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Economic impact of agricultural credit-lead technology on asset position and yield– a case study of borrowed farmers in eastern dry zone of Karnataka

BN VENU, R KIRAN* , V VENKATARAMANA REDDY and KB UMESH**

Department of Agricultural Economics
University of Agricultural Sciences, Bangalore 560065 Karnataka
***Department of Agriculture and Rural Management**
Tamil Nadu Agricultural University, Coimbatore 641003 TN
**** International Crops Research Institute for the Semi-Arid Tropics**
Patancheru 502324 Telangana
Email for correspondence: gowdaregalia@gmail.com

ABSTRACT

The study was undertaken in Chikkaballapura district located in eastern dry zone of Karnataka to assess socio-economic characters, asset position, mechanization and yield gaps of credit borrower and non-borrower farmers (NBF). The borrower farmers (BF) had higher cropping intensity (118.73%) than that of NBF (108.90%). The income distribution of the sample farmers revealed that the major contributor of income for BF was average crop income (73.00%) which was followed by non-farm income (14.63%) and livestock income (12.37%). In NBF it was observed that the crop income constituted (61.98%) of the total followed by non-farm (22.18%) and non-farm (17.83%). There was variation in yield of crops due to lag in transfer of technologies and difference in adoption of technology by farmers. However the yield gaps lesser in BF than the NBF may be called as the 'management gap'. This would call for strengthening of extension efforts to disseminate technologies to the farmers besides strengthening input marketing structure for the supply of needed farm inputs including credit so that farmers would use them at appropriate time.

Keywords: Credit-lead technology; borrower and non-borrower farmers; crop income

INTRODUCTION

Recent studies indicate that credit plays a crucial role in increasing technology adoption and input efficiency in the post-green revolution period. Increased specialization in portfolios of agricultural marketing and exports needed a stronger financial structure to aid the farmers in the competing environment. This is evident from a substantial improvement in the flow of institutional credit to agriculture and allied activities over years.

Agricultural development in India was due to Green Revolution. The main aim of Green Revolution was to increase production by increasing the productivity and this approach brought about dramatic structural changes in the agricultural paradigm of the country. Successful development and diffusion of modern high yielding varieties of rice and wheat resulted in a quantum leap in food production far exceeding the pre-Green Revolution phase. This huge leap in output growth was facilitated by the creation of irrigation infrastructure, establishment of specialized institutions, production and distribution of different kinds of inputs like high yielding variety seeds, fertilizers, pesticides and agricultural machinery and above all a strong research base which developed and disseminated the improved agricultural technology.

Karnataka state enjoys a prime position in terms of productivity of major agricultural commodities such as tomato mulberry, ragi, grapes, banana and groundnut. However the area under principal crops including cotton showed a declining trend. This was mainly due to the increase in productivity which was made possible due to the use of modern technologies in crop production and increased input intensity. Introduction of new agricultural technology and modern means of production requires availability of credit to agriculture. Further the impact of technology studied in isolation with credit will be erroneous. With this view in focus the present study was attempted to assess the impact of credit and technology on farm income in Chickballapur district of Karnataka. Earlier Gaddi et al (2002) estimated the magnitude of yield gaps, causative factors and constraints for attaining greater farm potential in Rabi sorghum production in Karnataka. Herdt and Wickham (1975) explored the gap between potential and actual rice yields in Phillipines. In Karnataka Chickballapur district located in south eastern part is endowed with bore wells and well irrigation and a wide variety of crops like tomato, potato, ragi, grapes, groundnut, mulberry, banana and mango etc are grown here. Chickballapur district happens to be an agriculturally developed region where agricultural productivities of major crops are higher than that of the state averages supported with strong rural institutional credit system.

METHODOLOGY

The present study mainly concentrates on impact of agricultural credit-lead technology on asset position mechanization and yield gap in the farm households of borrower and non-borrower farm households. Multistage stratified sampling procedure was adopted for the selection of ultimate units of sample.

Twelve villages were selected randomly for the study. Thus the sample

design resulted in sample size of twenty six for borrower and thirty one for non-borrower categories. The required primary data were collected by personal interview with the selected farmers using pre-tested interview schedule. The secondary data on area, production, cropping pattern and land-use pattern related to the study were collected from Block Development Office and office of the Assistant Director of Agriculture. The tools of analysis included conventional percentage analysis, cropping intensity and yield gap analysis.

Yield gap analysis

Variation in yield of crops due to lag in transfer of technologies and difference in adoption of technology by farmers were measured by yield gap analysis. It was observed that the farmers have not adopted the technologies in full and consequently potential has not been reached leaving a gap denoted as Gap I for the study and was measured by the difference between potential yield and the maximum yield observed in the sample farms.

Yield Gap I= Potential yield – Maximum yield

Potential is the yield obtained in the research plot. It was also assumed that the maximum yield attained by a farmer had the possibility of replication by the other farmers. However there was a shortfall from the maximum yield and this could be reasonably attributed to the failure to adopt technology to the extent possible in general field conditions, agro-climatic conditions and economic factors such as cost-price relationships prevailing in the district. Thus there was a gap due to differences in adoption of technology and this was called Gap II and measured as follows:

Yield Gap II= Maximum farm yield – Average farm yield

Thus it implied an assumption that the difference between average yield and the lowest yield of the sample farms was due to avoidable managerial deficiency and any farmer could easily attain the average yield. Then Gap I plus Gap II would measure the total gap in the yield of a crop.

The yield gap was conceptualized as the difference between potential yield and the actual farm yield and it was used to analyze the impact of technology. The potential yield data were collected from Agricultural College and Research Institute, and Horticultural College and Research Institute, GKVK, Bangalore, Karnataka.

RESULTS and DISCUSSION

Land holding pattern

Farm size is positively related to unit cost of operation and hence the same is discussed. The sample respondents were post-stratified into marginal, small, semi-medium, medium and large farmers taking into consideration the size of the farm. The details on category-wise distribution of sample respondents in the study area are presented in Table 1. Among the selected respondents there were 24 small

Table 1. Average land holding pattern of the sample farmers (in ha)

	BF	NBF
Group I	1.415385	1.227273
Group II	2.984444	2.84125
Group III	7.275	6.4
Total	11.63483	10.60852

(less than 2 hectares), 25 medium (2 to 5 hectares) and 8 large farmers (above 5 hectares).

It is observed from the table that the average land holding was higher with borrowing farmers than non-borrower farmers. In BF Group I average land holding was1.4 ha and 1.2 ha in NBF and in Group II it was 2.98 ha and 2.84 ha in BF and NBF respectively.

Asset position

The asset position of the sample farms formed the important factor for getting various loans from the banks ie it acted as a security and hence it is discussed in three sections namely land value, livestock position and other assets as follows:

Land value

Since the land value showed significant differences across types of lands it would be apt to discuss land value in terms of garden and dry land owned by the respondents. Hence the same was resorted to in the analysis of the land value distribution.

Table 2 depicts the average value of land for the BF which was Rs 4.69 lakhs/ ha while it was lesser for NBF ie Rs 4.01 lakhs/ha.

Livestock position

Extent of livestock rearing among the sample farms would help in understanding the extent of supplementary income earned by the sample farmers. The details regarding number of milch animals, work animals, sheep and goats maintained by the sample farms are given in Table 3.

The total value of livestock was more in BF (Rs 19054.91 per farm) when compared with that of NBF (Rs 17196.86 per farm). This can be observed from the Table 3 when the share of local and cross bred cow in BF and NBF were observed. The percentage contribution of cross bred cow to the total livestock value was lesser in NBF (17%) than that of BF (21%). However the contribution of sheep to the total livestock value was very high in BF (31%) than that in NBF (28%). However it can be observed from Table 3 that the percentage shares of sheep and goat of the NBF were

Table 2. Average land value of the sample farms (in lakh rupees/ha)

Type of land	BF				NBF			
	Group I	Group II	Group III	Group average	Group I	Group II	Group III	Group average
Garden land	5.82	5.86	5.99	5.89	4.96	5.12	5.24	5.10
Dry land	3.12	3.62	3.71	3.48	2.73	2.86	2.98	2.85
Irrigated land	4.53	4.76	4.85	4.71	3.83	4.15	4.28	4.08
Average land value	4.49	4.74	4.85	4.69	3.84	4.04	4.16	4.01

Table 3. Livestock position of the sample farmer in value (per farm)

Livestock position	BF				NBF			
	Group I	Group II	Group III	Group average	Group I	Group II	Group III	Group average
Bullock	1176.923	372.22	1685	1078.0	1663.6	1398.7	0	1020.7
a) Local cow	753.8462	1633.3	3062.5	1816.5	2109.0	2901.8	0	1670.3
b) Cross breed cow	703.8462	4405.5	5337.5	3482.3	540	3386.2	5737.5	3221.2
Buffalo	461.5385	500	1125	695.5	1352.7	1316.2	1687.5	1452.1
Sheep	16276.92	8177.7	0	8151.5	17168.0	1390.6	0	6186.2
Goat	5076.923	6416.6	0	3831.1	6859.0	4080	0	3646.3
Total	24450	21505.3	11210	19054.9	29692.3	14473.5	7425	17196.8

higher than that of BF. On the whole the livestock wealth was more in BF than that in NBF and this was partly because of larger size of holding and other asset position in BF than that of NBF.

Value of farm buildings, machineries and equipment

After the presentation of results of land value it could be apt to analyze the position of other assets such as farm house, machineries, tools and implements of the sample households. Hence the results of the same are presented in Table 4.

It can be observed from Table 4 that farm buildings contributed to about 56.61 per cent of total other asset value in the BF and the corresponding figure for NBF was 54.01 per cent. It was followed by machineries which accounted for 38.89 per cent in BF and 37.50 per cent in NBF. The contribution of equipments was higher for NBF (8.49%) than that of BF (4.50%).Thus the overall value of farm buildings, machineries and equipments of the BF was more in BF than NBF.

Cropping pattern in the sample farms

The cropping pattern of the sample farms gives an insight on the practice of agriculture and indirectly on the income of the farms in the study area. Table 5 shows the details of cropping intensity and the area

Table 4. Value of farm buildings, machineries and equipments in the sample farms

Type of asset	BF			NBF		
	Group I	Group II	Group III	Group I	Group II	Group III
Farm buildings						
Farmhouse	15384.62	22222.22	50000	4545.455	15625	50000
Cattle shed	11538.46	20000	22500	21818.18	18750	7500
Pump house	10769.23	22222.22	55000	12727.27	25000	45000
Silkworm rearing house	0	50000	45000	0	22500	22500
Farm machinery & equipment						
Tractor	41538.46	180000	405000	49090.91	67500	270000
Power tiller	0	25555.56	57500	0	14375	57500
Cultivator	615.3846	2666.667	8000	727.2727	1000	6000
Disc plough	0	2000	1500	545.4545	750	3000
Bullock cart	692.3077	500	0	1227.273	1406.25	0
MB plough	230.7692	166.6667	0	1090.909	750	375
Submersible pump set	10769.23	24444.44	55000	12727.27	22500	50000
Intercultural implements						
Spade	353.8462	655.5556	1375	272.7273	637.5	1250
Sickle	272.3077	446.6667	990	218.1818	437.5	812.5
Feeders	0	1694.444	1875	0	734.375	937.5
Egg trays	0	3055.556	2625	0	1453.125	1875
Buckets	0	488.8889	460	0	190	200
Chawki rearing boxes	0	588.8889	375	0	200	375
Rearing trays	0	4722.222	4687.5	0	1875	2187.5
Rearing stand	0	14444.44	12500	0	5875	7500
Chandrike	0	5444.444	5500	0	2187.5	2500
Total	92164.62	381318.9	729887.5	108263.6	204496.3	532512.5

Table 5. Cropping pattern of the sample farms (per ha)

Crop	BF		NBF	
	Area (ha)	%	Area (ha)	%
Banana	1.491935	12.25	0.817308	10.08
Potato	2.403846	19.77	1.129032	13.93
Tomato	1.682692	13.84	1.391129	17.17
Mulberry	0.913462	7.51	0.443548	5.47
Maize	0.769231	6.32	0.524194	6.47
Groundnut	0.907258	7.46	0.288462	3.56
Ragi	1.512097	12.4	1.25	15.42
Maize	0.721154	5.93	1.108871	13.68
Beans	0.673077	5.53	0.403226	4.97
Chilli	0.096154	0.79	0.141129	1.74
Mango	0.384615	3.16	0.282258	3.48
Grape	0.408654	3.36	0.16129	1.99
Pomegranate	0.192308	1.58	0.16129	1.99
Total	12.15648	100	8.101737	100

under different crops grown in the study area.

The Table 5 shows that among the sample farms potato was largely cultivated and it was followed by tomato, banana and mulberry in BF and NBF. The reason for this could be attributed to the short-term credit that was availed of by the BF whereas NBF depended on owned capital to raise the above mentioned crops. Also the commercial crops required huge working capital which was not available with NBF. Hence groundnut, sorghum and chilli were cultivated in a larger area in NBF than that in BF. Also the BF showed disinterest in raising low income crops. It was also observed that onion and chilly occupied only minimal area in both BF and NBF.

Impact of Technology

Technology in the present study was taken as the complete package of practices as recommended by the Karnataka Agricultural University, Bangalore. Thus in order to study the impact of agricultural credit-lead technology on yield gap of selected crops of sample farms the yield gap analysis was resorted to for the major crops grown by the respondents.

From Table 6 it could be seen that there existed yield gap in tomato. The yield gap I was 1110, 1070 and 1020 accounting for 30.83, 53.58 and 35.85 per cent of the total yield gap for Group I, Group II, and Group III respectively for BF. The yield gap II was 2489.8 (69.16%), 1914.6 (64.14%) and 883.4 (46.41%) for BF and 2243.1

Table 6. Yield gap in tomato (kg/ha)

Particulars	BF			NBF		
	Group I	Group II	Group III	Group I	Group II	Group III
Potential yield	19250	19250	19250	19250	19250	19250
Maximum yield	18140	18180	18230	17460	17610	17830
Yield gap I	1110	1070	1020	1790		
Maximum yield	18140	18180	18230	17460	17610	17830
Average yield	15650.2	16265.4	17346.6	15216.9	15374.1	15795.4
Yield gap II	2489.8	1914.6	883.4	2243.1	2235.9	2034.6
	(69.16)	(64.14)	(46.41)	(55.61)	(57.68)	(58.89)
Total gap	3599.8	2984.6	1903.4	4033.1	3875.9	3454.6
	(100)	(100)	(100)	(100)	(100)	(100)

Figures in parentheses indicate percentage to the total

(55.61%), 2235.9 (57.68%) and 2034.6 (58.89%) for NBF of the total yield gap. The total yield gap was 3599.8 (100%) and 2984.6 (100%) and 1903.4 (100%) for BF and 4033.1 (100%), 3875.9 (100%) and 3454.6 (100%) for NBF. Thus it could be observed that the gap was lesser for BF than that of NBF. The average yield in BF was higher (17346.6 kg/ha) when compared with that of NBF (15795.4 kg/ha) and this increased yield in BF accounted for 14.29 per cent of the yield obtained in NBF.

From Table 7 it could be observed that there existed yield gap in potato. The yield gap I was 17.9 (73.36%), 12.2 (70.93%) and 11.8 (75.15%) and 23.3 (69.34%), 18.6 (81.93%) and14.2 (86.58%) gap for BF and NBF respectively. The yield gap II was 6.5 (26.63%), 5 (29.06%) and 3.9 (24.84%) and 10.3 (30.65%), 4.1(18.06%) and 2.2 (13.41%) for BF and NBF respectively. The total yield gap was 24.4 (100%) 17.2 (100%) and15.7 (100%) and 33.6 (100%) 22.7 (100%) and16.4 (100%) for BF and NBF respectively. Thus it could be observed that the gap was lesser for BF than that of NBF. The average yield in BF was higher (264.3 q/ha) when compared with that of NBF (253.6 q/ha) and this increased yield in BF accounted for 12.29 per cent of the yield obtained in NBF.

Table 8 depicts the existence of yield gap in mulberry. The yield gap I was 56.6 (93.86%), 50.2 (87.15%) and 47.4 (86.65%) and 58.3 (75.32%), 55.7 (81.07%) and 50.5 (79.77%) for BF and NBF respectively. The yield gap II was 3.7 (6.13%), 7.4 (12.84%) and 7.3 (13.34%)

Table 7. Yield gap in potato (q/ha)

Particulars	BF			NBF		
	Group I	Group II	Group III	Group I	Group II	Group III
Potential yield	270	270	270	270	270	270
Maximum yield	252.1	257.8	258.2	246.7	251.4	255.8
Yield gap I	17.9	12.2	11.8	23.3	18.6	14.2
	(73.36)	(70.93)	(75.15)	(69.34)	(81.93)	(86.58)
Maximum yield	252.1	257.8	268.2	246.7	251.4	255.8
Average yield	245.6	252.8	264.3	236.4	247.3	253.6
Yield gap II	6.5	5	3.9	10.3	4.1	2.2
	(26.63)	(29.06)	(24.84)	(30.65)	(18.06)	(13.41)
Total gap	24.4	17.2	15.7	33.6	22.7	16.4
	(100)	(100)	(100)	(100)	(100)	(100)

Figures in parentheses indicate percentage to the total

Table 8. Yield gap in mulberry (kg/ha)

Particulars	BF			NBF		
	Group I	Group II	Group III	Group I	Group II	Group III
Potential yield	320	320	320	320	320	320
Maximum yield	263.4	269.8	272.6	261.7	264.3	269.5
Yield gap I	56.6	50.2	47.4	58.3	55.7	50.5
	(93.86)	(87.15)	(86.65)	(75.32)	(81.07)	(79.77)
Maximum yield	263.4	269.8	272.6	261.7	264.3	269.5
Average yield	259.7	262.4	265.3	242.6	251.3	256.7
Yield gap II	3.7	7.4	7.3	19.1	13	12.8
	(6.13)	(12.84)	(13.34)	(24.67)	(18.92)	(20.22)
Total gap	60.3	57.6	54.7	77.4	68.7	63.3
	(100)	(100)	(100)	(100)	(100)	(100)

Figures in parentheses indicate percentage to the total

and 19.1 (24.67%), 13 (18.92%) and 12.8 (20.22%) for BF and NBF respectively. The total yield gap was 60.3, 57.6 and 54.7 and 77.4, 68.7 and 63.3 for BF and NBF respectively ie cent per cent. Thus it could be observed that the gap was lesser for BF than that of NBF. The average yield in BF was higher (265.3 kg/ha) when compared with that of NBF (256.7 kg/ha) and this increased yield in BF accounted for 10.16 per cent of the yield obtained in NBF.

Table 9 displays the yield gap in banana. The yield gap I was 19.6 (70.25%), 16.8 (62.92%) and 15.4 (60.62%) and 21.3 (72.69%), 18.1 (63.28%) and 16.9 (61.45%) for BF and NBF respectively. The yield gap II was 8.3 (29.74%), 9.9 (37.07%) and 10 (39.37%) and 8 (27.30%), 10.5 (36.71%) and 10.6 (38.54%) for BF and NBF respectively. The total yield gap was 27.9, 26.7 and 25.4 and 29.3, 28.6 and 27.5 for BF and NBF respectively ie cent per cent. Thus it could be observed that the gap was lesser for BF than that of NBF. The average yield in BF was higher (29.6 tons/ha) when compared with that of NBF (27.5 tons/ha) and this increased yield in BF accounted for 6.16 per cent of the yield obtained in NBF.

The relative decline in the yield gap I and yield gap II in BF when compared with that of NBF would indicate more adoption of modern technologies by the former. Obviously the crop loan obtained by BF has aided them in the adoption of modern but costlier technology. This was further confirmed by the higher average

Table 9. Yield gap in banana (tons/ha)

Particulars	BF			NBF		
	Group I	Group II	Group III	Group I	Group II	Group III
Potential yield	55	55	55	55	55	55
Maximum yield	35.4	38.2	39.6	33.7	36.9	38.1
Yield Gap I	19.6	16.8	15.4	21.3	18.1	16.9
	(70.25)	(62.92)	(60.62)	(72.69)	(63.28)	(61.45)
Maximum yield	35.4	38.2	39.6	33.7	36.9	38.1
Average yield	27.1	28.3	29.6	25.7	26.4	27.5
Yield gap II	8.3	9.9	10	8	10.5	10.6
	(29.74)	(37.07)	(39.37)	(27.30)	(36.71)	(38.54)
Total gap	27.9	26.7	25.4	29.3	28.6	27.5
	(100)	(100)	(100)	(100)	(100)	(100)

Figures in parentheses indicate percentage to the total

yield in case of BF (39.6 tons/ha) than that of NBF (38.1tons/ha) and increase in yield in BF accounted for 23.74 per cent of the yield obtained in NBF.

CONCLUSION

Yield gap in selected crops was higher in non-borrower farmers than borrower farms. Gap I was comparatively higher in both the BF and NBF than the Gap II.

It was observed that Gap I was comparatively higher in both the BF and NBF than the Gap II. This was due to the non-adoption of recommended technology by both BF and NBF totally. Gap II was comparatively lesser than the Gap I for both BF and NBF for all the crops. This gap might be due to the biological, socio-economic and technical constraints which were responsible for the deviation in the adoption of recommended levels of new technologies. Maximum yield realized by one farmer could be realized by the other farmers in the similar agro-climatic conditions. Yet there were inter-farm differences in yield due to specific farm constraints that affected managerial efficiency of the farmers. Hence the difference between the maximum yield realized among the sample farms and the actual yield realized by the farmer was called the 'management gap'.

Borrowed credit was more invested on unproductive purposes in borrower farmers and due to delayed disbursement of loan amount not availing institutional credit to non-borrower farmers. These yield gaps can be brought down by strengthening the extension efforts and also by making necessary arrangements to supply the farm inputs at appropriate time through strengthening of input marketing infrastructure. Credit flow should also be adequate so that the farmers can be able to purchase quality farm inputs in adequate quantities.

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