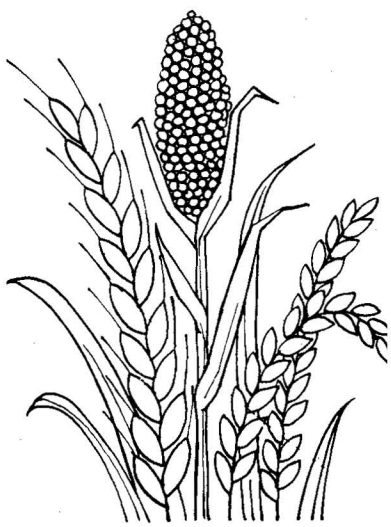
Vol XXVI
No. 4

ISSN 0019-5014

CONFERENC
NIMBER

OCTOBER-
DECEMBER
1971

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

Table VII shows that the per acre returns on the small, medium and large farm situations increased from Rs. 522.28 to Rs. 1,290.84, from Rs. 404.56 to 1,394.54 and from Rs. 584.87 to 1,167.97 respectively from 1969-70 to 1970-71. This increase could be attributed to the improvement in the ratio of working capital to the total capital.

Thus, the results of the study highlighted the increased capital and credit requirements and the role of the commercial banks in augmenting the credit advanced by the co-operatives. One very interesting and important conclusion that followed from this study is that the commercial banks should follow "village adoption approach" or "area planning approach" as a starting point, before they get too far in reaching out to the farmers scattered all over the area. This will reduce the cost of loaning operations and also facilitate easy recovery of the loans.

AN ASSESSMENT OF PRODUCTION CREDIT NEEDS IN DEVELOPING AGRICULTURE*

J. S. SHARMA

Senior Associate

AND

B. PRASAD

Assistant Professor

Department of Agricultural Economics
U. P. Agricultural University
Pantnagar (Nainital)

There has been a technological break-through in Indian agriculture during the last few years. Farmers are using more cash inputs for high-yielding varieties of seeds, fertilizers, irrigation, machinery and land development. Consequently, cash needs in agriculture have increased manifold. All of these cash needs cannot be met fully by the farmers out of their own savings. Unless they get some financial assistance from outside they cannot make full use of various technological developments. In order to sustain and grow the use of technological developments in agriculture, availability of credit in adequate amount is necessary.

* This paper is based on the project "Credit Needs in Changing Agriculture" conducted in the Department of Agricultural Economics, U. P. Agricultural University, Pantnagar, District Nainital (U. P.), 1971.

Several credit agencies, especially commercial banks, have come in a big way to help farmers in this respect. But before they extend the credit facilities in a particular region, they would like to have basic information about the potential of credit needs in a particular region. They would also like to know how the credit requirements vary among different farm size-groups as a result of technological change in the advanced and the less advanced regions. Farmers also would like to know the amount of credit they can profitably use on their farms and as to what would be the changes in their incomes.

With this problematic situation in view, an attempt has been made in this paper (*i*) to estimate the credit needs by farm size and by regions at different stages of technological development in agriculture, (*ii*) to compare the changes in the credit needs of a relatively advanced area, with a less advanced area, and (*iii*) to examine the impact of credit and/or technology on incomes of different sizes of farms.

DATA AND METHODOLOGY

This study was conducted in Tarai, Nainital and Rampur districts of the north-western region of Uttar Pradesh. Tarai, Nainital is relatively advanced than Rampur district. Ninety-five and 71 farmers were selected from Tarai, Nainital and Rampur districts respectively through multi-stage random sampling technique. The required information was collected for the agricultural year 1968-69. Farmers included in the sample of each region were classified in six groups, *viz.*, (*i*) irrigated small farms, (*ii*) unirrigated small farms, (*iii*) irrigated medium size farms, (*iv*) unirrigated medium size farms, (*v*) irrigated large farms, and (*vi*) unirrigated large farms. One representative farm was synthesized for each class of farms.

Linear programming technique was used to estimate the credit requirements and its impact on the cropping pattern and incomes. Optimum farm plans for each representative farm were prepared under four different situations which are summarized as follows:

Situation A

Present technology without borrowing: Optimum farm plans were prepared by using present technology. Cash availability was restricted to owned funds only. Situation A was designed to see whether the farmers have their own funds enough to meet the cash expenses for the best plan under the existing technology.

Situation B

Existing technology with borrowing: Borrowing activity absent in Situation A was introduced in this situation. Other things were similar to Situation A. The result of this situation would indicate the amount of credit

required in addition to their own funds, to execute on optimum farm plan under the existing technology.

Situation C

Improved technology[1] without borrowing: This situation was similar to Situation A except that current technology present in Situation A was replaced by improved technology. The difference in incomes in Situations C and A would measure the effect of improved technology on incomes.

Situation D

Improved technology with borrowing: Current technology included in Situation B was replaced by the improved technology with borrowing. The difference in incomes in Situations C and D would measure the effect of improved technology with credit on incomes and cropping pattern. This would also indicate the maximum amount of credit that can profitably be used under the conditions of improved technology with availability of credit.

The linear programming model used in this study can be stated symbolically as follows :

$$\text{Maximize} \quad \sum_{j=1}^{n} C_j \; X_j \qquad (j=1.....n)$$

Subject to

$$\sum_{j=1}^{n} a_{ij} \; X_j \leqslant b \quad (i=1.....n)$$

$$b \geqslant 0, \; X_j \geqslant 0, \; a_{ij} \geqslant 0$$

Where a_{ij}'s are input-output coefficients, C_j returns over variable costs, X_j real activities, and b_i resource restrictions.

RESULTS AND DISCUSSION

The linear programming models used in this study were solved with the aid of electronic computer. The solutions thus obtained are discussed below :

PER ACRE PRODUCTION CREDIT NEEDS AT DIFFERENT LEVELS OF TECHNOLOGY

The production credit needs of different sizes of farms under different technological conditions estimated by the linear programming technique have been reported in Table I.

1. The farmers included in the sample were ranked on the basis of the acreage under high-yielding crop varieties, quantity of fertilizer used and the area under irrigation. On the basis of this ranking, top 20 per cent farmers in the sample were selected representing the improved technology.

TABLE I—PER ACRE CREDIT NEEDS OF THE DISTRICTS

Size-group of farms		Tarai, Nainital		Rampur		Percentage increase in credit needs due to change in technology	
		Existing technology (Rs.)	Improved technology (Rs.)	Existing technology (Rs.)	Improved technology (Rs.)	Tarai, Nainital	Rampur
Small	Irrigated ..	169·77	456·63	153·57	353·28	168·97	130·05
	Unirrigated ..	87·14	197·60	144·14	180·81	126·76	94·82
	Average ..	128·43	327·11	148·85	317·50	154·66	103·90
Medium	Irrigated ..	147·82	460·29	186·40	552·32	211·38	196·30
	Unirrigated ..	118·32	192·60	202·92	298·53	62·78	96·39
	Average ..	133·70	326·44	194·66	425·42	144·16	43·79
Large	Irrigated ..	101·63	579·47	150·34	370·92	469·05	146·72
	Unirrigated ..	50·61	105·93	97·86	188·90	109·31	93·03
	Average ..	76·22	342·70	124·10	279·91	349·62	125·55
Overall average	Irrigated ..	138·80	498·79	163·43	425·51	260·07	160·35
	Unirrigated	83·35	165·35	148·30	256·06	93·75	72·67
	Average ..	125·58	352·08	155·87	381·59	194·98	118·63

Credit Needs at Existing Technology

Farmers need cash for buying annual inputs and carrying out operations on their farms. A portion of the total cash needs is met with their own funds and the remaining portion is borrowed from outside. In Tarai, Nainital the credit needs of the farmers are on an average about Rs. 113 per acre. They vary according to farm size, being highest (Rs. 134) on the medium-size farms followed by the small farms (Rs. 128) and lowest (Rs. 76) on the large farms. This is perhaps, because per acre cash expenses are less on the small farms as most of the labour needed on the farm is supplied by family members and manure is available from farm livestock. Large farmers are relatively rich and can meet substantial portion of their cash needs from their own savings. Medium farmers have to depend more on borrowed funds to meet their cash expenses needed to execute the best plans. Per acre credit needs are greater on the irrigated farms (Rs. 140) than on the unirrigated farms (Rs. 85).

The per acre credit needs at the existing technology in Rampur are on an average Rs. 156, which range between Rs. 98 to Rs. 203 on different size of farms. Thus, the situation in Rampur district is similar to Tarai region except that per acre credit needs in this region are greater than in Tarai, Nainital.

Credit Needs at Improved Technology

Per acre credit needs in Tarai, Nainital are on an average Rs. 332. There is not much variation in per acre credit needs on different size of farms. Credit needs on the irrigated farms are about three times more (Rs. 499) than on the unirrigated farms (Rs. 165).

The credit needs in Rampur district are on an average Rs. 381 per acre and vary from Rs. 279 to Rs. 317 on different size of farms. Credit needs on the irrigated farms are about two times (Rs. 425) more than on the unirrigated farms (Rs. 256).

In terms of percentage, credit needs at the improved technology are 195 per cent higher than credit needs at the current technology. This increase is different in various farm size-groups, highest (349 per cent) on the large farms, followed by the small farms (155 per cent) and least in the case of medium size farms (144 per cent). The increase in the credit needs is about three times more on the irrigated farms than those of the unirrigated farms.

In Rampur area, credit needs at the improved technology are 119 per cent higher than credit needs at the current technology. This varies among different farm size-groups, lowest being in the case of small farms (104 per cent) and highest (147 per cent) in the case of medium size farms. The increase in credit needs on the irrigated farms is 130 per cent, 196 per cent and 147 per cent for small, medium and large farms respectively. On the unirrigated farms the increase is on an average about 73 per cent.

Credit needs would increase at a faster rate in Tarai, Nainital than in Rampur district as a result of technological development. Consequently, the difference in credit needs in the two areas would be reduced.

TOTAL PRODUCTION CREDIT NEEDS OF THE TWO DISTRICTS AT DIFFERENT LEVELS OF TECHNOLOGY

As given in Table II, the total credit requirements in Tarai, Nainital are about Rs. 114 lakhs at the existing level of technology, of which about 35 per cent, 29 per cent and 36 per cent is needed by the small, medium and large farms respectively.

At improved technology, the credit needs are Rs. 367 lakhs of which 30 per cent, 20 per cent and 50 per cent is required by the small, medium and large farms respectively. One of the striking features of the growth in credit needs is that the increase in credit requirements of large farms would be faster than that of small and medium farms.

In Rampur district, the total credit needs are Rs. 681 lakhs at the existing level of technology of which about 11 per cent, 41 per cent and 48 per cent is needed by the small, medium and large farms respectively. At the improved technology, the total credit needs are Rs. 1,300 lakhs. Of the total

TABLE II—TOTAL CREDIT NEEDS OF THE DISTRICT BY FARM SIZE

(in round figures)

Size-group of farms	Tarai, Nainital					Rampur				
	Total cultivated area (thousand acres)	Per acre credit needs at existing technology (Rs.)	Per acre credit needs at improved technology (Rs.)	Total credit needs at existing technology (lakh Rs.)	Total credit needs at improved technology (lakh Rs.)	Total cultivated area (thousand acres)	Per acre credit needs at existing technology (Rs.)	Per acre credit needs at improved technology (Rs.)	Total credit needs at existing technology (lakh Rs.)	Total credit needs at improved technology (lakh Rs.)
Small	31·26	128	327	40 (35·18)	102 (30·00)	153	149	318	76 (11·23)	163 (12·53)
Medium	24·63	134	326	33 (28·86)	80 (20·00)	1430	195	425	278 (40·93)	400 (30·78)
Large	53·83	76	343	41 (35·96)	185 (50·24)	2631	124	279	327 (47·94)	737 (56·69)
Total amount	109·72	—	—	114 (100·00)	367 (100·00)	4214	—	—	681 (100·00)	1300

Note : Figures in parentheses show percentages.

credit needs, about 12 per cent, 31 per cent and 57 per cent is required by the small, medium and large farms respectively.

Growth in credit needs in Tarai, Nainital is higher than Rampur district perhaps, because the rate of technological advance in agriculture as measured in terms of per acre use of fertilizers, chemicals, high-yielding varieties of seed, would be higher in Tarai, Nainital than in Rampur. In absolute terms the credit needs in Rampur district are higher than Tarai, Nainital, because of the larger cultivated area in Rampur than in Tarai, Nainital.

INCOME LEVELS UNDER DIFFERENT SITUATIONS

Incomes obtained from the optimal farm plans prepared under different situations are discussed below :

Effect of Credit on Incomes under Existing Technology

Figures in Table III show that the average incomes obtained in Tarai, Nainital under Situation B are 41 per cent higher over incomes obtained in

TABLE III—CHANGES IN INCOMES DUE TO CREDIT AND TECHNOLOGY

(*percentage*)

Size-group of farms		Tarai, Nainital			Rampur		
		Percentage increase in income due to			Percentage increase in income due to		
		Credit (Situation B—A)	Technology (Situation B—C)	Credit + technology (Situation C—D)	Credit (Situation B—A)	Technology (Situation B—C)	Credit + technology (Situation C—D)
Small	Irrigated ..	79·58	—22·99	97·00	12·00	15·80	25·40
	Unirrigated ..	28·76	—37·49	44·61	14·10	3·87	132·18
	Average ..	55·52	—27·71	72·12	13·31	6·20	92·80
Medium	Irrigated ..	13·89	26·82	82·86	116·41	2·40	293·65
	Unirrigated ..	47·98	—9·21	43·55	71·57	21·80	79·67
	Average ..	30·57	12·60	78·19	95·61	13·40	194·58
Large	Irrigated ..	143·41	4·39	211·93	60·66	—5·21	130·29
	Unirrigated ..	64·56	1·37	81·40	125·39	14·67	154·78
	Average ..	106·49	3·00	104·61	92·61	4·90	136·03
Overall average	Irrigated ..	71·40	9·00	121·80	53·10	6·50	127·10
	Unirrigated ..	45·70	—11·50	43·06	65·50	11·11	119·30
	Average ..	40·85	4·23	104·44	60·34	0·26	125·27

Situation A. The rate of increase in incomes is different on different sizes of farms, being highest on the large farms (106 per cent) followed by small farms (56 per cent) and lowest on the medium size farms (31 per cent). The average incomes under Situation B are 71 per cent and 46 per cent higher than that under Situation A on the irrigated and on the unirrigated farms respectively. Thus, the potential of increasing incomes through credit is higher on the irrigated farms than on the unirrigated farms.

In Rampur, the average incomes under Situation B is 60 per cent higher than the incomes obtained under Situation A. The rate of increase varies from about 13 per cent on the small farms to 96 per cent on the medium size farms. The increase in incomes on the irrigated farms is higher than that on the unirrigated farms due to the availability of credit.

Effect of Technology on Incomes without Borrowing

Table III shows that in Tarai, Nainital a forced situation of adoption of improved technology without any credit, increases the incomes on an average by about 4 per cent only, since the farmers do not have their own cash enough to make full use of the improved technology. Incomes on the small and medium size unirrigated farms are going to be affected adversely if they switch over to the improved technology without borrowing.

In Rampur, the average income would increase slightly but the small farmers and the medium size irrigated farmers would be faced with a decline in their incomes if they are forced to adopt the improved technology without any credit. The per acre incomes under the improved technology without credit vary very little.

Effect of Credit and Technology on Incomes

Incomes obtained from optimal farm plans prepared under Situation D are 104 per cent higher than that obtained under Situation C. The increase in income is the highest on the large farms (105 per cent) followed by the medium size farms (78 per cent) and lowest (72 per cent) in the case of the small farms. Incomes on irrigated farms of all farm sizes are higher than that on the unirrigated farms.

The mean incomes in Rampur district increased by 125 per cent as a result of the adoption of improved technology and availability of adequate credit. The increase is highest on the medium size farms (212 per cent) followed by the large farms (105 per cent) and is the lowest on the small size farms (72 per cent). Similar to Tarai, in this area also the percentage increase in incomes on the irrigated farms is greater than those of the unirrigated farms in all the farm size-groups (Table III).

SUMMARY AND CONCLUSIONS

In Tarai, Nainital, per acre production credit requirements are, on an average, Rs. 113 and Rs. 332 at the existing and improved levels of tech-

nology respectively. Credit needs are more on the irrigated farms than on the unirrigated farms. At improved technology, production credit needs on the medium size farms work out to be the highest followed by the large farms and lowest on the small farms at the current and improved levels of technology respectively. The total production credit needs of the region are Rs. 114 lakhs and Rs. 367 lakhs at the existing level of technology and at the improved level of technology respectively.

In Rampur, per acre credit needs are, on an average, Rs. 156 and Rs. 341 at the current and the improved levels of technology respectively. The total production credit needs of the whole district are Rs. 680 lakhs under the existing level and Rs. 1300 lakhs at the improved level of technology. This indicates that, in absolute terms, per acre credit needs are little higher in relatively less progressive areas than in the progressive region. Given the availability of own cash at original level, growth in credit needs is higher in the progressive areas than in the less progressive areas.

An adequate use of credit increased the incomes substantially even at the prevailing state of technology. A situation of adoption of improved technology without any credit did not increase the incomes of the farmers significantly. But a situation of adoption of improved technology with adequate credit facilities almost doubled the incomes of the farmers in both the regions.

The empirical findings of this study indicate that even at the current level of technology there exists large potential market of credit which is expected to be doubled as a result of further technological development in agriculture. In future, the production credit needs are expected to grow at a faster rate in relatively progressive areas than in less progressive areas. Introduction of improved technology without any credit facilities would not have significant impact on incomes of the farmers. Therefore, efforts have to be made to extend credit facilities in order to harvest the fruits of improved technology.