Dynamics of Institutional Agricultural Credit and Growth in Punjab: Contribution and Demand-Supply Gap

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Abstract

The contribution of institutional credit to agricultural growth has been estimated in the state of Punjab. The demand-supply situation under different scenarios and change therein over a decade period have been examined. A simultaneous (four) equation model has been used to estimate the contribution of institutional credit towards use of production inputs, private investments and agricultural growth. The study has revealed that supply of production credit doubled and that of investment credit increased by about 80 per cent during the period 2001-02 to 2003-04. It took more than 15 years to double from 1984-85 to 2000-01. The relationship between use of variable inputs and production credit disbursement has been found highly significant. A similar relationship has prevailed between private capital formation and investment credit. The results have further exhibited significant and positive impact of capital investments on productivity with elasticity of 1.02. Higher use of inputs was ushered by favourable input-output pricing policy along with easy and cheap short-term credit availability in the state. Private capital formation has also helped in increasing the use of variable inputs in the crop sector. The contribution of institutional credit in promoting use of modern production inputs and private capital investments has been found to be significantly positive. The demand-supply situation in terms of short-term institutional credit has undergone a change over time, with the demand exceeding supply by 49 per cent in 1995-96, but later, the supply has been found exceeding demand by 122 per cent in the year 2005-06. It, therefore, becomes imperative that first the demand for agricultural credit in each state/region be assessed, depending on crop patterns and current inputs and capital requirements in relation to targeted output growth-rate and then, policy framework should be put in place to meet those requirements, instead of increasing the credit supply uniformly across the board in all the states/regions of the country. Such a policy sometimes proves counterproductive and that appears to have happened in the Punjab agriculture.

Introduction

The demand for capital increases with transformation of the agriculture sector from traditionalism towards commercialization. The seed of commercialization in Punjab agriculture was sown with the introduction of high-yielding varieties of wheat and rice, followed by use of chemical fertilizers and investments in irrigation, especially on tubewells, agro-chemicals to control weeds, diseases and insect-pests management, and tractorization to ensure timeliness and precision in farm operations. Favourable output pricing policy, assured marketing, and subsidies on inputs like power and fertilizers further facilitated this process. The agriculture sector, therefore, witnessed high growth till mid-1990s. But, thereafter, the growth of agriculture sector started decelerating and profitability started declining in the state of Punjab (Sidhu *et al.*, 2005). The issue of growing indebtedness has become central and is being regarded associated positively with farmers' suicides

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(Satish, 2006). The Debt and Investment Survey of 2003 brought out startling results on debt position in different states of India. The amount of debt was higher in the developed states and highest in Punjab, at Rs 41,576 per farm. Secondly, the proportion of non-institutional debt in total debt had gone up as compared to the year 1991 (Sidhu and Gill, 2006).

Institutional agricultural credit has played a significant role in the fast and widespread adoption of modern production technologies and promotion of private investments on farms through its increasing as well as cheap supply. The basic objective of agricultural credit policy remained focused on adequate availability of credit at lower rates of interest at a time when it is required. Since the recommendations of Rural Credit Survey of 1954, the institutional agricultural credit policy has undergone many changes to meet this objective. The policy shifts included strengthening of old institutions like cooperative credit structure, creation of new institutions like Regional Rural Banks (RRBs) and National Bank for Agriculture and Rural Development (NABARD), development of new approaches to agricultural lending like service area approach, kisan credit card, and simplification of lending procedures.

However, the recent agrarian crisis has provoked policymakers to argue that the formal banking sector has focused more on the consumer and services sectors, as they were experiencing high growth, whereas agriculture sector was ignored, which created credit supply constraints, leading to deceleration in growth as well as over-dependence of farmers on non-institutional finance. Under this assumption, the Government of India advised the financial institutions to double the supply of agricultural credit in three years, from 2004 to 2007. Two things were over-looked in this process. First, the demand for credit was not estimated at the individual state/region level and supply was enhanced across the board for all the states. Second, it was presumed that agricultural growth is being constrained by lack of capital, in general and inadequate access to institutional credit of smallholders, in particular. In this paper, the contribution of institutional credit towards agricultural growth and demand for production credit

in relation to its institutional supply has been estimated to examine whether indebtedness is associated with lack of adequate availability of institutional funds or its over-supply.

Data Set and Model

Primary and secondary data were used to estimate demand-supply situation of institutional agricultural credit as well as its contribution to agricultural growth. The data on disbursement of credit over time were taken from the published documents of Reserve Bank of India, while the data on use of intermediate production inputs were collected from a randomly selected sample of 160 farmers, representing all the three agro-climatic zones and all farm-size groups in the state. The data included variable inputs for all crops, such as seed, fertilizers and manures, pesticides, hired labour, hired machinery, diesel and mobile oil use, marketing expenses, minor repairs, etc. The private investments in the state were estimated from the over time growth of farm machinery, tubewells, land development, etc. and then converting them into monetary units at constant prices.

To estimate demand for short-term production credit, the variable expenditure incurred at farm level, was used to blow the figures at macro level by using number and cultivated area for different farm-size groups on the basis of Agricultural Census 1995 and 2001. Different scenarios of credit demand were constructed as shown below.

Scenario-1: $OC_{mar}*L_{mar}+ OC_{sm}*L_{sm} + 0.75*OC_{med}*L_{med} + 0.5*OC_{lar}*L_{lar}$

Scenario-2: $OC_{mar}*L_{mar}+ OC_{sm}*L_{sm}+ OC_{med}*L_{med}+ 0.5*OC_{lar}*L_{lar}$

Scenario-3: $OC_{mar}*L_{mar}+ OC_{sm}*L_{sm}+ OC_{med}*L_{med}+ 0.75*OC_{lar}*L_{lar}$

Scenario-4: $OC_{mar}*L_{mar}+ OC_{sm}*L_{sm}+ OC_{med}*L_{med}+ OC_{lar}*L_{lar}$

where, OC_{mar}, OC_{sm}, OC_{med} and OC_{lar} are the operational costs of cultivation (per ha) for marginal (below 1 ha), small (1-2 ha), medium (>2-6 ha) and large (> 6 ha) farmers (given in Annexure I) and L_{mar}, L_{sm}, L_{med} and L_{lar} are the proportions of area operated by them, respectively. It was assumed that while

marginal and small farmers required 100 per cent of their operational cost as short-term credit, the proportion varied from 50 per cent to 100 per cent under different scenarios for the medium and large farmers.

To estimate the contribution of institutional agricultural credit towards the use of production inputs, private investments and growth, a simultaneous equations model specifying different relationships among these variables was developed and estimated with 3 SLS method, using statistical package STATA 9.2. The results of the model are based on data set for the period 1981-82 to 2003-04. Usual diagnostic tests of multi-collinearity and auto-correlation were carried out to test the validity of the model. The equations included in the model are given below:

Equation 1: $VOP = f(TOTIO, INDEXPRO)$ …(1)

Equation 2: $INDEXPRO = f(TOTIO, INPUTS, PVCAP)$ …(2)

Equation 3: $INPUTS = f(TOTINTER, STCREDIT, PVCAP)$ …(3)

Equation 4: $PVCAP = f\{TOTCAPFOR, INVESTCREDIT, INDEXPRO(-1)\}$ … (4)

where,

VOP	=	Value of output from agriculture at 1993-94 prices, in crore Rs
TOTIO	=	Index of terms of trade in the form of output-input prices
INDEXPRO	=	Index of productivity
INPUTS	=	Value of variable inputs use at 1993-94 prices (in crore Rs) deflated by price index of intermediate inputs
PVCAP	=	Value of private capital stock at 1993-94 prices, in crore Rs
TOTINTER	=	Index for input-output price ratio for intermediate inputs
STCREDIT	=	Short-term credit for agriculture at 1993-94 prices, in crore Rs
TOTCAPFOR	=	Index for input-output price ratio for capital formation

INVESTCREDIT	=	Investment credit in agriculture at 1993-94 prices, in crore Rs
INDEXPRO (-1)	=	Lagged productivity index

Growth of Institutional Credit

Institutional credit is supplied in the form of production credit and investment credit to the farming sector for incurring expenditure on: (i) variable production inputs like fertilizers, seeds, agro-chemicals, labour hiring, machinery hiring, fuel and oil, electric motor charges, etc., and (ii) private capital formation such as irrigation facility, tractors and other machinery, land development, etc. Table 1 shows the growth in production and investment credit at constant prices in the state over time and its association with the use of modern production inputs and private investments. The production credit increased from Rs 555.4 crore in 1984-85 to Rs 2657.8 crore in 2003-04 at the rate of 9.54 per cent per annum, while investment credit increased from Rs 167.7 crore to Rs 500.5 crore, respectively during this period at the rate of 5.1 per cent. The growth in per ha disbursement of institutional credit was also very high during this period. However, it was noted that there was no growth in the production and investment institutional credit during 1984-85 to 1993-94 and it was during the later period of 1993-94 to 2003-04 only that the growth was substantial. Consequently, the share of institutional credit in agriculture GDP came down from 16.61 per cent in 1984-85 to 10.40 per cent in 1995-96 but climbed to 27.3 per cent in 2003-04. Secondly, the growth was much higher in production credit than investment credit.

The supply of production credit more than doubled during 2000-01 to 2003-04, while that of investment credit increased by about 50 per cent only. This stupendous credit growth raises an important issue: has the demand for variable inputs and private capital stock risen at this rate during this period when the output growth has decelerated?

The association of variable inputs with production credit disbursement was found to be very high and significant. The correlation coefficient between production credit and fertilizer-use was as

Table 1. Availability of agricultural credit in Punjab at 1990-91 prices

Year	Production credit		Investment credit		Total agricultural credit		Total
	Total (Rs crore)	Per ha of GCA (Rs)	Total (Rs crore)	Per ha of GCA (Rs)	Total (Rs crore)	Per ha of GCA (Rs)	agricultural credit as % of GDP
1984-85	554.37	790.48	167.70	239.13	722.07	1029.61	16.61
1989-90	671.24	907.93	251.43	340.09	969.82	1311.80	12.62
1995-96	680.79	883.57	317.81	412.47	989.96	1284.83	10.40
2000-01	1283.50	1616.30	334.85	421.67	1618.34	2037.96	13.75
2003-04	2657.83	3362.22	500.52	633.17	3158.35	3995.39	27.30
CGR (1984-85 to 1993-94)	0.95^{ns}	0.10^{ns}	1.58^{ns}	0.72^{ns}	0.44^{ns}	0.17^{ns}	-
CGR (1994-95 to 2003-04)	18.51*	18.18*	6.23*	5.93*	14.60*	15.15*	-
Overall CGR (% per annum)	9.54*	8.88*	5.13*	4.49*	8.21*	7.71*	-

Note: ns means non-significant, and * means significant at 5 per cent level.

high as 0.86, indicating the role of short-term credit in promoting fertilizers in the state (Table 2). As a matter of fact, fertilizer is supplied at the doorsteps of the farmers as a kind component of the short-term loans through Primary Agricultural Cooperative Credit Societies and the dependence of small and semi-medium farmers is very high on cooperative credit structure (Sidhu *et al.*, 2006).

Tractorization, especially on small and semi-medium holdings, is largely financed by easy availability of institutional credit in the state. Farm level studies have shown that 36 per cent of such farms own tractors (Singh *et al.*, 2007). That is another matter that such farms are over-capitalized and do not support tractorization on economic principles. Same is the story with respect to investments on tubewells. The number of tubewells has gone up from 6.0 lakh in 1980-81 to 11.9 lakh in 2005-06 and the proportionate area irrigated by them has increased from 57.3 per cent to 72.3 per cent during this period. The fall in groundwater table necessitated deepening of wells and replacement of centrifugal pumps by submersible pumps. Such investments by resource-poor farmers were supported by the institutional finance. Thus, the correlation coefficient of investment credit with tractors and tubewells was more than 0.81, indicating their strong association. The share of investment credit in the private capital formation was 83 per cent in 2003-04.

Table 2. Correlation matrix of important variables with production and investment credit in Punjab

Variables	Production credit	Investment credit
Fertilizer consumption	0.86	-
Pesticide consumption	0.44	-
Diesel use	0.67	-
Number of tractors	-	0.86
Number of tubewells	-	0.81
Private Investments	-	0.87

Note: All the correlation coefficients are significant at 5 per cent level

Contribution of Agricultural Credit towards Growth

Agricultural output in the state was influenced by growth in productivity and favourable output-input price regime since 1980-81. The elasticity of value of agricultural output to productivity index was estimated at 0.57 and that of output-input price ratio at 0.63 (Table 3). The productivity, in turn, was hypothesized to grow due to capital investments and higher use of variable inputs. The model estimated the impact of capital investments on productivity to be significantly positive with elasticity as 0.67. However, the marginal productivity of variable inputs-use was found to be non-significant during this period. The production process in Punjab is highly input-intensive, where inputs are being over-used. The empirical studies have shown that farmers

use very high amounts of chemical fertilizers and other agro-chemicals, irrigation water and other inputs to wheat and rice crops to maintain the current levels of productivity (Sidhu *et al.,* 2006; 2007). Degradation of natural resources such as soil fertility and groundwater has resulted into higher use of variable inputs to sustain productivity in the state.

Higher use of inputs was ushered by favourable input-output pricing policy and easy and cheap availability of short-term credit in the state. Input subsidies on fertilizers and power on one hand and continuous and significant increase in output prices of wheat and rice, especially during 1990s (Sidhu *et al.*, 2005) motivated the farmers to use more and more inputs even at the cost of their un-economic use. The elasticity of inputs-use to input (intermediate)-output price ratio was (-) 0.39, indicating that one per cent relative fall in input prices caused higher use of production inputs by 0.39

per cent. Private capital formation also helped in increasing the variable inputs-use in the crop sector. Apart from their assured prices, marketing and yields, investments on tubewell irrigation and tractors changed crop patterns in favour of rice and wheat crops, which require more inputs like fertilizers, irrigation water, agro-chemicals as compared to other crops. Similarly, private investments were promoted by productivity growth and favourable output prices in relation to prices paid for capital formation. The elasticity of private investments to input (capital formation) -output price ratio was as high as (-) 1.49.

The contribution of institutional credit to promoting the use of modern production inputs and private capital investments was found to be significantly positive. The increase in short-term institutional credit by one rupee resulted in higher use of inputs by Rs 0.37, while one rupee growth in

Table 3. Three SLS estimates of the model for impact of institutional agricultural credit in Punjab

Variables	VOP		INDEXPRO		INPUTS		PVCAP	
	Coefficient	Elasticity	Coefficient	Elasticity	Coefficient	Elasticity	Coefficient	Elasticity
Constant	-3260.75	-	238.01	-	3204.07	-	3263.00	-
	(0.000)		(0.000)		(0.008)		(0.035)	
TOTIO	86.79	0.72	-1.38	-0.53	-	-	-	-
	(0.000)		(0.003)					
INDEXPRO	26.29	0.57	-	-	-	-	-	-
	(0.000)							
INPUTS	-	-	-0.006	-0.10	-	-	-	-
			(0.746)					
PVCAP	-	-	0.06	0.67	0.80	0.54	-	-
			(0.009)		(0.002)			
TOTINTER	-	-	-	-	-14.33	-0.39	-	-
					(0.014)			
STCREDIT	-	-	-	-	0.37	0.07	-	-
					(0.093)			
TOTCAPFOR	-	-	-	-		-	-40.03	-1.49
							(0.003)	
INVESTCREDIT	-	-	-	-		-	4.10	0.42
							(0.000)	
INDEXPRO (-1)	-	-	-	-		-	10.02	0.89
							(0.001)	
R-square	0.95		0.80		0.97		0.89	

Note: Figures within the parentheses are the probability values

For abbreviations, refer to Equations (1) to (4)

long-term investment credit led to private capital formation by Rs 4.10. The elasticity of inputs-use to short-term credit was 0.07 and that of private capital investments to long-term credit was 0.42. Similar results were reported by Roy and Pal (2002) and Desai (1994). They have concluded that availability of institutional credit along with technological change make significant contributions to agricultural growth under land and labour augmenting technologies.

Institutional Credit and Farm Size

Equity issues involved in institutional agricultural credit are widely debated across India. Various farm level studies have shown that the access to institutional finance of smallholders is limited and inadequate (Vyas, 2004). They are excluded from the institutional credit delivery system due to high transaction cost, poor recovery and low margins. Table 4 brings out the size-wise distribution of agricultural credit in Punjab to investigate how different farm classes were sharing the institutional credit. Smallholders accounted for 26.3 per cent of the total institutional credit disbursed in 2005-06, while their share was 33.7 per cent in 1986-87 and 44.9 percent in 1995-96. Therefore, the availability of institutional credit to smallholders improved during the period 1986-87 to 1995-96, but deteriorated since mid-1990s. On the other hand, their number must have swelled over time due to laws of inheritance. The share of medium and large farm-size households in the total institutional credit has improved in recent years. This shows that when the process of deceleration in agricultural sector was set in, the banking sector started excluding small borrowers, whose incomes were low and recovery doubtful.

Demand and Supply Situation

Demand and supply of credit was estimated for the years 1995-96 and 2005-06 to examine their temporal shifts under the environment of deceleration in output growth, stagnation in technological changes and increase in credit supply, especially after the year 2004 (Table 5). Under Scenario-1 (where the whole variable expenditure for small and marginal farms, 75 per cent for medium

Table 4. Share of small farms in institutional agricultural credit in Punjab

(% of total amount outstanding)

Year	Type of ownership	
	Up to 5 acres	Above 5 acres
1986-87	33.7	66.3
1995-96	44.9	55.1
2005-06	26.3	73.7

farms and 50 per cent for large farms, depending on their income and saving levels, is assumed to be financed), the demand was estimated to be Rs 2344 crore in 1995-96, which increased to Rs 5523 crore in 2005-06 at current prices. Correspondingly, the supply of institutional short-term production credit was Rs 1,188 crore and Rs 12,300 crore; which shows that while demand exceeded supply by 49 per cent in 1995-96, the situation got reversed recently when supply exceeded demand by 122 per cent in the year 2005-06. Similar were the results in other scenarios of demand estimation. Even when it was assumed that all the variable expenditure in the case of all farm-size categories should be provided by the institutional sources (Scenario-4), the demand was estimated at Rs 9223 crore in 2005-06 and was less than the amount of institutional credit disbursed by 33 per cent. These findings corroborate two phenomena. First, due to higher demand of credit than supply, the share of non-institutional sources in the total debt increased during 1990s. Secondly, in recent years, there has been over-supply of production credit in the state under the influence of over-enthusiastic policy of increasing institutional agricultural loans, irrespective of the fact whether demand was there or not, resulting into the problem of growing indebtedness. The share of non-institutional sources in the total debt declined from 46.3 per cent in 1997 (Shergill, 1998) to 38.1 per cent in 2006 (Singh *et al.*, 2007). Besides deceleration in growth, the indebtedness might have occurred due to diversion of loans from productive to non-productive purposes. There could be some cases where large and influential farmers might have borrowed from institutional sources at low rate of interest and lent it to marginal, small and tenant cultivators and landless labourers at high rate of interest.

Table 5. Demand and supply of short-term institutional credit in Punjab

(in crore Rs)

Year	1995-96			2005-06		
	Demand	Supply	Deficit (%)	Demand	Supply	Surplus (%)
Scenario-1	2344.50	1188.32	49.3	5522.87	12299.92	122.7
Scenario-2	2550.72	1188.32	53.4	6044.38	12299.92	103.5
Scenario-3	3248.84	1188.32	63.4	7633.77	12299.92	61.1
Scenario-4	3946.97	1188.32	69.9	9223.16	12299.92	33.4

Policy Implications

Credit plays a significant role in promoting modern production technologies and private investments on the farms by making available adequate funds for the agriculture sector of developing countries, where inflow of funds is seasonal and income and savings of the farmers are low. However, it also acts like a double-edged weapon; if used productively it raises productivity and production, but if used irrationally on un-productive activities, it leads to the problem of indebtedness. The study has shown that institutional credit has contributed positively to the adoption of modern production inputs and private investments in tubewell irrigation, tractorization and other farm machinery in the Punjab state, which has contributed towards the growth of the agriculture sector. Yet, its demand and supply has remained unmatched over the years, creating difficulties in its economic and productive use. During the period 1985 to 1995, the growth of institutional agricultural credit has been found to slow down, whereas demand for capital had increased in the wake of degradation of natural resources like soil and groundwater and deceleration of output growth. Consequently, the role of non-institutional sources in financing capital requirements was increased and led to the problem of indebtedness due to unscrupulous nature of such loans along with decelerating growth.

The demand-supply gap in the institutional agricultural credit has, however, undergone changes in recent years due to the current credit policy of enhancing flow of agricultural credit. Consequently, increase in the supply of institutional credit occurred at a higher rate than increase in demand for credit due to which supply exceeded demand. The excessive supply seems to have gone to unproductive activities, leading to indebtedness. A recent study by Punjab State Farmers Commission has estimated the amount of debt in the state at Rs 21064 crore, almost 89 per cent farmers are indebted with an average debt of more than Rs 2 lakh per farmer (Singh *et al.*, 2007), while in 1997, it was estimated at Rs 5700 crore (Shergill, 1998). Therefore, it becomes imperative that first the demand for agricultural credit in each state/region be assessed depending on crop patterns and current inputs and capital requirements in relation to targeted output-growth rate and then, policy framework should be put in place to meet those requirements, instead of increasing the credit supply uniformly in all the states/regions of the country. Such a policy sometimes proves counterproductive and that appears to have happened in the Punjab agriculture.

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Appendix I

Operational cost of cultivation on different farm-size categories in Punjab: 1995-96 and 2005-06

(Rs/ha at current prices)

Particulars/cost	Farmers			
	Marginal	Small	Medium	Large
A. 1995-96				
1. Seed	981	941	903	1037
2. Fertilizers and FYM	2440	2556	2682	3159
3. Chemicals	1019	1050	952	1148
4. Diesel and mobile oil	1146	1016	1638	1984
5. Hired labour	1747	2038	2130	1628
6. Hired machinery	1857	2095	1257	599
Total	9190	9696	9562	9555
B. 2005-06				
1. Seed	3020	2888	2395	3714
2. Fertilizers and FYM	4618	4545	4608	5472
3. Chemicals	2077	1817	2876	1950
4. Diesel and mobile oil	5109	5008	6766	4913
5. Hired labour	2267	4245	2995	4310
6. Hired machinery	5657	6426	4161	2136
Total	22748	24929	23801	22495

Source: For 1995-96: *Comprehensive Scheme for Estimating Cost of Cultivation for Major Agricultural Crops in Punjab.*

For 2005-06: Primary data collected from 160 farmers belonging to these categories