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Truncated Access to Institutional Agricultural Credit as a Major Constraint for Rural Transformation: Insights from Longitudinal Village Studies

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Abstract

The study has examined the trend of formal credit growth and its influence on rural transformation in terms of accelerating growth in household income levels. It has also identified the factors influencing the access to formal agricultural credit in the study regions, viz. eastern and semi-arid tropics (SAT) of India. The longitudinal household level data of about 1200 households in three states each in these two regions have been analysed for the period 2010 to 2013. The study has observed that the poor access to formal credit has compelled these households to take loan from informal sources who sometimes charge interest @ 60 to 120 per cent per annum, threatening the livelihoods of these smallholders and poor households. During the study period of three years (2010 - 2013), no change in situation was visible in these villages and the access to formal sources of agricultural credit seems to remain truncated. The main reasons for this disturbing trend is the lack of institutional framework to provide cheap and subsidized credit to these marginal and landless households, who take land on lease for cultivation. The Tobit model has been fitted to determine the accessibility to formal agricultural credit in these regions. The study has highlighted the need of building a strong and inclusive financial infrastructure to provide necessary credit support to the smallholder farmers in the eastern and SAT regions for bringing a rapid rural transformation.

Key words: Rural credit, agricultural credit, interest subvention, eastern region, SAT region, Village level studies, Panel data, India

JEL Classification: Q28, G29, I38, Q14, Q18

Introduction

In India, about 138 million farms, mostly smallholders, constitute a vital part of the arterial system through which goods and services of the national economy flow. However, access to the institutional credit for them is still a distant dream. The smallholders (with land holding < 2 ha) constituted 85 per cent of the total number of operational holdings and accounted for 44.6 per cent of the area operated as per the recent report (GoI, 2014). The appointment of

the all-India rural credit survey committee in the year 1951 emphasized the role and importance of rural institutional finance in saving the peasantry from the clutches of moneylenders and catalysing the rapid transformation in agriculture. Despite successive initiatives¹ taken by the government, the latest All India Debt and Investment Survey has shown that non-institutional financial agencies accounted for as much as 44 per cent of the outstanding credit in 2012-13 (Hoda and Terway, 2015).

Although institutional credit flow to agriculture has shown a significant increase of more than ten-times, from ₹ 0.53 lakh crore in 2001-02 to ₹ 6.07 lakh crore

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in 2012-13, only about half of the 14 crore farm households were covered by the formal institutions (NABARD, 2014). Several studies have argued that there have been three major problems with respect to the supply of credit in rural India: one, the supply of formal credit to the countryside as a whole has been inadequate; two, the rural credit markets in India have been imperfect and fragmented; and three, the major source of credit to rural households, particularly resource-poor working households, has been the informal sector (Ramachandran and Swaminathan, 2002; Chavan, 2005; 2007).

Among the major states, significantly large dichotomy exists between the rural economies of eastern and semi-arid tropic (SAT) regions of India. The overall economy of the three states (Bihar, Jharkhand and Odisha) in the eastern region together is equivalent to merely one-fourth of that of the three SAT region states (undivided Andhra Pradesh, Karnataka and Maharashtra). Similarly, the gross state domestic product (GSDP) from agriculture and allied sectors of the three eastern states during TE 2013-14 was equivalent to about 40 per cent of that of the three SAT states (GoI, 2015). The eastern states also relegate at the bottom of the league on many counts of economic and social development.

Against this backdrop, the current study has examined the questions like, how the supply of formal rural and agricultural credit in two regions has changed?, why the informal source of rural credit is still important? and what are the important factors that determine the access and distribution pattern of households to formal sources of credit? The specific objectives of the study were to: (i) examine the trend and pattern of rural/ agricultural credit in India; (ii) determine the access and distribution pattern of different sources of rural credit in the selected states of eastern and semi-arid tropic (SAT) regions of India; and (iii) analyse the factors determining access of various categories of farm households to formal credit in the eastern and SAT regions.

Data and Methodology

The analysis has been carried out at both macro and micro levels. At the macro level, the analysis was carried out using secondary data on the number of rural bank branches, and the volume of credit (both direct

and indirect) flowing to agriculture and rural development collected from various publications and databases available online from the Reserve Bank of India (RBI), Central Statistical Organisation, different ministries of Government of India, and other sources. For analysis, the states of Bihar, Jharkhand and Odisha were selected to represent the eastern region and the states of Andhra Pradesh (undivided), Maharashtra and Karnataka were selected to represent the SAT region. The primary data consisting of household panel survey in these six states were collected under the project 'Village Dynamics Studies in South Asia (VDSA²)' coordinated by the International Crops Research Institute for Semi-Arid Tropics (ICRISAT) in partnership with ICAR institutes in India. Under the project, from each of the six states, 2 districts and then 2 villages from each district and finally, 40 panel households were selected from each village for observation and longitudinal data collection. A resident investigator has been posted in the village to collect information on all socio-economic variables on a continuous basis. The information is being collected on monthly basis every year from the same households. For the present study, household survey information collected from a total of 3325 households (1876 from SAT region and 1449 from eastern region) related to the years 2010-11 to 2013-14 has been used. For modelling, only those households were considered who had availed any kind of credit. Accordingly, 1000 households from SAT region and only 192 households from eastern region were included in the model.

Tobit Model

Factors Influencing Access to Formal Credit

To determine the factors influencing the decision of a household to access formal credit (likelihood of farmers' participation in the formal credit market), "Tobit" model introduced by Tobin (1958) was used. In the present study, the regressand is the farmers' participation in the formal agricultural credit market, measured as the share of formal agricultural credit in total agricultural credit of the farmer. The ratio becomes zero for the farmers who have no access to formal credit and hence the lower limit is 0. Likewise, the ratio becomes one for the farmers who have accessed only the formal credit and hence the upper limit is 1. The censored panel regression model can be specified as follows:

For each observation i ($i = 1, \dots, N$) and the time period t ($t = 1, \dots, T_i$), the dependent variable is defined by expression (1):

$$y_{it} = \begin{cases} 0 & \text{if } y_{it}^* \leq 0 \\ y_{it}^* & \text{if } 0 < y_{it}^* < 1 \\ 1 & \text{if } y_{it}^* \geq 1 \end{cases} \quad \dots(1)$$

where,

$$\begin{bmatrix} y_{it}^* = x_{it}'\beta + \varepsilon_{it} \sim \text{Normal}(0, \sigma^2) \\ = \alpha + \beta_1 X_{1it} + \dots + \beta_k X_{kit} + v_{it} \end{bmatrix}$$

in which, α is the intercept, β_k is the unknown parameter, and v_{it} is the remaining disturbance.

Here, the subscript i ($i = 1, \dots, N$) indicates the households, t ($t = 1, \dots, T_i$) indicates the time period observed for the i th individual, y_{it}^* is an unobserved (latent) variable, i.e. ratio of formal borrowing to the total loan, x_{it} is a vector of explanatory variable, i.e. x_{kit} . Here, the individual heterogeneity effect is known as the random effect as the model has been estimated on a sample of the population. The model estimated the impact of characteristics of the farmer as well as of the village on the probability of a farmer accessing the formal credit in any given year (see Table 1 for a description of the structure of the variables used). Exploiting the panel nature of the VDSA Survey, we estimated the panel data random effects model.

However, as the dependent variable and many of the explanatory variables were relatively time invariant, we also estimated the pooled Tobit model. The estimation of the above model was carried out by the maximum likelihood in STATA 12.1.

Results and Discussion

Performance of Formal Sector Credit in Eastern and SAT Regions

Two types of imperfection existed in the factors market during the economic transition period: (i) imperfect competition, and (ii) imperfect implementation (Cianian and Swinnen, 2009). The rural credit market in India also seems to be trapped in both these imperfections. The performance of the formal credit sector in rural areas of eastern and SAT regions of India during the period 2000 - 2014 is presented in Table 2. The density of bank branches is much lower in the eastern region than in SAT region. Each commercial bank branch in the eastern region is serving 10 - 20 thousand population in rural and semi-urban areas, which is almost double than that in the SAT region. Though, the number of bank branches has grown at higher rates in the eastern region, the quantum of agricultural credit outstanding in the region is one-fifth of that in the SAT region. The trend of credit-deposit ratio of eastern and SAT states also suggests

Table 1. Definition of variables considered in Tobit model — Random effect

Variable	Description
Dependent variable	Ratio of formal agricultural credit to total agricultural credit availed by an individual farm-household
Explanatory variables	
Land ratio	Ratio of own land to gross cropped area (GCA)
Farm income	Net farm income over paid out cost (₹)
Education	Years of schooling of farmers (Number of years)
District HQ	Distance of village from district headquarter (km)
Rainfall	Rainfall in the village during monsoon, i.e. June to Sept (mm)
Year	Year (2010 to 2012)
Farm size- dummy	1 for large and medium farmers; 0 for marginal and landless farmers
Region- dummy	1 for SAT region; 0 for Eastern region
Credit society- dummy	Presence of a co-operative credit society in the village (1 for ≤ 5 km; 0 for others)
Bank- dummy	Presence of a commercial and/or co-operative bank branch in the village (1 for ≤ 5 km; 0 for others)
SHG- dummy	Presence of a self- help group (SHG) in the village (1 for Yes; 0 for No)

Table 2. Indicators of availability and access to rural credit in eastern and SAT regions of India

State	*Rural population per branch ('000)	Growth of bank branches in rural area (% p.a.) (2000-2014)	Growth of rural credit out-standing (% p.a.) (2000-2014)	*Per capita agricultural credit out-standing in rural area (₹)	*Share of agricultural credit in total credit (%)	*C-D ratio
Bihar	20	-0.37	4.5	1572	25.31	30
Jharkhand	11	0.42	3.6	1672	11.22	32
Odisha	10	0.44	3.4	2960	14.27	46
Andhra Pradesh	8	0.19	5.2	17557	21.65	110
Maharashtra	7	0.52	5.0	9331	3.99	88
Karnataka	4	0.25	4.0	13302	14.14	71

Source: *Banking Statistics*, RBI accessed from <https://rbi.org.in/Scripts/Statistics.aspx>.

Notes: *relates to the year 2013.

Andhra Pradesh includes Telangana state.

that the levels of credit that goes into the credit market as a proportion of deposits mobilized from the state, is very low in the eastern states as compared to the states in SAT region.

Trends in Credit Outstanding and Credit to Agriculture

The access to financial services, while not a means to an end, is critical for the remunerative farming.

However, the access to a complete range of financial services is a bigger challenge for smallholders, who constitute the vast majority of farmers in the eastern region. The disparities in availability of rural credit became more evident when we analysed the quantum of credit available for agriculture in the rural areas of both the regions (Figure 1). The widening gap in availability of formal credit for agriculture in these two regions is the testimony of precarious condition of the

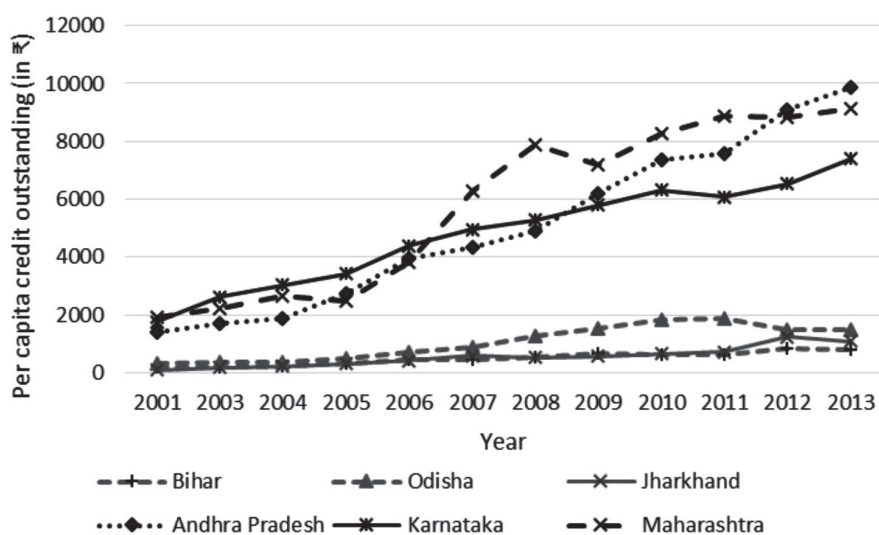


Figure 1. Total per capita (of rural population) credit outstanding for agriculture and allied activities in SAT and eastern states of India during 2000-2014

Source: *Banking Statistics*, Reserve Bank of India, 2015

Table 3. Incidence of indebtedness and amount of debt by rate of interest in rural areas of eastern and SAT regions of India as on 30 June, 2012

State/ Region	Per cent of households reporting cash loan outstanding at different rates of interest										AODL* (₹ / house- hold)
	Nil	< 6	6-10	10-12	12-15	15-20	20-25	25-30	≥ 30	Average	
Bihar	2.0	18.7	1.0	0.9	0.1	1.0	0.0	3.4	4.5	29.1	56,416
Jharkhand	1.6	4.3	0.4	1.4	0.0	1.5	0.0	2.4	8.3	18.5	34,624
Odisha	4.6	8.1	1.6	3.3	0.3	3.8	0.6	4.4	3.9	25.7	53,023
Eastern region	2.7	10.4	1.0	1.9	0.1	2.1	0.2	3.4	5.6	24.4	48,021
Andhra Pradesh	8.3	9.0	3.1	15.5	4.9	21.9	0.5	25.3	5.2	56.6	96,805
Maharashtra	2.5	3.4	2.3	5.2	3.0	1.1	0.3	12.2	7.7	31.3	1,08,336
Karnataka	3.6	15.5	3.1	10.2	2.8	9.7	0.3	6.4	8.0	46.4	1,10,659
SAT region	4.8	9.3	2.8	10.3	3.6	10.9	0.4	14.6	7.0	44.8	1,05,267
India	2.9	7.4	2.2	5.8	1.6	5.7	0.2	6.1	6.5	31.4	1,03,457

Source: NSSO (2014)

*AODL: Average amount of debt per household with outstanding loan

smallholders in the eastern region. Not only the levels are low, but the growth also points to a near stagnation in the eastern region. This clearly indicates the absence of enabling environment in terms of credit support for bringing any kind of rural transformation based on agriculture and allied sector.

The trends in availability of credit per capita of rural population, however, hid the distribution of flow of credit. Ramakumar and Chavan (2014) have pointed out that there has been a substantial increase in the share of agricultural credit outstanding that emanates from the urban and metropolitan areas, uncomfortably high concentration of disbursement of agricultural credit during January to March months (lean season for agriculture). This shows that to meet the priority sector lending targets, the banks possibly raise their lending activity in the months when farmers may not necessarily need it the most.

The huge disparity between the two regions in terms of availability and access to formal credit results in low levels of investment in the agriculture sector. This is one of the major binding constraints in achieving rural transformation required to address the development challenges and regional disparities. Table 3 further strengthens the argument that the reach of formal credit in the rural areas of eastern region is very limited as well as truncated at a lower rate of interest. The region not only has only 24.4 per cent households

accessing formal credit (compared to about 45% in SAT region), but the level of average outstanding loan is also less than half, which may not be sufficient to meet the working capital requirements of smallholders and poor farmers. Another important point to be noted is that the majority of households in the eastern India are availing loan at very high rates of interest (> 25% per annum) compared to that for SAT India. Only 16 per cent of the rural households in the eastern region access credit at less than 15 per cent rate of interest, as compared to 31 per cent in SAT region.

Insights from Village Level Studies

The present study is based on the information received from the household level panel data collected from 12 villages in 3 states each in the two regions under the VDSA project. The information from the panel households is collected every year on seasonal/ monthly basis, depending upon the nature of information. The details of the number of households, districts and villages are given in Appendix I.

Credit Needs and Sources of Credit in Eastern and SAT Regions

From the VDSA longitudinal survey, it may be observed that in the selected villages of eastern region, less than 50 per cent of the households get credit from any source, while in the SAT region, almost 90 per

Table 4. Access of rural households to credit in eastern and SAT regions of India

Region	Survey year	Total VDSA panel households (No.)	Households availing any type of credit (% of total)	Share of households availing credit (%)		Households not availing any loan (%)
				Formal sources*	Informal sources**	
Eastern region	2010	480	54.8	50.6	65.0	45.2
	2011	483	58.2	45.6	68.3	41.8
	2012	486	46.7	54.6	63.4	53.3
SAT region	2010	626	90.3	70.1	80.2	9.7
	2011	627	89.2	70.3	82.6	10.8
	2012	623	91.2	75.9	82.2	8.8

Source: VDSA Survey data

Notes: *Formal sources include commercial banks, co-operative banks, self-help groups, micro-finance company, etc.

**Informal sources include friends & relatives, local money lender, input dealers, local traders, etc.

cent of the households participate in the formal and/or informal credit market for different purposes (Table 4).

There is unusually high demand for credit in the SAT region, which is met from both formal and informal sources. Many a times, the households resort to take loan from multiple sources, causing high indebtedness and exposing themselves to high risk of default in case of crop/business failures. In the SAT region, while the highest amount of loans was taken for the purchase or construction of houses, a large number of households took loan mostly from the informal sources to repay the old loans (Figure 2 and Appendix II). One thing that was common in both the regions is that more number of households avail formal credit for agricultural purposes, however, at the same time, the amount of credit raised from the informal sources was much higher in the case of eastern region. It increases stress on the farmers, as these credits bear exorbitantly high interest rates (sometimes even more than 60% annually).

In recent years, rural financing through SHGs (bank-promoted/ government-promoted/ NGOs-promoted) has become the primary mode of microfinance in India (Christen, 2005; Bharamappanavara and Jose, 2015). The lending by the microfinance³ industry at high interest rate (20-30% annually) and following coercive loan recovery methods had created storm in the SAT region few years ago and the state government had to clip the wings of

microfinance industry by putting cap on the interest rates (Anonymous, 2010). However, the growth of microfinance has reduced the dependability of rural smallholders and poor households on rural moneylenders, who lend at a much higher interest rate. On the other hand, the limited expansion of such micro-lending system in the eastern states, has compelled the rural households to meet their credit needs and obligations from informal sources at onerous terms and conditions (predominantly moneylenders), in the hindsight of crippled formal credit system.

Access to Credit for Agricultural Purposes

Table 5 reveals that only one-third of the households in the eastern region availed agricultural credit out of which 60-70 per cent got access to formal credit. The farmers in SAT region had a better access to formal or informal credit. Interestingly, during the past 4 years (2010 - 2013), the accessibility to credit has not improved significantly in both the regions.

Distorted and Inefficient Agricultural Credit Ecosystem

The two regions (eastern and SAT) not only have a large number of smallholders (>85%), but also cultivate crops on leased-in lands. This can be observed by the ratio of operational landholding to own landholding in these two regions given in Appendix III. Small and/or landless households in the eastern region were found to have functionally more

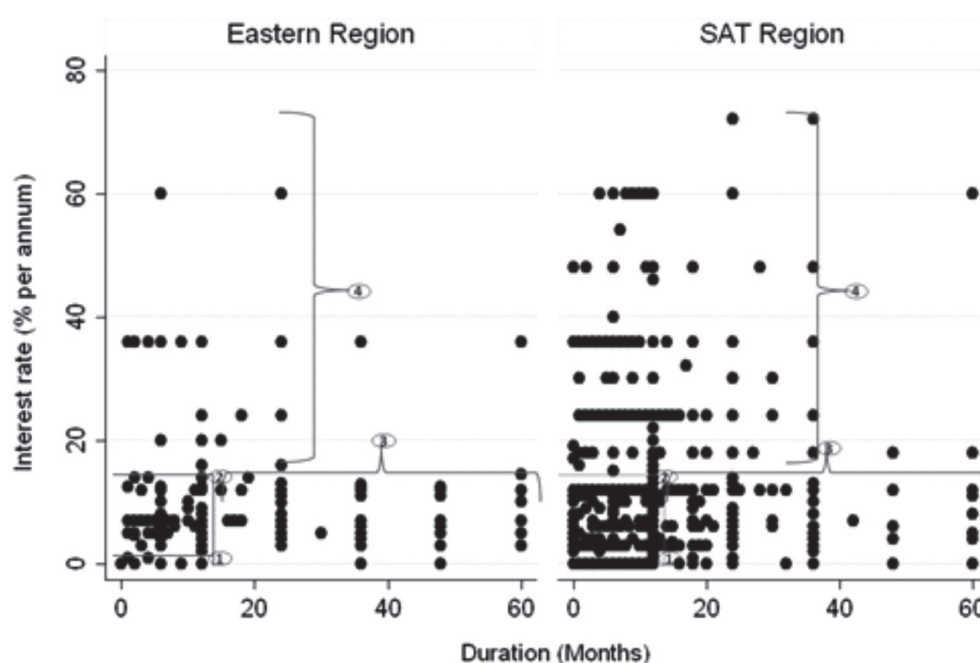


Figure 2. Distribution of loan taken by panel households by its periodicity and interest rates in the study regions, 2012-13

Source: VDSA household survey

Notes: 1. Interest-free loan taken from friends & relatives for agricultural or personal purposes.

2. Institutional subsidised short-term loan taken from commercial banks or co-operative society for agriculture or purchase of livestock.

3. Loans from formal sources at subsidised rate for farm implements.

4. Loans mainly from informal sources like money lenders at high interest rate for consumption purposes or from private banks/ finance company at high rate for purchasing vehicles, meeting marriage expenses, or other non-productive purposes.

Table 5. Distribution and access of rural households to agricultural credit in the eastern and SAT regions of India

Region	Survey year	Households availing any type of agri-credit* (% of total)	Share of households (% of agri-credit)		Households not availing any agri-credit (%)
			Formal sources	Informal sources	
Eastern region	2010	35.2	62.7	46.7	64.8
	2011	38.3	57.3	53.0	61.7
	2012	32.7	67.3	45.9	67.3
	2013	28.5	70.0	35.7	71.5
SAT region	2010	72.2	73.9	67.0	27.8
	2011	73.7	70.6	68.0	26.3
	2012	73.7	75.2	71.5	26.3
	2013	73.9	69.9	68.2	26.1

Source: VDSA Survey data

Note: *Agri-credit includes loans taken for crop cultivation, purchase of tractor & farm implements, purchase of livestock, drilling borewells or digging wells.

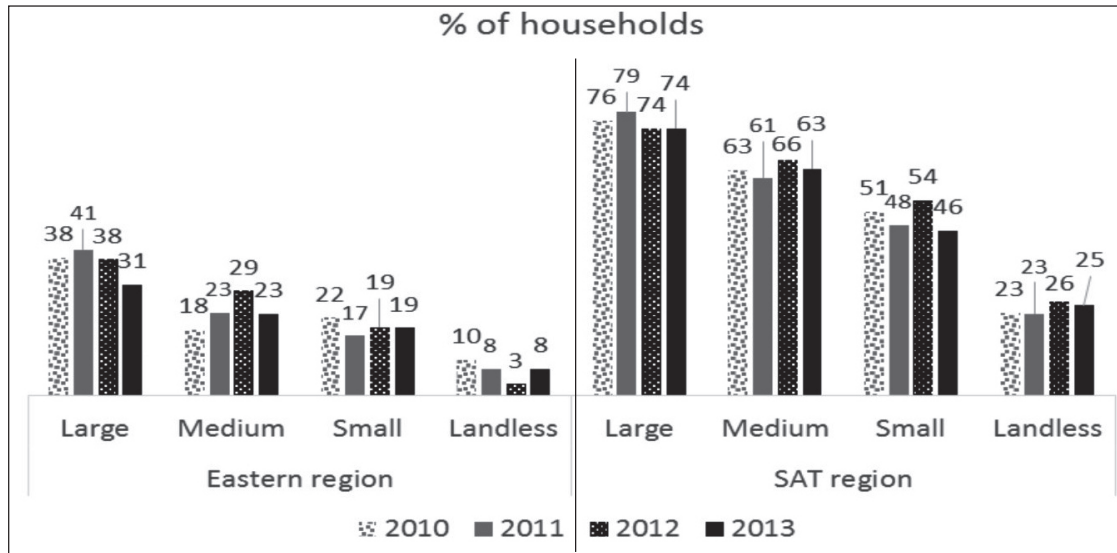


Figure 3. Access of VDSA households to formal agricultural credit according to farm-size in eastern and SAT regions

Source: VDSA Survey data

Note: Panel households have been categorized according to farm-size as large, medium, small farmers and landless labour. Since the categorization has been done as 4 quartiles of households in each village, the farm-size varies for each category from one village to another. Similarly, landless category may also have lands (< 0.5 acres).

operational land than originally they owned. While in the SAT region, the reverse tenancy was also seen as some large farmers also leased-in from smallholders, particularly for cultivation of horticultural crops like grapes, onion, etc.

Despite several measures taken to improve the access of farmers to institutional credit, the observation in the selected villages of VDSA study fuels the debate whether agricultural sector is being adequately supported by the institutional credit. The trend also mars the agenda of financial inclusiveness in the rural areas, as in both the regions, large and medium farmers continue to get access to the financial institutions and avail subsidized agricultural loans, whereas there is unfathomable entry barriers for smallholders and landless farmers. The situation is even worse in the eastern region, where hardly 10 to 20 per cent of the poor smallholders and landless households get access to institutional credit (Figure 3).

Appendix III shows that small and landless farmers in the eastern region hardly earn ₹ 12 thousand to ₹ 22 thousand in a year from crop cultivation, even after cultivating leased-in lands. But, they usually face double whammy of paying lease-rent to land owners and high interests on loan taken from the informal

sources to meet the operational expenses. Unfortunately, 'tenant farmers' do not exist in the revenue records, thus keeping them away from the several institutional benefits.

The tenant farmers, who are eligible for crop loans from banks up to Rupees one lakh under interest subvention scheme, are denied loans as their names do not appear in the revenue records. As a result, they are forced to depend on money lenders, landlords, input sellers and/or friends and relatives. A recent government report, based on national sample survey, has estimated that the area under informal tenancy in the country varies between 15 per cent and 35 per cent of the total farm area. And 36 per cent of the total rural households leasing-in land are landless labourers and 47.5 per cent have land below 0.5 hectare. Thus, ensuring easy access of cheaper credit to these households is essential for rapid transformation of the region. As mentioned in previous section, there has been a manifold increase in the flow of direct agricultural credit advanced by the institutional agencies in the previous decade. The Kisan Credit Card (KCC) scheme was launched way back in 1998-99 to facilitate all types of farmers to readily access the institutional credit with least hassles and at subsidized

interest rate. The cumulative number of operative KCCs issued by the co-operative banks and Regional Rural Banks (RRBs) up to August 2013 was 35.77 million and 10.58 million, respectively, against 138 million farm holdings in the country.

Interest Subvention on Agricultural Credit — Who Gets the Benefit?

From the year 2011, all crop loans up to ₹ 3 lakh are being disbursed at the interest rate of 7 per cent p.a. The government also provides interest subvention of 3 per cent to prompt repaying farmers in time, thus bringing down the effective interest rate for the crop loans to 4 per cent (GoI, 2015a). Contrary to this, during the past 3 years (2010-2012), more loans for agricultural purposes were taken by the VDSA households from informal than formal sources. In fact, the ratio of number of households taking informal loan to that of formal loan is more than 2:1 in the eastern region (Table 6).

Though, the volume of formal credit is more than of informal credit, however, the gap is dangerously converging in both the regions (Table 6 and Appendix III). Besides, a very small proportion of total formal credit amount falls under the subsidized interest regime of 3-4 per cent, which is something oxymoron to the prevailing policy environment. That means the farmers do not get enough incentive to repay the loan on time to avail cheaper loan, while in the case of informal loan, either majority of farmers take small amount of interest-free loan from friends & relatives or they largely depend on money-lenders and traders for a very costly credit.

Factors Influencing Access to Formal Loan

The institutional agricultural credit in India is substantially influenced by the state ownership of financial institutions (Cole, 2009; Burgess and Pande, 2005; Burgess *et al.*, 2005). The current study used 3

Table 6. Total loan amount taken for agricultural purposes by the panel households at varying interest rate in study region

Source	Interest rate (% p.a.)	Percent of total loan taken by households					
		SAT region			Eastern region		
		2010	2011	2012	2010	2011	2012
Formal source	3-6	8 (24)	38 (64)	9 (20)	34 (4)	13 (3)	8 (1)
	6-12	55 (40)	40 (47)	44 (50)	37 (21)	47 (8)	83 (3)
	12-24	36 (65)	19 (40)	40 (35)	28 (5)	37 (5)	9 (1)
	24-36	2 (14)	4 (7)	3 (12)	0	0	0
	36	0.01 (1)	0.3 (2)	3 (2)	0.2 (1)	3 (1)	0
	Total amount (in '000 ₹)	9637	8997	8534	1268	530	193
Informal source	0-6	30 (94)	23 (97)	26 (113)	17 (15)	9 (12)	23 (8)
	6-12	4 (9)	3 (7)	1 (5)	2 (3)	0	0
	12-24	8 (17)	18 (19)	19 (29)	10 (6)	10 (3)	8 (1)
	24-36	36 (39)	25 (30)	20 (59)	12 (2)	57 (9)	9 (3)
	36	21 (43)	30 (50)	33 (2)	30 (14)	15 (12)	44 (8)
	48	0	0	1 (2)	5 (3)	0.2 (1)	1 (2)
	60	1 (3)	1 (4)	0.1 (2)	17 (18)	4 (6)	7 (4)
	≥ 120	0	0	0	7 (12)	4 (6)	9 (4)
	Total amount (in '000 ₹)	4009	4192	5918	622	499	200

Source: VDSA Survey

Note: Figures within the parentheses indicate number of households, who have taken loan at respective interest rate

Table 7. Factors influencing access to formal agricultural credit — Tobit model

Dependent variable: Ratio of formal agricultural credit to total agricultural credit

Variable	Eastern region	SAT region	Pooled results
Land ratio	-0.0018 (0.0088)	0.0068*** (0.0021)	0.0063*** (0.0020)
Farm income	0.7871 (1.1286)	0.3113* (0.1688)	0.3388* (0.1613)
Education	0.0114* (0.0063)	0.0167*** (0.0031)	0.01672*** (0.0029)
Age	-0.0044** (0.0023)	0.0025** (0.0011)	0.0010 (0.0011)
District HQ	-0.0118*** (0.0034)	-0.0027*** (0.0071)	-0.0028*** (0.0007)
Rainfall	-0.0071*** (0.0018)	0.00001 (0.0001)	-0.00004 (0.0001)
Year	0.0951 (0.0576)	-0.0362*** (0.0152)	-0.0237* (0.0147)
Farm size- dummy	0.1130* (0.0656)	0.0888*** (0.0286)	0.0819*** (0.0265)
Credit society- dummy	-0.7343*** (0.1442)	-0.2178*** (0.0463)	-0.1776*** (0.0362)
Bank- dummy	0.1870 (0.1200)	0.0707** (0.0375)	0.0225 (0.0322)
SHG- dummy	-0.3695*** (0.0977)	0 (omitted, =1 for all villages)	0.0514 (0.0776)
Region- dummy			0.2083***(0.0699)
Constant	-189.2513* (115.857)	73.1173** (30.5426)	47.7836* (29.5705)
Sigma	0.3952 (0.0150)	0.4019 (0.0050)	0.4062 (0.0048)
No. of observation	192	1000	1192
log likelihood	-94.1673	-507.4435	-617.5918

Notes: Figures within the parentheses are robust standard errors.

***, ** and * indicate significance at 1 per cent, 5 per cent and 10 per cent of probability, respectively.

years (2010 through 2012) panel farm survey data collected in the VDSA study in the eastern and SAT regions. Table 7 presents the results of the random effect Tobit estimates of the equations explaining the probability of households' access to formal credit market.

The low values of sigma indicate the models were well fit in absolute terms. From the variables included in the model, the regional influence came up strongly as an influencing factor to access the formal credit.

Thus, the SAT region is better equipped to provide access of formal agricultural credit to farmers than the eastern region. Likewise, the probability of accessing formal agricultural loan increases with increase in farm-size. Thus, the current credit ecosystem doesn't favour those farmers who are smallholders and who lease-in land for cultivation. Similarly, educated farmers have a better edge to access the credit, while age of the farmers have a mixed influence in both the regions. The geographical location of the village is an important

factor, as an increase in time taken to reach the nearest urban centre decreases the probability of formal credit access, as the presence of primary agricultural credit society or SHGs in the vicinity of the villages has not increased the flow of formal credit to the agriculture sector. This reinforces the argument that poor market access for households located in the remote areas raises the transaction costs and the formal financial institutions are unable to serve the poor households. Year, which captures the trend in the farmers' likelihood access to formal credit, points out that there has been a decline in the farmers' participation in the formal credit market across the region over 2010 to 2012 period.

Conclusions and Policy Implications

The study has examined the trend of formal credit growth and its influence on agricultural transformation in terms of accelerating growth in household income levels. It has also identified the factors influencing the access to formal agricultural credit in the study regions, viz. eastern and SAT region. The results have shown a wide disparity in the reach of formal credit in eastern and SAT regions in terms of both horizontal spread and volume, which seems to be insufficient to meet the farm needs. The lack of availability and access to formal credit in these areas have pushed these households to the clutches of informal sources of loan. In many cases, these informal sources charge 60 - 120 per cent interest on loan, threatening the livelihoods of smallholders and poor households. During the study period of three years (2010-2013), no improvement in the situation was visible in these villages and the access to formal sources of agricultural credit seems to remain truncated. The main reasons for this disturbing trend is the lack of institutional framework to provide cheap and subsidized credit to the marginal and landless households, who mostly lease-in land for cultivation.

The results have highlighted the need of building a strong and inclusive financial infrastructure to provide necessary credit support to the millions of smallholder farmers in the eastern and SAT regions for bringing any kind of rural transformation. Smallholder-friendly lending requires development of and innovation in appropriate products, approaches, and systems with a strong institutional commitment. Developing digital database of each rural household in a region and creating an ecosystem where these information can be seamlessly shared with all financial institutions may

be of great assistance in determining the loan requirement and carrying out the due diligence for better service to meet the credit needs of smallholders and poor farmers in these regions.

End-notes

1. The establishment of Regional Rural Banks (RRBs) in 1976 and of NABARD in 1982 have been the two major steps for infusing rural credit. Further, RBI stipulated in 1985 that banks allocate 40 per cent of adjusted net bank credit (ANBC) to the priority sector lending (PSL) with the target for agricultural advances fixed at 18 per cent for domestic banks. In July 2014, a target of 8 per cent of ANBC of exposure was fixed for small and marginal farmers within agriculture (RBI, 2015). Other major initiatives like Self-Help Group-Bank Linkage Programme in 1992, Special Agricultural Credit Plans in 1994-95, Kisan Credit Card (KCC) Scheme in 1998, doubling of agricultural credit over 3 years in 2004, etc. were put in place to increase the flow of credit to the agricultural sector.
2. VDSA is a longitudinal Village Level Study being carried out by ICRISAT since 1975, when it was initiated in 6 villages in 2 states — Andhra Pradesh and Maharashtra. Since 2009, with the funding support of Bill and Melinda Gates Foundation (BMGF), the high frequency household survey is being done on 42 villages comprising 18 villages in SAT India, 12 villages in eastern India and 12 villages in Bangladesh. The high frequency information is gathered with the help of 12 designed questionnaire modules from the selected households. All the households level data are kept as international public good in open access at www.vdsa.icrisat.ac.in.
3. In 1996, RBI included financing of SHGs as a main stream activity of banks under the priority sector lending programmes. That's why the current study clubbed the credit sources from micro-finance and SHG into formal sources of credit.

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Appendix I

Sampling distribution of panel households, 2010-11

Sample details	Eastern region			Semi-arid tropics (SAT) region		
	Bihar	Jharkhand	Odisha	Andhra Pradesh	Karnataka	Maharashtra
Districts	Darbhanga, Patna	Dumka, Ranchi	Balangir, Dhenkanal	Mahbubnagar, Prakasham	Bijapur, Tumkur	Akola, Solapur
Villages (No.)	4	4	4	4	4	4
No. of panel households	160	160	163	198	162	269

Source: VDSA (2013)

Note: Number of households in SAT region is more, as several households in the region under study have split over the project periods since year 1975, as in the case of few households in Odisha.

Appendix II

Average volume of loan availed for different purposes by households during 2013-14

(in ₹ per loanee-household)

Purpose	Eastern region		SAT region	
	Formal credit	Informal credit	Formal credit	Informal credit
Crop cultivation	42,396 (18.1)	12,452 (6.3)	39,501 (45.9)	67,286 (20.3)
*Purchase of implements	2,48,601 (1.0)	n.a.	97,500 (2.1)	1,40,138 (1.3)
Drill bore-well/ dug-well	n.a.	n.a.	53,500 (0.3)	1,12,500 (1.6)
Purchase of livestock	19,210 (0.8)	n.a.	99,656 (1.9)	35,008 (1.1)
Purchase of land, house repairs & construction	1,000 (0.2)	1,41,750 (1.2)	2,54,000 (1.3)	1,71,000 (3.7)
Consumption	2,800 (1.0)	10,345 (3.9)	3,455 (8.3)	7,898 (32.3)
Social functions including marriage	63,403 (2.2)	99,107 (5.2)	1,43,681 (3.9)	86,929 (11.5)
Repay of old debt	35,000 (0.4)	7,650 (0.4)	44,143 (2.6)	33,618 (2.2)
Education	1,250 (0.4)	77,500 (0.4)	18,667 (1.1)	23,000 (1.0)
Medical	17,000 (1.4)	19,931 (3.3)	26,522 (1.1)	11,750 (3.5)
Business	44,020 (1.6)	47,140 (1.0)	1,07,125 (2.6)	2,05,841 (1.3)
#Others	1,16,193 (3.0)	44,675 (3.9)	76,773 (8.8)	1,52,045 (9.0)

Source: VDSA Survey data

Notes: Figures within the parentheses indicate percentage of households availing loan for respective purposes and sources. n.a.- 'not available'.

*include tractors, other farm implements; #include house construction, vehicle loan, heavy machines like JCB & cranes, marriage, etc.

Appendix III

Average farm income and formal credit taken by the households in SAT and eastern regions

Year	SAT region					Eastern region				
	Large	Medium	Small	Landless	All	Large	Medium	Small	Landless	All
	Net farm income (₹ per household)					Net farm income (₹ per household)				
2010	162182	55683	31994	48112	79836	74602	20600	7919	22394	36013
2011	151562	45518	26395	14535	68668	80300	28694	14398	9206	44561
2012	205473	82448	49249	38987	103877	153793	41067	44087	8417	79951
TE:2010-12	173110	61630	36246	32999	75996	100809	30619	21861	11646	41234
	Ratio of operational to own landholding					Ratio of operational to own land holding				
2010	1.0	1.0	1.1	1.7	1.1	0.9	0.9	1.0	2.9	0.9
2011	1.0	1.0	1.2	1.5	1.0	0.8	0.9	1.1	3.5	0.9
2012	1.0	1.1	1.1	1.2	1.0	0.8	0.9	1.1	2.4	0.9
TE:2010-12	1.0	1.0	1.1	1.4	1.0	0.8	0.9	1.0	2.9	0.9
	Formal credit amount (₹ per household)					Formal credit amount (₹ per household)				
2010	96257	42578	22961	16025	49686	67793	47773	17240	8222	44494
2011	140841	51786	34118	24535	72019	69700	24471	22053	14300	44299
2012	123943	73978	42826	68694	76747	107436	41849	26813	5200	64010
TE:2010-12	120595	56305	33507	37494	61975	80934	37754	21826	9927	37610

Source: VDSA household survey (2010 - 2012)