Research Article

Impact of Formal Credit on Subsistence Farmers Dairy Production in Southern Punjab, Pakistan

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Abstract | Livestock plays a significant role in promoting the financial status, assuring food security and reducing poverty specifically rural community of developing countries. The present study attempts to analyze the impact of formal credit on milk production of dairy animals and household income in district Vehari of southern Punjab, Pakistan. The study used simple random sampling approach for collecting primary data of 240 livestock household farmers and employed regression analysis model to estimate credit impact on household income and livestock production. An economic technique of log-linear regression model was applied to identify the factors influencing dairy production and estimate household income difference from dairy production due to formal credit from Zarai Taraqiati Bank Limited (ZTBL). Estimates of the study indicated that agricultural credit facilitated to enhance household income 23.58%, increases herd size 35.5% and raises the average number of milking animals 39.74%. The elasticity of milking animals (0.72%) and agricultural credit (0.139%) is relatively more comparative to education level (0.113%) and family size (0.076 %). In the scenario of findings of the study, it is suggested that policymakers and concerned institutional authorities focus priority to infusion and easy access of credit in formulating easy credit procedures for specifically subsistence farmers which will help in increasing livestock production, reducing poverty and unemployment in the region.

Introduction

Dairy hubs are potentially elaborated as a strong platform for access to markets services for subsistence dairy farmers (Rademaker *et al.*, 2016). In the world scenario, Brazil, India, and China consider among major livestock producing countries while Pakistan ranked 8th major livestock producing country (FAO, 2018). Livestock plays a significant role in socio-economic development, specifically rural community as approximately 8 million household of rural areas engaged and earn 35% share of their income from livestock (PBS, 2018). In agriculture, livestock contributes 58.9% while 11.11% share in Gross Domestic Product (GDP) of the country (PBS, 2018). In Pakistan, estimated dairy animals were 76.8 million while Punjab province sharing major proportion as 44.5% of total livestock of the country (Livestock Census Punjab, 2018).

Subsistence farmers focus on dairy farming specifically for nutrition access, financial assistance sound livelihood (Taj *et al.*, 2012; Ahmad *et al.*, 2015). Increasing dairy productivity of small farmers is required by

improved advisory and technological extension services enhance linkages with the market and financial support through dairy cooperatives (Wilkes et al., 2018). In the economy of Pakistan, the dairy sector is indicated the major single sub-sector (Wilkes et al., 2018) and traditionally following a "top-down" approach in its economic development (Livestock Census Punjab, 2018). The increasing rate of population growth, urbanization and augmenting income subsequently rising demand for dairy products which increases the growth of the dairy sector need to increased investment in dairy hubs and milk processing in the country. The response of the private sector towards increasing demand for dairy hubs is significant while small-scale household farms in rural areas have lost their profit in dairy development (Ahmad et al., 2004). Presently the condition of the national herd with its level of per animal productivity is not capable to meet the rising demand for dairy products (Burki et al., 2004).

Technological and administrative limitations can be accomplished by upgraded access to financial and management services as access to formal credit can allow farmers to attain higher yields (Khandker and Koolwal, 2016). Improved advisory services can reduce time limitations and management gaps through used for technology exploration and a bridge between research and farm (Davis et al., 2012; Omanya et al., 2013). Formal credit facilitates subsistence farmerin covering the gap of income and spending on-farm management (Khan and Khan, 2017). The significance of the dairy sector generally for Pakistan's economy, and particularly for the rural economy cannot be over emphasized. Milk specified the prominent commodity in livestock sector, while this sector in Pakistan facing various constraints and not performing to its potential level. In the scenario of market value, the contribution of milk is higher in GDP than any single crop (Burki, 2004; Livestock Census Punjab, 2018). Despite the major share of 56.8% in the agriculture sector, livestock farmers access the agricultural credit less than 7% (Livestock Census Punjab, 2018).

Pakistan is facing many significant issues like lack of commercialization of dairy farms, training and awareness education about dairy farms and infrastructure services (Jalil et al., 2009). Milk production is the main source of nutrition and income while poor nutrition of animal negatively affects the protection and performance of dairy animals (Kekana et al., 2018). Farmers of dairy farms face many problems in their profitability due to animal disease, the lake of artificial fertilization, veterinarian cost, high cost of modern technologies and low quality of animal fodder (Bonilla, 2018). The livestock sector is facing problems such as the lake of modern technology, management, imperfect market structure, and inadequate infrastructure, facilities, and credit constraints (Fielke and Bardsley, 2014; Khan et al., 2018). Marginal farmers by using potential use of available credit to purchase inputs for increasing livestock productivity in order attain maximum output farmers need the wise utilization of credit facilities (Rehman et al., 2017; Ngeno, 2018).

Commercialization of livestock farming can considerably enhance the economic role of this sector in the development of Pakistan (Andaleeb et al., 2019). Credit Guarantee Scheme for Small and Marginalized Farmers (CGSMF) in collaboration with state budget statement is developed in 2018 to fulfill the financial requirements of subsistence farmers in Pakistan (PBS, 2018). An increase of 39.4% agriculture credit disbursement in the fiscal year of 2018 relative to the previous fiscal year of 2017 as indicated government dedication to hold up the agriculture sector. Dairy farms play a key role to promote the livestock sector as well as to enhance the social status of the rural household by increasing their saving and insurance during uncertainties. Credit plays a significant role to increase dairy productivity while limited availability of credit caused slowdown dairy production.

In literature many studies focused to estimate livestock production, (Taj et al., 2012; Naz and Khan, 2018; Ahmad et al., 2015; Khan et al., 2018) while the aspect of formal credit impact on dairy production not properly explored in developing countries specifically in Pakistan. The present study was designed to investigate theimpact of formal credit on dairy production in Vehari district of southern Punjab, Pakistan. In evaluating formal credit impact on farmer's income, the major purpose of this work is to estimate the formal credit impact on milk production per milking animal. This study is categorized into four sections as the first section elaborated introduction while material and method indicated in section two. Results and discussion explained in section three while conclusion and suggestions highlighted in the last section of the study.

Materials and Methods

In the present study subsistence farmers according to landholding size was categorized into three groups' upper, medium and lower subsistence farmers. Lower subsistence farmer holding land less than five acres, medium subsistence farmers with the land of five to seven acres while upper subsistence farmers with the land of seven to twelve acres. The study used a multistage sample approach for data collection and there were some significant reasons in the selection of study area, firstly, Punjab province selected for study due to major share 60% in livestock production with growth rate of 3.67% of the country of dairy production in the country (PBS, 2018; Livestock Census Punjab, 2018). The region of southern Punjab selected from province due to bulk share in dairy and livestock production of the province in the second phase (PBS, 2018). In higher diary production district of southern Punjab, vehari was purposively selected due to its significant share in dairy production in the third stage (Livestock Census Punjab, 2018).

Two tehsils from district Vehari were randomly chosen in the fourth stage while two union councils from each tehsil were selected in the fifth stage. In the sixth stage from each union council, two villages were selected and from each village, thirty-five respondents were chosen according to dairy farmers' list access formal credit from ZTBL bank in the last stage. The data of 280 respondents collected from the study area with face-to-face meeting from well designed and relevant information in the questionnaire. The questionnaire was designed in the English language while translated into Urdu for ease to understand while respondents were questioned in local language Punjabi and Saraiki for proper response and respondent were already informed about the purpose and use of data.

Table 1: *Dairy farmers sample size of study area.*

District	Tehsils	Union council	Villages	Respondent
Vehari	Vehari	Qadar Wah	Qadar Abad	35
		Qadar Wah	Faiz Wah	35
		Qadar Wah	Fateh Ali	35
		Qadar Wah	Zaheer wala	35
	Malsi	Chak No. 41/WB	Chak 45	35
		Chak No. 41/WB	Chak No 47	35
		Chak No. 41/WB	Chak 49	35
		Chak No. 41/WB	Chak 53	35
Grand total				280

Data was collected based on the formula of Yamane (Yamane, 1967).

$$S = \frac{N}{1 + N(e^2)} \quad \text{.........(1)}$$

In equation (1) 'S' indicate the size of the sample while 'N' as livestock household total in chosen UCs while 'e' elaborated precision that is put at 6% (0.06). In using Yamane's formula, the selected sample size indicated as 277.

To analyses of credit impact on household dairy production as indicated in equation (2) highlights household income from dairy products before taking credit from ZTBL bank.

$$H\pi_1 = N_A + P_m Q - P_f Q - P_v Q - C_m - C_f \quad (2)$$

Where $H\pi_1$ as household income from dairy production, N_A shows the number of milking animals, P_m indicate milk price (per liter), P_f as the price of animal feed (per kilogram), P_v points out the cost of veterinarian Treatment (per visit), C_m shows miscellaneous cost while C_f as the fixed cost.

After using the formal loan equation (3) as given

$$H\pi_2 = N_A + P_m Q - P_f Q - P_v Q - C_m - C_f - I \quad (3)$$

In equation (3) as 'I' shows real interest rate paid to the bank for credit and interest rate paid yearly. Hence to originate the incremental increase in household income from dairy products can be estimated by the following formula in equation (4)

$$\Pi = H\pi_2 - H\pi_1 \quad (4)$$

In the above equation formula, $H\pi_1$ shows household income before taking credit and $H\pi_2$ indicate income after taking the loan. By taking the difference between them, the "Π" shows the change in income from dairy production.

To examining the association among one variable to a situate of variables, analysis of linear regression model is used. The regression model is identifying the outcome of one variable even as regulate for further observable differences. Ordinary Least Squares (OLS) method used for estimation of the linear regression model for lessening dissimilarity in value of the ob-

served sample and built-in values from the model. In evaluating model multiple tools are accessible.

Now to estimating credit impact on dairy production statistical technique, OLS is used in the following equation

$$lnY = \alpha + \alpha_1 lnA + \alpha_2 lnN + \alpha_3 lnE + \alpha_4 lnC + \mathcal{E} \quad (5)$$

Where Y as dairy production (per month), A defined number of milking animals, N family size, E as education level while C shows agricultural credit. The study employed 23rd version of Statistical Package for Social Sciences (SPSS)for empirical estimation of the study.

Results and Discussion

Results and discussion have focused on the major outcomes obtained from data collected from subsistence dairy farmers of Southern Punjab.

Table 2: *Dairy farmers' pre-credit and post-credit income status.*

Category	Average pre-credit status	Average post-credit status
Average value of milking animals	2.929	4.093
Average monthly income from milking animals	17228.93	21290.71
Total herd size	1.38	1.87
Percentage change in Income 23.58 %		

Table 2 indicates the income status of dairy farmers' pre-credit and post-credit formal credit from ZTBL bank. In pre-credit status, the average value of milking animal was 2.929 while in the post-credit average value of milking animals was estimates as 4.093 which is indicated almost double than pre-credit status. Average monthly income from milking animals in pre-credit status was estimated Rs. 17228.93 while average post-credit monthly income was Rs. 21290.71 which shows the increase in income 23.58% is significant due to agriculture credit.

Results of Table 3 illustrate positive association amongst all variables but the coefficients of correlation are lower than 0.50 as indicating no problem of multicollinearity in the model. However, the correlation between the amount of agriculture credit and education is quite high as compared to other variables.

This relationship is quite meaningful which shows that educated farmers can easily access formal loan as compared to illiterate farmers. The diagonal matrix demonstrates no problem of multicollinearity among independent variables as each independent variable significantly influences the dependent variable.

It is determined that unemployed and untrained labor in rural areas can be absorbed in the dairy sector to facilitate moderate encumber of the population in urban areas of Pakistan. The results exposed that availability of credit increase production of farmers from dairy hubs according to the number of milking animals, level of education to achieve a higher level of production, understanding facility of credit markets and the number of family members in a house (Saqib et al., 2018).

Table 4 indicates the regression results of the model as estimated variables are statistically significant. The coefficient of family size (0.076) is positive and significant indicating 1%raise in size of family direct to raise monthly milk production of farmers by 0.076%. Increase in family size raises dependency on livestock for nutritional and financial requirements while the income of agriculture inadequate for limited family. These results are similar to findings of the studies that exposed as dairy production is significantly affected by household size (Oboh and Ekpebu, 2011; Sebopetji and Belete, 2009; Saleem and Jan, 2011). Farmer's schooling years play a significant task in lending choice and reducing transaction expenses of formal credit. Education with a positive and significant coefficient (0.113) elaborates the positive relationship with dairy production illustrates as 1% raise in farmer schooling increase the income of dairy farmers by 0.113% monthly. It is beneficial for future investment in livestock and this sector has a large capacity to absorb the educated and unemployed labor force of rural areas. Educated farmers have the opportunity for developing efficiency in using resources long run livestock while most farmers in this sector are uneducated and are unaware to realize the process of credit access from official institutions. Estimates are similar with the result of (Amjad and Hasnu, 2007; Abdullah et al., 2009; Oboh and Ekpebu, 2011; Sebopetji and Belete, 2009; Saleem and Jan, 2011; Siddiqi et al., 2015; Saqib et al., 2018).

The significant and positive coefficient value (0.139) of agricultural credit comparatively large than

Table 3: *Matrix of correlation.*

		ln Milk production	ln Hhs	ln Edu	ln received amount	ln of Milking animals
Pearson Correlation	ln Milk production	1.000	0.404	0.041	0.449	0.793
	ln Hhs		1.000	0.235	0.286	0.361
	ln Edu			1.000	0.042	0.131
	ln received amount				1.000	0.391
	ln of milking animals					1.000

Table 4: *Coefficient of linear regression model.*

Variables	Unstandardized Coefficient		Standardized Coefficient	T	Significance	Collinearity Figures	
	β	Std. Error	β			Tolerance	VIF
constant	0.108	0.336	0.543	0.323	0.748	0.341	1.123
ln Hhs	0.144	0.106	0.076	2.353	0.028	0.772	1.295
ln Edu	0.113	0.052	0.113	2.159	0.033	0.889	1.125
ln credit	0.075	0.029	0.139	2.563	0.011	0.821	1.219
ln milking animals	0.697	0.055	0.726	12.63	0.000	0.734	1.362
R = 0.8							
R Square = 0.673							
Adjusted R square = 0.663							
Std. error of estimate 0.2805							

education and household size coefficients reports as 1% rise in agriculture credit will raise dairy production by 0.139%. The positive effect on the production capacity of milking animal due to appropriate availability of credit guarantees timely and rational use of inputs in the production of livestock. These estimates are alike with the findings of (Abdullah *et al.*, 2009; Chandio *et al.*, 2017; Shahab *et al.*, 2017).

Formal sources credit access significantly associated with the experience of the farmer the reason for proper information regarding institutional credit procedure have previously contract with banks for credit several times (Saqib *et al.*, 2017). Hence due to the lower rate of interest on credit experienced farmers more access to formal institutions. The significant and positive association of credit access and farming experience reports as farmers experience increases credit access increases. Our results are similar to the findings of (Oboh and Ekpebu, 2011; Nouman *et al.*, 2013; Saqib *et al.*, 2018).

Each milking animal per month income denoted as dependent variable and outcomes mean improving credit access and schooling of farmers milking animal income can be increased without varying other input

in the study area. It can be interpreted that education and credit, helps to enhance the productivity of inputs being used in livestock sector because of their rational and timely use. It indicates the resource use efficiency and these results are similar to the studies of (Siddiqi *et al.*, 2015; Oboh and Ekpebu, 2011; Saqib *et al.*, 2018). The R^2 value indicates 67% variation in the dependent variable due to independent variables while leftover deviation independent variable may be owing to random shocks as indicated beyond farmers manage.

Conclusions and Recommendations

It is concluded from the results of this study that formal credit access significantly contributes in farmers raising milking herd size, milk production and net return in farmers' income as elaborated in pre-credit and post-credit comparison of farmers in the study area. Farmers' family size, schooling years, formal credit access and milking animals are significant factors that influence farmers' dairy production. Formal credit contributes financial support for subsistence farmers to increase their efficiency by using proper treatment and better feed of milking animals in

earning handsome profit. Higher schooling increases farmer level of knowledge in appropriate understanding in livestock market and credit access and its proper utilization as highlighted in the estimates of the study. In the light of outcomes, this study emphasizes national level proper policy measures for increasing disbursed limit of livestock credit and its equitable distribution among farmers. The government action is not satisfactory due to ineffective implementation and complicated procedure of credit access. There is a need for specific credit policy for dairy farmers which must be with the easy procedure, easy terms and conditions and establish more financial organizations and institution that provides agricultural credit. The government needs to re-categorize farmers and establish a more financial institution in rural areas with a relatively lower interest rate for livestock farmers.

Novelty Statement

Formal credit contribution in dairy production regarding southern Punjab perspective not significantly addressed in literature as tried to highlight in this research work.

Author's Contribution

Dilshad Ahmad: Collected data, developed conceptual framework of study, manuscript write-up, estimated results.
Muhammad Afzal: Proofreading and suggesting corrections
Asif Ali Abro: Proofreading and suggesting corrections.

Conflict of interest
The authors have declared no conflict of interest.

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