

An Empirical Analysis on Enhancing The Farm Profitability By Maize Cultivation

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Abstract

A research was done to uplift the economic condition of small farmers through cultivation of maize crop. Maize is considered the queen of all cereal crops due to its high genetic yield potential among other cereal crops. The country has exported 10,51,277.95 MT of maize to the world for the value of Rs. 1,871.62 crore / 270.16 USD million in 2018-19. In this research, spending on various inputs in maize cultivation viz. machine power, seeds, fertilizers and fertilizers, irrigation and plant protection chemicals, was seen to increase at different speeds, while spending on family labor in terms of credit utilization Reduced post-credit utilization conditions across levels. Thus, the total cost of cultivation of maize was increased to Rs 13.41 per hectare from Rs.33498 per hectare in the credit utilization situation to Rs.13498 per hectare. After the credit status, the net profit received by the farmers from the cultivation of maize is increasing from Rs.5226 per hectare to Rs.6952 per hectare before the credit utilization status after the credit utilization situation. Thus, there was a 33.03 percent increase in the net return received after the credit usage condition compared to the earlier one. The higher net profits obtained after the loan utilization situation from maize were due to higher yields and better prices received by farmers.

Key words: Maize, total cost of cultivation, credit and net agricultural income.

Introduction

Maize (*Zea mays* L.) is considered to be the versatile emerging crop sharing wide suitability to various agro-climatic zones. Globally, it is known as the queen of grains because it has the highest genetic yield potential among grains. It is cultivated in about 165 countries in 190 countries, with a wide variety of soils, climate, biodiversity and management practices that contribute 39% to global grain production. USA is the largest producer of maize which contributes about 36% of the total production in the world and corn is the driver of the US

economy. In India it is grown throughout the year. It is mainly a kharif crop, with 85 percent of the area cultivated. After rice and wheat, maize stood in third position in India . It accounts for about 10 percent of the total grain production in the country. The major wheat growing states in India are Karnataka, Madhya Pradesh, Bihar, Tamil Nadu, Telangana, Maharashtra and Andhra Pradesh. The production of maize is estimated to be 21,1010 thousand tonnes from an area of 100091 thousand hectares giving an average yield of 2509 kg / ha in 2015-16 [Anonymous, 2011 estimated]. The nutritional value per 100 grams contains energy: 360 kJ (86 kcal), carbohydrates (18.7 g), starch (5.7 g), sugars (6.26 g), dietary fiber (2 g), fat (1.35 g). It serves as a basic raw material for thousands of industrial products including starch, oil, protein, alcoholic beverages, edible sweeteners, medicine, cosmetic, film, textiles Includes, gum, package and paper industries, etc. apart from being the staple food for humans and quality food for animals[Anonymous, 2018]. The country has exported 10,51,277.95 MT of maize to the world for the value of Rs. 1,871.62 Crore / 270.16 USD Mills in 2018-19. MOG Export Destinations (2018–19): Nepal, Bangladesh, Vietnam Society Rape, Pakistan, Ir and Philippines [Anonymous, 2018].

The impact of institutional agriculture credit on net farm income

This was estimated by comparing the costs and returns in crop cultivation of loanee farmers before and after using the institutional agriculture production credit. Costs and returns were recalculated using cost concepts as given by Commission for Agricultural Costs and Prices (CACP).

CACP cost concept

CACP cost concepts has been more profoundly applied because of their relevance in the decision- making process. This means that these costs serve as a basis to expand the size of the farm, to buy the requisite capital assets in the long run and the requisite inputs in the short run. For example, variable costs have a bearing on the level of production in the short run, on the other hand the decision like expanding the size of the farm, buying the durable assets, etc., are based on the total costs. Crop costs are divided under different costs component, such as cost A_1 , A_2 , B_1 , B_2 , C_1 , C_2 , C_2^* and C_3 .

Cost A₁: The following items are included in cost A₁.

1. Wages of hired humanlabour.
2. Wages of permanent labour.
3. Wages of contract labour.
4. Wages of hired bullocklabour.
5. Imputed value of owned bullocklabour.
6. Charges of hired machinery.
7. Imputed value of owned machinery.
8. Market rate of manures and fertilizers.
9. Market rate of seeds.
10. Imputed value of owned seeds.
11. Imputed value of owned manures.
12. Market value of pesticides, herbicides, hormones, etc.
13. Irrigation charges.
14. Land revenue, cess and other tax
15. Depreciation on farm machineries, equipments, farm buildings, irrigation structures, etc.
16. Interest on working capital.
17. Miscellaneous expenses (value of other items which are used up in current production).

Cost A₂: Cost A₁ + Rent paid for leased land.

Cost B₁: Cost A₁ + interest on value of owned capital assets (excluding land).

Cost B₂: Cost B₁ + imputed rental value owned land (net of the land revenue) and rent paid for leased- inland.

Cost C₁: Cost B₁ + imputed value of family labour.

Cost C₂: Cost B₂ + imputed value of family labour.

CostC₂*:CostC₂ estimated by taking into account statutory minimum wage or actual wage rate, whichever is higher.

CostC₃:CostC₂* + 10 % of CostC₂* on account of managerial function performed by farmers.

Grossreturns

Returns from each selected crops were calculated by multiplying of physical output of main and by-products with their respective current year prices. By adding returns from main and by-product gross return from the crop were calculated.

Symbolically,

$$GR_{ij} = [Y_{ij} * P_i] + [y_{ij} * p_i]$$

Where,

GR_{ij} = gross returns from ith crop,

Y_{ij} = physical output of main product from ith crop,

y_{ij}= physical output of byproduct from ith crop,

P_i = prevailing price of main product of ith

crop, P_i = prevailing price of byproduct of

ith crop and i= paddy, wheat, maize and

potato.

Farm incomemeasures

These are the returns over different costs. Different income measures are derived using the cost concepts. These measures include farm business income, family labour income, net farm income, farm investment income, etc. The farm income measures were estimated using following formulae.

1. Farm business income = Gross income – Cost A₂
2. Family labour income = Gross income – Cost B₂
3. Net farm income = Gross income – Cost C₃
4. Farm investment income = Farm business income – Wages of family labour.

Input use levels in Maize cultivation before and after using the institutional agriculture credit

The input use level in maize cultivation has been given in **table 1**. A perusal of the table indicates that the use of human labour in before and after credit use situations was 79.39 man days per hectare and 64.63 man days per hectare, respectively which found to be decreasing by 18.59 per cent in after credit use situation. The levels of use of bullock labour in before and in after credit use situations were of 10.40 hours per hectare and 14.51 hours per hectare, respectively and estimated to be increased by 39.52 per cent after use of credit. The use of machine power was increased from 8.80 hours per hectare in before credit use situation to 15.82 hours per hectare in after credit use situation and the increase was estimated to be 79.77 per cent. The quantity of seed used per hectare found to be increasing by 15.38 per cent, from 52 Kg per hectare in before credit use situation to 60 Kg per hectare in after credit use situation. The use of fertilizer was also increased by 28.57 per cent, as it was 175 Kg per hectare in before credit use situation and 225 Kg per hectare in after credit use situation, respectively. Further, the application of urea, DAP and MOP was increased by 20.53 percent, 39.53 percent and 50.00 percent, respectively from their respective application levels in before credit use situation. Similarly, after using of credit the application of plant protection chemicals and irrigation was found to be increasing by 79.49 percent and 57.59 per cent, respectively.

Table 1: Input use levels in Maize cultivation before and after using the institutional agriculture credit (Unit/ha)

Sl.No.	Inputs	Before	After	Change (%)
1.	Human Labour (man days)	79.39	64.63	-18.59
2.	Bullock Labour (hours)	10.40	14.51	39.52
3.	Machine Power (hours)	8.80	15.82	79.77
4.	Seed (Kg)	52	60	15.38
5.	Manure (qtl)	1.28	2.32	81.64

6.	Fertilizer (Kg)	175	225	28.57
(i)	Urea (Kg)	112	135	20.53
(ii)	DAP (Kg)	43	60	39.53
(iii)	MOP (Kg)	20	30	50.00
7.	Plant Protection Chemicals (Kg)	2.34	4.20	79.49
8.	Irrigation (hours)	27.40	43.18	57.59

It can be inferred from the table that except human labour in maize cultivation application of all inputs was increased in after institutional agriculture production credit use situation from respective levels in before credit use situation. The decrease in human labour in after institutional agriculture production credit use situation was due to relatively more use of bullock power and machine power in after institutional agriculture production credit use situation. It can be inferred that the institutional agriculture credit support to the farmers allowed them to use more inputs.

Cost of Maize Cultivation Before and after using institutional agriculture production credit

The component wise various costs incurred in the cultivation and returns from maize in before and in after using credit have been given in **table 2**. A perusal of table reveals that the total cost of cultivation of maize crop increased from Rs. 38354 in before credit use situation to Rs. 43498 per hectare in after credit use situation. This increase in total cost of cultivation of maize was on account of increase in expenditure on seed, manures and fertilizer, irrigation and plant protection chemicals. The expenditure on hired human labour increased from Rs. 4527 per hectare in before credit use situation to Rs. 5048 per hectare in credit use situation this increase was estimated to be 11.51 percent. The expenditure on hired human labour was found to be 11.60 per cent of total cost cultivation in before use situation and 11.81 per cent of the total cost in after credit use situation, respectively. The expenditure on family labour was found to be decreasing by 39.28 per cent from Rs. 6588 per hectare in before credit use situation and Rs. 4000 per hectare in after credit use situation. The expenditure on family labour was estimated to be

17.18 per cent of total cost in credit use situation which was decreased to 9.20 per cent in after credit use situation. The expenditure on bullock labour was also increased 39.44 per cent from Rs. 624 per hectare in before use situation and Rs. 870 per hectare in after credit use situation. The expenditure on same as the percentage of the total cost was 1.63 in before credit use situation while it was 2.00 per cent in after credit use situation. The expenditure on machine power was found to be increasing by around 80 per cent from Rs. 1758 per hectare in before credit use situation to Rs. 3163 per hectare in after credit use situation. The expenditure on machine power stood at was 4.58 per cent of total cost in before credit use situation, which increased to 7.27 per cent in after credit use situation.

Table 2: Cost of Maize Cultivation Before and after using institutional agriculture production credit (Rs./hectare)

Sl. No.	Cost items	Maize		
		Before	After	Change (%)
1.	Hired Human Labour	4527 (11.80)	5048 (11.61)	11.51
2.	Bullock Labour	624 (1.63)	870 (2.00)	39.44
3.	Machine Power	1758 (4.58)	3163 (7.27)	79.91
4.	Seed	1828 (4.77)	2636 (6.06)	44.15
5.	Manure	256 (0.67)	465 (1.07)	81.69
6.	Fertilizer	2254 (5.88)	3832 (8.81)	70.01
7.	Irrigation Charges	2740 (7.14)	4318 (9.93)	57.62
8.	Plant Protection	426 (1.11)	756 (1.74)	77.47
9.	Working Capital	14415 (37.58)	20335 (46.75)	41.07
10.	Interest On Working Capital	360 (0.94)	508 (1.17)	41.07
11.	Land Revenue And Other Taxes	62 (0.16)	62 (0.14)	0.00
12.	Depreciation On Farm Assets	706 (1.84)	706 (1.62)	0.00
13.	Cost A ₁	15120 (39.42)	21759 (50.02)	43.90
14.	Rental Value Of Own Land	11430 (29.80)	11430 (26.28)	0.00
15.	Cost A ₂	15120 (39.42)	21759 (50.02)	43.90

16.	Fixed Capital (14+15+17+18)	12198 (31.80)	12198(28.04)	0.00
17.	Interest On Fixed Capital	693 (1.81)	693(1.59)	0.00
18.	Cost B₁	15814(41.23)	23485(53.99)	48.51
19.	Cost B₂	27244(71.03)	34915(80.27)	28.16
20.	Family Labour	6588(17.18)	4000(9.20)	-39.28
21.	Cost C₁	22402(58.41)	27485(63.19)	22.69
22.	Cost C₂	33832(88.21)	38915(89.46)	15.02
23.	Cost C₂*	34867(90.91)	39544(90.91)	13.41
24.	Cost C₃	38354(100.00)	43498(100.00)	13.41

Note: The figures in parentheses denote percentage share in total cost of cultivation

The expenditure on seed was found to be increasing by around 44 percent from Rs.1828 per hectare in before credit use situation to Rs.2636 per hectare in after credit use situation. The proportion of expenditure on seed as the percentage of the total cost of cultivation was 4.77 in before credit use situation which increased to 6.06 percent in after credit use situation. The magnitude of expenditure on manures and fertilizers was found to be increasing by 81.69 per cent, 70.01 per cent from Rs.256 per hectare and Rs.2254 per hectare, respectively in before credit use situation to Rs.465 per hectare and Rs.3832 per hectare, respectively in after credit use situation. The proportion of expenditure on manure and fertilizers of the total cost were estimated to be 0.67 per cent and 5.88 per cent, respectively in before credit use situation, which increased to 1.07 per cent and 8.81 per cent, respectively in after institutional agriculture production credit use situation. The expenditure on irrigation and plant protection chemicals were found to be increasing by 57.62 percent and 77.47 percent, respectively in after credit use situation over their respective levels in before credit use situation. The expenditure on irrigation and plant protection chemicals occupied 7.14 percent and 1.11 percent of total cost, respectively in before credit use situation, which increased to 9.93 percent and 1.74 per cent, respectively in after credit use situation. The working capital incurred in paddy cultivation increased by 41.07 per cent from Rs. 14415 per hectare in before credit use situation and Rs. 20335 per hectare in after credit use situation. As a proportion of total cost of cultivation the working capital was

found to be increasing from 37.58 per cent in before credit use situation to 46.75 per cent in after credit usesituation.The total cost of maize cultivation was estimated to be Rs.38354 per hectare in before credit use situation, which was increased to Rs.43498 per hectare in credit use situation. This increase in total cost of maize cultivation was estimated to 13.41 per cent.

ReturnsreceivedfromMaizeCultivationbyloaneefarmersinbeforeand after credit usesituations

Returnsreceivedinmaizecultivationovercosthavebeenshownin**Table3**. The table shows that the yield of maize (main product) was found to be increasingby 6.97 per cent from 43Qt. per ha in before credit use situation to 46qtl/ ha in after credit use situation. Similarly, the yield of by-product of maize increased by 7.27 per cent from 110Qt. per ha in before credit use situation to 118Qt. per ha after credit use situation. Table also reveals that the price realized by farmers for their main product was found to be increasing by 8.13 per cent from Rs. 860 per quintal in before credit use situation to Rs. 930 per quintal in after use situation. Further, the gross returns received from maize cultivation were Rs.43580 per hectare in before credit use situation, which reached to Rs. 50450 per hectare in after credit use situation having increased by 18.44 per cent. The net returns received from maize cultivation were also increased from Rs. 5226perhectareinbeforecreditusesituationtoRs.6952perhectareinaftercredituse situation. This increase was estimated to be 33.03 per cent over net return in before credit usesituation.

Table 3: Returns received from Maize Cultivation by loanee farmers in before and after credit use situations

Sl. No.	Output/ Income	Maize		
		Before	After	Change (%)
1.	Main product (Qt. per ha)	43	46	6.97
2.	by-product (Qt. per ha)	110	118	7.27

3.	Price Main product (Rs./qtl)	860	930	8.13
4.	Price By-product (Rs./qtl)	60	65	8.33
5.	Gross returns (Rs./ha)	43580	50450	18.44
6.	Farm business income (Rs./ha)	27474	28690	4.43
7.	Family labour income (Rs./ha)	15350	15534	1.20
8.	Family investment income (Rs./ha)	20886	46450	122.40
9.	Net return (Rs./ha)	5226	6952	33.03

The table also indicates that farmers were obtaining high yield of maize and realizing better price for their produce in after credit use situation hence, farmers realized more returns from maize cultivation in after credit use situation.

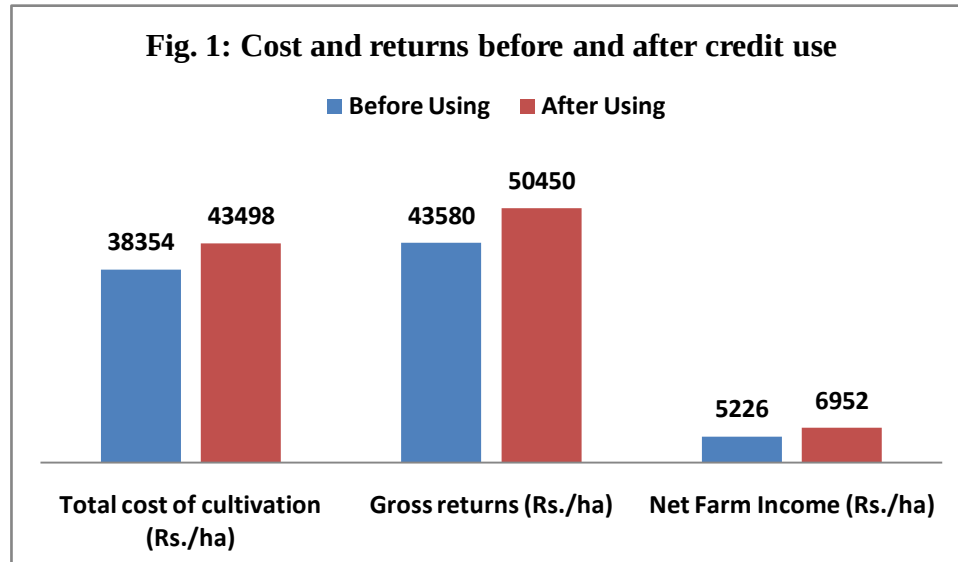
Impact of institutional agriculture production credit on Net Farm Income

In order to assess the impact of institutional agriculture production credit on net farm income the changes in cost of cultivation, gross returns, net farm income and net return over one rupee expenditure have been calculated in before and after agricultural production credit use situations. The magnitudes and percentage changes in respect of maize have been presented in **table 4** and **figure 1**.

Table 4: Impact of institutional agriculture credit on Net Farm Income

Crop	Cost/Return	Before Using	After Using	Change (%)
Maize	Total cost of cultivation (Rs./ha)	38354	43498	13.41*
	Gross returns (Rs./ha)	43580	50450	18.44**
	Net Farm Income (Rs./ha)	5226	6952	33.03*
	Net Return over one rupee expenditure	0.14	0.16	14.16

Note: *, ** and **** significant at 1 per cent, 5 per cent and 10 per cent level, respectively.



In case of maize cultivation, the cost of cultivation in after agriculture credit use situation was Rs. 43498 per hectare, which was 13.41 per cent higher than that in before credit use situation. In before agricultural credit use situation, the gross returns realized from maize cultivation were estimated to be Rs. 43580 per hectare, which increased to Rs. 50450 per hectare. This increase in gross return turned out to be 18.44 percent. The net farm income realized by maize growing farmers in after agricultural credit use situation was found to be Rs. 6952 per hectare, which was 33.03 per cent higher than in before agricultural credit use situation. Further, farmers in cultivating maize realized Rs. 0.16 net return over one rupee expenditure, which was 14.16 per cent higher than that realized in before agricultural credit use situation (Rs. 0.14).

Conclusion

The use of all input except human labour in maize cultivation was found to be increasing in after credit use situation. The decrease in human labour in after credit use situation was recorded due to increase in use of bullock labour and machine power in after credit use situation. The expenditure on different inputs, like, machine power, seeds, manures and fertilizer, irrigation and plant protection chemicals in maize cultivation was observed to be increasing by different pace, whereas the expenditure on family labour exhibited a decrease in after credit use situation over their respective levels in before credit use situation.

Thus, the total cost of maize cultivation was increased by 13.41 percent from Rs. 38354 per hectare in before credit use situation to Rs. 43498 per hectare in after credit use situation.

Further, the net returns received by farmers from maize cultivation were found to be increasing from Rs. 5226 per hectare in before credit use situation to Rs. 6952 per hectare in after credit use situation. Thus, net returns received were increased by 33.03 per cent after credit use situation over the same in before credit use situation. The higher net returns realized in after credit use situation from maize were on account of higher yield obtained and better price fetched by the farmers.

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