

Original Research Article

The impact of training; technology adoption and improvement of livelihood of trained livestock farmers in different zones of Bangladesh

ABSTRACT

The present study was conducted to examine the impact of training provided to livestock farmers facilitated by the Bangladesh Livestock Research Institute (BLRI) for transferring technology, adoption, and impact on the livelihood of trained farmers from July 2020 to June 2021. A purposive sampling technique was used to select 80 trained livestock farmers from Dhamrai, Jessore Sadar, and Naikhongchhari Upazilas of Dhaka, Jessore, and Bandarban districts respectively. Data were collected through a pre-tested questionnaire and analyzed descriptively. The majority of respondents were found male (66.25%) and the average age, year of schooling, and family members were 37.10 ± 0.86 , 9.05 ± 0.24 years, and 5.10 ± 0.19 respectively. Agriculture (72.50%) was the main occupation of livestock farmers. The average number of cattle and poultry was the highest in Dhamrai (5.83 ± 0.20) and Jessore Sadar (727.20 ± 54.79) Upazilas respectively. The livestock farmers were found moderately adapted to scientific management and technologies. However, in most of the cases, there was a significant difference ($p < 0.05$) found between knowledge and skill level. It was also observed that after training all parameters of livelihood assets were improved. The annual income was changed from BDT 181937.50 ± 19169.98 to BDT 247637.50 ± 20079.57 after training and the change was found statistically significant ($p < 0.05$). Thus, the training was found moderately effective to

disseminate knowledge and skill in technology and management of livestock and improve the livelihoods of the livestock farmers.

Keywords: Training, Adoption, Knowledge, Skill, Livelihood assets, Annual Income

INTRODUCTION

Bangladesh is a South Asian developing country and its economy primarily depends on agriculture. The sectoral share of agriculture to total GDP at constant prices is 12.07% and the sectoral growth rate is 3.17% in the FY 2020-21 (BBS, 2021). However, in agriculture, the livestock sector is an essential component of the economy. The sectoral share of animal farming to total GDP at constant prices is 1.98% and the sectoral growth rate is 2.94% in the same FY (BBS, 2021). The production of animal proteins like milk, meat, and eggs increased to 119.85 lakh MT, 84.40 lakh MT and 2057.64 crores respectively. As a result, per capita availability of milk, meat and eggs increased to 193.38 ml/day, 136.18 gm/day, and 121.18 nos/year respectively in the FY 2020-21 (BER, 2021) against the demand of 250ml/day, 120 gm/day and 104 nos/year respectively. The farm animals in Bangladesh mostly include cattle, buffalo, goat, and sheep and the most important species of poultry is chicken and duck. Most of the farm animals are still reared under the traditional production system except some commercial dairy and beef fattening farms have developed. The development of the commercial poultry production system has been based on imported germplasm, feed, and medicines Hamid *et al.* (2017). Cattle is one of the most desired livestock species in the subsistence agriculture of Bangladesh. They provide almost all the market milk (95%) in the country (DLS 2019). About 5.786 million MT of

cow milk is produced annually Hamid *et al.* (2016). The country produces about 1.751 million MT of beef annually, the most popular type of meat. Cattle and buffalo provide 65% of the total draught power of the country at present. Landless and small farmers hold about 62.6% of the total large ruminants and are used as sources of income and nutrition, and considered as a resource for employment and poverty alleviation. Beef fattening, dairying, and heifer rearing are the production systems for the exploration of cattle germplasm in the country. About 68% of village families keep cattle traditionally. A family on average produces 8.3 liters of milk in a week and the average production of the cow was found as 0.8 liters per day Huque *et al.* (2004). Goat occupies an important place as an animal genetic resource in the agro-based economy of the country having greater importance, particularly, in subsistence agricultural operations. In the case of chicken, commercial chicken production in the country's last two decades developed at a faster rate than that of other poultry species. On the other hand, the production system of native chicken did not change very much. Most of the native chicken is still raised under a low input system and their productivity remains low. Strategies are to be adopted for the development of the livestock sector in Bangladesh. Adoption and dissemination of livestock technology are important for the development of this sector and training is considered a strong tool Hossain *et al.* (2021). Development in the behavior of farmers towards livestock technology and rearing can occur as a result of training Sharma *et al.* (2017). The participation of rural people in livestock farming activity plays an important role in the economic development of Bangladesh Huque *et al.* (2017). Realizing the great contribution of the rural people in the production process of farm facilities, government planners, policymakers and administrators are trying to take necessary steps to include rural people in the livestock development process in recent years. It is observed that smallholders can play an important role and would get far better opportunities to organize

themselves as a functional group for livestock development. In the production of livestock, both men and women integrate with the rearing and management. The improvement of livelihoods and food security of moderate and hard-core poor households and the empowerment of women through training on the adoption of livestock technologies for sustainable income-generating activities need to be studied. Bangladesh Livestock Research Institute (BLRI) has given farmers training on different livestock technology in different areas of Bangladesh through its revenue and development budget. But there has no information about the impact of training on-farm conditions used by fattening, dairy, and poultry farmers. Considering these facts the present study attempted to examine the impact of training on the adoption of technology and management practices along with the impact on livelihood improvement of trained livestock farmers.

METHODOLOGY

Selection of study areas and sample farmers

Farm/households were selected who are trained in livestock technologies and management from Dhamrai, Jessore Sadar, and Naikhongchhari Upazilas of Dhaka, Jessore, and Bandarban districts respectively. Table 1 shows the locations, frequency, and percentage ratio of respondent farmers interviewed. These are the part of the areas where livestock farmers were trained on different livestock technologies and management.

Table 1: Location and distribution of respondents

Location	Frequency (N)	Percentage
Dhamrai, Dhaka	30	37.50 (%)
Jessore Sadar, Jessore	30	37.50 (%)

Naikhongchhari, Bandarban	20	25.00 (%)
Total	80	100 (%)

Methods of data collection

The purposive sampling technique was used to select livestock farmers for interviews in each of the areas. A direct face-to-face on-farm individual interview approach using a standard pre-tested questionnaire was used to collect necessary data. A questionnaire was designed to measure the perceived level of knowledge and skill on a list of topics related to livestock production which topics followed a logical sequence of the production chain. 4 points Likert scale was developed to measure the level of knowledge and skills that respondents perceived to possess about the topics in the questionnaire. The Likert scale is a fixed choice response format to measure attitudes and opinions of respondents and also measure the competencies and what an individual believes, perceives, or feels about self, others, activities, institutions, or situations Gay *et al.*(2009). For the present study a 4 points Likert scale was developed from score 1= least knowledge, 2= moderate knowledge, 3= much knowledge, and score 4= highly knowledgeable and score 1= least skilled, 2= moderate skilled, 3= much skilled, and score 4= highly skilled for measuring the level of knowledge and skill respectively. In the case of assessment of the level of need of training 3 points score from 1= do not need training, 2= would need training, and 3= strongly need training was used.

Analytical technique

The means and standard error were used to indicate the level of knowledge and skill respectively the livestock farmers indicated against the statement.

Equation 1: Formula for mean: $A = \frac{1}{n} \sum_{i=1}^n a_i$

A= arithmetic mean

n= number of values

a_i= data set values

Equation 2: Formula for standard error: $SE = \frac{\sigma}{\sqrt{n}}$

SE= Standard error of the sample

σ = Standard deviation of the sample

n= number of the sample

Therefore, the lower means indicate possession of lesser knowledge and skill, while the higher means indicate possession of higher knowledge and skill about the statement. A parametric test (z-test) was conducted to measure the significant difference between knowledge and practical skill of trained livestock farmers at 5% level of significance. In the case of assessment of the level of need for training, the lower means indicate a lesser level of need for training, while the higher means indicate a higher need for training against the subject. To measure the improvement of livelihood status of livestock farmers before and after situation of getting training from BLRI was compared using five types of livelihood assets or capitals upon which livelihoods are built namely human assets, social assets, natural assets, physical assets, and financial assets (DFID, 2000). The livelihood outcome such as annual income along with expenditure and savings was also measured and compared (paired sample t-tests) using the before and after approach. All the collected data were processed and analyzed with descriptive statistics, z-test, and paired sample t-tests were conducted using MS Excel and SPSS 20.0 software.

RESULTS AND DISCUSSIONS

Demographic characteristics of livestock farmers

Table 2 shows the demographic characteristics of livestock farmers. The majority of respondents were male (66.25%) compared to female (33.75%). The average age of the livestock farmers was 37.10 ± 0.86 years which was almost similar to Hossain *et al.* (2021) who reported the average age of the respondent was 36.73. The average year of schooling was 9.05 ± 0.24 years indicating the livestock farmers were moderately educated. Akteruzzaman *et al.* (2008) reported that the average level of education of the respondent was 4.50 which was lower than the present finding because the education level of respondent farmers may be improved. The level of education was found slightly higher in Jessore Sadar Upazila of Jessore district. Agriculture was the main occupation and 72.50% of livestock farmers found agriculture as their main occupation. The average family member was 5.10 ± 0.19 which was almost the same as Hossain *et al.* (2021) who found the average family size of the respondent was 4.77. The highest number of family members per household was found in Dhamrai Upazila (5.97 ± 0.41) and the lowest was in Jessore Sadar Upazila (4.57 ± 0.14).

Table 2: Demographic characteristics of livestock farmers

Variables	Dhamrai	Jessore Sadar	Naikhongchhari	Overall
Gender				
Male (%)	50 (15)	83.33 (25)	65 (13)	66.25 (53)
Female (%)	50 (15)	16.67 (5)	35 (7)	33.75 (27)
Age (Mean±SE)	39.40 ± 1.49	35.37 ± 1.29	36.40 ± 1.64	37.10 ± 0.86
Year of schooling	9.13 ± 0.31	9.60 ± 0.44	8.10 ± 0.52	9.05 ± 0.24

(Mean±SE)				
Main Occupation				
Agriculture (%)	100 (30)	26.66 (8)	100 (20)	72.50 (58)
Family member (Mean±SE)	5.97±0.41	4.57±0.14	4.60±0.24	5.10±0.19

(Number in the parenthesis indicates the respondent number)

Types of livestock reared by respondent farmers

Different types of livestock were reared by the respondent farmers presented in Table 3. The average number of cattle was the highest in Dhamrai Upazila (5.83 ± 0.20) followed by Naikhonchhari (2.45 ± 0.62) and overall was 3.60 ± 0.27 . In the case of goats, the average number was the highest found in Naikhonchhari (2.90 ± 1.05) and the overall value was 1.58 ± 0.34 . However, the average number of poultry was found 279.76 ± 43.98 and the highest was in Jessore Sadar (727.20 ± 54.79).

Table 3: Types of livestock reared by farmers

Types of livestock	Dhamrai	Jessore Sadar	Naikhongchhari	Overall
Cattle (Mean±SE)	5.83 ± 0.20	2.13 ± 0.23	2.45 ± 0.62	3.60 ± 0.27
Goat (Mean±SE)	0.77 ± 0.38	1.53 ± 0.43	2.90 ± 1.05	1.58 ± 0.34
Sheep (Mean±SE)	0.13 ± 0.07	0.20 ± 0.11	0.10 ± 0.10	0.15 ± 0.05
Poultry (Mean±SE)	11.33 ± 1.64	727.20 ± 54.79	11.25 ± 2.98	279.76 ± 43.98
Duck (Mean±SE)	0.50 ± 0.5	0.50 ± 0.29	1.90 ± 0.88	1.02 ± 0.38

Extent and rate of the adoption of different parameters of livestock technologies

Table 4 shows the knowledge and skill level of different parameters of livestock technologies adapted after the training. The higher points of knowledge and skill indicate a higher level of the adoption rate of livestock technologies among livestock farmers in the study areas. From the table, a comparatively higher knowledge level was found in the case of housing and shed management. However, the skill level was found slightly lower than the knowledge level indicating that farmers apply less in practice than they know about housing and shed management. The highest score was 2.45 ± 0.08 found in the case of knowledge level about the type of housing and the lowest knowledge level was found in the case of fencing management (1.91 ± 0.08). However, the skill level was the highest at 1.71 ± 0.06 and the lowest was 1.42 ± 0.05 in the case of the type of housing and fencing management respectively. Moreover, in the case of housing and shed management, the difference between knowledge level and skill level in the case of all parameters was found statistically significant ($P < 0.05$). Hundal *et al.* (2016) reported the awareness of farmers regarding housing management was improved. In the case of feeds and feeding management, the highest knowledge score was 2.00 ± 0.06 and 2.00 ± 0.09 found on the use of supplement and fodder processing techniques respectively and the lowest score was 1.66 ± 0.06 on water supply and quality. Moreover, the highest level (1.56 ± 0.05) of skill was found in the balance ration and the lowest was 1.30 ± 0.06 for the fodder cultivation technique. However, in this case, the skill level was also found slightly lower than the knowledge level indicating that farmers apply less in practice than they know and in the case of all parameters the difference between knowledge level and skill level was found statistically significant ($P < 0.05$). Table 4 contains data on the perceived knowledge and skill levels of livestock farmers about breeding management. The highest knowledge score of 2.25 ± 0.08 was found on natural breeding

and artificial insemination and the lowest score was 1.76 ± 0.07 on service per conception rate. Moreover, the highest skill score of 1.57 ± 0.05 was found for natural breeding and artificial insemination and the lowest was 1.47 ± 0.07 for service per conception rate. Similarly, the skill level was found slightly lower than the knowledge level in the case of breeding management, and in the case of all parameters, the difference was statistically significant ($P < 0.05$). In the case of health management practices, the highest knowledge score of 2.01 ± 0.06 was found on deworming and the lowest score was 1.49 ± 0.06 on parasite control. However, the highest skill score of 1.50 ± 0.08 was found for deworming and the lowest score was 1.12 ± 0.03 and 1.12 ± 0.04 on symptom and primary treatment of disease respectively. From table 4 the difference between knowledge level and skill in the case of health management practices was much indicating the gap between high knowledge but less in practice. A previous study found that awareness level was higher about health management after training Hundal *et al.* (2016).

Table 4: Knowledge and skill level on different parameters of livestock technologies

Sl. No.	Technology	Parameters	Knowledge level (Mean±SE)	Skill level (Mean±SE)	Sig.
1	Housing/shed management	Type of housing	2.45 ± 0.08	1.71 ± 0.06	*
		Light and aeration	2.43 ± 0.07	1.70 ± 0.07	*
		Drainage	2.01 ± 0.06	1.61 ± 0.06	*
		Cleaning and hygiene	2.22 ± 0.07	1.56 ± 0.06	*
		Fencing management	1.91 ± 0.08	1.42 ± 0.05	*
2	Feeds/feeding management	Balance ration	1.90 ± 0.08	1.56 ± 0.05	*
		Feeding pattern and quantity of feed	1.96 ± 0.06	1.35 ± 0.06	*

		Use of supplement	2.00±0.06	1.45±0.06	*
		Fodder cultivation technique	1.85±0.06	1.30±0.06	*
		Fodder processing technique	2.00±0.09	1.52±0.05	*
		Water supply and quality	1.66±0.06	1.43±0.06	*
		Preparation of Silage and UMS	1.81±0.09	1.40±0.07	*
		Homemade and readymade feed	1.81±0.09	1.40±0.05	*
3	Breeding Management	Natural breeding and AI	2.25±0.08	1.60±0.05	*
		Breed identification	2.03±0.08	1.50±0.06	*
		Heat determination and time of insemination	2.12±0.08	1.57±0.05	*
		The idea of service per conception rate	1.76±0.07	1.47±0.07	*
		Management of pregnant animal	2.14±0.09	1.54±0.06	*
		Other reproductive traits	1.97±0.09	1.50±0.06	*
4	Health management	Neo-natal nourishment practice	2.00±0.07	1.29±0.06	*
		Deworming	2.01±0.06	1.50±0.08	*
		Vaccination	1.99±0.07	1.49±0.08	*
		Dipping	1.50±0.06	1.15±0.04	*
		Symptoms of disease	1.67±0.07	1.12±0.03	*
		Primary treatment	1.64±0.06	1.12±0.04	*
		Parasite control	1.49±0.06	1.14±0.04	*
		Treatment by an expert veterinarian	1.74±0.06	1.26±0.05	*
5	Record keeping and	Livestock Inventory	1.47±0.06	1.12±0.04	*
		Production record	1.35±0.06	1.01±0.01	*

	account management	Income and expenditure record	1.33±0.05	1.02±0.02	*
		Profit/loss calculation	1.39±0.05	1.10±0.03	*
		Family and farm account combination	1.26±0.05	1.00±0.00	*
		Farm diary	1.31±0.05	1.01±0.01	*
		Sales record	1.26±0.05	1.00±0.00	*
		Net worth calculation	1.27±0.05	1.09±0.03	*
		Unnecessary and unplanned investment	1.27±0.05	1.00±0.00	*
6	Marketing management	Idea of marketing	1.35±0.06	1.01±0.01	*
		Idea of intermediaries	1.34±0.06	1.04±0.03	*
		Market selection, pricing, and selling time	1.32±0.05	1.04±0.03	*
		Market information and networking	1.01±0.01	1.00±0.00	NS
		Idea and calculation of marketing cost	1.04±0.02	1.00±0.00	*
7	Other livestock technologies	Preparation of Silage and UMS	1.61±0.08	1.28±0.07	*
		Feed master app	1.16±0.05	1.30±0.05	*
		Breeding app	1.31±0.05	1.27±0.05	NS
		Fodder cultivation	1.51±0.07	1.26±0.05	*

(* **Significant, NS-Non-significant at 5% level of significance**)

(**Score:** Knowledge level: 1= Least Knowledge, 2= Moderate Knowledge, 3= Much Knowledge, 4=Highly Knowledge)

(**Score:** Skill level: 1= Least Skill, 2= Moderate Skilled, 3= Much Skilled, 4= Highly Skilled)

Record keeping and account management are important for farm monitoring and evaluation of the performance and decisions making about the farm enterprises. Table 4 contains data on the perceived knowledge and skill levels of livestock farmers about farm records. Respondents

farmers were less knowledgeable and skilled in record keeping and account management found in the study areas. Respondents indicated that they were not skilled in any of the farm records listed. The respondent farmers indicated that though they may know why farm records are kept, they did not have the expertise to keep them properly. From the study, the highest knowledge score was found 1.47 ± 0.06 on-farm inventory and the lowest was 1.26 ± 0.05 on family and farm accounts combined and sales records. Also, the least skill score was found on family and farm accounts combined and sales records, and the score was 1.00 ± 0.00 . This is an indication of a serious problem in farm management if farmers cannot keep proper records of farms. The difference between knowledge and skill level, in this case, was also found statistically significant ($p < 0.05$). However, in the case of marketing management livestock farmers were also found less knowledgeable and skilled. The highest knowledge score was 1.35 ± 0.06 and the lowest was 1.01 ± 0.01 on the idea of marketing and market information and networking respectively. In the case of skill level, the highest score was 1.04 ± 0.03 on the idea of intermediaries and market selection, pricing, and selling time, and the lowest was 1.00 ± 0.00 on market information, networking, and calculation of marketing cost respectively. The least scores on the parameters of marketing management indicated that farmers were not aware and skilled in the marketing of their livestock and products. From the study, it was also observed that farmers have moderate knowledge of silage, Urea-Molasses-Staw (UMS) preparation, and fodder cultivation but the skill level was near to least level. It indicates that the farmers were lesser skilled in the use of these technologies. In the case of feed master application farmers were found lesser knowledgeable but higher-skilled and found statistically significant ($p < 0.05$). Ceballos *et al.* (2018) reported that the trained farmers have better knowledge and skill in on-farm management practices. The provision of training facilities could make a positive impact on the farmers and

make them better farm managers Sharma *et al.* (2017). From the present study, it was found that the trained farmers moderately adopted livestock technologies after getting training, and more inclusive training and demonstration were needed for further expansion of the livestock technologies.

Perceived topics and level of interest of livestock farmers for assessing the training need

For the rapid dissemination of livestock technologies, integrated training and demonstration are very important factors Akteruzzaman *et al.* (2008). Table 5 contains the topics that livestock farmers identified as the gap in knowledge and skill and showed interest and need to receive training on the topics further. It was observed that livestock farmers express their highest training interest score of 1.87 ± 0.04 on record and account management followed by marketing management (1.56 ± 0.06) and breeding management (1.46 ± 0.07). The livestock farmers showed a higher level of interest in the topics in which they have lesser knowledge and skill. The training content development process should take into account the training needs found of livestock farmers at the field level Abdulkadir *et al.* (2021).

Table 5: Perceived topics of interest in livestock training

Topics	Level of training need (Mean \pm SE)
Housing management	1.02 \pm 0.02
Feed/feeding management	1.30 \pm 0.06
Breeding management	1.46 \pm 0.07
Health management and treatment	1.25 \pm 0.05
Record and account management	1.87 \pm 0.04
Marketing management	1.56 \pm 0.06

(Score: Level of need: 1= Do not need training on the subject area, 2= would need training on the subject area, 3= strongly need training on the subject area)

Improvement of livelihood of trained farmers

Table 6 shows the improvement of livelihood assets of trained farmers after training irrespective of the study areas. Thus the assessment of the impact of training is difficult immediately after training. It was observed that after training all parameters of human assets were improved reported by most of the livestock farmers. The highest 91.25% of farmers reported that among human assets the condition of health and sanitation was improved along with the training facility. However, the lowest was 53.75 % in the case of knowledge/efficiency. The findings suggested that training is an important factor in increasing the human assets of the farmers. In the case of social assets, farmers reported that the highest 91.25% got involved in social groups or activities and their decision-making ability was improved and the lowest 21.25% of farmers thought that their social prestige was improved. However, 43.75% of respondent farmers reported an improvement in women empowerment and the finding agreed with the result reported by Jadav *et al.* (2014). Remarkable improvement occurred in the case of social assets among trained farmers. Table 6 also indicates that the highest 50.00% of farmers reported that their mortgage in cultivable land was increased and the lowest was in the case of access to open water sources (0.00%) followed by own cultivable land (15.00%). This means the farmers who have training the number of natural assets increased but at a lower ratio. However, among physical assets, the highest improvement occurred in the case of tubewell or pump and electric fan reported by 91.25% of the respondent farmers, and the lowest 37.50% have increased the freeze or computer. The findings suggested that training is an important factor also for increasing the physical assets of the farmers. Moreover, the least amount of farmers reported that their financial assets

increased after training. In the case of financial assets, 52.50% of farmers reported that their liquid cash in hand increased remarkably. However, no one farmer has found whom the donation or aid increased and only 13.75% of farmers reported that their amount of cash in the bank increased. Increasing all kinds of livelihood assets of farmers indicated that training exposure helped to improve the livelihood status of the trained farmers which was agreed with the argument of Hossain *et al.* (2021).

Table 6: Livelihood improvement of trained farmers

SL. No.	Assets	Parameters	Improved (%)
1	Human Assets	Health and sanitation	91.25 (73)
		Education	90.00 (72)
		Training facility	91.25 (73)
		Knowledge/efficiency	53.75 (43)
		Access to information	82.50 (66)
2	Social Assets	Involvement in social group/activities	91.25 (73)
		Political involvement	37.50 (30)
		Self-managerial capability	52.50 (42)
		Social prestige	21.25 (17)
		Decision-making ability	91.25 (73)
		Women empowerment	43.75 (35)
3	Natural Assets	Cultivable land (Own)	15.00 (12)
		Cultivable land (mortgage in)	50.00 (40)

		Pond area	37.50 (30)
		Open water access	0.00 (0)
4	Physical Assets	Housing	50.00 (40)
		Furniture	58.75 (47)
		Agricultural Equipments	48.75 (39)
		Bicycle/motor cycle or van	57.50 (46)
		Tube well/pump	91.25 (73)
		Electricity	53.75 (43)
		TV/radio/DVD	48.75 (39)
		Cable network	43.75 (35)
		Freeze/computer	37.50 (30)
		Electric fan	91.25 (73)
		Mobile phone	53.75 (43)
		Toilet facility	53.75 (43)
5		Financial Assets	Cash in hand
	Cash in bank		13.75 (11)
	Jewelry		0.01 (1)
	Donation/aid		0.00 (0)

(Number in the parenthesis indicates the respondent number)

Changes in annual income, expenditure, and savings of trained livestock farmers

Table 7 represents the changes in annual income, expenditure, and savings of trained livestock farmers after getting training. The highest annual income was found in Dhamrai Upazila (BDT

320333.30±37242.55) and the lowest was in Jessore Sadar (BDT 79500.00±500.02) Upazilas and overall was BDT 181937.50±19169.98 before getting the training from BLRI. However, after getting training the annual income of all study areas improved and the highest improvement occurred in Dhamrai Upazila (BDT 76133.33±4287.12) followed by Naikhongchhari Upazila (BDT 66850.00±21374.64) and was found statistically significant ($p<0.05$). The overall change in annual income was BDT 65700.00±17309.35 and was also found statistically significant ($p<0.05$). A similar result was reported by Akteruzzaman *et al.* (2008) who reported that the farmers having training exposure earned more money. Moreover, the overall annual expenditure was also increased (BDT 26175.00±2135.79) and found statistically significant ($p<0.05$). In Naikhongchhari Upazila annual expenditure was also increased and found statistically significant ($p<0.05$). Furthermore, the annual savings of all study areas was increased and overall improvement was (BDT 43232.88±17632.76) and in Dhamrai it was found statistically non-significant ($p<0.05$). The highest increase in annual savings was occurred in Naikhongchhari Upazila (BDT 51500.00±17612.87) and found statistically significant ($p<0.05$).

Table 7: Annual income, expenditure, and savings of trained livestock farmers

Particulars	Dhamrai	Jessore Sadar	Naikhongchhari	Overall
Annual income				
Before (BDT) (Mean±SE)	320333.30±37242.55	79500.00±500.02	128000.00±21027.55	181937.50±19169.98
After (BDT) (Mean±SE)	396466.70±32096.61	134000.00±2779.23	194850.00±37610.56	247637.50±20079.57
Change (BDT) (Mean±SE)	76133.33±4287.12	54500.00±2737.03	66850.00±21374.64	65700.00±17309.35

Significance	*	*	*	*
Annual expenditure				
Before (BDT) (Mean±SE)	71766.67±3874.97	73700.00±1835.25	47250.00±8625.81	66362.50±2924.81
After (BDT) (Mean±SE)	98133.33±6317.78	106900.00±5453.95	62600.00±12230.12	92537.50±4748.35
Change (BDT) (Mean±SE)	26366.67±3020.04	33200.00±3620.31	15350.00±3861.60	26175.00±2135.79
Significance	*	*	*	*
Annual savings				
Before (BDT) (Mean±SE)	248566.70±38360.59	5800.00±1831.02	80750.00±13195.27	126315.10±19405.76
After (BDT) (Mean±SE)	298333.30±30157.68	27100.00±2798.74	132250.00±25418.07	169547.90±18570.32
Change (BDT) (Mean±SE)	49766.67±43775.88	21300.00±1214.99	51500.00±17612.87	43232.88±17632.76
Significance	NS	*	*	*

(*Significant, NS-Non-significant at 5% level of significance)

CONCLUSIONS

The livestock farmers were moderately knowledgeable and skilled and the rate of adoption of livestock technology such as housing or shed management, feeds or feeding management, breeding management, and health management were moderately satisfactory for the beneficiaries having training exposure. However, they were less knowledgeable and skilled in record keeping,

account management, and marketing management which should be integrated into all livestock extension training programs. However, in most of the cases, skill level score was lower than knowledge level and found statistically significant ($p < 0.05$). It was also observed that after training all parameters of human assets were improved remarkably reported by most of the livestock farmers. However, other livelihood assets such as social assets, natural assets, and physical assets moderately improved as reported by the farmers. In the case of financial assets, cash in hand improved more than other parameters found in the study. However, after getting training the annual income of all study areas was improved and found statistically significant ($p < 0.05$). Moreover, the annual average savings of all study areas was increased. The intervention of BLRI technology was found moderately effective in the improvement of knowledge and skill and adaption of technologies at the field level along with the improvement of livelihoods of the livestock farmers. A more integrated training approach followed by practical demonstration may be more helpful for the rapid dissemination of livestock technologies at the field level and it may be more effective in contributing to the extension of technologies and development of the livestock sector in Bangladesh.

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