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CONTENTS

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NEED/IMPORTANCE OF THE STUDY

STATEMENT OF THE PROBLEM

OBJECTIVES

HYPOTHESES

RESEARCH METHODOLOGY

RESULTS & DISCUSSION

FINDINGS

RECOMMENDATIONS/SUGGESTIONS

CONCLUSIONS

SCOPE FOR FURTHER RESEARCH

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REFERENCES

APPENDIX/ANNEXURE

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- Garg, Sambhav (2011): "Business Ethics" Paper presented at the Annual International Conference for the All India Management Association, New Delhi, India, 19–22 June.

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- Kumar S. (2011): "Customer Value: A Comparative Study of Rural and Urban Customers," Thesis, Kurukshetra University, Kurukshetra.

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- Garg, Bhavet (2011): Towards a New Natural Gas Policy, Political Weekly, Viewed on January 01, 2012 http://epw.in/user/viewabstract.jsp

DETERMINANTS OF INSTITUTIONAL CREDIT TO AGRICULTURE IN UNION TERRITORY OF PUDUCHERRY: AN ECONOMIC ANALYSIS

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ABSTRACT

In India farmers are not able to meet their agriculture expenditure from their own savings alone. Hence borrowing becomes essential for farmers to manage their farms. The financial requirement of the farmers in met by the institutional and non- institutional sources besides their own resources. Credit is an important instrument for crop production the present study examined the determinants of flow of institutional credit to agriculture in union territory of Puducherry and Karaikal district formed the universe of the study. The method of data collection was by personal interview, using a separate pretested schedule. A determinant of flow of institutional credit to agriculture was analyzed by using a multiple linear regression and principal component regression. It could be observed that all the variables had a positive correlation. A backward elimination multiple linear regression analysis showed a significant positive relationship of crop loan with the high yielding variety, rainfall, term loan, however negative relationship with land holding pattern variables. The results of PC regression showed that commercial crops, HYV, land holding, bank deposit, and term loans influenced significantly with the flow of crop loan. Impact of agricultural credit lending programme was indicated that most of the farmers expressed the positive impact of the programme on the agricultural improvement.

KEYWORDS
Agricultural credit, Determinant, Institutional credit, Institutions.

INTRODUCTION

The institutional credit encourages the poor farmers to invest in capital intensive new technologies to increase farm income. Even if a fraction of the additional income is saved and invested on farm, net worth of the farmers, their repaying capacity, and borrowing power all grow, and in the long run their dependence on credit itself may be less. A study was conducted to analyze the determinants of institutional credit to agriculture in union territory of Puducherry.

Puducherry is the union territory which gets maximum share in institutional credit per hectare gross cropped area in India.Puducherry is a highly banked area with 118 branches. In this territory the highest credit of Rs.4500 per ha of cropped area is disbursed. Puducherry is economically advanced as evidenced by the high per capita income of Rs.61064 and with an annual compound growth rate of 13.3 percent**.** This territory is highly developed in agriculture in terms of highest fertilizer consumption per cropped ha (534.80 Kgs per ha),highest cropping intensity (202 percent)andlargest (41.29 percent) of net irrigated area to net cultivated area as well as coverage of 73 percent of paddy area under high yielding varieties. Further it has witnessed highest productivity in crops like cotton, paddy, ragi and sesamum. All these positive attributes of Puducherry appear to be because of good financial facilities besides the availabilities of other infrastructures. Hence it is worthwhile to study flow of institutional credit to agriculture in the union territory of Puducherry.The present study was carried out with the following objectives, to analyze the determinants of the flow of institutional credit to agriculture in Union Territory of Puducherry.

METHODOLOGY

DATA SOURCES

The secondary data on crop loan, term loan, total loan, rainfall, and fertilizer consumption, size of land holding and area of irrigation to gross cropped area were collected from different sources such as lead bank Indian bank, Directorate of Economics and Statistics, Directorate of Agriculture, State Cooperative Banks, and Reserve Bank websites.

TOOLS OF ANALYSIS

ANALYSIS OF CREDIT SUPPLY

Analysis of the factors determining the flow of crop loan, term loan and total agricultural loan over the study period was made by applying the multiple linear regressions for the time series data. In the analysis, a backward elimination technique was used.

The model of regression fit for analysis and the estimates of the parameters have the following form.

$Y= a+ b_1x_1+b_2x_2+b_3x_3.....+b_ix_i+e_i$

Where,

Y = Dependent variable

a = Estimated intercept

b_i = Estimated coefficient

x_i = Variables considered, for i = 1,2,3…….n

e_i = Error term

The variables considered in the model for the years 1980-81 to 2005-06 are,

x_1 = Proportion of area under irrigation to the gross cropped area(CGA)
x_2 = Proportion of area under commercial crop to the CGA
x_3 = Proportion of area under high yielding varieties(HYV) to GCA
x_4 = Level of fertilizer consumption per hectare of GCA in kgs.
x_5 = Amount of rainfall in the state per year in mm
x_6 = Average operational size of land holdings in the state in hectares.
x_7 = The number of commercial banks and regional rural banks(RRBs) per lakh population
x_8 = Level of bank deposit per capita of the state(Rs)
x_9 = Dummy variable for the impact of financial reform measures on agricultural credit. It is "0" for years 1980-81 to1992-93 and "1" for years from 1993-94 to 2005-06.
x_{10} = Quantum of crop loan per hectare GCA, used as an independent variable for term loan(Rs)
x_{11} = Quantum of term loan per hectare GCA, used as an independent variable for crop loan(Rs)

An application of multiple linear regression analysis is often faced with the problem of Multicollinearity, which is phenomenon of the existence of perfect linear relationship among the explanatory variables. If the explanatory variables are perfectly linearly correlated, that is if the correlation coefficient of these variables is equal to or near to unity, the accuracy and stability of the parameter estimates obtained by the method of OLS will be impaired and apparently signs attached to certain regression coefficients will be per versed. It gives misleading results.

Collinearities between two or more independent variables may arise due to the inherent characteristics of the economic variables, which move together, which may be influenced by some unknown factor. To depend upon the results obtained by the method of OLS, thus a test for Multicollinearity is crucial.

PRINCIPAL COMPONENTS REGRESSION ANALYSIS

To overcome the effect of Multicollinearity various methods are suggested by various authors like dropping out the collinear variables, increasing the sample size, use of extraneous information etc., but none of these methods could improve the efficiency and accuracy of the OLS estimates. The application of principal component regression analysis is found to be the most suitable one to overcome the problem of Multicollinearity. (Choubey, et al, 1989)

The method of principal components analysis is a special case of the general method of factor analysis. The principal components regression keeps all the explanatory variables in the model but brings some changes in the estimates of least square estimates in a way which reduces the effect of Multicollinearity. (Joliffe, 1986).

The aim of the method of principal components is the construction, out of the set of variables X_j's (j = 1, 2, 3.....K) of new variables (P_i) called principal components, which are linear combinations of the X's.

It should be noted at the outset that the method of principal components can be applied by using the original variables, or the deviation from their means, or the standardized variables. In this study the standardized values of variables are analyzed first, then standardized coefficients of variables were converted into unstandardized coefficients by using the method outlined by Nieuwoudt (1972).

The a's called factor loadings are chosen in such a way that constructed principal components satisfy two conditions (i) the principal components are orthogonal (ii) the first principal component P_1 absorbs and accounts for the maximum proportion of the total variation in the set of all the X's, the second principal component absorbs the maximum of the remaining in the X's and so on.

To compute the principal component regression a series of steps are required. The procedures are given below.

a) Estimation of the Factor Loadings and Latent Roots of the Principal Component

For the estimation of the loadings and latent roots of the principal component a procedure is outlined by Koutsoyiannis (1977).

b) Estimation of the Principal Component Model

Assuming that we have retained r number of principal components (where r<K) out of all the principal components, such that:

$$P_1 = a_{11}z_1 + a_{12}z_2 + \ldots\ldots\ldots\ldots + a_{1k}z_k$$

$$P_2 = a_{21}z_1 + a_{22}z_2 + \ldots\ldots\ldots\ldots + a_{2k}z_k$$

• • • •

• • • •

$$P_t = a_{r1i}z_1 + a_{r2}z_2 + \ldots\ldots\ldots\ldots + a_{rk}z_k$$

Where the Z's are the standardized values of the original X's.

We regress Y on the chosen components.

$Y = W_1P_1 + W_2P_2 + \ldots\ldots\ldots\ldots + W_rP_r + V$

From which we obtain the OLS estimates W_1, W2,.....W_r of the principal components (where V is the random term).

c) Estimation of the Structural Parameters, B's

Given the estimates a's and w's we transform back from the w's to obtain estimates of b's the coefficients of the standardized X's in the original modes, by a multiplication of the matrices set as follows:

$P_1 \quad P_2 \ldots\ldots P_r \qquad W_i \qquad \text{Standardized } b_i\text{'s}$

$$\begin{pmatrix} a_{11} & a_{12}\ldots\ldots a_{1r} \\ a_{21} & a_{22}\ldots\ldots a_{2r} \\ \bullet & \bullet \quad \bullet \\ \bullet & \bullet \quad \bullet \\ a_{k1} & a_{k2}\ldots\ldots a_{kr} \end{pmatrix} * \begin{pmatrix} W_1 \\ W_2 \\ \bullet \\ \bullet \\ W_r \end{pmatrix} = \begin{pmatrix} b_1 \\ b_2 \\ \bullet \\ \bullet \\ b_k \end{pmatrix}$$

We have thus the principal components estimates of the b's of original standardized variables. If we retain all K principal components the coefficients of the standardized X's would be identical with those obtained by the straightforward application of OLS of Y on the standardized X's.

The variance of b's computed by taking the number of principal components into consideration. If we take the variance of b_1 where there are three principal components.

$\text{Var}(b_1) = a^2_{11} \text{ var } W_1 + a^2_{12} \text{ var } W_2 + a^2_{13} \text{ var } W_3$

Where a_{11}, a_{12} and a_{13} are factor loadings of variable x_1 in the first second and third principal components respectively. The variance of W_1 is given as:

$$\text{Var}(W_1) = \frac{1 - \sum_{i=1}^{r} \lambda i a^2 i}{(n-r)\lambda_1}$$

In general,

$$\text{Var}(bi) = \sum_{i=1}^{k} \sum_{j=1}^{r} a_{ij}^2 \times Var(W_1)$$

Where

n = Number of observations
r = Number of principal components
k = Number of explanatory variables
a_{ij} = Factor loadings of the i th variable in the j principal component
W_i = Coefficients of the regression of Y on the principal components.
The significance of the b's is thus tested by using the student's t test as

$$t = \frac{bi}{Var(bi)}$$

This follows the t distribution with (n-1-k) degrees of freedom.
The unstandardized regression coefficients of the variables are obtained by multiplying the standardized regression coefficients computed in the before mentioned procedure by S_y/S_{xj}, where S_y and S_{xj} are standard deviations of the dependent and independent variables, respectively. The unstandardized coefficients are expressed in terms of units of measurements of the variables, the standardized coefficients are however, independent of the original units of measurement and comparison of any two variables show the relative importance of the independent variables involved (Nieuwoudt, 1972).

RESULTS AND DISCUSSION

TABLE 1: FACTOR DETERMINING THE FLOW OF PER HA CROP LOAN: A REGRESSION ANALYSIS

EXPLANATORY VARIABLES	MULTIPLE LINEAR REGRESSION	PRINCIPAL COMPONENT REGRESSION	
	BACKWARD ELIMINATION	UNSTANDARDISED COEFFICIENTS	STANDARDIZED COEFFICIENTS
Constant	100.28** (3.23)	97.99** (3.23)	-
Irrigation	-	1.95 (0.51)	0.185
Commercial crops	-	0.55* (2.30)	0.125
HYV	2.63** (3.31)	2.81** (3.53)	0.270
Fertilizer consumption	-	0.30 (0.68)	0.255
Rainfall	0.45 (1.73)	0.47 (1.79)	0.086
Land holding	-12.22** (4.13)	8.08** (3.13)	-0.201
Bank branch expansion	-	0.07 (0.03)	-0.310
Bank deposit	-	0.23** (2.89)	0.241
Term loan	0.80** (15.40)	1.80** (5.43)	1.180
R^2	**0.941**	**0.856**	
Durbin Watson d value	**2.021**	**2.133**	

Figures in parentheses indicate't' statistic valueNote:
** Significant at 1 per cent level
* Significant at 5 per cent level

DETERMINANTS OF FLOW OF INSTITUTIONAL CREDIT

The factors influencing the flow of agricultural loans viz., crop, term and total loans in the state were analyzed by the using a multiple linear regression analysis and principal component regression analysis. The results are furnished below.

CROP LOAN

To analyze the factors influencing the flow of crop loan in the state, nine variables were assessed and the results are presented in table 1. From the table, it could be observed that all the variables had a positive correlation.

A backward elimination multiple linear regression analysis showed a significant positive relationship of crop loan with the high yielding variety, and term loan, however negative relationship with variables land holding pattern. The regression, on the other hand, had showed a higher percentage of goodness of fit, which is 94.1 percent. It was also observed from the table that the result of the principal component regression analysis on factors affecting the crop loan is presented.

The results of principal component regression showed that commercial crops, HYV, land holding, bank deposit, and term loans influenced significantly the flow of crop loan. According to the results, an increase in the proportion of area under commercial crops per GCA by one unit increased the flow of short term credit per hectare GCA by Rs.0.55 per annum. A unit increase in the proportion of HYV per GCA induced an increase of Rs.2.81 credit per hectare GCA. Likewise the increase in the level of land holding per cultivator, there was an associated increase in agricultural credit per ha GCA of Rs.8.08 and for every unit increase in the amount of bank deposit per capita, there was an associated increase in the amount of credit per ha GCA is increased by Rs.0.23 per ha GCA. The advances of crop loan were found to have a complementary relation with the advances of term loan. For every rupee increase in term credit per ha GCA, there was an associated increase of crop loan Rs.1.80 per ha GCA.

In table 1 standardized coefficient are also presented. That is, mean value of the variable is deducted from each observation and subsequently the result of each observation is divided by the standard deviation of the variables. These values were used for the PC regression analysis. The resulting standardized coefficients were free of units and the values indicate only the relative importance of the variables in influencing the dependent variable. From the table, it was evident that the most important factor in influencing the flow of crop loan was the term loan followed by level fertilizer use and per capita bank deposit.

TABLE 2: FACTOR DETERMINING THE FLOW OF PER HA TERM LOAN: AREGRESSION ANALYSIS

EXPLANATORY VARIABLES	MULTIPLE LINEAR REGRESSION	PRINCIPAL COMPONENT REGRESSION	
	BACKWARD ELIMINATION	UNSTANDARDISED COEFFICIENTS	STANDARDIZED COEFFICIENTS
Constant	-61.85** (3.75)	-59.31** (3.66)	-
Irrigation	-	-2.27 (1.19)	-0.213
Commercial crops	-	0.65** (2.71)	0.311
HYV	-	0.81 (0.69)	0.232
Fertilizer consumption	0.85** (8.14)	0.84** (8.02)	0.264
Rainfall	-	-0.23 (1.38)	-0.192
Land holding	4.00** (2.52)	3.75** (2.41)	0.042
Bank branch expansion	2.61** (4.23)	2.66** (4.37)	0.300
Bank deposit	0.51** (8.04)	0.508** (8.16)	0.473
Crop loan	-	0.15 (1.25)	0.322
R^2	**0.953**	**0.885**	-
Durbin Watson d value	**1.985**	**2.121**	-

Figures in parentheses indicate't' statistic value

Note: ** Significant at 1 per cent level

* Significant at 5 per cent level

TERM LOAN

Similar to that of crop loan the flow of term loan in the U.T of Puducherry was analyzed both by multiple linear regression and principle component regression. The analysis of PC regression involved components with eigen values of more than 0.75, and four principal components were extracted. The measures of goodness of fit adjusted for degree of freedom was significantly high enough to about 0.88. The Durbin Watson test of autocorrelation for these components regression showed a value of 2.121, which was free of auto correlation problem.

Results of multiple linear regression analysis had come up with a significant positive relation of level of fertilizer use, land holding, bank branch expansion and bank deposit. Crop loan and high yielding variety was reported to be insignificant the measures of goodness of fit had been showed to be 0.953, which was very high and significant. The results of principal component regressionanalysis, on the other hand, factors such as commercial crops, level of fertilizer use, land holding indicated to have significant positive relationship.

A unit increase in the level of bank deposit per capita, induces an associated increase Rs.0.508 term loan per ha GCA. On the other hand, a unit increase in the level of land holding hectare induced an increase of Rs.3.75 term loan per ha GCA. For every unit increase in the consumption of fertilizer per GCA, the amount of credit per ha GCA is increased by Rs.0.84. and for every unit increase in the number of bank branches per lakh population, there was an associated increase in the level of agricultural credit Rs.2.66 per hectare GCA.

TOTAL AGRICULTURAL LOAN

The combined quantum of crop and term loans was also subjected for a similar pattern of analysis. The results of multiple linear and principal component regression analysis are presented in table 3.

In the principal component regression analysis, three principal components with eigen values of more than one were taken. The goodness of fit for the model of PC regression adjusted for its degrees of freedom showed that 72.9 percent of variation in the model explained by these variables. The value of the Durbin Watson d test, which was 1.878, indicated the absence of autocorrelation problem in the component regression.

TABLE 3. FACTOR DETERMINING THE FLOW OF PER HA TOTAL AGRICULTURAL LOAN: A REGRESSION ANALYSIS

Explanatory variables	Multiple linear regression	Principal component regression	
	Backward elimination	Unstandardised coefficients	Standardized coefficients
Constant	37.69 (1.22)	31.74 (1.09)	-
Irrigation	2.52** (2.60)	2.25** (3.03)	0.206
Commercial crops	-	1.07** (2.67)	0.125
HYV	-	1.95 (0.98)	0.255
Fertilizer consumption	1.01** (6.04)	0.92** (5.90)	0.406
Rainfall	-	0.32 (1.19)	0.233
Land holding	-7.08** (2.36)	-6.15* (2.17)	-0.096
Bank branch expansion	-	1.53** (2.24)	0.315
Bank deposit	0.61** (8.36)	0.60** (9.11)	0.788
R^2	**0.952**	**0.729**	-
Durbin Watson d value	**1.434**	**1.878**	-

Figures in parentheses indicate't' statistic value

Note: ** Significant at 1 per cent level

* Significant at 5 per cent level

The analysis of linear regression had come up with the positively significant coefficients for irrigation, level of fertilizer use, and per capita bank deposit and negative coefficients for land holding variable. Factors as irrigation, commercial crops, and bank branch expansion and bank deposits had positive significant influence on total agricultural loan in the Union Territory of Puducherry. For each unit increase in the proportion of irrigation and commercial crops per GCA, the consumption of per GCA, will be increased by Rs.2.25 and Rs.1.07 units respectively.

On the other hand sizes of land holding was related to the flow of agricultural credit negatively. It was meant that if the average size of holding per cultivator was reduced by one hectare, the credit supply or absorption increases by Rs.6.15 per GCA. For each unit increase in the proportion of level of fertilizer use, branch expansion and per capita bank deposit per GCA, the consumption of per GCA, will be increased by Rs.0.92, Rs.1.53 and Rs.0.60 respectively. Similar study was conducted by Abate *et al*., (2003).

CONCLUSION

The forgoing analysis indicated that the most important factor in influencing the flow of crop loans was the commercial crops, HYV, land holding, bank deposit, and term loans. Accordingly, the fertilizer use, played a key role in the flow of term loans followed by land holding, bank branch expansion and bank deposit variables. The irrigation was the prominent factors in the flow of the total loans, followed by level of fertilizer use, and per capita bank deposit. The policy of RBI played the primary role in determining the flow of institutional finance to agriculture. Therefore, to channel sufficient financial resources to the sector effectively, strengthening the ground level planning activity and monitoring of banks to fulfil the RBI priority sector lending policy are crucially essential.

SUGGESTIONS

The policy of RBI played the primary role in determining the flow of institutional finance to agriculture. Therefore, to channel sufficient financial resources to the sector effectively, strengthening the ground level planning activity and monitoring of banks to fulfill the RBI priority sector lending policy are crucially essential. There was a tendency of the banking sector to lend to and invest in less risk areas than to agricultural sector. So the banks have to be advised to lend for priority sector. Time lag between the releases of credit may be avoided.

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