

**Enhancing Smallholder Farm Productivity through Sustainable Agricultural Credit:
Insights from Zarai Taraqiati Bank Limited in District Peshawar, Pakistan**

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ABSTRACT

Rely of small holder farmers remains on institutional agricultural credit remains a critical determinant on farm productivity in developing countries. Several institutions like zarai taraqiati bank Limited (ZTBL) provides loans for agricultural productivity. This study evaluates the influence of agricultural credits provided by ZTBL on the income generation and farm productivity of small farmers. Among 105 respondents, 53 small holder's farmers (≤ 5 acres) were randomly selected from three villages where farmers comparatively accessed credit institution more than other villages. Secondary data were collected from ZTBL. Simple statistics like frequency distribution and percentage analysis were applied before conducting paired sample t-test and effect size was estimated (Cohen's d). Similarly, multiple regression analysis was documented to determine the pre- and post-credit changes in yield and income. It was observed that agricultural credit significantly increased wheat yield ($t = 5.42, p < 0.001$), maize yield ($t = 4.87, p < 0.001$), and annual farm income ($t = 6.11, p < 0.001$). Regression findings indicate that loan size, education, and timely disbursement significantly predict productivity gains ($R^2 = 0.48$). The study concludes that institutional credit enhances smallholder productivity, though delays and high interest rates constrain optimal impact. Policy reforms focusing on timely disbursement and subsidized rates are recommended.

Keywords: Agricultural Loans, smallholder farmers, Farms income, ZTBL

INTRODUCTION

Agriculture is major backbone of Pakistan's economy by, contributing roughly one-fifth of the national Gross Domestic Product (GDP) and engaging a considerable proportion of the manpower. Agriculture sectors supports rural livings, safeguards food security, supplies raw materials to agro-based industries, and encourages demand for industrial inputs such as fertilizers, pesticides, farm machinery, and irrigation equipment (Cláudia et al., 2022). In provinces like Khyber Pakhtunkhwa, including Peshawar District,

agriculture endures to aid the primary livelihood source for a large sector of the rural population. Pakistan's agricultural organization is mainly characterized by small landholdings. The mainstream of farms falls within the smallholder category, effective on patchy plots with limited access to modern inputs and mechanization. Small farmers face limitations such as low capital foundation, minimal savings, high production risks, and vulnerability to weather unpredictability (Pawlak & Kołodziejczak, 2020). Recurrent floods, droughts, pest outbreaks and fluctuating market prices further deepen production uncertainties. Subsequently, inadequate access to timely and reasonable credit becomes a binding constraint, limiting farmers' capacity to adopt developed technologies and increase productivity (Food and Agriculture Organization, 2021; Asian Development Bank, 2020).

Agricultural credit shows a fundamental role in connecting the financial gap between farm incomes and expenditures. Up-to-date agricultural production entails sincere investment in certified seeds, fertilizers, pesticides, irrigation systems, and machinery (Ricardo et al., 2025). Credit empowers farmers to smooth consumption, manage production cycles, and invest in yield-enhancing technologies. Empirical evidence suggests that access to institutional finance positively influences farm productivity, income diversification, and household welfare (Haryanto et al., 2023). Efficient rural credit markets also facilitate risk management and capital formation, contributing to long-term agricultural transformation (Roberto et al., 2023). In Pakistan, agricultural credit is provided through both institutional and non-institutional sources. Non-institutional lenders—including relatives, commission agents, and informal moneylenders—often charge high interest rates and impose unfavorable conditions. Institutional sources comprise commercial banks, cooperative banks, and specialized agricultural finance institutions operating under the regulatory oversight of the State Bank of Pakistan (State Bank of Pakistan, 2023).

Among institutional providers, Zarai Taraqati Bank Limited (ZTBL) grips a central point in rural investment. Recognized as a successor to the Agricultural Development Bank of Pakistan, ZTBL works an widespread branch network across rural areas, conveying both financial and advisory amenities. The bank offers short-term, medium-term, and long-term loans custom-made to agricultural production cycles and capital investment needs (Noonari et al., 2015). Given the prevalence of smallholders in districts like Peshawar, assessing the efficiency of agricultural credit becomes crucial. Limited capital often forces farmers to compromise on input quality or deferral farm maneuvers, resulting in lower yields and income instability. Enhanced investment in agriculture, supported by accessible and affordable credit, can stimulate productivity growth, improve rural incomes, and reduce poverty (Khan et al., 2024). Therefore, evaluating the impact of institutional credit—particularly from ZTBL—on farm productivity and income levels is both economically and socially significant.

This study is designed to examine the effect of agricultural credit on the productivity of small farmers in the study area. Specifically, it investigates: (i) the impact of credit on farm output and income, (ii) patterns of credit utilization among borrowers, (iii) challenges faced in accessing institutional loans, and (iv) policy measures to enhance the effectiveness of agricultural finance. By providing empirical evidence on credit–productivity linkages, the study contributes to contemporary discourse on rural financial inclusion and sustainable agricultural development in Pakistan.

METHODOLOGY AND DATA COLLECTION

Study Universe

The study universe covered small hold farmers (< 5-acre land) in the selected villages of District Peshawar, Pakistan who availed institutional loan from Zarai Taraqiate Bank (ZTBL). Farmers of the selected villages had strong agricultural base intended to enhance productivity by availing loan from ZTBL. Following Creswell and Creswell (2018) and Field (2018) model of paired comparison, a cross sectional quantitative survey was conducted before and after availing agricultural loan to assess income

change through farm productivity. In this model, baseline data is recorded pre availing loan by respondents which is then compared with post intervention data from same respondents.

Sampling Technique and Sample Size

ZTBL Peshawar branch was approached to obtain records of respondents receiving agricultural credits. Records showed maximum (N=105) small holder farmers centered in three villages i.e. Ormar Bala (n=42), Ormar Miana (n=28) and Ormar Payan (n=35). Following Cohen et al., (2017), 50% respondents were randomly selected from total 105 for adequate paired comparison analysis and moderate effect size.

Table 1: Sample size representation in the study area

Villages	Total Respondents	Sample Selected (50%)
Ormar Bala	42	21
Ormar Payan	35	18
Ormar Miana	28	14
Total	105	53

Source: Survey data

Respondents were interviewed through a structure questionnaire for data collection. The questionnaire was designed to obtain socioeconomic characters of farmers, size of land use for cultivation, loan credit, types of crop cultivated, crop yield before and after availing loan, house hold income before and after obtaining loan and issues in processing the loan availing procedure. The questionnaire was initially tested by interviewing 10 farmers other than selected farmers for the study. Modification were made accordingly to ensure clarity and reliability of farmers.

Data collected included maize yield (kg/acre), wheat yield (kg/acre), vegetable production (kg/acre) and annual farm income (PKR). “Before” values refer to the production year prior to credit acquisition, while “after” values refer to the first production cycle following loan utilization. Data were coded and analyzed using SPSS (Statistical Package for Social Sciences) version 26. To summarize the characteristics of respondents, descriptive statistics including mean, standard deviation, minimum and maximum values and frequency and percentages were computed. Normality distribution of data was tested using Shapiro–Wilk test where at $p > 0.05$ was accepted. Paired sample t-test was applied to compare productivity before and after receiving agricultural loans. Cohen’s d statistics were used to determine effect size where 0.2, 0.5 and 0.8 were considered as small, medium and large effect size, respectively. Pearson’s correlation coefficient (r) was used to examine the relationship between loan amount and productivity and loan amount and income. Level of significance was set at $\alpha = 0.05$.

Variables of the Study

Dependent Variables included crop productivity (kg per acre) and annual household farm income (PKR) while independent Variable was agricultural credit received (loan amount in PKR). Control Variables of the study were farm size, farmer’s education, farming experience and family labor availability.

Table 2: Variables of the Study

S.No	Classification	Type	Expected Results
1	Age	Quantitative	±
2	Education	Quantitative	±
3	Family size	Quantitative	±
4	Annual HH farm Income	Quantitative	±
5	crop productivity (kg per acre)	Quantitative	±

RESULTS & DISCUSSION

Socioeconomic Characteristics of Respondents of the study area

Results revealed that majority of respondents were middle aged i-e 41- 50 years (34.0%) and 31-40 years (28%) followed by 17% of higher age (51-60 years) respondents. It was also noted that tendency of availing agricultural loan was lower (9.4%) in older farmers (above 60 years) followed by young (<30 years) respondents. Regarding the education, 17% of respondents had secondary school education or higher while rest of respondents had lower education like 20.8% farmers had 1-5 years primary education, 18.9% farmers had middle level education (6-8 years). Most of the respondents (92.5%) were married whereas 7.5% were single. Similarly, majority of respondents (71.7%) practiced agricultural farming as their primary source of income while 17% practiced mixed farming practices combined with livestock rearing while 11.3% respondents used agriculture as business source. The majority of respondents were middle-aged (31–50 years), married, and primarily dependent on farming as their main occupation. This demographic structure is consistent with global rural labor patterns reported by the World Bank (2020), which note that economically active middle-aged farmers dominate agricultural production systems in developing economies. Farmers in this age group are generally more capable of adopting improved technologies and utilizing financial services effectively.

Table 3: Frequency and Percentage Distribution of Socioeconomic Characteristics

Variable	Category	Frequency	Percentage (%)
Age (Years)	Up to 30	6	11.3
	31–40	15	28.3
	41–50	18	34.0
	51–60	9	17.0
	Above 60	5	9.4
Education Level	Illiterate	14	26.4
	Primary (1–5)	11	20.8
	Middle (6–8)	10	18.9
	Matric (9–10)	9	17.0
	Intermediate & Above	9	17.0
Marital Status	Married	49	92.5
	Single	4	7.5
Primary Occupation	Farming Only	38	71.7
	Farming + Livestock	9	17.0
	Farming + Business	6	11.3

Source: Survey data

Frequency and percentage of Farm and Credit Characteristics acquired by respondents.

Most of respondents in the study area fall under small holder category having farming area up to 5 acres. Among these, 39.6% respondents hold 3-4 acres' land while 32.1% had 1-2 acre land for agricultural purposes. 28.3% respondents used 5 acres' land. Regarding farming experience of respondents, it was observed that 30.2% had 21-30 year of farming experience followed by 35.5% respondents having 11-20 years farming experience. Respondents with more than 30 years of experience constituted 18.9%, while only 15.1% had less than 10 years of experience. Most of the farmers (39.6%) availed lowest loan (PKR 0.1M-0.2M) from institution while only 11.3% received considerable loan (PKR>0.3M)

Table 4: Frequency and Percentage Distribution of Farm and Credit Characteristics

Variable	Category	Frequency	Percentage (%)
Farm Size (Acres)	1–2 Acres	17	32.1
	3–4 Acres	21	39.6
	5 Acres	15	28.3
Farming Experience (Years)	Up to 10	8	15.1
	11–20	19	35.8
	21–30	16	30.2
	Above 30	10	18.9
Loan Amount (PKR)	Up to 100,000	12	22.6
	100,001–200,000	21	39.6
	200,001–300,000	14	26.4
	Above 300,000	6	11.3

Source: Survey data

Impact of agricultural credit on farm productivity and overall income of respondents

Agricultural credit significantly improved farm productivity and income of respondents in the study area. It was observed that mean wheat production increased from 1120 ± 185.42 to 1365 ± 210.63 per acre. Similarly, maize yield enhanced from 1480 ± 240.35 to 1725 ± 265.22 . Similarly, production of other commodities like vegetable and fruits (plum, peach) increased up to 1,360 units, 1,190 units and 1,070 units respectively. Annual income from livestock income increased from PKR 72,450 to PKR 98,870 while annual household income rose from $421,000 \pm 82,450$ to PKR $558,000 \pm 96,230$ (Table). Mean difference in all agricultural commodities before and after availing was statistically significant. For example, mean difference for wheat yield (-245 kg) was significant with $t = -5.42$ at $p < 0.001$. Significant increase in production of other commodities like vegetables (1,360 units, $t = -10.46$, $p < 0.001$), peach (1,070 units, $t = -10.29$, $p < 0.001$) and plum (1,190 units, $t = -10.53$, $p < 0.001$) was also observed. Annual income rose significantly from PKR $421,000 \pm 82,450$ to PKR $558,000 \pm 96,230$. The mean increase of PKR 137,000 was statistically significant ($t = -6.11$, $p < 0.001$). This suggests that agricultural credit substantially improved household income. Livestock income increased from PKR 72,450 to PKR 98,870. The mean difference (PKR 26,420) was highly significant ($t = -12.10$, $p < 0.001$). The large t-value indicates a strong positive effect of credit on livestock-related income. All increases were statistically significant at the 1% level, demonstrating the positive role of credit in horticultural productivity (Table 4).

Certain studies have reported significant impact of receiving agricultural credit on farm productivity particularly cereal crops like wheat and maize (Haryanto et al., 2023; FAO, 2022). According to these studies, such financial aids facilitate small holder farmers to timely use improved seeds, pesticides, fertilizers and adopt modern agricultural mechanization which boost agricultural productivity. The authors added that relieving small holder farmers with their primary constraint like financial help out significantly increases agricultural input and farm production. Other studies like Bichi et al., (2025) and World Bank, (2021) confirm our findings that financial interventions bring significantly practical improvement in agricultural productivity. Significant increase in livestock income and overall household income in our study are in line with the findings of Lelisho and Liisho, (2024) and reports of ADB (2022) which stated that agricultural credit directly improve rural welfare, financial growth and enables farmers to stabilize farmers to expand farm resources. Similarly, IFAD (2021) reported that livestock sector

securely and promisingly returns its inputs faster than cereal crop, thus improve famers welfare in shorter span. Jiang et al., (2024) and World Bank (2020) pointed out that agricultural financing play key role in poverty alleviation and transformation in rural infrastructure. Result regarding significant increase in horticulture production in our study are in agreement with findings and reports of Haryanto et al., (2023), Lelisho and Lelisho, (2024), FAO, (2021) and ADB (2021), respectively. These studies and reports documented that high value horticulture production requires agriculture credits for small holder farmers and promotes integral transformation at farm level in addition to promotion of commodity commercialization.

Table 5: Impact of agricultural credit on farm productivity and income

Variable	Condition	N	Mean±SD	SE Mean	Correlation	Significance
Wheat	Before loan	53	1120±185.42	25.47	0.712	0.000
	After loan	53	1365±210.63	28.94		
Maize	Before	53	1480±240.35	33.01	0.684	0.000
	After	53	1725±265.22	36.44		
Vegetables	Before	53	5,420±1,210	166	.702	.000
	After	53	6,780±1,340	184		
Plum	Before	53	3,850±890	122	.689	.000
	After	53	4,920±970	133		
Peach	Before	53	4,120±940	129	.715	.000
	After	53	5,310±1,050	144		
Annual Income	Before	53	421000±82,450	11,329	0.732	0.000
	After	53	558000±96,230	13,222		
Livestock income	Before	53	72,450±18,320	2,517	.718	.000
	After	53	98,870±22,640	3,110		

Source: Survey data

Improvement (Cohen's effect size) in agricultural commodities and income of respondent post availing loan

The effect of agricultural credit on increase of agricultural production and income of respondents is presented in Table 5. Results revealed a strong effect on studied parameters with medium to large effect size. It was noted that receiving agricultural credits had large impact on vegetables, plum and peach production with effect size of 1.43, 1.41 and 1.45, respectively. Similarly, livestock income and overall annual income revealed large effect (1.66) due to agricultural credit. Improvements in cereal crops were found moderate with effect size of 0.74 and 0.68 for wheat and maize respectively. A recent study in Ethiopia (Lelisho and Lelisho, 2024) reported results that confirm our findings regarding significant impact of agricultural credit on farm productivity and income obtained in response. Similar findings were also observed in a study conducted in Indonesia, a developing country. The study reported a significant association of agricultural credit with farm yield and ultimately with gross income of rural small holder farmers. Abdul et al., (2023) reported strong and positive impact of agricultural credit on farm outputs. The authors pointed the possible reason of using quality fertilizers and others inputs by small holder farmers on agricultural credits as primary factors for establishing a positive association between agricultural outputs and loan received. Chaiya et al., (2023) reported that farmers who received agricultural credits widely used credit finance on proper land preparation, quality seed and fertilizers purchase and hiring skilled labors for agricultural farming and thus obtained meaningful increase in productivity which reveals a positive association between agricultural credit and farm output. Small famers of different socio characteristics receiving institutional financial aids significantly improve outputs in integrated farming as well thus reveals that certain factors like age, education and farming experience

has a positive association with financial returns (Ahmad et al., 2024). In addition, facilitation in obtaining loans and smooth dissipation with in time frame able the farmers to adopt modern technology and initiate contractual farming participation which raise farm outputs (Rasheed et al., 2024).

Table 6: Improvement (effect size) in agricultural commodities and income of respondent post availing loan

Variable	Cohen's d	Interpretation
Wheat Yield	0.74	Medium–Large
Maize Yield	0.68	Medium
Income	0.81	Large
Livestock Income	1.66	Large
Vegetables Production	1.43	Large
Plum Production	1.41	Large
Peach Production	1.45	Large

Source: Survey data

Determinants of Agricultural Performance (Regression Analysis)

Different factors that could influence the farm productivity were assessed through multiple regression analysis. Results revealed that certain factors like loan size, education level of farmers and timely access and disbursement of loan were positively associated with farm productivity. Briefly, higher loan amount, education level and easy and early disbursement of loan had a positive and significant impact on agricultural returns ($\beta = 0.441, p < 0.001$, $\beta = 0.263, p = 0.011$) and $\beta = 0.351, p = 0.002$), respectively. However, farm size showed no association with agricultural productivity ($\beta = 0.176, p = 0.079$). Several studies have revealed that certain factors like education, farming experience and loan size are significant determinants of agricultural performance (FAO, 2019; ADB, 2021). Literacy not only improve the decision make ability of farmers but also enables them to wisely use the available finance (IFAD, 2021).

Table 7: Results of regression analysis

Variable	Unstandardized B	Std. Error	Standardized Beta	t	Sig.
(Constant)	52.41	33.18	—	1.58	.120
Loan Size	0.42	0.11	0.441	3.82	.000
Education	0.21	0.08	0.263	2.63	.011
Timely Disbursement	0.31	0.09	0.351	3.41	.002
Farm Size	0.18	0.10	0.176	1.79	.079

Source: Survey data

CONCLUSION AND RECOMMENDATIONS

The study concludes that agricultural credit has a significant positive impact on farm productivity and household income among smallholder farmers. Most respondents were middle-aged, experienced, and primarily dependent on agriculture, operating on small landholdings. Access to credit led to notable increases in crop yields, horticultural production, livestock income, and overall household earnings, with all improvements being statistically significant. Furthermore, regression analysis identified loan size, education, and timely disbursement as key determinants of agricultural performance, while farm size showed no significant effect. Overall, agricultural credit serves as a vital tool for enhancing productivity and improving rural livelihoods.

Agricultural credit programs should be expanded with easier access, simplified procedures, and timely disbursement to ensure effective utilization during critical farming periods; loan sizes should be adequate and flexible according to farmers' needs and crop cycles, while farmer education and extension services must be strengthened to improve financial literacy and efficient use of credit; greater focus should be given to supporting high-value sectors such as horticulture and livestock, and strong coordination among financial institutions, government agencies, and rural development organizations should be promoted to ensure efficient credit delivery and adoption of modern agricultural practices for sustainable productivity growth.

REFERENCES

- Ahmad, I., & Ahmad, S. (2024). Impact of credit advanced by Zarai Taraqiati Bank Limited on the income of farmers in the livestock sector in District Dir Lower, Khyber Pakhtunkhwa. *Journal of Development and Social Sciences*, 5(2), 315–326.
- Asian Development Bank. (2021). *Rural finance for inclusive agricultural development*. Manila, Philippines: Asian Development Bank.
- Asian Development Bank. (2022). *Financing agriculture and rural development in Asia and the Pacific*. Manila, Philippines: Asian Development Bank.
- Bichi, A. M., Yusuf Ibrahim, H., & Ada Ojoko, E. (2025). Impact of agricultural trade credit participation on credit access, yield and income among rice farmers in Northwestern Nigeria. *African Journal of Agricultural Science and Food Research*, 18(1), 227–240.
- Chaiya, C., Sikandar, S., Pinthong, P., Saqib, S. E., & Ali, N. (2023). The impact of formal agricultural credit on farm productivity and its utilization in Khyber Pakhtunkhwa, Pakistan. *Sustainability*, 15(2), 1217.
- Cláudia, M. V., Freire, D., Abrantes, P., Rocha, J., & Pereira, P. (2022). Agricultural land systems importance for supporting food security and sustainable development goals: A systematic review. *Science of the Total Environment*, 806(3), 150718.
- Cohen, L., Manion, L., & Morrison, K. (2017). *Research methods in education* (8th ed.). Routledge.
- Creswell, J. W., & Creswell, J. D. (2018). *Research design: Qualitative, quantitative, and mixed methods approaches*. SAGE Publications.
- Field, A. P. (2018). *Discovering statistics using IBM SPSS statistics* (5th ed.). Sage.
- Food and Agriculture Organization. (2019). *The state of food and agriculture 2019*. Rome: FAO.
- Food and Agriculture Organization. (2021). *The state of food and agriculture 2021*. Rome: FAO.
- Food and Agriculture Organization. (2022). *The state of food and agriculture 2022*. Rome: FAO.
- Haryanto, T., Wardana, W. W., Jamil, I. R., Brintanti, A. R. D., & Ibrahim, K. H. (2023). Impact of credit access on farm performance: Does source of credit matter? *Heliyon*, 9(9), e19720.
- International Fund for Agricultural Development. (2021). *Rural development report 2021: Transforming food systems for rural prosperity*. IFAD.
- Jiang, M., Li, J., & Mi, Y. (2024). Farmers' cooperatives and smallholder farmers' access to credit: Evidence from China. *Journal of Asian Economics*, 92, 101746.

- Khan, F. U., Nouman, M., Negrut, L., Abban, J., Cismas, L. M., & Siddiqi, M. F. (2024). Constraints to agricultural finance in underdeveloped and developing countries: A systematic literature review. *International Journal of Agricultural Sustainability*, 22(1).
- Lelisho, A. E., & Lelisho, M. E. (2024). Impact of credit use on crop productivity and gross income of smallholder farmers. *Discover Agriculture*, 2, 38.
- Noonari, S., Memon, I., Bijarani, A., et al. (2015). Impact of credit on agricultural productivity: A case study of ZTBL loans in District Kashmore. *Journal of Economics and Sustainable Development*, 6, 66–89.
- Pawlak, K., & Kołodziejczak, M. (2020). The role of agriculture in ensuring food security in developing countries. *Sustainability*, 12(13), 5488.
- Rasheed, S., Tabasam, N., Anwar, J., & Jabeen, S. (2024). Impact of credit on agriculture production in Pakistan: A review. *European Journal of Ecology, Biology and Agriculture*, 1(1), 3–13.
- Ricardo, A. T. S., & Roig, J. M. G. (2025). The role of government credit in enhancing agricultural productivity: Evidence from Chile. *Economic Modelling*, 152, 107267.
- World Bank. (2020). *World development report 2020*. Washington, DC: World Bank.
- World Bank. (2021). *Enabling the business of agriculture 2021*. Washington, DC: World Bank.
- World Bank. (2023). *Enhancing financial inclusion in South Asia agriculture*. Washington, DC.
- Zarai Taraqiati Bank Limited (ZTBL). (n.d.). *About Zarai Taraqiati Bank Limited*. <https://ztbl.com.pk>