

Sub-Project:
**Baseline survey on socio-economic development of the
microenterprises through environment friendly dairy farm**

“Sustainable Enterprise Project (SEP)”

Baseline Study

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Study Conducted By

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Acronyms:

IDF- Integrated Development Foundation
SEP- Sustainable Enterprise Project
PKSF- Palli Karma-Sahayak Foundation
ME- Micro- Enterprise
WQ- water quality
GOB-Government of Bangladesh
HES- Health and Environmental Safety
WHO- World Health Organization
DLS- Department of Livestock Services
BRAC- Bangladesh Rural Advancement Committee
NGO- Non-Government Organisation
RDRS- Rangpur-Dinajpur Rural Service
Tk- Taka (Bangladeshi currency)
ASA-Association for Social Advancement
YTC- Youth Training Center
KII- Key Informant Interview
ICT- Information and Communications Technology
CLSP- Community Livestock Service Provider
ToR- Terms of Reference
MoU- Memorandum of Understanding
SAS- Statistical Analytical Software

ACKNOWLEDGEMENTS

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Finally, I acknowledge the contribution of Executive Director of IDF for selecting me a consultant for the baseline survey for this project, without his cooperation and valuable support the study could not be conducted. My heartfelt thanks go out to everyone who helped us directly or indirectly to complete this study.

The Author

Executive Summary

The study was conducted in the different unions of the 03 upazillas of the Chattogram district of Bangladesh from April 2021 to September 2021 to understand baseline information on the socio-economic development of the micro-entrepreneurs (MEs) through environmentally friendly, of dairy farms including COVID-19 issues on dairy farms. A survey tool was developed by considering five modules including the effect of COVID-19 situations on the dairy farm and milk production and marketing scenarios. A total of 110 farm households (96 MEs (project beneficiary group, those who are getting benefit from IDF), and 14 non-beneficiaries (control group), has been covered in this baseline study. A random sampling method was used for collecting the data. The collected data consists of both the qualitative and quantitative and was analyzed using SAS and Microsoft excel software.

Average number of households were ranging from 4.29 to 4.64 for the control and beneficiary groups, respectively. The highest percentage (31.25%) of people were among the aged group 11 to 20 years and the lowest percentage was above 60 years. On the other hand, 21 to 30 years of old people's percentage was more (19.26%) than the groups of 21 to 30, 31 to 40 and 41-50 years. And it noticed that the workable people's percentage (from 21 to 50 years old) was higher than other groups of people. The highest percentage (48.02%) of peoples has the educational level from 0 to 5 classes followed by 6 to 8 classes (23.57%). The main occupation for the peoples was agriculture, rickshaw/van puller, small traders, and livestock farmers and livestock cum agriculture farmer. As per the number of respondents, it was found that 63.27 % people have semi-pakka house from beneficiary group and 42.86% of the control group. The most of the peoples in both groups use septic tank/ slab latrine and no one use the hanging latrine and the open place/bush. It was also observed that only 3.06 % of respondents of beneficiary people use rain water as drinking water. Most of the people (60 to 67%) from both group drink water without applying any purifying method. Very few numbers of people used solar (8.33 vs, 9.62% control vs, beneficiary) and biogas the beneficiary group (1.92%). The yearly average net income per household of beneficiary group was higher (BDT 6,125) than the control group (BDT 4,483), more percentage of people's income coming from agriculture followed by livestock rearing.

In the studied area the available species of livestock were cattle, goat, chicken, duck and pigeon and no significant differences was found between the control and beneficiary groups for the total number of cattle per household. About 42.46 to 46% household have improved dairy shed, they clean their shed regularly with disinfectant, their animal shed was semi-pakka and these types. The beneficiary farmers reared their cattle in intensive rearing system. Most of the farmer's dairy farm has electricity connection and less than 50% people under both group checked their electricity connection regularly. Comparatively lower percentage of people used less cost light, fan, and transparent and heat tolerance material in their animal shed. The more number of people of beneficiary group was responding that they fed straw, roughage, concentrate and green straw to their cattle. Generally, cattle are grazed in grazing land 4.60 ± 1.29 h for control group and 5.75 ± 1.22 h for beneficiary group, respectively. About 82.76% respondent don't know about the daily feed requirements of cattle. About 66.07% and 68.52% of the farmers follow regular vaccination and deworming schedule, respectively for their animals. The beneficiary group farmers cultivated High yielding variety fodder, but the numbers of peoples are few. The daily average milk yield for cows of control group was 14.35 ± 4.04 litre and for beneficiary group was 14.75 ± 3.29 litre. The highest lactation yield of cows was observed in beneficiary group (2189.20 ± 63.679 litre) than the control group (1806.79 ± 98.731 litre). Most of the respondent said they checked their cows routinely as weekly and periodically. Usually, farmers from both groups clean their cow before milking. They also clean the milking places and milker's hand after milking. The people from both group preserved their cow's milk in a pot and they don't use any type of preservatives and foreign materials in the milk and farmers thrown spoilage milk. About 50% people sell their milk in the market and 50% sale their milk to the goala/ middle man at the farm gate. More than 90% and 83.33% beneficiary and control group farmers, respectively don't produce milk products only a few numbers (only 1 person from each group) of people produced dahi (yoghurt). Farmers used artificial insemination for their cows instead of natural service. The sources of frozen semen were BRAC (41.40%), DLS (41.75%) and milk vita (3.88%), respectively. When they use BRAC semen their service cost was higher up to 1000 Taka.

Only 33% of the respondent people from both groups received training on improved feeding and rearing of cows, beef fattening technology, disease control and vaccination. The training agencies were the DLS, BRAC, IDF, YTC, ASA and RDRS and the duration of the training were ranging from 01 to 03 days. Among the agencies IDF has given more training to their members followed by DLS. Farmers do not have training on bio-security. In addition, a few numbers of people got training on preliminary treatments of animals. About 75% farmers from both groups said that they will not be able to apply the training knowledge in their farms.

About 50% of the farmers from both group rearing their cattle under the separate shed. About 50% of the respondents said that their cattle come into contact with the wild animals/birds and children. Farmers separated their sick animals from others. When their animal died from any diseases, most of the people of both group buried it. From both group about 55% people said that there is a health risk if they do not wash their hands after touching animals and before preparing or eating food. For the washing of hands, about 50% people used soap with water and more than 26% people washed their hands with water only, and very few number of people used water and ash for washing their hands. More than 50% people among the respondents from both groups said that they have arranged for personal protection equipment (PPE) for their workers on their farm.

About 83% of the respondents of control group and 97% of beneficiary group peoples said that natural disaster happened due to the change of climates in their areas. Furthermore, about 66.67% of the respondents from the control group and 89.19% of the beneficiary group people said the milk yield of cows were fluctuated with the fluctuation of ambient temperature.

As per the respondents, of the control group farmers, they don't have a generator in their dairy farm and from the beneficiary farmers, only 3.39% farmers have generator in their farm. Nearby 64.81% and 83.33% of beneficiaries and control group farms do not have a separate arrangement to separate manure and urine in their dairy shed. About 45% peoples of the control group and 29.73% peoples of the beneficiary group uses cow dung as a fuel.

Among the respondents, 87.5% people in the control group and 94.57% of the beneficiary group buy their animals, mainly once a year and they buy animals from local market and small traders, Bepari/Faria and wholesale market. The people of the buy the animal feed from the local market and wholesale market. The higher percentage of the beneficiary group people sells their animals to the small traders, whereas the highest percentage of control group farmers sell their animals to the Bepari/Faria. Among the constraints of selling the animals most of the respondents' people said that low price, distance of markets, Bapari/Faria interference and transportation. The people sell the raw milk and the milk price depends on volume only. There is a milk processing plant (Milk-Vita) at the studied area and about 50% people respondents from both groups that they knew the name of the milk processing technique, which is pasteurization of milk.

Farmers from both groups, mainly purchased bull calf for fattening, cattle feeds and medicines for their cattle from the local market and wholesale market. They are getting semen and the vaccine from the department of livestock services (DLS) for the insemination of their cows and vaccinate the animals as a preventive measure.

A little number of respondents from both groups replied that they have affected by corona, and those who were affected, they had taken measures. More than 73% people from both groups respondent that they were facing many problems during COVID-19 pandemic, like treatments of peoples, treatments of animals, purchase of animal feed, marketing of milk and milk products, and getting credits from bank and NGOs. The 100% control group people have not hanged a notice board in their farm to protect the corona pandemic. Among the respondents, more than 66% of control group and 84% of the beneficiary people knew that milk is a good drink to prevent corona. About 60 to 80% people's respondents from both the group that the cow's milk production and prices of milk was reduced during the corona pandemic and animal feed and medicine costs had been increased and also faces crisis to get input for their dairy farming. Among the respondents about 98% (94 out of 96) people from the beneficiary group taken loans from the IDF and average loan was BDT 78563.83±6437.06 (94) per household and 4 out of 6 of control group people taken loan from the bank, and the average loan per household was 120000.00±27080.12

(4). Mostly it was seen that both the woman and men take care for their animals and do take active participation with all the related activities.

1. Introduction and Project Background

Dairying in Bangladesh is mostly integrated with crop production and 1 to 2 cows with 0.50-acre land is common (Khan, 2009) and the rural household keeps cows for land cultivation and also to produce milk for family consumption (Quddus, 2017). Dairy development in developing countries, including Bangladesh has played a major role for increasing milk production, improve income level in rural people, generating employment opportunities and improve the nutritional status of the people. However, nowadays the dairy farming pattern is changing and people are mostly interested in Holstein genetics for commercialization as Holstein cows' produces 10 to 20 litre milk per day (Khan et al., 2005; Chando et al., 2021).

For sustainable and continuous production of milk and calves, to express the full genetic potential of a cow, adequate environment should be maintained by providing proper housing, balance and proper feeding, and routine vaccination against the common infectious diseases (and maintain the routine and regular deworming programme (Khan, 2020). The house should keep free from any dirt and clean it regularly. The ration of the cow should contain both roughage and concentrate. In the ration the roughage and concentrate ratio should maintain at least 3:1 on a dry matter (DM) basis. In the roughage, feed staff should include both straw and green grasses (Khan, 2020). If possible, the cows should allow for 4 to 6 hours grazing in grazing land, which promote the cow to be normal and healthy; in addition, the cow does not need any extra exercise. If the cow is in a stall feeding condition, they should maintain the proper balance ration. Without the cultivation of high yielding variety (HYV) fodders (for example, perennial: Napier, para, German; seasonal: maize, cowpea) the farmers are not able to supply continuous green grasses for their cows and the scarcity of green grasses will remain. If the farmers could cultivate the HYV fodders after feeding, the excess fodders they can preserve it's as silage and hay for the lean season. However, adequate training with proper guidelines is essential for fodder cultivation and feeding of cows. Nowadays, mechanistic system is replacing the traditional backyard system and it's found that it is profitable. However, on farm mechanization and associated research is required at university and research organization level.

In addition, the improve genetics produce more milk with fewer cows, reducing the amount of greenhouse gas (GHG) emission per kg of milk. Artificial Insemination (AI) allows the farmers to breed bulls and cows with superior genes to increase milk production in a safe environment. Dairy cows are able to utilize byproducts of different industries or farms as mix feed. Cows can be eating byproducts that humans cannot eaten, such as citrus pulp, almond hulls, and more, that reduces our food waste going into landfills. These byproducts are also beneficial to the cows, providing their needed energy for milk production. Furthermore, dairy farming can also contribute to the crop production that is the manure itself is also used as a natural fertilizer for crop production. This nourishes the soil health. Dairy farmers have taken advantage of modern technology to create a more sustainable system. Farmers may install solar panels to create energy for the farm. Using naturally found resources like the sun, wind and—especially on a dairy farm—manure, farmers can help power lights, milkers, fans and more. Some of that power may even be used in farmers' communities.

Sustainable Enterprise Project (SEP) project is jointly financed by Palli Karma-Sahayak Foundation (PKSF) and World Bank. The objective of the SEP is to increase the adoption of environmentally sustainable practices by targeting the microenterprises (ME) of dairy farmers. SEP has selected 30 lead districts as the project working area to demonstrate the project impact on different sub-sectors. The project prioritizes a selected number of polluting microenterprise business clusters and supports the expansion of innovative economic activities conducive to a more sustainable environment.

Integrated Development Foundation (IDF) implementing this sub-project in Patiya, Anowara, Chandanasih upazilla under the Chattogram district of Bangladesh. This sub-project will support to achieve 03 years from June 2020 to June 2023. This sub-project will support to achieve global goals of the main SEP project. This sub-project activity is implementing in the business clusters of dairy farm sub-sector to improve the overall business and the environment of the microenterprises.

Accordingly, IDF has taken initiative to conduct a baseline survey through an individual consultant to understand the present business, economic and environmental status of microenterprises, entrepreneur and their enterprises under dairy sub-sector in the sub-project working area as a baseline. A baseline information is to assess the effect of the programme and to compare what happens before and after the programme that has been implemented. Therefore, the baseline survey is undertaken with the following purposes and objectives.

2. Project implementation locations

The study was conducted in the different unions under the 03 upazila (Patiya, Chandanaish and Anowara) of Chattogram district of Bangladesh from April 2021 to September 2021.



3. Purpose of study

The study was conducted with a view to understand baseline information on the socio-economic development of the micro entrepreneurs through environmentally friendly, of dairy farms including COVID-19 situation.

The following objectives were considered under the purpose of the study

4. Objectives of the Baseline Study

The baseline survey was conducted with a view to obtain a snapshot assessment of the current business, economic, environment and climatic conditions of the dairy micro-entrepreneurs, who are participating in the project activities, so that the changes related to the project interventions and their progress can be evaluated after the project period.

The following are the specific objective of the SEP project

- To increase adoption of environment friendly dairy production practices and safe milk production.
- To improvement of dairy waste management at cluster.
- To reduction in mortality and morbidity of farm animals.
- To awareness raising on environmental promotion at dairy production, processing and marketing clusters.

Based on the SEP project objectives, the following objectives was set for this current survey

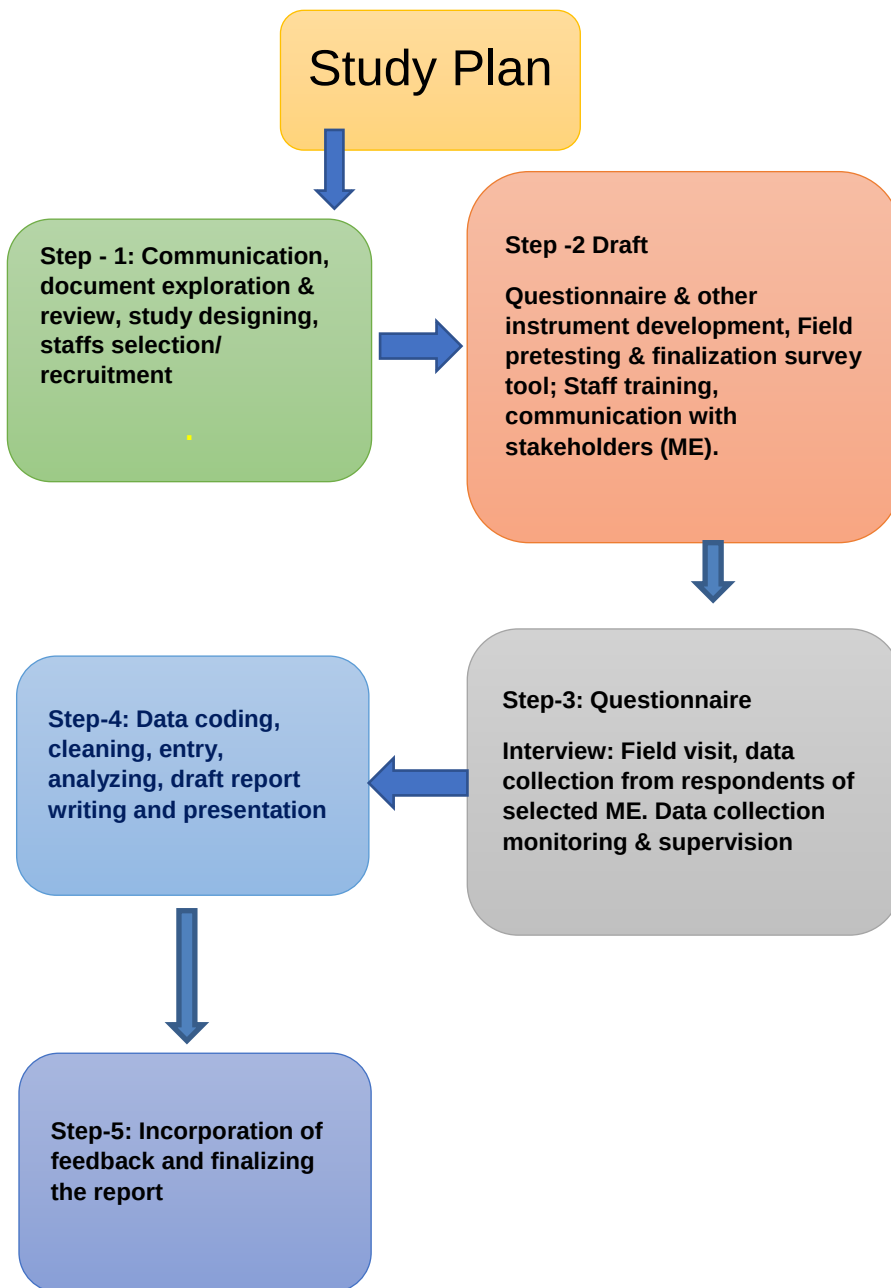
1. To conduct a baseline survey on the dairy micro-entrepreneurs to assess the existing status of relevant socio economic and adaptive environmentally sustainable indicators like air, soil, water quality, health and environmental safety issue, waste management and climatic problems and marketing and value chain of the of the MEs dairy farms.
2. To know the effect of COVID-19 pandemic on health of farmers and milk production of cows, opportunities of input and output of dairy farm operation.

5. a) Scope of Work for the Study:

The study team developed a detailed activity plan for the study according to the ToR. The study entails following scope of assignment:

- Review of the secondary data/relevant literature and project document available;
- Develop methodology including study plan and key questions to be answered;
- Development of data collection tools which contains questions related to the socio-economic aspects and relevant adaptive environmentally sustainable indicators like, air, soil, water quality, health and environmental safety issues (HES), waste management and climatic problems of the project and finalize the tools in consultation with IDF and PKSf (instruments to assess the current scenario).
- Pre-testing of the research tools in one or two communities and adaption and re-appropriation of the tools;
- Training of the enumerators / data collectors;
- Fieldwork for data collection;
- Collect, clean data and preparation it for analysis;
- Share data analysis plan with IDF and PKSf;
- Data punching in Microsoft Excel and analysis of data using widely recognized statistical software like, SAS (2010) and Microsoft Excel (2013).
- Analyze data and present it to the project team before preparing the draft report;
- Develop Table of Contents (ToC) for approval and prepare a first draft of the report and presentation of the draft for feedback;
- Incorporate feedbacks and finalize the report.

5. b) Study Design:



Detail Work Plan:

Indicative time frame (180 days upon signing of contract)

SL #	Activity	Time duration	Date of completion	Remarks
1	Contract signing	-	-	Depends on IDF authority
2	Inception report submission, feedback and finalization	7 Days	-	-
3	Survey tools development	15 days	-	Depend on the questionnaire
4	Tools sharing with IDF and PKSF for feedback and finalization	7 days		Depend on IDF and PKSK
5	Orientation for enumerator/ data collection	3 days	15/04/2021	-
6	Data collection by household interviewing	60 days	15/08/2021	Due to COVID-19 pandemic and lockdown of whole country and restriction of movement of people by GoB
7	Data entry, cleaning and analysis	15 days	31/08/2012	-
8	Submission of draft report	21 days	30/09/2021	-
9	Incorporation of feedback and finalizing of draft	21 days	30/12/2021	-

6. Methodology

A total of 110 households from a numerous number of unions like Shikolbaha, Boro Uthan, Char Lakkha, Char Patharghata, Julda, Asia, Kachuri, Kasiasi, Kusumpura, Kolagaon, Kharana, Jangalukhain, Jiri, Dakhinbhurshi, Dalghat, Baralia, Batikhan, Sobhandandi, Habilah Dwip, Kelishahar, Haidgaon, Chahara of Patiya upazila; Bairag, Barshot, Raypur, Battali, Borumchora, Barkhain, Anowara, Chatori, Poroikora, Haidhor, Juidondi of Anowara upazilla and Kanchanbad, Jowara, Borokol, Borma, Boilto, satba, Hasimpur, Dohajari, Dhopachori of Chandanaish upazila of Chattogram district was surveyed from June to July 2021. The study team collected data from the above selected locations which covered the project area.

Both desk reviews of existing literature of the project and collects the primary data from the project sites to understand the current situation on socio-economic development of the micro enterprises (MEs) of the environmentally friendly dairy farm. The survey questionnaire contained questions under 5 modules and effects of COVID-19 issues on dairy farms. In module 1, (i) demographic and socio-economic information, (ii) living condition, safe water, sanitary and fuel, land ownership and operation, income and expenditure of the family; In module 2 (status of animal production, processing and marketing), livestock statistics, rearing of animals, feeds and fodder for dairy cattle, availability of feeds and fodder for animals throughout the year, milk production characteristics of different breeds, measurements taken before and after milking of the cows, handing of cow's milk, breeding related information; In module 3, training, extension and other related activities in livestock rearing (training on livestock and farmers opinion on the livestock technology training courses); In module 4, environmental factors in dairy sub-sector (animal environment and social safety, health safety issues of workers in the animal farm, climatic factors, air, water and sound pollution; In module 5, (opportunities for livestock entrepreneurs and value chain development (marketing and value chain (livestock farming))); and the effects of COVID-19 on dairy farm and milk production; sources of investment of livestock; credit facilities and women's participation on dairying. At the same time consultation meeting held by project team members of IDF to understand the specific needs of project management as well as donor to develop survey tools (survey questionnaire). The project documents reviewed as a source of secondary information and other available secondary data reviewed along with a briefing with project personnel. In this survey mixed method was used both for qualitative and quantitative method followed includes the following-

- ME Households Survey : 96
- Control Household Survey: 14

6.1. Sample Design:

A random sampling approach was undertaken in the selection of study samples. The number of participants in a study was adequate, in order to be able to determine any important differences (outcome measures) between the study groups.

The research team consulted together with the IDF team repeatedly to analyze the scenario virtually to come into a precise decision about sample design and sample size. Regarding sample size, the research team consulted with representatives of the IDF and PKSf for defining the number. Therefore, concentration has been given to collect the necessary and relevant qualitative and quantitative primary information/data from the targeted stakeholders.

6.2. Sample Size:

A total of 96 ME (project beneficiary group, those who are getting benefit from IDF), 14 non-beneficiaries (control group), have been covered during this baseline study. Considering the COVID-19 pandemic situation and lockdown of whole country from 14 April, 2021 up to the baseline data collection was delayed.

6.3. Study Tool Development and Orientation:

Considering the following important points and target respondents, questionnaires have been developed. To prepare the questionnaire, the following issues considered on the basis of the study aims and objectives.

- Deciding what are the right questions to put in a questionnaire as the need of the study objectives.
- This survey questionnaire contains both open and close ended questions and drafted it by the consultative discussion meeting of 10 to 15 participants from Chattogram Veterinary and Animal Sciences University (CVASU) and sufficient thought and inputs were given to develop the questions that was incorporated in the first draft.
- After drafting the questionnaire, there was field tested in several targeting geographical locations and very important adjustments were addressed and finalized the survey tool.
- This survey tool was shared with the project concern personnel of IDF and PKSf for comments and feedbacks. Their valuable comments were addressed and the survey tool was finalized based on their feedback.
- Then the team submitted the developed final questionnaire to the IDF authority for final approval.
- The approved final questionnaires executed at field level study using ICT tool.
- The Key Informant Interview (KII) and in depth interview the same were shared with IDF authority for taking the final approval that was used for taking qualitative and quantitative data interview from MEs.

6.4. Quality Control Mechanism of Data Collection:

Appropriate follow-up mechanisms put in place to ensure that the data is collected, verified and submitted according to the approved schedule. After data collection all filled-questionnaires and field notes of Key Informant Interviews (KIIs) is registered through ICT service. The collected data were exported and processed for analysis into the computers under careful supervision. It ensured the quality data at all levels through following measures:

- Organized training as well as an orientation session for the data collectors on principles and method of data collection, including best possible quality data collection and taken measures to minimize non-sampling errors.
- Spot-check the field force of Data Collectors and recall them, if needed and checked that all filled-questionnaires (100%) by the respective expert/consultant.
- In-built mechanisms in the checklist/schedules to cross-check consistency of the responses.
- Close supervision of the work of the data collectors.
- Random checks on the work of the data collectors.

- Edition of filled questionnaires every evening to find out the omissions, non-response, and irrelevant answers.
- Feedback from supervisors, monitoring & follow up as well as Project Manager (PM) and solution for bottlenecks, as and when arisen.



Picture A, B: Data collection by the data collectors

9.5. Statistical Analysis

The collected data were compiled and scrutinized in Microsoft Excel and the data was analyzed using SAS software (SAS, 2010) taking into account the effects of survey data. The mean differences in the quantitative variables were compared using ANOVA. Means showing significant differences ($P < 0.05$) were separated by least significant difference (LSD) test at 5% level of significance (Steel et al. 1997).



Picture C, H: Green grass feeding to cattle, D: Milking of cow, E: Napier grass for feeding of cattle, G: Interviewing of farmers by data collector

7. Findings

7.1. Module 1:

7.1.1. Section A: Socio-Economic and Demographic Information of Households

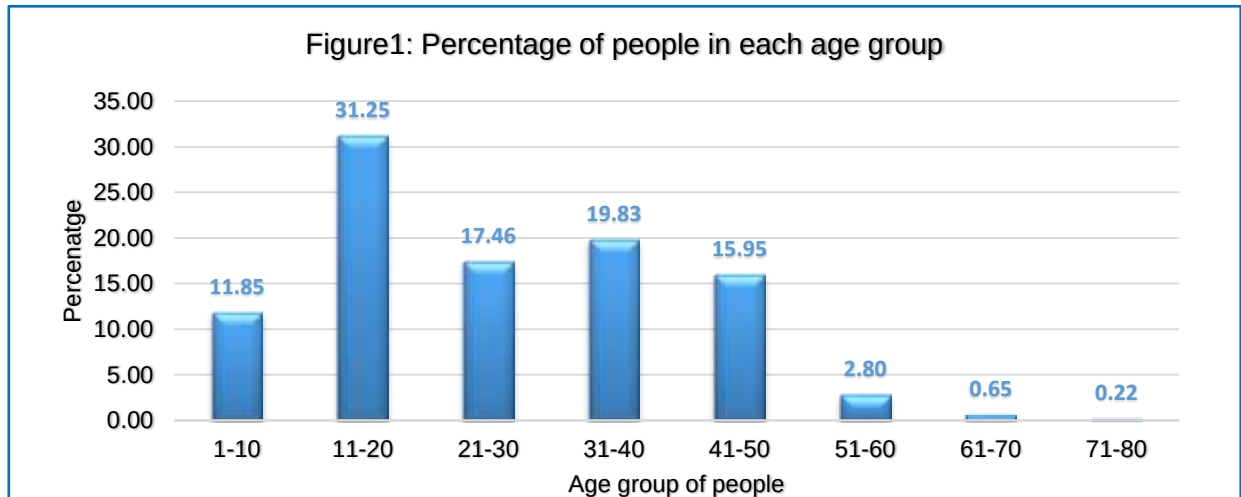
A total of 96 ME households and 14 control households were interviewed for this study. The population demography in the study area is presented in Table 1. Average no of households' ranges from 4.29 to 4.64 and no significant differences was observed between the control and beneficiary groups households. Among the responded percentage the male was higher than females in both group and married percentage was also higher in the control group (55%) than the beneficiary group.

Table 1: Population demography

Traits	Criteria	Control	Beneficiary group
Average no of people/household		4.29±1.03 (14)	4.64±1.07 (96)
Gender	Male (%)	61.67 (36)	57.88 (248)
	Female (%)	38.33 (23)	43.11 (188)
Marital status	Married (%)	55.00 (33)	45.64 (199)
	Unmarried (%)	43.44 (26)	54.36 (237)

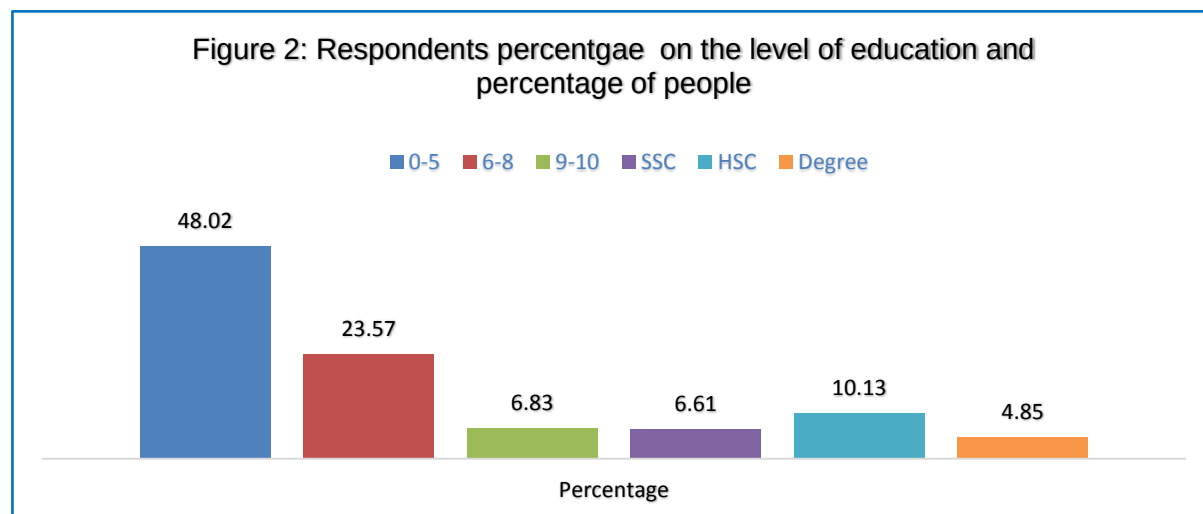
Parenthesis indicates the number of respondents

Irrespective of control and beneficiary group the ages of the studied household are shown in Figure 1. Figure 1, showed that the highest percentage (31.25%) of people were among the aged group 11 to 20 years and the lowest percentage of people were aged above 60 years of age and age from 21 to 50 years of ages was more in number. That is more workable people ages 21-50 years of age) are available in the studied areas.

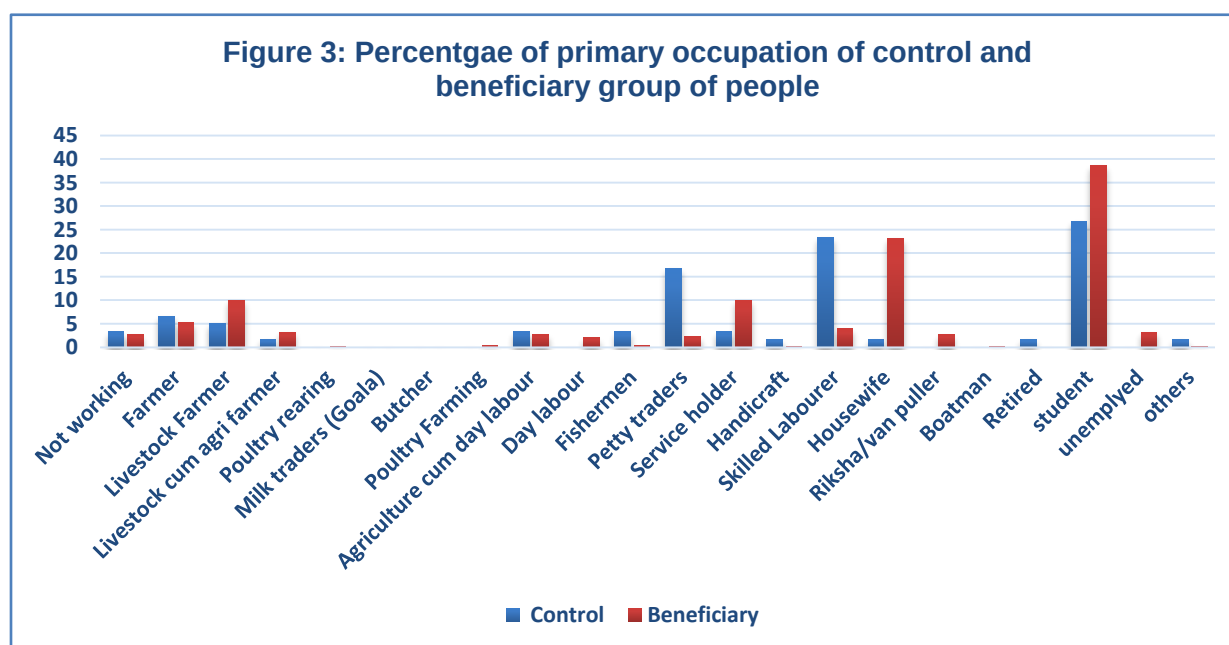


The percentages of people on the education level irrespective of sex and in the studied, household are presented in Figure 2. Figure 2, showed that the highest percentage (48.02%) of peoples

have the education 0 to 5 classes followed by 6 to 8 classes (23.57%) and degree or more educated person's percentage was very low (4.85%). And 9 to 12 classes, educated people are moderate percentage. Usually, up to 5 classes, student goes to government primary school, registered primary school, non-formal primary education, madrasah, kindergarten and other community school. Although the illiterate person's number was lower and also the gradually lower number of people was found with the increasing number of education level. This figure is similar to the other parts of Bangladesh (Saha and Biswas (2015) and Khan et al. (2020).



The primary occupations of the both groups of peoples are shown in the Figure 3. This Figure 3, indicated that the highest percentage of people among the respondents was in both groups. On the other hand, the highest percentage of people was a housewife, service holder, rickshaw / van puller and livestock farmers and livestock cum agricultural farmers were seen higher % under the beneficiaries than the control group. On the other hand, skilled labour, pretty traders and farmer's percentage under control group was higher. No people were involved with poultry rearing, milk traders, butcher and boatman.



The living condition, safe water use, sanitation and fuel use by the people in studied areas are presented in Table 2 and Figure No 4, 5 and 6, respectively. Table 2, indicated that all respondent people have their own house. The structure of the main dwelling house (recorded by observation) the beneficiary group households was better than the control group households. As per the number of respondents, it was found that 63.27% people have semi-pakka house from beneficiary group and 42.86% of the control group. In the case of sanitary facilities, it was observed that most of the peoples in both control and beneficiary group uses septic tank/ slab latrine and no people use the hanging latrine and the open place/bush.

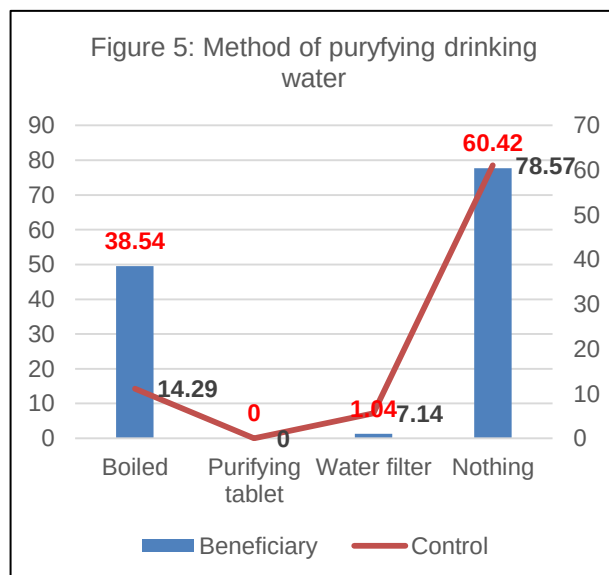
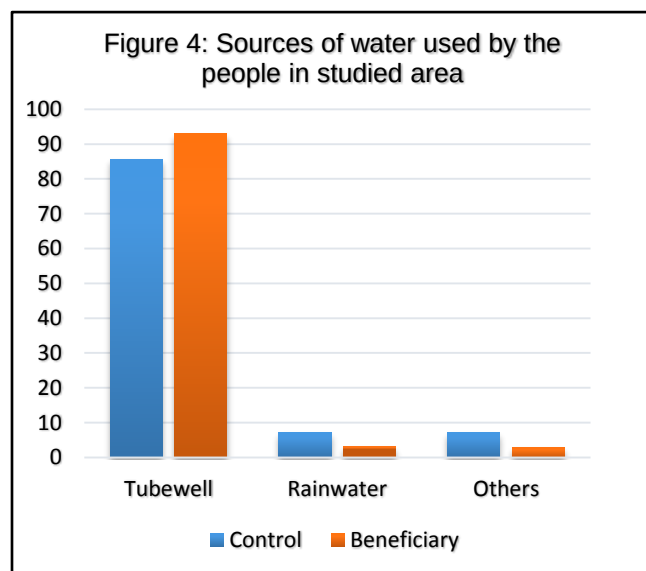
Table 2: Information about living condition, safe water, sanitation and fuel use

Questions	Response	Control	Beneficiary group
		Percentage	Percentage
Ownership of House	Own	100 (14)	100 (96)
	Rented	0	0
Structure of main dwelling house (record by observation)	Thatched/straw	14.29 (2)	4.08 (4)
	Golpata	-	1.04 (1)
	Tin/CI Sheet	28.57 (4)	25.51 (25)
	Semipakka	42.86 (6)	63.27 (62)
	Pakka/Building/Tile	14.29 (2)	6.12 (6)
Sanitation (latrine) Facilities	Septic tank/Slab latrine	83.33 (10)	95.05 (96)
	Pit latrine	16.67 (2)	3.96 (4)
	Hanging latrine		0.99 (1)
	Open place/bush		00
Source of Fuel for Cooking (Multiple)	Wood	35.71 (5)	30.11 (36)
	Bamboo	28.57 (4)	10.22 (19)
	Jute stick	-	5.38 (10)
	Cow dung	21.43 (3)	4.84 (9)
	Tree leaves	-	2.69 (7)
	LP Gas	14.29 (2)	46.24 (86)
	Electricity	-	0.54 (1)

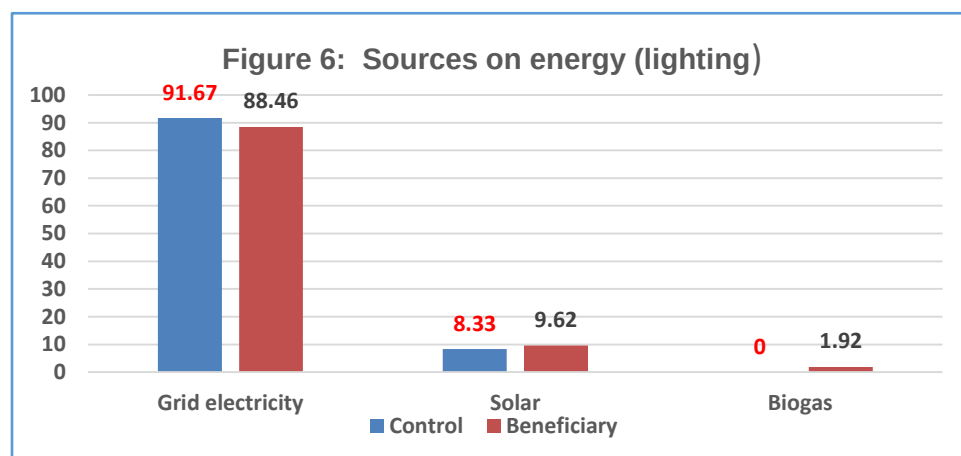
Parenthesis indicates the number of respondents

The most of the respondent people from the both groups used water from a tube well as drinking water (Figure 4). It was also observed that only 3.06 % (4) of respondents of beneficiary people use rain water as drinking water. In case of the method of purifying the

drinking water, most of the people (60 to 67%) from both group drink water without applying any purifying method and they do not use fitkriri (hydrated potassium aluminum sulphate) or any purifying tablet in their drinking water. Furthermore, it was observed that the more percentage (38.54 %) of people from the beneficiary group boiled their drinking water than the control group. The rain water was a good source of drinking water as it does not require further treatment.



The sources of energy that is, lighting and other purposes are used by the respondent is shown in Figure 6. The Figure 6, indicated that most of the people (88.45% of control and 91.67% from the beneficiary group) use grid electricity for their sources of energy. Very few numbers of people used solar (8.33 vs. 9.62% control vs. beneficiary) and biogas only one people from the beneficiary group (1.92%). In the case of sources of fuel for cooking, people uses LP gas, wood and cow dung and it was seen that higher number of the beneficiary group of people uses LP gas (46.24%), wood and cow dung than the control group of people (Table 2).



The total land ownership and operation of people in the studied areas is depicted in Table 3. Own homestead land, agriculture/crop land, pond partly or owned and mortgage was not differed significantly between the control and beneficiary group (Table 3). However, the beneficiary group has comparatively more land numerically than the control group. On the other hand, the beneficiary group has significantly more land for share crop in and grazing land than the control group of people. This might be the cause the beneficiary group is rearing more lumber of milking cows than the control group.

Table 3: Land ownership and use of lands

Description	Control			Beneficiary group			SEM
	Average (deci)	Min (deci)	Max (deci.)	Average (deci.)	Min (deci.)	Max (deci.)	
Homestead land owned	7.8±3.22 (14)	3	13	9.76 ± 4.29 (96)	1	33	0.980
Agriculture/Crop land owned	25.5±19.6 (12)	8	45	34.00 ± 17.88 (49)	20	121	4.250
Pond owned or part, if family owned	7.75±6.89 (10)	2	15	9.73 ± 13.38 (33)	2	80	0.990
Mortgage in	32.5±5.53 (10)	30	35	27.50 ± 6.33 (16)	15	40	2.500
Lease-in	-	-	-	28.60 ± 9.69 (15)	16	40	-
Share crop in	17.12 ^a ±3.23 (12)	10	25	31.28 ^b ± 6.53 (18)	20	40	7.080
Grazing land	7.2 ^a ±4.08 (6)	3	20	15.79 ^b ± 9.47 (19)	2	40	1.295
Fallow land	-	-	-	25.38 ± 14.33 (8)	8	15	-
Total Land (deci)	97.87±42.55			182.04±81.90			42.085
Source and availability of irrigation							
1. Rain water	-			7.69			
2. Deep tube well	-			84.62			

3. River water	-			7.69			
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Legends: deci= decimal, SEM= Standard error of mean, Parenthesis indicated the number of respondents; Means with different superscript a and b differed significantly at P<0.05. The household income and expenditure of the people in the studied areas from different sources (e.g. agriculture, livestock, business and job) are presented in Table 5.

Table 4: Income and expenditure (Bangladesh Taka) per households

Item	Control	Beneficiary group	SEM
Income/ year			
Income from crop production	60,000±12247.45 (13)	70,705±4832.68 (96)	352.45
Income from livestock rearing	74,000 ^a ±10295.69 (9)	77118 ^b ±4659.69 (94)	1559.00
Income from fisheries	35,000±8660.25 (7)	33,636±2295.34 (33)	681.82
Income from poultry	-	-	-
Income from business	87,500 ^a ±0.0 (8)	131,429 ^b ±40380.84 (7)	31964.29
Income from Job	-	73,500±9670.28 (30)	-
Others (Please specify)	155,000 ^b ±33291.94 (3)	86,556 ^a ±9872.70 (5)	34222.22
Total Income (BDT)	411,500^a±16123.83	472944^b±12814.34	-
Expenditure/ Year			
Food Expenditure	140,000±18973.67 (14)	136,188±16153.08 (96)	51906.25
Fuel/Electric	12,000±123.54 (14)	18,600±2708.82 (96)	3300.00
Travel Expenditure	26,400±2400 (5)	21,200±2516.93 (96)	2600.00
Communication/Mobile Expenditure	10,800±1200 (14)	14,963±2329.76 (96)	2081.25
Cloth Expenditure	23,000±4289.53 (12)	14,391±1517.93 (92)	4304.345
Children's Education Cost	21,000±1870.83 (10)	22,240±2302.85 (79)	620.25
Health Care Cost	10,146±3862.35 (6)	4,919±1178.27 (37)	2613.55
House building and maintenance	10,379±0 (1)	12,833±4044.89 (5)	1227.06
Payment of Loan	50,000 ^a ± 1234.87 (2)	75,000 ^b ±45000 (2)	12500.00
Payment of Installment	47,500 ^a ± 0 (1)	77,800 ^b ±21799.43 (20)	43887.50
Expenditure for social festival	4,596±1180.96 (7)	4,523±1813.69 (22)	36.54
Expenditure for livestock rearing	49,000±12453.23 (9)	64,162±3669.02 (94)	13830.68
Others (Please specify)	2196±216.53 (2)	-	-
Total Expenditure (BDT)	407017 ± 5345.96	466819 ± 9548.61	-
Net income/ Year/ Household	4,483 ± 10777.87	6125 ± 3265.73	-

Legends: SEM= Standard error of mean, BDT= Bangladeshi Taka, Parenthesis indicates the number of respondents; Means with different superscript a and b differed significantly at $P<0.05$.

The yearly average income per household of beneficiary group was higher (BDT 472,944) than the control group (BDT 411,500). More percentage of people's income coming from agriculture followed by livestock rearing and others. It was found that income from livestock, business and others differed significantly ($P<0.05$) between control and beneficiary group. Other income includes remittance of foreign, however, very few numbers of households fallen in this category. Furthermore, it was seen that livestock, poultry and fisheries sector contributes less income and thus, there is plenty of scope to increase the livestock, poultry and fisheries production in this area. A similar trend of income of rural people was reported by Khan et al. (2020) and Jamal Uddin et al. (2010). The main expenditures of both groups of peoples was food, expenditure for livestock rearing, fuel/electric, travel, communication (mobile costs), cloth and children's education and health care cost. Most of the costs were similar for both groups of people. However, the payment of the loan and the instalment of the loan was differed significantly between the control and beneficiary group and it was the more expenditure for the beneficiaries group as they are paying loan instalment to the IDF. The total net income per households of beneficiary group was more (BDT 6,125) than the control group (BDT 4,483) for the control group. These might be due to the beneficiary group of people earn more income from livestock rearing than the control group of people.

7.2. Module 2

7.2.1. Section B: Status of Animal Production, Processing and Marketing

The average number of livestock and poultry per household and breed percentage of the study areas is presented in Table 5. In the studied area the available species of livestock, such as, cattle, goat, chicken, duck and pigeon was seen. There were no significant differences found between the control and beneficiary groups for the total number of cattle per household (Table 5). Significant ($P<0.05$) differences were observed in the number of pregnant and dry cows only, between these two groups. Among the livestock and poultry numbers the average chicken's number per household was higher than other species. In the comparison to breeds in cattle, it was seen that Holstein–Friesian breed cows was a higher percentage than Deshi, Sahiwal and other genotype. The available goat breeds in the studied area were black Bengal. The breed type and the herd structure of both groups was similar to the study of Khan et al. (2012) and Uddin et al. (2011).

The animal (dairy) management information in the studied areas is presented in Table 6. Improved housed farms percentage was lower (42.46 to 46%) than non-improved (54 to 57%) housing of dairy farms under both control and beneficiary group in the studied areas. The shed type and construction of the shed was a semi-pakka and pakka and these types of shed was higher than the other types. Beneficiaries farm was more (57.41%) well ventilated than the control group farmers (37.50%). Both types of farmers' keep cleanliness to their cow shed more, and few numbers of respondents are separating the cow dung and urine and have drain around the animal shed under both group (Table 6). And the less number of farms has fenced in their animal shed found in the both types of farms. Systems of rearing for cattle are presented in Figure 7. For dairy cattle, it was seen that the higher percentage of farmers in both control and

beneficiary groups are rearing their cattle under intensive rearing system which was higher than the semi-intensive and extensive rearing systems. It was also seen that comparatively more percentage of beneficiary farmers reared their cattle in intensive rearing system than control farmers.

Table 5: Number of livestock and poultry per households and percentage of available breeds

Animal		Sex		Type of cattle						Total		
		Male	Female	Milking cow	Pregnant	Heifer	Bull	Dry cow	Bullock	Average	Min	Max
Cattle (Beneficiary)	Average	2.85 ±0.117 (48)	3.92 ±0.423 (58)	1.97 ±0.219 (58)	1.50 ^a ±0.046 (14)	1.44 ±0.08 (9)	1.25 ±0.125 (4)	1.40 ^b ±0.069 (10)	1.0 ±0 (4)	5.62 ±0.023 (58)	1.0	20.0
	Breed (%)	Deshi	58.33 (28)	5.17 (3)								
		Friesian	22.92 (11)	88.0 (51)								
		Sahiwal	18.75 (4)	3.44 (2)								
		Others	00	3.44 (2)								
Cattle (Control)	Average	1.61 ± 0.40 (8)	3.19 ±0.12 (7)	1.79 ±0.41 (7)	2.60 ^b ± 0.24 (5)	1.25 ± 0.25 (4)	-	1.0 ^a ±0 (1)	-	4.40 ±0.49 (8)	2.0	8.0
	Breed (%)	Deshi	60.00 (2)	60 (3)								
		Friesian	60.00 (3)	40 (2)								
Goat	Average	1.67±0.256 (3)	2.71± 0.67 (8)							4.20 ± 0.79 (8)	2.0	7.0
	Breed (%)	Black Bengal	100 (3)	100 (8)								

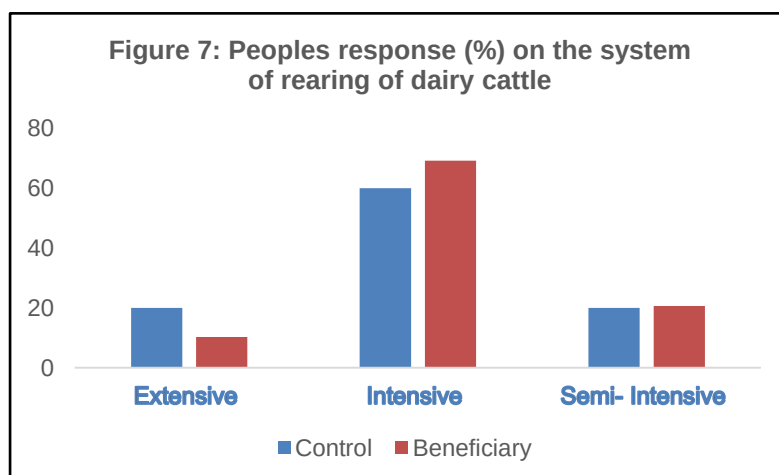
Parenthesis indicates the number of respondents

Means with different superscript a and b differed significantly at P<0.05.

Table 6: Percentages of respondents on animal (dairy) shed management

Questions	Response	Control	Response
Is there any Improved animal shed?	Yes	42.86 (6)	46.00 (41)
	No	57.14 (8)	54 (48)
If Yes, what type of shed you constructed?	Katcha	-	33.87 (21)
	Semi-pakka	33.33 (4)	25.81 (16)
	Pakka Other	66.67 (8)	38.71 (24)
	Others	-	3.23 (2)
Have the shed proper ventilation?	Well Ventilated	37.50 (3)	57.41 (31)
	Not well Ventilated	50.00 (4)	27.78 (15)
	Not Ventilated	12.50 (1)	5.56 (3)
	Other (Specify)	-	9.26 (5)
Do you maintain cleanliness of shed?	Well drainage	33.33 (3)	24.19 (15)
	Not Well drainage	66.67 (6)	75.81 (47)
Do you have arrangement for separating cow dung and urine?	Yes	28.57 (2)	22.22 (14)
	No	71.43 (5)	77.78 (49)
Do you have drain around the animal shed?	Yes	50 (3)	59.02 (36)
	No	50 (3)	40.98 (25)
Do you have any fence around the animal shed to protect the insects, bird's other animal?	Yes	28.57 (2)	35.09 (20)
	No	71.43 (5)	64.91 (37)

Parenthesis indicated the number of respondents



The information regarding the supplying of electricity and use of transparent and heat tolerance material in cow shed is presented in Table 7. Most of the farmer's dairy farm has connected with electricity, however, less than 50% people under both group checked their electricity connection regularly in their dairy shed. In addition, the comparatively lower percentage of people used less cost light, fan and other equipment's in their animal shed. For use of transparent material for adequate light shed material in your animal shed it was observed that less number of people of both groups used this material in their farm, however, the beneficiary group of people used more in number than the control group. For use of heat tolerance material in the animal shed and solar panel most of the respondents' people do not use these in their cattle shed. The percentage of respondents between the control and beneficiary group peoples did not differ except the use of transparent and heat tolerance material in the animal shed.

Table 7: Supplying of electricity and use of transparent and heat tolerance material in animal shed

Questions	Response	Control group	Beneficiary group
Does your farm have electricity connection?	Yes	76.92 (10)	82.86 (58)
	No	23.08 (3)	17.14 (12)
Do you check your electric connection regularly?	Yes	46.15 (6)	49.09 (27)
	No	53.85 (7)	50.91 (28)
Are you using less cost light, fan and other equipment's in your animal shed?	Yes	38.46 (5)	35.14 (13)
	No	61.54 (8)	64.86 (24)
Do you use any transparent material for adequate light shed material in your animal shed?	Yes	9.09(1)	14.29 (8)
	No	90.91 (10)	85.71 (48)
Do you use heat tolerance shed material in your animal shed?	Yes	16.67 (2)	8.16 (4)
	No	83.33 (10)	91.84 (45)
Do you use renewable solar panel in your animal shed?	Yes	16.67 (2)	10.87 (5)
	No	83.33 (10)	89.13 (41)

Parenthesis indicated the number of respondents

The information regarding the feeds, fodder and feeding of dairy cattle are presented in Table 9. The farmers fed their cattle roughages straw, green grass, green straw and concentrate mixture. However, the more number of people in beneficiary group is responding that they fed all the four feeds (straw, roughage, concentrates and green straw) to their cattle (Table 9). The more percentages (60.47%) of the peoples under beneficiary group preserve their cattle feed in the

Table 9: Response (%) of people on feeds and feeding of dairy cattle

Questions	Response	Control group	Beneficiary group
What are the feed you fed to your cattle	Straw	38.46 (5)	27.89 (70)
	Green Straw	7.69 (1)	22.71 (57)
	Green Grass	23.07 (3)	24.30 (61)
	Concentrate feed	30.76 (4)	25.10 (63)
Where do you preserve animal feed?	Open place close to animal shed	-	5.81 (5)
	Open place far from animal shed	35.71(5)	3.49 (3)
	In animal shed	21.43 (3)	60.47 (52)
	Separate open house	7.14 (1)	17.44 (15)
	Separate close house	21.43 (3)	12.79 (11)
	Others (Specify)	14.29 (2)	-
How do you feed your animal?	Stall feeding	66.66 (8)	83.33 (55)
	Pasture	16.67 (2)	12.12 (8)
	tethering	16.67 (2)	3.03 (2)
	Others	-	1.52 (1)
Where the animals usually graze?	Hill	7.14 (1)	7.84 (8)
	Plain land	50.00 (7)	37.25 (38)
	Fallow land	28.57 (4)	28.43 (29)
	Roadside	-	0.98 (1)
	Embankment	-	5.88 (6)
	Homestead	14.28 (2)	19.61 (20)
How many hours' animal is grazed in the field in a day?		4.60 ±1.29 (9)	5.75 ±1.22 (65)

Parenthesis indicated the number of respondents

dairy shed, whereas more percentages of people under control group preserve their cattle feed in the open place far from animal shed. More percentages of peoples from both groups feed their cattle in stall-feeding conditions. The farmers grazed their cattle on the plain land, fallow land and homestead from both groups. However, the differences observed between control and beneficiary group peoples response in case of green straw feeding, preserve the feed in open place far from animal shed, stall feeding and grazing on the plain land. The cattle are grazed in

grazing land 4.60 ± 1.29 h for control group and 5.75 ± 1.22 h for beneficiary group, respectively, and this grazing hours was differed significantly ($P < 0.05$).

Table 10, indicated that whether farmers know the daily feed requirements of cattle and irrespective of treatments, about 82.76% respondent don't know about the daily feed requirements of cattle and 17.24% respondents said they have idea about the cattle feed requirement and they also mentioned the requirements of roughages and concentrated of local and crossbred cattle (Table 10).

Table 10: Feed requirements of cattle

Questions		Response			Percentage	
Do you know daily feed requirement of cattle?		Yes (%)			17.24 (5)	
		No (%)			82.76 (24)	
Please mention the required feed elements with amount for cattle per day						
Item	Local		Crossbreed		Breed (pl specify-----)	
	Feed (kg)	Price (Tk/Kg)	Feed (kg)	Price (Tk/Kg)	Feed	Price (Tk/Kg)
Concentrate feed used (Kg/head/day) (Cattle)	3	40.00	4.5	40.00		
Straw/ UMS used (Kg//head/day) (Cattle)	10	4.00	12	4.00	-	-
Green grass supplied (kg/head/day) (Cattle)	16	2.00	20	2.00		
Which feed is available in your area?		Concentrate feed	Concentrate: broken corn and wheat, rice polish, rice bran, grains, brans and protein concentrate, vitamin and minerals			
		Straw	Rice straw			
		Green Straw	Immature dry paddy, maize			
		Green Grass	HYV: Napier (<i>Pennisetum purpurium</i>), para (<i>Brachiaria mutica</i>) and German (<i>Echinochloa polystachya</i>) Local grasses: Durba (<i>Cynodon dactylon</i>), Helancha, Mutha (<i>Cyperus rotundus</i>), Puti (<i>Heliotropium indicus</i>) Chora (<i>Algelica glauca</i>), Painna grass.			

The information of supplying of water to the dairy cattle and sources of water and water preservation for the animals is presented in Table 11. This table 11, showed that the peoples of

both group supply tube well water to their cattle. Both groups of people know that tube well water is safe for dairy cows. This Table 11, also indicated that no control group people preserve rain water for their cattle, but very few numbers of people from the beneficiary group preserved rain water in the tank for their cows.

Table 11: Percentage of respondents about supplying of water to the cattle and sources of water and water preservation

Questions	Response	Control	Beneficiary group
Do you supply water to your cattle?	Yes	72.23 (8)	97.83 (90)
	No	27.27 (3)	2.17 (2)
Indicate the sources of water for cattle	Tube well	83.33 (5)	95.45 (84)
	Ring well	-	-
	Pond	16.67 (1)	2.27 (2)
	River/canal	-	1.14 (1)
	Rainwater	-	-
	Others(spfy)	-	1.14 (1)
Which source of water is safe for cattle?	Tube well	66.67 (6)	80.00 (16)
	Pond	33.33 (3)	10.00 (2)
	Ring well	-	10.00 (2)
Do you preserve rainwater for use of drinking water for cattle?	Yes	-	10.00 (5)
	No	100.00 (6)	90.00 (45)
If yes, where do you preserve rainwater?		-	tank

Parenthesis indicated the number of respondents

The vaccination, deworming and biosecurity of dairy cattle under both control and beneficiary group is presented in Table 12. From the Table 12, it was seen that the most of the farmers from beneficiary group follow regular vaccination (66.07%) and deworming (68.52%) schedule for their animals, as they know that the regular vaccination and deworming reduces the infectious diseases. They keep regular vaccination of common infectious diseases like foot and mouth diseases (FMD), black quarter (BQ), anthrax and hemorrhagic septicemia (HS) to their cattle. The farmer's follow the bio-security measures for their animal. However, more number of the people of the beneficiary group maintained the disease control and biosecurity measures.

Table 12: Respondents percentage on vaccination, deworming and biosecurity in cattle shed

Questions	Response	Control	Beneficiary group
Did you practice scheduled vaccination?	Yes	28.57 (4)	66.07 (37)
	No	71.73 (10)	32.93 (19)
If yes, which vaccination used?	FMD	38.46 (5)	31.94 (61)
	BQ	23.08 (3)	23.56 (45)
	Anthrax	30.77 (4)	26.18 (50)
	HS	7.69 (2)	15.71 (30)
	Others	-	2.62 (5)
Scheduled de worming practiced?	Yes	33.33 (4)	68.52 (37)
	No	66.67 (8)	31.48 (17)
Bio-security of animal shed followed?	Yes	30.76 (4)	29.27 (12)
	No	69.23 (9)	70.73 (29)

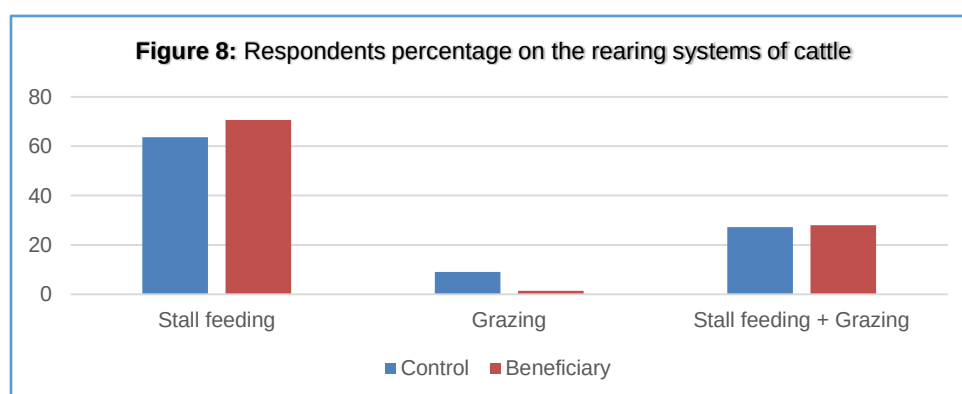
Parenthesis indicated the number of respondents

The information about the feeds and fodders for dairy cattle is presented in the Table 13. More than 85% people from the beneficiary and 72.72% people from the control groups did not cultivate high yielding (HYV) perennial fodders (Table 13). It was also observed that both the group of people cultivated perennial and seasonal fodders and they fed their cattle mainly seasonal fodders. Cattle are grazed on the hilly plain land, fallow land, and roadside embankment and homestead areas. Among the HYV fodders Napier (*Pennisetum purpurium*), para (*Brachiaria mutica*) and German (*Echinochloa polystachya*) grasses were cultivated by the both groups of farmers. In addition, both groups of farmers also cultivated the seasonal grasses like cowpea (*Vigna unguiculata*), maize (*Zea mays*) and khesari (*Lathyrus sativus*) etc. and more people of the beneficiary group cultivated than the control group farmer. Both groups of farmers don't have idea that Shajna (*Moringa oleifera*) is an animal feed and they are not agreed to feed Shajna to their cattle. Furthermore, the farmers feed their cattle the local grasses and they indicated the name of some local grasses. The systems of rearing of cattle in both groups are shown in Figure 8. Figure 8, indicated that farmers rearing their cattle in stall-feeding and stall feeding+grazing system.

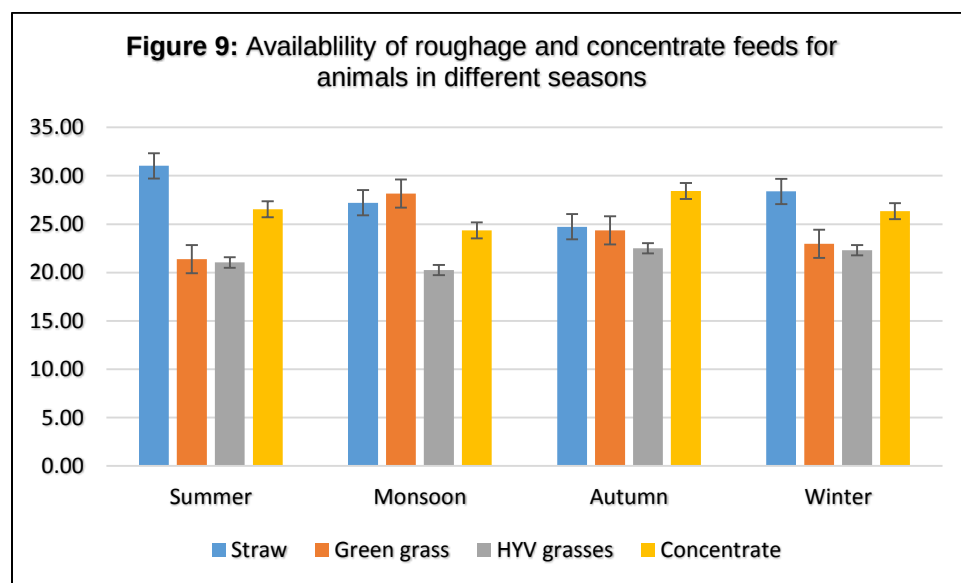
Table 13: Respondents percentage on the feed and fodder for animals (cattle)

Questions	Response	Control group	Beneficiary group
Do you use cultivated fodder (HYV) for your cattle?	Yes	27.27 (3)	14.75 (9)
	No	72.72 (8)	85.25 (52)
If Yes, what type of fodder you fed?	Perennial	22.22 (2)	9.68 (6)
	Seasonal	77.78 (7)	90.32 (56)
	Tree leaves	-	-
What are perennial fodders (HYV)?	Napier	44.44 (4)	36.54 (38)
	Para	33.33 (3)	21.15 (22)
	German	22.22 (2)	42.31 (44)
What are seasonal fodders?	Cowpea	-	6.98 (6)
	Lintil	-	2.33 (2)
	Kheshari	23.08 (3)	40.70 (35)
	Maize	61.54 (8)	18.60 (16)
	Others	15.38 (2)	31.40 (27)
Do you have any idea that Shajna Can use as animal feed?	Yes	-	18.75 (3)
	No	100.00 (2)	81.25 (13)
Will you feed Shajna to your animal if it will work best?	Yes	0	0
	No	100.00 (2)	100.00 (13)
Do your animals feed local grass?	Yes	75.00 (6)	91.57 (76)
	No	25.00 (2)	8.43 (7)
If yes, please indicate the name of these local grasses?	Durba (<i>Cynodon dactylon</i>), Helancha, Mutha (<i>Cyperus rotundus</i>), Puti (<i>Heliotropium indicus</i>) Chora (<i>Algelica glauca</i>), Painna grass. -		

Parenthesis indicated the number of respondents



The availability of feeds and fodder in the studied areas is shown in the Figure 9. Figure 9 showed that straw is available throughout the year and abundant during winter to summer and lean season is autumn. Green grasses are available during the monsoon and autumn, but scarcity period is late winter to summer. The beneficiary group farmers cultivated High yielding variety of fodder, but the numbers of respondents' peoples are few. However, farmers keep continuity throughout the year feeding with a concentrated mix of their cattle.



The milk production characteristics of cows under control and beneficiary group farmers is presented in Table 14. The available breeds of the cows were found non-descriptive Deshi, Holstein-Friesian and crossbreds and more number of respondents people rear Holstein genotype, this finding agreed with the findings of Chando et al. (2021a). Farmers milked their cows in the morning and evening and it was observed that morning milk production was higher than evening. The daily average milk yield for cows of control group was 7.96 ± 1.062 litre/day and for beneficiary group was 9.63 ± 2.726 litre/day, which was significantly differed between the beneficiary and control groups. Farmers of both groups reared mainly Holstein and their crossbreds. The daily milk production of available Holstein genotypes is similar to Khan et al. (2005) and Hossain et al. (2002) under Bangladeshi conditions. There were no significant differences observed the between control and beneficiary farmer's cows for lactation length, and calving interval. The highest lactation yield of cows was observed in beneficiary group (2189.20 ± 63.679 litre) than the control group (1806.79 ± 98.731 litre) people and which differed significantly ($P < 0.05$) between the beneficiary and control groups. The lactation production of Holstein and Holstein crossbred was concordant with Khan and Mazumder (2011), Das et al. (2013). Lactation number of cows were also significant ($P < 0.05$) difference between the group that is the value 2.54 vs. 3.57, beneficiary vs. control group.

Table 14. Milk production characteristics of cows under control and beneficiary group farmers

Cattle	Breed	Percent age	Milk yield (litre)		Daily milk yield (litre)	Lactation length (day)	Total milk yield (litre)	Lactation Number	Calving interval (day)	Post-Partum heat period (day)
			Morning	Evening						
Control group	Deshi	7.69 (1)	6.32 ^a ± 0.609 (13)	3.29 ± 0.563 (6)	7.96 ^a ± 1.062 (13)	227.85 ±10.098 (13)	1806.79 ^a ± 98.731 (13)	3.57 ^b ±0.179 (12)	387.30 ±6.498 (12)	66.17 ^a ±6.323 (12)
	Friesian	53.85(7)								
	Crossbred	46.15(5)								
Min			3	2	3	180	540	3	350	45
Max			10	6	15	270	3150	5	420	120
Beneficiary group	Deshi	1.87 (2)	7.80 ^b ± 0.152 (113)	3.32 ± 0.107 (62)	9.63 ^b ± 0.272 (113)	227.69 ± 2.726 (113)	2189.20 ^b ± 63.679 (113)	2.54 ^a ±0.088 (108)	377.44± 3.391 (86)	76.78 ^b ±2.745 (87)
	Friesian	85.98 (92)								
	Crossbred	4.67(13)								
Min			4	2	4	170	800	1	300	45
Max			11	5	16	270	3360	5	480	120

Legends: Min: Minimum, Max= Maximum, Parenthesis indicates the number of respondents

Means with different superscript a and b differed significantly at P<0.05.

The response percentage regarding the measurements taken before and after milking of cows is shown in Table 15. Table 15, showed that both groups of farmers clean their farm in the morning and noon, but the number of farmers was more under beneficiary group than the control group. Both types of farmers used sanitizer / cleaning agent during cleaning to their farms, but the high percentage of farmers from the beneficiary group than the control group practiced it. Usually, they use bleaching powder, Lysol and Savlon. For the time interval between routine checkups of their cows, most of the respondent said that they checked their cows routinely as a weekly and periodically basis. The less percentage of the farmers from both groups clean their cows before milking, they washed the cow's udder, hind quarter, etc. They also cleaned the milking places and milker's hand, after milking their cow but the number of percentages was lower than the numbers were unpracticed.

Table 15. Percentage of people on the measurements taken before and after milking of cows

Questions	Response	Control	Beneficiary group
Do you clean your farm and cow?	Yes	18.18 (2)	60.49 (49)
	No	81.82 (9)	39.51 (32)
In what time, you clean your farm and cows?	Morning	83.33 (10)	51.81 (43)
	Noon	16.67 (2)	26.51 (22)
	Afternoon		15.66 (13)
	Before milking		3.61 (3)
	After milking		2.41 (2)
	Others		
Do you use sanitizer/cleaning agent during cleaning?	Yes	16.67 (2)	52.27 (23)
	No	83.33 (10)	6.82 (21)
Please give the name of sanitizer / cleaning agent	Bleaching powder, Savlon, Lijol		
Time interval between routine checkup of the cow	Weakly	20.00 (2)	17.07 (7)
	periodically	80.00 (8)	78.05(32)
	Monthly	-	-
	Bi-monthly	-	4.88 (2)
	Six monthly	-	-
	Yearly	-	-
	None	-	-
Do you wash and clean the cows before milking?	Yes	40.00 (4)	76.67 (23)
	No	60.00 (6)	23.33 (7)
Do you wash the udder of cows before milking?	Yes	100.00 (7)	100.00 (31)
	No	-	-
Do you wash the hind quarter of cows before milking?	Yes	20.00 (2)	29.03 (9)
	No	80.00 (8)	70.97 (22)
Do you Clean the milking place before milking?	Yes	30.00 (8)	43.33 (13)
	No	70.00 (7)	56.67 (17)
Are the milkers clean their hand before milking?	Yes	40.00 (2)	26.67 (8)
	No	60.00 (3)	73.33 (22)

Parenthesis indicates the number of respondents

The response (%) about handling of cow's milk, after milking is presented in Table 16. The people from both the control and beneficiary group preserved their cow's milk in a pot and drum; and more number of people preserve milk in a pot. Table 16, also indicated that farmers don't use any type of preservatives and foreign materials in the milk and farmers thrown spoilage milk on the ground and water. In addition, it was seen that 50% people carry their milk to the market themselves and 50% sale their milk to the goala/ middle man at the farm gate. Moreover, most of the farmers don't produce milk products only a few numbers of people produced dahi (yoghurt) and people do not have any idea of using 1 kg milk, how much milk products are produced.

Table 16: Respondent percentage on the handling of cow's milk

Questions	Response	Control group	Beneficiary group
How do you preserve the milk after milking?	Pot	83.33 (10)	95.91 (47)
	Drum	16.67 (2)	4.09 (2)
Do you use any preservatives for milk preservation	No	100.00 (6)	100 (19)
How do you carry milk to the market	Himself	50.00 (3)	44.44 (8)
	Goala	50.00 (3)	55.56 (10)
If milk are spoilage what do you do with this milk	Thrown in mud/water		
Do you mix any foreign matter (flour, myda, sugar, batasha etc.) in the milk?	Yes	-	-
	No	100.00 (3)	100.00 (19)
Do you produce any milk products?	Yes	16.67 (1)	10.00 (1)
	No	83.33 (5)	90.00 (9)
If yes, what are this?	Dahi	100.00 (1)	100.00 (1)
	Ghee	-	-
	Ghol	-	-
	Powder milk	-	-
	Butter	--	-
	cheese	-	-
	Sweatmeat	-	-
	Others	-	-
Do you have any idea of using 1 kg milk, how much milk products are produced	Yes	-	-
	No	100 (4)	100 (19)

Parenthesis indicates the number of respondents

Breeding related information of cows in in the studied areas is shown in Table 17. The average age and service per conception of the cows was 3.36 to 3.87 years and 2.01 to 2.33 between the beneficiary and the control group's cow's, respectively. About 67.62% of the farmers from beneficiary group and 66.67% from control group given their opinion that they used artificial insemination instead of natural service and the success rate of AI was higher. The sources of frozen semen were BRAC, DLS and milk vita. When they use BRAC semen their AI service cost

was higher than the users of DLS semen. The same statement was observed by Khan et al. (2018) at the Chattogram Hill Tracts (CHT).

Table 17. Breeding related information of dairy cows

Cattle No	Age (Year)	No of Service	Type of insemination (%)		Insemination Cost, Taka	Result (%) (1= Successful 2=Unsuccessful)		Sources of semen (%)			
			Natural	Artificial		1	2	DLS	BRACK	Milk vita	Others
Beneficiary group	3.36±1.08 (105)	2.01±0.85 (100)	32.38 (34)	67.62 (71)	300.00 to 1000.00	71.43 (13)	28.57 (3)	41.75 (11)	53.40 (17)	3.88 (4)	0.97 (1)
Control group	3.87±0.99 (15)	2.33±0.35 (15)	33.33 (2)	66.67 (4)	300.00 to 1000.00	64.28 (5)	35.71 (2)	60.00 (6)	40.00 (4)	-	-

Parenthesis indicates the number of respondents

7.3. Module 3

7.3.1. Section C: Training, extension and related activities

Information on training and extension related activities of livestock rearing to the farmers in the studied areas are presented in the Table 18. From Table 18, it can be seen that about 33% of the respondent people from both the control and beneficiary group received training on livestock rearing. The training agencies were the Department of Livestock Services (DLS), Bangladesh Rural Advancement Committee (BRAC), Integrated Development Foundation (IDF), Youth Training Center (YTC), Association for Social Advancement (ASA) and Rangpur- Dinajpur Rural Service (RDRS) and the duration of the training was ranging from 01 to 03 days (Table 18). Among the agencies BRAC has given more training to their beneficiary members followed by IDF and DLS, respectively. This table also indicated that among the respondent farmer's no one has attendant on the training course on bio-security.

The information regarding the farmer's opinion on the livestock technology training courses is shown in the Table 19. Farmers from both groups received training on improved feeding and rearing of cows, beef fattening technology, disease control and vaccination. However, the number of respondents of these trainings was very little. In addition, a few numbers of people got training on preliminary treatments of animals and training on global practices. Farmers also given their comments whether they will practice the training knowledge in their own farm or they will advise to implement the training knowledge on their neighbor's farms. About 78 to 80% farmers from both control and respondent groups said that they would not be able to apply their training knowledge in their farms, as the training course was complicated for them, training duration was very short and lack of hands on practice in training (Table 19). However, fewer numbers of respondents farmer also said that they would apply their training knowledge in their own farms and they would provide advice to their neighbors and they try to motivate themselves.

Table 18. Information regarding the Training on Livestock

Questions		Control group			Beneficiary group		
Did you receive any training on Livestock technology?	Yes (%)	33.33 (4)			33.66 (34)		
	No (%)	66.67(8)			66.34 (67)		
Which agency and training course, duration respondent?	Agency	Respondent (%)	Duration (Days)	Training course	Respondent (%)	Duration (day)	Training course
	DLS	33.33 (1)	01 to 03	Fattening of cattle, vaccination and preventive measures	24.24 (8)	01 to 03	HYV fodder cultivation, Fattening of cattle, Vaccination and preventive measures
	BRAC	66.67 (2)	03	Fattening of cattle	39.39 (13)	03	Fattening of cattle
	IDF	-	-		30.30 (10)	01 to 03	Fodder production, Dairy rearing, vermin composting
	YTC	-	-		6.06 (2)	01	Vaccination and preventive measures
You or any members of house hold attended bio-security training?	Yes	-			-		
	No	100.00 (3)			100 (95)		

Parenthesis indicates the number of respondents

Table 19. Farmer's response (%) on the livestock technology training courses

Question	Response	Control group (%)	Beneficiary group (%)
In which Livestock Technology you received training and How many times	Improved feeding and rearing practices of cow	50.00 (2)	50.00 (6)
	Beef fattening technology	25.00 (1)	33.33 (4)
	Disease prevention & Vaccination	25.00 (1)	16.67 (2)
Do you have training on preliminary treatment of your animal?	Yes	20.00 (2)	22.00 (22)
	No	80.00 (8)	78.00 (78)
Do you have training on global good practice?	Yes	8.33 (1)	3.33 (3)
	No	91.67 (11)	96.77 (90)
Are you applying your training knowledge in your farm?	Yes	22.22 (2)	25.00 (12)
	No	77.78 (7)	75.00 (36)
If no, why?	Duration of training was very short, Lack of practical knowledge, Could not memorize the training subjects		
If yes, how?	Practicing the improved methods in own farm	50.00 (2)	75.00 (9)
	Motivating neighbors for practicing improved methods	50.00 (2)	25.00 (3)

Parenthesis indicates the number of respondents

7.4. Module 4

7.4.1. Section D: Environmental factors in dairy sub-sectors

Information about the animal environment and social safety issues regarding the transmission of diseases is presented in Table 20. About 50% of the respondents' farmers from the both group rearing their cattle under the separate shed. On the other hand, a higher percentage (41.67%) of farmers from control groups rearing their cattle inside a room. Whereas 20.59% of beneficiary farmers rearing their cattle in the free ranging conditions (Table 20) and the differences was observed between the control and beneficiary group on this observation. About 50% of the respondents said that their cattle come into contact with the wild animals/birds. More than 54% of respondent from the both groups said that their cattle come into contacts with wild fox, vermin etc. A lower number (25.00%) of control group and higher number (59.59%) of beneficiary group farmers have idea that the wild animals/birds could be a source of infection/illness of their cattle.

Furthermore, both groups of farmers thought there was a risk of mixing of animals with other animals/birds causing disease of their cattle (Table 20).

Table 20: Animal environment and social safety issues: Farmers response (%) regarding the transmission of diseases

Questions	Response	Control group	Beneficiary group
How do you rear your cattle?	Under separate shed	50.00 (6)	51.47 (70)
	Inside a room	41.67 (5)	27.94 (38)
	Free ranging	8.33 (1)	20.59 (28)
Does your animal come in contact with any wild animals/birds?	Yes	54.55 (6)	42.22 (38)
	No	45.45 (5)	57.78 (52)
If yes, which animals/birds?	Migrated birds	-	8.57 (9)
	Dog	33.33 (2)	34.29 (36)
	Pig	-	2.86 (3)
	Chi/Eagle	-	-
	Others (fox, vermin Etc.)	67.67 (4)	54.29 (57)
Do you think wild animal/birds can be a source of infection/illness to your animal?	Yes	25.00 (2)	59.59 (50)
	No	75.00 (6)	40.41 (34)
Do you think there is a risk from mixing of animal with other animals causing disease of your animals?	No risk	20.00 (2)	23.46 (19)
	Some risk	60.00 (4)	65.43 (53)
	Big risk	20.00 (2)	11.11 (9)

Parenthesis indicates the number of respondents

The information about the animal environment and social safety regarding the transmission and management of diseases are shown in Table 21. From Table 21, it was seen that, most of the respondents from both groups said that their children do not come in contact with their animal. However, those children come in contact with animals they respondents that it was not a big risk to come in contact their children with animals. This Table 21, also indicated that when their cattle become sick, they separated the sick animals with others, but some respondents said they don't do anything for the sick animals, and some people sell their infected animals in the market. When their animal died from any diseases, most of the people of both group respondents that they buried the dead carcass, and some people said they were thrown the carcass in the open places but the respondents' number was less. When, if there is an outbreak occurred in the neighborhood's animal, then the people taken measures not to mix their animals with the neighbor's animals, and some peoples said they vaccinated their animals. After the handling of animals and after slaughtering and handling animal meat, about 46-49% of the peoples from beneficiary group and 33-43% from control group respondents that they washed their hands with soap and water. More than 80% peoples among the respondents from both control and beneficiary groups said that they buried the slaughter waste properly.

Table 21: Animal environment and social safety issues: Respondents percentage regarding the transmission and management of diseases

Questions	Response	Control group	Response group
Do children come in contact with animal?	Yes	33.33 (4)	45.78 (38)
	No	66.67 (8)	54.22 (45)
Do you think there is any risk that a child can become ill after contact with animals?	No risk	14.29 (1)	15.00 (12)
	Some risk	57.14 (4)	57.50 (46)
	Big risk	28.57 (2)	27.50 (22)
What do you do when you notice a sick animal in your stock?	Nothing	50.00 (5)	21.52 (17)
	Put in separate	30.00 (3)	35.44 (28)
	Sell	20.00 (2)	29.11 (23)
	Slaughter and eat	-	1.27 (1)
	slaughter and sell	-	3.80 (3)
What do you do when any animal dies?	Throw in roadside/river/ditch /bush	14.29 (1)	15.52 (9)
	Bury	57.14 (4)	74.14 (43)
	uncover the skin & sell	14.29 (1)	6.90 (4)
	Nothing	14.29 (1)	3.45 (2)
What do you do if there is an outbreak in the neighborhood?	Nothing	18.18 (2)	12.94 (11)
	Take measures not to mixed with neighborhood animals	54.55 (6)	54.12 (46)
	Vaccinate own animals	27.27 (3)	28.24 (24)
	Others	-	4.71 (4)
How often do you wash your hands with soap and water after handling/s animals?	Always	42.86 (3)	48.86 (43)
	Sometimes	28.57 (2)	35.23 (31)
	Rarely	14.29 (1)	10.23 (9)
	Never	14.29 (1)	5.68 (5)
How often do you wash your hands with soap and water after slaughtering and handling animal meat?	Always	33.33 (2)	46.43 (26)
	Sometimes	33.33 (2)	30.36 (17)
	Rarely	16.67 (1)	17.86 (10)
	Never	16.67 (1)	5.36 (3)
How do you dispose slaughter waste?	Leave them at slaughter place	16.67 (1)	8.93 (3)
	Throw in open area	-	1.79 (1)
	Bury	83.33 (5)	89.29 (50)

Parenthesis indicates the number of respondents

The information regarding the animal environment and social safety issues: measures with slaughter and dead animals are shown in Table 22. About 33.33% respondents from the control group and 62.35% from the beneficiary group of people's said that there is a health risk in handling the dead animals. From the both groups, about 57.29% people from the control group and 42.13% from the beneficiary group said that there is no health risk if they do not wash their hands after touching animals and before preparing or eating food. In addition, Table 22, also indicated that 75% respondent people from the control group and 98.98% of the peoples from the beneficiary group given their opinion that they washed their hands after burying or disposing of dead animal. For the washing of hands, about 50% people used soap with water and more than 26% people washed their hands with water only, and very few number of people used water and ash for washing their hands.

Table 22. Animal environment and social safety issues: People response (%) on the measures with slaughter and dead animals

Questions	Response	Control group	Beneficiary group
Do you think there is a health risk in handling dead animal?	Yes	33.33 (2)	62.35 (53)
	No	66.67 (4)	37.65 (32)
How risky is it to your health if you do not wash your hands after touching animals and before preparing or eating food?	No risk	57.29 (4)	42.53 (37)
	Some risk	28.57 (2)	47.13 (41)
	Big risk	14.29 (1)	10.34 (10)
Do you wash your hands after burying or disposing of dead animal?	Yes	75.00 (6)	98.86 (87)
	No	25.00 (2)	1.14 (1)
What do you use in washing your hands?	Soap and water	50.00 (3)	53.52 (38)
	Water only	33.33 (2)	26.76 (19)
	Water and ash	16.67 (1)	11.27 (8)
	Disinfectant	-	-
	Others	-	8.45 (6)

Parenthesis indicates the number of respondents

The information about the health safety issues of workers in the animal farm is presented in the Table 23. More than 44% people among the respondents from both groups said that they have arranged for personal protection equipment (PPE) for their workers on their farm and they mentioned the available PPE in their farm was hand gloves, mask and gumboot. Besides, when the workers clean the manure and urine in the farm, they used personal protection equipment (PPE), said 62.50% among the respondents of the control group and 74.29% of the beneficiary group. The workers used the PPE like gumboot, mask, hand gloves, etc. For the risk in the workplace, the respondent said they have risk from snake bite, harmful insects and plants and others, but they could not mention the name of the risks specifically. The respondents also said if they felt in any accident, they have taken treatments. Furthermore, very few number of respondents from both control and beneficiary group told that they have preliminary treatment facilities, hand washing facilities, toilet facilities and supply of fresh water for washing of hand

and mouths of their workers. However, more than 96.87% respondent said they don't have separate toilet facilities for the male and female workers.

Table 23: Respondents percentage on the health safety issues of workers in the dairy farm

Questions	Response	Control group	Beneficiary group
Do you have arrangement of any personal protection equipment (PPE) for the workers in your farm	Yes	44.44 (4)	44.68 (21)
	No	55.56 (5)	53.32 (26)
If yes, please indicate the name of the PPE	Hand gloves	25.00 (1)	28.57 (6)
	Mask	50.00 (2)	52.38 (11)
	Gumboot	25.00 (1)	19.04 (4)
When the workers clean the manures and urine are they use any personal protection equipment (PPE) in your farm?	Yes	37.50 (3)	25.71 (9)
	No	62.50 (5)	74.29 (26)
If yes, please indicate what are the PPE	Hand gloves	-	33.33 (3)
	Mask	21.43 (2)	44.44 (4)
	Apron		
	Shoe (Gumboot)	21.43 (1)	22.23 (2)
	Others	0.00	22.81 (26)
Is there any risk in workplace	Yes	62.50 (5)	51.35 (19)
	No	37.50 (3)	48.65 (18)
If yes, what are these?	Snake bite	20.00 (1)	9.52 (2)
	Harmful insects or plant	40.00 (2)	14.29 (3)
	Others	40.00 (2)	76.19 (16)
What are the measures have you taken to recover this risk at workplace?		Treatment	Treatment
Is there any preliminary treatment for the workers in your farm?	Yes	16.67 (1)	17.65 (6)
	No	83.33 (5)	82.32 (28)
Is there any hand washing facilities for workers in your farm?	Yes	40.00 (2)	56.76 (21)
	No	60.00 (3)	43.24 (16)
Do you have supply fresh water in your farm for washing hand and mouth of your worker?	Yes	80.00 (4)	88.89 (32)
	No	20.00 (1)	11.11 (4)
Do you have good toilet facilities for your workers in your farm?	Yes	20.00 (4)	31.25 (10)
	No	80.00 (1)	68.75 (22)
Do you have separate toilet facilities for your male and female workers?	Yes	-	3.13 (1)
	No	100 (5)	96.87 (31)

Parenthesis indicates the number of respondents

The information about the climatic factors are presented in Table 24. About 83% of the respondents of control group and 97% of beneficiary group peoples said that natural disaster happened due to the change of climates in their areas. They also mentioned the name of the disasters, as flood, drought, cyclone, tornado, salinity, tidal, earth quark and heavy raining.

However, the highest percentage of respondents said flood and tidal is a big problem for them. The respondent farmers also said during the last 5 years, they faced problems with flood, drought and tidal. More than 50% respondents' people from both groups have taken measures by storing human and animal food and buying some medicine for preliminary treatments. Furthermore, about 66.67% of the respondents from the control group and 89.19% of the beneficiary group people said the milk yield of cows were fluctuated with the fluctuation of ambient temperature. More than 66% people from the respondents of control group and 75% people of the beneficiary group said that the highest milk yield of cows was obtained during monsoon because, during this period green grass are available.

Table 24: Farmers opinion (%) on the climatic factors

Questions	Response	Control group	Beneficiary group
Is there any disaster happened due to the change of climates in your area?	Yes	83.33 (5)	97.70 (85)
	No	16.67 (2)	2.30 (2)
If yes, please indicate the name	Flood	33.33 (4)	36.84 (77)
	Drought	16.67 (2)	8.13 (17)
	Cyclone	0.00	14.35 (30)
	Tornado	0.00	8.13 (17)
	Salinity	0.00	4.78 (10)
	Tidal	33.33 (4)	19.62 (41)
	Earth quake	8.33 (1)	1.91 (4)
	Heavy raining	8.33 (1)	6.22 (13)
	Others	-	-
List the disasters you faced last 5 years.	Flood	40.00 (2)	49.02 (25)
	Drought	40.00 (2)	41.18 (21)
	Tidal	20.00 (1)	9.80 (5)
Have you taken any steps to overcome the disasters	Yes	50 (2)	63.64 (28)
	No	50 (2)	36.36 (16)
If yes, what are these?	Storage of food and water and important medicine for preliminary treatment		
Do you think milk yield of cows are affected with the fluctuations of ambient temperature?	Yes	66.67 (4)	89.19 (33)
	No	33.33 (2)	10.81 (4)
Indicate the milk yield of cow highest in season	Winter	33.33 (1)	24.39 (10)
	Monsoon	66.67 (2)	75.61 (31)

Parenthesis indicates the number of respondents

The air, water and sound pollution information of dairy farm is shown in the Table 25. As per the respondents of the control group farmers, they don't have a generator in their dairy farm and from the beneficiary farmers, only 3.39% farmers have generator in their farm. However, they did not maintain proper height for setting the chimney of generator (15 ft height of land) and don't have a protective wall (canopy) for reducing the sound of the generator. Both groups of farmers don't use any high sound producing machine (chopper, grinder etc.) in their dairy shed. Furthermore, only 1 to 2 farmers have separate pit for disposed the manure and urine. The distance of the manure pit from the farm was 25.15 ± 2.34 ft and 29.23 ± 54.21 ft for control and beneficiary group farmers, respectively. Most of the farms do not have a separate arrangement

for separating manure and urine in their dairy shed. About 45% peoples of the control group and 29.73% people of the beneficiary group uses cow dung as a fuel. Very fewest number of people from both groups has

Table 25. Respondents percentage on the air, water and sound pollution in the cattle shed

Questions	Response	Control group	Beneficiary group
Do you use generator in your dairy farm?	Yes	-	3.39 (2)
	No	100 (13)	96.61 (57)
If yes, is the chimney of generator set in safety height (15 ft height from land)	Yes	-	100 (2)
	No	-	-
Do you have protective wall (canopy) for reducing the sound of generator?	Yes	-	
	No	-	100 (2)
Are you using any high sound producing machine (chopper, grinder etc.) in your animal shed?	Yes		
	No	100 (12)	100 (43)
What are the measures you taken for reducing air pollution?		-	-
For reducing the air pollution are you hang a notice board in your animal shed?	Yes	-	-
	No	100 (11)	100 (42)
How do your drainage manure and urine produced from your cow shed?			
Do you have any separate pit for dispose the manure and urine?	Yes	14.29 (1)	4.44 (2)
	No	85.71 (6)	95.56 (44)
How far the manure pit from your cow shed?		25.15± 2.34 (5-50) ft	29.23±54.21 (2-200) ft
Do you have separate arrangement to separate manure and urine in your animal shed?	Yes	16.67 (1)	35.19 (19)
	No	83.33 (5)	64.81 (35)
Do you use cow dung as fuel?	Yes	45.45 (5)	29.73 (11)
	No	54.55 (6)	70.27 (26)
Do you have biogas plant?	Yes	7.69 (1)	8.57 (3)
	No	92.31 (12)	91.43 (32)
What kind of raw material you use in your biogas plant?	Cow dung		
What do you do by the used syringe, needle, bottle, and others treatment debris?	Thrown	16.67 (1)	22.22 (2)
	Buried	83.33 (5)	77.78 (7)
Where you through it or you give it to others?	Thrown	-	22.22 (1)
	Buried	-	77.78 (2)

Parenthesis indicates the number of respondents

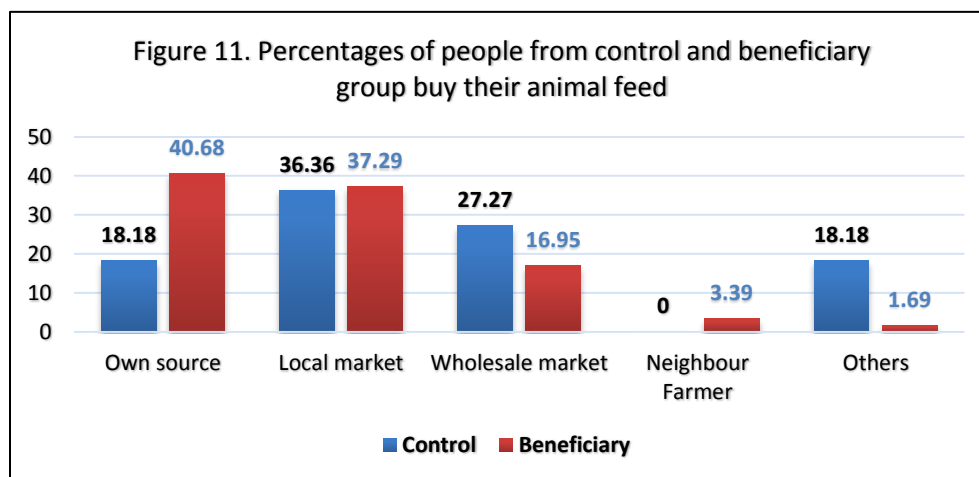
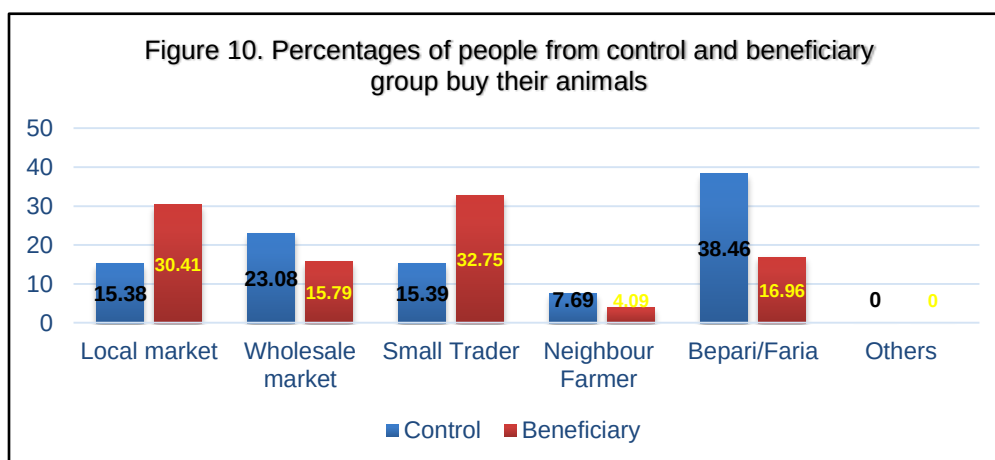
biogas plant and they use cow dung as raw material for this plant. More than 77% people among the respondents of the beneficiary group and 83% people of control group said that they buried the used syringe, needle, bottle, and others treatment debris. Moreover, people from the beneficiary group responded that if they give the used syringe, needle, bottle, and others treatment debris to the others 77.78% people buried and the rest of the people throw it.

7.4. Module 5

7.4.1. Section E: Opportunities of livestock entrepreneurs and value chain development

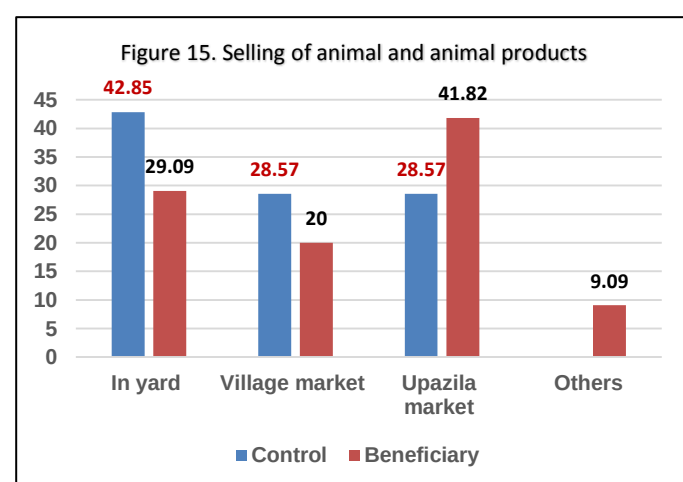
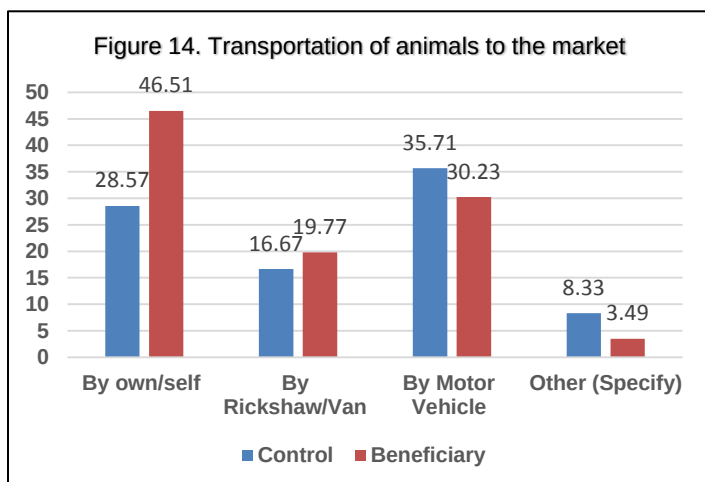
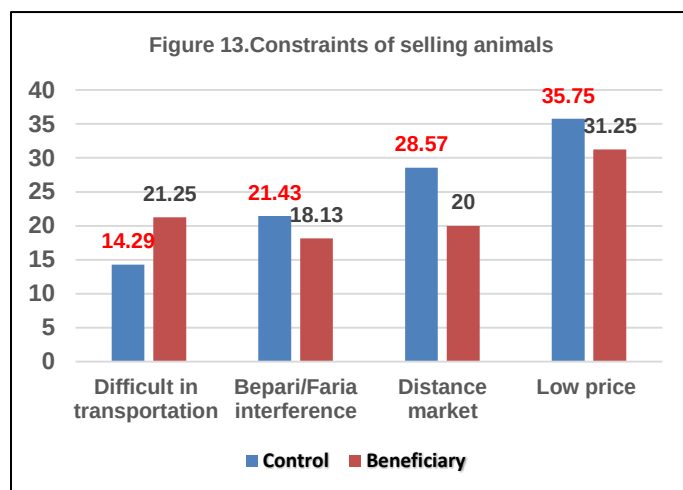
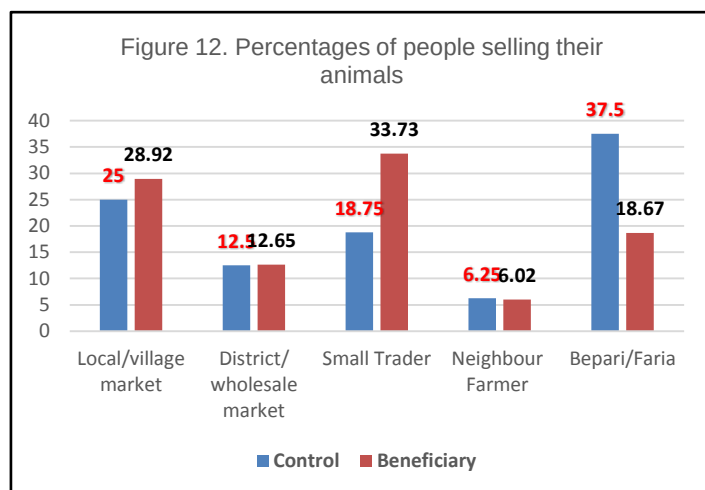
7.4.1.1. Purchases of animals

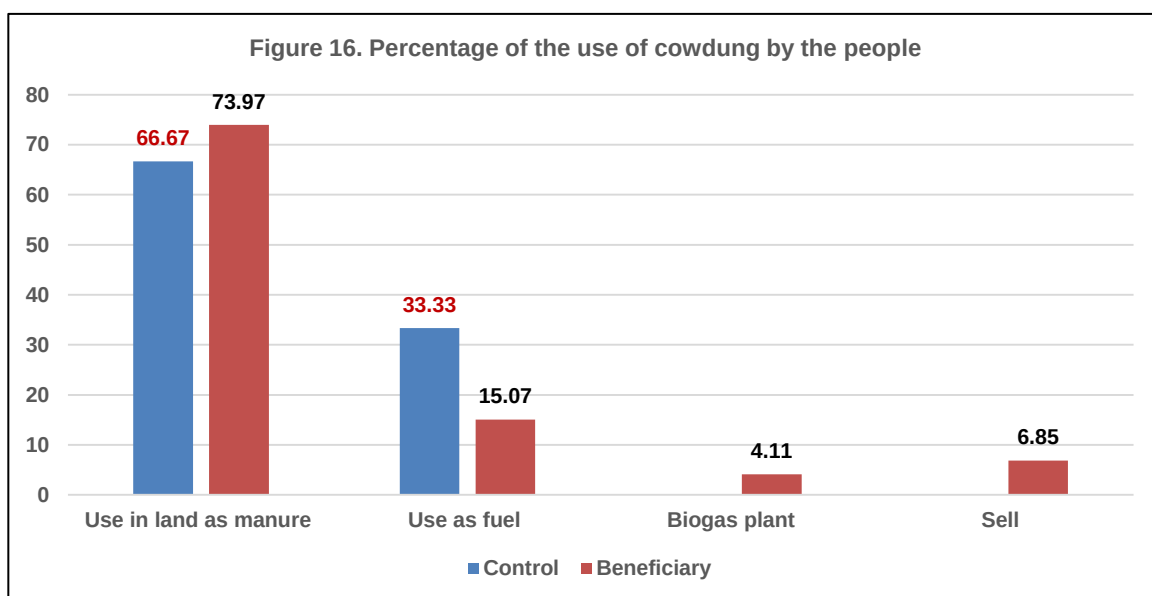
Among the respondents of the farmers, 87.5% people in the control group and 94.57% of the beneficiary group buy their animals, mainly once a year, however, the rest of the people buy their animals twice a year. The percentage of people of the control and the beneficiary group buys their animals from different sources (Figure 10). The beneficiary group people, mainly buy their animals from local market and small traders, whereas the control group people buy their animals from Bepari / Faria and wholesale market (Figure 10). The percentage of people of the control and the beneficiary group buy / use their animal feed from the sources, like, own, local and wholesale market, neighbors' farmers sources are shown in Figure 11. The people of the beneficiary group used the animal feed from their own sources and buy mostly from the local market, and the control group people buy their animal feed from the local and wholesale market (Figure 11). Both groups of people respond that their animals did not die after purchasing.



7.4.1.2. Selling of animals and animal products

Information regarding the selling of animals and animal products and the use of cow dung is presented in the Figures 12 to 16. Figure 12, indicated that a higher percentage of the beneficiary group people sell their animals to the small traders, whereas the highest percentage of control group farmers sell their animals to the Bepari / Faria. Among the constraints of selling the animals (Figure 13), most of the respondents people said that low price, distance of markets, Bapari / Faria interference and transportation, among them highest percentage of people indicated the low price and Bapari / Faria interference is a main constraint. Available transportation facilities for carrying the animals to the market is walking of the animals, rickshaw/van, motor vehicle, and others in the studied area. Mainly people of both groups carry their animals to the market by walking themselves followed by motor vehicle (Figure 14). The places for selling of animals and their products are shown in Figure 15. Figure 15, indicated that among the respondents, higher percentage of people from the control group sells their animal and animal products in their yard and the beneficiary group people sell their animals and animal products at the Upazilla market. The uses of cow dung by the respondents from the control and beneficiary group is shown in Figure 16, it was seen that the higher percentage of people from both groups uses cow dung as a manure followed by fuel for cooking. A little number of people from the beneficiary group used cow dung for the biogas production.





The information about the marketing of milk and milk products is presented in Table 26. The Table 26, showed that most of the people sell the raw milk and the milk price depends on volume only. About 68% people respondents that there is a milk processing plant (Milk-Vita) at the studied area Sikolbha (greater Patiya Upazilla) of Chattogram district. Furthermore, about 33.33% people respondents from the control and 65.79% from the beneficiary groups said that they knew the name of the milk processing technique, and that is pasteurization of milk.

Table 26: Peoples response (%) on the marketing milk and milk products

Questions	Response	Control group	Beneficiary group
Do you sell raw milk?	Yes	85.71 (6)	96.88 (31)
	No	14.29 (1)	3.13 (1)
Milk price depends on?	Volume	100 (5)	100 (34)
	Fat percentage	-	-
	Protein percentage	-	-
	Fat+Protein content	-	-
	Others	-	-
Do you have any milk processing plant in your area?	Yes	33.33 (2)	65.79 (25)
	No	66.67(6)	34.21 (13)
Do you know the name of any milk processing technique?	Yes	45.45 (4)	44.74 (17)
	No	55.55 (5)	55.26 (21)
If yes, what are these?	Pasteurization	50.00 (2)	58.82 (10)
	Homogenization	-	5.88 (1)
	Fortified milk	-	-
	skim milk	-	11.76 (2)

	Others	50.00 (2)	23. 53 (4)
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Parenthesis indicates the number of respondents

For livestock farming, the input like, cow, bull calf, heifer, semen, animal feed, vaccine / drug, cattle shed / stat / equipment's or others were purchased / received by both the control and beneficiary groups are shown in the Table 27. Farmers from the both groups, mainly purchased bull calf for fattening, semen for insemination of the cows', cattle feeds and vaccine and medicines for their cattle.

Table: 27: Respondents percentage on the value Chain (Livestock rearing): input purchased/received

Questions	Item	Control group	Beneficiary group
What were the inputs you purchased/ received in the last one year for rearing cow? (Multiple Responses)	Cow	0	9.33 (21)
	Bull calf	25 (5)	15.11 (34)
	Heifer	0	5.33 (12)
	Semen	25 (5)	14.67 (33)
	Feed	5 (1)	20.44 (46)
	Vaccine/drug	25 (5)	17.33 (39)
	Cattle shed/slat/ Equipment	0	11.56 (26)
	(Others (specify)	20 (4)	6.22 (14)

Parenthesis indicates the number of respondents

The sources and price per unit of input information for livestock rearing is presented in Table 28. Table 28, indicated that most of the farmers from the studied area purchased their animal feed, animals and animal shed / slat equipment's from the local market and wholesale market in similar percentage, and per kg concentrate feed price was 40 Taka. They are getting semen and the vaccine from the Department of Livestock Services (DLS) for the insemination of their cows and vaccinated their animals as a preventive measure.

Table 28. Value chain (livestock rearing): sources and price (BDT) per unit of input

Source	Semen		Feed		Animal		Vaccine/Drug		Animal shed/slat/ Equipment	
	Place	Price	Place	Price	Place	Price	Place	Price	Pace	Price
Neighbor										
Local Market	-	-	58.30 (37)	40	44.74 (17)	-	11.11 (7)	-	31.82 (21)	-
Wholesale Market	-	-	42.70 (27)	40	55.26 (21)	-	20.63 (13)	-	68.18 (45)	-
DLS	96.87 (31)	300	-	-	-	-	66.67 (41)	-	-	-
NGOs	3.13	300	-	-	-	-	1.59 (1)	-	-	-

	(1)									
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Legends: DLS= Department of Livestock services, NGOs: Non-Government Organization
 Parenthesis indicates the number of respondents

7.4.2. Section F: Effect of COVID-19 on animal farm and milk production

7.5.2.1 Effects of COVID-19 on dairy farming

During the COVID-19 pandemic period, respondent people from both the group said that they faced many challenges and problems on how to survive for upcoming days and they all are concerned about the impacts of COVID-19 pandemic.

The effects of COVID-19 on the smallholder dairy farm are stated in Table 29. A few number of respondents from the both groups replied that they have affected by corona, but most of the respondents did not affected by corona (Table 29). Those who were affected, they had taken measures, like isolation and treatments from a doctor over the telephone or taken / purchased medicine from the medicine shop nearby. Among the respondents more than 73% people from the both groups were faced many problems during COVID-19 pandemic, like treatments of peoples, treatments of animals, purchase of animal feed, selling of milk and milk products, and getting credits from bank and NGOs. They overcome these issues by taking loan from neighbors, relatives and communicating with others.

Table 29: Response of peoples on the effects of COVID-19 on the smallholder dairy farm

Questions	Response	Control	Beneficiary group
Do your worker have been affected by Corona Virus	Yes	14.29 (1)	10.34 (6)
	No	85.57 (6)	89.66 (52)
If yes, what measures you taken	Isolation and treatments from doctor over telephone or taken medicine after purchased from medicine shop		
Do you facing any problems during corona pandemic	Yes	75 (3)	73.33 (22)
	No	25 (1)	26.67 (8)
If yes, what are these	Treatment of yourself	0.00	17.71 (17)
	Workers treatment	0.00	15.63 (15)
	Treatment of animals	26.67 (4)	17.71 (17)
	Animal feed	26.67 (4)	17.71 (17)
	Marketing of milk and milk products	26.67 (4)	19.79 (19)
	Bank or NGO Credit	20.00 (3)	8.33 (8)

	Others	0.00	3.13 (3)
How do you overcome these?	Loan from neighbors, relatives and communicating with other peoples.		

The measures that have been taken by both the control and beneficiary groups were as personal protection equipment (PPE), gloves, gumboot, mask, etc. for the workers on the farm. Comparatively higher number of people from the beneficiary group has taken these measures than the control group of the people (Table 30).

The 100% control group people have not hanged a notice board in their farm to protect the corona pandemic, however, very few numbers (two out of thirty four) of people among the respondents hanged this notice in their farm.

Table 30: Respondents percentage on the measures taken by smallholder dairy farm to prevent corona outbreak

Questions	Response	Control group	Beneficiary group
What are the measures have you taken to prevent corona outbreak at your workplace	Personal protection equipment (PPE) for the workers in the farm	50.00 (7)	21.88 (21)
	Hand gloves	14.29 (1)	38.19 (7)
	Mask	42.86 (2)	23.81 (5)
	Apron	-	-
	Shoe (Gumboot)	14.29 (1)	14.29 (3)
	Vaccine	28.55 (1)	19.05 (4)
	Others	-	4.76 (1)
Do you hang a notice board in your farm to protect the corona pandemic?	Yes	-	5.88 (2)
	No	100 (6)	88.24 (32)

Parenthesis indicates the number of respondents

The effect of COVID-19 on the milk production from the cows and the prices of milk is presented in Table 31. Among the respondents, more than 50% of the control group and 69.23% of the beneficiary people knew that milk is a good drink to prevent corona and rest percentage of people do not know about this (Table 31). About 60 to 85% respondents' people from both the group stated that the cow's milk production and prices of milk was reduced during the corona pandemic. Both groups of people have not taken any measures for selling their milk and milk products during this pandemic period.

Table 31: Peoples response (%) on the effects of COVID-19 on the milk production and its price

Questions	Response	Control group	Beneficiary group
Do you know milk is a good drink to prevent corona?	Yes	50.00 (3)	69.23 (27)
	No	50.00 (3)	28.21 (11)
Does the milk yield of your cows are reduced during corona pandemic?	Yes	57.14 (4)	77.14 (27)
	No	42.86 (3)	22.86 (8)
Does milk and milk product price reduced during corona pandemic?	Yes	60.00 (3)	85.29 (29)
	No	40.00 (1)	14.71 (5)
What measures you have taken to sell your milk and milk products?	No measures		

Parenthesis indicates the number of respondents

Among the respondents, the more percentage of people from the both groups said that the animal feed and medicine costs had been increased and also faces a crisis to get input for their dairy farm during a corona pandemic (Table 32). Both groups of farmers feed their animals with locally available grasses and homemade concentrate ingredients. Farmers collected medicines / vaccines from the locally available shop and inputs from the local markets. They have also taken loan from neighbors to meet up the crisis. Besides, more than 80% respondents said that their measures were not sufficient to overcome the crisis faced during corona pandemic.

Table 32: Peoples response (%) on milk, dairy feed and medicine purchasing problems during COVID-19 pandemic

Questions	Response	Control group	Beneficiary group
Does the feed and medicine costs increase during corona pandemic?	Yes	75.00 (6)	71.43 (25)
	No	25 (2)	28.57 (10)
Do you face any crisis to get any input in your farm during corona pandemic?	Yes	71.42 (5)	75.86 (22)
	No	28.57 (2)	24.14 (7)
What measures you taken to meetup this crisis?	Feed the animals with locally grasses and homemade concentrate ingredients, collects medicines from the locally available shop and taken loan from neighbors		

Does your measures were sufficient?	Yes	20.00 (1)	17.24 (5)
	No	80.00 (4)	82.76 (24)

Parenthesis indicates the number of respondents

Information regarding the sources of investment for dairying is presented in Table 33. Table 32, showed that more respondents of the beneficiary group (56.67%) people's sources of investment for dairy farming was from the loan from the IDF, whereas more control group people's (36.36%) source of investment were from the bank loans. The next sources of investment for dairying were from the mortgage of assets and the other sources of investment was from the sale of assets and from savings and dairy farming.

Table 33. Sources of investment for dairying

Sources	Control group	Beneficiary group
From Savings	9.09 (1)	10.00 (6)
From sale of Assets	18.18 (2)	6.67 (4)
From Mortgaged of assets	27.27 (3)	18.33 (11)
Income from dairy farm	9.09 (1)	8.33 (5)
Loan from Integrated Development Foundation (IDF)	-	56.67 (34)
From cooperatives	-	-
Loan from Bank	36.36 (4)	-

Parenthesis indicates the number of respondents

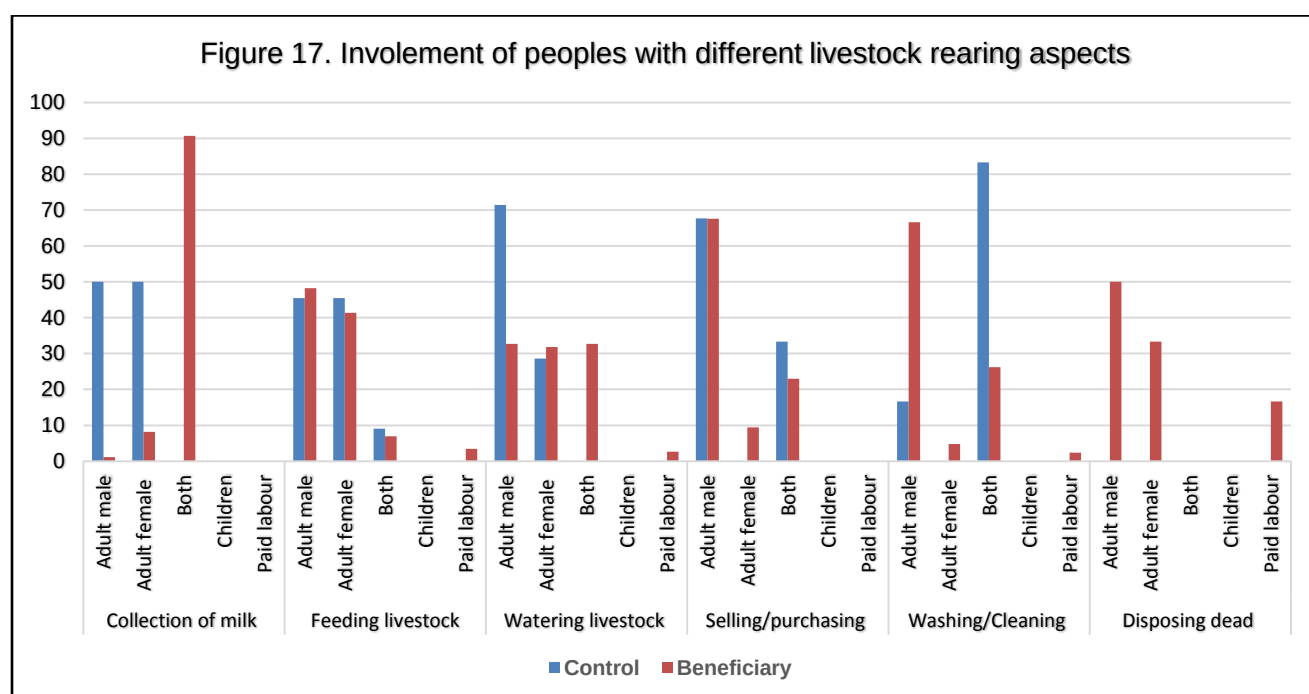
About 98% (94 out of 96) people from the beneficiary group taken loans from the IDF and average loan was BDT 78563.83±6437.06 (94) per household. On the other hand, maximum number (4 out of 6) of the control group people taken loan from the bank and the average loan per household was 120000.00 ± 27080.12 (4) for dairying. The peoples of the both groups received credits from other sources like, BRAC bank, Middleman/Goala for dairying. The IDF have a policy for soft loan for community drainage system development, rump development and marketing, and value chain linked with cow dung and vermin-compost production. In addition, they have some grants for the construction of ecofriendly cow shed.

The information of women's participation in the livestock rearing and decisions about family consumptions is presented in Table 34. Usually both the woman and men take care for their animals and the value for the control group, 64.29% and for the beneficiary group 80.49% among the respondents. A similar pattern was seen for taking the decision on consumption of the livestock and livestock products by both groups.

Table 34. Respondent's percentage on woman's participation with livestock rearing and consumptions

Questions	Response	Control group	Beneficiary group
Who takes care of livestock (animal)?	Woman	14.29 (2)	4.88 (4)
	Men	21.43 (3)	10.98 (9)
	Both	64.29 (9)	80.49 (66)
	Children	0.00	0.00
	Paid labour	0.00	3.66 (3)
Who takes the decision on consumption of the livestock and livestock products?	Woman	18.18(2)	-
	Men	18.18 (2)	-
	both	63.64 (7)	100 (82)

Involvements of peoples with different livestock rearing aspects are shown in Figure 16. For the collection of milk, among the respondents from the control group, it was seen that 50% of men and women and from the beneficiary group about 90% of both men and women were involved in these activities. For feeding and watering of livestock, almost the same percentage of men and women was involved. On the other hand, for slaughtering maximum respondents said that a higher percentage of men are involved in this activity. For washing, among the respondents the control group people said that adult male and the beneficiary group said both men and women were involved; and for disposing adult men and women disposed the dead animal.



8. Suggestions for sustainable environmental development or others issues by dairy farmers

The most of the respondents' farmers have given the following opinion

1. They have lack of capital and land for large scale farming and construct the environmentally friendly animal shed.
2. The training which they received is insufficient for profitable livestock production.
3. The interest rate for the loan was higher and they are under a pressured to give the instalment of loan if they take loan from NGOs.
4. They need government support by loan with less interest rate for dairy farming.
5. They want to form cooperative for the pasture management of their cattle, and marketing their produced milk.

9. Conclusions and Recommendations

The following recommendations for achieving better results at the end of project operation:

- Project may take initiative for increasing more biogas plant establishment and solar panel as the source of fuel, treatment of purification of drinking water and preservation of rain water for the MEs in an appropriate manner.
- Facilitate and motivate MEs for constructing environmentally friendly animal shed using transparent and heat tolerance shed materials with all modern facilities like manure and urine separation. Moreover, the project should focus on proper drainage, arrange disposal site, control odor, insects, and mosquito breeding, properly dispose of dead animal, vaccination of animals against infectious diseases, purchase medicine from an authentic source, medical waste management, and to ensure quarantine facility for newly purchased animals.
- For increasing the household's income project may take the initiative to introduce improve the genetics of cows to produce more milk with fewer number by allowing artificial insemination with superior genes to increase milk production in a safe environment.
- To maintain friendly environment, project may involve MEs for composting, vermi-composting, high yielding fodder cultivation, fodder processing and preservation etc. in an appropriate manner.
- To increase the knowledge of the MEs project may introduce more hands on training with more duration. Furthermore, project may take steps to develop Community Livestock Service Provider (CLSP) to make available inputs and service to the farming community, at the same time establish an effective linkage with the Department of Livestock Services and relevant Govt. Departments channeling support and assistances e.g. technical, legal, business environment, etc. in a sustainable manner.
- Project may take steps to ensure health and safety equipment, personal protection equipment (PPE) for workers and first aid box at farm level and the awareness buildup of the MEs to maintain all the health safety issues.

- Project may emphasis to establish a milk processing plant in the project area, which will be facilitated to the MEs for milk marketing, forms a cooperative and linkage with the market.
- Project may emphasis on technical (environment friendly production/ farming, processing, farm management, marketing and COVID-19 awareness, etc.) and business (business development, value chain development, linkage-networking with service providers, etc.) capacity building through training need assessment, facilitate appropriate training, learning visit on spot coaching, etc. for the MEs.
- Private sector engagement is essential for the production, processing and marketing (including e-marketing system), therefore, the project may initiate for that. Develop linkage with relevant market actors for access to market information, connection with wider market and inputs availability at ME's at door step.
- Project may create scope of access to finance for developing affordable loan product and introducing an insurance system to help MEs in expanding farm through developing partnership through the mapping service provider.
- Project may facilitate in the development of association like platform for exchange idea, information, and problem solve wider linkage and negotiation, etc.
- Project may take initiative for increasing more female ownership of the farm for availing outside opportunities through women entrepreneurship development.

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