Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

Agricultural Credit- Flow, Constraint and Linkage with Distress Sale

[1]Dr. Sanjib Kumar Hota and [2]Dr. Anil Kumar Mishra
[1]Faculty Member, Madhusudan Institute of Cooperative Management,
Bhubaneswar, Odisha, India
[1]Associate Professor, IMIS, Bhubaneswar, Odisha, India

Abstract

In India the literature on rural credit market reveals the poor accessibility of peasant farm households to institutional credit, which may be attributed to many factors. The farmers are suffering from the interlocked market linking informal credit to the sale of paddy which results in distress sale (i.e. the difference between price offered by informal lender and the price prevailing in the open / regulated market). The distress sale is mainly attributed to the bargaining strength of the farmers borrowing from informal credit market, the extent of their involvement in the interlocked credit arrangement to meet the requirements of additional liquidity for production and consumption needs and the nature of market paddy market i.e. monopsony for Paddy sale in the state. The data collected from the sample farms across various agro-climatic zones (by canal irrigation status) of Bargarh district in Odisha suggest that the access to formal credit is limited in rural areas although there exists high demand for it and significantly influenced by land owned. Further, poor implementation of minimum support price policy gives rise to the need for informal credit and interlocked credit market in rural agrarian economy of the state.

Keywords*: Interlocked market, Distress sale, Institutional credit, Input Index*

1.1 Introduction

The economically relatively backward regions have less access to institutional credit in India (Reddy, 2001). It is underlined by a number of studies that credit flow occurs across various regions and farm-sizes are economically dissimilar in rural India. The ineffective accessibility and insufficient availability of institutional credit compel most of the farmers to depend on informal sources of credit irrespective of the hidden costs involved in it. The major portions of hidden cost are often linked to non-monetary resources like land, labour, inputs or outputs. Thus, it is reflected in terms of the undervaluation of either the labour or the output of the borrower, or alternatively the overvaluation of inputs supplied by the lender. Given the unequal bargaining power between the borrowers and lenders, the extent of hidden cost incurred by borrowings from informal market varies leading to a situation that in turn affects the degree to which the distress sale takes place. Moreover, the improper or poor implementation of minimum support price system by the government is also one of the significant factors responsible for distress sale. The issue of remunerative price for the crops grown by the farmers in general and paddy crop in particular is of the prime concern for the district i.e. Bargarh district under study as distress sale and active interlocking market are still observed in different regions of Bargarh district in Odisha. Thus, an attempt has been made in this paper to analyze the magnitude of distress sale and accessibility to credit market across various villages with different irrigation status and farm sizes under study.

1.2 Agricultural Credit

The majority of farmers are in need of borrowings in India as their own fund is insufficient to meet the cost of various agricultural operations (Lipton, 1976). The improved access to formal credit broadly is not only helps the farmers to shift their borrowings from informal market to formal institutions but also increase their access to the use of modern technology for increasing their production and income (Donald, 1976, Sarap,1990). Many of the empirical studies reveal that the beneficiaries of these formal rural credit extension policies and programmes are the large farmers as compared to that of small and marginal farmers in rural India due to several reasons. So a large gap exists between the supply of credit to small and marginal farmers and their need for credit. It can thus be inferred from the above discussions that agricultural credit has broadly two types of impact such as firstly, the access to credit by a different categories of borrowers and secondly, the flow of credit itself. The persistence of interlinked markets in rural India, a phenomenon confirmed by many subsequent studied conducted in Odisha (Sarap, 1987, 1991a, 1991b). The provison of adequate credit to the farmers has become a major concern due to the increase in demand for credit with the spread of green revelation in India. Despite the institutionalization of credit, dependency of rural households on non-institutional credit remains due to increase in gap between the demand and the supply of institutional credit along with certain other factors such as divergent interest rate, security oriented lending policies, associated transaction costs, delay in sanctioning loans, small farmers image as high risk borrowers and political clout of the large farmers in the credit

institutions particularly, in cooperatives etc. It is also that among several factors, wealth matters in gaining access to preferred credit sources and wealthy land owning households, which could offer different types of collateral and has diversified income base, were likely to receive more formal credit than landless households. Anderson (1990) while attempting to relate the characteristics of farm households to the probability of receiving credit, found that the size of farm, measured by the gross value of production, had a positive effect on the probability of receiving a bank loan. Similarly, Reddy (1990), observed that the landlords and rich peasants met their credit demand chiefly from commercial banks and cooperative societies, while the agricultural labourers, poor and middle peasants mainly depend on money lenders and traders for credit.

1.3 The Objectives of Study

The main objectives of the study are:

(i) To identify the factors affecting accessibility to formal credit market across various villages with different irrigation status and farm sizes under study.

(ii) To analyze the magnitude and determinants of distress sale.

(iii) To study the impact of credit on resource use and productivity.

1.4 Data base and Methodology:

The flow of formal credit has been observed from the primary sources data collected from the various farm sizes such as Small (S), Medium (M) and Large (L) farms belongs to three different villages with varied irrigation (canal irrigation) status such as V-1 (irrigated), V-2 (Semi-irrigated) and V-3 (non-irrigated) drawn at random (based on canal irrigation status, access to credit, magnitude of distress sale and level of technology used) from three different blocks of Bargarh district of Odisha state. Altogether 474 farm households have been considered for the study. The aspects of cost of production, formal credit, informal credit and marketing of paddy have been analyzed in the study.

Analytical tool-Probit Model:

The Probit model has been used to analyse the determinants of access to credit. The general model is a binary choice model involving estimation of the probability of access to credit (y) as a function of a vector of explanatory variables(X). It is assumed that there is an underlying response variable y_i^* defined by the regression relationship:

$$y_i^* = \beta' x_i + u_i \quad (1)$$

In practice, y_i^* is unobservable; what we observe is a dummy variable y defined by:

$$y = 1 \; if \; y_i^* > 0 \; (access \; to \; credit)$$

$$= 0 \; otherwise \; (not \; access \; to \; credit) \quad (2)$$

From the above relations, we get:

$$Prob \; (y_i = access \; to \; credit) = Prob(u_i > -\beta' x_i)$$

$$= 1 - F(-\beta' x_i) \quad (3)$$

Where F is the cumulative distribution function for u. In this case the observed values of y are just realizations of a binomial process with probabilities given by equation (3) and varying from trial to trial (depending on x_i). Hence the likelihood function is:

$$L = \prod_{y=0} F(-\beta' x_i) \prod_{y=1} [1 - F(-\beta' x_i)] \quad (4)$$

taking the logarithm of L and maximizing with respect to β, which gives the ML estimator of slope coefficient.

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

Principal Component Analysis

The Principal Component Analysis **(PCA)** has been applied as an analytical tool to construct the Resource use (i.e. Input use) Index based on certain parameters such as Expenses of Bullock/Machine Labour (Rs./ acre) , Expenses human labour (Rs./ acre), Expenses of seeds (Rs./acre), Expense of Fertilizer & FYM (Rs./ acre), Farm yard manure-FYM (RS/acre), Fertilizer (Rs/acre), Expenses on Pesticide (Rs./acre), Irrigation charges (Rs./acre), Gross Cropped Area (in acre), Ratio of workers to family size, Proportion of area under HYV (%)

$$PC_1 = a_{11}X_1 + a_{12}X_2 + \cdots + a_{1n}X_n$$

$$PC_m = a_{m1}X_1 + a_{m2}X_2 + \cdots + a_{mn}X_n$$

where a_{mn} represents the weight for the mth principal component and the nth variable.

By multiplying the individual weights (i.e. Factor Loadings) with individual indicators and taking their sum we find the index

Linear Regression model (OLS)

The Linear Regression model (OLS) has been used to assess the **Determinants of formal credit obtained by the farmers** .The regression equation is follows.

$Y = \alpha + \beta_1 D_1 + \beta_2 D_2 + \beta_3 X_1 + \beta_4 X_2 + \beta_5 X_3 + \beta_6 X_4 + \beta_7 X_5 + \beta_8 X_6 + u_i$

Where, Y= Amount of formal credit obtained by the farmers (in Rs.)

X_1 = Percentage of irrigated area to gross cropped area, X_2 = Income excluding own farm activity as proportion of total family income (in rupees), X_3 = Ratio of workers to family members, X_4 = Operated Areas (in acres), X_5 = Fertilizer & pesticide (in Rs.), X_6 = Total Production (in Rs.),

D_1 = Dummy variable for Caste status

=1, if borrower belongs to Schedule caste or Schedule tribe, = 0, otherwise

D_2 = Dummy variable for Educational qualification of the borrower

= 1, for 10^{th} or more, = 0, otherwise

Y is the dependent variable and X_1 to X_6 with dummy D_1 and D_2 (dummy for intercept term only) are the independent variables. α is the intercept coefficient and β_i's are the partial regression coefficient, u_i is the stochastic disturbance terms.

The Linear Regression model (OLS) has been used to assess the **Determinants of distress sale of paddy.** The regression equation is follows.

$Y = \alpha + \beta_1 D_1 + \beta_2 D_2 + \beta_3 X_1 + \beta_4 X_2 + u_i$

Where, Y=Income loss due to distress sale (in Rupees)

X_1 = Informal credit (Rs.), X_2 = Proportion of Marketable surplus per acre sold to regulated market (in bags)

D_1 = Dummy variable for Caste status

=1, if borrower belongs to Schedule caste or Schedule tribe, = 0, otherwise

D_2 = Dummy variable for Access to formal credit

= 1, If Yes, = 0, otherwise

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

The Linear Regression model (OLS) with dummy variable (for both intercept and slope terms) has been used to assess the **effect of formal and informal credit** on the dependent variable **Y= Index of Input used** across the farm sizes and villages and following the same type of equation is applied to assess the effect of formal and informal credit on the dependent variable **Y= Productivity i.e. Production of rice (paddy) per acre (in Rs.)** across the farm sizes and villages The regression equation is follows.

$$Y = \propto + \sum_{i=1}^{4} \beta iDi + \sum_{J=1}^{2} \gamma j\, Fj + \sum_{i=1}^{4} \delta iDi\ (F1) + \sum_{i=1}^{4} \theta iDi\ (F2) + u - - - -eqn.(1)$$

Where,
D_1 = Semi irrigated Village, D_2 = Non-irrigated Village, D_3 = Medium Farm size, D_4 = Large Farm size, F_1 =Formal Credit, F_2 = Informal Credit
Because of the presence of multicollinearity alternative specification of eq.(1) are computed and results are reported in the relevant tables.

1.5 The Rural Credit Market for Agriculture

It is observed from the table-1.5 that out of the total 474 samples, 93 percent of farm households depend on credit (both formal and informal sources of credit) to meet their production costs. However, only 32 percent of farm households had borrowed from the formal credit institutions. Further, out of the total borrowers from formal sources, 57 percent have also borrowed from the informal sources. The percentage of total borrowers to total farm households decreases with the increase in farm sizes. It means the percentage of small farms depends on borrowing is comparatively found higher than other categories of farms irrespective of irrigation status of the area under study. However, the percentage of farms borrowing from formal sector found increases with the increase in farm sizes. Further, the percentage of borrowers from formal sector found higher in irrigated Village i.e. V-1 compared to other villages V-2 and V-3 respectively. So the formal sector credit flow is higher in agriculturally developed area compared to that of less developed area. The percentage of borrowers from informal sector found higher for Small and Medium farm sizes than that of large farm size. Further, it is found that the percentage of formal borrowers taking informal loans increases with the increase in farm sizes. Thus, it can be inferred from this analysis that the formal sector credit is found relatively higher in irrigated area and has a direct relationship with farm sizes. Irrespective of the irrigation status and level of agricultural status the dependency on informal credit by all categories of farms found in the area under study. Further, availability and accessibility of formal credit is found relatively less for small farm sizes. So the government should formulate effective policy measures to increase the availability and accessibility of formal credit.

It is observed from table-1.5(a) that the proportion formal credit to total credit has a direct relationship with the farm sizes in V-1, V-3 and All-V whereas in V-2 it is inversely related to farm sizes. Further it is observed that the percentage of small farm households to total sample farm households constitute higher percentage compared to other farm sizes but secured less percentage of the institutional credit disbursed irrespective of the irrigation status of the villages under study. This indicates that still the concentration of institutional credit towards the better-off farmers or large farm sizes is found higher. This also supports the findings of (Adams and Vogel,1986, Sarap, 1990 and Basu, 1997). Hence, it can be said that the institutional credit fails to reach to the small farm sizes in rural area despite various policy measures to improve the spread of formal agricultural credit in rural areas.

Table-1.5(b) reveals the level of farm dependency on credit to meet the production costs. It is observed that production cost per acre shows a positive association with the farm sizes. But the level of dependency on formal credit to meet the cost is found quite low. Thus the credit deficit (i.e. the difference between production costs and formal credit availed per acre) is found much higher (ranging from 60 to 80%) for each of the categories of farm sizes in the villages under study. This indicates that almost all of the farm sizes are dependent on informal credit to meet the total credit requirement for financing production cost. Thus credit constraint is one of the factors to achieve the optimal goal of enhancing productivity which requires immediate attention.

Table- 1.5

Distribution of Borrowers across Farm Sizes and Villages																
	V-1				V- 2				V- 3				All - V			
	S	M	L	Total	S	M	L	Total	S	M	L	Total	S	M	L	Total

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

All households	84	52	56	192	86	24	29	139	82	53	8	143	252	129	93	474
% of farm households in each category from total samples	44	27	29	100	62	17	21	100	57	37	6	100	53	27	20	100
All borrowers	83	52	56	191	60	21	27	108	82	53	8	143	225	126	91	442
% of borrowers to total households	99	100	100	99	70	88	93	78	100	100	100	100	89	98	98	93
Formal borrowers	21	26	41	88	18	9	14	41	9	10	4	23	48	45	59	152
% of formal borrowers to total households	25	50	73	46	21	38	48	29	11	19	50	16	19	35	63	32
Informal borrowers	70	44	47	161	42	12	13	67	78	50	5	133	190	106	65	361
% of Informal borrowers to total households	83	85	84	84	49	50	45	48	95	94	63	93	75	82	70	76
No of formal borrowers taking informal loans	8	18	32	58	2	4	9	15	5	7	1	13	15	29	42	86
% of formal borrowers taking informal loans	38	69	78	66	11	44	64	37	56	70	25	57	31	64	71	57

Table- 1.5 (a)

Distribution of Formal loans across farm sizes and villages																
	V- 1				V- II				V- III				All - V			
	S	M	L	Total	S	M	L	Total	S	M	L	Total	S	M	L	Total
Proportion of formal loan to total loan borrowed	43	65	72	67	71	65	68	68	25	26	57	32	47	59	70	64
proportion of formal credit obtained by the group to total formal credit	8	24	68	100	27	20	53	100	29	36	35	100	12	24	64	100

Table-1.5 (b)

Dependency on Credit per acre of Gross Cropped Area across Farm sizes and Villages																
	V- I				V- II				V- III				All - V			
	S	M	L	Total	S	M	L	Total	S	M	L	Total	S	M	L	Total
Cost per acre (%)	67	94	113	100	72	101	111	100	85	101	146	100	67	91	119	100
Cost per farm (%)	28	78	229	100	26	145	281	100	57	133	321	100	28	91	307	100

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

Level of dependency on credit (%)	51	59	50	52	69	42	45	48	50	44	50	47	55	53	49	51
Level of dependency on formal credit (%)	24	37	34	33	47	26	29	31	17	16	28	18	27	31	33	31
credit (formal) deficit as % of cost of production per acre/farm	76	63	66	67	53	74	71	69	83	84	72	82	73	69	67	69

1.6 Determinants of Accessibility to Formal Credit

The risk involved in pre-contractual arrangement which may results in the form of adverse selection (i.e. fear of selecting a bad borrower) and that of in post contractual arrangement which may result in the form of moral hazard (i.e. willful and non-willful default in repaying the debt) often restricts the formal credit institutions to ensure adequate flow of credit to the farmer. Thus, given these problems, it is pertinent to examine the factors influencing the access to formal credit by the farmers. The credit transaction between the farmers and formal credit institutions not only depends on the need of a farmer but also the willingness of the lender to extend credit. The access of farmers' to formal credit is estimated by applying the Probit model where Y_i is dependent variable and dichotomous (1, 0) indicating whether the *i*-th farm household has access to credit or not. So, the dummy =1 if the farm households have access to credit from formal sources, and =0 if otherwise. The agricultural loans are advanced to the farmer borrowers on the basis of land they own, as the land owned acts as collateral from the lender's point of view. Hence, the land owned by the farmers can be taken as one of the important factors governing access to formal credit. The descriptive Statistics of Variables used in the analysis (probit model) and results of the model are depicted in table-1.6, table-1.6 (a) and table-1.6(b) respectively.

The result shows that Total Land Owned (TLO) is found positive and significant in V-1, V-3 and All-V [table-1.6 (a)] as well as for Small and Medium farm sizes [table-1.6(b)] except in the case of V-2 and large farm size. This finding supports the earlier findings of some experts that the larger the landholding owned by the households, the greater the probability of its access to formal credit. The quality of land (LNDQ) is found negative but not significant in V-1, V-2, V-3 and All -V [table-1.6(a)] whereas it is found negative and significant for Medium and large farm sizes [table-1.6(b)] but found positive and insignificant for Small farms. Thus, it implies that it is not the quality of land but the size of landholding owned that matters to bankers while selecting a borrower, and in turn access by the latter to formal credit.

In the case of non-land factors, the coefficient of ASSET is positive but not significant in all [table-1.6(a)] whereas it is found positive and significant for Small and Medium farm sizes [table-1.6(b)] but found positive and insignificant for large farm size. This implies that other things remaining constant, the higher the value of non-land assets, the higher the probability of access to credit as because possessing of non-land assets (like agricultural implements) is not only contributing towards improvement of farm productivity but also a symptom of credit worthiness. The possession of required assets by the small and medium farms in this case may raise their probability of access to formal credit. A farmer having a higher non-farm income as proportion of total income is also less likely to have access to formal credit as the coefficient of IEOFA is found negative and significant for V-1 and V-2 [table-1.6(a)] and for large farm size [table-1.6(b)]. Thus, a bank usually prefers tangible assets (such as land) while making decision on lending to farmer borrowers. The positive and significant coefficient of PIAGCA indicates that the presence of irrigation also improves the prospects of a farm household's access to a formal credit. The coefficient of PIAGCA is found positive and significant for V-1, V-2 and ALL-V [table-1.6(a)] as well as for small farm size [table-9.6(b)]. The effect of PIAGCA could not be assessed for V-3 as it is a rain-fed village. The positive and significant coefficient of CASTE indicates that the schedule caste and schedule tribe farmers are less likely to have access to formal credit. The coefficient of CASTE is found positive and significant in V-1 whereas it is found positive but not significant in V-2, V-3 and All-V as well as for small and medium farm sizes except the case of large farm size where it is found negative but not significant. The coefficient of EDU is found negative but not significant across the villages and across farm sizes (Small and Large farms) except medium farm

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

size where it is positive as depicted in table- 1.6 (a) and 1.6 (b). This implies that education has no influence on the access to formal credit.

The coefficient of GCAR is found negative and significant in V-1, V-3 and All-V and for medium farm sizes [table-1.6 (a) & 1.6 (b)] indicating the fact that farmers having higher gross cropped area under rice are also less access to formal credit. However, the coefficient of AHYVSR is found positive and significant in V-1, V-3 and All - V and for medium farm sizes [table-1.6 (a) & 1.6 (b)] indicating the fact that farmers having higher area under HYV seeds of rice (paddy) are also more accessible to formal credit. This may be attributed to the more need for credit to adopt HYV seeds and in turns higher productivity is expected. The age of the borrowers is not found significant except the case of large farm size where it is positive and significant as observed from table-1.6 (a) & 1.6 (b). Thus age of the farmer borrowers may not be an important factor influencing the access to formal credit. The coefficient of FSB is found positive and significant in V-2, All-V and for large farm size, which indicates that the higher the family sizes higher the access to formal credit in these cases. Probably the higher family size may be instrumental for ensuring recovery by the banks. The coefficient of RWFM is found negative across the villages but it is negative and significant for large farm size , only negative for medium and only positive for small farm size. This implies that higher the ratio of farm workers to family members, the less is the access to formal credit. This may be a reflection of less credit worthiness.

Table- 1.6: Determinants of Accessibility to Formal Credit- Descriptive Statistics of Probit model

Variable Description, Descriptive Statistics and Expected Sign of variables used in Probit equation								
	V1	V2	V3	All S	All M	All L	ALL V	
Variable Description	**Mean and Std Dev**	**Mean and Std Dev**	**Mean and Std Dev**	**Mean and Std Dev**	**Mean and Std Dev**	**Mean and Std Dev**	**Mean and Std Dev**	**Expected sign**
Dependent Variable Access to formal credit: = 1 if yes, = 0, otherwise	0.46 (0.50)	0.29 (0.46)	0.16 (0.37)	0.19 (0.39)	0.35 (0.48)	0.63 (0.48)	0.32 (0.47)	
TLO :Total Land Owned (in acres)	8.18 (6.97)	4.03 (3.92)	4.87 (3.76)	3.01 (2.08)	6.62 (3.38)	13.08 (7.76)	5.97 (5.64)	+
LANDQ: land quality = 1, for low quality of land = 0, otherwise	0.54 (0.50)	0.33 (0.47)	0.31 (0.46)	0.30 (0.46)	0.50 (0.50)	0.58 (0.50)	0.41 (0.49)	+
ASSET :Value of assets excluding land (in rupees)	35496 (84771)	14846 (54362)	9742 (29546)	5480 (3058)	13661 (30937)	76654 (127155)	21671 (64501)	+
IEOFA : Income excluding own farm activity as proportion of total family income (in rupees)	18836 (47820)	34767 (74506)	9311 (25838)	9010 (23496)	21488 (53551)	50946 (88412)	20634 (53312)	+
PIRGCA: Percentage of Irrigated area to gross cropped area	41.75 (8.44)	29.83 (17.96)	0.00 (0.00)	21.80 (20.76)	24.55 (21.45)	37.66 (14.75)	25.66 (20.79)	+
CASTE: Caste status: =1, if borrower belong to Schedule caste or Schedule tribe, = 0, otherwise	0.19 (0.40)	0.47 (0.50)	0.37 (0.48)	0.44 (0.50)	0.22 (0.42)	0.18 (0.39)	0.33 (0.47)	–
EDU: Educational qualification of the borrower: = 1, for 10^{th} or more, = 0, otherwise	0.34 (0.48)	0.22 (0.41)	0.08 (0.27)	0.16 (0.37)	0.23 (0.42)	0.39 (0.49)	0.23 (0.42)	+
GCAR; Gross cropped area under rice (in acres)	16.41 (13.30)	6.94 (6.73)	5.52 (2.53)	4.36 (2.48)	10.35 (3.69)	26.59 (13.22)	10.35 (10.58)	+
AHYVSR: Area (in acres) under HYV Seeds (rice)	15.79 (13.17)	6.22 (6.35)	4.28\ (2.19)	3.87 (2.63)	9.22 (3.98)	25.22 (13.83)	9.51 (10.52)	+
AGEB: Age of the borrowers (in years)	43.06 (9.40)	55.31 (9.06)	48.04 (6.00)	48.13 (10.16)	47.81 (9.01)	48.70 (9.91)	48.16 (9.80)	–
FSB: Family Size of the	6.48	4.94	4.82	4.73	5.36	7.92	5.53	_

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

borrowers (in Nos.)	(2.83)	(2.05)	(2.05)	(1.77)	(2.07)	(3.25)	(2.52)	
RWFM: Ratio of workers to family members	0.49 (0.23)	0.55 (0.26)	0.63 (0.23)	0.61 (0.24)	0.51 (0.24)	0.43 (0.22)	0.55 (0.25)	+
N : No. of Observations	192	139	143	252	129	93	474	

Notes:

1. The data regarding the area (in acres) under various quality of land such as high, medium and low land has been collected from the farmers during the survey. The high quality of land is normally rainfed whereas the low quality of land has more capacity to retain water and hence productivity of low land is relatively much higher than other types of land. The low land amounting to at least 30% of the total land owned by a farmer is considered to have low land as a variable for the model.
2. Figures in parentheses indicate standard deviation.

Table-1.6 (a): Determinants of Accessibility to Formal Credit - (across villages)
Results of Probit model

	V1		V2		V3		ALL V	
Variable Description	Coefficient	Wald Chi-Square	Coefficient	Wald Chi-Square	Coefficient	Wald Chi-Square	Coefficient	Wald Chi-Square
Intercept	-4.37* (1.23)	12.63	-0.70 (1.00)	0.49	-3.78 (2.32)	2.66	-1.78* (0.53)	11.09
TLO	0.28* (0.08)	12.73	-0.02 (0.08)	0.04	0.15*** (0.09)	2.99	0.13* (0.03)	14.78
LANDQ	-0.17 (0.27)	0.42	-0.07 (0.31)	0.05	-0.46 (0.39)	1.35	-0.23 (0.16)	2.16
ASSET	0.00 (4E-06)	0.79	4E-05 (4E-05)	0.78	8E-05 (7E-05)	1.51	0.00 (0.00)	1.03
IEOFA	-1E-05** (5E-06)	8.46	-5E-06*** (3E-06)	2.91	-3.3E-06 (7E-06)	0.25	0.00** (0.00)	9.03
PIRGCA	0.07** (0.02)	9.08	0.02** (0.01)	4.21	0	.--	0.01*** (0.00)	2.99
CASTE	0.60*** (0.37)	2.72	0.20 (0.29)	0.49	0.30 (0.53)	0.32	0.18 (0.18)	1.10
EDU	-0.18 (0.31)	0.34	-0.44 (0.42)	1.08	-0.46 (0.65)	0.50	-0.31 (0.20)	2.42
GCAR	-0.61** (0.23)	7.36	-0.03 (0.19)	0.03	-1.30** (0.49)	7.07	-0.31** (0.10)	8.85
AHYVSR	0.60** (0.22)	7.70	0.05 (0.18)	0.07	1.47** (0.57)	6.60	0.32** (0.10)	9.64
AGEB	-0.01 (0.02)	0.74	-0.01 (0.02)	0.63	0.05 (0.03)	2.01	0.01 (0.01)	2.32
FSB	0.00 (0.06)	0.00	0.14*** (0.08)	3.31	0.17 (0.15)	1.20	0.07*** (0.04)	3.48
RWFM	0.23 (0.64)	0.12	-0.81 (0.68)	1.40	-1.07 (1.35)	0.62	-0.54 (0.37)	2.09
N	192		139		143		474	
Max-rescaled R-Square	0.66		0.31		0.60		0.49	
-2 Log L (Intercept Only)	264.834		168.62		126.14		594.754	
-2 Log L (Intercept and Covariates)	135.498		134.33		65.49		389.945	

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

Likelihood ratio (Chi-Square)	129.34		34.29		60.65		204.81	
Percent Concordant	92		77.2		92.1		85.6	

Table-1.6 (b): Determinants of Accessibility to Formal Credit - (across farm sizes)
Results of Probit model

	All S		All M		All L	
Variable Description	Coefficient	Wald Chi-Square	Coefficient	Wald Chi-Square	Coefficient	Wald Chi-Square
Intercept	-2.67* (0.79)	11.42	-1.23 (1.51)	0.66	-5.09** (1.83)	7.74
TLO	0.17** (0.07)	5.49	0.20** (0.09)	4.77	0.01 (0.07)	0.04
LANDQ	0.12 (0.24)	0.23	-0.57*** (0.32)	3.15	-0.88*** (0.51)	2.94
ASSET	2E-04** (6E-05)	7.43	8E-05** (4E-05)	4.53	5E-06 (1E-05)	0.22
IEOFA	5E-08 (5E-06)	0.00	-3.99E-06 (3E-06)	1.74	-9E-06 *** (5E-06)	3.43
PIRGCA	0.02** (0.008)	6.19	-0.02 (0.01)	1.22	-0.03 (0.03)	1.92
CASTE	0.21 (0.24)	0.75	0.32 (0.49)	0.44	-0.38 (0.55)	0.48
EDU	-0.43 (0.29)	2.30	0.13 (0.41)	0.10	-0.79 (0.67)	1.40
GCAR	0.003 (0.25)	0.0002	-0.80** (0.28)	8.25	0.08 (0.21)	0.16
AHYVSR	-0.03 (0.24)	0.01	0.84** (0.27)	9.81	0.09 (0.20)	0.23
AGEB	0.01 (0.012)	0.22	0.01 (0.02)	0.18	0.08** (0.03)	8.65
FSB	0.002 (0.06)	0.00	-0.03 (0.08)	0.18	0.17** (0.09)	3.81
RWFM	-0.48 (0.54)	0.78	-1.38 (0.84)	2.695	-2.79** (1.15)	5.84
N	252		129		93	
Max-rescaled R-Square	0.35		0.58		0.68	
-2 Log L (Intercept Only)	245.40		166.85		122.12	
-2 Log L (Intercept and Covariates)	184.13		96.07		58.77	
Likelihood ratio (Chi-Square)	61.27		70.78		63.36	
Percent Concordant	82.9		89.5		92	

1.7 Determinants of formal credit obtained by the farmers

The probit model analyzed in the previous section suggested that access to formal credit was determined by the land owned, non-land assets, proportion of irrigated area and adoption of HYV seeds etc .The present model (regression analysis) deals with the amount of formal credit lent is influenced by various factors as shown in table-1.7. It is observed from the table-1.7 that the Percentage of irrigated area to gross cropped area is found positive and significant in V-3 whereas it negative and significant in ALL-V which may be due the negative relationship of this factor with the demand for formal credit in V-1and V-2 (even though not significant) . Similarly while analyzing the relation of irrigated land with demand for credit across farm sizes it is found positive but not-significant for Small and positive but not-significant for Medium and Large farm sizes. Thus in this case the expected relation (i.e. positive) proves to be varied across the villages and farm sizes. Thus the presence of irrigation in all the cases may not be considered as important

determinants of credit disbursed by formal lenders. The relationship of Caste factor with demand for formal credit is found negative but not significant in V-1, V-2 and ALL-V (except V-3, where it is positive but not significant). Similarly, while analyzing it across the farm size, the relationship of caste factor with the demand for formal credit is found negative but insignificant for all farm sizes (for large farm sizes it is negative and significant).Thus it can be said that the expected relationship of caste factor with demand for formal credit is found almost equal to actual findings even though statistically not significant indicating the fact that framers belongs to non-schedule castes and non-schedule tribes obtain higher amount of formal credit compared to that of framers belongs to schedule castes and schedule tribes. The positive and significant coefficient of Education as found in V-3 and for Small farms reveals that farmers who possessed a 10^{th} class or above enjoyed more credit than their less well educated counterparts. However the coefficient of education is found negative but not significant in case of others villages and entire area under study (i.e. V-1, V-2 and ALL-V) as well as for Medium and Large farm sizes. Thus in this case also the expected sign is not equal to actual findings as difference is observed across the villages and farm sizes. The Income excluding own farm activity as proportion of total family income (i.e. proportion of non-farm income) is found positive and significantly related to the amount of formal credit obtain in ALL-V as because it is found positive for V-1 and V-2 even though not-significant whereas it is negative but not-significant in V-3. Similarly, this relationship is found negative but not-significant for Small and Medium farm sizes whereas it is found positive and significant for Large farm sizes. Thus, on an average considering the whole sample case the result indicates a positive relationship of the non-farm income of the farmers with the amount of formal credit obtained i.e. creditworthy farmers borrow more compared to their less creditworthy counterparts. Thus this relationship may be considered nearly as expected. The relationship of the Ratio of workers to family members with the demand for formal credit is found negative and significant (at different level of significance) across the villages as well as across farm sizes (where for Small far sizes it is negative but not significant). This shows lower the ratio, higher the demand for credit may be to meet the expenses of hired farm workers or to suffice the deficiency of own fund for farming as number of farm workers are less in the family. The relationship of the expenditure on fertilizer and pesticide with the demand for formal credit is found positive in all the villages i.e positive in V-1 and significantly positive in V-1 and ALL-V (except V-3 where it is negative and significant) and also found positive for all farm sizes (even though it is positive and significant for large farm sizes and positive for other farm sizes).This indicates that the per acre expenditure on these inputs not only increases the farm productivity but also enhance the creditworthiness to demand more formal credit to improve further the agricultural productivity. The relationship between the Operated Area and the amount of formal credit obtained is found negative and significant in all the villages. This indicates that the amount of formal credit obtained decreases as the operated area increase which may be due to the fact that loan is given by the formal credit institution mainly based on land owned but not on operated area which is also a major concern for the tenant farms to obtain a formal loan against the area leased in without depending on the landlord. The same negative but not significant results found across farm sizes (except the case of medium farms where it is positive but insignificant). Thus, the operated area may be considered as one of the important factor affecting the amount of credit obtained from the formal sector. The value of agricultural output is found having positive and significant relation with the demand for formal credit in V-1, V3 and All-V (it is negative and significant only in V-2 i.e. Semi-irrigated village). This relationship is also found positive (not significant) across the farm sizes. This positive relation implies that an increase in production raises the demand for more formal farm credit. It can be inferred from the above analysis that the Ratio of farm workers to family members, Operated Area, Expenditure on Fertilizer & pesticide , Value of total Production and to certain extent proportion of non-farm income are found as the important determinants of the amount of formal credit obtained by the farmers belongs to different villages and various size-classes.

Table-1.7: Determinants of Demand for Formal Credit: Regression (OLS) result
Dependent Variable: Amount of formal credit obtained by the farmers (in Rs.)

	V- I	V- II	V- III	ALL- V	SML	MED	LARGE
	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Intercept	5665.34 (0.88)	6888.99** (2.50)	-682.65 (-0.70)	5878.15* (3.63)	1185.38 (1.03)	-9050.99 (-1.25)	5951.87 (0.54)
Percentage of irrigated area to gross cropped area	-45.51 (-0.35)	-41.07 (-0.95)	299.88* (6.26)	-82.35 * (-3.10)	7.36 (0.34)	-97.03 (-0.85)	-60.35 (-0.33)
Caste status:	-1904.16	-1351.88	447.01	-151.06	-558.45	-	-32.70

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

=1, if borrower belong to Schedule caste or Schedule tribe, = 0, otherwise	(-0.92)	(-0.90)	(1.02)	(-0.17)	(-0.99)	3696.28 *** (-1.89)	(-0.01)
Educational qualification of the borrower: = 1, for 10th or more = 0, otherwise	714.82 (0.41)	-2474.96 (-1.05)	1480.68 ** (2.08)	-58.90 (-0.05)	1646.88 ** (2.20)	-1183.88 (-0.56)	-745.93 (-0.21)
Income excluding own farm activity as proportion of total family income (in rupees)	0.01 (0.57)	0.02 (1.16)	-0.01 (-0.80)	0.03 * (3.05)	-0.01 (-0.97)	-0.02 (-0.95)	0.04 ** (2.04)
Ratio of workers to family members	-13279.68 * (-3.54)	-6415.44 *** (-1.91)	-2942.08 ** (-3.04)	-7570.75 * (-4.10)	-633.44 (-0.53)	-7216.28 *** (-1.83)	-28523.40 * (-4.16)
Operated Areas (in acres)	-1960.87 ** (-2.47)	-1121.72 ** (-2.33)	-947.98 ** (-2.04)	-1393.76 * (-5.73)	-390.37 (-1.20)	560.76 (0.58)	-718.12 (-0.92)
Fertilizer & pesticide (in Rs.)	0.90 (1.11)	4.95 * (4.89)	-0.73 ** (-2.74)	1.24 * (3.61)	0.14 (0.27)	1.01 (0.93)	1.44 *** (1.80)
Total Production (in Rs.)	0.20 ** (2.79)	-0.32 ** (-2.19)	0.47 * (5.34)	0.12 * (3.70)	0.07 (1.58)	0.17 (1.37)	0.07 (0.81)
R Square	0.77	0.51	0.63	0.73	0.19	0.56	0.75
No. of Observations	192	139	143	474	252	129	93

1.8 Factors influencing distress Sale of Paddy

The effect of the variables influencing the distress sale of paddy has been examined by using regression analysis (ordinary least squares method) as represented in table-1.8. It is observed from the table-1.8 that irrespective of the irrigation status of the villages and size groups of the farms under study the Informal credit is found having positive and highly significant relationship with the distress sale of paddy (i.e. income loss due to distress sale) in the area under study. It means an increase in informal credit availed by the farmers' leads to an increase in the income loss due to distress sale. Whereas the access to formal credit is found negative and significant relationship with income loss due to distress sale for all the villages and farm sizes under study. It implies that an increase in the accessibility to formal credit reduces the income loss due to distress sale. Similarly, the caste status is found having negative and significant relationship with income loss due to distress sale for all size groups of farms and for V-2 and All-V (except in V-1 & V-3). It implies higher is the caste status less is the income loss due to distress sale. Further, The Proportion of marketable

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

surplus sold to regulated market is found having negative and significant relationship with the income loss due to distress sale for all villages and all farm sizes (except large farms) in the area under study. It implies that the higher the proportion sold to regulated market (as it is at MSP), the lower will be the income loss due to distress sale.

Table-1.8: Determinants of Distress Sale- Regression Results (OLS)
Dependent Variable: income loss due to distress sale (in Rupees)

	V-1	V-2	V-3	All S	All M	All L	ALL V
Variable Description	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient	Coefficient
Intercept	-867.28 *** (-1.75)	187.31 (0.79)	182.83 (1.22)	-381.12 * (3.47)	1244.86 * (4.36)	3933.04 ** (2.74)	-522.66 (-1.45)
Informal credit (in Rs.)	0.64 * (11.55)	0.77 * (20.60)	0.32 8* (7.09)	0.62 * (18.66)	0.44 * (11.37)	0.46 * (6.51)	0.70 * (20.77)
Access to formal credit: = 1 if yes = 0, otherwise	-8757.8 * (-6.86)	-1784.6 * (-3.20)	-898.37 * (-4.09)	-1805.5 * (-5.92)	-3341.85 * (-5.30)	-11422.02 * (-8.9)	-5523.27 * (-8.61)
Caste status: =1, if farmers belong to Schedule caste or Schedule tribe = 0, otherwise	-463.02 (-0.75)	-1008.82 ** (-2.93)	111.63 (0.78)	-104.64 * (-0.81)	-605.08 *** (-1.88)	-5372.92 * (-3.97)	-945.67 ** (-2.13)
Proportion of Marketable surplus per acre sold to regulated market (in bags)	-37.72 ** (-2.05)	-29.68 * (-5.30)	-18.28 * (-5.77)	-14.49 * (-3.76)	-14.06 ** (-2.54)	-7.83 (-0.37)	-32.94 * (-4.48)
N	192	139	143	252	129	93	474
F	133.04 *	244.07 *	36.45 *	133.41 *	64.87 *	75.18 *	210.48 *
R square	0.63	0.66	0.60	0.61	0.52	0.53	0.64

VIF

VIF	V1	V2	V3	All S	All M	All L	ALL V
Informal credit (Rs.)	1.09	1.03	1.22	1.17	1.27	1.23	1.04
Access to formal credit	3.37	1.84	1.81	2.10	2.14	2.01	2.28
Caste status	1.20	1.03	1.09	1.04	1.12	1.10	1.10
% of Marketable surplus sold to regulated market	3.22	1.83	1.05	1.93	2.02	2.05	2.23
Mean VIF	2.22	1.43	1.44	1.56	1.64	1.60	1.66

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

1.9 Impact of Credit on Resource (Inputs) use and Rice Productivity

The impact of credit (formal and informa) on the input used and on the productivity i.e. production of rice (paddy) per acre is required to be analyzed to assess the importance and efficiency in the use of the said sources of credit by different farm sizes and by farmers belongs to different villages with varied level of irrigation status. For assessing the impact of credit (formal & informal) on the resource i.e. input used, an Index of inputs used in farming has been constructed by applying Principal Component Analysis (PAC) as mentioned in the methodology and the linear regression (OLS) model with dummy (for intercept & slope) has been applied to estimate the impact of formal and informal credit on the Index of input used across different farm sizes and villages under study. Similarly, to assess the impact of credit (formal & informal) on the Productivity of rice (paddy) across the various size groups of farm and villages considered for the study also the linear regression (OLS) model with dummy (for intercept & slope) has been applied. The specification of the regression equation applicable to both the cases is given as follows:

$$Y = \propto + \sum_{i=1}^{4} \beta iDi + \sum_{j=1}^{2} \gamma j\, Fj + \sum_{i=1}^{4} \delta iDi\ (F1) + \sum_{i=1}^{4} \theta iDi\ (F2) + u - - - -eqn.(1)$$

Where,
D_1 = Semi irrigated Village, D_2 = Non-irrigated Village, D_3 = Medium Farm size
D_4 = Large Farm size, F_1 =Formal Credit, F_2 = Informal Credit

Because of the presence of multicollinearity alternative specification of eq.(1) are computed and results are reported in the table.

Table-1.9 reveals the operationalisation of variables i.e. description of variables such as dependent, independent and dummy variables used in regression model for both the cases.

Impact of Credit on Resource (Inputs) use

Table 1.9 (a) reveals the regression results pertaining to the impact of credit (formal & informal credit) on input used across the farm sizes and villages. The results of two models (model-I & II) has been discussed to avoid the problem of multicolinerarity and so as to get unbiased results.

As evident from the result of model-I, there is no impact of credit whether formal or informal on the index of input used (as found statistically insignificant). The index of input used in non-irrigated area is found significantly negative (i.e. found declining) as compared to irrigated area. It means a unit increase in non-irrigated area leads to decrease the magnitude of inputs used for farming to certain extent as observed from the table. Hence, the index of input used is higher in irrigated area than that of non-irrigated area. Further, it is found that the index of input used is directly related to farm sizes. It means the use of inputs for farming is found significantly increasing with the increase in farm size. Hence, the magnitude of input used is higher for large and medium farm as compared to small farm. The impact of medium and large farms in semi-irrigated as well as non-irrigated area on the index of inputs used is found negative and significant as compared to the small farms of irrigated area as observed from the table. It means the magnitude of input used is found less for medium farm and large farms in semi-irrigated and non-irrigated areas as compared to that of small farm in irrigated area.

From model-II, it is observed that the farm size has a positive and significant relationship with the index of inputs used. It means the magnitude of inputs used is found higher for medium and large farms as compared to small farm. The impact of formal credit on index of input used is found negative and significant in non-irrigated villages as compared to irrigated area. This may be attributed to diversion or misutilisation of production oriented formal credit in non-irrigated village. However, the impact of informal credit on inputs used is found positive and significant in semi-irrigated villages but found negative and significant in non-irrigated villages as compared to irrigated villages. The impact of medium and large farms in semi-irrigated as well as non-irrigated area on the index of inputs used is found negative and significant as compared to the small farms of irrigated area as observed from the table. It means the magnitude of input used is found less for medium farm and large farms in semi-irrigated and non-irrigated areas as compared to that of small farm in irrigated area.

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

Impact of Credit on Rice Productivity

Table 1.9.(b) reveals the regression results pertaining to the impact of credit (formal & informal credit) on productivity of rice across the farm sizes and villages. The results of two models (model-I & II) has been discussed to avoid the problem of multicolinerarity and so as to get unbiased results.As evident from the result of model-I, there is a significantly negative impact of informal credit on the production of rice per acre but there is no such impact of formal credit. The production of rice per acre is lower in semi-irrigated and non-irrigated area as compared to irrigated area. Moreover, the production of rice is much lower in non-irrigated area as compared to semi-irrigated area. The production of rice is higher in medium size farm and large size farm in comparison to small size farm and it happens to be much higher in large size farm. The productivity of rice is higher in case of medium farm size in semi-irrigated area. This happens to be much higher if the farm is of medium size and the village is non-irrigated as compared to small farm size in irrigated villages. From model-II, it is observed that the productivity of rice is higher for medium and large farm size than small farm size and it happens to be much higher in large farm size. The productivity of rice is lower if the source of credit is formal in semi-irrigated and non-irrigated area than irrigated area. It happens to be much lower if the source of credit is formal in semi-irrigated villages. This may be attributed to diversion or misutilisation of formal credit from production purpose to other purposes in both the semi-irrigated and non-irrigated area. There is no such impact of formal credit of farm-sizes on the productivity of rice. The productivity of rice is lower if the source of credit is informal in semi-irrigated and non-irrigated area than irrigated area. It happens to be much lower if the source of credit is informal in non-irrigated villages. It implies that the informal credit also not utilized properly for production purpose in both semi-irrigated and non-irrigated area. The medium farm size of semi-irrigated area has a positive impact on productivity of rice. The productivity of rice is lower in case of medium farm size in semi-irrigated area. This happens to be much lower if the farm is of large size in semi-irrigated village. The productivity of rice is also lower in non-irrigated area in case of medium and large farm size as compared to small farm in irrigated village and this happens to be much lower if the farm size is medium and the village is non-irrigated.

Table-1.9: Impact of Credit on Index of Input used and Rice Productivity-Operationalization of Variables

Variable Name	Description of variables	Measurement	Expected Sign
Index of Input used	Dependent variable	Cost of Input used per acre (in Rs.)	
Rice Productivity	Dependent variable	Production of Rice (Paddy) per acre (in Rs.)	
D_1 =Semi irrigated Village	Dummy variable	D_1 = 1, if village is Semi-irrigated else = 0	+
D_2 = Non-irrigated Village	Dummy variable	D_2 = 1, if village is non-irrigated else = 0	-
D_3 = Medium Farm size	Dummy variable	D_3 = 1if farm size is Medium Else = 0	+
D_4 = Large Farm size	Dummy variable	D_4 = 1 if farm size is Large else = 0	-
F_1 =Formal Credit	Independent variable	Amount of formal credit per acre (in Rs.)	
F_2 = Informal Credit	Independent variable	Amount of informal credit per acre (in Rs.)	

Table 1.9 (a): Impact of credit (formal & informal) on Index of Inputs used across farm sizes & Villages Regression Results
Dependent variable: Index of Input used

Variable Name	Model-I		Model-II	
	Coefficient	t-value	Coefficient	t-value
Constant	1049.007*	44.14	936.6216*	49.98
F_1 =Formal Credit	.000313	0.13		
F_2 = Informal Credit	-.0012689	-0.05		
D_1 =Semi irrigated Village	-22.76343	-0.68		
D_2 = Non-irrigated Village	-401.8182*	-20.14		
D_3 = Medium Farm size	353.3712*	14.30	467.3948*	15.61
D_4 = Large Farm size	553.0582*	24.24	682.5338*	14.31

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

D_1 F_1 = Formal credit by Semi irrigated Village			.0189333	0.90
D_2 F_1 = formal credit by Non-irrigated Village			-.0154186**	-2.40
D_3F_1 = Formal credit by Medium Farm size			-.0194811	-1.35
D_4 F_1 = Formal credit by Large Farm size			-.0622209	-1.09
D_1 F_2 = Informal credit by Semi irrigated Village			.1015927 **	2.04
D_2 F_2= Informal credit by Non-irrigated Village			-.340483*	-10.79
D_3F_2 = Informal credit by Medium Farm size			.0289106	0.57
D_4 F_2 = Informal credit by Large Farm size			-.0067445	-0.11
D1D3	-302.0493*	-6.27	-371.5084*	-8.90
D1D4	-360.9755*	-7.30	-446.6962*	-9.45
D2D3	-124.2832*	-4.44	-365.3136*	-13.54
D2D4	-46.32355***	-1.72	-243.7908*	-4.78
R^2	0.7775		0.6938	
F- Test	479.00		207.29	
No. of Observations, No. of Variables	474, 11		474, 15	
Mean VIF	2.09		3.02	

Note: (*) at 1%, (**) at 5% and (***) at 10% level of significance

Table 1.9 (b): Impact of credit (formal & informal) on Rice Productivity across farm sizes & Villages Regression Results

Dependent Variable: Production of rice per acre (in Rs.)

Variable Name	Model-I		Model-II	
	Coefficient	t-value	Coefficient	t-value
Constant	7078.052*	78.24	6031.107	48.87
F_1 =Formal Credit	.0010011	0.08		
F_2 = Informal Credit	-.1550297**	-1.95		
D_1 =Semi irrigated Village	-1505.989*	-14.94		
D_2 = Non-irrigated Village	-3006.568*	-31.48		
D_3 = Medium Farm size	231.0409**	2.32	1000.933*	5.70
D_4 = Large Farm size	486.8161*	4.95	1341.521*	5.59
D_1 F_1 = Formal credit by Semi irrigated Village			-.2050141*	-2.93
D_2 F_1 = formal credit by Non-irrigated Village			-.1271896**	-2.53
D_3F_1 = Formal credit by Medium Farm size			.0565111	0.78
D_4 F_1 = Formal credit by Large Farm size			.0118306	0.10
D_1 F_2 = Informal credit by Semi irrigated Village			-.6092225*	-3.85
D_2 F_2= Informal credit by Non-irrigated Village			-2.245205*	-10.25
D_3F_2 = Informal credit by Medium Farm size			.7871496*	3.80
D_4 F_2 = Informal credit by Large Farm			.2431874	0.83

Journal of Informatics Education and Research
ISSN: 1526-4726
https://doi.org/10.52783/jier.v3i2.554
Vol 3 Issue 2 (2023)

size				
D1D3	319.6968**	2.21	-925.2088*	-6.75
D1D4	-121.8939	-0.78	-1322.634*	-8.84
D2D3	275.7936**	2.26	-1781.333*	-13.12
D2D4	238.2828	1.15	-1586.449*	-8.99
R^2	0.8527		0.5848	
F- Test	395.91		158.70	
No. of Observations, No. of Variables	474, 11		474, 15	
Mean VIF	2.09		3.02	

Note: (*) at 1%, (**) at 5% and (***) at 10% level of significance

1.10 Findings and Conclusion

The percentage of small farms depends on borrowing is comparatively found higher than other categories of farms under study. However, the percentage of farms borrowing from formal sector is having direct relationship with farm sizes. It indicates that the dependency of large farm size on informal credit is relatively less than that of other farm sizes. Further, the percentage of borrowers from formal sector found higher in irrigated Village compared to semi-irrigated and non-irrigated villages. It is also found that the percentage of formal borrowers taking informal loans increases with the increase in farm sizes. This indicates credit deficit for all farm sizes. Irrespective of the irrigation status and level of agricultural development the dependency on informal credit by all categories of farms found in the area under study. This finding supports the findings of Selvaraj et.al, 1998 i.e. the growth of formal credit does not necessarily lead to a decline in informal credit despite high interest rate as farmers of all categories depend on both the sources of credit for adoption of modern technology.

The significant determinants of access to formal credit found are the total land owned, value of non-land assets and area under HYV. Similarly, the factors affecting significantly to the demand for formal credit by the farmers are the non-farm income of the farmers, expenditure on fertilizer and pesticide, increase in production and operated area (even though the operated holding is found having negative relationship with the demand for formal credit due to tenancy factor). The most significant factors found affecting the distress sale of paddy acroos the villages and farm sizes in the area under study and dependency on informal credit, less accessibility to formal credit, Caste discrimination and less proportionate sale of paddy in regulated market.

It is found while discussing the impact of formal and informal credit on the use of resources or inputs for farming across the villages and farm sizes that the size of the farms and irrigation status are more influencing the quantum of inputs used than that of credit (formal & informal) factor. However, the impact of formal credit on index of input used is found negative and significant in non-irrigated villages as compared to irrigated area.. But the impact of informal credit on inputs used is found positive and significant in semi-irrigated villages whereas found negative and significant in non-irrigated villages as compared to irrigated villages. Similarly, while discussing the impact of formal and informal credit on the productivity of rice across the villages and farm sizes it is found that the size of the farms and irrigation status are more influencing the productivity of rice than that of credit (formal & informal) factor. However, there is a significantly negative impact of informal credit on the production of rice per acre but there is no such impact of formal credit. Further, the productivity of rice is lower if the source of credit is formal in semi-irrigated and non-irrigated area than irrigated area. Whereas the productivity of rice is lower if the source of credit is informal in semi-irrigated and non-irrigated area than irrigated area.

Thus, based on the finding of the analysis made it can be concluded that the dependency on informal credit by all size groups of farms at different degree is still prevailing indicating the fact that the accessibility and adequacy of formal sources of credit for farming is yet to achieve its goal of catering the credit needs of the farmers. The credit is required very much for adopting modern technology and thereby increasing productivity, But due to the inadequate formal farm credit farmer suffers from credit deficit due to increase in cost of production in one hand and distress sale of their marketable surplus on the other hand. The land owned being one of the important criteria for accessibility to formal farm credit the farmers having higher operated are or the tenants are suffering from inadequacy of credit as well as succumbed to the pressure of distress sale of their produces. Further, the irrigated or agriculturally developed area is getting more advantages of formal credit as well as marketing than that of non-irrigated area is also creating a disparities

in the agricultural development. Therefore steps should be taken to provide adequate formal farm credit at affordable rate with due accessibility and market & marketing infrastructure including warehousing facilities should be strengthened so as to ensure equitable and sustainable development of agriculture in the area/ regions under study.

References

1. Binswanger, H.P. and Donald A. Sillers, (1983)Risk Aversion and Credit constraints in Farmers' Decision Making: A Reinterpretation, Journal of Development Studies,Vol.22, No.1
2. Donald, G. (1976), Credit for Small Farmers in Developing Countries, Boulder, CO: Westview Press.
3. Lipton, M. (1976), Agricultural Finance and Rural Credit in Poor Countries, World Development, Vol.4, No.7
4. Reddy, M.V.. Narayana, (2001), Interlinkages of Credit with Factor and Product Markets: a study in Andhra Pradesh, Indian Journal of Agricultural Economics, Vol. 47, No.4, Pp. 618-630
5. Raparthi, M., Dodda, S. B., & Maruthi, S. H. (2020). Examining the use of Artificial Intelligence to Enhance Security Measures in Computer Hardware, including the Detection of Hardware-based Vulnerabilities and Attacks. European Economic Letters, 10(1), https://doi.org/10.52783/eel.v10i1.991
6. Reddy, T. Pravakhar, (1990), Agricultural Credit A survey, Yojana, 34(17), 27-29
7. Sarap, K. (1987), Transactions in Rural Credit Markets in Western Orissa, India, The journal of Peasant Studies, Vol. 15, No.1
8. Sarap, K. (1990), Factors Affecting Small Farmers' Access to Institutional Credit in Rural Orissa, India, Development and Change, Vol.21, No.2
9. Sarap, K. (1991a),Collaterals and other Forms of Guarantee in Rural Credit Markets, Evidence from Eastern India, Indian Economic Review, , Vol.26, No.2
10. Sarap, K. (1991b),Interlinked Agrarian Markets in Rural India, New Delhi, Sage Publication
11. Selvaraj K.N., Chandran K. and Sundaravaradarajan, (1998), Access to Credit and the Effects of Credit on Resource allocation decisions and Productivity in Indian Agriculture, Asia-Pacific Journal of Rural Development, Vol. VIII, No.2