely to purchase them for future feeding.

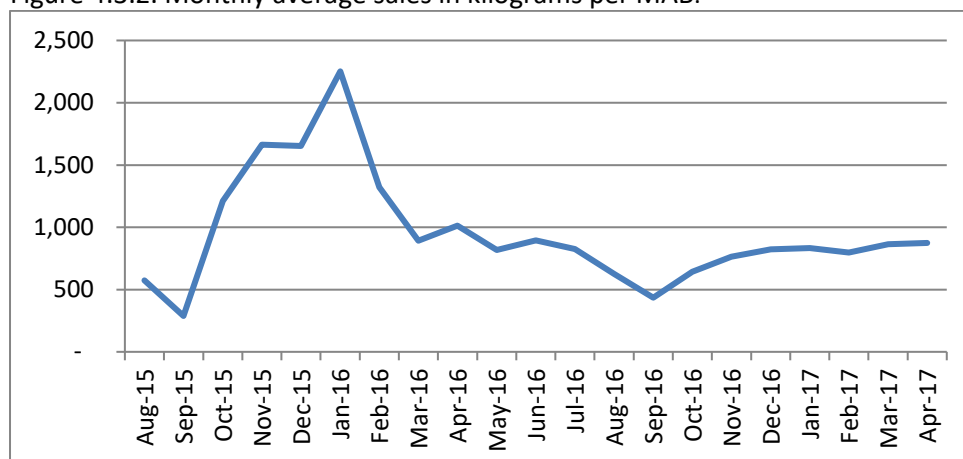
Since the project greatly promoted the use of concentrate, it is important to note the changes in concentrate sales over the course of the project. Figure 4.3.1 below shows how the sales of concentrate also increased over this time, as the number of MABs and farmers involved in the project increased. By the end of the project, nearly 100,000 Kg of concentrate was being sold by the 105 MABs that sold concentrate. Figure 4.3.2 shows the progress of sales per MAB throughout the project. It is unclear why there was a peak in concentrate sales from November 2015 to January 2016, but the general trend show an increase per MAB from about 500 to 1,000 kg a month.

Figure 4.3.1. Monthly total sales in kilogram of concentrate by all MABs.



Source: Project data, MAB reports, project partner reports

Figure 4.3.2. Monthly average sales in kilograms per MAB.



Source: Project data, MAB reports, Project Partner reports.

Revenue and Profitability

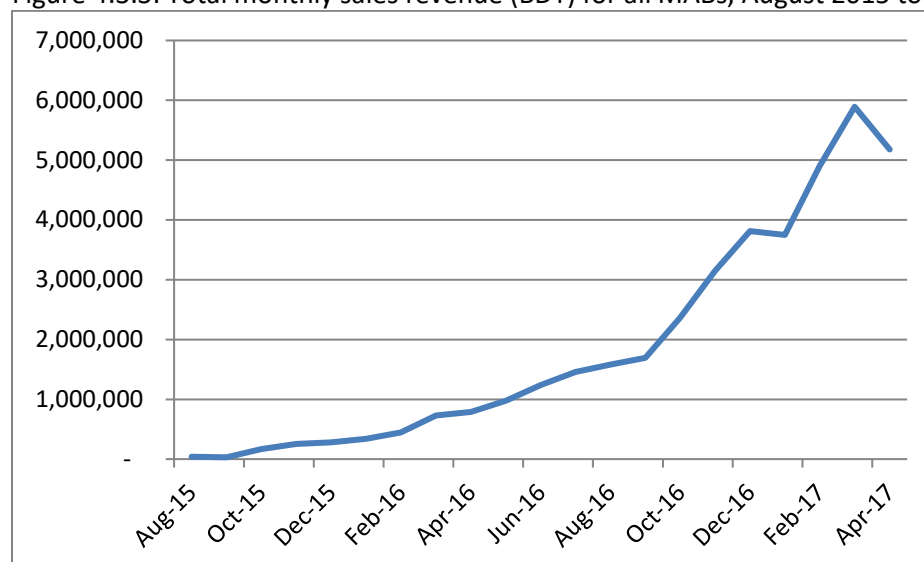
The revenue from all MABs increased to a total of about 6 million BDT by the end of the project as more MABs and farmers joined the project (Figure 4.3.3). The average monthly revenue and profits (Figure 4.3.4 and 4.3.6) of the MABs increased as more farmers were trained in the BDEP whole farm management approach.

In March 2017, the peak month for revenue and profit during the recorded period of the project, the average profit per MAB was BDT 15,780 (about \$200) while the median profit was BDT 12,100 (about \$155). The highest monthly profit was an impressive BDT 67,565 (about \$840). This was achieved by one of the few fodder-only MAB established by BDEP. The second highest monthly profit was BDT 60,500, and this was for an MAB who blends concentrate as well as growing fodder and offering other goods and services. For comparison purposes, farm laborers tend to receive around BDT 300 per day, less than \$4 per day. In addition, rural day labor work tends to be seasonal and not available throughout the year.

The variability of average MAB revenue and profit throughout the project is due to new MABs starting their business throughout the project. New MABs had lower sales because they were just starting their business and building up their customer base. There was a large increase in new MABs between July and September of 2016 which explains the variability.

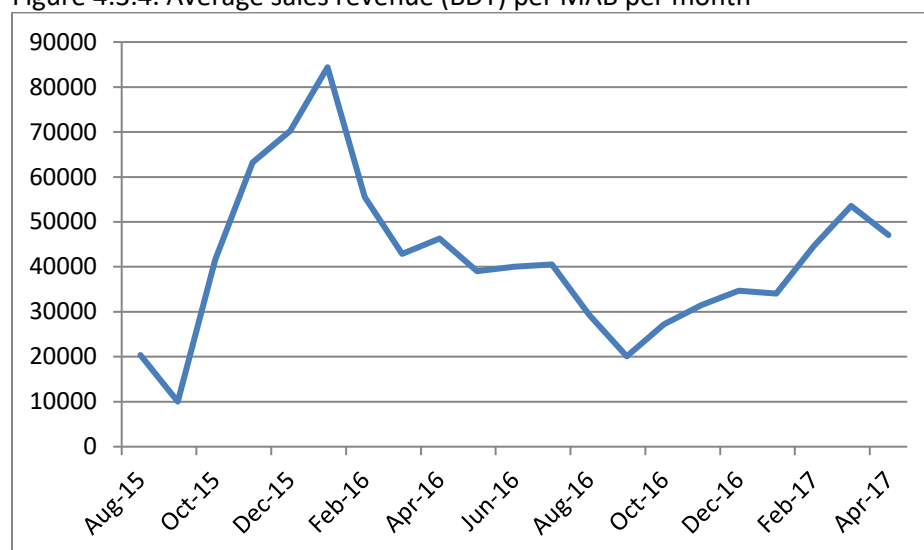
BDEP staff report that the drop in revenue and profit in April is due to seasonal factors, with maize harvests coming to an end prior to the monsoon season. It is noted that greater fodder production would allow higher volumes of silage to be prepared, and in this manner such seasonal fluctuations should be able to be reduced in the future.

Figure 4.3.3: Total monthly sales revenue (BDT) for all MABs, August 2015 to April 2017.



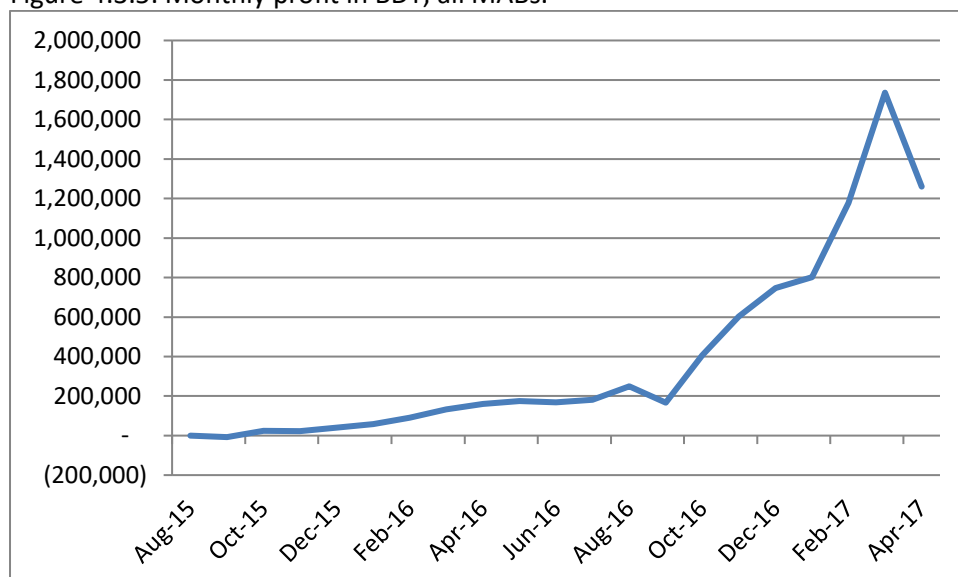
Source: Project data, MAB reports, Project Partner reports

Figure 4.3.4. Average sales revenue (BDT) per MAB per month



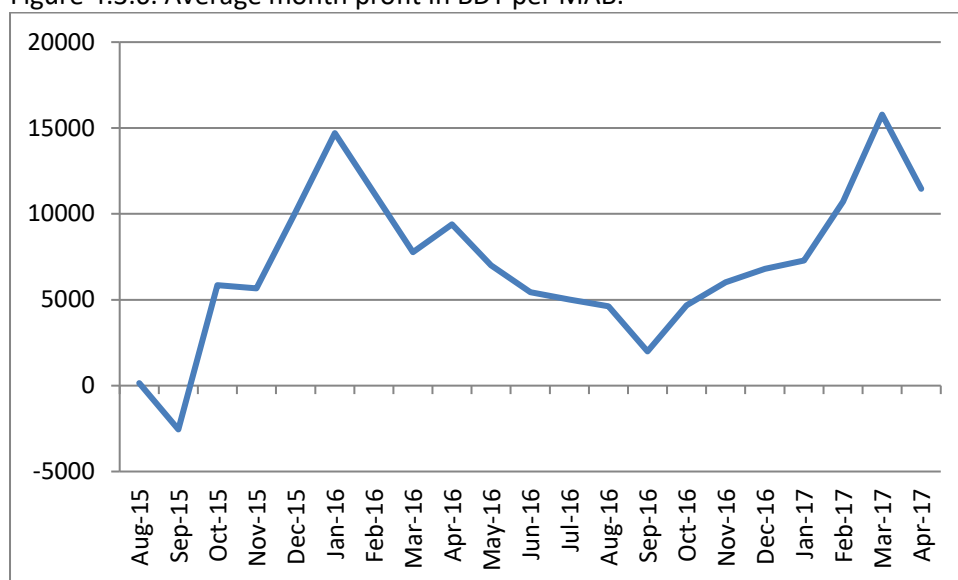
Source: Project data, MAB reports, Project Partner reports

Figure 4.3.5: Monthly profit in BDT, all MABs.



Source: Project data, MAB reports, Project Partner reports

Figure 4.3.6. Average month profit in BDT per MAB.



Source: Project data, MAB reports, Project Partner reports

Farmer use of MABs

As discussed in the Component 2 findings, most farmers interviewed buy inputs from their local MABs, 95% buy concentrate and 50% buy green feed. The use of improved nutrition inputs has increased significantly since the beginning of the project, which can be attributed partly due to the availability of these inputs at the MABs. This includes an increase in green fodder use (60% to 99%), concentrate (5% to 96%), and rock salt (0% to 61%). The use of individual ingredients that are typically part of concentrates has reduced (wheat bran reduced from 84% to 11%).

Farmers in focus group discussions were very positive about the MABs in the local areas. All groups liked the accessibility of the MABs, and found them to provide quality products. Some groups thought the products were reasonably priced, while one group indicated that the costs were very

high, but note the increased productivity may make up for this. A number of groups highlighted that MABs are a good source of information regarding better dairy farming.

Farmers nearly unanimously have seen the effect of the improved inputs on cow health and productivity. Groups indicated that they have seen a drastic increase in milk yield (as much as 4-5 liters) and fat content since using improved concentrate and fodder. However, it is difficult to separate this effect from the total effect of improved practices. One farmer noted that “we buy from the MAB because we get instant results.”

Challenges

In several cases, respondent MABs stated that they did not face any challenges worthy of mention in the operation of their businesses. Other MABs reported challenges such as reliable electricity to run their office and equipment and competition with government livestock officers that were promoting poorer quality, cheaper alternatives. Some MABs encountered problems associated with growth. For example, when concentrate sales volumes grow, it becomes harder and harder to undertake blending by hand. Only some of the MABs were supported by BDEP to have blending equipment prior to the end of the project (the BDEP guide was that when sales reached three tons per month, the MAB was ready for blending equipment). Some local traders provide credit for farm purchases; most MABs elected not to play that role, or if they did extend credit, it was on a much shorter timescale than what other traders offered.

As all too often stated by MABs, the biggest constraint is the conservative mindset of farmers regarding the update of new innovations such as formulated concentrates and forage maize green-chop. The experience of some MABs, those with the highest sales and the longer experience of being an MAB, suggest that traditional approaches can be broken down over time with the necessary support. MABs were very keen for BDEP to continue in Bangladesh for at least another 12 months.

Sustainability

With respect to their future as MABs, all 14 interviewees were very positive in their comments on current business profits and their long-term plans to continue operating MAB offices and farm supply services. Some typical statements were:

- “The MAB opportunity has changed my life positively. I was unemployed having no work that time. After becoming an MAB, my standard of living has changed.”
- “Support from BDEP has changed my life positively, I planned to go abroad as a laborer by investing lots of money and faced an uncertain life; but now I am confident about my own business.”
- “After being involved with these projects, it has changed my lifestyle positively. I have learnt a lot, I am happy to be a MAB and thanks to BDEP.”
- “I plan to keep functioning MAB because it is profitable and it has changed my life style positively. I plan to expand my business through establishing new shop project which has impacted on my business positively.”

The profitability of MABs has been noted above. MABs interviewed about their business were very enthusiastic about the opportunity and the potential for these to grow. All MABs interviewed intend to remain as MABs.

MABs were operating as commercial businesses, albeit with continuing support from BDEP, from the start of their operations. The most critical support from BDEP was technical support, and MABs interviewed stated that they now have the knowledge to produce high yields of maize, purchase

good quality ingredients and blend concentrate to meet the needs of dairy cows. Many MABs are eager to expand their businesses.

It is probable that more and more farmers will convert to the BDEP approach in the future, and as this occurs there will be ever greater demand for MAB products. Indeed, in many cases, the penetration of MABs in terms of the proportion of local farmers to whom they are selling is low. The limited but real ability of some MABs to assist farmers in their dairy operations is also a positive factor.

All of the above suggests that the MAB component is fully sustainable. MABs and farmers need to continue to operate in enlightened self-interest for the partnership of farmers needing MAB products to produce more milk with higher fat content.

5 Conclusions

BDEP has implemented its field activities in an integrated manner, with village level MCCs (Component 1) receiving milk from farmers being trained by dairy company employed DDOs (Component 2). A significant part of that training is on the need for much enhanced animal nutrition, much of which is sourced from local MABs (Component 3). The local networks of DDOs, MABs and farmers support each other to build all businesses participating in the network. In the case of BDEP, the whole is greater than the sum of the components.

The BDEP approach has focused on specialization so that each player can concentrate on their comparative advantage. BDEP worked with dairy companies to expand and manage infrastructure, and MABs to produce key animal nutrition and sourcing of other inputs. This allows farmers to focus on providing proper care to their dairy cattle rather than diverting their attention to producing their own fodder and concentrate, and helping to manage farmer owned infrastructure.

Key conclusions from each of the components are noted below:

Infrastructure

An important feature of the BDEP approach was to involve dairy companies in the project, in both infrastructure and farmer training components. With respect to infrastructure, the close involvement of dairy companies has enabled several important features:

- It has allowed farmers to focus on addressing on-farm issues as opposed to taking them away from on-farm productivity issues by requiring them to be involved in the management of farmer group owned infrastructure.
- It enables testing of and payment by individual fat content, essential if farmers are to invest time and effort in improving their farms.
- It has brought a significant sum of private sector capital into the project, without which the scale of the project would have been much reduced.

The project and its close involvement with dairy company partners has resulted in significant new infrastructure being in place for the procurement, chilling and transport of milk. Co-investment in this infrastructure has been made by the project and dairy company partners. These partners operate the new equipment, and will maintain it to protect their own significant investment. The contribution of the new infrastructure in terms of additional milk procurement to these three partners is useful, and will continue after the project has ended. Dairy company involvement not only reflects the same business model as followed almost exclusively in developed dairy economies, it has resulted in close to \$3.5 million in co-investment, it has enabled a greater number of MCCs to be established than targeted, and it virtually guarantees sustainability of MCC operation.

The new infrastructure enables farmers to deliver milk directly to dairy companies, enhancing milk quality, allowing payment by individual fat content, and supporting the continuing operation of the new advisory services within the dairy companies. For the dairy company partners, direct farmer supply enabled by the new village level MCCs facilitates much better milk quality.

Farmer Training

The farmer training component was highly successful, with all farmers trained implementing at least half of the practices promoted by the project. The evaluation team asserts that the success for this component is due to the on-farm training approach and promotion of the practices that address the real reason for low productivity. As noted by the project management, there was a need in Bangladesh to turn away from the traditional dairy farming system, and not just add one or two new

technologies to the traditional approach¹⁶. A total change in approach, necessitated in depth one-on-one on-farm training that could not have been achieved through classroom training. The on-farm training approach worked both ways, in that as the DDOs worked with farmers on practical matters, their knowledge and experience also built. Now, DDOs and more senior staff who led the teams of DDOs are a huge asset to Bangladesh. On-farm training also allowed BDEP and the DDOs to reach female farmers who normally would not attend classroom training. Since females undertake much of the animal husbandry, especially on very small farms, the gap between the trainee (male) and implementer (female) is a problem for typical classroom training approaches.

It is also important to note that there have been some major spillover effects of the BDEP approach. Neighbors of BDEP farmers and commercial farmers not directly linked to the project have started implementing the improved practices since the project activities ceased. Additionally, the Bangladesh Agricultural University has started changing how they teach animal husbandry courses to include the BDEP method.

This Final Evaluation finds the impact of BDEP on farming practices to be highly sustainable. Farmers are more productive and profitable. The improved health and condition of their cows is self-evident. Fertility is improved and milk production is up, while costs are down, especially in Rajshahi where the feeding of high quantities of concentrate was common before BDEP. Nearly all farmers (99%) are planning to continue investing in their dairy farms including increasing their herd size, improving their cow sheds, increasing the size of the dairy farm, and increasing the area they grow fodder. Other are joining the sector after seeing the results.

The involvement of dairy company partners is also a key factor in the farmer training component. Dairy companies have a self-interest in greater volumes and better quality of milk. Genuine farmer training as provided by DDOs, in addition to MCCs closer to the farmers, drives those greater volumes and quality improvements. Dairy companies have the opportunity to achieve greater sales volumes and profit, a part of which can be invested in continuing training through the DDOs. All dairy company partners confirmed to the Evaluation team that was indeed their intention.

MAB Component

The MAB component is a novel approach, introduced to Bangladesh by BDEP to sustainably deal with the shortage of sources of good quality animal nutrition. The Evaluation Team considers it to be a great example of identifying needs and deriving unique solutions to address those needs.

BDEP supported MABs with start-up capital, inventory, and technical training. MABs reported now having the knowledge to produce high yields of maize, purchase good quality ingredients, blend concentrate to meet the needs of dairy cows, and provide guidance to farmers that buy their product. BDEP, through the MABs, has introduced green-chop maize, rock salt, and the use of CMR to Bangladesh. MABs also support the use of CMT, regular de-worming and better quality vaccines.

The evaluation finds that the MABs are highly profitable, and make more money than other job opportunities in the rural areas. The penetration of the MABs into the local market is still quite low, and thus there is much space for the MABs to expand their businesses as more farmers adopt improved practices of their neighbors and start depending better inputs. Response from current farmers on the inputs provided by the MABs is very favorable, especially the fodder and concentrate, and they plan to continue purchasing their inputs from the MABs going forward.

¹⁶ Geoff Walker and Dr. John Moran, one of the evaluation team members, wrote an article, published by FAO on the role of tradition in impeding the adoption of productive dairying practices. This article can be found in Annex 4.

With respect to their future as MABs, all interviewees contacted in the course of this evaluation affirmed their long-term plans to continue operating MAB offices and farm supply services. MABs interviewed about their business were very enthusiastic about the opportunity and the potential for expansion.

The evaluation team finds that the MAB component is fully sustainable. MABs and farmers need to continue to operate in enlightened self-interest for the partnership of farmers needing MAB products to produce more milk with higher fat content.

6 Recommendations

1. Dairy development projects need to have durations longer than three years. Best results will be seen when better nutrition is provided from when the unborn calf is within the womb until milking. This will not be the case in dairy sectors where donor funds are being invested. Recommendation 2 also requires time before real dairy development at scale can be undertaken.
2. Wherever milk production yields are as low they are in Bangladesh, it is probable that there is a lack of proper animal nutrition. Four recommendations arise from this observation:
 - a. It is probable that there is a lack of understanding of the need for better animal nutrition, and therefore considerable focus needs to go on developing human capacity before attempting to improve genetic capacity. That human development needs to be in a very practical manner if it is to result in genuine assistance to farmers.
 - b. In Bangladesh, at least, there was also a lack of sources of nutrition. Addressing such shortages need to be an important part of dairy development projects in many areas.
 - c. The approach as per the MAB component is recommended for wider adoption when dairy sectors are in similar situations.
 - d. In addition to increased milk yield and composition, improved body condition, improved herd fertility, reduced age at first calving, decreased mortality and reduced cost of milk production, investment in animal nutrition will also result in better animal health and lower treatment costs, and accordingly should be prioritized over a treatment approach.
3. Dairy company involvement should be the aim of all dairy development projects to achieve sustainable operation of MCCs and supporting infrastructure. Significant private sector investment should be sought in all dairy development projects, when possible, to build in sustainability and formal market linkage.
4. In many developing dairy sectors, dairy companies will provide the best home for advisory services. Sustainability is achieved through real farmer training being able to drive higher milk volumes and better milk quality.
5. The three components of BDEP, infrastructure, farmer training (and associated direct supply of milk from farmers to the new MCCs) and the establishment of local MABs, were co-located in villages and their surroundings where milk production was at a reasonable level but with potential for growth. Each component supported the success of the other components, and tight integration of the three components was important. It is recommended that such close integration must be followed in other dairy development projects.
6. In traditional dairy sectors as are found in the sub-Continent and very likely in other parts of the world, on-farm training is necessary to breakdown the traditional practices which have a negative impact on productivity.
7. Farmers must be paid on individual fat content and desirably total milk solids if they are to invest time and effort in farm and herd improvement.

8. Project design should allow for learning throughout the project life as demonstrated by BDEP. This requires greater contact between implementing agency and donor than is the case in many projects, as the former needs to be aware of how the project can achieve better impact participants as field experience grows.
9. Many BDEP indicators were repetitive and not relevant to dairy development. More focused indicators would drive projects to achieve desired results.
10. As BDEP shows, a focus on depth of training is much more effective than a focus on scale.
11. BDEP has demonstrated that a dairy approach to development works better than a development approach to dairy. As part of this, the BDEP project management has remarked to the Evaluation team of his gratitude that USDA allowed BDEP to be a dairy project only, without other added high level goals, for example connected to human nutrition. Such narrower scope allows the building and deployment of necessary specialist skills.

Annex 1: Indicator Table

Indicator	Target	Result
Overall		
Value of incremental sales attributed to USDA assistance	\$6,400,000	\$9,307,516
Number of individuals benefitting directly from USDA-funded intervention	10,005	10,770 Male: 8,362 Female: 2,408
Number of individuals benefitting indirectly from USDA-funded intervention	38,019	40,926
Number of Jobs attributed to USDA assistance	380	634
Percent change in volume of the formal value chain (cold chain) locally-produced milk and milk products.	6.5%	8.66%
Percent increase in volume of annual milk output per cow per day in two targeted regions (Local breed)	50%	115%
Percent increase in volume of annual milk output per cow per day in two targeted regions (Cross breed)	25%	107%
Average margin between farm-gate price and end product price for milk and milk products through the formal domestic and international chains	50%	61.5% ¹⁷
Number of downstream milk products produced	5	8
Percent of milk and milk products certified as meeting international / Bangladesh processing standards	15%	100%
Percent of registered dairy firms that obtain certification with international standards related to milk quality	100%	0% ¹⁸
Percent decrease in average production cost per unit of dairy products.	5%	N/A. Dairy company partners could not provide such information.
Infrastructure		
Number of MCCs	55	80
Number of milk collection Hubs	3	4
Total increase in installed storage capacity of cold storage as a result of USDA assistance in (MT)	150	193

¹⁷ This is the % of final sale price captured by the farmer for pasteurized milk, which is the least processed form of milk and thus not

¹⁸ No company exports milk, and thus international certifications are not necessary. There is also not a mechanism to get certified internationally.

Indicator	Target	Result
Number of insulated tankers for milk deliveries.	7	12
Number of firms in target regions using modern equipment to process milk and milk products	3	3
Number of processors buying milk from beneficiary farmers.	3	3
Number of MCC staff trained in milk quality and record keeping systems	55	108
Number of training sessions for MCC staff in milk quality and record keeping systems	6	10
Number of Milk Collection staff trained in milk hygiene and handling	55	108
Number of milk hygiene and handling training sessions for Milk Collection staff	6	10
Number of farmers in target regions that have access to quality, effective off-farm storage for their milk and milk products	9,625	12,500
Number of farmers delivering milk to milk collection centers / hubs.	9,625	7,625
Farmer and Other Training		
Number of farmers and others who have applied new techniques or technologies as a results of USDA assistance	7,700	10,523 Male: 8,121 Female: 2,402
Percent of farms in target areas using sustainable agricultural practices	80%	100%
Percent of farmers who demonstrate proficiency in animal nutrition techniques and water	80%	99%
Number of farmers and others who have received training on improved agricultural techniques or technologies as a result of USDA assistance	9,625	10,531 Male: 8,128 Female: 2,402
Number of farmers directly benefitting from standards and record keeping training	9,625	10,140
Number of Individuals who have received USG supported short-term agricultural sector productivity or food security training	7,700	10,523 Male:8,121 Female: 2,402
Number of 1 day on-farm training on optimal animal nutrition and water	308	24,193
Number of farmers trained in optimal feed utilization	9,625	10,114

Indicator	Target	Result
Number of farmers trained on whole-farm-management	9,625	10,125
Number of trainings on whole-farm-management	308	24,193
Numbers of farmers trained in hygienic milk handling	9,625	10,133
Number of training sessions for farmers in hygienic milk handling	563	22,312
Number of Demonstration farms established	1	4
Input Businesses		
Number of agricultural input suppliers / mini agribusinesses in the target regions that supply / sell improved inputs (eg. Feed, AI, minerals)	90	110
Number of specific improved inputs (feed concentrate, AI semen, supplements) available to farmers in target regions	13	14
Number of new or improved feed formulations	7	10
Number of farmers participating in feed formulation trials and testing	39	120
Value of grants to mini agribusinesses (small input suppliers)	\$247,500	\$299,768
Number of grants mini agribusinesses (small input suppliers)	90	110
Number of feasibility studies conducted	6	6
Financial Linkages		
Number of Linkages with Formal Financial Institutions	3	4
Total number of loans leveraged by formal financial institutions made to farmers trained by partner processors	450	341

Annex 2: Data Collection Tools

Bangladesh Dairy Enhancement Project Final Evaluation Farmer Survey – 2017

Interview Details

Fill out Q_1 to Q_7 prior to the interview

#	Question	Response
Q_1	Questionnaire Number	
Q_2	Household Name (From List)	
Q_3	Division	
Q_4	District	
Q_5	Upazila (sub-district)	
Q_6	Village	
Q_7	Dairy Company Code Number	
Q_8	Survey Outcome First Attempt	a. Date: b. (circle one) Survey Completed Survey Declined Arranged to return – Date:
Q_9	Survey Outcome Second Attempt	a. Date: b. (circle one) Survey Completed Survey Declined Arranged to return – Date:
Q_10	Interviewer Name	
Q_11	Interviewer Mobile Number	
Q_12	Signature of Interviewer upon completion	

Introduction

Hello, my name is _____ and I am part of a team hired by Land O'Lakes to conduct a survey regarding dairy production and your participation in training from Dairy Development Officer or Artificial Insemination Volunteers. May I speak with the member of the household that has received most of the training from the DDOs or AIVs?

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, and help dairy companies and other organizations to better provide support to dairy households in the future.

Your answers will be kept confidential, and will not be used for any purpose other than a report that will help inform future dairy work in the region.

The interview should last around 1 hour. Participation is voluntary and you can choose not to take part, or not to answer any specific questions. We are conducting this survey as a separate entity, not as a part of the dairy company or Land O'Lakes, 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 assistance in the future.

- i. Do you have any questions about any of the things I have just said?
- ii. Are you willing to participate in this interview?
 - a. If Yes -> Continue
 - b. If No -> **End interview and randomly select a replacement**

Instruction for interviewer: Be sure you are talking to the person that has received the most training from the project/DDOs/ AIVs. If that person is not available, please schedule a better time to return.

Demographic information*First I want to ask you a few questions about yourself*

#	Questions	Answers
Q_13	Primary Respondent's Name	
Q_14	Respondent's Mobile Number	
Q_15	Respondent's Sex 1. Male 2. Female	Enter Code: _____
Q_16	Respondent Age	
Q_17	Can you read and write?	1. Yes 2. No
Q_18	What is your formal education level? 1. No education 2. Some primary 3. Primary 4. High school 5. Secondary certificate 6. Higher secondary 7. Graduate/Bachelor and above	Enter Code: _____
Q_19	What MCC/company do you sell your milk to?	

Next I want to ask you a little about your household

#	Questions	Answers
Q_20	What is your relationship to the household Head? 1. Self -> skip to Q_23 2. Spouse 3. Parent 4. Child 5. Sibling 6. Other family member 7. Other	Enter Code: _____ if 1 -> skip to Q_23
Q_21	What is the Sex of the Household Head? 1. Male 2. Female	Enter Code: _____
Q_22	What is the highest formal education achieved by the household head? 1. No education 2. Some primary 3. Primary 4. High school 5. Secondary certificate 6. Higher secondary 7. Graduate/Bachelor and above	Enter code: _____
Q_23	How many individuals are in your household (including yourself)	Number: _____

#	Questions	Answers
<i>If more than 1, ask the respondent the following. Make sure the number here matches the number in Q_23</i>		
Q_24	How many household members are in each of the following categories	
	a. Male	b. Female
i. <5 years		
ii. 5 – 17 years		
iii. 18 – 35 years		
iv. 36-60 years		
v. Over 60 years		
Q_25	Please indicate which of the following are sources of income for your household	1. Yes 2. No
	a. Crop farming	Enter Code: _____
	b. Dairy production	Enter Code: _____
	c. Other livestock rearing	Enter Code: _____
	d. Aquaculture	Enter Code: _____
	e. Day laboring	Enter Code: _____
	f. Public service	Enter Code: _____
	g. Employee	Enter Code: _____
	h. Own business	Enter Code: _____
	i. Other (specify): _____	Enter Code: _____
Q_26	Please indicate your top 3 sources of income from the above (enter letter from above)	1: _____ 2: _____ 3: _____
Q_27	How much land does your household own?	

Training by Project, DDO, or AIVs

Now I want to ask you a few questions about the training on dairy husbandry you received from Land O'Lakes, dairy development officers or AIVs

#	Questions	Answers
Q_28	Who trained you on dairy farming practices in the last 12 months? 1. Dairy Development Officer/ DDO 2. Artificial Insemination Volunteer 3. Land O'Lakes staff 4. Other (specify) _____	(Select up to two) Enter code: _____ Enter code: _____
Q_29	What month and year did you start receiving training from the above person?	a. Month: _____ b. Year: _____

#	Questions	Answers
Q_30	How many people in your household received training from the above person (including yourself)?	
<i>If more than one person trained: Who else (other than you), in the household was trained?</i>		
Q_31	a. Name:	Sex: M F Age:
	b. Name:	Sex: M F Age:
	c. Name:	Sex: M F Age:
Q_32 :	Did you receive the following training from the above person? (read out and circle)	
	a. Water and nutrition	1. Yes 2. No
	b. disease management	1. Yes 2. No
	c. calf rearing	1. Yes 2. No
	d. cow housing and ventilation	1. Yes 2. No

Dairy Cattle

Now I want to ask you about the cattle that your household owns currently and before you started receiving training

#	Questions	Answers
Q_33	How many total cattle do you own now? (including bulls, cows, heifers, calves)	
<i>Now ask the farmer how many of each of the following types of cattle they own. Be sure that these sum up to the number in Q_33</i>		
Q_34	How many of the following types of cattle do you own now?	i. Crossbred ii. Local
	a. Bulls	
	b. Male Calves	
	c. Cows	
	d. Heifers	
	e. Female Calves	

For each of the females above, please ask the respondent to talk about each in turn

Q_35	a. Number	b. Age in months	c. Type of breed 1. Local 2. Cross bred	d. Status of female 1. Dry 2. Dry & pregnant 3. Milking & pregnant 4. Milking & not pregnant 5. Calf/Heifer
	Female 1			
	Female 2			
	Female 3			
	Female 4			
	Female 5			
	Female 6			
	Female 7			
	Female 8			
	Female 9			
	Female 10			
	Female 11			
	Female 12			
	Female 13			
	Female 14			
	Female 15			

*Now I want to know how many dairy cattle you owned **before** you started receiving training*

#	Questions	Answers	
Q_36	How many cattle did you own before being trained? (including bulls, cows, heifers and calves)		
Q_37	How many of the following types of cattle did you own before being trained?	i. Cross Bred	ii. Local
	a. Bulls		
	b. Male calves		
	c. Cows		
	d. Heifers		
	e. Female Calves		

Now I want to ask you about changes in your cows and heifers in the last 12 months.

#	Questions	Answers
Q_38	How many cows and heifers did you purchase or were given in the last 12 months?	
Q_39	How many cows and heifers died in the last 12 months?	
Q_40	How many cows and heifers did you sell in the last 12 months?	
Q_41	How many cows or heifers were eaten or given away in the last 12 months?	

Husbandry Practices

Now I want to talk to you about the dairy husbandry practices you do currently/in the last 6 months, and those that you did before receiving training. We will talk about a few different categories of practices.

Nutrition and Feeding

Now I'm going to ask you about what you feed your cows

Ingredients of diet	Currently		Before Receiving Training	
	Q_42 . Do you currently feed your milking cows the following ?: 1. Yes 2. No -> Skip to Q_44	Q_43 How much of ____ do you currently feed your whole herd per day (kg)?	Q_44 Did you feed your milking cows ____ before receiving training? 1. Yes 2. No -> Skip to next line	Q_45 About ow much ____ did you feed your whole herd per day (kg) before receiving training?
a. Straw				
b. Green Fodder				
c. Silage Fodder				
d. Formulated Concentrate (i.e. MAB, other company)				
e. Boiled Rice				
f. Wheat Bran				
g. Pulse Bran				
h. Rice Bran/ Polish				
i. Oil Cake				
j. Molasses				
k. Mineral pre-mix				
l. Rock Salt				
m. . Other				

Now I want to ask you about how you currently source the feeds above.

Ingredients of diet	Q_46 Do you produce this feed yourself? 1. Yes -> Skip to next Line 2. No	Q_47 Do you purchase this ingredient? 1. Yes 2. No -> Skip to Next line	Q_48 What is the cost per KG when you buy this ingredient.....? (taka)
a. Straw			
b. Green Fodder			
c. Silage Fodder			
d. Formulated Concentrate (i.e. MAB, other company)			
e. Boiled rice			
f. Wheat Bran			
g. Pulse Bran			
h. Rice Bran/ Polish			
i. Oil cake			
j. Molasses			
k. Mineral pre-mix			
l. Rock Salt			
m. Other: _____			

If the farmer provides **green fodder** now or before the training, ask the following questions....

#	Question	Currently 1. Yes 2. No	Before Receiving Training 1. Yes 2. No
Q_49	Is the green fodder you provide to your cows chopped into small pieces?		
Q_50	Which green fodder do you give cows?		
	a. Maize		
	b. Napier		
	c. Jumbo		
	d. Para		
	e. Other		
Q_51	If you grow fodder (Q_47 b or c = 1), on how much land do you grow fodder?		
Q_52	If you grow fodder (Q_47 b or c=1), What type of fodder do you grow?		
	a. Maize		
	b. Napier		
	c. Jumbo		
	d. Para		
	e. Other		
Q_53	If you purchase fodder (Q_48 b or c = 1), do you purchase fodder from the MABs?		

#	Question	a. Currently 1. Yes 2. No	b. Before receiving training 1. Yes 2. No
Q_54	If you purchase concentrate (Q_48d = 1), Do you purchase MAB concentrate?		
Q_55	If you do not purchase concentrate (Q_48d = 2), Do you blend your own concentrate?		
Q_56	If yes, do you use the BDEP formulation for your own blending ?		

Water Specifics

#	Question	a. Currently 1. Yes 2. No	b. Before being trained ... 1. Yes 2. No
Q_57	Do you provide feed and water separately to your cows?		
Q_58	Do you have a separate water trough?		
Q_59	Do you provide water 24-hours a day to your cows?		

Calf Management

Now I want to ask you about how you take care of your calves

#	Answer	a. Currently (or in the past 6 months)	b. Before being trained ...
Q_60	Do you feed colostrum to your calves?	1. Yes 2. No	1. Yes 2. No
Q_61	If yes, how long after birth do you provide colostrum?	1. Within an hour 2. Between 1 and 2 hours 3. After 2 hours 99. N/A	1. Within an hour 2. Between 1 and 2 hours 3. After 2 hours 99. N/A
Q_62	Do you use CMR for calf feeding?	1. Yes 2. No	1. Yes 2. No
Q_63	Is CMR cheaper, the same or more expensive than the equivalent amount of milk?	1. Cheaper 2. Same 3. More expensive 98. Don't know	1. Cheaper 2. Same 3. More expensive 98. Don't know
Q_64	Do you practice early weaning of your calves?	1. Yes 2. No	1. Yes 2. No
Q_65	At what age do you wean your calves?	1. less than 3 months 2. 3-6 months 3. After 6 months	1. less than 3 months 2. 3-6 months 3. After 6 months
Q_66	Do you provide maize powder or other solid feed to your young calves?	1. Yes 2. No	1. Yes 2. No

Reproduction

Now I want to talk to you about how you breed your cows

#		a. Currently	b. Before being trained
Q_67	Do you breed your cows though:		
	a. artificial insemination?	1. Yes 2. No	1. Yes 2. No
	b. bulls?	1. Yes 2. No	1. Yes 2. No
Q_68	If use both, which do you use more often?	1. Artificial insemination 2. Bulls	1. Artificial insemination 2. Bulls
Q_69	What is your biggest problem in breeding cows?	1. Cost 2. Missing heat detection 3. Lack of availability of AI/ bull 4. Failure of conception 5. No oestrus 6. sick/weak animals 7. No problem 8. Others	1. Cost 2. Missing heat detection 3. Lack of availability of AI/ bull 4. Failure of conception 5. No oestrus 6. sick/weak animals 7. No problem 8. Others
	That last time you bred a cow:		
Q_70	What technique did you use?	1. Artificial Insemination 2. Bulls	
Q_71	How many attempts did it take?		

#		a. Currently (or since you have started receiving training)	b. Before being trained ...
Q_72	What is the average age that your heifers show first heat?	1. <15 months 2. 15-18 months 3. 18-24 months 4. 24+ months 97. N/A	1. <15 months 2. 15-18 months 3. 18-24 months 4. 24+ months
Q_73	What is the average age that your heifers are first calving?	1. <24 months 2. 24-27 months 3. 28-30 months 4. 30+ months 97. N/A	1. <24 months 2. 24-27 months 3. 28-30 months 4. 30+ months

#		a. Currently (or since you have started receiving training)	b. Before being trained ...
Q_74	Typically how many months does your cow require to show heat again after calving?	1. <1 months 2. 1-2 months 3. 2-3 months 4. More than 3 months 98. Don't know	1. <1 months 2. 1-2 months 3. 2-3 months 4. More than 3 months 98. Don't know
Q_75	What is the typical number of days between calving and next conception?	1. Less than 2 months 2. 2 months – 3 months 3. More than 3 months	1. Less than 2 months 2. 2 months to 3 months 3. More than 3 months

Disease Control

Now I want to ask you about how you control disease in your cattle currently and before being trained

#	Question	a. Currently 1. Yes 2. No	b. Before being trained ... 1. Yes 2. No
Q_76	Do you provide regular foot and mouth vaccination?		
Q_77	Do you provide regular deworming treatment?		
Q_78	Do you or someone else conduct California Mastitis Test on your cows?		

#		a. Currently	b. Before being trained ...
Q_79	What are your typical monthly costs of <u>prevention</u> for all disease for the whole herd? (taka)		
Q_80	What are your typical monthly costs of <u>treatment</u> for all disease for the whole herd? (taka)		
Q_81	Has the incidence of mastitis increased, stayed the same or decreased since beginning your training?	1. increased 2. stayed the same 3. decreased	

Cow Comfort

Now I want to ask you how you house your cow?

	#	a. Currently... 1. Yes 2. No	b. Before being trained ... 1. Yes 2. No
Q_82	Does your cow shed allow for good ventilation?		
Q_83	Do you have fans in your shed?		
Q_84	Do you tie up your cows for 12 hours or more each day?		
Q_85	Do you clean the floor of your shed at least twice a day?		
Q_86	Do you have a sand bed and/or rubber mats for your cows to lie on?		
Q_87	Do you practice daily bathing for cows?		
Q_88	If so, how many times a day?		
Q_89	Do you or your DDO measure/ use cow body weight?		
Q_90	Do you or your DDO measure/ use cow body condition score?		

Milking

Now I want to ask you about how you milk your cows currently and before you participated in the project

	#	a. Currently	b. Before being trained...
Q_91	Who of the following milks your cows?		
	a. Self	1. Yes 2. No	1. Yes 2. No
	b. Household members/employees	1. Yes 2. No	1. Yes 2. No
	c. milkman/Goala	1. Yes 2. No	1. Yes 2. No
	d. Other (specify)_____	1. Yes 2. No	1. Yes 2. No
Q_92	If more than one of the above milks the cows, who milks them the most?	1. Self 2. Household members/ employees 3. Milkman/Goala 4.. Other	1. Self 2. Household members/ employees 3. Milkman/Goala 4 Other
Q_93	Do you practice hygienic and complete milking when <u>you</u> milk your cows?	1. Yes 2. No 3 N/A	1. Yes 2. No 3. N/A
Q_94	Do your <u>household members/ employees</u> practice hygienic and complete milking when they milk your cows?	1. Yes 2. No 3 N/A	1. Yes 2. No 3. N/A

	#	a. Currently	b. Before being trained...
Q_95	Does the milkman/Goala practice hygienic and complete milking when they milk your cows?	1. Yes 2. No 3. N/A	1. Yes 2. No 3. N/A

Milk Production

Now I want to ask you about the milk production of your cows (that you listed above) currently and before you received the training

	a. Number <i>Write in female number above that are milking</i>	b. Liters of milk production yesterday?	c. Peak liters of milk during this lactation?	d. How many days has it been since this cow calved?	e. How many liters of milk does this cow "typically" produce during this lactation?	f. How many liters of milk did this cow "typically" produce before you were trained? (N/A if never produced for them before)
Q_96	Female					
	Female					
	Female					
	Female					
	Female					
	Female					
	Female					
	Female					
	Female					

#	Questions	Answers
Q_97	Do you think your cows are producing more, less or about the same amount milk on average than before you started receiving training?	1. More 2. Less 3. About the same
Q_98	If more, then why? (circle the ones that they say – do not probe)	
	a. Increased water provision	1. Yes 2. No
	b. Increased nutritious feeds	1. Yes 2. No
	c. No or Less Disease	1. Yes 2. No
	d. Do not know	1. Yes 2. No
	e. Others (specify)	1. Yes 2. No

#	Questions	Answers
Q_99	If less, then why do you think that is? (circle the ones that they say – do not probe)	
	a. Death of animals	1. Yes 2. No
	b. Lack of feed stuffs	1. Yes 2. No
	c. Lack of knowledge	1. Yes 2. No
	d. Inadequate water feeding	1. Yes 2. No
	e. Lack of training	1. Yes 2. No
	f. Do not know	1. Yes 2. No
	g. Others (specify)	1. Yes 2. No

Milk Sales

Now I want to ask you about your milk sales currently

#	Questions	Answers	
Q_100	How much milk (in liters) did you sell to the following sources <u>yesterday</u> ? What price did you receive?	Quantity	Price
	a. Processor/MCC	_____ Liters/day	_____ Tk/Liter
	b. Goala	_____ Liters/day	_____ Tk/Liter
	c. Neighbors/Farmgate	_____ Liters/day	_____ Tk/Liter
	d. Other	_____ Liters/day	_____ Tk/Liter
Q_101	If supplied to a processor/MCC, what was the milkfat content <u>yesterday</u> ?	_____ %	
Q_102	How much milk (in liters) have you typically sold per day to the following sources <u>since you started receiving training</u> ? What price do you typically receive?	Quantity	Price
	a. Processor/MCC	_____ Liters/day	_____ Tk/Liter
	b. Goala	_____ Liters/day	_____ Tk/Liter
	c. Neighbors/Farmgate	_____ Liters/day	_____ Tk/Liter
	d. Other	_____ Liters/day	_____ Tk/Liter

#	Questions	Answers	
Q_103	How much milk (in liters) did you typically sell per day to each of the following sources before receiving training ? What price did you typically receive?	Quantity	Price
	a. Processor/MCC	_____Liters/day	_____Tk/Liter
	b. Goala	_____Liters/day	_____Tk/Liter
	c. Neighbors/Farmgate	_____Liters/day	_____Tk/Liter
	d. Other	_____Liters/day	_____Tk/Liter

Now I want to ask you about your consumption of milk

#	Questions	Answers
Q_104	About how much milk per day did your household consume:	
	a. Yesterday?	_____ Liters
	b. Typically since receiving training?	_____ Liters
	c. Before receiving training?	_____ Liters

Access to Finance

Now I want to ask you about any loans you have taken out

#	Question	Answer
Q_105	Have you paid off any loans since you started receiving training?	1. Yes 2. No
Q_106	Have you taken out a loan for dairy activities since you started receiving training?	1. Yes 2. No -> Skip to Q114
Q_107	What is the total amount of loans taken out?	_____Taka
For the last loan taken out for dairy activities since receiving training:		
Q_108	What was the source of the loan?	a. Goala
		b. Local money lender
		c. Microfinance
		d. Community lending organization
		e. Commercial or Development Bank
Q_109	Why did you take out the loan?	

#	Question	Answer
Q_110	What was the value of the loan? (taka)	

Decision-making & roles in dairy farming

Lastly, I want to talk to you about decision-making in your household and how it changed, if at all since participation in the project.

Q_111 Who in the household makes the decision for:	a. Currently 1. Woman 2. Man 3. Both	b. Before being trained 1. Woman 2. Man 3. Both
a. What to feed the cow		
b. Growing of fodder for cows		
c. Preventative care for cows		
d. Getting medical care for cows		
e. Reproduction		
f. Selling cows		
g. Selling milk		
h. expanding the farm		
i. accessing a loan		

Q_112 Who in the household does the following activities:	a. Currently (in the past 6 months)? 1. Woman/girl 2. Man/boy 3. Both	b. Before being trained? 1. Woman/girl 2. Man/boy 3. Both
a. Cow feeding		
b. Maintenance of shelter		
c. bathing cows		
d. milking cows		
e. Taking the milk to the MCC		

Q_113	What advantages did the on-farm nature of training have for you?	
--------------	--	--

Future Plans

Finally, I want to ask you about your future plans for your dairy farm

#	Question	Answer
Q_114	Do you plan to increase the number of dairy cows in your herd?	1. Yes 2. No
Q_115	Do you plan to improve your cow shed?	1. Yes 2. No
Q_116	Do you plan to increase the area of your dairy farm?	1. Yes 2. No
Q_117	Do you plan to increase the area where you can grow more forage?	1. Yes 2. No
Q_118	Has the new management system increased the profitability of your dairy farm?	1. Yes 2. No

THANK YOU

Bangladesh Dairy Enhancement Project
Final Evaluation Farmer Survey – 2017

Dairy Farmer Focus Group Discussion Checklist

Number of participants :
GPS Coordinates :
Landmark :
District : Upazila :
Union : Village :

Details of the participants

S/N	Name	Sex	Age	Village	Union	Upazila	Mobile
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

Introduction

Hello, my name is _____ and I am part of a team from the Bangladesh Agricultural University hired from Land O'Lakes to evaluate their dairy project in your area. Today I would like to ask you questions about your participation in training from Land O'Lakes, or processor-supported Dairy Development Officers (DDOs) or Artificial Insemination Volunteers (AIVs). The information you provide will improve our understanding of dairy activities in the area and the households that work in dairy, and help dairy companies and other organizations to better provide support to dairy households in the future.

The discussion will last a few hours. Participation is voluntary and you can choose not to take part, or not to answer any specific questions. We are conducting this survey as a separate entity, not as a part of the dairy company or Land O'Lakes, 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 assistance in the future. Your answers will be kept confidential, and will not be used for any purpose other than a report that will help inform future dairy work in the region.

Before we begin, do you have any questions about the purpose of the interview 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 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 at any point you want me to turn off the recorder, please let me know and I'll be happy to comply.

Discussion Questions

Training

First we will talk about the support you have received from Land O'Lakes, dairy development officers (DDOs), or Artificial Insemination Volunteers.

1. What types of training/advice have you received from the DDOs, AIVs or Land O'Lakes?
 - a. What topics were the most useful/appropriate for you? Why?
 - b. What topics were the least useful/appropriate for you? Why?
2. The training is provided on farm. What do you think about this training approach?
 - a. What do you like the most about the on-farm training approach? What are the benefits for men? Women?
 - b. What do you like the least about the on-farm training approach? Why? What are the challenges for men? Women?
 - c. If you had to travel to other village for training, would you be able to do that? If not, why not?
3. How could the training be improved?
 - a. What additional topics on dairy farming would you like to learn?

Dairy Practices

Now I want to ask you about your cattle and how you care for them

4. How many dairy cows do you currently own? What type of cows (local/crossbred)?
 - a. How many dairy cows did you have before starting the training? What type (local/ crossbred) of cows?
 - i. If you changed the number of dairy cows, why?
 - ii. If you changed the type of dairy cows (local/crossbred), why?
5. What do you currently feed your cows (*probe with the different type of feed: green fodder, silage, concentrate, rock salt, rice straw, etc.*)?
 - a. Has what you feed your cows changed since you started receiving training? How? Why or why not?
 - i. IF CHANGED FEEDING: Have you seen any change in the dairy cows since making changes in feeding? What changes have you noticed?
 - ii. IF CHANGED FEEDING: Will you continue to use these practices in the future? Why or why not?
 - iii. IF CHANGED FEEDING: How have your feeding costs changed?
 - b. Do you purchase concentrate or fodder from one of BDEP's MABs? Why or why not?

- i.* IF BOUGHT MAB PRODUCTS: What products and services are you buying? Do you consider these to represent good value? Why or why not?
- 6. How do you house your cows and keep them comfortable (*probe: ventilation in shed, light, where to cows lay down, bathing of cows – how often*)?
 - a. Has the way you house your cows and keep them comfortable changed since you started receiving training? How? Why or why not?
 - i.* IF CHANGED COW HOUSING/COMFORT: Have you seen any change in the dairy cows since making change to the way they are housed or kept comfortable? What changes have you noticed? Why do you think that is?
 - ii.* IF CHANGED HOUSING/COMFORT: Will you continue to use these practices in the future? Why or why not?
- 7. How do you care for your calves? (*Probe: what do you feed them? Colostrum, CMR, maize powder, etc. Do you give them sufficient water? Do you keep them clean?*)
 - a. Has the way you care for your calves changed since you started receiving training? How? Why or why not?
 - i.* IF CHANGED CALF CARE: Have you seen any change in the calves since making change to the way you care for them? What changes have you noticed? Why do you think that is?
 - ii.* IF CHANGED CALF CARE: Will you continue to use these practices in the future? Why or why not?
- 8. How do you control disease in your cattle, both prevention and treatment (*probe: vaccinations, mastitis test/treatment, deworming, using animal health services*)?
 - a. Has the way you control disease in your cattle changed since you started receiving training? How? Why or why not?
 - i.* IF CHANGED CONTROL OF DISEASE: Have you seen any change in the cattle since making change to the way you control disease? What changes have you noticed? Why do you think that is?
 - ii.* IF CHANGED CONTROL OF DISEASE: Will you continue to use these practices in the future? Why or why not?
 - b. How have costs of disease prevention and treatment changed since starting to receive training? Why do you think that is?
- 9. Thinking of all of the difference practices you use on your cows now.
 - a. Have the changes proposed by the training increased or decreased your work load? For men? For women? Please explain.
 - i.* If increased workload, will you continue to use these practices? Why or why not?
 - b. Have the changes proposed by the training increase or decrease the productivity of the cows? The revenue you receive for selling milk? How? Why do you think that is?

Milk Sales

10. Where do you typically sell your milk (*probe: MCC, goala, neighbors*)? Why?
- Where did you sell your milk before you started receiving the training/MCC established?
 - How has the price that you receive changed since you started receiving the training/MCC established?
11. IF SELL AT MCC/PROCESSOR: What do you like about selling at the MCCs? What challenges do you face in selling at the MCC?

Finance

12. Have any of you secured financing for your dairy activities? If yes, please explain the terms? What did you use if for?
- Do you have any challenges securing financing? Please explain.

Household Roles

13. Who makes the decisions in your household about how you care for your cattle, selling of milk, and use of income from milk sales? Why?
- Has the way your household makes decision about caring for your cattle, sales of milk and use of income changed since you have received the training. How? Why do you think that is?
14. Who in the household has the responsibility for caring for the cattle, selling the milk, etc.
- Has the roles of men and women in caring for cattle and selling milk changed since you have started receiving training? How? Why do you think that is?

Future Plans

Now I want to talk about your future plans:

15. Do you have plans to increase your herd size in future? Why or why not? What type of cattle?
16. Do you have plans to increase the area of your farm in the future? Why or why not?
17. Do you have plans to invest in your cow shed in the future? Why or why not?

General

18. What more could the processors or Land O'Lakes have done for you as a farmer?
19. Have your neighbors that are not receiving training shown any interest in what you are doing? Please explain. Have any of these farmers made changes to their traditional practices?

FGD with Non-BDEP Dairy Farmers

Number of participants :
GPS Coordinates :
Landmark :
District : Upazila :
Union : Village :

Details of the participants

S/N	Name	Sex	Age	Village	Union	Upazila	Mobile
1							
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6							
7							
8							
9							
10							

Introduction

Hello, my name is _____ and I am part of a team from the Bangladesh Agricultural University hired from Land O'Lakes to evaluate their dairy project in your area. Today I would like to ask you questions about your non-participation in training from Land O'Lakes, or processor-supported Dairy Development Officers (DDOs) or Artificial Insemination Volunteers (AIVs). The information you provide will improve our understanding of dairy activities in the area and the households that work in dairy, and help dairy companies and other organizations to better provide support to dairy households in the future.

The discussion will last a few hours. Participation is voluntary and you can choose not to take part, or not to answer any specific questions. We are conducting this survey as a separate entity, not as a part of the dairy company or Land O'Lakes, and so you can feed free to be open and honest with us in your responses. Neither your participation nor your responses will affect your ability to receive assistance in the future. Your answers will be kept confidential, and will not be used for any purpose other than a report that will help inform future dairy work in the region.

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

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

FDGs with non-BDEP Farmers

1. Are you aware that a new MCC has been established in your village?
2. Why are you not supplying milk to that new MCC?
3. Are you aware that if you supply milk to the new MCC, then you will be able to get free training on better dairy farming practices?
4. Are you aware that other farmers in the village are receiving that free training and making good progress with more milk, higher fat content and better animal health?
5. Do you intend to supply milk to the new MCC in future?

Mini Agri-Businesses (MAB) Key Informant Interview

Background:

Name: _____

Sex: _____

Age: _____

Education level: _____

Questions:

1. For how long a time have you operated as an MAB?
 - a. Why did you decide to become an MAB?
2. What type of support did BDEP/Project Partner provide to you and your business?
 - a. Do you think that support was appropriate to your needs? Why or why not?
3. How many clients do you have at present?
 - a. How many of those are supplying milk to the local MCC?
 - b. For the clients not involved with BDEP, how did they hear about your business?
4. What services / products do you provide to the dairy farmers?
 - a. What are the most popular services/products that are requested? Why do you think that is? Please rank them in order of market demand.
 - b. What items are not as popular? Why do you think that is?
 - c. How has the demand for your products and services changed overtime? Please explain.
 - d. Can you currently fulfill the demand of your clients for products/services? Please explain.
5. To how many villages do you provide products/services?
 - a. Have you considered expanding to a larger coverage area? Why or why not?

- b. Are all farmers in your target areas aware of your services? How or why not?
- 6. Where do you source the raw materials or other inputs to run your business?
 - a. Why do you source them from there?
 - b. Can you source inputs to run your business consistently? Please Explain.
 - c. Do you have any challenges sourcing the inputs? Please explain.
- 7. Have you accessed any finance for your business outside of the grants from the project? Please explain.
 - a. How much money have you accessed?
 - b. What are you using the finance for?
 - c. What challenges have you faced in accessing finance?
- 8. Is your business currently profitable? Why do you think that is?
 - a. What do you think you could do to increase profits in the future?
- 9. What are the largest challenges you face in running your business? Please explain.
 - a. How do you overcome the challenges?
- 10. What are your future plans for your business?
 - a. Do you plan to keep functioning as an MAB after the project ends? Why or why not?
 - b. Do you have any plans to expand your business? Please explain. Why or why not?
- 11. How do you think working with the project/processors has changed your business and wellbeing, both positively and negatively?
- 12. How could BDEP/Project Partner have improved their support to you as an MAB? Please explain.
- 13. Any last comments about the project or your business?

Dairy Company Management Key Informant Interview

Key Objective:

Understand dairy companies' experience with the project, activities that they implemented and their sustainability.

1. Can you describe what activities you are doing with the BDEP project?
 - a. Dairy Development Officers (DDO):
 - i. What has your experience been with utilizing the DDOs? What successes and challenges have you encountered?
 - ii. What do you think of the capacity of the DDOs trained by BDEP and their ability to assist farmers, and thereby increase milk supply? What do you know of the training which BDEP has provided to DDOs?
 - iii. Will you continue to employ the DDOs to support farmer training?
 - b. MCC & other infrastructure establishment:
 - i. What challenges have you encountered in sourcing and establishing the MCCs and other infrastructure? What challenges do you have in MCC management?
 - ii. Will you continue operations of the MCCs?
2. What do you think of the direct farmer contact model (in which farmers supply milk directly to chilling centers/chilling points), rather than have govt collect milk from many farmers and supply to the chilling center)? Does your company have plans to expand the proportion of milk which it collects directly from farmers?
3. What do you know of the impact of the BDEP whole farm management approach is having on milk production and profitability?
4. Are you happy with the volume of milk being collected through the new MCCs? If not, what steps will you take or have you taken to increase procurement volumes?
5. Have you been able to produce new products with the additional milk supplied through the new MCCs? What are those (if any)?
6. Has the quality of milk from farmers trained by BDEP and supplied directly to the new MCCs been satisfactory? Is milk quality better than typically supplied to your company?
7. Do you make any products exclusively from milk from the new MCCs? Why or why not? If yes, please describe. What is the gross margin on any new product?
8. Can you tell me what your gross margin is across your dairy business?
9. What potential do you envisage or what measures are needed to make these activities sustainable and propagating?
10. Does your company have any relationship with commercial banks to introduce formal finance to the dairy farming sector?
 - a. If so, please advise how this operates. Can you advise the number of loans made by partner banks and the value of those loans?
 - b. If not, please advise whether you intend to seek banking partnerships in future, and what steps have been taken so far.

11. Does your company export? If so, what certification do you have?
12. Will you invest in additional chilling facilities to enable more farmers to directly supply milk to you? Why or why not?
13. Do you have any plans to expand the deployment of DDOs to other locations? Please explain. Why or why not?
14. What unexpected positive or negative results came out of working with the project for your company?
15. What strengths do you consider BDEP is bringing to dairy development in Bangladesh?
16. Do you think the BDEP project design [*dairy company partnership to establish infrastructure; in depth training of dairy farmers by DDOs employed by dairy companies; establishment of MABs to provide animal nutrition*] and implementation was appropriate for dairy development in Bangladesh? Why or why not?
17. How do you think the BDEP project could have been enhanced? For your company? For farmers?
18. Do you have any women in your leadership (board or leadership team)?

DDOs Key Informant Interviews

Key Objectives

1. Learn about the training that BDEP has provided. Learn about whether this DDO (or master) training is of value when training farmers.
2. Understand DRS.

Questions

1. Do you think BDEP trained has helped you in terms of understanding dairy farm management, and for communicating enhanced farming practices to Bangladeshi farmers?
2. What are the most important things that you have learned?
3. Has your training equipped you to communicate more efficient farm practices to the farmers?
4. How do you consider farmers feel about BDEP?
5. Can you convince them easily to join BDEP or its partners?
6. What proportion of your time is spent in the field with farmers?
7. What are the key messages (key trainings) which you provide to farmers so that they become more productive and more profitable?

Dairy Company Field Staff (other than DDOs under BDEP training)

Key Objectives:

1. Determine the extent of the understanding of dairy company field staff of the BDEP whole farm management approach.
2. Determine whether dairy company field staff believe the BDEP whole farm management approach is working in terms of higher milk production, better milk quality, profitability and farmer satisfaction.
3. Determine whether dairy company field staff believe the BDEP whole farm management system will result in farmers supplying more milk to their companies.

Questions

1. What is the extent of your contact with BDEP?
2. Have you seen for yourself the implementation of the BDEP whole farm management system, on-farm?
3. What do you think has been the impact of BDEP whole farm management to date?
4. Do you consider that, if your company can be trained in the whole farm management approach, this will be good for your company?
5. Do you believe that farmers are positive towards the BDEP whole farm management system?
6. Have you any experience of the BDEP MAB concept? What do you think of the BDEP MAB concept? Will it be good for the farmers supplying milk to your company? Do you have any suggestions on how to enhance the value of the MABs?

Team Leaders, BDEP Key Informant Interview

Key Objectives

1. Understand the key differences between BDEP and standard development approaches.
2. Understand the key factors being addressed by BDEP through its whole farm management approach.
3. Understand the overall impact on productivity and profitability.
4. Ask whether Team Leaders consider the project and its whole farm management approach can be improved.
5. Understand DRS.

Questions

1. Does BDEP use a different approach from other dairy development projects operating in Bangladesh? If yes, what are these key differences?
2. Are the farmers accepting the changes that BDEP is recommending? How easy is to convince the farmers? Are the farmers pleased with the interaction they have with BDEP?
3. What is the impact of the BDEP whole farm management system on productivity and profitability?
4. What are the key things you have learned since joining BDEP?
5. Do you consider that the BDEP whole farm management approach could be improved, and if so, how?
6. Describe DRS. Are you using DRS? What do you think of this system? Could it be improved?
7. Do you believe the project activities and philosophies to be sustainable? If not, why not?
8. What challenges have you faced in implementation? What have been strategies to overcome these challenges?

Project Management Key Informant Interview

Key Objectives /Questions

1. Understand the BDEP approach with respect to partner selection, whole farm management and DRS.
2. Does the project management consider the project could have been enhanced?
3. What would the project management do differently if starting again?
4. How would the project management expand the project if this were possible?
5. What is your thinking about sustainability of the interventions?
6. What could be done to do for national policy level?

Annex 3: Final Evaluation Scope of Work

Bangladesh Dairy Enhancement Project Final Evaluation Request for Proposals

1. Introduction

This document contains the Request for Proposals (RFP) for conducting the final evaluation of Land O'Lakes' Bangladesh Dairy Enhancement Project (BDEP). BDEP is a 42-month dairy project funded by United States Department of Agriculture Food Assistance Services' (USDA-FAS) Food for Progress program. BDEP, implemented in Khulna and Rajshahi divisions of Bangladesh, aimed to increase agricultural productivity and expand trade of agricultural products in the dairy sector. Land O'Lakes is soliciting applications from local or regional consultants or evaluation firms to carry out the activities described in this RFP. Land O'Lakes will also hire an international dairy expert to support the evaluation team and oversee the process.

This document includes background information on the USDA-funded BDEP program, the desired methodology, including objectives and evaluation questions, the timeframe for conducting the final evaluation and a list of deliverables. This document also contains information about the kind of expertise that Land O'Lakes seeks for this activity and guidance on how to submit a proposal to conduct the final evaluation. All proposals are due to Land O'Lakes by 5pm Bangladesh time on March 13th, 2017.

2. Background

The Bangladesh dairy sector suffers from a variety of problems and circumstances which make productive and profitable dairy farming a significant challenge:

- The sector is smallholder based, with an average herd size of about four, and these smallholders follow traditional practices derived from times when the main purpose of cattle was for draft power and dung production, with minimal milk production for internal family use an added bonus.
- Few dairy farmers are linked to the formal market; the involvement of middlemen makes it much harder to provide farmers with the support needed to achieve higher levels of productivity; procurement systems involving middlemen tend to be more open to adulteration and suffer from an inability to protect the quality of raw milk.
- The lack of formal market linkages limits the ability of dairy companies to meet consumer needs from Bangladesh milk; rather there is a reliance on imports to meet a significant proportion of consumer demand for processed dairy products.
- Weak institutions do not provide the support farmers need, nor produce professionals capable of leading Advisory Services.
- Above all, there is an absence of knowledge about the nutritional needs of dairy cows and how best to meet those needs in the local context.

Bangladesh Dairy Enhancement project (BDEP) is a \$7.1 million, three and half year project funded by United States Department for Agriculture (USDA) to achieve profitable dairy farming, while building profitable linkages between farmers and input suppliers on the production side, and with the processors on the marketing side. Through technical assistance and training, Land O'Lakes links farmers to the formal market by partnering with dairy companies (processors) for long term, integrated and sustainable linkages. Land O'Lakes and dairy companies entered into sub-agreements that incentivized dairy companies to make necessary investment in dairy infrastructure now and in the future.

During the life of the project BDEP is implementing the following key activities:

- Identifying the real underlying reasons leading to current unproductive dairy farming practices.
- Demonstrating enhanced dairy farm management and animal husbandry practices which enable much more productive and profitable dairying.

- Linking farmers to the formal market and value chain through partnering with dairy companies, who will establish 55 milk chilling centers and associated procurement and logistical infrastructure.
- Leveraging up to \$4 million in private sector investment through dairy company partnerships, alongside USDA funding.
- Building Advisory Services within partner dairy companies in order to achieve sustainability, these Advisory Services will be trained in BDEP's Whole Farm Management system, and they in turn provide genuine assistance to the dairy farmers of Bangladesh.
- Training farmers using a hands-on, practical and on-farm approach.
- Providing seed funding and technical assistance to "mini-agribusinesses" based in the villages where dairy farmers are being trained, with the ability to grow enhanced fodder crops produce silage in times of surplus, and blend concentrate to BDEP specifications and quality.
- Creating a dairy recording system, a farm management tool, based around mobile capture of data, and analysis of that data by a cloud-based system such that it delivers information needed for dairy management purposes and M&E purposes.

3. Final Evaluation Methodology

Objectives of the Final Evaluation

The purpose of the final evaluation is to assess the appropriateness of the program approach, effectiveness of the implementation in achieving expected results as outlined in the results framework, and sustainability of the program activities and outcomes. Specifically, the final evaluation will meet the following objectives:

1. Assess the appropriateness of the strategies employed by Land O'Lakes in the program given the Bangladesh context, including the perspectives of private sector input providers, and smallholder farmers;
2. Understand what positive and negative outcomes (both expected and unexpected) resulted from the project at household, community and market levels;
3. Assess the degree to which the project has met its projected goals, objectives, outcomes and targets and explain deviations using an evidence based approach (see Annex 1 for the results framework and Annex 2 for a list of key outcome indicators to be measured);
4. Provide an objective description of the overall sustainability of the program activities and outcomes;
5. Assess how women and men have benefited differently;
6. Identify key strengths and weaknesses of the program;
7. Identify key challenges, lessons learned and recommendations for future programming.

The findings of the final evaluation will be shared with all program stakeholders, including USDA / Washington DC., dairy company partners, Department of Livestock Services, Bangladesh Livestock Research Institute (BLRI), and other donor organizations involved in funding dairy development in Bangladesh.

Evaluation Questions

The table below identifies the questions anticipated to be addressed by the final evaluation. The contractor is expected to assess the program using the following five evaluation criteria: relevance/appropriateness, effectiveness/impact, efficiency, sustainability and gender equality and equity.

Evaluation criteria	Program evaluation questions
Relevance / Appropriateness	• To what extent has the program design and intervention met the needs of the participants, including farmers, processors and input providers? • To what extent are project activities aligned with Bangladesh priorities and regulations? If they contrast, why? • What improvements could have been made to the design and/or implementation to improve appropriateness?

Evaluation criteria	Program evaluation questions
Effectiveness / Impact	• How have the intended target groups (i.e. smallholder farmers, input providers, processors, etc.) participated in program activities? • What effect did the program activities have on the specific program participants? ○ To what extent has project training of advisory services staff at processors led to improved training for the farmers? ○ To what extent has hands-on and on-farm training and demonstration plot approach improved farm and business management practices of participant dairy farmers in the following areas: (a) animal nutrition (including improved feed formula) ; (b) animal husbandry (day to day care);(c) animal health; (d) farm and milking hygiene; (e) record keeping? ○ To what extent have better access to new and/or improved agricultural technologies and use of improved farm management practices increased agricultural productivity and milk quality/safety among participant farmers? ○ To what extent have improved productivity and market linkages enhanced household dairy revenue/costs? ○ To what extent has training and finance to mini agribusinesses impacted the revenue/costs and sustainability of these businesses? How has this investment improved access and update of improved dairy inputs, especially feed, for farmers? ○ To what extent did access to finance services change for the participants? What type of finance were utilized by dairy actors (farmer, MABs, etc), including terms and conditions, type of investment made? What effect did use of finance services have on the participants that accessed it? ○ How well have the MCCs functioned in aggregating milk for the processors? ○ To what extent has the intervention changed the volume of milk in the formal sector, and overall processor production, sales, and final product quality? ○ How did the dairy recording system function as a means to collect and analyze dairy-related data for both the project team and the dairy partners? ○ What effect has the intervention had on crowding in similar behavior? • What other unexpected positive or negative results resulted from the program? • What internal or external factors have influenced the ability of the program to meet the project targets and outcomes? • How has work of the dairy companies with other partners during the project affected the intervention and the dairy sector at large? • What improvements could have been made to the program's design or implementation that would have improved the results? • How have organizational wide Practice area indicators (PAIs) changed throughout the project?
Efficiency	• Were the program time and resources spent appropriately on the different activities to achieve the desired outcomes in a timely and cost-effective manner? • What were some of the challenges and how did Land O'Lakes overcome these issues?
Sustainability	• What mechanisms have been put in place to ensure sustainability of program activities and results? • To what extent are the following project activities and outcomes likely to be continued and/or scaled up after the end of the project? ○ Farmers: ▪ Use of improved whole farm management practices ▪ Demand for dairy inputs, especially those produced by the mini-

Evaluation criteria	Program evaluation questions
	- agribusinesses ▪ Sales to the processors ○ Mini agribusinesses ▪ Continued operation ○ Processors ▪ Continued operation of the MCCs ▪ Continued provision of advisory services to farmers ▪ Continue other activities with the farmers ▪ Additional investment in their businesses/work with farmers • What effect has the intervention had on crowding in similar behavior by non-participants? • How has working through processors affected the sustainability of the project activities and outcomes? • What are the major factors influencing the achievement or non-achievement of sustainability of the program or project? • What more could the project have done to ensure greater sustainability?
Gender Equality and Equity	• How did the project address the constraints faced by women in the dairy sector, including women's ownership of dairy cows, management of dairy cows, participation in training, role as entrepreneurs and service providers? • What did the program do well to ensure participation of both women and men? What could the program have done better? • Did the outcomes of the project differ between men and women? How or in what manner? If so, what could the project have done differently to ensure that women and men benefited equally?

Desired Methodology

The final evaluation should be carried out in a participatory manner that actively seeks stakeholder feedback. The final evaluation will use both quantitative and qualitative methods. This may include:

- Household surveys with dairy farmer participants
- Focus group discussions with dairy farmer participants (that don't participate in household surveys)
- Structured interviews with mini-agribusiness entrepreneurs
- Structured interviews with processors leadership
- Structured interviews or focus group discussion with advisory service staff
- Key Informant Interviews with MCC managers, project staff, USDA staff, and other relevant public and private stakeholders.
- Review of existing monitoring data, including information collected through the Dairy Recording System and other data collected outside of the system, including training records.

The baseline study used propensity score matching with difference in difference analysis. However, due to a change in project approach, using a control group no longer makes sense. The final evaluation, instead, will use a repeated cross section approach. Dairy farmer participants should be randomly selected in each project region to take part in the household survey. The survey results should be compared to that of the baseline, using linear regression to account for differences in observable characteristics between baseline and final evaluation populations.

The data collection tools for collection of key indicators should be similar to that of the baseline and midterm, so that program evaluation data and results may be compared with baseline data and results. The quantitative sample size should ensure a 95% significance level with a 5% confidence interval in each region. The sample frame is currently 8,000 dairy farmers, 110 mini agribusinesses, 3 processors and 55 associated milk collection centers and 80 advisory services staff. Prior to starting evaluation

activities, the contractor will schedule a meeting to discuss with USDA-Washington staff on the methodology. We are expecting to have close to 9,000 farmers by the end of the project.

Key activities will include:

- **Review of Documents:**

Undertake review of the BDEP program documents and other relevant documents including, but not limited to, the following:

- Project agreement and modifications with USDA;
- The BDEP Evaluation Plan;
- The BDEP Performance Management Plan (PMP);
- Dairy Recording System data;
- Baseline report & data collection tools;
- Midterm report & data collection tools;
- Semi-annual technical progress reports submitted by Land O'Lakes to USDA;
- Any other program documents to get acquainted with the program.

- **Refinement of methodology and data collection tools:**

Based on the survey instruments from the baseline and midterm, as well as the current monitoring tools, the contractor, in close collaboration with Land O'Lakes M&E team, will do the following:

- Develop a methodology for the final evaluation, including a realistic sampling frame, sampling technique and sample sizes for household surveys, structured interviews, and qualitative FGDs and KIIs.
- Revise the tools and create any new tools necessary to answer the evaluation questions.
- Based upon a reading of the program documents, propose any additional topics or issues for analysis in the final evaluation.
- Send tools to the international dairy expert for input, and revise based on his/her comment;
- Submit the draft methodology and tools in an implementation report for review and approval by Land O'Lakes and revise based on their comment.

- **Field Data Collection**

- Plan and coordinate the necessary logistics to collect the data in accordance with the selected methodology.
- Pre-test, edit, translate (if needed), finalize and reproduce the data collection tools.
- Train and orient field interviewers and enumerators with support from international dairy expert on dairy issues;
- Carry out the field work to collect quantitative and qualitative data using own transportation (Dairy expert will lead the KIIs with project staff, processor leadership, MCC managers and record the session. A member of the evaluation team can also attend.)

- **Data entry, analysis and reporting**

- Enter, clean, synthesize, analyze, and interpret data from both the quantitative surveys and the qualitative studies using approved statistical packages.
- Prepare a draft final evaluation report that draws findings and conclusions from the data that addresses the objectives and questions of this evaluation, outlined in this RFP.
- Ensure all indicators in the performance monitoring plan and practice area indicators with their appropriate disaggregations are calculated and discussed in the findings as well as in an indicator table at the end of the report.
- Send draft report to international dairy expert to further draw findings and conclusions for dairy specific portions, and update the report based in his/her feedback.
- Send final draft report to Land O'Lakes staff for review and comments and finalize the final evaluation report with support from international dairy expert that includes any

revisions required to meet the comments and suggestions provided during the feedback process.

- Develop a power point presentation of key evaluation findings and recommendations;
- Prepare and submit data set(s) and transcripts/notes with relevant documents to Land O'Lakes. (Evaluation firm is responsible for transcribing qualitative interviews done by the dairy expert)

Deliverables

Deliverables under this contract will be:

- i. Implementation Report that describes the following:
 - a. Detailed methodology, including sampling plan
 - b. Field procedures
 - c. Quality control measures
 - d. Communication protocol
 - e. Analysis Plan
 - f. Finalized timeline (activities, responsible party, outputs and timing)
 - g. Understanding of the project based on project documents and literature review
 - h. Detailed and unbiased analysis and discussion of any limitations to program's methodology or approach
- ii. Electronic copies of all clean and final English-version of data collection tools;
- iii. Clean and final English versions of quantitative data sets in agreed upon format and qualitative transcripts, field and interview notes in MS-Word document;
- iv. Draft final evaluation report in English addressing all of the evaluation objectives and questions in this RFP;
- v. Final electronic version of the evaluation report in English that includes, but is not limited to the following sections:
 - a. List of Acronyms and abbreviations
 - b. Table of Contents
 - c. Executive Summary (that includes brief background, methodology, key findings and conclusions)
 - d. Background (Program description and purpose of end-line)
 - e. Evaluation Methodology, Implementation details, and limitations
 - f. Results and Findings (structure to be discussed with Land O'Lakes)
 - g. Recommendations (for similar future projects)
 - h. Annex: Table of all project indicators with baseline values and practice area indicators
 - i. Annex: Results Framework
 - j. Annex: Scope of Work for the evaluation
 - k. Annex: Survey Instruments: questionnaire(s), interview guides(s)
- vi. 10-15 high-quality pictures of the data collection process submitted in soft copy in a separate folder
- vii. PowerPoint presentation of key findings of the evaluation.

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

Timeline

This assignment will last about 12 weeks starting on or about April 2nd, 2017. An illustrative timeline is presented below, but the team should suggest a timeline in line with their methodology, mindful that they must work with the international dairy expert on finalization of tools and reporting, with the final report due no later than June 22nd, 2017.

Activity	Responsibility	Timeline/ Due Date
Discuss with USDA-Washington prior to beginning field work	Evaluation Team	To be scheduled before April 18 th , 2017
Review of relevant documents to prepare for inception meeting	Evaluation Team	April 2-5 th , 2017
Inception meeting with Land O'Lakes to discuss protocol, methodology, sampling, tools and timeline	Evaluation Team, Dairy Expert & Land O'Lakes Staff	April 5 th , 2017
Develop an implementation report and data collection tools	Evaluation Team & Dairy Expert	April 6 th – 18 th , 2017, submit to dairy expert April 15 th for input
Implementation report and tools due	Evaluation Team & Dairy Expert	April 18 th , 2017
<i>Land O'Lakes reviews report and tools and provides feedback, comments and suggestions to evaluation team</i>	<i>Land O'Lakes</i>	<i>April 19th – 21st, 2017</i>
Prepare for field work	Evaluation Team	<i>April 19th – 21st, 2017</i>
Finalize Tools	Evaluation Team & Dairy Expert	April 23 rd – 27 th , 2017 (work with dairy expert)
Enumerators training, pretesting, and data collection	Evaluation Team	April 27 th – May 14 th , 2017
Data entry and cleaning	Evaluation Team	May 14 th – 19 th , 2017
Data analysis and report writing	Evaluation Team & Dairy Expert	May 21 st – June 11 th , 2017 (Send to dairy expert on June 2 nd)
Draft report is submitted to Land O'Lakes	Evaluation Team & Dairy Expert	June 11 th , 2017, 2017
<i>Land O'Lakes reviews draft final report and provides evaluation team with comments and suggestions for revisions for final report</i>	<i>Land O'Lakes</i>	<i>June 12th – 15th, 2017</i>
Finalize Final evaluation report	Evaluation Team & Dairy Expert	June 18 th – 22 nd , 2017 (work with dairy expert)
Final Report and accompanying deliverables due	Evaluation Team & Dairy Expert	June 22 nd , 2017

4. Application Procedures

Required Expertise

The selected final evaluation team is expected to have in-depth knowledge and experience in carrying out project evaluations, especially for dairy development programs, preferably with in-depth experience in Bangladesh. The evaluation team is also expected to have a dairy expert and documented prior experience in evaluating USAID and/or USDA funded programs.

Required expertise, skills and knowledge are as follows:

- Minimum 10 years work experience in conducting sound and thorough technical evaluations of agricultural development programs;
- Proven expertise, knowledge and skills in the dairy value chain;
- Evidence of success in completing similar evaluations in terms of size, design and rigor;
- Previous experience in evaluating USDA/USAID programs;

- Strong qualitative and quantitative research and analytical skills;
- Ability to recruit enumerators who know the local language and who have some demonstrated understanding of animal husbandry;
- Proven record of excellent management, leadership, decision-making and interpersonal skills;
- Proven strong, clear technical writing and oral presentation skills in the English language;
- Proven ability to prepare high quality technical reports on time;
- Ability to work within an international and multicultural environment.

Relationship and Responsibilities

The evaluation team will perform the tasks described above in collaboration with the separately hired dairy expert in evaluation tool design, data collection and report writing, as indicated above. Land O'Lakes BDEP staff members, assigned by the BDEP Chief of Party, will provide logistical support to locate the beneficiaries and other relevant stakeholders. The evaluation team will communicate with the BDEP M&E Specialist and the headquarters MEL Senior Manager, and keep them informed of their progress. Land O'Lakes staff and stakeholders will provide feedback on the data collection tools and draft report. During the evaluation, the evaluation team may seek and receive additional advice or guidance from the above-mentioned Land O'Lakes staff, but the team will operate independently, without direct supervision by any Land O'Lakes staff. The BDEP Chief of Party will make the final approval for payments to the final evaluation team.

Logistics

The assignment will require travel to and staying in the target program regions in Khulna and Rajshahi Divisions of Bangladesh. Use of Land O'Lakes' office space in the capital city of Dhaka may be available. Other than office space, all other resources (e.g. interpreters, enumerators, transport, hotel reservations, etc.) should be arranged by the evaluation team and be included in the evaluation budget.

Proposal Submission Requirements

All interested bidders will submit their proposals in English with the following information:

Technical Proposal (not to exceed 10 pages)

- A detailed methodology on how the assignment will be conducted, including a sampling strategy, data collection methods, field procedures, quality control practices and data analysis (of both collected and provided data)
- A clear and comprehensive work plan, outlining the major activities and time schedule
- List and briefly describe the team and its proposed personnel, indicating what role each proposed individual will have in conducting the final evaluation and why they were chosen for the team. (Curriculum vitae (CV) of the team members to be provided as an Annex)
- Organizational capacity statement, including past experiences and activities related to the theme of the study, and experience with USDA/USAID projects. Reference information must include the location, award numbers, and brief description of work performed.
- At least 3 references of other clients for which similar evaluation assignments were undertaken with contact information for each one.

Financial Proposal

- Itemized budget;
- Narrative explanations of line items;
- Present existence of financial and administrative systems to adequately account for funds provided under this assignment;

Criteria for Evaluation

Submitted proposals must clearly demonstrate alignment with the scope of work outlined above with an adequate level of detail. Proposals shall be evaluated according to the following criteria:

Proposal Evaluation Focus	Marks
1. Technical approach and methodology	25%
2. Proposal is complete and addresses the objectives as outlined in this RFP	25%
3. Proposed personnel – ability to address different components of the assignment	15%
4. Relevance of the firm or individuals' core capability /skills, and capacity to implement or manage the assignment and funds awarded	15%
5. Budget justification and cost realism	20%
Total	100%

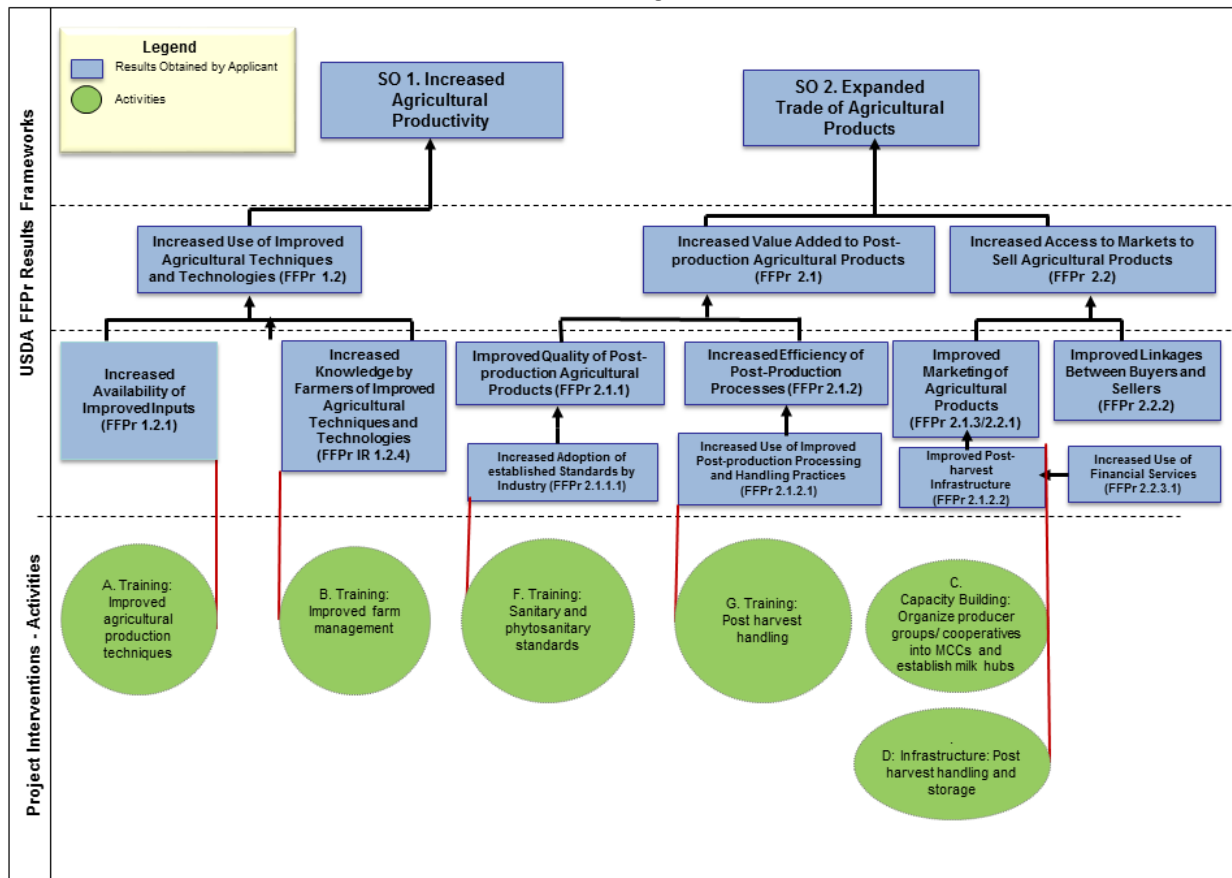
Submission Due Date

Your technical and financial proposal must be submitted electronically not later than 5pm Bangladesh time on **March 13th, 2017** to. No hardcopy submissions will be accepted.

Land O'Lakes reserves the right to fund any or none of the applications submitted.

Annex 1

ATTACHMENT G Project-level Results Framework



Annex 2: Key Outcome Indicators

- Value of Incremental sales attributed to USDA assistance
- Percent decrease in average production cost per unit of dairy products
- % change in the volume of the formal value chain locally-produced milk and milk products
- % change of raw milk entering the formal value chain
- Average margin between farm gate price and end product price for milk and milk products through the formal domestic and international chains
- Percent increase in volume of annual milk output per cow per day – cross breed/local breed
- Number of farmers and others that have applied new techniques or technologies as a result of USDA assistance
- Percent of farmers in target areas using sustainable agricultural practices
- Number of farmers in target regions that have access to quality, effective off-farm storage for their milk and milk products
- Number of firms in target regions using modern equipment to process milk and milk products
- % of milk and milk products certified as meeting international/ Bangladesh processing standards
- Percent of registered dairy firms that obtain certification with international standards related to milk quality
- # of linkages with formal financial institutions
- Number of jobs attributed to USDA assistance.

Annex 4: The Role of Tradition in Impeding Progress in Dairy Sectors of South Asia.

Article for FEEDIPEDIA, (submitted May 2017)

How tradition constrains progress towards the development of the dairy industries of southern Asia

John Moran (Profitable Dairy Systems, Kyabram, Victoria Australia) and Geoff Walker (Land O' Lakes, Dhaka, Bangladesh)

With increasing per capita consumption of milk and other dairy products throughout developing countries, virtually every country in southern Asia is seeking to increase its domestic production of raw milk. This task seems easier in certain countries as smallholder dairy (SHD) farmers understand that improved farming practices are the key to increasing per cow and per herd daily milk yields and per farm profitability. The dairy industries in southern Asia can be split up into two types, namely those that have been established for many centuries and those that are relatively new. Examples of established dairy industries can be found in India, Pakistan and Bangladesh whereas newer dairy industries are becoming more prominent in many South East Asian countries such as Indonesia, Malaysia, Vietnam, Philippines and Thailand.

The brief overview of the history of Asia's dairy industries

The origins of the dairy farming sectors of the Indian Sub-Continent lie at least much in the use of cattle for draught power and the economic value of dung for both fertilizer and fuel as for milk production. Any volume of milk gained by milking cows might be a bonus; the value of female cows was more in reproductive capacity for future producers of dung and suppliers of draught power than arising from being producers of high volumes of milk. It may be fair to say that most attempts to develop the long-established dairy industries of the Indian subcontinent are based on trying to upgrade "the traditional way of doing things". In addition, owing to the historic role of dairy products in their diets, raw milk has been eagerly sought after by farmers in the Indian subcontinent such that a cow is hand milked, no matter how small a volume she may produce. In the other countries mentioned above, however, dairy products have not been an integral part of the diet until quite recently. In these South-East Asian countries, with the virtual disappearance of draught animals, cattle are now generally categorised either as dairy or beef. The beef cattle were generally selected from the remaining draught stock in the country. In the Indian subcontinent, however, "dairy" cows and buffalo are routinely milked to produce as little as 1 or 2 L/cow/day and still be classified as "local" genotype dairy. So we have a situation where "local" dairy cows, with very low milk yields on the whole are very poorly fed and managed yet still be considered an integral part of that country's dairy industry.

The problems with tradition on smallholder dairy farms

Even if the local cows were better fed and managed, they may not be genetically capable of producing much more than 10 L/cow/d of milk. This would not be considered a high milk yield for well fed and managed dairy genotypes in South East Asia that have originated from western countries, usually Friesians. In this case SHD farmers successfully managing these stock would be expected to know how to look after them better than farmers with the "local" dairy cows; peak milk yields of 15 L/head/d or even more for Friesians are common

It has often been stated that it is harder to “unlearn” bad habits (be they personal, social or technical, with a good example of the latter being dairy production technology) than it is to learn new habits from a blank sheet of paper. Therefore if “local” dairy cows are very poorly fed and managed, traditional smallholder farmers often believe that this is the normal way of farming such stock. Hence the tradition continues and is rarely questioned by farmers and unfortunately by many government and other institutional dairy stakeholders.

In comparison with traditional practices, the Bangladesh Dairy Enhancement Project, being implemented by Land O’Lakes International Development and funded by USDA, has introduced a more modern and productive “whole farm management” approach to the smallholder sector. The project has demonstrated how introducing very different farm management practices to replace traditional practices, can boost farm productivity to a significant extent. The experience of BDEP also shows, however, the difficulty in achieving changes away from traditional practices. For example, BDEP can recount examples of farmers building improved cow sheds, but tearing them down before completion and rebuilding traditional brick and concrete “hot boxes” owing to neighbours all saying “the new design will never work”. It has taken more than a year of active field work to achieve real momentum among farmers to end many of the traditional practices.

The remainder of this article discusses how the continuous use of traditional practices has adversely impacted on the rate of development of such dairy industries. If such practices ceased to be used and promoted by many government dairy advisers, these industries could be more effectively upgraded.

Feeding and watering practices

- The tradition of only offering water through mixing it with concentrates is far too common in Bangladesh. Cows require fresh drinking water (throughout the day and night) for efficient rumen metabolism as well as to satisfy their basic needs in all tissues, particularly the mammary gland.
- Owing to the traditional origins of the dairy sector of South Asia, the feeding of crop residues is the norm. Rice straw and wheat straw form a major part of the “ration” provided to dairy animals through the Indian Sub-continent. These straws, however, have very low nutritive values and they do not enable satisfactory milk production. In high-yielding milking cows, their roles are to ensure there is sufficient dietary fibre for efficient rumen digestion and also to provide the feeling of satiation. But they do not drive good milk production through the direct provision of necessary protein and energy.
- Concentrates formulated for milking cows should provide the essential nutrients (energy, protein, macro and micro minerals and vitamins) to supplement the forage base diets so that cows can achieve their target milk yields and fertility parameters. Price is certainly an issue but it should be considered along with the need for the ration to satisfy the cow’s nutrient demands for the target milk yields. A further problem is adulteration of the ingredients of such concentrates which necessitate their sampling and chemical analyses in reputable feed analysis laboratories to more accurately formulate the diet.
- All forages should be chopped to 2 to 3 cm lengths prior to feeding, to reduce wastage and improve digestibility. This is often not practiced on traditional farms.
- A common feature on many Bangladesh traditional dairy farms is the feeding of boiled rice as the only concentrate feed. Rice may have sufficient dietary energy but it is very low in protein and many minerals. Feeding this together with rice straw is hardly a suitable diet for milking cows – it impairs milk yields and results in severe fertility issues over time.

- The cow's appetite drives her mammary gland and this is primarily determined by rumen retention time which depends on the quality of the feed entering the rumen and its rate of breakdown to convert it into microbial protein (which is digested in the abomasum). Therefore to achieve high intakes (hence milk yields and then profit margins), feed quality must be optimised.
- The forages grown on most Asian soils benefit from applications of inorganic fertilisers which supply minerals such as nitrogen, phosphorous and potassium as well as pH stabilisers such as limestone, whereas many traditional dairy farmers only use organic soil additives such as cow manure and shed effluent. A series of fertiliser strips where different fertiliser applications are compared, either visually or better still, following chemical analyses, to determine the optimum fertiliser regime for that particular crop on that particular soil.
- A year round supply of quality forages is essential for maintaining profitable feed nutrient intakes and in many areas of Asia (subjected to regular flooding or drought), and this can only be achieved using forage conservation. Because of the lack of sufficient rain-free days during harvesting (to make hay), this generally means having to learn to make silage. Developing the skills for good silage making will reap dividends in ensuring reduced annual variations in the forage contribution to the diet.

Young stock management

- All too often, traditional dairy farmers accept the fact that not all newborn calves live to become weaned heifers. True, milk fed calves are very susceptible to invasion by the many tropical pathogens and respiratory issues such as pneumonia, however there is no reason to accept calf mortalities as normal. There are several improved practices that can virtually guarantee calves will survive and thrive to become useful members of the milking cow team. These include:
 - A specific place in the shed for calving cows down is logical because this can be more easily disinfected, provided with rubber mats and fans to improve the calving down environment.
 - Effective colostrum feeding management is essential for calf health. The concentration of immunoglobulins in the colostrum (which can be easily tested) and the timeliness of its administration to the new born calf (within 30 to 60 minutes of birth) should be an integral part of the birth process on many well managed tropical dairy farms.
- Weaning can naturally occur as early as 6 weeks in calves with good rumen development. This is encouraged by offering quality calf concentrates that have been specially formulated for their needs and include high carbohydrate feeds, such as maize meal, sufficient protein (up to 16 to 18%) and rumen buffers. A small quantity of roughage should also be offered to stimulate saliva production as a natural rumen buffer. With better calf rearing practices, including ensuring early rumen development, and calf milk replacer becoming available (at lower cost versus the milk presently being consumed by calves), the day of calves still drinking from their dam at 6 to 9 months of age should be in the past.
- Key performance indices are the best way to monitor the farmers' ability to rear calves, and feed and manage mature dairy cattle. Therefore these should be readily available to all farmers, big or small. The age at first calving provides an excellent assessment of the farmer's skills in calf and heifer rearing and it should be in the range of 24 to 28 months. For farmers following traditional practices, the typical range is 30 to 36 months of age, representing significant economic loss.

Housing and cow comfort

Ensuring good ventilation is nearly just as important as regular bathing of cows and providing shade, when designing cow sheds. In Bangladesh, we have seen some very poor dairy cow housing. Cows are tied up in brick “hot boxes” with only cement floors, no open windows, a very low roof and minimal sunlight; the air temperature and humidity is such that this housing exposes the cows to very severe heat stress (measure as the Temperature Humidity Index).

- Cows are more heat susceptible than humans in that they feel hot at lower temperatures and humidities than do humans. They have a large fermentation vat (the rumen) continually generating heat as well as a mammary gland that synthesises up to 4 times as much milk protein than a feedlot steer generates muscle protein in its entire body. To maintain the appetite required to produce milk, milking cows must be “happy”: heat stress must be addressed, cows want to comfortably lie down for 12 hours or more each day. They want to be able to move around and feel secure in their living quarters.
- Cows should be offered a soft place on which to lie. For cows excluded from open land, which is the norm in Asia, thick (sponge) rubber mats or sand beds are ideal. Another major problem with housed stock are the common practice of tying cows, often using tie stalls often with only short pieces of rope attached to the stall. Cows like to interact with their herd mates, lick themselves and “stretch their legs” during each day, which they cannot do when tied in a restricted manner. Stock in loose housing can be just as easy to manage as cows tied in small sheds, and indeed this is the experience of the farmers working with BDEP.

Other aspects of herd management

- It goes without saying that heat detection is considerably easier when the cow can move around in a yard rather than being tied. Yet on traditional farms in Bangladesh and elsewhere in South Asia, many cows are routinely tied for 24 hours a day, seven days a week.
- Disease management requires following a protocol of vaccinations and routine anthelmintics, and regular observations for symptoms of ill health which must be followed by diagnosis and treatment. In traditional farms, too often the farmer waits for a problem to arise and then pays a high cost for treatment, rather than vaccinating and de-worming routinely using reputable medications.
- Paying strict attention to shed cleanliness is essential in a housed dairy herd. It is not that traditional farmers pay less attention to it, but “farm layout” on traditional farms makes it harder to maintain cleanliness. In addition, on traditional farms cows are rarely if ever provided with rubber mats or sand beds, and the forage is often fed unchopped, all factors resulting in shed cleanliness being harder to achieve.
- In some countries, there is a degree of preference for genotypes perceived to be “hardy, disease resistant and heat tolerant”. That such genotypes may not be high milk producers does not stop recommendations for their use. But in many heat stressed countries of the world, including in the Gulf and in South-East Asia, and on large scale farms in Pakistan, Friesians are proving to be very high yielding just as in more temperate climates. Great results are achieved by using the right genotype with **modern management practices** adapted for the condition. Where less productive genotypes are being recommended, this could be perceived to be as an alternative to the hard work of introducing modern management practices, especially to traditional dairy sectors. Thus it appears that genotype choice, when sourcing semen for artificial insemination, may be used as an alternative to enhancing farmers’ skills and work practices capacity. In smallholder sectors in which cows are producing two litres milk per day or less, the first step

towards improved dairy farming must be in the field of whole farm management, especially including much better nutrition than is the norm on traditional farms relying on rice and wheat straw. Once improved management is in place, there is less need to consider traits sometimes thought to be of high value, namely genetic resistance to the heat and the many diseases of the tropics. Conversely, all breeds, including the tropical breeds, suffer from poor farm management. Better farm management allows the selection of efficient dairy genotypes such as Friesians. The dairy feedlots in low land Vietnam and Thailand routinely use high grade Friesian semen because of the excellent management on farm. This even includes tunnel ventilation through the shed to minimise heat stress.

Support infrastructure

- In southern Asia, milk may be destined either for the informal or the formal market. The informal market may be anywhere that consumers want to purchase it, while the formal market is normally via a milk collection centre. With milk being such a perishable commodity, food safety issues are of utmost importance; hence virtually every professional dairy stakeholder would prefer the informal market to be phased out either through legislation or emerging consumer preference for processed milk as economic development builds. Consumer preference, however, also has developed over a long period of time, and has its own traditions. Changing these traditional preferences is a challenge to the formal dairy processors of South Asia.
- In far too many places in the Indian subcontinent, the SHD industry supports a “middle man” who takes the milk from the farm to the market place, generally via the informal market, although in certain places he can sell it to milk collection centres. Not only does the farmer receive less money for his milk, the milk can be adulterated to increase its volume, thus increasing food safety concerns when handling such a perishable animal product as raw milk. Further, when milk is sold to a middleman, the farmer is not paid on milk fat content, certainly not in any reliable manner. This significantly reduces the incentive for the farmer to improve his farm management practices. In Bangladesh, the “middle man” can even milk the cows for the farmer. His milking hygiene is often questionable and mastitis can be spread through milking herds.

Conclusions

Many of the above improved practices have been developed recently meaning that dairy farmers need to be flexible and modify their farming systems when necessary and possible. Clearly there is little role for maintaining the traditions of the past when profit margins are becoming smaller due to the increasing costs of farm inputs. Although there is nothing wrong with many traditions among human society, in something as biologically complex as tropical dairy farming, advances can be very rapid and farmers and their advisers need to be more aware of “better” ways of carrying out these practices. Sure, farmers should try them out and may be even modify them to their situation. But they cannot be ignored without significant opportunity cost in terms of productivity and profitability. Improving dairy farm practices is not simply a matter of adding a few changes to the underlying traditional foundation; rather, a breaking down of traditional practices is necessary. This is vital if the sector is to progress for the betterment of smallholder farmers and consumers. The profitable management of dairy cows in the lowland tropics such as in Vietnam, where dairy feedlots with herd averages of 20 to 25 litres/cow/d and daily peak production considerably higher, indicates that much of the tradition of herds producing less than 5 litres/cow/d has been replaced successfully with more modern practices. We have a challenge to ensure that such models are

spread much more widely than is the case at present in traditional dairying sectors such as in Bangladesh and other countries in the Indian subcontinent.

Further reading:

For many more best management practices, readers are directed to a recent CSIRO book by one of the authors (JM): "Blueprints for tropical dairy farming. Increasing domestic milk production in developing countries". Each chapter is freely downloadable from the website www.profitabledairysystems.com.au.