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RESEARCH PAPER

Impact of Credit Advanced by Zarai Taraqiati Bank Limited on the Income of Farmers in the Livestock Sector in District Dir Lower, Khyber Pakhtunkhwa

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ABSTRACT

This study examines the impact of credit advanced by ZTBL on the income of farmers in the livestock sector in district Dir Lower, KP. A multistage random sampling technique was employed to randomly select district Dir Lower in the first stage, followed by four tehsils. The Yamane formula and Proportional allocation technique were used to randomly select a sample size of 298 farmers from a total of 1193 loanee farmers. Data were collected through a semi-structured questionnaire and personal interviews during 2017–2020. The data were analyzed using descriptive and inferential statistics. A multiple linear regression model was applied to quantitatively determine the impact of ZTBL credit on the income of farmers in the livestock sector. The estimated results show that ZTBL credit has a positive and statistically significant impact on farmers' income in the livestock sector. Additionally, other variables, such as age, education level, family size, farm size, livestock holdings, and farming experience, also show a positive and statistically significant relationship with farmers' income. The study recommends that ZTBL should introduce interest-free loans based on Islamic partnership, recognize its friendly policy regarding collateral requirements, and simplify the credit procedure to facilitate credit access. Furthermore, the study suggests that ZTBL should increase its local branches to support farmers and increase their income.

Keywords: Agriculture, Livestock, ZTBL Credit, Farmer Income, Dir Lower

Introduction

In Pakistan, the agricultural sector is the major economic sector that provides employment to about 45% of the country's labor force, contributes 21% to Gross Domestic Product (GDP), and accounts for nearly 60% of the country's exports (Syed et al., 2022). It consists of major crops, minor crops, forestry, fishery, and livestock. The combined contributions of major crops, minor crops, forestry, and fishery sectors account for 37.45% of the value addition in agriculture and represent 7.27% of the GDP. Livestock is the largest sub-sector, accounting for 60.6% of agricultural value addition and 11.7% of GDP (Jatoi, 2021). It contributes significantly to the country's economy, accounting for approximately 2.0% of total exports. The livestock sector provides employment opportunities to a substantial portion of the rural population, with over 8 million families involved in livestock-related activities, generating 35-40% of their income from this sector (GOP, 2023).

The livestock sector and its importance have been recognized in many developing countries, including Pakistan. It provides raw materials for various industries such as carpets, rugs, leather, and shoes (Iqbal et al., 2012). Livestock contributes significantly to food security for both rural and urban populations, providing essential products for domestic consumption and commercial use. It is used as a means of transportation for agricultural inputs, output, and people, and is considered an important source of ploughing and land leveling. Livestock is a crucial component of sustainable agriculture, serving as a source of draft power for farming and providing valuable manure for fertilizing crops (Bettencourt et al., 2015).

Despite the growing number of livestock, there is a decline in per-animal productivity in Pakistan. The majority of farmers are smallholders with limited resources, depending on traditional breeding methods and managerial tools, as well as lacking access to quality feeding items, and medicines (Ashfaq et al., 2015). Agricultural credit can help modernize and commercialize the livestock sector, benefiting both farmers and animals. Iqbal et al. (2003) emphasized that in Pakistan, farmers obtain agricultural credit from both non-institutional and institutional sources for their agricultural financing needs. Non-institutional sources comprise family members, friends, neighbors, moneylenders, commission agents, and traders. Shah et al. (2008) highlighted that non-institutional credit is provided at a high interest rate and on the condition that borrowers sell their produce at lower prices to the lenders. In order to protect poor farmers from exploitation, the government extended credit facilities through institutional sources. Institutional sources include commercial banks, Taqavi loans, cooperative societies, and the Zarai Taraqiati Bank Limited (ZTBL). ZTBL is considered a specialized financial institution in Pakistan that provides financial services to the agricultural sector. The brief background of ZTBL is given below.

Zarai Taraqiati Bank Limited

The Agricultural Development Finance Corporation (ADFC) was established in 1952 to increase financial facilities and promote development in the agricultural sector of Pakistan. In September 1957, the Agricultural Bank of Pakistan (ABP) was created to provide financial support to farmers. In February 1961, ADFC and ABP were merged to form the Agricultural Development Bank of Pakistan (ADBP). In December 2002, the Federal Government of Pakistan transformed ADBP into ZTBL (Rehman et al., 2015). ZTBL currently operates with 9 audit zones, 31 zonal offices, and 501 branches nationwide, including two branches in district Dir Lower. It provides short, medium, and long-term loans to farmers for various agricultural activities, including the livestock sector. The present study aims to analyze the impact of ZTBL credit on farmers' income in the livestock sector in district Dir Lower.

Livestock farming is crucial for the economy of district Dir Lower, providing employment and income for many people. However, financial constraints limit farmers' ability to invest in their livestock operations. To overcome farmers' financial constraints, agricultural credit, particularly from ZTBL, is widely recognized as an effective tool for the development of the livestock sector. Access to institutional credit enables farmers to invest in high-quality animals, improved feeding practices, veterinary care, and modern equipment, resulting in increased productivity, higher quality products, and ultimately higher income for livestock farmers. In this regard, ZTBL is a prominent financial institution that supports the development of the livestock sector and the overall economy in the region through financial assistance.

Literature Review

Khan et al. (2007) conducted a study on the impact of ZTBL credit on farm production in district Karak, Pakistan. Data were collected from 75 respondents through a standardized questionnaire during 2005-06. For statistical analysis, percentage analysis was applied before and after credit. The findings revealed that ZTBL credit increased crop production, animals, and farmers' income.

Abedullah et al. (2009) conducted a study on the impact of agricultural credit on the growth of the livestock sector in Faisalabad, Pakistan. A stratified random sampling approach was used to collect data from 50 livestock farmers. Multiple linear regression analysis was employed to analyze the relationship between income per milking animal and credit amount. The results showed that credit increased milking animals by 160%, resulting in a corresponding 181% increase in family income.

Mohsin et al. (2011) studied the effect of supervised agricultural credit on farm income in Punjab, Pakistan. An interview schedule was applied to collect data from 80 respondents. The findings highlighted a positive and significant relationship of animals, production, and income with credit. Total animals increased by 20%, milk production by 78%, and earnings from livestock by 78.48%.

Iqbal et al. (2012) emphasized the influence of agricultural credit on livestock and the income level of farmers in district Swat, Pakistan. Data were collected from 80 respondents through a structured questionnaire. A paired t-test was applied to compare animals and the income level of farmers before and after credit utilization. The results found that credit had significantly increased animals by 31% and the income level by 23%.

Khan et al. (2015) highlighted the role of livestock in poverty alleviation in district Lasbela, Pakistan. Data were collected from 100 farmers in five tehsils through a well-developed questionnaire. The Ordinary Least Squares (OLS) method was employed to examine the impact of various variables on farmers' income level. The result indicated that access to credit positively and significantly affected the income of the respondents.

Kuye (2015) estimated the impact of microcredit on livestock production in Yakurr, Nigeria. A purposive, 3-stage random sampling technique was used to collect primary data from 150 smallholder livestock farmers. Descriptive as well as inferential statistics were applied for data analysis. The estimated results showed that microcredit had a positive and statistically significant effect on the production of livestock in the research area.

Khan et al. (2018) investigated the impact of ZTBL credit on livestock income in district Lasbela, Pakistan. Data were collected through a well-structured questionnaire from 100 livestock farmers. The statistical analysis using the OLS technique revealed that ZTBL credit significantly contributes to the growth of the livestock sector, leading to a substantial 65% increase in farmers' income in the livestock sector.

From the above discussion, various researchers have found that institutional credit positively impacts farmers' income in the livestock sector. Livestock farming is a common occupation in district Dir Lower, providing livelihood and earning opportunities for many people. Despite its importance, farmers in the area often face challenges in financing their livestock activities due to their limited financial resources. To finance livestock activities, farmers in the district receive financial assistance from ZTBL. However, to the best of our knowledge, there is a lack of empirical research on measuring the impact of ZTBL credit on farmers' income in the livestock sector in district Dir Lower. This study aims to fill the gap by collecting and analyzing quantitative data to understand the actual impact of ZTBL credit on farmers' income in the livestock sector in the study area.

Hypotheses

H_0: ZTBL credit has no significant impact on farmers' income in the livestock sector in district Dir Lower

H_1: ZTBL credit has a significant impact on farmers' income in the livestock sector in district Dir Lower

Materials and Methods

The present study was conducted in district Dir Lower, Khyber Pakhtunkhwa (KP) province, Pakistan. A multistage random sampling method was used to select district Dir Lower, followed by four tehsils – Adenzai, Balambat, Munda, and Timergara. A list of 1193 farmers who had received credit from ZTBL was obtained from Chakdara and Timergara branches. The sample size of 298 respondents was determined using the Yamane formula and Proportional allocation technique. Primary data were collected from sampled farmers

through pretested semi-structured questionnaire and personal interviews from 2017–2020. Descriptive and inferential statistics were used to analyze the data. A multiple regression model was applied to assess the relationship between farmers' income (dependent variable) and various independent variables, including age, education level, family size, farm size, livestock holdings, farming experience, and credit. The multiple linear regression model is presented in equation 1 as follows.

$$LogY = \beta_0 + \beta_1 logX_1 + \beta_2 logX_2 + \beta_3 logX_3 + \beta_4 logX_4 + \beta_5 logX_5 + \beta_6 logX_6 + \beta_7 logX_7 + \varepsilon \ldots\ldots (1)$$

Where:

Log	=	Logarithm
Y	=	Annual income of farmers (PKR)
X_1	=	Age of farmers (Years)
X_2	=	Education level of farmers (Years)
X_3	=	Family size (No. of persons)
X_4	=	Farm size (Kanal)
X_5	=	Livestock holdings (No. of animals owned)
X_6	=	Farming experience (Years)
X_7	=	Credit size (PKR)
β_0	=	Intercept of the model
β_0, β_1, β_2, β_3, β_4, β_5, β_6, and β_7 are the coefficients of independent variables		
ε	=	Error term

The Yamane formula for sample size determination is shown in equation 2 below.

$$n = N/1+N(e)^2 \ldots\ldots (2)$$

Where:

n	=	Sample size
N	=	Total population
e	=	Margin of error (5%)

Substituting the values in equation 2 gives the total sampled size as follows.

$$n = 1193/1+1193\times(0.0025) = 300 \text{ (Approximately)}$$

The Proportional allocation technique is given in equation 3 as follows.

$$n_i = Ni/N\times n \ldots\ldots (3)$$

Where:

n_i	=	Sample size in each tehsil
N_i	=	Total number of loanee farmers in each tehsil
N	=	Total loanee farmers
n	=	Total sample size

By using equation 3, the sample size for each tehsil is shown in Table 1.

Table 1
Tehsil wise distribution of sample size in the research area

Tehsils	Total loanee farmers	Sample size
Adenzai(n_1)	308	$n_1 = 308/1193\times300 = 77$
Balambat(n_2)	288	$n_2 = 288/1193\times300 = 72$
Munda(n_3)	261	$n_3 = 261/1193\times300 = 65$
Timergara(n_4)	336	$n_4 = 336/1193\times300 = 84$
Total	1193	298

Source: ZTBL Chakdara and Timergara Branches

Results and Discussion

The results in Table 2 highlights that the majority of respondents, comprising 41.61%, were in the age group of 41-50 years, followed by 28.19% in the age group above 50 years, 26.51% in the age group 26-40 years, and 3.69% in the age group up to 25 years.

In the age group 41-50 years, tehsil Adenzai reported the maximum percentage of respondents, followed by Balambat, Timergara, and Munda. In the age group above 50 years, tehsil Timergara recorded the highest proportion of respondents, followed by Balambat, Adenzai, and Munda. In the age group 26-40 years, Munda was the leading tehsil in respondents, followed by Timergara, Adenzai, and Balambat. In the age group up to 25 years, tehsil Adenzai noticed the biggest share of respondents, followed by Balambat, Timergara, and Munda. Age influences household economy of livestock farming. Experienced older farmers contribute to higher productivity and income through their knowledge and skills, while younger farmers adopt the latest technologies and increase labor supply, leading to higher productivity and income (Zahra et al., 2013; Baidoo et al., 2016).

Table 2
Distribution of respondents by age

Tehsils	Up to 25		26-40		41-50		Above 50		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Adenzai	5	1.68	19	6.38	35	11.74	18	6.04	77
Balambat	3	1.01	15	5.03	33	11.07	21	7.05	72
Munda	1	0.34	24	8.05	25	8.39	15	5.03	65
Timergara	2	0.67	21	7.05	31	10.40	30	10.07	84
Total	11	3.69	79	26.51	124	41.61	84	28.19	298

Education level of respondents

Table 3 reveals that the majority of respondents, accounting for 41.95%, had a matric education, followed by 28.68% with primary education, 15.10% above matric, and 14.09% were illiterate. For matric education, tehsil Timergara led the majority of respondents, followed by Balambat, Adenzai, and Munda. For primary education, tehsil Adenzai reported the maximum percentage of respondents, followed by Munda, Balambat, and Timergara. In the above matric education category, tehsil Timergara observed the majority of respondents, followed by Munda, Adenzai, and Balambat. In the illiterate group, tehsil Adenzai registered the largest proportion of respondents, followed by Munda, Timergara, and Balambat. Education is important for the development of farming communities as it enhances farmers' productivity, income, and decision-making abilities. Farmers with a higher education level are more likely to adopt new technologies and practices, leading to increased efficiency and income in the livestock sector (Cooper & Davis, 2017; Ahmad et al., 2022).

Table 3
Distribution of respondents by education level

Tehsils	Illiterate		Primary		Matric		Above matric		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Adenzai	14	4.70	26	8.72	28	9.40	9	3.02	77
Balambat	7	2.35	21	7.05	33	11.07	11	3.69	72
Munda	12	4.03	24	8.05	26	8.72	3	1.01	65
Timergara	9	3.02	15	5.03	38	12.75	22	7.38	84
Total	42	14.09	86	28.86	125	41.95	45	15.10	298

Family size of respondents

Table 4 highlights that the majority of respondents, comprising 44.63%, had a family size of 6-10 persons, followed by 30.54% with up to 5 persons, 18.12% with 11-15 persons, and 6.71% had above 15 persons. In the family size 6-10 persons, tehsil Timergara had the highest share of respondents, followed by Adenzai, Munda, and Balambat. In the family size up to 5 persons, tehsil Timergara recorded the largest number of respondents, followed by

Adenzai, Balambat, and Munda. In the family size of 11-15 persons, tehsil Balambat led the biggest proportion of respondents, followed by Adenzai, Munda, and Timergara. In family size above 15 persons, tehsil Munda had the majority of respondents, followed by Balambat, Adenzai, and Timergara. Larger families contribute to increased labor availability for farming and income generation, enabling them to cultivate larger farm sizes, which lead to higher production and income in the livestock sector (Baidoo et al., 2016).

Table 4
Distribution of respondents by family size

Tehsils	Up to 5		6-10		11-15		Above 15		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Adenzai	24	8.05	33	11.07	16	5.37	4	1.34	77
Balambat	20	6.71	28	9.40	18	6.04	6	2.01	72
Munda	15	5.03	30	10.07	12	4.03	8	2.68	65
Timergara	32	10.74	42	14.09	8	2.68	2	0.67	84
Total	91	30.54	133	44.63	54	18.12	20	6.71	298

Farm size of respondents

Table 5 demonstrates that the majority of respondents, accounting for 46.31%, had a farm size of up to 5 kanals, followed by 37.92% from 6-10 kanals, 8.72% from 11-15 kanals, and 7.05% above 15 kanals. In the farm size of up to 5 kanals, tehsil Adenzai registered the highest number of respondents, followed by Balambat, Timergara, and Munda. In the farm size of 6-10 kanals, tehsil Timergara recorded the largest proportion of respondents, followed by Munda, Adenzai, and Balambat. In the farm size of 11-15 kanals, tehsil Balambat reported the biggest share of respondents, followed by Adenzai, Timergara, and Munda. In the farm size of above 15 kanals, tehsil Timergara noted the major proportion of respondents, followed by Balambat, Adenzai, and Munda. Larger farm sizes increase production and marketable surplus (Ghafoor et al., 2010), as well as improve the availability of livestock fodder. Livestock health and productivity also tend to improve with larger farm sizes, leading to higher farmers' income.

Table 5
Distribution of respondents by farm size (in Kanal*)

Tehsils	Up to 5		6-10		11-15		Above 15		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Adenzai	39	13.09	26	8.72	8	2.68	4	1.34	77
Balambat	35	11.74	23	7.72	9	3.02	5	1.68	72
Munda	31	10.40	29	9.73	2	0.67	3	1.01	65
Timergara	33	11.07	35	11.74	7	2.35	9	3.02	84
Total	138	46.31	113	37.92	26	8.72	21	7.05	298

**1 Kanal = 0.125 Acre (1 Acre = 8 Kanals) (Ahmad & Jan, 2023).*

Livestock holdings of respondents

Table 6 illustrates that the majority of respondents, consisting 42.95%, owned up to 3 animals, followed by 41.28% owning 4-6 animals, 13.42% owning 7-9 animals, and 2.35% owning above 9 animals. In up to 3 animal group, tehsil Balambat led the respondents, followed by Adenzai, Timergara, and Munda. For the 4-6 animal group, tehsil Timergara recorded the majority of respondents, followed by Munda, Adenzai, and Balambat. In the 7-9 animal group, tehsil Adenzai registered the maximum percentage of respondents, followed by Balambat, Timergara, and Munda. In the above 9 animal group, tehsil Munda noticed the largest proportion of respondents, followed by Adenzai, and Balambat. Livestock can boost farmers' income through sales of animals and by-products like milk,

meat, manure, hides, and wool, leading to a positive impact on their overall earnings in the livestock sector (Baltenweck et al., 2020).

Table 6
Distribution of respondents by livestock holdings

Tehsils	Up to 3		4-6		7-9		Above 9		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Adenzai	35	11.74	26	8.72	14	4.70	2	0.67	77
Balambat	38	12.75	23	7.72	10	3.36	1	0.34	72
Munda	25	8.39	29	9.73	7	2.35	4	1.34	65
Timergara	30	10.07	45	15.10	9	3.02	0	0.00	84
Total	128	42.95	123	41.28	40	13.42	7	2.35	298

Farming experience of respondents

Table 7 indicates that the majority of respondents, comprising 38.46%, had farming experience ranging from 11-20 years, followed by 25.84% with experience from 21-30 years, 19.46% with experience of up to 10 years, and 16.44% with experience above 30 years. In the experience rang of 11-20 years, tehsil Timergara had the highest percentage of respondents, followed by Adenzai, Balambat, and Munda. For experience from 21-30 years, tehsil Adenzai had the most respondents, followed by Balambat, Munda, and Timergara. In the category of experience up to 10 years, tehsil Timergara had the highest number of respondents, followed by Munda, Adenzai, and Balambat. In the group of experience above 30 years, the majority of respondents were in tehsil Timergara, followed by Balambat, Adenzai, and Munda. Experienced farmers in the livestock sector tend to make more informed decisions and operate more efficiently, leading to higher income (Akouegnonhou & Demirbaş, 2021).

Table 7
Distribution of respondents by farming experience

Tehsils	Up to 10		11-20		21-30		Above 30		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Adenzai	13	4.36	30	10.07	24	8.05	10	3.36	77
Balambat	9	3.02	27	9.06	21	7.05	15	5.03	72
Munda	17	5.70	24	8.05	18	6.04	6	2.01	65
Timergara	19	6.38	33	11.07	14	4.70	18	6.04	84
Total	58	19.46	114	38.26	77	25.84	49	16.44	298

Credit size of respondents

Table 8 shows that the majority of respondents, consisting 43.96%, borrowed from PKR 0.21-0.40 million, followed by 28.19% up to PKR 0.20 million, 21.48% from PKR 0.41-0.60 million, and 6.38% above PKR 0.60 million. In the credit size from PKR 0.21-0.40 million, tehsil Balambat led the respondents, followed by Timergara, Adenzai, and Munda. For credit size up to PKR 0.20 million, tehsil Munda reported the highest percentage of respondents, followed by Adenzai, Timergara, and Balambat. In the credit size from PKR 0.41-0.60 million, tehsil Timergara accounted for the largest number of respondents, followed by Adenzai, Munda, and Balambat. In credit size above PKR 0.60 million, tehsil Balambat recorded the most respondents, followed by Timergara, Adenzai, and Munda. Access to credit from institutions like ZTBL can help farmers in the livestock sector expand their operations, increase productivity, and enhance their income (Abedullah et al., 2009; Mohsin et al., 2011, and Iqbal et al., 2012).

However, farmers in the research area avoid interest-based credit, which hinders their access to required funds. Introducing Islamic finance in agriculture can promote

sustainable growth and development while adhering to Islamic principles. To address the issue of high-interest rate, ZTBL bank should introduce an interest-free loan scheme based on Islamic partnership, such as Musharaka and Mudaraba in Islamic banking. Additionally, ZTBL needs to reorganize collateral requirements for institutional loans, simplify credit procedures, and establish new branches in research areas to support farmers and increase their income. These recommendations are consistent with the research of Akram (2008), Kuye (2015), Chandio et al. (2016), and Noonari et al. (2016).

Table 8
Distribution of respondents by credit size (PKR in million)

Tehsils	Up to 0.20		0.21-0.40		0.41-0.60		Above 0.60		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Adenzai	22	7.38	33	11.07	18	6.04	4	1.34	77
Balambat	15	5.03	39	13.09	10	3.36	8	2.68	72
Munda	27	9.06	23	7.72	14	4.70	1	0.34	65
Timergara	20	6.71	36	12.08	22	7.38	6	2.01	84
Total	84	28.19	131	43.96	64	21.48	19	6.38	298

Income of respondents

Table 9 exhibits that the majority of respondents, accounting for 46.31%, had an annual income ranging from PKR 0.21-0.40 million, followed by 23.49% up to PKR 0.20 million, 22.82% from PKR 0.41-0.60 million, and 7.38% above PKR 0.60 million. In the income range of PKR 0.21-0.40 million, tehsil Adenzai registered the highest percentage of respondents, followed by Balambat, Timergara, and Munda. For incomes up to PKR 0.20 million, tehsil Munda recorded the maximum number of respondents, followed by Adenzai, Timergara, and Balambat. In the income range of PKR 0.41-0.60 million, tehsil Timergara had the largest segment of respondents, followed by Balambat, Adenzai, and Munda. For the income group above PKR 0.60 million, tehsil Timergara had the major share of respondents, followed by Adenzai, Balambat, and Munda.

Table 9
Distribution of respondents by annual income (PKR in million)

Tehsils	Up to 0.20		0.21-0.40		0.41-0.60		Above 0.60		Total
	Freq.	%	Freq.	%	Freq.	%	Freq.	%	
Adenzai	19	6.38	40	13.42	13	4.36	5	1.68	77
Balambat	14	4.70	35	11.74	19	6.38	4	1.34	72
Munda	21	7.05	31	10.40	11	3.69	2	0.67	65
Timergara	16	5.37	32	10.74	25	8.39	11	3.69	84
Total	70	23.49	138	46.31	68	22.82	22	7.38	298

Measuring the impact of ZTBL credit

The section examines the relationship between ZTBL credit and various independent variables, including age, education level, family size, farm size, livestock holdings, and farming experience, with the farmers' income in the livestock sector. Data normality, heteroskedasticity, and multicollinearity were checked before estimating the model.

Normality and Heteroskedasticity, and Multicollinearity

The results in Table 10 show that the p-values for the Shapiro-Wilk test and Breusch-Pagan test were greater than the significance level of 5%. This indicates that the data were normally distributed and there was no issue of heteroscedasticity in the model.

Additionally, the VIF values for all independent variables were not greater than 5, indicating that there is no problem of multicollinearity between the independent variables.

Table 10
Tests for Normality, Heteroskedasticity, and Multicollinearity

Test	Normality	
	Statistic	p-value
Shapiro-Wilk	0.994	2.01
	Heteroskedasticity	
	$Chi^2(1)$	p-value
Breusch-Pagan	2.01	0.240
	Multicollinearity	
Independent variables	Variance Inflation Factor (VIF)	
Age	1.166	
Education level	3.955	
Family size	4.687	
Farm size	2.084	
Livestock holdings	2.222	
Farming experience	1.327	
Credit	1.746	

Impact of ZTBL credit on farmers' income

The estimated results in Table 11 reveal a statistically significant relationship between the dependent variable and all independent variables. The coefficient of age was -0.143, representing a negative but statistically significant relationship with farmers' income at a 5% significance level. This suggests that a 1% increase in age corresponds to a 14.3% decrease in farmers' income, holding all other variables constant. The present result supports the findings of Mabe et al. (2010), who also estimated an inverse relationship between age and farmers' income in the livestock sector. The coefficient of education level was 0.08, indicating a positive and statistically significant relationship with farmers' income at a 5% significance level. This shows that a 1% increase in education level increases farmers' income by 8.0%. Ahmad et al. (2022) also observed the positive and significant impact of farmers' education on dairy farmers' income. The coefficient of family size was found to be 0.209, signifying a positive and statistically significant relationship with farmers' income at a 1% significance level. This suggests that a 1% increase in family size could result in a 20.9% increase in farmers' income. This result aligns with the research by Abedullah et al. (2009), who similarly estimated a positive and statistically significant influence of family size on farmers' income in the livestock sector.

The coefficient of farm size was 0.167, indicating a positive and statistically significant association with farmers' income at a 1% significance level. This suggests that a 1% increase in farm size results in a 16.7% increase in farmers' income. This result supports the findings of Baidoo et al. (2016), who similarly emphasized the positive and significant impact of farm size on household income derived from livestock and crop production. The coefficient of livestock holdings was 0.312, demonstrating a positive and statistically significant relationship with farmers' income at a 1% significance level. This shows that a 1% increase in livestock holdings would lead to a 31.2% increase in farmers' income. This finding is consistent with the studies of Mabe et al. (2010) and Akouegnonhou and Demirbaş (2021), who also found that the number of cattle has a positive and significant effect on farmers' income. The coefficient for farming experience was 0.061, indicating a positive and statistically significant relationship with farmers' income at a 5% significance level. This indicates that a 1% increase in farming experience results in a 6.1% increase in farmers' income. This result aligns with the research of Akouegnonhou and Demirbaş (2021), who also observed a significant positive effect of farming experience on farmers' income. The

coefficient of credit was 0.105, indicating a positive and statistically significant impact on farmers' income at a 1% significance level. This suggests that a 1% increase in credit results in a 10.5% increase in farmers' income in the livestock sector.

The estimated results indicate that the coefficient of determination (R^2) for farmers' income was 0.841, indicating that 84.1% of the total variation in farmers' income was explained by the independent variables included in the model. The F-statistic, with a value of 191.87, was found to be statistically significant at a 1% significance level. This suggests that the overall model is significant, and all independent variables explain a significant amount of variation in farmers' income compared to a model with no independent variables.

Table 11
Estimated results of multiple regression model used to measure the impact of ZTBL credit on farmers' income

Variables	Coefficients	S.E	t-value	p-value
Intercept	.324	.141	2.294	.023
Age	-.143	.061	-2.331	.021
Education level	.080	.040	2.012	.045
Family size	.209	.042	4.963	.000
Farm Size	.167	.036	4.674	.000
Livestock holdings	.312	.032	9.752	.000
Farming experience	.061	.026	2.395	.017
Credit	.105	.025	4.172	.000
R-squared = 0.841				
F-statistic = 191.87				
p-value = 0.000				

Conclusion

Livestock farming is vital for employment and income generation in district Dir Lower. However, limited resources hinder farmers from financing farming activities. Access to credit, particularly from ZTBL, can increase farmers' income. This study investigates the impact of ZTBL credit on farmers' income in the livestock sector in district Dir Lower. The findings reveal that ZTBL credit has a positive and statistically significant impact on the income of farmers in the livestock sector. Additionally, other variables such as age, education level, family size, farm size, livestock holdings, and farming experience also exhibit a positive and statistically significant relationship with the income of farmers in the livestock sector.

Recommendations

Based on the study's findings, the following recommendations are proposed:

- ZTBL should introduce an interest-free loan scheme based on Islamic partnership to facilitate farmers in utilizing funds for farming activities and enhancing their income.
- ZTBL should revise the collateral requirements to help farmers increase their income.
- ZTBL should simplify loan procedures to increase accessibility and benefit more farmers, ultimately boosting their income.
- ZTBL needs to extend its services by establishing additional branches to support livestock farming and generate more income in the region.

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