Impact of Institutional Credit on Aggregate Agricultural Production in India during Post Reform Period

Izhar, Ahmad and Tariq, Masood

Aligarh Muslim University, Aligarh, India

13 August 2009

Impact of Institutional Credit on Aggregate Agricultural Production in India during Post Reform Period

Dr. Mohd. Izhar Ahmad*
Tariq Masood**

***Professor, Dept. of Economics AMU, Aligarh, India**
Email- izharshaista@gmail.com
****Research Scholor, Dept. of Economics AMU, Aligarh, India**
Email - tariqmasood8@gmail.com

Abstract

The study attempts to assess the impact of institutional credit on agriculture production by estimating Cobb Douglas agricultural production function for the pre reform (1972-91) and post reform (1992-2005) period in India using time series data. Study also analyses the trends and pattern of institutional credit during pre reform and post reform period. Annual average growth rate of institutional credit was lowest during the decade 1990-2000 and was highest during 1971-80. Institutional credit as percentage of agricultural gross domestic product increases more rapidly during the post reform period. Institutional credit per cultivated area also increases tremendously over the period since the total cultivated area remains more or less same over the period. Study also analyses sectoral share of total non food bank credit for the period 1980-2005. The share of agriculture sector in total non food bank credit deteriorated during the post reform period. In last cob Douglas production function has been estimated to assess the impact of institutional credit on aggregate agricultural production. Model estimated for the over all period 1972-2005 suggest that institutional credit has significant impact on aggregate agricultural production in India. Cob Douglas production function for the pre reform period (1971-91) gives coefficient which has significant impact on agricultural production. But the model estimated for the post reform period shows that institutional credit does not affect agricultural production. Study concludes that during post reform period the sectoral share agriculture sector declined and also the growth rate of agricultural credit deteriorated. During post reform period institutional credit is not a significant determinant of agricultural production in India.

Introduction

The Indian economy has been experiencing high growth rate especially after the various reforms measures adopted by the successive Governments. The sustainability of the growth momentum however critically depends on the growth of the agriculture sector. Though the share of agriculture sector in the Gross Domestic Product (GDP) declines considerably over the period it still provide livelihood to almost two-third of the country's population. Finance in agriculture is as important as development of technologies. Technical inputs can be purchased and used by farmer only if he has money (funds). But his own money is always inadequate and he needs outside finance or credit. Credit is not only a critical input in agriculture but also an effective means of economic transformation.

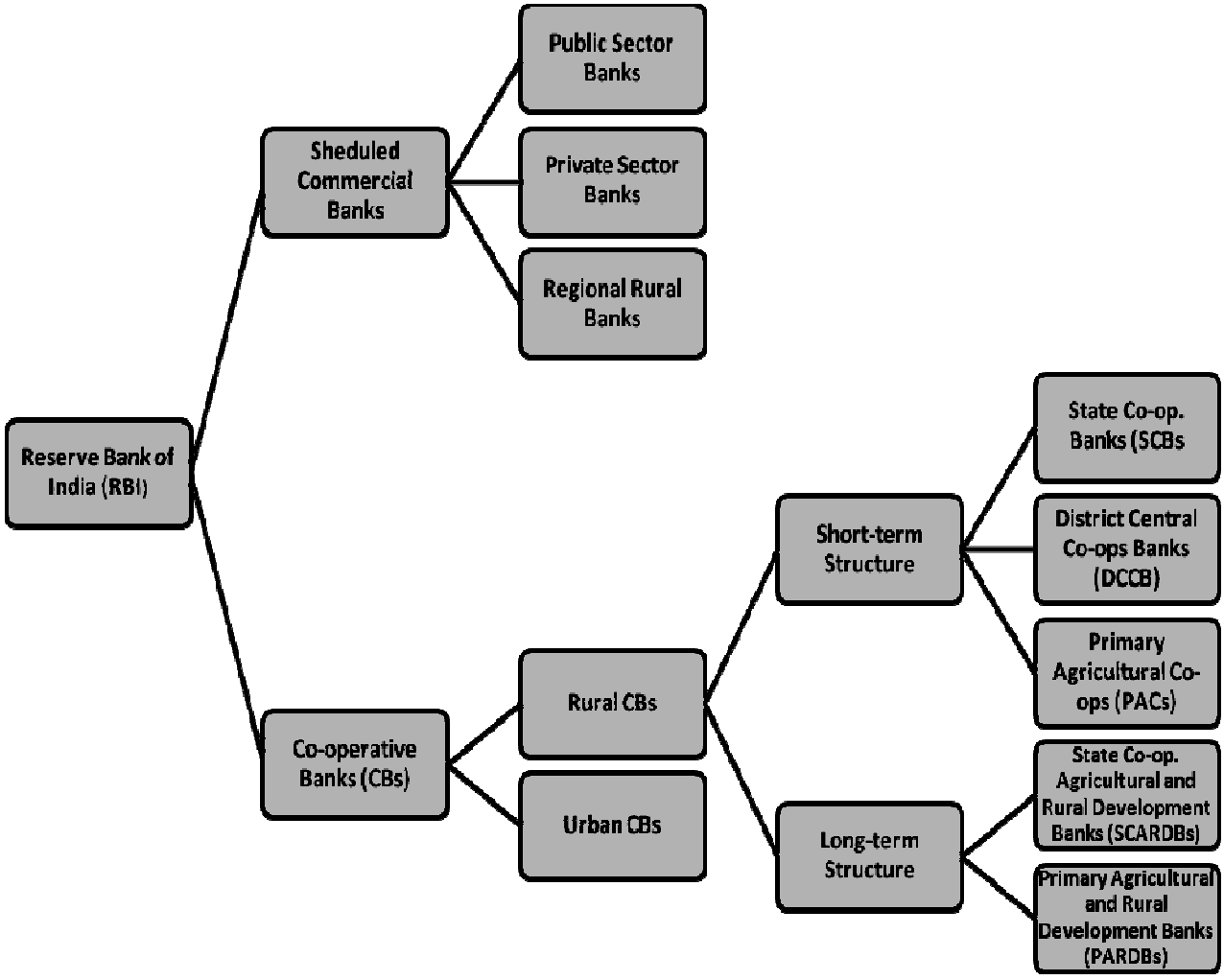
Professional money lenders were one of the main sources of credit to agriculture till 1935. They usually charge unduly high rates of interest and follow serious practices while giving loans and recovering them. As a result, farmers were heavily burdened with debts and many of them perpetuated debts. There were widespread discontents among farmers against these practices and there were instances of riots also. With the passing of Reserve Bank of India Act 1934, District Central Co-op. Banks Act and Land Development Banks Act, agricultural credit received impetus and there were improvements in agricultural credit. A powerful alternative agency came into being. Large-scale credit became available with reasonable rates of interest at easy terms, both in terms of granting loans and recovery of them. Both the co-operative banks advance credit mostly to agriculture. First bank advances short-term and medium term loans while the second bank advances long-term loans. The Reserve Bank of India as the Central bank of the country took lead in making credit available to agriculture through these banks by laying down suitable policies.

Although the co-operative banks started financing agriculture with their establishments in 1930's real impetus was received only after Independence when suitable legislation were passed and policies were formulated. There after, bank credit to agriculture made phenomenal progress by opening branches in rural areas and attracting deposits. Till 14 major commercial banks were nationalized in 1969, co-operative banks were the main institutional agencies providing finance to agriculture. After nationalization, it was made mandatory for these banks to provide finance to agriculture as a priority sector. These banks undertook special programs of branch expansion and created a network of banking services through out the country and started financing agriculture on large scale. Thus agriculture credit acquired multi-agency dimension. Development and adoption of new technologies and availability of finance go hand in hand. In bringing "Green Revolution", "White Revolution" and now "Yellow Revolution" finance has played a crucial role. Now the agriculture credit, through multi agency approach has come to stay. The procedures and amount of loans for various purposes have been standardized. Among the various purposes "Crop loans" (Short-term loan) has the major share. In addition, farmers get loans for purchase of electric motor with pump, tractor and other machinery, digging wells or boring wells, installation of pipe lines, drip irrigation, planting fruit orchards, purchase of dairy animals and feeds/fodder for them, poultry, sheep/goat keeping and for many other allied enterprises.

A large Number of agencies including Co-operatives, Regional Rural Banks (RRBs), Scheduled Commercial Banks (SCBs), Non Banking Financial Corporations (NBFCs), Self Help Group and well spread informal credit market together constitute Indian Agricultural credit delivery system. According to all India debt and investment survey the share of non

institutional credit for agriculture sector was around 92.7% during year 1950-51 which decreases to 38.9% during 2001-02 and the share of institutional credit increases from 7.3% during 1950-51 to 61.1% during 2001-02.

Fig.1. Structure of Agricultural Credit In India



The findings of the National Sample Survey Organistion (NSSO) 59th round (2003) revealed that only 27% of the total number of cultivated households received credit from formal sources while 22% received credit from informal sources. The remaining households comprising maily small and marginal farmers had no credit outstanding.

In light of the above discussion the objective of the study is to

- analyse the trends and pattern of institutional credit for agricultural sector during pre and post reform period
- Estimate the production function in order to determine the impact of institutional credit on agricultural production separately during pre and post reform period

The paper has been divided in four sections. First section discusses the trends and pattern of institutional credit for agricultural sector during pre and post reform period in India. Second section describes data source, variables included and the methodology used for the estimation of the aggregate agricultural production function. The results are explained in the third section. The last section briefly concludes the findings of the study.

Analysis of Trends and Pattern of Agricultural Credit

We have constructed some indicators to understand the pattern of agricultural credit during pre and post reform period in India. Table.1. Shows the growth rate of nominal institutional credit to agricultural sector for different time periods. Growth rate of direct Institutional during 1971-80 was 16.7% which decreases to 13.9% during 1981-90 and again to 12.8%. During the period 2001-05 there was some improvement in the growth rate of nominal direct institutional credit (18.4%). Growth rate of nominal indirect institutional credit was highest during 70's (11.4%) and lowest during 80's. During reform period growth rate of indirect institutional credit was more or less 9 % which was better than the 80's. Total nominal institutional credit (Direct + indirect) grows fastest during 70's and slowest during the 90's. Hence various reform measures adopted by the successive Governments to liberalize the economy have retarded the growth rate of agricultural credit.

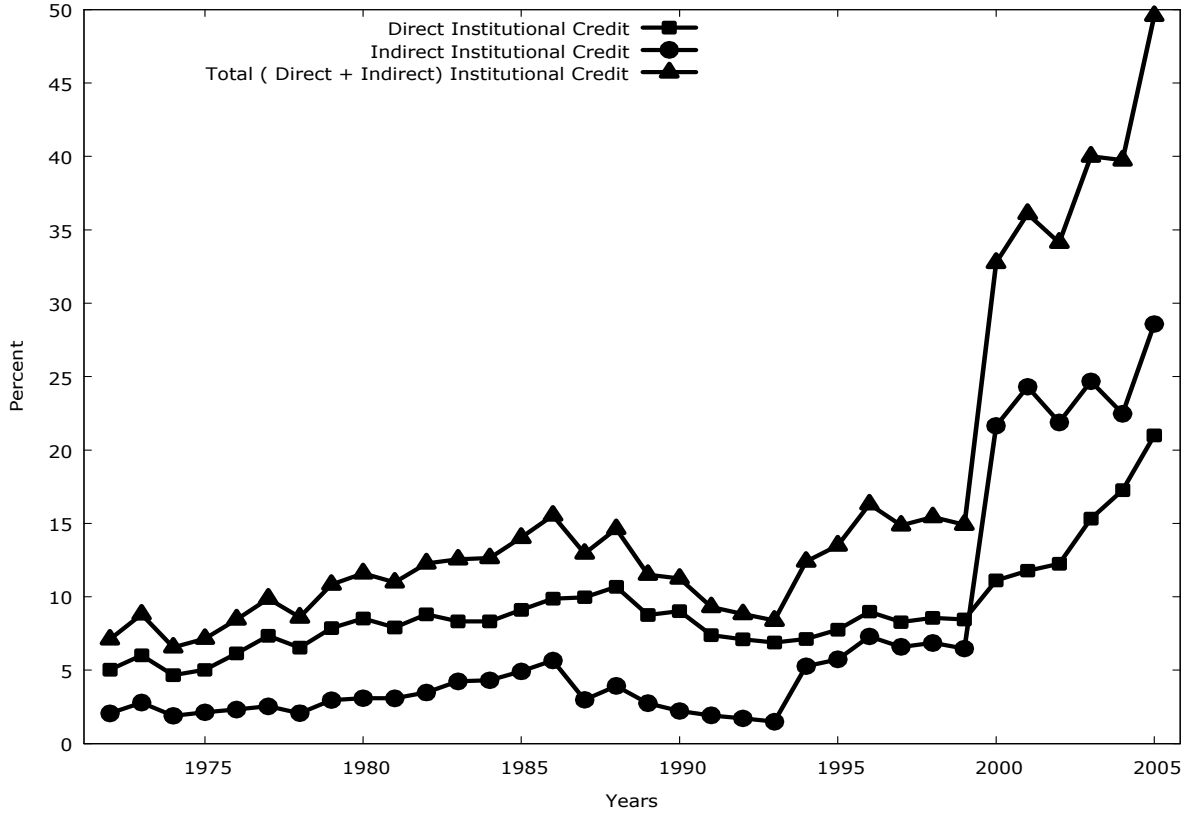
Annual Average Growth Rate of Agricultural Credit

Period	Direct Institutional Credit (%)	Indirect Institutional Credit (%)	Total (Direct +Indirect) Institutional (%)
1971-80	16.7	11.4	16.5
1981-90	13.9	4.7	13.5
1991-00	12.8	9.5	12.7
2001-05	18.4	8.6	13.6
1971-05	**15.1**	**8.3**	**14.1**

Source: Handbook of statistics on Indian Economy 2007-08

Fig.2. depicts the behaviour of institutional credit as percentage of agricultural gross domestic Product (AGDP) over the period 1971-2005. Direct institutional credit as % of agricultural GDP was 5.04% which increases to 8% in 1980-81 and again to 10.69% in 1987-88. It decreases to 6.89% in 1992-93 and during 1998-99 it was 8.45%. After the year 1999 direct institutional credit as percentage of agricultural GDP increases rapidly and it was 21% during 2004-05. The indirect institutional credit as percentage of agricultural GDP was around 2 to 3 percent during seventies which increases during 80's and it was 5.66% in 1985-86. After 1985-86 it decreases continuously and it was 1.49% I 1992-93. After 1993-94 indirect institutional credit as percentage of agricultural GDP increases continuously and it was 6.47% in 1998-99 and 28.58% in 2004-05. Total (Direct + Indirect) Institutional credit as percentage of agricultural GDP was 7.1% 1n 1971-72 it increases to 11.6% in 1979-80.

Fig.2. Agricultural Credit as % of Agricultural GDP

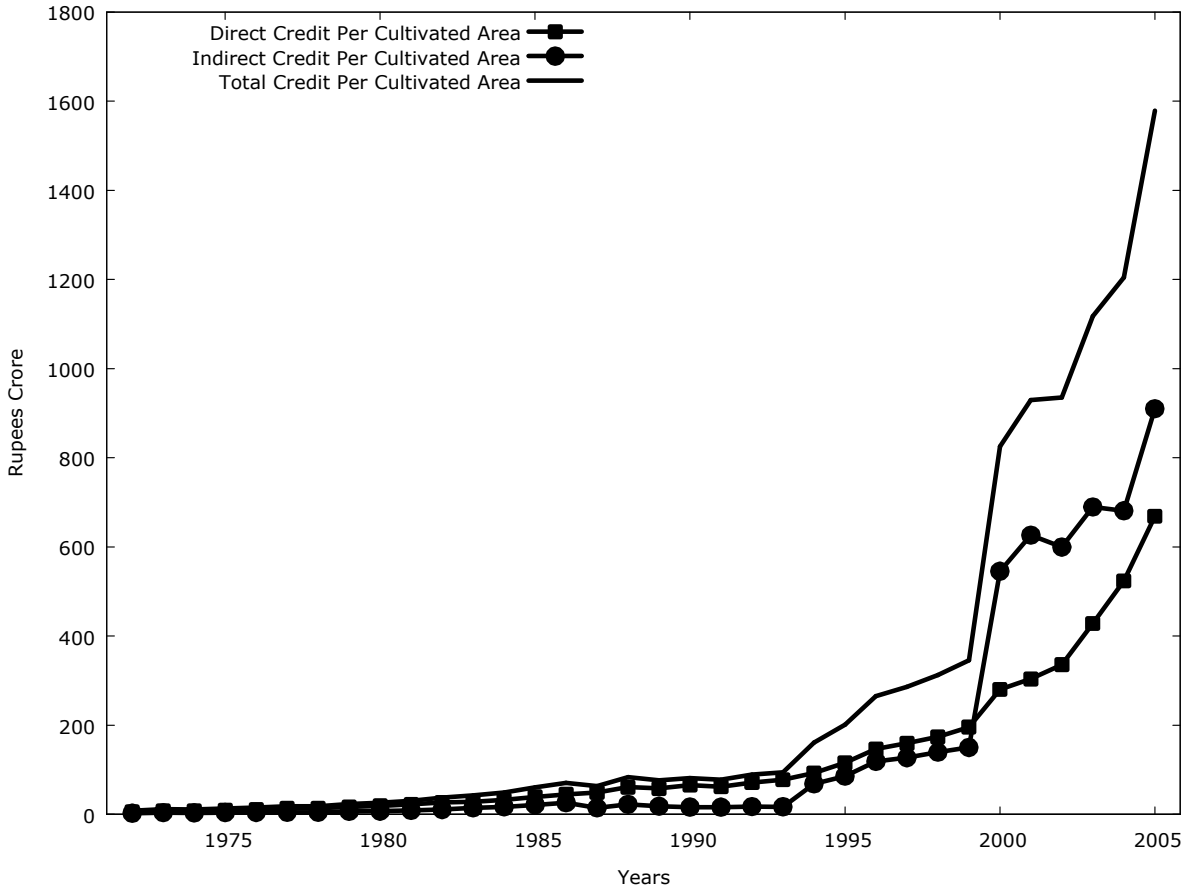


Source: Handbook of statistics on Indian Economy 2007-08

Direct Institutional credit per cultivated area was Rupees 5.8 Crore during 1971-72 which increases to Rupees 18.88 crore during 1979-80, Rupees 65.34 crore during 1989-90 and reaches up to 668.63 during 2004-05. Indirect institutional credit per cultivated area was Rupees 2.37 crore during 1971-72 and it was Rupees 16.1 crore during 1989-90. Indirect credit increases tremendously during post reform period from Rupees 16.01 crore during 1990-91 it

increase to Rupees 149.78 crore and again to Rupees 909.91 crore during 2004-05. Total institutional credit per cultivated area increases significantly during post reform period due to the rapid increase in both direct and indirect credit per cultivated area and constant level of total cultivated area.

Fig.3. Agricultural Credit per Cultivated Area (Million Hectares)

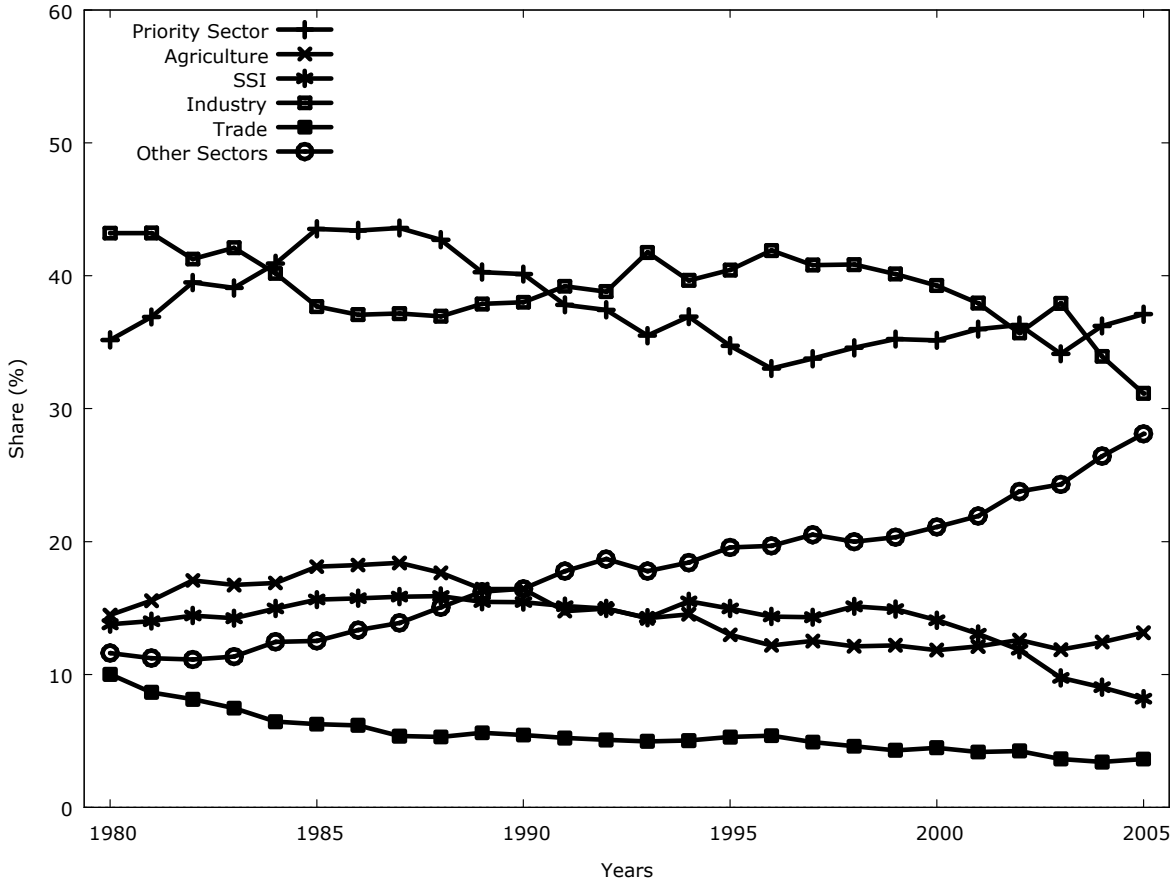


Source: Handbook of statistics on Indian Economy 2007-08

Fig.4 shows the sectoral deployment of non food credit for the period 1979-2005.The share of agriculture sector in total non food bank credit during year 1979-80 was 14.46% which increases to 18.39% during 1986-87. During post reform period the sectoral share of agriculture in total non food bank credit declines continuously and was 11.83% during 1999-2000 which rises marginally to 13.14% during the year 2004-05. The share of SSI (small scale industry) and industry (medium and large) remains more or less same during pre reform period and post reform period.

Two of the four indicators constructed to analyse the pattern of institutional credit viz. annual growth rate of institutional and sectoral share of agriculture credit in total nonfood bank credit suggest that economic reform policies have impacted agricultural credit negatively.

Fig.4.Trends in Sectoral Deployment of Non Food Credit



Source: Handbook of statistics on Indian Economy 2007-08

Data Source and Methodology

The study attempts to access the impact of institutional credit on agricultural production in India using time series data during pre and post reform period. To investigate the impact of institutional credit on aggregate agricultural production we have estimated Cob Douglas Production function with agricultural gross domestic product (ADGP) as dependent variable and Institutional credit (IC) for agriculture sector as one of the independent variable. Institutional credit includes direct credit and indirect credit to agriculture sector. Other explanatory variables included in the study to estimate the Cobb Douglas production function besides institutional credit are total cultivated area (CULT), agricultural labour force (ALF), net irrigated area (IA), and consumption of fertilizers (FR). Selection of the explanatory variables has been made on the basis of literature surveyed and some previous studies. There are some other important determinant of agricultural production like use of pesticides, use of electricity, use of machinery etc. but these variables are not included in the model since they

can be purchased with the availability of credit. Institutional credit has been directly introduced in the model.

Data regarding variables ADGP, IC, CULT, IA, and FR have been taken from Handbook of Statistics on Indian Economy 2007-08, RBI. Data of the variable ALF has been taken from Food and Agriculture Organization of the United Nations (FAO), 2006. Agricultural gross domestic product and Institutional credit are measured in Rupees crore, total cultivated area and net irrigated area is measured in million hectares, consumption of fertilizers is measured in lakh tonnes and agricultural labour force is measured in thousand persons. Institutional Credit to Agriculture comprises of direct (short-term and long-term) credit issued by Cooperative, State governments, Scheduled Commercial Banks and Regional Rural Banks to agriculture and allied sector. Consumption of Fertilizers (FR) includes *N*+*P*+*K*. Agricultural labor force is the number of economically active persons engaged in agriculture, hunting, forestry or fishing.

Agricultural production function shows the technical relationship between agricultural output and various determinant of agricultural output. We have included agricultural gross domestic product (AGDP) as dependent variable and explanatory variables are institutional credit to agriculture sector, total cultivated area, agricultural labour force, net irrigated area and consumption of fertilizers. To avoid the problem of multicolinearity and to overcome the problem of degree of freedom all the variables are transformed to per cultivated million hectares. To estimate the Cobb Douglas production function all the variables are transformed to logarithmic form. The model used in the study is

$$LAGDPCULT = \beta 0 + \beta_1 LICPCULT + \beta_2 LALFPCULT + \beta_3 LIRPCULT + \beta_4 LFRPCULT$$

Where

LAGDPPCULT = Natural Logarithm of agricultural gross domestic product per cultivated Million Hectares
LICPCULT = Natural logarithm of institutional credit per cultivated million hectares
LALFPCULT = Natural logarithm of agricultural labour force per cultivated million hectares
LIRPCULT = Natural logarithm of net irrigated area per cultivated million hectares
LFRPCULT = Natural logarithm of consumption of fertilizers per cultivated million hectares

We have estimated Cobb Douglas production function for pre reform period (1971-91) and post reform period (1992-2005) separately to assess the impact of institutional credit on agriculture production during pre reform period and post reform period and to assess whether the relationship between the two variables undergone a significant change due to the various banking reform measures adopted by the Government.

Results and Discussion

To overcome the problem of Multicollinearity all the variables are transformed to per cultivated million hectares. In original form some of the variables are highly multicollinear, in transformed model variables are not highly correlated although some degree of multicollinearity is still present in the model. As there are only few options before us to reduce the problem of multicollinearity we will accept moderate degree of multicollinearity among variables. The Cobb Douglas agricultural production function estimated using the ordinary least square method exhibits the problem of autocorrelation. To reduce the problem of autocorrelation we have applied Cochrane Orcutt regression method for estimating all the three models. The Cochrane Orcutt iterative procedure requires the transformation of the regression model to a form in which the ordinary least square procedure is applicable.

Table.2.Regression Results Using Cochrane Orcutt Regression Method

Dependent Variable – LAGDPCULT (log of agricultural Gross Domestic Product per Cultivated Area)									
Time Period	**Model I For period 1972- 2005**			**Model II For Period 1972-1991**			**Model III For Period 1993-2005**		
Variables	**Coefficients**	**t-values**	**p-Values**	**Coefficients**	**t-values**	**p-Values**	**Coefficients**	**t-values**	**p-Values**
Constant	36.8417	4.0873	0.00030	10.3625	0.7931	0.4401	16.0128	6.0246	0.0003
LICPCULT	0.66174	4.4690	0.00010	0.60665	2.4780	0.0255	0.08978	0.9147	0.3870
LALFPCULT	-3.7057	2.9198	0.00659	-0.90501	-0.5651	0.5803	-1.0006	-2.6640	0.0286
LIRPCULT	5.0726	5.8081	<0.00001	-0.23611	-0.1273	0.9003	0.6479	2.1296	0.0658
LFRPCULT	-0.48006	2.6896	0.01157	0.35358	2.8781	0.0114	-0.0855	-0.4820	0.6427
N	34			20			13		
Adjusted R-squared	0.987242			0.968147			0.992821		
Durbin-Watson	1.847321			1.599801			2.347473		

First model for the period 1972-2005 is estimated using Cochrane Orcutt iterative procedure. The period of study as mentioned above is 1971-2005 but due to the transformation of the model in Cochrane Orcutt iterative procedure one observation is lost. All the coefficients of the model are highly significant. LICPCULT and LIRPCULT affect agriculture production positively. Sign of the coefficients of the variables LALFPCULT and LFRPCULT are significant but negative. Adjusted R-squared for the model is 0.987, which means log of the

variables included in the model are able to explain 98% variation of the log of agricultural production over the period 1972-2005. The coefficient of the variable LICPCULT is 0.6617 which implies that for a percent change in institutional credit per cultivated million hectare agricultural GDP per cultivated million hectare increases by 0.66%. Another variable which has positive impact on the agricultural production is net irrigated area.

Second model is estimated for the period 1972-91. The model is representative of the pre reform period and attempts to analyse the association between agricultural production and various determinant of it during pre reform period. Coefficients of the variables LICPCULT and LFRPCULT have significant impact on agriculture production but two other variables included in the model viz. LALFPCULT and LIRPCULT are not impacting agricultural production significantly. Coefficient of the variable LICPCULT suggest that for one percent increase in institutional credit agricultural GDP increases by around 0.60 percent. For one percent increase in the consumption of fertilizers per cultivated area agricultural GDP increases by around 0.35 percent. Two other variables included LALFPCULT and LIRPCULT does not have any significant impact on agricultural product. Adjusted R-squared for the model is 0.968 i.e. around 96 percent variation of the log of agricultural gross domestic product has been explained by the log of the variables included in the model.

The third model for the period 1993-2005 has been estimated to assess the impact of institutional credit on agricultural production during post reform period. Coefficient of the variable LICPCULT is not significant. The p-value for the coefficient of LICPCULT is 0.387 which is quite high. The value of the coefficient is 0.08 which means for one percent increase in the institutional credit per cultivated area agricultural production per cultivated area increases by 0.08 percent. The value of the coefficient of LICPCULT differs significantly from the coefficient of the same variable for the pre reform period 1972-91 (0. 60) and also from the over all period (0.66). During post reform period LIRPCULT is the only variable which affects agricultural production significantly. LALFPCULT impacted agricultural production negatively. The value of the adjusted R-squared is quite high (0.995) for this model.

Conclusion

First part of the study analyses the trend and pattern of institutional credit in India during pre reform and post reform period. We have constructed four indicators annual growth rate of institutional credit, institutional credit as percentage of agricultural GDP, Institutional credit per cultivated area and sectoral share of agricultural credit to understand the trends and pattern of agricultural credit. Two indicators viz. annual growth rate of institutional credit and sectoral share of agricultural credit in total nonfood bank credit suggest that economic reform policies are unfavorable for agricultural credit. Institutional credit as percentage of agricultural GDP increases rapidly during the post reform period which may be due to the slow growth rate of the agricultural GDP during the period. Institutional credit per cultivated area increases

tremendously during post reform period which is due to the constant level of the total cultivated area which remains almost same during the whole reform period.

In the second section we have estimated Cobb Douglas production Function separately for the pre reform period and post reform period. Estimated coefficient of the institutional credit in model II suggests that it was one of the most important determinants of the aggregate agricultural production during pre reform period. The estimated coefficient of the institutional credit is not significant in model III. During Post reform period Institutional credit does not affects agricultural production.

Hence various reform measures including banking reform measures are not fruitful for agriculture finance. Not only annual growth rate of the agricultural credit retarded during post reform period but sectoral share of agricultural credit also declines. During pre reform period agricultural credit is one of the determinants of agricultural production but during post reform period such association does not exists.

References

- Acharya, S.S.(2006) " Agricultural Marketing and Rural Credit for Strengthening India Agriculture" INMR Policy Brief No. 3 Asian Development Bank

- Economic Survey, *Government of India*, various issues

- Golait, Ramesh (2007) "Current Issues in Agriculture Credit in India: An Assessment" *Reserve Bank of India Occasional Papers Vol. 28, No. 1, Summer 2007*

- Government of India, Economic Survey, Ministry of Finance, New Delhi, various issues

- Gulati, Ashok and Bathla, Seema (2002) "Institutional Credit to Indian Agriculture: Defaults and Policy Options" *Occasional Paper – 23 Nabard Mumbai 2002*

- Iqbal, Muhammad, Ahmad, Munir and Abbas, Kalbe "The Impact of Institutional Credit on agricultural production in Pakistan" *The Pakistan Development Review*42 : 4 Part II (Winter 2003) pp. 469–485

- Kalamkar, S.S., and Narayanmurthy, A. (2003), 'Impact of Liberlisation on Domestic Agricultural prices and farm Income', *Indian Journal Agricultural Economics*, Vol.3.

- Mohan, Rakesh (2004) "Agricultural Credit in India: Status, Issues and Future Agenda" *RBI Bulletin*, November
.
- Reddy, Y.V. (2001) "Indian Agriculture and Reform: Concern, Issues and Agenda" *RBI Bulletin*, March.

- ''Handbook of Statistics on the Indian Economy", 2007-08

- "Report of the Advisory Committee on Flow of Credit to Agriculture and Related Activities from the Banking System" (2004), Chairman: Prof. Vyas

- Reserve Bank of India. (2005). Draft Technical Paper on Priority Sector Lending. RPCD, Mumbai

- Roy, M., (2006). A Review of Bank Lending to Priority and Retail Sectors. *Economic and Political Weekly,* 41, 1035-1040

- Sahu, Gagan Bihari and Rajasekhar D (2005) " Banking Sector Reform and Credit Flow to Indian Agriculture" *EPW December 31, 2005*

Appendix Table.1.Institutional Credit as percent of agricultural GDP and Institutional credit per cropped area (million hectares)

	Institutional credit as percentage of Agricultural GDP			Institutional Credit per Cultivated Area (million hectares)		
Years	Direct Credit	Indirect credit	Total Credit	Direct Credit	Indirect Credit	Total Credit
1971-72	5.04	2.06	7.1	5.8	2.37	8.18
1972-73	6.02	2.79	8.8	7.86	3.64	11.5
1973-74	4.67	1.89	6.56	7.61	3.09	10.7
1974-75	5.02	2.13	7.15	9.23	3.91	13.14
1975-76	6.14	2.32	8.46	10.67	4.03	14.7
1976-77	7.34	2.54	9.88	13.35	4.62	17.97
1977-78	6.53	2.07	8.6	13.65	4.33	17.98
1978-79	7.86	2.96	10.83	16.49	6.22	22.71
1979-80	8.52	3.09	11.6	18.88	6.84	25.72
1980-81	7.9	3.08	10.98	21.87	8.51	30.39
1981-82	8.8	3.48	12.28	26.61	10.52	37.12
1982-83	8.32	4.24	12.55	27.86	14.19	42.05
1983-84	8.33	4.31	12.64	32.22	16.66	48.88
1984-85	9.11	4.92	14.03	39.01	21.05	60.06
1985-86	9.88	5.66	15.54	44.76	25.63	70.39
1986-87	9.97	2.98	12.95	48.88	14.59	63.46
1987-88	10.69	3.93	14.62	60.72	22.34	83.07
1988-89	8.76	2.75	11.51	57.85	18.2	76.04
1989-90	9.02	2.22	11.24	65.34	16.1	81.44
1990-91	7.39	1.92	9.3	61.67	16.01	77.69
1991-92	7.1	1.72	8.83	71.47	17.31	88.78
1992-93	6.89	1.49	8.38	77.59	16.78	94.36
1993-94	7.13	5.27	12.4	92.49	68.39	160.88
1994-95	7.76	5.74	13.5	115.37	85.34	200.71
1995-96	8.99	7.3	16.3	146.11	118.64	264.75
1996-97	8.27	6.59	14.86	159.26	126.86	286.13
1997-98	8.56	6.86	15.43	173.61	139.2	312.81
1998-99	8.45	6.47	14.92	195.68	149.78	345.46
1999-00	11.12	21.65	32.76	280.05	545.39	825.44
2000-01	11.78	24.31	36.09	303.52	626.18	929.71
2001-02	12.25	21.88	34.13	335.61	599.47	935.09
2002-03	15.32	24.68	40	427.99	689.64	1117.64
2003-04	17.27	22.47	39.74	523.55	681.01	1204.56
2004-05	21	28.58	49.58	668.63	909.91	1578.54

Appendix Table.2.Sectoral Share of non food bank credit
(% of total non food bank credit)

Year	Priority Sector	Agriculture	SSI	Industry	Trade	Other Sectors
1979-80	35.17	14.46	13.77	43.21	10.01	11.61
1980-81	36.9	15.55	14.01	43.22	8.65	11.23
1981-82	39.49	17.07	14.43	41.26	8.13	11.12
1982-83	39.08	16.73	14.23	42.11	7.46	11.34
1983-84	40.93	16.88	14.96	40.17	6.44	12.46
1984-85	43.53	18.11	15.63	37.69	6.26	12.52
1985-86	43.41	18.23	15.73	37.08	6.17	13.33
1986-87	43.59	18.39	15.85	37.16	5.36	13.88
1987-88	42.71	17.64	15.9	36.95	5.29	15.06
1988-89	40.28	16.42	15.46	37.88	5.61	16.23
1989-90	40.12	16.42	15.44	38.01	5.44	16.44
1990-91	37.81	14.76	15.14	39.21	5.21	17.78
1991-92	37.44	14.96	14.96	38.81	5.07	18.68
1992-93	35.49	14.22	14.26	41.76	4.96	17.78
1993-94	36.92	14.53	15.5	39.65	5.02	18.41
1994-95	34.74	12.98	14.96	40.43	5.28	19.56
1995-96	33.02	12.18	14.36	41.9	5.39	19.68
1996-97	33.76	12.51	14.3	40.81	4.91	20.51
1997-98	34.58	12.12	15.12	40.84	4.59	19.99
1998-99	35.24	12.19	14.91	40.13	4.29	20.33
1999-00	35.14	11.83	14.08	39.27	4.48	21.1
2000-01	35.98	12.1	13.05	37.94	4.16	21.92
2001-02	36.3	12.59	11.85	35.7	4.24	23.76
2002-03	34.13	11.86	9.74	37.93	3.64	24.3
2003-04	36.22	12.43	9.04	33.94	3.41	26.43
2004-05	37.11	13.14	8.17	31.15	3.63	28.11