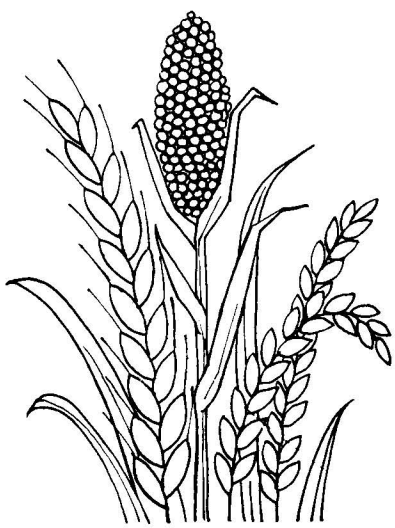
Vol. XLIX
No. 3

CONFERENCE
NUMBER

JULY -
SEPTEMBER
1994

ISSN 0019-5014

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

Ind. Jn. of Agri. Econ.
Vol. 49, No. 3, July-Sept. 1994

Variation in Productivity of Short-Term Credit Used for Wheat Production in Different Zones of Uttar Pradesh Hills

R.S. Tripathi, Chandra Dev and M.L. Sharma*

The emergence of Green Revolution in the late sixties clearly demonstrated the need for effective credit support to farmers for the purpose of inputs and installation of infrastructure for the high-yielding crops. The present approach to agricultural credit is an explicit relationship between credit and input use. The role of crop credit is to enable farmers to switch over to a superior production function and provide support particularly to those farmers whose low income-saving base precludes their undertaking investment without credit (Gadgil, 1986). The importance of credit in agricultural income is thus indirect but positive and its productivity no different from that of the investment financed by it.

The contribution made by credit to agricultural income would depend upon the adequacy and efficiency of infrastructure and the agro-economic situation of the area. It is evident that credit alone can make a limited contribution to securing agricultural income in the less developed regions due to a lower level of use of purchased inputs such as improved varieties of seeds, chemical fertilisers, plant protection measures, etc. The hill region of Uttar Pradesh is one of the backward regions of the country where productivity and return from agricultural enterprises are at a very low level. The uneven topography, terraced fields, lack of irrigation facilities and poor infrastructure restricted the use of high-yielding seeds to 19.5 per cent of the cultivated area, fertilisers to 12 kg/ha and plant protection chemicals to either nil or at a very low level (Sharma and Prasad, 1980; Tripathi, 1987; Kumar and Tripathi, 1989). The main reason for limited adoption of modern farm inputs in the area is the poor investment capacity of the farmers in the hilly region.

On the basis of elevation, temperature, vegetation, rainfall, snowfall, etc., the hill regions are classified into five zones - valleys [<1,000 metres mean sea level (MSL)], mid-hills (1,000 - 1,600 metres MSL), high-hills (1,600-3,000 metres MSL), alpine zone (3,000-4,500 metres MSL) and snow zone (>4,500 metres MSL). But from the view-point of agriculture, only three zones upto an elevation of 3,000 metres MSL, viz., valleys, mid-hills and high-hills have relevance for crop cultivation (Tripathi and Pandey, 1986). Therefore, for the present study only these three zones are considered for detailed investigation. Mostly, the crop cultivation is being taken up under rainfed conditions in these zones and limited irrigation facility is available only in the valleys. Wheat is the major crop of the zones, covering more than 80 per cent of the total cropped area during the *rabi* season, in which the short-term crop credit is used extensively. The major source of crop credit is District Co-operative Bank in all the three zones under study.

There is a lot of variation in the use of modern farm inputs including farm credit and their productivity in agricultural enterprises among different hill zones. At present, very limited information is available on the productivity of farm credit for the hilly areas of Uttar Pradesh and so far only few studies have been conducted to examine the variation in the productivity of short-term crop credit in different zones of the region. This creates a big hurdle not only in the proper utilisation of crop credit at the farm level but also creates

* Govind Ballabh Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal (U.P.).

problems for planners in financial planning and assessment of the credit requirement of the area at macro level. Keeping these facts in mind, the present study was planned and carried out to (i) estimate the variation in the productivity of short-term crop credit in the three zones of Uttar Pradesh hills; and (ii) examine the productivity of rainfed wheat grown under crop credit and non-credit facilities in the area.

METHODOLOGY

Out of the eight hill districts of Uttar Pradesh, Tehri district and Chamba block of the selected district were chosen purposely, considering the easy approach from the Hill Campus, G.B. Pant University of Agriculture and Technology, Ranichauri. Two villages from each zone, i.e., valleys, mid-hills and high-hills, falling under Chamba block, were selected randomly. From each of the selected villages, 10 per cent of the total wheat growers using crop credit and 10 per cent of non-users of credit were selected randomly. Thus in all, 36 farmers using crop credit and 43 non-users of credit were interviewed in all the three zones during the agricultural year 1993-94 to collect the desired data.

The cost of input factors and value of output were based on the prevailing market rates of the locality. The concept of costs A_1, A_2, B_1, B_2, C_1 and C_2 was used to analyse the cost and return (Tripathi, 1992). The following linear form of the multiple regression equation was adopted to estimate the productivity of short-term crop credit and other important variables.

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5$$

where Y is gross return from the production of wheat rainfed in Rs./ha; X_1, human and bullock labour cost in Rs./ha; X_2, cost of seed in Rs./ha; X_3, amount of crop credit used in the crop in Rs./ha; X_4, farm income received from all the sources in Rs./ha; X_5, size of holding in ha; b_1 to b_5 are regression coefficients; and a is the intercept.

RESULTS AND DISCUSSION

The utilisation pattern of input resources under the two conditions - crop credit use and non-use - revealed that the use of inputs was much higher on borrower farms than on non-borrower farms in all the three zones under study, except for hired human labour and manure. The average physical quantities of various input resources used for wheat production in various zones under both cases - borrower and non-borrower groups - are presented in Table I. It is revealed that the use of urea was as high as 645 per cent on borrower farms as compared to the non-borrower group of farms, followed by muriate of potash (561 per cent) and di-ammonium phosphate (540 per cent) in the mid-hill zone. The use of total fertilisers was about 46 per cent higher in the valleys as compared to the high-hills and 100 per cent more than the mid-hill zone in the case of the borrower group of wheat growers. The use of manure under credit condition was about 45 per cent less in the high-hills than that in mid-hill and valley zones. The borrower farmers of the valley zone paid comparatively better attention to plant protection measures. The bullock labour and seed costs were also higher for borrower farms than the non-borrower group and the difference ranged between 1.50 to 78.41 per cent. In general, the use of most of the inputs showed an increasing trend with the decrease in the elevation of the zones. This trend indicates that the investment capacity of the farmers is comparatively more in lower zones.

TABLE I. AVERAGE PHYSICAL UNIT OF THE INPUTS USED ON BORROWER AND NON-BORROWER FARMS GROWING WHEAT IN DIFFERENT ZONES OF THE SAMPLE FARMS

(per hactare)

Inputs	High-hills			Mid-hills			Valleys		
	Non-borrowers	Borrowers	Per cent difference in borrowers over non-borrowers	Non-borrowers	Borrowers	Per cent difference in borrowers over non-borrowers	Non-borrowers	Borrowers	Per cent difference in borrowers over non-borrowers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Family human labour (days)	90.83	123.43	+35.89	136.54	132.53	-2.94	132.95	137.92	+3.74
Hired human labour (days)	13.77	11.54	-16.19	16.83	7.88	-53.18	13.18	1.25	-90.51
Bullock labour (days)	29.36	30.77	+4.80	33.66	35.62	+5.82	21.72	38.75	+78.41
Seed (kg)	111.47	100.70	-9.66	100.00	105.31	+5.31	97.29	98.75	+1.50
Manure (qtl)	39.91	27.63	-30.77	49.52	50.00	+0.97	56.59	51.25	-9.44
Fertiliser (kg)									
(a) Urea	18.35	52.45	+185.83	8.18	60.96	+645.23	20.94	118.75	+467.10
(b) Di-ammonium phosphate	27.53	99.66	+162.01	8.18	52.40	+540.59	21.71	107.92	+397.10
(c) Muriate of potash	2.30	3.50	+52.17	0.13	0.86	+561.54	1.94	1.67	-13.92
Plant protection chemicals (kg)	0.13	0.25	+92.30	0.10	0.12	+20.00	0.22	0.80	+263.64

The details of average cost on various input factors for both the categories of wheat growers are presented in Table II. It is evident from the table that all the costs, i.e., Cost A_1,

TABLE II. AVERAGE INPUT COST FOR BORROWER AND NON-BORROWER WHEAT GROWERS IN DIFFERENT ZONES OF THE SAMPLE FARMS

(Rs./ha)

Inputs	High-hills			Mid-hills			Valleys		
	Non-borrowers	Borrowers	Per cent difference in borrowers over non-borrowers	Non-borrowers	Borrowers	Per cent difference in borrowers over non-borrowers	Non-borrowers	Borrowers	Per cent difference in borrowers over non-borrowers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Hired human labour	344.25	288.50	- 16.20	420.75	197.00	- 53.17	329.50	31.25	- 90.51
Bullock labour	1,059.60	1,230.80	+ 16.16	1,346.40	1,424.80	+ 5.83	868.80	1,550.00	+ 78.41
Seed	668.82	604.20	+ 9.66	600.00	631.86	+ 5.31	583.74	592.50	+ 1.50
Manure	798.20	552.60	- 30.80	990.40	1,000.00	+ 0.97	1,131.80	1,025.00	- 9.44
Fertilisers	285.22	955.30	+234.94	92.38	628.60	+580.45	250.87	1,267.52	+405.25
Plant protection	4.59	8.74	+ 90.42	3.37	4.11	+ 21.96	7.76	27.92	+259.79
Interest on working capital	94.82	107.40	+ 13.27	103.60	116.59	+ 12.54	95.17	134.83	+ 41.67
Depreciation	62.31	71.60	+ 14.91	69.05	72.77	+ 5.39	64.94	98.88	+ 52.26
Land revenue	16.65	16.65	0.00	16.65	16.65	0.00	16.65	16.65	0.00
Cost A_1	**3,334.46**	**3,775.79**	+ 13.24	**3,642.60**	**4,092.38**	+ 12.35	**3,349.23**	**4,744.55**	+ 41.66
Cost A_2	**3,334.46**	**3,775.79**	+ 13.24	**3,642.60**	**4,092.38**	+ 12.35	**3,349.23**	**4,744.55**	+ 41.66
Interest on fixed capital	125.40	134.20	+ 7.02	135.13	154.55	+ 14.37	125.89	197.77	+ 57.10
Cost B_1	**3,459.86**	**3,909.99**	+ 13.02	**3,777.73**	**4,246.93**	+ 12.42	**3,475.12**	**4,942.32**	+ 42.22
Rental value of land	600.00	600.00	0.00	400.00	400.00	0.00	800.00	800.00	0.00
Cost B_2	**4,043.21**	**4,493.34**	+ 11.14	**4,161.08**	**4,630.28**	+11.28	**4,258.47**	**5,725.67**	+ 34.45
Family human labour	2,270.75	3,885.75	+ 35.90	3,413.50	3,313.25	- 2.94	3,323.75	3,448.00	+ 3.75
Cost C_1	**5,730.61**	**6,995.74**	+ 22.08	**7,191.23**	**7,560.18**	+ 5.13	**6,798.87**	**8,990.32**	+ 23.41
Cost C_2	**6,313.96**	**7,579.09**	+ 20.04	**7,574.58**	**7,943.53**	+ 4.87	**7,582.22**	**9,173.67**	+ 20.99

A_2, B_1, B_2, C_1 and C_2 were significantly higher for borrower farmers as compared to the non-borrower group in all the zones. The difference in the costs ranged from 4.87 per cent as in cost C_2 in the mid-hills to 42.22 per cent as in B_1 in the valley zone. This finding shows that the borrower farmers of the valley zone put more emphasis on input resources whereas those in the mid-hill zone attached least importance to it. The itemwise investment pattern showed that the cost of fertilisers was remarkably high for credit users as compared to the non-users in all the zones. The highest difference was noticed in the mid-hill zone, being 580 per cent more use of fertilisers over the non-borrowers whereas this difference was the lowest in the high-hill zone (234 per cent). It was also noticed that the cost involved on hired human labour and manure was comparatively less for credit users in almost all the zones under study.

The comparative economics of wheat production for short-term crop credit user and non-user groups is shown in Table III. The analysis portrays that the yield of wheat crop

TABLE III. ECONOMICS OF WHEAT PRODUCTION FOR BORROWER AND NON-BORROWER FARMS IN DIFFERENT ZONES OF THE SAMPLE FARMS

(per hectare)

Particulars	High-hills			Mid-hills			Valleys		
	Non-borrowers	Borrowers	Per cent difference in borrowers over non-borrowers	Non-borrowers	Borrowers	Per cent difference in borrowers over non-borrowers	Non-borrowers	Borrowers	Per cent difference in borrowers over non-borrowers
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Yield (qtl)									
(i) Main product	7.30	12.45	+ 70.55	9.55	11.83	+23.88	10.75	20.79	+93.40
(ii) By-product	10.56	17.65	+ 67.14	14.91	15.48	+ 3.82	14.54	25.67	+76.55
Gross income (Rs.)	3,976.00	6,745.00	+ 69.64	5,311.00	6,280.00	+18.25	5,754.00	10,883.00	+89.14
Net income (Rs.) over									
(a) Cost A_1	641.54	2,969.21	+ 362.83	1,680.40	2,187.62	+30.18	2,404.77	6,138.45	+155.26
(b) Cost A_2	641.54	2,969.21	+ 362.83	1,680.40	2,187.62	+30.18	2,404.77	6,138.45	+155.26
(c) Cost B_1	516.14	2,835.01	+ 449.27	1,533.27	2,033.07	+32.60	2,278.88	5,940.68	+160.69
(d) Cost B_2	- 67.21	2,251.66	+3,350.18	1,149.92	1,649.72	+43.46	1,495.53	5,157.33	+244.85
(e) Cost C_1	-1,754.61	-250.74	- 85.71	-2,249.18	-1,280.18	- 43.08	-1,044.87	2,492.68	+238.56
(f) Cost C_2	-2,337.96	-834.09	- 64.32	-2,263.58	-1,663.50	- 26.51	-1,828.22	1,709.33	+93.50
Benifit-cost ratio (Rs.) over									
(a) Cost A_1	1.19	1.79	+50.42	1.46	1.54	+ 5.48	1.72	2.29	+33.14
(b) Cost A_2	1.19	1.79	+50.42	1.46	1.54	+ 5.48	1.72	2.29	+33.14
(c) Cost B_1	1.15	1.73	+50.43	1.41	1.48	+ 4.97	1.66	2.20	+32.53
(d) Cost B_2	0.98	1.50	+53.06	1.28	1.36	+ 6.25	1.35	1.90	+40.74
(e) Cost C_1	0.69	0.96	+39.13	0.74	0.83	+12.16	0.85	1.47	+72.94
(f) Cost C_2	0.63	0.89	+41.27	0.70	0.79	+12.86	0.76	1.19	+56.60

was about 71, 24 and 93 per cent higher on borrower farms than on the non-borrower farms in high-hill, mid-hill and valley zones respectively. The highest yield of 20.79 qtl/ha was obtained by the credit user wheat growers in the valley zone and the lowest yield (11.83 qtl/ha) by the borrower farmers of the mid-hill zone. The net return received from wheat production by the credit users was more by 362.83, 30.18 and 155.26 per cent than the non-borrowers on cost A_1 and A_2 basis in high-hill, mid-hill and valley zones respectively, whereas the net loss incurred on cost C_2 basis was less by 64.32 and 26.51 per cent for credit

users in the high-hills and mid-hills respectively. The return over each rupee invested for the production of wheat by the borrower farmers was more by 39 to 53 per cent in the mid-hills and by 32 to 73 per cent in the valley zone over non-borrower group of farmers. These findings clearly explain that crop credit has an encouraging and remarkable impact on the return of the crop in all the zones under study.

To estimate the productivity of short-term crop credit and other important variables, regression coefficient (b_i) and coefficient of multiple determination (R^2) were estimated with the help of linear multiple regression analysis considering five independent variables and one dependent variable. One variable, manure and fertiliser, has been dropped from the analysis due to high multicollinearity between crop credit and manure and fertiliser. The results of the analysis are presented in Table IV. It is evident from the results that the R^2 was significant at 1 per cent level of probability for high-hill and mid-hill zones and showed 94 and 91 per cent variation in the return due to variation in the input factors considered in the analysis whereas in the case of valley zone, the R^2 was significant at 5 per cent level and showed 81 per cent variation in the return.

TABLE IV. MARGINAL VALUE PRODUCTIVITY OF SHORT-TERM CROP CREDIT AND OTHER VARIABLES USED FOR WHEAT PRODUCTION IN DIFFERENT ZONES OF THE SAMPLE FARMS

Variables	Regression coefficients		
(1)	High-hill zone (2)	Mid-hill zone (3)	Valley zone (4)
Human and bullock labour (X_1)	0.056	0.629	0.269
	(0.488)	(0.344)	(0.578)
Seed (X_2)	12.882	-11.728*	12.977
	(11.697)	(4.786)	(18.945)
Crop credit (X_3)	2.147*	0.657**	1.056*
	(0.647)	(0.155)	(0.312)
Total farm income (X_4)	0.332	0.182	-0.089
	(0.312)	(0.263)	(0.246)
Size of holding (X_5)	-1545.901	-2530.116*	1944.630
	(2109.723)	(1010.894)	(2627.008)
Intercrop (a)	-8464.257	11266.800	-2871.246
R^2	0.9417**	0.9118**	0.8095*

* Significant at 5 per cent level of probability.
** Significant at 1 per cent level of probability.
Note: Figures in parentheses denote standard errors of the variables.

The regression coefficients of crop credit were positive and highly significant at 1 per cent level of significance in the mid-hill zone and at 5 per cent level in high-hill and valley zones. This result indicates that credit has remarkable and highly favourable impact on the return of the crop. The significant but negative coefficients of seed and holding size indicate excess use of seed and inverse relationship of holding size with the return of the crop in the mid-hill zone. The regression analysis further revealed that the marginal value productivity (MVP) of crop credit was the highest in high-hill zone (2.15), followed by valleys (1.06). This finding clearly depicts that there is a lot of scope to raise the return of the crop through increased use of crop credit in these zones. In the case of mid-hill zone, although crop credit has positive impact on the return, the lower value (0.66) indicates no further scope to raise the return through more use of credit in this zone. The lower MVP of credit in mid-hill may be due to poor water retaining capacity and lower fertility status of the soil as compared to

other zones.

The analysis of correlation coefficient was also made to explain the association between crop credit and fertiliser consumption as well as fertiliser consumption and the return of the crop (see Table V). The coefficient of correlation between crop credit and fertiliser consumption showed positive and statistically significant values in mid-hill and valley zones.

TABLE V. ASSOCIATION BETWEEN CROP CREDIT AND FERTILISER CONSUMPTION; AND FERTILISER CONSUMPTION AND RETURN OF WHEAT CROP IN DIFFERENT ZONES OF THE SAMPLE FARMS

Zones	Correlation coefficient between	
	Crop credit and fertiliser consumption	Fertiliser consumption and return of the crop
(1)	(2)	(3)
High-hills	0.231	0.218
Mid-hills	0.724*	0.749*
Valleys	0.824	0.649*

* Significant at 5 per cent level of probability.

But in the case of high-hills, the coefficient indicated non-significant value. These results suggest that crop credit has favourable and remarkable relationship with the consumption of fertilisers in mid-hill and valley zones. The correlation coefficient between fertiliser consumption and return of the crop also showed similar results. These findings confirm that, among other things, credit does influence the crop return in mid-hill and valley zones. Thus it proves that there is strong association between crop credit and the return of the crop in wheat production at the existing system of hill farming.

CONCLUSION

It is can be concluded from the above discussion that the impact of the short-term crop credit is encouraging and provision of short-term crop credit is an effective way to increase the farm return in the rainfed hilly conditions. The study also suggests that there is tremendous scope to raise the crop return at farm level through increased use of crop credit at the prevalent resource use pattern and the existing level of technology adoption in different hill zones of Uttar Pradesh.

REFERENCES

Gadgil, M.V. (1986), "Agricultural Credit in India: A Review of Performance and Policies", *Indian Journal of Agricultural Economics*, Vol. 41, No. 3, Part I, July-September, pp. 282-309.

Kumar, J. and R.S. Tripathi (1989), *Study of Yield Gap and Constraint Analysis in Major Crops at Farm Level in Tehri District of U.P.*, Research Report, Department of Agricultural Economics, G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal (U.P.).

Sharma, A.N. and B. Prasad (1980), *Base Line Survey of Chamba Block of Tehri Garhwal District*, Research Report, Department of Agricultural Economics, G.B. Pant University of Agriculture and Technology, Pantnagar (U.P.).

Tripathi, R.S. (1987), *Investment, Income and Employment Pattern of Hill Farming in Tehri Garhwal Himalaya*, Research Report, Department of Agricultural Economics, G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal, (U.P.).

Tripathi, R.S. (1992), "Economic Analysis of Finger Millet *(Eleusine coracana)* Cultivation in the Hills of U.P., *Annals of Agricultural Research*, Vol. 13, No. 2, pp. 150-156.

Tripathi, R.S. and V.K. Pandey (1986), *A Perspective of Development of Hill Agriculture in Tehri District*, Research Report, Department of Agricultural Economics, G.B. Pant University of Agriculture and Technology, Hill Campus, Ranichauri, Tehri Garhwal (U.P.).