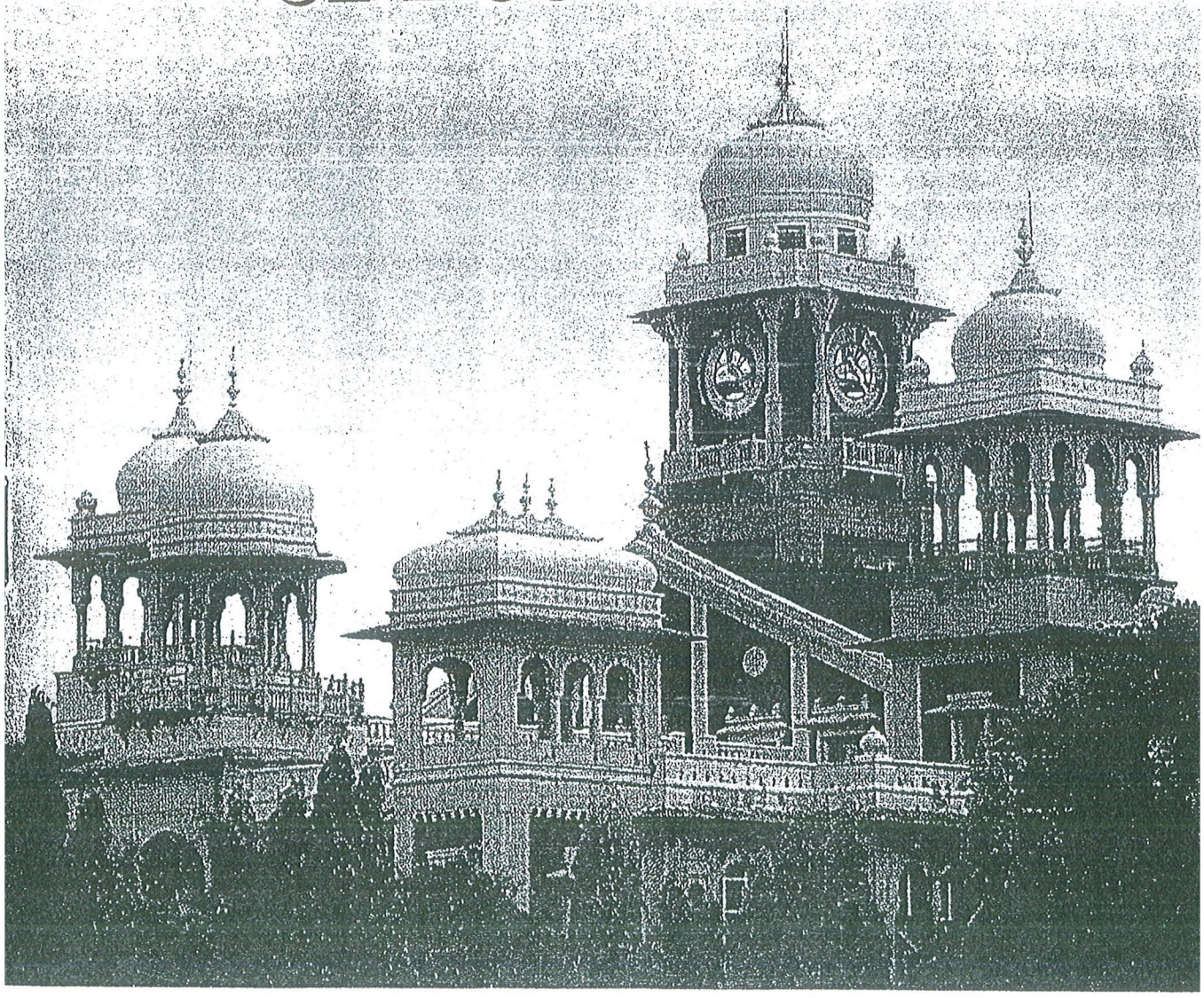
No. 360 July 2010 Part-I Vol XIC ISSN 0019-5170

The Indian Journal of Economics



CONTENTS

BOOK REVIEW

Determinants of Agricultural Credit Constraint—A Micro Level Analysis

P. Ambiga Devi* and S. Gandhimathi†

Abstract

In India, commercial banks, co-operative and Regional Rural banks were the main conduit for providing agriculture credit. Though the total agricultural credit of institutional agencies had increased from Rs.885 crore in 1970-1971 to Rs.1,25,309 crore in 2004-2005, till the year 2003-2004, the private sector and public sector commercial banks did not achieve the target lending (18 percent net bank credit) to the agricultural sector fixed by the Reserve Bank of India. Around 60 percent of the working capital of the farmers was not financed by the financial institutions and remained as institutional credit gap. The above facts brought out the presence of institutional credit gap in the agricultural sector lending and substantiated for disequilibrium credit market condition in agriculture (National Accounts Statistics, 2006).

The studies in India on the extent of credit constraint and the impact of agricultural credit on agricultural sector in a disequilibrium market condition are very limited (Kochar, 1997). Hence the major objective of the present study is to analyse the extent of credit constraint and the factors determining credit constraint.

To conclude, in the study area, the area under cultivation (except in Karamadai block) and farmers' own fund to invest, turned out to be the significant factors to determine probability of credit constraint. The co-efficient of farmers' own fund had consistent negative sign. It revealed that the probability of credit constraint had declined with increase in the amount of farmers' own fund to invest.

*Professor of Economics, Avinashilingam University for Women, Coimbatore–641 043, Tamilnadu, India.

†Lecturer in Economics, Avinashilingam University for Women, Coimbatore–641 043, Tamilnadu, India.; Email:gandhimathi_senni@yahoo.co.in

I. INTRODUCTION

Government financial intermediation in rural economics is geared to mobilize savings and investment, via lending. There is a growing body of literature that has focused on the linkages between credit market development and economic growth, the role of financial institutions in mobilizing savings and the effect of credit on agricultural investment and output [Goldsmith (1969), Shaw (1973), David and Meyer (1980), Pischke et al., (1983), Giovannini (1985), Braverman and Guasch (1986). Iqbal (1986), Feder et al., (1988), Feder et al., (1991) and Foltz (2004)].

Agricultural credit structure in a developing economy is characterized by dualism, that is co-existence of institutional (formal) and non institutional credit (informal) (Singh et al, 2001). In India, the formal sector consisting of co-operatives, commercial banks and the Regional Rural Banks as the main conduit for providing agricultural credit. From the institutional agencies, the total agricultural credit had increased from Rs.885 crore in 1970-1971 to Rs.1,25,309 crore in 2004-2005. Though there was increase in the flow of institutional credit, the non institutional credit accounted for 38.9 percent in the year 2002. (All India Debt and Investment Survey, 2002). It revealed that not withstanding the outreach of banking, the formal credit has not been able to absolutely penetrate the informal financial markets. Rather, it seems to have shrunk in some respects in recent years (Throat, 2006). It revealed the absence of adequate institutional credit in agriculture even after various agricultural credit policy oriented reforms.

Moreover, the Reserve Bank of India fixed the target for agricultural sector advances to fulfill and to cater to the credit needs of the farmers. Firstly, a sub-target[1] of 15 percent of total bank credit was fixed by the Reserve Bank of India in 1985. It was subsequently raised to 16 percent in March, 1987, 17 percent in March, 1989 and 18 percent of net bank credit in March, 1990. Till the year 2003-2004, the private sector and the public sector commercial banks did not achieve the target lending fixed by the Reserve Bank of India (Report on trend and progress of banking in India, 1987-1988 and 2003-2004). The short term credit[2] provided by the financial institutions covered only 16 percent of the working capital requirements of the farmers in 1971-72. The coverage of working capital by short term credit was 13.93 percent in 1980-81, 28.08 percent in 1999-2000, 36.11 percent in 2001-2002 and 40.83 percent in 2003-2004. Around 60 percent of the working capital of the farmers was not financed by the financial institutions and remained as institutional credit gap. The above facts brought out the presence of institutional credit gap in the agricultural sector lending and substantiated for disequilibrium credit market conditions in agriculture. (National Accounts Statistics, 1971-2006).

In this backdrop, the Indian studies by Shukla el al,, (1977), Lavanya el al., (1977), Subramanyam and Doss (1981), Pandey (1983) and Uddin (2003), attempted to analyse credit requirements, credit gap, credit inadequacy and the impact of credit on agricultural production, employment and welfare. They also attempted to identify the impact of credit by estimating separate production functions (for farm production) or supply functions for borrowers and non-borrowers as well as for before and after availing credit. According to Feder et al., (1990), the major weakness of this approach is the implicit assumption that all borrowers and non-borrowers are respectively homogeneous with respect to their credit demand and supply situations. This assumption is often not valid as many non-borrowers did not borrow because they actually have sufficient liquidity from their own resources and not because they cannot obtain credit, while some non-borrowers do not borrow because they are not credit worthy. Similarly some borrowers may have borrowed adequately and some may not have been able to borrow adequately. Thus the credit constraint situation will occur for both borrowers and non-borrowers.

The incidence of formal credit constraint and credit unconstraint arises among both groups of farmers who have access and do not have access to formal credit. The farmers who have access to credit are credit constrained, when they do not receive adequate amount of credit. The farmers who do not have access to credit are credit unconstrained, when they are not in need of credit.

The studies in India by Kochar (1997) and in other countries by Feder et al, (1991), Diague et al., (2000), Diague and Zeller (2001), Foltz (2004) and Nuryartono et al, (2005) analysed the extent of credit constraint and impact of credit on production, farm income, investment and profit by taking both borrowers and non-borrowers into consideration.

The studies in India on extent of credit constraint and the factors determining credit constraint based on the approach of Feder et al., (1990) are very limited. Hence the major objectives of the study is to analyse the extent of credit constraint and factors determining credit constraint.

II. OBJECTIVES

Specific objectives of the study are :—

To estimate the extent of credit constraint

To identify the factors responsible for agricultural credit constraint.

Hypotheses

The hypotheses tested are :—

Credit constraint was independent of socio-economic characteristics of farm households.

III. METHODOLOGY

1. Selection of the Sample

As the study is mainly based on primary data, the sample borrowers and non-borrowers of the study were selected through multistage and purposive random sampling techniques. In the first stage, the 19 rural blocks in Coimbatore district were considered. They are Anamalai, Annur, Avinashi, Gudimangalam, Karamadai, Kinathukadavu, Madathukkulam, Madukkarai, Palladam, Perianaickanpalayam, Pollachi (North), Pollachi (South), Pongalur, Sarkar Samakulam, Sultanpet, Sulur, Thondamuthur, Tirupur and Udumalpet. They were classified as high credit intensive and low credit intensive blocks based on the district average agricultural loan disbursement.

Among the high credit intensive blocks, Udumalpet was the first largest block in the number of agricultural loan accounts (20,760) and the second largest block was Thondamuthur (18,509). But the cropping intensity was higher in Thondamuthur block (95.79 percent) than in Udumalpet block (89.94 percent). Among the low credit intensive blocks, Karamadai was the third largest block (7,913) in the number of agricultural loan accounts, the first being Gudimangalam block (9,157) and second being Pongalur block (8,236). The number of cultivators was higher in Karamadai block (13,151) than in Gudimangalam block (9,560) and Pongalur block (7,450). Hence Thondamuthur among high credit intensive blocks and Karamadai among low credit intensive blocks were selected.

In the second stage, the branches of State Bank of India, Canara Bank, Corporation Bank, Indian Overseas Bank, Indian Bank, Syndicate Bank, Primary Agriculture Co-operative Societies and Land Development Banks which had achieved and exceeded the target in lending (for the year 2003-2004) to agriculture in Coimbatore district were selected (Annual Credit Plan, 2004-2005). In the third stage, the size of borrowers of institutional credit and non-borrowers were decided, based on the proportion of borrowers of institutional credit to cultivators in the selected blocks. Accordingly, 68 percent of borrowers (169 borrowers) and 32 percent of non-borrowers (81 non-borrowers) in Thondamuthur block were selected. In Karamadai block, 58 percent of borrowers (130 borrowers) and 42 percent of non-borrowers (120 non-borrowers) were selected. In the fourth stage, the farmers were classified as credit constrained and credit unconstrained, based on the survey responses of the farmers. In the post stratification, there were 115 credit constrained and 135 credit unconstrained farmers in Thondamuthur block. In Karamadai block, there were 163 credit constrained and 87 credit unconstrained farmers.

The period of the study was pertaining to the crop year 2003-2004.

2. Identification of Credit Constrained Farmers

Direct elicitation methods use responses to qualitative survey questions on the perception of constraints, the history of households' access to credit and demand for current credit to identify households facing credit constraints. In an early application of this approach, Jappelli (1990) classified households as credit constrained if they had a loan application rejected or did not apply for a loan because they believed that they would face a high probability of rejection (labeling the latter as discouraged borrowers). Feder et al., (1990) classified households as credit constrained from a household survey in China if they stated that they would have liked to borrow more credit at current interest rates if it were made available to them.

In the present study, the identification of credit constrained farmers was based on the approach of Feder et al., (1990). The farmers were classified as credit constrained farmers if they stated that they would have liked to borrow more institutional credit at current interest rate if it were available to them. Households who did not like to borrow more credit were asked the reasons for not borrowing.

3. Specification of Econometric Model and Estimation Issues

The current study dealt with disequilibrium credit market and its impact on farm sector. It identified the probable farmers becoming credit constrained, impact of credit on production, farm income and asset holding of farmers. To identify probable credit constrained farmers, probit model was built. The probit model used maximum likelihood estimator to estimate the parameters. To estimate the above model, ordinary least squares method could not be applied. In regressions, involving binary dependent variables, the problem of heteroscedasticity arises, making the ordinary least squares estimation of the standard errors biased. In addition, the disturbance terms are bounded and only approximated to normal distribution (Knowles and Anker, 1977). Hence, maximum likelihood method of estimation was used.

4. Credit Constraint Function

A farmer is credit constrained when he demands more than the availability of credit from the credit institutions. Hence credit constraint is a function of farm and farmer characteristics affecting both availability and demand for credit. The availability and demand for credit were determined by a set of farm and farmer characteristics such as area under cultivation, farming experience, education, family size, non-farm income and availability of own fund to invest.

The probability of a farmer to be credit constrained is estimated, based on the above farm and farmer characteristics using equation

$$G^* = \gamma z + \varepsilon \quad \text{(Feder } et\ al.\text{, 1990 and Foltz, 2004)}$$

where G=probability of a farmer to be credit constrained or credit unconstrained.

γ = parameter co-efficient

Z=area under cultivation (in hectares), farming experience (in years), education (in years), family size (in number); non-farm income (in Rs.) and availability of own fund to invest (in Rs.), all being measured in natural logarithmic form. ε is a random disturbance term.

If $G^* > 0$, the farmer is credit constrained. With the above formulation, the probability that the farmer becomes credit constrained ($G* > 0$) can be written as

$$\text{prob } (G^* > 0) = \text{ probability } (\gamma^1 z + \varepsilon > 0).$$

This formulation leads to a standard probit model to estimate the probability that a household is credit constrained. Assuming ε has a standard normal distribution [N(0, 1)], the log likelihood function for a probit model is

$$\ln L = \sum_{Gi=0} \ln(1 - \phi_i) + \sum_{G_i=1} \ln \phi_i$$

where ϕ is the standard normal distribution evaluated at $\gamma' z$ (Foltz, 2004).

The probit model was also used by Feder *et al.*, (1990), Swain (2002), Foltz (2004), Gilligan *et al.*, (2005), Nuryartono *et al* (2005) and Guirhingeri and Boucher (2006) to measure the probability of a farmer being credit constrained.

As the model is pertaining to imperfect market condition, no unambiguous predictions on the signs of the reduced form estimation of excess credit demand can be made. The reduced form estimation shows the factors which are more important to either supply or demand. A positive estimated co-efficient, γ signifies a characteristic which increases demand more than supply. Among the variables included in the model, non-farm income and availability of own fund were expected to have negative relationship with credit constraint. (Feder *et al.*, 1990). Education, family size, area under cultivation and farming experience were expected to have intermediate a priori sign depending on the strength of its influence on either availability of credit or demand for credit (Feder *et al.*, 1990). The above analysis was carried out through LIMDEP computer package.

5. Limitations of the Study

The following are the limitations of the study :—

1. The study included farmers who availed only institutional credit. The borrowers of informal credit were excluded.

2. In the present study, the farmers were classified as credit constrained if they were constrained either for crop loan or investment loan or for both.

3. The study was based on cross section data and there was no significant variation in many of the supply side factors such as rate of interest, scale of finance fixed by the banks, number of finance institutions existed etc., Hence the above factors were not included in the credit constraint equation the distance to the financial institutions was not taken into account because the policy of the banks such as service area approach. The farmers were restricted to borrow only from the financial institutions to the area allotted.

4. To know the impact of agricultural credit on farm income beyond the credit intensity in the blocks, the low credit intensive and high credit intensive blocks were combined together and the analysis were undertaken.

5. To analyse the credit constraint and the factors determining credit constraint beyond the credit intensity and irrigational factors, both high credit intensive and low credit intensive blocks were combine together.

IV. RESULTS AND DISCUSSION

1. Agricultural Credit Constraint

Technology increases the demand for both short and long term agricultural credit from various institutional agencies. The institutional agencies could not meet the demand for credit. There is, thus, a gap between the supply and demand for credit (Shukla *et al.*, 1977).

Agricultural credit constraint is the excess demand for credit compared to credit availability. An attempt was made to analyse the extent of agricultural credit constraint among the credit constrained farm households in the study area. The table-1 shows details on the agricultural credit constraint in the study area. The credit unconstrained farmers did not have crop and investment loan constraints.

Crop loan constraint is a short period loan constraint. It is the excess demand over availability of crop loan. The crop loan constraint adversely

affects the use of farm variable inputs such as labour, seeds, fertilizers, pesticides, etc. Table-1 revealed that in the high credit intensive Thondamuthur block, the extent of crop loan constraint was Rs.6,742 per hectare. Investment loan constraint is the excess demand over availability of investment loan. The extent of investment loan constraint was Rs.31,267 per hectare.

In the low credit intensive Karamadai block, the extent of crop loan constraint amounted to Rs.2,812 per hectare among the credit constrained farmers. The amount of investment loan constraint was Rs.25,851 per hectare.

When both the high credit intensive Thondamuthur block and the low credit intensive Karamadai blocks were combined, the extent of crop loan constraint was Rs.4,438 and the investment loan constraint was Rs.28,092.

The amount of investment loan constraint was higher than the crop loan constraint in both the high credit intensive Thondamuthur block and the low credit intensive Karamadai block. It was because long term investment needs larger amount of capital to be invested (Table-1).

Prasad and Singh (1981), observed that the actual cost for different categories of farmers for different investment purposes was far larger than the approved unit cost fixed by the Refinance Development Corporation. It was the main factor behind credit constraint in investment loan.

Sisodia and Singh (1987), Patel *et al.*, (1988), Ramesh (1990), Makadia *et al.*, (1992), Prasad and Parthasarathy (1993) and Singh and Mruthyunjaya (1992) found that credit needs of the farmers exceeded credit availability from financial institutions.

2. Determinants of Agricultural Credit Constraint

Theoretical and empirical works in economics had established that credit markets in developing countries work inefficiently due to a number of market imperfections which included—

(1) interest rate ceilings usually imposed by the government,

(2) monopoly power in the credit markets often exercised by the informal lenders (Bell *et al.*, 1997),

(3) large transaction costs incurred by the borrowers in applying for loans and

(4) moral hazard problems (Carter, 1989). The above imperfections combined together led the farmers to be credit constrained (Foltz, 2004).

In this section, an attempt was made to identify the factors which led the farmers to be probable credit constrained.

A farmer is credit constrained when he demands more than the available credit from the credit institutions. Hence credit constraint is a function of farm and farmer characteristics such as area under cultivation, farming experience, education, family size, non-farm income and own fund, affecting both the availability and demand for credit. It leads to the formulation of reduced form model which can be estimated by a probit procedure. The probit procedure was also used by Feder *et al.*, (1991), Swain (2002), Foltz (2004), Nuryartono *et al.*, (2005), and Guirhingeri and Boucher (2006) to measure the probability of a farmer being credit constrained.

TABLE–1
Agricultural Credit Constraint

(in Rs. per hectare)

Block	Type of loan constraint	CC
HCIB (Thondamuthur)	Crop loan constraint	6,742
	Investment loan constraint	31,267
LCIB (Karamadai)	Crop loan constraint	2,812
	Investment loan constraint	25,851
Both blocks combined	Crop loan constraint	4,438
	Investment loan constraint	28,092

Source : Field Survey, 2004-2005, CC : Credit Constrained Farmers;
HCIB : High credit intensive block, LCIB : Low credit intensive block

The reduced form estimation shows factors which are important to either supply or demand. A positive estimated parameter co-efficient signifies characteristics which increase demand more than supply. Among the variables such as area under cultivation, farming experience, education, family size, non-farm income and own fund; non-farm income and availability of own fund were expected to have negative relationship with credit constraint (Feder *et al.*, 1990). Education, family size, area under cultivation and farming experience were expected to have intermediate a priori sign depending on the strength of its influence on the availability of credit than demand (Feder *et al.*, 1990 and Foltz, 2004). Table-2 shows the means of the variables selected for probit regression analysis.

In the high credit intensive Thondamuthur block, on an average, the area under cultivation was 1.4540 hectares. The farmers had 27 years of experience in farming. The head of the farm households just crossed the primary education. On an average, there were four members in the family. They earned Rs.5,208 per year as non-farm income. The farmers got own

fund to invest from previous season's crop income, savings in the banks, the old debt given to their friends, relatives, etc. From these sources, they had availed an average amount of Rs.54,772 as their own fund to invest (Table-2).

TABLE–2

Means of Selected Variables for Probit Regression Analysis in the High Credit Intensive Thondamuthur Block

Variable	Unit	Mean
Area under cultivation	Hectares	1.4540
Farming experience	Years	26.9120
Education	Years	6.6600
Family size	Number	3.7880
Non farm income	Rupees	5,208
Own fund	Rupees	54,772
N	250	

Source : Field survey, 2003–2004.

The estimated credit constraint equation in the high credit intensive Thondamuthur block is shown in table-3. The estimation procedure is discussed in detail under methodology.

TABLE–3

Determinants of Credit Constraint in the High Credit Intensive Thondamuthur Block–Probit Regression Analysis

Variable	Probit Co-efficient	't' value
Constant	2.1849**	3.048
Area under cultivation	0.5022**	3.036
Farming experience	−0.1292	−0.726
Education	−0.0156	−0.153
Family size	−0.7695**	−2.782
Non farm income	−0.0170	0.682
Own fund	−0.1610**	−8.331
Chi square	96.4098**	
Log likelihood function	−124.2810	
Model prediction	79.2 percent	
N	250	

Source: Estimates based on field survey, 2003-2004, **: significant at one percent level.

The estimated probit co-efficients showed that among the selected variables, area under cultivation, family size and availability of own fund to invest were the significant factors to determine the probability of farmers being credit constrained. The sign of the estimated probit co-efficients showed that the probability of farmers being credit constrained had increased with increase in area under cultivation and had declined with family size.

The probability of credit constraint associated with farmers' own fund to invest was −0.1610. The sign of the above estimated probit co-efficient was in conformity with the theoretical relationship, which was expected to be negative. The probability of credit constraint had declined with increase in own fund to invest.

The value of chi-square revealed that the model was statistically significant to influence credit constraint. Of the total 250 sample farmers, 79.2 percent were correctly classified as being credit constrained or credit unconstrained implying a good fit of the model (Table-3).

The means of the selected socio-economic factors in probit regression in the low credit intensive Karamadai block is given in table-4.

In the low credit intensive Karamadai block, average area under cultivation was 1.5283 hectares. The farmers had completed only primary education and on an average, had four members in the family. The amount of non-farm income per year was Rs.3,934. The farmers had an average amount of Rs.47,343 as their own fund to invest. (Table-4)

TABLE–4

Means of Selected Variables for Probit Regression Analysis in the Low Credit Intensive Karamadai Block

Variable	Unit	Mean
Area under cultivation	Hectares	1.5283
Farming experience	Years	26.7760
Education	Years	6.5120
Family size	Number	3.9160
Non farm income	Rupees	3,934.40
Own fund	Rupees	47,343
N	250	

Source : Field survey, 2003–2004.

The estimated credit constraint equation in the low credit intensive Karamadai block is shown in table-5.

The estimated probit regression equation showed that among the selected determinants of credit constraint, farming experience, non-farm income and own fund to invest were significant factors to determine the probability of farmers to be credit constrained in the low credit intensive Karamadai block. The probability of farmers becoming credit constrained associated with farming experience was 0.5182. The probability of farmers to be credit constrained had increased with farming experience. Probability associated with non-farm income was 0.1129. The probability of farmers being credit constrained had increased with the amount of non-farm income.

The probability of farmers becoming credit constraint associated with farmers' own fund was −0.0664. It confirmed the theoretical relationship and was negatively related with credit constraint. The probability of credit constraint had declined with increase in the farmers' own fund. The estimated chi-square value was significant at one percent level. It showed that the model was statistically significant to determine the probability of farmers being credit constrained. Of the total 250 sample farmers in the low credit intensive Karamadai block, 66.8 percent were properly classified as being either credit constrained or credit unconstrained. It revealed the good fit of the model. (Table-5)

TABLE–5

Determinants of Credit Constraint in the Low Credit Intensive Karamadai Block-Probit Regression Analysis

Variable	Probit Co-efficient	't' value
Constant	−1.5373*	−1.979
Area under cultivation	−0.0323	−0.233
Farming experience	0.5182**	2.726
Education	0.0862	0.737
Family size	0.2671	1.058
Non farm income	0.1129**	3.521
Own fund	−0.0664**	−3.976
Chi square	37.31225**	
Log likelihood function	−142.8938	
Model prediction	66.8 percent	
N	250	

Source : Estimates based on field survey, 2003-2004; *–significant at five percent level, **–significant at one percent level.

The means of the selected variables in the probit regression analysis for the pooled data of the high credit intensive Thondamuthur block and the low credit intensive Karamadai block are shown in table-6.

For the pooled data, on an average, the area under cultivation was 1.4912 hectares. The farmers had greater farming experience (27 years). They had crossed the primary education level. The average size of family was 4 members. The farmers had an average amount of Rs.51,057 as their own fund to invest. (Table-6)

TABLE–6

Means of Selected Variables—Both Blocks Combined

Variable	Unit	Mean
Area under cultivation	Hectares	1.4912
Farming experience	Years	26.8440
Education	Years	6.5860
Family size	Number	3.8520
Non farm income	Rupees	4,571.20
Own fund	Rupees	51,057
N	500	

Source : Field survey, 2003-2004.

The estimated credit constraint equation when both blocks are pooled together (high credit intensive Thondamuthur block and low credit intensive Karamadai block) is shown in table-7.

Among the selected factors, area under cultivation, non-farm income and availability of own fund to invest were the significant factors to determine the probability of credit constraint, when both blocks were taken together. The probability of farmers becoming credit constraint associated with area under cultivation was 0.2048 and for non-farm income it was 0.0534. It showed that the probability of credit constraint had increased with increase in the area under cultivation and non-farm income.

The probability of farmers to be credit constrained associated with own fund was −0.1082. The magnitude of own fund came out with consistent sign. It revealed that the probability of credit constraint had declined with increase in the farmers' own fund.

The estimated chi-square value showed that the model turned out to be significant to determine probability of credit constraint. Of the total 500 farmers in the sample, both in the high credit intensive Thondamuthur block

and in the low credit intensive Karamadai block, 71.2 percent were correctly classified as being credit constrained and credit unconstrained. It showed the good fit of the model. (Table-7)

TABLE–7
Determinants of Credit Constraint—Both Blocks Combined

Variable	Probit Co-efficient	't' value
Constant	0.2893	0.588
Area under cultivation	0.2048*	2.024
Farming experience	0.1533	1.250
Education	0.0185	0.254
Family Size	−0.1198	−0.683
Non farm income	0.0534**	2.954
Own Fund	−0.1082**	−9.029
Chi square	107.6647**	
Log likelihood function	−289.5986	
Model prediction	71.2 percent	
N	500	

Source : Estimates based on field survey, 2003–2004, **— significant at one percent level, *— significant at five percent level.

V. CONCLUSION

To conclude, in the study area, the area under cultivation (except in Karamadai block) and farmers' own fund to invest, turned out to be the significant factors to determine probability of credit constraint. The co-efficient of farmers' own fund had consistent negative sign. It revealed that the probability of credit constraint had declined with increase in the amount of farmers' own fund to invest. Similar observation was made by Feder *et al.*, (1990). According to them, the previous season's income and savings in the financial institutions might be used as their own fund to invest in the farm. They were found to be the significant factors to determine the probability of farmers being credit constrained. The income of the farmers (farm and non-farm income) was observed by Nuryartono *et al.*, (2005) to be the significant factor to determine probability of credit constraint in agriculture. It had negative relationship with credit constraint. Gilligan *et al.*, (2005) observed that the area under cultivation was a significant factor determining credit constraint.

VI. SUGGESTION

1. The allocation of agricultural credit by the lead bank is based on the target oriented approach. The lending approach can be adopted on the basis of potentiality of area rather than target oriented approach.

2. The crop loan availed by the farmers did not entirely cover the cost of production. Credit given on the basis of cost of cultivation rather on the basis of scale of finance can reduce the existing crop loan constraint.

3. In the context of diversified agriculture in the district, working capital is needed throughout the year. Hence the Kisan Credit Card System may be extended to all the potential borrowers. The transaction costs and the costs of recovery can be reduced by this type of lending policy.

4. The scheme formulation in relation to long term investment needs closer attention. The under estimation of cost of investment and farmers' capability to fill the resource gap with their own fund, over optimistic assumptions made in the formulation of scheme for term loan about incremental income and gestation period required to generate this income led the farmers to be credit constrained.

5. Financial institution should include consumption expenditure as a component in the scale of finance to cover the entire credit needs. The entire credit needs of borrowers should be worked out in an integrated manner so that over/under financing do not take place.

6. The farmers in the survey reported that the tenant farmers were not able to get credit. Instead, the landowners availed credit, which was used for other unproductive purposes. Proper measures taken by the government to tie up the loan account of landowners and tenant farmers with controlled agreement between them could reduce the problem of credit inadequacy of the tenant farmers.

7. The time required to avail loan is an important factor which needs consideration. The borrowers of institutional agencies have to wait for a month after applying for loan. But the borrowers of non-institutional agencies get loans immediately and they need not wait for a long period of time. Thus the time consuming process of institutional loans leads to misuse of funds which needs due consideration by the institutional agencies.

8. The commercial and co-operative banks have followed long procedure in sanctioning the crop loan and investment loan. It particularly discouraged the marginal and small farmers.

9. Promoting dry land farming with appropriate technology support and a cyclical credit management would ensure regular income of the farmers. It will increase their own fund which can be invested and thereby reduce credit constraint.

10. Strengthening backward and forward linkages by way of proper extension services, quality inputs and developing infrastructure for processing, transport and marketing of agricultural products would enhance effectiveness of credit provided by banks.

REFERENCES

1. All India Rural Debt and Investment Survey, (2002), *Reserve Bank of India, Bulletin, Bombay.*

2. *Annual Credit Plan, 2003-2004*, (2004), Canara Bank, Lead Bank Division, Coimbatore.

3. *Annual Credit Plan, 2004-2005,* (2005), Canara Bank, Lead Bank Division, Coimbatore.

4. Bell, C., Srinivasan, T.N. and Udry, C., (1997), "Rationing, Spillover and Interlinking in Credit Markets : The Case of Rural Punjab", *Oxford Economic Papers,* Vol.4, No.49, pp.557-585.

5. Braverman, A. and Guasch, L., (1986), "Rural Credit Markets and Institutions in Developing Countries ; Lessons for Policy Analysis from Practice and Modern Theory", *World Development*, Vol.14, No.10/11, pp.1253-1267.

6. Carter, M.R., (1989), "The Impact of Credit on Peasant Productivity and Differentiation in Nigeria", *Journal of Development Economics*, Vol.31, Issue.1, pp.13-36.

7. David, C. and Meyer, R., (1980), Measuring the Farm Level Impact of Agriculture Loans, in Howell, J. (ed.), *Borrowers and Lenders : Rural Financial Markets and Institutions in Developing Countries*, Overseas Development Institute, London.

8. Diague, A. and Zeller, M., (2001), *Access to Credit and its Impact on Welfare in Malawi,* Research Report 116, International Food Policy Research Institute, Washington.

9. Diague, A., Zeller, M. and Sharma, M., (2000), *Empirical Measurement of Households' Access to Credit and Credit Constraints in Developing Countries : Methodological Issues and Evidence,* FCND Discussion Paper No.90, Food Consumption and Nutrition Division, International Food Policy Research Institute, Washington.

10. Feder, G. L., Lawrence, J., Lin, J. Y. and Luo, X., (1990), "The Relationship Between Credit and productivity in Chinese Agriculture: A Micro Economic Model of Disequilibrium", *American Journal of Agricultural Economics*, Vol.72, No.5, pp.1151-1157.

11. Feder, G., Tongroj, O. and Tejaswi, R., (1988), "Collateral, Guarantees and Rural Credit in Developing Countries : Evidence from Asia", *Agricultural Economics*, Vol.2, No.3, pp.231-245.

12. Feder, G.L., Lawrence, J., Lin, J. Y. and Luo, X., (1991), *Credit's Effect on Productivity in Chinese Agriculture—A Micro Economic Model of Disequilibrium,* Working Paper No.571, Agriculture and Rural Development Department, The World Bank, Washington.

13. Foltz, J. D., (2004), "Credit Market Access and Profitability in Tunisian Agriculture", *Agricultural Economics*, Vol.30, No.1, pp.229-240.

14. Gilligan, D.O., Harrower, S. and Hugnes, Q., (2005), *How accurate are Reports of Credit Constraints Reconciling Theory with Respondents' Claims in Bukidnon, Philippines?,* Research Project Administered by University of Wisconsin, Madison.

15. Giovannini, A., (1985), "Savings and the Real Interest Rate in Less Developed Countries", *Journal of Development Economics*, Vol.18, Issue 2, pp 197-217.

16. Goldsmith, R.W., (1969), *Financial Structure and Development*, Yale University Press, New Haven.

17. Guirhingeri, O. and Boucher, S., (2006), *Credit Constraints and Productivity in Peruvian Agriculture,* Working Paper, Agricultural and Resource Economics, University of California, Davis.

18. Iqbal, F., (1986), The Demand and Supply of Funds Among Agricultural Households in India in Singh, I., Squire, L., and Strauss, J., (eds), *Agricultural Household Models : Extensions, Applications and Policy,* John Hopkins University Press, Baltrimore.

19. Jappelli, T., (1990), "Who is Credit Constrained in the US Economy?", *Quarterly Journal of Economics*, Vol.105, No.1, pp.219-234.

20. Knowles, C. J. and Anker, R., (1977), *An Analysis of Income Transfers in a Developing Country : The Case of Kenya*, World Employment Programme, Research Working Paper Series No.59, ILO, Geneva.

21. Kochar, A., (1997), "An Empirical Investigations of Rationing Constraints in Rural Credit Market in India", *Journal of Development Economics,* Vol.53, No.2, pp.339-371.

22. Lavanya, G.S., Bhalerao, M.M. and Rao, P. R., (1977), "Impact of Bank Finance on Agricultural Incomes and Yields in Andhra Pradesh", *Agricultural Banker,* Vol.9, No.2, pp.12-15.

23. Makadia, J.J., Thumar, B.L. and Shiyani, J.J., (1992), "An Evaluation of Acquisition and Utilisation of Co-operative Credit in Junagad District", *Indian Co-operative Review*, Vol.30, No.1, pp.56-61.

24. Nuryartono, Zeller, M. and Schwarze, S., (2005), *Credit Rationing of Farm Households and Agricultural Production : Empirical Evidence in the Rural Areas of Central Sulawesi, Indonesia*, Institute of Rural Development, Georg August University of Goettingen.

25. Panda, R.K., (1985), "Implementation of IRDP in Orissa", *Kurukshetra*, Vol.33, No.11, pp.29-31.

26. Patel, G.N., Patel, R.M. and Desai, M.M., (1988), "Credit Requirements and Gap on Small and Marginal Bidi Tobacco Farms in Central Gujarat", *Indian Co-operative Review*, Vol.26, No.2, pp.121-127.

27. Pischke, V., Adams, D. and Donald, G. (eds), (1983), *Rural Financial Markets in Developing Countries*, The Johns Hopkins, Baltimore.

28. Prasad, V. and Parthasarathy, (1993), "Supply of Short-term Credit and Estimation of Credit Gaps in Medak district, (A.P)", *Indian Co-operative Review*, Vol.30, No.4, pp.335-339.

29. Prasad, V. and Singh, B, (1981), "Credit Needs in Farming", *Financing Agriculture*, Vol.13, No.3, pp.9-13.

30. Ramesh, K., (1990), "An Assessment of the Production Credit Gap on Paddy Farms", *Agricultural Banker*, Vol.14, No.1, pp.29-39.

31. *Report on Trends and Progress of Banking in India, 1987-1988*, (1988), Reserve Bank of India, Mumbai.

32. *Report on Trends and Progress of Banking in India, 2002-2003*, (2003), Reserve Bank of India, Mumbai.

33. Sai, S.K., Venkateswarlu, U., Seetharaman, S. and Ram, R.P., (1988), "Supply of Institutional Credit – An Estimation of Credit Gap", *Indian Co-operative Review*, Vol.25, No.4, pp.377-385.

34. Shaw, E.S., (1973), *Financial Deepening in Economic Development*, Oxford University Press, New York.

35. Shukla, G.S., Sharma, P.K. and Lal, S., (1977), "Short Term Credit Gap in Agriculture: A study of Pawa block district, Azamgarh", *Financing Agriculture*, Vol.9, No.2, pp.27-30.

36. Singh, I., Squire, L. and Strauss, J., (eds), (1986), *Agricultural Household Models*, The Johns Hopkins University Press, Baltimore.

37. Singh, R.P., Pandey, A.K. and Singh S.K., (2001), "Rural Credit and Participation of Credit Agencies - An Analysis", *Indian Co-operative Review*, Vol.38, No.4, pp.211-220.

38. Singh, S.P. and Mruthyunjaya, (1992), "Credit Utilization and Over dues on Marginal and Small Farm in Aligarch District of Uttar Pradesh", *Agricultural Banker*, Vol.15, No.2, pp.27-39.

39. Sisodia, S.K. and Singh, R.K., (1987), "Adequacy of Short Term Finance in Agriculture in Hathras Block of Aligarch District", *Indian Co-operative Review*, Vol.24, No.3, pp.286-295.

40. Subramanyam, K.V. and Doss, M. V., (1981), "Credit Needs and its Adequacy for Vegetables Cultivation in Karnataka", *Financing Agriculture*, Vol.13, No.4, pp.15-18.

41. Swain, R.B., (2002), "Credit Rationing in Rural India", *Journal of Economic Development*, Vol.27, No.2, pp.1-20.

42. Throat, Y. S. P., (2006), "Rural Credit in India : Issues and Concerns", *Indian Journal of Agricultural Economics*, Vol.61, No.1, pp.1-10.

43. Uddin, N., (2003), *Regional Rural Banks and Development*, Mittal Publication, New Delhi.

End Notes

1. The target amount included only the direct finance upto 1989. In 1990, 13.5 percent of direct finance and 4.5 percent of indirect finance to total net bank credit to the agricultural sector was fixed as target. The direct finance means the amount directly given to the farmers to purchase of seeds, fertilizers, pesticides, labour and other variable inputs and for long term assets.

2. Short term credit is the crop loan given by the commercial banks to enable the farmer members to cultivate a crop. Under the crop loan system, the amount of loan is fixed according to the scale of finance prescribed for different crops prepared by the district level technical committee of the lead bank. The maturity period is a maximum of one year.

INSTRUCTIONS TO AUTHORS

1. Papers for consideration of publication be sent in *duplicate to*

   Editor
   Indian Journal of Economics
   University of Allahabad
   Post Box No. 2005, Allahabad-211 002 (India)

2. Manuscripts should be clearly typed in double space on quarter size (A-4 in Europe) paper with 1.5" wide margin on the ieft and .5" on the right. Professionally drawn graphs and diagrams must be provided wherever necessary along with the manuscript.

3. The manuscript should be accompanied by the author's declaration stating that it is being despatched for exclusive consideration by the Journal.

4. No manuscript should ordinarily exceed 24 typed pages, including graphs, tables and appendices.

5. The cover page of the manuscript should contain the title of the paper, author's name, mailing address, professional affiliation (if different from the mailing address), and acknowledgements. The first page of the paper must also provide the title of the paper-but it should not give the author's name or address.

6. Every manuscript must include a 150 words long abstract, typed on a separate page.

7. All notes must be serially numbered. These may be given at the end of the paper, or on every page as footnotes.

8. Complete references should be given separately at the end of the paper and arranged alphabetically as, Tobin, J, 1958, "Liquidity Preference as Behavior Towards Risk," *Review of Economic Studies,* Vol. 25, pp. 65-86.

   Tobin, J. 1971, *Essays in Economics,* Vol. 1, Macroeconomics, Amsterdam : North Holland.

   Glejier, Herbert, 1970, "Pridictive World Models," in Callette Bujrez and Etienne Sadi Kirschen, eds., Megrates, *A World Income and Trade Model for* 1975, pp. 3-16, Amsterdam : North Holland.

   References in the text and in the notes (or footnotes) should simply give the name of the author and the year of publication quoted, e.g. Theil. (1970) Page numbers too may be given wherever necessary e.g. Hicks, (1974), pp.15-23.

9. The first author of every paper published in the Journal will be given 25 off-prints of the paper free of charge.

Contributors, who wish to receive back manuscripts, that are not approved by the Editorial Board, are advised to enclose postage stamps of appropriate value to enable us to return the manuscripts. Manuscripts ordinarily are retained by the Journal.

DESPATCH : All issues are despatched by registered post. No duplicate copies are supplied gratis. Some back volumes are available.