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Role of Agricultural Credit towards Productivity in Paddy, Cotton and Maize

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ABSTRACT: The present focus of Indian agriculture is to improve agricultural productivity and profitability contributing to growth of the farm economy. For this challenge to be achieved credit being the critical input and occupying an important place in strategy for development of agriculture, the present thrust is laid through intervention in Agricultural credit. The lack of adequate financial resources and absence of timely credit facilities at reasonable rates result in a situation wherein many of the farmers, even though otherwise willing, are unable adopt and harness the results arising out of major and minor technological changes. In the current study to emphasize the role of credit towards agricultural production Cobb-Douglas form of production function has been fitted to understand the relationship between per hectare output of crops *i.e.* paddy, cotton and maize and quantities of inputs while institutional credit is taken as dummy variable. In paddy, credit is a positive factor increasing productivity by 0.04 per cent at 0.05 per cent probability level. Regression coefficient of credit for cotton was 0.19. In maize contribution of credit is positive to maize yield and was found to be capital intensive crop.

Keywords: Agricultural credit, productivity, loanee, non-loanee farmers.

INTRODUCTION

The population of India in 2011 census was 1210.19 million, which increased to 1393.4 million in 2021 census. The decadal growth rate was 15.13 per cent. To feed the ever-increasing population, productivity of agriculture has to be increased strategically. Since overall agricultural production is majorly dependent on small, marginal farmers, it is the intensity of their effort and the efficiency of their technique that will help in raising yields per acre. Indian agriculture has transformed from critical dependence on imported food grains during mid-sixties to self-sufficient and became seventh largest agricultural exporter during 2013. The success of self-sufficiency was made possible by development and availability of production technology packages along with 'Green Revolution' technologies. The technologies include HYV seed, fertilizer, plant Protection chemicals, irrigation technologies enabling double cropping intensity etc. the policies were then focused upon incentives such that diffusion of new technology was encouraged. However, lack of adequate financial resources and absence of timely credit facilities at reasonable rates led to situation wherein many of the farmers, even though otherwise willing, are unable adopt and harness the results arising out of major and minor technological changes like improved seeds and manures, agricultural practices integrating mechanization could not be fully utilized. Hence, adoption of new technologies greatly influences the development of the agriculture which in turn increases the demand for agricultural credit. Agricultural credit in it itself is not an important input but it helps in creating environment for the adoption of modern production technology and encourage private investments on the farms (Sidhu and Gill 2006). Besides, during the last three decades credit has not only emerged as a critical instrument for the survival of small and marginal farmers but also required by the large farmers for enhancing their income (Das *et al*, 2009). While policies aimed at increasing yields per hectare through the use of modern seeds and sufficient fertilizer are important, other policy interventions need to be implemented, such as expanding credit in rural areas (Zedillo, 2015). The role of credit in agriculture performance is summarized in three ways namely: (i) it encourages efficient resource allocation by overcoming constraints to purchasing inputs and using them optimally; (ii) it shift input-output frontier if used to acquire modern farm technology and (iii) it increases the use intensity of fixed resources such as land, labour and management Carter (1998). Thus, Credit is an important instrument that enables farmers to acquire

command over the use of working capital, fixed capital and consumption goods. Credit plays an important role in increasing agricultural productivity. Timely availability of credit enables farmers to purchase the required inputs and machinery for carrying out farm operations (Afrin *et al.,* 2017). Agricultural credit is confirmed to create a positive and highly significant effect on crop productivity, wherein the short-term loan has a stronger effect on productivity than the long-term loan (Chandio *et al*., 2017; Ahmad, 2016; Rahman *et al*., 2014). Impact of institutional credit towards agriculture resulted in increased farm income (Bhat, 2015). Further, institutional financial assistance towards agriculture enabled investment on technological inputs like farm machinery and implements and also on livestock increasing and sustaining the farm productivity (Chandel and Swarup 2015). The responsible factor for increased agricultural production and farm income was Livelihood diversification wherein credit remained the critical driver (Baffoe *et al.,* 2014). The disbursement of institutional agricultural credit not only increased agricultural production but inturn induced the increase in agricultural GDP (Iqbal *et al.,* 2003). Thus, availability of credit to farmers was much more important than any other factor to improve the resource use efficiency in agriculture sector (Ayaz and Hussain 2011). Therefore, role of agricultural credit is significant in facilitating the transformation of agriculture and expand the participation of farmers in production process (Bashir *et al*., 2010) and thereby contribute doubling farmer's Income. Further studies at both macro and micro level point out that relationship between institutional credit an agriculture is positive and statistically significant wherein every 1 per cent increase in real agricultural credit resulted in an increase in real agricultural GDP by 0.22 per cent with a one-year lag (Subbarao, 2012).

As per NSSO Situation Assessment Survey 70 th round, of various sources of credit, dependence on non-institutional channels was high (nearly 40 %). Marginal land holding households suffer the most with only 15% of their credit from institutional sources. Credit flow to agricultural sector although multiplied by four times since independence, small and marginal farmers still confront credit issues. With rising importance of farm size, in disbursement of credit in the categories of short, medium and long term, between regions and access and equity too gain importance and play a vital role in utilizing credit in improving the crop productivity. The objective of the present study is to examine the contribution of agricultural credit (institutional) towards agricultural productivity as per the farm size.

MATERIALS AND METHODS

A Total sample of farmers selected for the investigation were 300, of which 150 were loanees and non-loanees were 150, 30 each belonging to marginal, small farmers, semi-medium farmers, medium farmers and large farmers were selected. Two districts, Ranga Reddy and Karimnagar were purposively selected as the form the highest and lowest credit disbursed districts respectively. Thus from each district a sample size of 150 is selected of which 75 belong to loanee category and the rest 75 belong to non-loanee category.

Student t' test. To test the equality of means pertaining to output, income and financial status of farmers, the students 't' test was carried out to know the existence of difference between loanee and non-loanees with respect to selected indicators by using the following formula.

$$t = \frac{|\bar{X}_1 - \bar{X}_2|}{\sqrt{S_P^2\left[\frac{1}{N_1}+\frac{1}{N_2}\right]}} \text{ Where } S_P^2 = \frac{(n_1-1)S_1^2+(n_2-1)S_2^2}{(n_1+n_2-2)}$$

X_1 = Mean of first group
X_2 = Mean of second group
N_1 = No. of observations of first group
N_2 = No. of observations of second group
S^2_P = Pooled variance of sample
S^2_1 = Variance of first group
S^2_2 = Variance of second group

The resulting "t" values were compared with table values at 1% and 5% level of significance.

Production function analysis was carried out to estimate the contribution of credit towards productivity in major crops grown by the sample farmers, paddy cotton and maize. Cobb-Douglas form of production function has been fitted to estimate the relationship between per hectare output of crops *i.e*. paddy, cotton and maize and quantities of seed, FYM, fertilizer, plant protection chemicals human labour, machine power and credit taken.

Following equation represents Cobb Douglas Production Function for the current study

$$Y = A X_1^{b1} X_2^{b2} X_3^{b3} X_4^{b4} X_5^{b5} X_6^{b6} \quad ...(1)$$

Where

Where,

Y = Yield (output) (qt ha^{-1})
X_1 = Seed (kg ha^{-1})
X_2 = FYM (tractor ha^{-1})
X_3 = Fertilizer (kg ha^{-1})
X_4 = Plant protection chemicals (l ha^{-1})
X_5 = Human labour (man days ha^{-1})
X_6 = Machine power (hr ha^{-1})
X_7 = Loan taken (1 for loan taken and 0 alternatively)
U_i = error term

b_1, b_2, b_3, b_4, b_5, b_6, b_7 are the output elasticity coefficients of the model.

Log linearizing and adding stochastic term to (1),

$$\ln Y = b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + ui$$

where u = disturbance term

While A and b_0 are the constants and b_1, b_2, b_3, b_4, b_5, b_6, b_7, are the elasticity coefficients of the model.

Institutional credit is lended to the farmers of all size groups with an intention to supply enough working

capital to the farmers and enable them to judiciously apply the inputs on time expecting higher productivity in those crops.

RESULTS AND DISCUSSION

Crop wise – farm size wise contribution of credit for loanee and non-loanee farmers. The mean productivity levels of the crops paddy, cotton and maize cultivated by Loanee and Non-loanee farmers were calculated and presented farm size wise in Table 1. It is evident from the Table that the mean yield of paddy per hectare was higher among the loanee farmers compared to non loanee farmers of all farm size groups. Care has been taken to cover equal number of farmers under each crop of loanee and non loanee farmers *i.e*. 50 loanee farmers cultivating each crop namely paddy, cotton and maize while 50 non loanee farmers cultivating paddy, cotton and maize. Among them there were 10 farmers in each size group of loanee and non-loanees.

It was evident from the Table 1 that mean yield of paddy per hectare was highest recorded by loanee farmers (61.6 q ha^{-1}), as against 50.38 q ha^{-1} among non-loanee farmers which was significant at 1 per cent probability level. Among the different farm size categories of paddy loanee and non-loanee farmers, it is observed that the mean yield levels were higher for all the loanee farmers in categories of marginal, small, semi-medium, medium and large farmers and the difference is found to be significant at 1 per cent probability level. The results were in confirmation with Miah *et al.* (2006) revealing loan users achieved higher yield than non-loan users.

Table 1: Comparison of farm size wise mean productivity levels of loanee and non-loanee farmers.

Farm Size Group	Loanee Yield (q ha^{-1})	Non-loanee Yield (q ha^{-1})	Percentage difference of loanee to non-loanee farmers	t-value
	Paddy (q ha^{-1})			
Marginal farmers	59.69	50.06	16.13	6.24**
Small farmers	61.73	48.38	21.63	4.18**
Semi-Medium farmers	63	51.92	17.59	8.74**
Medium farmers	63.67	47.88	24.80	10.38**
Large farmers	60.25	54	10.37	2.42**
Pooled farmers	61.6	50.38	18.21	10.60**
Farm Size Group	**Cotton (q ha^{-1})**			
Marginal farmers	24.38	17.3	29.04	4.10**
Small farmers	22.00	15.5	29.55	3.50**
Semi-Medium farmers	23.38	16.3	30.28	2.54*
Medium farmers	24.75	17.9	27.68	2.16*
Large farmers	26.00	22.9	11.92	1.31
Pooled farmers	24.1	17.71	26.51	5.84**
Farm Size Group	**Maize (q ha^{-1})**			
Marginal farmers	49.25	29.75	39.59	3.59**
Small farmers	45.875	30.38	33.78	3.29**
Semi-Medium farmers	51	30.25	40.69	4.90**
Medium farmers	47.75	44.5	6.81	0.80
Large farmers	50.25	38.5	23.38	2.76*
Pooled farmers	48.81	34.68	28.95	6.61**

Note: ** , * indicate significant at 1 per cent and 5 per cent level of probability respectively

Similarly, there was a significant difference in yield of cotton at 1 per cent probability level between loanee farmers (24.1 q ha^{-1}) and non-loanee farmers (6.61 q ha^{-1}). Among the loanee and non-loanee cotton farmers the mean yield levels were higher for loanee marginal and small farmers at 1 percent probability level, while semi-medium and medium loanee farmers' yield was significant at 5 percent level of probability. Although there was difference in the yield of loanee large farmers and non-loanee large farmers, the difference was non-significant.

In maize the mean yield for loanee farmers was 48.81 q ha^{-1} and 34.68 q ha^{-1} for non-loanee farmers and the difference was found to be significant at 1 percent level

of probability. The loanee marginal, small and semi-medium farmers showed higher yield than non-loanee farmers and the difference was significant at 1 percent level of probability for the yield recorded by large farmers also the difference was significant at 1 per cent level of probability. However the case of medium loanee farmers although obtained higher yield than non-loanee farmers was found to be insignificant. The results confirmed that the institutional credit extended for marginal and small farmers resulted in increased yields of paddy, cotton and maize, which was established by the higher yields registered by loanee farmers when compared to non-loanee farmers. Therefore the yield increased for the crops paddy, cotton and maize can be attributed to credit. The results obtained were in confirmation with Shah *et al.* (2008); Shalini (2011).

Comparative credit contribution to productivity in paddy, cotton and maize of loanee and non loanee farmers- Cobb Douglas production function analysis. Another way of understanding the contribution of credit to the productivity is by introducing dummy variable in the functional analysis. The loanee farmers availed institutional credit were assigned with '1' and non-loanee farmers who have not availed institutional credit were assigned with '0' for the dummy variable credit. The other variables considered were seed (kg ha^{-1}), machine (hours ha^{-1}), fertilizer (kg ha^{-1}), plant protection chemicals (l ha^{-1}), total human labour (mandays ha^{-1}), along with credit, as a dummy variable. Even though credit may influence the productivity through enabling the farmers to use optimum level of inputs there was no problem of multicollinearity among the factors considered. Accordingly the Cobb Douglas production function with dummy variable resulted in regression coefficients with positive contribution of credit as shown in Table 2 for paddy. It can be inferred from the Table that credit is a positive factor with a coefficient of 0.04 and was significant at .05 per cent level of probability. This implied that one per cent increase in credit would contribute to an increase of productivity by 0.04 per cent. Other positive factors were fertilizer and human labour which were significant. However credit can be considered as one important contributor to yield in paddy. The fitted function is a better fit as indicated by R square value 0.86. Afrin *et al.* (2017) found that credit taking farmers were having 86 per cent technically efficient compared to non-credit takers. Rahman *et al.* (2014) found that credit has positive impact on the rice production and R square of the present study indicated a better fit than the present study which recorded R^2 0.70.

Table 2: Results of Cobb Douglass Production function loanee farmers –Paddy.

Particulars	Variable	Coefficients	t-value	Significance
Intercept	a	0.705509	2.982	0.00367 **
Seed (kg ha^{-1})	ln X_1	0.005241	0.331	0.74146
FYM (tractor ha^{-1})	ln X_2	0.015265	1.562	0.12172
Fertilizer (kg ha^{-1})	ln X_3	0.212127	3.363	0.00113 **
Plant protection chemicals (l ha^{-1})	ln X_4	-0.00236	-0.068	0.946
Total human labour (mandays ha^{-1})	ln X_5	0.450571	6.242	1.31e-08 ***
Machine (hours ha^{-1})	ln X_6	0.040729	1.22	0.2256
Credit	ln X_7	0.040663	2.044	0.04378 *
Multiple R-squared		0.8659	F-statistic	84.83

Note: ***, ** and * indicate significant at .001, .01 and .05 per cent level of probability

Similarly, cotton was found to be influenced positively by credit as found in the Table 3 presented below. In this the same technique of introducing credit as a dummy variable was followed and the independent variables were free from multi-collinearity. Regression coefficient of credit was highly significant for cotton recording 0.19, meant that one per cent increased credit contributed to .19 per cent of productivity in cotton. This confirmed that cotton requires more credit comparatively. The fitted function registered 0.65 of R^2 which indicated that 65 % of the variation in yield is explained by explanatory variables. The results were in line with Ahmad (2016); Nepal Rastra Bank (2014); Bashir *et al.* (2010); Iqbal and Abbas (2003). The results of Cobb Douglas production function by considering the dummy variable of credit were presented in Table 4. Credit again contributed positively to maize yield also. The results indicated that one per cent increase in credit would contribute positively for an increase of .28 per cent in maize as it is a capital intensive crop. There was no problem of multi-collinearity among the independent variables considered. The results were in line with Ahmad (2016); Nepal Rastra Bank (2014); Bashir *et al.* (2010). The study of Saleem and Jan (2011) also confirmed the results concluding that credit disbursed for seed and fertilizer had greater impact on production.

Table 3: Estimated regression results for cotton loanee farmers in Karimnagar and Ranga Reddy districts.

Particulars	Variable	Coefficients	t-value	significance
Intercept	a	0.7371	0.684	0.49571
Seed (kg ha^{-1})	ln X_1	0.14269	1.083	0.28155
Fertilizer (kg ha^{-1})	ln X_2	-0.1798	-2.628	0.01006 *
Plant protection chemicals (l ha^{-1})	ln X_3	0.11658	1.706	0.09141 ‘
Total human labour (mandays ha^{-1})	ln X_4	0.32493	5.934	5.02e-08 ***
Machine (hours ha^{-1})	ln X_5	0.30466	2.692	0.00843 **
Credit	ln X_6	0.19063	5.762	1.07e-07 ***
Multiple R-squared		0.6577	F-statistic	29.79

Note: ***, **, * and ‘ indicate significant at .001, .01, .05 and .1 percent level of probability.

Table 4: Estimated regression results for maize loanee and non-loanee farmers in Karimnagar and Ranga Reddy districts.

Particulars	Variable	Coefficients	t-value	Significance
Intercept	a	1.07236	0.989	0.325396
Seed (kg ha^{-1})	ln X_1	0.56008	2.083	0.040052 *
FYM (tractor ha^{-1})	ln X_2	0.07059	1.969	0.051923 ‘
Fertilizer (kg ha^{-1})	ln X_3	-0.20172	-2.439	0.016657 *
Plant protection chemicals (l ha^{-1})	ln X_4	0.03644	1.468	0.145409
Total human labour (mandays ha^{-1})	ln X_5	0.36692	4.013	0.000122 ***
Machine (hours ha^{-1})	ln X_6	0.30838	2.317	0.022719 *
Credit	ln X_7	0.28314	5.319	7.3e-07 ***
Multiple R-squared		0.5239	F-statistic:	14.46

Note: ***, **, * and ‘ indicate significant at .001, .01, .05 and .1 percent level of probability.

CONCLUSION

The study concluded that institutional agricultural credit (crop loan) increased the productivity of the selected crops if used for the purpose it has been taken. The yield level obtained by loanee farmers of all size groups were significantly higher than non-loanee farmers in paddy cotton and maize. The analysis has revealed that credit has a positive impact and was a significant factor in increasing the productivity of paddy crop and maize. Access to institutional credit by loanee farmers enabled the farmers to purchase timely inputs helped realize increased productivity and thereby contribute to improved income, decreased dependency on non-institutional sources unlike non-loanee farmers. Measure should be strengthened to access credit in right time, through right agency and adequate quantum shall shield the farmer from exploitation by non-institutional sources, greater cost of credit and avoid falling into debt trap thereby continue farming with profitable yields.

FUTURE SCOPE

Having reconfirmed that the impact of credit on productivity to be positively significant, future thrust may be laid upon crop insurance encouraging marginal and small farmers to get into the channel institutional source of credit narrowing the demand supply gap in agricultural credit to certain extent.

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Conflict of Interest. None.

REFERENCES

Afrin, S., Haider, M. Z. and Islam, S. (2017). Impact of financial inclusion on technical efficiency on paddy farmers in Bangladesh. *Agriculture Finance Review, 77*(4), 484-505.

Ahmad, B. S. (2016). Empirical analysis of institutional credit supply and agricultural production with special reference to Jammu and Kashmir. *Indian Journal of Economics and development, 12*(1), 113-122.

Bashir, M. K., Mehmood, Y. and Hassan, S. (2010). Impact of agricultural credit on productivity of wheat crop: evidence from Lahore, Punjab, Pakistan. *Pakistan Journal of Agricultural Sciences, 47*(4), 405-409.

Baffoe, G., Matsudab, H., Nagaoc, M. and Akiyamad, T. (2014). The dynamics of rural credit and its impacts on agricultural productivity: An empirical study in rural Ghana. *International Journal of Sustainable Development, 7*(5), 19-34.

Bhat, S. A. (2015). Impact of institutional credit on agricultural output: A case study of district Pulwama (J&K). Ph.D. Thesis. Jamia Millia Islamia, New Delhi, India.

Chandio, A. A., Jiang, Y., Wei, F. and Guangshun, X. (2018). Effects of agricultural credit on wheat productivity of small farms in Sindh, Pakistan: Are short-term loans better ? *Agricultural Finance Review*, *78*(5), 592-610.

Das, A., Senapati, M. and John, J. (2009). Impact of agricultural credit on agriculture production: An empirical analysis in India. *Reserve Bank of India Occasional Papers*, *30*(2), 75-107.

Finance for agriculture Chapter 16 http://planningcommission.nic.in/plans/planrel/fiveyr/1st/1planch16.html

Iqbal, M., Ahmad, M. and Abbas, K. (2003). The impact of institutional credit on agricultural production in Pakistan. *The Pakistan Development Review*, *42*(4), 469-485.

Miah, M. A. K., Alam, A. K. M. A. and Rahman, A. H. M. A. (2006). Impact of agricultural credit on MV Boro rice cultivation in Bangladesh. *Journal of Agriculture & Rural Development (Gazipur*), *4*(1/2), 161-168.

Nepal Rastra Bank (2014). Agricultural credit and its impact on farm productivity: A case study of Kailali district. Nepal.

Rahman, M. S., Khatun. M, Rahman, M.A., Azam, M. G. and Sultana, S. (2014). Assessing the impact of credit on rice production and food security on farm households in Bangladesh. *International Journal of Innovative Research and Development*, *3*(6), 300-308.

Saleem, M. A. and Jan, F. A. (2011). The impact of agricultural credit on agricultural productivity in Dera Ismail Khan (district) Khyber Pakhtonkhawa. *Pakistan European Journal of Business and Management*, *3*(2), 38-44.

Shah, M. K., Khan, H., Jehanzeb and Khan, Z. (2008). Impact of agricultural credit on farm productivity and income of farmers in mountaneous agriculture in Northern Pakistan (A case study of selected villages in Chitral). *Sarhad Journal of Agriculture*, *24*(4), 713-718.

Shalini, H. (2011). Institutional credit to agriculture and its impact on the farm economy in Tumkur District, Karnataka- An Economic Analysis. M.Sc. Thesis, submitted to University of Agricultural Sciences, Dharwad.

Sidhu, R. S. and Gill, S. S. (2006). Agricultural credit indebtedness in India: some issues. *Indian Journal of Agricultural Economics*, *61*(1), 11-35.

Subbarao, D. (2012). Agricultural credit-accomplishments and challenges. Speech delivered at the thirty years anniversary celebration of NABARD at Mumbai on July 12, 2012.

Zedillo, E. (2015). "Overview". In Eds. E. Zedillo, O. Cattaneo and H. Wheeler, *Africa at a Ford in the Road. Taking Off or Disappointment once again?* Yale Centre for the Study of Globalization.

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