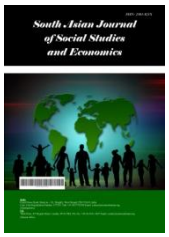

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The Impact of Training; Technology Adoption and Improvement of Livelihood of Trained Livestock Farmers in Different Zones of Bangladesh

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The study was conducted to examine the impact of training provided to livestock farmers facilitated by the Bangladesh Livestock Research Institue (BLRI) for transferring technology, adoption, and its impact on the livelihoods of trained farmers from July 2020 to June 2021. A Simple random 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 was collected through a pre-tested questionnaire and analyzed descriptively. The majority of respondents were 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

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Dhamrai (5.83±0.20) and Jessore Sadar (727.20±54.79) Upazilas respectively. The livestock farmers were found moderately adopted 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 increased from BDT 181937.50±19169.98 to BDT 247637.50±20079.57. Thus, training was found to be moderately effective in disseminating knowledge and skill in technology and management of livestock and improving the livelihoods of the livestock farmers.

Keywords: Training; adoption; knowledge; skill; livelihood assets; annual income.

1. 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 [1]. However, within agriculture, the livestock sub-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 [1]. 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 [2] against the demand of 250ml/day, 120 gm/day and 104 nos/year respectively. In Bangladesh, the farm animals mostly include cattle, buffalo, goat, and sheep whilst the most important species under poultry is chicken and duck. Most of the farm animals are still reared under the traditional production system except for some commercial dairy and beef fattening farms that have developed recently. The development of the commercial poultry production system has been based on imported germplasm, feed, and medicines Hamid et al. [3]. 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 [4]. About 5.786 million MT of cow milk is produced annually Hamid et al. [3]. The country produces about 1.751 million MT of beef annually, the most popular type of meat. Presently, Cattle and buffalo provide 65% of the total draught power of the country. . 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. According to Huque et al. [5] on average, a family produces about 8.3 liters of milk per week whilst a cow produces an average of 0.8 liters per day. Goats are another species of livestock that plays an important role as an animal genetic resource in the agro-based economy of the country particularly in subsistence agricultural operations. In the case of chicken, one hand, the last two decade has seen commercial chicken production developing at a faster rate than any other poultry species in the country last two decades. Whilst, on the other hand, the production system of native chickens did not change very much as most of the native chickens are still raised under a low input system and this has resulted in their productivity remaining low. Therefore, in order to develop the livestock sector in Bangladesh, new strategies need to be adopted and the dissemination of livestock technologies and training are important tools for the development of this sector as alluded by Hossain et al. [6]. As pointed out by Sharma et al. [7], training can expedite the development of the behavior of farmers towards the adoption of livestock technology and this will resultantly improve livestock rearing by them. The participation of rural people in livestock farming activity plays an important role in the economic development of Bangladesh Huque et al. [8]. Realizing the great contribution of the rural people in the production process of farm facilities, government planners, policymakers and administrators have been trying to take necessary steps to include rural people in the livestock development process in recent years. Smallholder farmers have the potential to play an important role in livestock development if they get better opportunities to organize themselves as a functional group. In the production of livestock, both men and women integrate with the rearing and management. Despite the fact that training and adoption of livestock technologies have the potential of improving the livelihoods and food security of moderate and extremely poor households whilst at the same time empowering rural women through sustainable income-generating activities

there are limited studies done in this area. Through the Bangladesh Livestock Research Institute (BLRI) farmers were trained on different livestock technologies in different areas of Bangladesh through its revenue and development budget. Despite undertaking these training and availing financial resources to rural farmers there has been limited information about the impact of the training on-farm conditions used by fattening, dairy, and poultry farmers. Considering these facts, this study examines the impact of training on the adoption of technology and management practices along with the impact on livelihood improvement of trained livestock farmers in selected zones of Bangladesh.

2. METHODOLOGY

2.1 Selection of Study Areas and Sample Farmers

The selection of farm/households was based on those who had been trained in livestock technologies and management from Dhamrai, Jessore Sadar, and Naikhongchhari Upazilas of Dhaka, Jessore, and Bandarban districts respectively. The study zones were selected purposively and then sample farmers were selected using a simple random sampling technique.

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.

2.2 Methods of Data Collection

The simple random sampling technique was used to select 80 farmers from 150 trained livestock farmers from the three selected zones for the survey. A direct face-to-face on-farm individual interview was conducted to collect necessary data using a standard pre-tested questionnaire. A questionnaire was designed combined with both quantitative and qualitative data from selected farmers. Qualitative data was collected 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. Thus, 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 the 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*.* [9]. 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 knowledged 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 for training 3 points score from 1= do not need training, 2= would need training, and 3= strongly need training was used.

2.3 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

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 (%)**

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 [10]. 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 Exel and SPSS 20.0 software.

3. RESULTS AND DISCUSSION

3.1 Demographic Characteristics of Livestock Farmers

The following Table 2 provides the demographic data of livestock farmers. From the respondents interviewed, (66.25%) were males and were also the majority as compared to female who constituted (33.75%). The average age of the livestock farmers was 37.10±0.86 years which was almost similar to Hossain et al*.* [6] who reported the average age of the respondent was 36.73. The average years of schooling were 9.05±0.24 years indicating that the livestock farmers were moderately educated. Akteruzzaman et al*.* [11] 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 have 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*.* [6] 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).

3.2 Types of Livestock Reared by Respondent Farmers

The following Table 3 shows different types of livestock reared by the respondent farmers. 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).

3.3 Extent and Rate of the Adoption of Different Parameters of Livestock Technologies

The following Table 4 represents the knowledge and skill level of different parameters of livestock technologies adopted after the training.

Table 2. Demographic characteristics of livestock farmers

Variables	Dhamrai	Jessore Sadar	Naikhongchhari	All areas
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 (Mean±SE)	9.13±0.31	9.60±0.44	8.10±0.52	9.05±0.24
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)

Table 3. Types of livestock reared by farmers

Types of livestock	Dhamrai	Jessore Sadar	Naikhongchhari	All areas
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

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 account management	Livestock Inventory	1.47±0.06	1.12±0.04	*
		Production record	1.35±0.06	1.01±0.01	*
		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	*

Sl. No.	Technology	Parameters	Knowledge level (Mean±SE)	Skill level (Mean±SE)	Sig.
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 Knowledged)

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

3.3.1 The knowledge and skill level of respondents farmers on housing/shed, feeds and feeding management

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. [12] reported the awareness of farmers regarding housing management was improved agreed with the current findings. 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). Ceballos et al. [3] reported that the trained farmers have better knowledge and skill in on-farm management practices agreed with the present finding.

3.3.2 The knowledge and skill level of respondents farmers in breeding and health management

Table 4 also contains the 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. [12] agreed with the present finding.

3.3.3 The knowledge and skill level of respondents farmers on record keeping, account and marketing management

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. From the respondents, it was apparent that the farmers were less knowledgeable and lacked record keeping as well as account management skills. Respondents indicated that they were not skilled in any of the farm records listed. The respondent farmers indicated that though they had some knowledge of why farm records are kept but they did not have the expertise to properly keep them. 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 was an indication of a serious problem in farm management because farmers were not able to keep proper records of their farms. The difference between knowledge and skill level, in this case, was also found statistically significant ($p<0.05$). Significantly, results also indicate that livestock farmers were less knowledgeable and lacked skills in marketing management of their livestock. 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.

3.3.4 The knowledge and skill level of respondents farmers on other livestock technologies

From the study, it was also found 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 BLRI feed master application farmers were found lesser knowledgeable but higher-skilled and found statistically significant ($p<0.05$). From the present study, it was found that the trained farmers moderately adopted livestock technologies after getting training, and the provision of integrated training and demonstration is important for the rapid dissemination of livestock technologies agreeing with the finding of Sharma et al*.* [7] and Akteruzzaman et al*.* [11]. More inclusive training and demonstration were needed for further expansion of the livestock technologies.

3.4 Perceived Topics and Level of Interest of Livestock Farmers for Assessing the Training Need

The following Table 5 represents 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. The respondent's 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 were less knowledgeable and have the least skills. The training content development process should take into account the training needs found of livestock farmers at the field level Abdulkadir et al*.* [14] agreed with the finding.

3.5 Improvement of Livelihood of Trained Livestock Farmers

The following 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. The results showed that after training all parameters of human assets were improved as reported by most of the livestock farmers. From the respondents, it emerged that 91.25% of farmers reported that on human assets, the condition of health and sanitation was improved along with the training facility. However, knowledge/efficiency was the lowest as it stood at 53.75 %. The findings suggested that training was an important factor in

Table 5. Perceived topics of interest in livestock training

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

Table 6. Livelihood improvement of trained livestock 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)

SL. No.	Assets	Parameters	Improved (%)
		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	52.50 (42)
		Cash in bank	13.75 (11)
		Jewelry	0.01 (1)
		Donation/aid	0.00 (0)

(Number in the parenthesis indicates the respondent number)

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

Particulars	Dhamrai	Jessore Sadar	Naikhongchhari	All areas
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)*

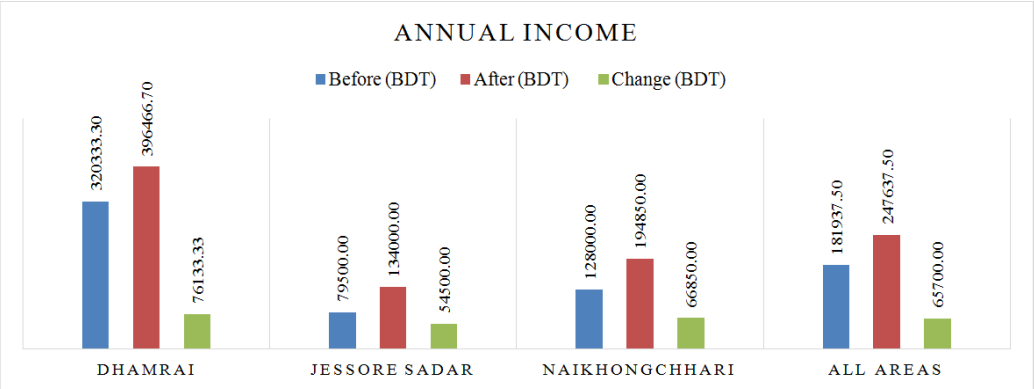

Fig. 1. Changes of annual income of trained livestock farmers

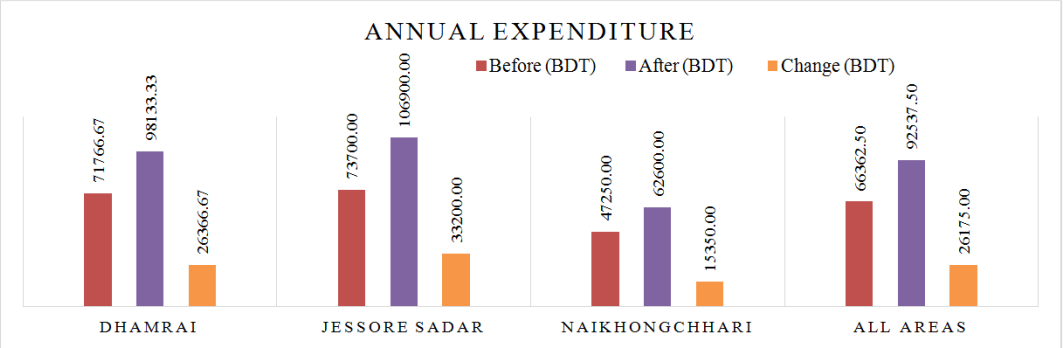

Fig. 2. Changes of annual expenditure of trained livestock farmers

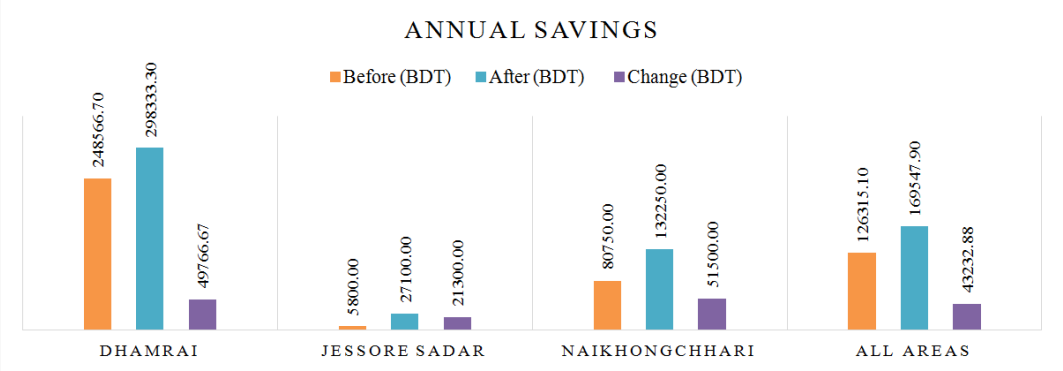

Fig. 3. Changes of annual savings of trained livestock farmers

increasing the human assets of the farmers. In the case of social assets, farmers reported that 91.25% which was the highest got involved in social groups or activities and their decision-making ability was improved. Conversely, 21.25% of farmers which was the lowest indicated that their social prestige was improved. On the other hand, 43.75% of respondent farmers reported an improvement in women empowerment and this finding resonates well with the result reported by Jadav et al. [15] when they stated that training is an important aspect of empowerment, which can enhance knowledge, improve skill and change the attitude of rural women. 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 were trained had 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 was an important factor also for increasing the physical assets of the farmers. In the case of financial assets, 52.50% of farmers reported that their liquid cash in hand increased remarkably. However, only 13.75% of farmers reported that their amount of cash in the bank increased. The increase in all kinds of livelihood assets of farmers indicated that training exposure helped to improve their livelihood status and this is in agreement with the argument postulated by Hossain et al. [6] when they stated that training exposure improved the livelihood assets [16].

3.6 Changes in Annual Income, Expenditure and Savings of Trained Livestock Farmers

The following Table 7 represents the changes in annual income, expenditure, and savings of trained livestock farmers after getting training. The highest annual income before being trained by BLRI was in Dhamrai Upazila (BDT 320333.30±37242.55) and the lowest was in Jessore Sadar (BDT 79500.00±500.02) Upazilas and the average of all areas was BDT 181937.50±19169.98. However, after being trained the annual income of all study areas improved and the highest improvement recorded was 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 change in annual income of all areas was BDT 65700.00±17309.35 and was also found statistically significant ($p<0.05$) which agreed with the argument postulated by Hossain et al. [6] and Akteruzzaman et al. [11] when they stated that training exposure earned more money than the farmers having non-training and also earned more money than before. Moreover, the overall annual expenditure also increased (BDT 26175.00±2135.79) and was found statistically significant ($p<0.05$). In Naikhongchhari Upazila annual expenditure also increased and was 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 ($p<0.05$).

4. CONCLUSIONS

The livestock farmers were moderately knowledgeable and skilled and the adoption of livestock technologies such as housing or shed management, feeds or feeding management, breeding management, and health management were moderately improved and adopted among the trained livestock farmers. 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 noted that after training all parameters of human assets improved remarkably as reported by most of the livestock farmers. However, other livelihood assets such as social assets, natural assets, and physical assets moderately improved. In the case of financial assets, cash in hand improved more than other parameters found in the study. Further, 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 adoption 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 is more helpful for the rapid dissemination of livestock technologies at the field level and it will be more effective in contributing to the extension of technologies and development of the livestock sector in Bangladesh.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. BBS. Statistical Year Book of Bangladesh, Bangladesh Bureau of Statistics, Ministry of planning, Government of the peoples" Republic of Bangladesh. Dhaka, Bangladesh; 2021.
2. BER. Economic Adviser's Wing, Finance Division, Bangladesh Economic Review, Ministry of Finance, The Government of the peoples' Republic of Bangladesh, Dhaka, Bangladesh; 2021.
3. Hamid MA, Ahmed S, Rahman MA, Hossain KM. Status of Buffalo production in Bangladesh compared to SAARC countries. Asian J Anim Sci. 2016;10(6):313-29.
4. DLS (Department of Livestock Services). Annual report on livestock, Division of Livestock Statistics. Ministry of fisheries and livestock, farmgate, Dhaka, Bangladesh; 2019.
5. Huque QME, Faruque MO, Bhuiyan AKFH, Huque KS. Report on animal genetic resources of Bangladesh. The Govt. of the peoples' Republic of Bangladesh; 2004;14-5.
6. Hossain MA, Islam MS, Akhter A, Rashiduzzaman M. Impact of training on livestock technology transfer for rural poor farmers livelihood improvement in Bangladesh. SAARC J Agric. 2021;19(1):223-35.
   DOI: 10.3329/sja.v19i1.54792.
7. Sharma VK, Amrish Vaid S, PK, Ajrawat, B, Jamwal A et al. Impact assessment of training on farmer's perception, performance and entrepreneurship development. Maharashtra Jn Agrol Econ. 2017;20(2):154-6.
8. Huque KS, Khan MYA. Socio-geographic distribution of livestock and poultry in Bangladesh-A review. Bangladesh J Anim Sci. 2017;46(1):65-81.
9. Gay LR, Milles EG, Airasian P. Educational research: competencies for analysis and applications. 9th ed, Pearson Educational Inc. Upper Saddle River. 2009;150.
10. DFID. Sustainable livelihoods guidance sheets. Department for International Development; 2000.
    Available:http://www.livelihoods.org/info/info_guidancesheets.
11. Akteruzzaman M, Miah MAM, Hossain MM, Fattah KA, Rahman R. Impact of training on transferring livestock technology for improvement of livelihoods of the rural farmers. Bang. J Anim Sci. 2008;37(2):106-15.
12. Hundal JS, Singh U, Navdeep Singh K, SK, Bhatti JS. Impact of training on knowledge level of goat farmers in Punjab. Haryana Vet. 2016;55(1):47-9.
13. Maria C, Ceballos A, C. SantÕAnna, Xavier Boivin, Franciely de Oliveira Costa , Monique V. de L. Carvalhal, Mateus J.R. Livest Sci. Impact of good practices of handling training on beef cattle welfare and stockpeople attitudes and behaviors; 2018.
    DOI: 10.1016/j.livsci.2018.06.019.
14. Abdulkadir B, Gebreyes M, Mekonnen K. Training needs assessment report on livestock feed and forage production and utilization. Accelerating Impacts of CGIAR Climate Research for Africa (AICCRA); 2021.
    Available:
    https://hdl.handle.net/10568/116332
15. Jadav SJ, Rani VD, Mudgal S, Dhamsaniya HB. Women empowerment through training in dairy farming. Asian J Dairy Food Res. 2014;33(2):147-53.
    DOI: 10.5958/0976-0563.2014.00592.2.
16. Hamid MA, Rahman MA, Ahmed S, Hossain KM. Status of poultry industry in Bangladesh and the role of private sector for its development. Asian J Poult Sci. 2016;11(1):1-13.

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