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An Economic Analysis of MAUS-162 Soybean Cultivation in Parbhani and Latur District of Maharashtra, India

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ABSTRACT: Soybean (*Glycine max* (L.) Merrill) or soyabean is a legume crop belonging to the family Leguminosae or Fabaceae and sub-family Papilionaceae. The area under soybean crop in Maharashtra state in 2022 was 49.09 lakh hectare with production of 65.85 lakh MT and productivity of 1341 kilo grams per hectare. The study was conducted in Maharashtra state of India in the year 2022-23. Two district, six villages were randomly selected. Thus, from six villages, 60 adopted and 60 non-adopted MAUS-162 soybean growers was selected. The overall objective of present study was observed estimate the economic impact of MAUS-162 variety on farmer's field. For this purpose, analytical tools *viz.*, tabular analysis, partial budgeting technique and profit regression model was employed. Result revealed that, the soybean MAUS-162 variety adopter benefitted in term of getting high quality of source seeds. Average per hectare gross return from soybean was Rs. 87420.98 which was higher than non-adopter Rs. 82084.54. The cost benefit ratio was highest for adopters *i.e.*, 1.63 per cent and 1.51 per cent for non-adopter.

Keywords: Economic impact**,** cost of cultivation, cost of production, profitability, improved soybean variety.

INTRODUCTION

Soybean (*Glycine max* (L.) Merrill) or soyabean is a legume crop belonging to the family Leguminosae or Fabaceae and sub-family Papilionaceae. soybean is gaining importance because of various quality factors. It is especially interesting to vegetarians because of rich protein content (40 per cent) and edible oil (20 per cent). United States, Brazil, Argentina, China, India are the top five producers of soybean of which United states being in first position and India being in fifth position. World soyabean production in 2020-21 is estimated as 353.47 million tonnes from a total area of 136.82 million hectares. Brazil ranks first in soyabean production with 121.80 million tonnes. Currently, in India in the year 2022-23, soybean cultivation reached to 128.92 Lack MT from an area of 120.90 lack ha and a productivity of 1066 (kg/ha). In India the major soybean growing states are the major soyabean growing states are Madhya Pradesh, Maharashtra, Rajasthan, Karnataka, and Telangana. The area under soybean crop in Maharashtra state in 2022 was 49.09 lakh hectare with production of 65.85 lakh MT and productivity of 1341 kilo grams per hectare. The area under Soybean crop in Marathwada region in 2022 was 24.87 lakh hectare with production of 33.05 lakh MT and productivity of 1329 kilo grams per hectare. Soybean variety MAUS-162 most of the soybean varieties developed in the country has shown narrow adoptability with unstable yield. The only exception is JS 335 and JS 93-05 which are cultivated on more than 50 per cent area in the country. Soybean is grown during rainy (*Kharif season), Kahrif* soybean is grown mainly in almost all districts. The seven division of Maharashtra having Area (Lakh ha), Production (lakh MT), and Productivity (kg per hectare) are as Amravati (13.30, 15.33 and 1153), Nagpur (2.76, 2.77 and 1001), Latur (19.11, 24.08 and 1260), Nasik (1.34, 1.49 and 1108), Pune (1.63, 1.80 and 1110), Aurangabad (24.87, 33.05 and 1329) and Kolhapur (37.87, 42.59 and 1125) respectively. In Marathwada region soybean was cultivated on 24.87 lakh ha with production of 33.05 lakh tons and productivity of 1329 Kg per hectare in *kharif* season. Area of soybean cultivation in Maharashtra was 49.09 (ha), in Marathwada maximum cultivation is in Latur district that is 4.89 (Lakh/ha), production is 5.39 (Lakh mt/ha) and productivity is 1102 (kg/ha).

METHODOLOGY

Sampling procedure: In Maharashtra, Marathwada region was purposively selected, because this region covered under rainfed region. In Marathwada region, there eight districts. Out of which, Parbhani and Latur were selected purposively and criteria for selection of district were based on area under soybean cultivation in

the district. From two district, six villages were randomly selected on the basis of highest area under MAUS-162 variety. The name of selected villages was Zari, Dudhgaon, Jamb (from Parbhani), Kava, Ujani, Charola (from Latur). Each village, ten farmers of soybean MAUS-162 variety adopters and non-adopter were randomly selected. Thus, from six villages, 60 adopted and 60 non-adopted MAUS-162 soybean growers was selected.

Analytical technique was used to achieve the pre-determined objectives.

To estimate the economic impact of MAUS-162 variety on farmer field. The objective, economic impact of MAUS-162 we will estimate with help the partial budgeting technique. The technique is an analytical tool for determining answers to the first question about impact on profitability. Secondly, impact of adoption variety on farmer's income was assessed with the help of profit regression.

$$Y = a + bX + E$$

Where,

Y = Dependant variable

X = Independent variable

A = Intercept

B = Slope

E = Error

RESULTS

To estimate the economic impact of MAUS-162 variety on farmer field

Physical inputs and outputs of adopter and non-adopter. The per hectare utilization of machinery was found to be highest in non-adopters (16.65 hours) and in case of Adopter 15.9, respectively. The per hectare utilization of hired human labour was found to be highest in adopters (10.98 hours) and in case of non-adopter 9.04, and female is 11.59 adopter whereas 13.96 non adopter respectively. In case of Adopter per hectare utilization of seed was high (70.75 kg) and for non-adopters it was 72.48 kg per hectare. Use of nitrogen was observed in adopters *i.e.*, 28.14 kg per hectare and by non-adopters *i.e.*, 26.72. While the use of phosphorus was in highest by adopter (42.21 kg) and by non-adopter (32.07 kg) per hectare and use of potassium was high in Adopter (28.14 kg) and non-adopter (26.72 kg) per hectare.

Table 1: Physical inputs and outputs of adopter and non-adopter farmers.

Sr. No.	Particulars	Unit	Adopter	Non-Adopter
1	Hired human labour (male)	Days	10.98	9.04
2	Hired human labour (Female)	Days	11.59	13.96
3	Bullock labour	Pair Days	0.80	0.79
4	Machinery Charges	Hrs.	16.55	15.9
5	Seed	Kg/q	72.48	70.75
6	Seed Treatment		217.43	178.73
7	Manure	Qt.	3.50	3.09
8	Fertilizers	N(kg)	26.72	28.14
		P (kg)	32.07	42.21
		K (kg)	26.72	28.14
9	Plant protection	kg/lit	1.80	1.5
10	Family human labour (Male)	Days	5.99	6.15
11	Family human labour (Female)	Days	1.56	1.37

Table 2: Per hectare cost of cultivation of MAUS-162 by adopter farmer Per hectare cost of cultivation of MAUS-162 by adopter farmers.

Sr. No.	Particulars	Adopter				
		Unit	Quantity used(kg)	Rate per unit	Total cost	Percent
1	Hired human labour (male)	Days	9.04	366.67	3313.25	6.18
2	Hired human labour (Female)	Days	13.96	265.50	3705.27	6.91
3	Bullock labour	Pair Days	0.79	509.17	403.86	0.75
4	Machinery Charges	Hrs.	15.90	625.00	9935.37	18.54
5	Seed	Kg/q	70.75	135.68	9600.00	17.91
6	Seed Treatment		178.73	2.45	437.90	0.82
7	Manure	Qt.	3.09	149.17	460.53	0.86
8	Fertilizers N(kg)	N(kg)	28.14	13.00	365.85	0.68
	Fertilizers P (kg)	P (kg)	42.21	45.25	1910.18	3.56
	Fertilizers K (kg)	K (kg)	28.14	26.16	736.21	1.37
9	Plant protection	kg/lit	1.5	750.85	1126.28	2.10
10	Land revenue	Rs.			90.51	0.17
11	Depreciation on implements	Rs.			575.10	1.07
	Total WC	Rs.			32235.61	60.14
12	Expenses on acquisition of inputs	Rs.			644.71	1.20
13	Interest on working capital @6per cent	Rs.			1934.14	3.61
	Cost A (1 to 13)	Rs.			34814.46	64.95
14	Rental value of land	Rs.			14570.16	27.18
15	Interest on fixed capital @12per cent	Rs.			1828.29	3.41
	Cost B (Cost A+14+15)				51212.92	95.55
16	Family human labour (Male)	Days	6.15	330	2031.02	3.79
17	Family human labour (Female)	Days	1.37	260.83	356.16	0.66
	Cost C *i.e.*, Total cost per ha.	Rs.			53600.10	100.00
18	**Yield**					
	B:C Ratio	Rs.			1.63	
	Net profit	Rs.			33820.88	

Plant protection with 1.5 Liter was used by Adopters and 1.8 litters by non-adopter. Similar result observed by Meena *et al.* (2012). The share of each item in the total cost provided is necessary due to economizing

costs. The cost has been determined based on standard cost concepts *i.e.*, cost A, cost B, and cost C. The different cost concepts have different utilities. Here an attempt has been made to estimate the figures of cost of cultivation of adopter and non-adopter presented in Table 2. Amongst the direct expenses the share of human labour in total cost was highest in non-Adopter. The percentage share of the rental value of land was observed highest in adopter (27.18 per cent) After the rental value of land and human labour, the major contributing input in total cost was fertilizer observed optimized in case of adopter the cost of fertilizer, Nitrogen (N) was Rs. 347.38 for adopter and it was contributed 0.68 per cent in total cost. Phosphorus (P) was Rs. 1910.18 for adopter and it was contributed 3.56 per cent in total cost. Potassium (K) was Rs. 736.21 for adopter and it was contributed 1.37 per cent and in total cost. Whereas cost for plant protection. Use of machine labour was observed for adopter *i.e.*, Rs. 9935.37 which accounts for 18.54 per cent by adopter and by adopter of the total cost. The uses of bullock labour for adopter (0.75 per cent) were observed. Utilization of optimum seed was used by adopters (17.91 per cent). The interest on fixed capital in adopter was Rs. 1934.14 respectively which accounts for 3.61 in total cost are respectively. The total cost of cultivation Cost-C of MAUS-162 was highest in the adopter *i.e.*, Rs. 53600.10 per hectare in adopter. Cost-A which includes the direct expenses, was highest in adopters *i.e.*, Rs. 34814.46 per hectare, which accounted for 64.95, respectively.

Per hectare cost of cultivation of MAUS-162 by non-adopter farmers. The share of each item in the total cost provided is necessary due to economizing costs. The cost has been determined based on standard cost concepts *i.e.*, cost A, cost B and cost C. The different cost concepts have different utilities. Here an attempt has been made to estimate the figures of cost of cultivation of non-adopter presented in Table 3. Amongst the direct expenses the share of human labour in total cost was highest in non-Adopter. The percentage share of the rental value of land was observed it was (25.14 per cent) in non-adopter. Similar result observed by Adisa and Balogun (2013).

Table 3: Per hectare cost of cultivation of MAUS-162 by non-adopter farmers.

Sr. No.	Particulars	Non adopter				
		Unit	Quantity used(kg)	Rate per unit	Total cost	Percent
1	Hired human labour (male)	Days	10.98	429.17	4710.48	8.66
2	Hired human labour (Female)	Days	11.59	272.00	3152.46	5.79
3	Bullock labour	Pair Days	0.80	536.67	429.57	0.79
4	Machinery Charges	Hrs.	16.55	626.67	10370.92	19.06
5	Seed	Kg/q	72.48	131.37	9521.20	17.50
6	Seed Treatment		217.43	3.00	652.30	1.20
7	Manure	Qt.	3.50	318.33	1115.21	2.05
8	Fertilizers	N(kg)	26.72	13.00	347.38	0.64
		P (kg)	32.07	39.74	1274.25	2.34
		K (kg)	26.72	26.16	699.03	1.28
9	Plant protection	kg/lit	1.8	750.85	1355.92	2.75
10	Land revenue	Rs.			97.72	0.18
11	Depreciation on implements	Rs.			595.26	1.09
	Total WC	Rs.			34009.12	62.50
12	Expenses on acquisition of inputs	Rs.			680.18	1.25
13	Interest on working capital @6per cent	Rs.			2040.55	3.75
	Cost A (1 to 13)	Rs.			36729.85	67.49
14	Rental value of land	Rs.			13680.76	25.14
15	Interest on fixed capital @12per cent	Rs.			1724.85	3.17
	Cost B (Cost A+14+15)				52135.45	95.80
16	Family human labour (Male)	Days	5.99	314.83	1886.26	3.47
17	Family human labour (Female)	Days	1.56	255.00	397.22	0.73
	Cost C *i.e.* Total cost per ha.)	Rs.			54418.93	100.00
18	**Yield**					
	B:C Ratio	Rs.			1.51	
	Net profit	Rs.			27665.61	

The fertilizer observed optimized in case of non-adopter the cost of fertilizer, nitrogen (N) was Rs. 347.38 for non-adopter and it was contributed 0.64 per cent in total cost. Phosphorus (P) was Rs. 1274.25 for non-adopter and it was contributed and 2.34 per cent in total cost. Potassium (K) was Rs. 699.03 for non-adopter and it was contributed 1.28 per cent in total cost. Whereas use of machine labour was observed non-adopter *i.e.*, Rs. 10370.92 which accounts for 19.06 per cent by non-adopter of the total cost. The use of bullock labour for non-adopter (0.79 per cent) was observed. Utilization of optimum seed was used by non-adopter (17.50 per cent). The interest on fixed capital in non-adopter was Rs. 2040.55 respectively which accounts for 3.75 per cent in total cost are respectively. The total cost of cultivation Cost-C of MAUS-162 was Rs. 54418.93 per hectare for non-adopter. Cost-A which includes the direct expenses, was non-adopter it was Rs. 36729.85 per hectare, which accounted for 67.49 per cent, respectively. Similar result observed by Gajja *et al* (2014).

Table 4: Per ha profitability of adopter and non-adopter.

Sr. No.	Particulars	Adopter	Non-Adopter
1.	Returns from main produce	85631.83	80438.16
2.	Returns from by produce	1789.16	1646.38
3.	Gross returns (items 1+2)	87420.98	82084.54
4.	Cost-A	34814.46	36729.85
5.	Cost -B	51212.92	52135.45
6.	Cost-C	53600.10	54418.93
7.	Farm business income	52606.52	45354.69
8.	Family labour income	36208.06	29949.09
9.	Net profit	33820.88	27665.61
10.	Output-input ratio	1.63	1.51
11.	Per Quintal Cost of Production	3051.29	3281.87

Per ha profitability of adopter and non-adopter. Result concluded that, the per hectare gross income received by adopters was Rs. 87420.98 which was higher than non-adopter Rs. 82084.54. Gross produce constitutes of main produce and the by-produce. The per hectare Cost A, Cost B, and Cost C for adopter were Rs. 34814.46, Rs. 51212.92 and Rs. 53600.10, for non-adopter's cost were Rs. 36729.85, Rs. 52135.45 and Rs. 54418.93. The farm business income for adopter and non-adopters were Rs. 52606.52 and Rs. 45354.69. The family labour income for adopter and non-adopters were Rs. 36208.06 and Rs. 29949.61. The study revealed that, proper adoption of improved variety and efficient utilization of required inputs result the adopters to secure highest net profit of Rs. 33820.88, by the non-adopters with net profit of Rs. 27665.61. Hence the cost benefit ratio was highest for adopters *i.e.*, 1.63 per cent and 1.51 per cent for non-adopter. Similar result observed by Ogunsumi *et al*. (2007).

Table 5: Economic impact of adoption of MAUS-162 on income.

	Coefficients	Standard Error
Intercept	-3741.29	12254.92
Dummy Variable	2156.3944 ***	4079.04
Age	88.04 *	178.02
Education	247.79	413.47
Soybean area	1814.78 *	6197.12
Annual Income	-0.0078	0.0245
Yield	4579.22 ***	360.01

*, **, *** represent significance at 10 per cent, 5per cent, 1per cent, respectively.

Economic impact of MAUS-162. Approximation the impact of soybean MAUS-162 variety on farmers income using profit regression module use, the result is presented in Table 5. The soybean MAUS-162 variety adopter benefitted in term of getting high quality of source seeds. When independent variable was significant at 1 per cent and 10 per cent level in explaining the adoption of improved soybean variety. Yield showed significant relationships with adoption of improved MAUS-162 variety production.

Result concluded that, the soybean MAUS-162 variety adopter benefitted in term of getting high quality of source seeds. Yield showed significant relationships with adoption of improved MAUS-162 variety production. The adopter to secure highest net profit of Rs. 33820.88, by the non-adopter is net profit of Rs. 27665.61. Hence, the cost benefit ratio was highest for adopters *i.e.*, 1.63 per cent and 1.51 per cent for non-adopter.

CONCLUSIONS

Result concluded that, the soybean MAUS-162 variety adopter benefitted in term of getting high quality of source seeds. Yield showed significant relationships with adoption of improved MAUS-162 variety production. The adopter to secure highest net profit of Rs. 33820.88, by the non-adopter is net profit of Rs. 27665.61. Hence, the cost benefit ratio was highest for adopters *i.e.*, 1.63 per cent and 1.51 per cent for non-adopter. Similar result observed by Peshin *et al*. (2018); Danso-Abbeam (2022).

Conflict of Interest. None.

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