



International Journal of Research in Agronomy

E-ISSN: 2618-0618
P-ISSN: 2618-060X
© Agronomy
NAAS Rating (2026): 5.20
www.agronomyjournals.com
2026; SP-9(1): 373-377
Received: 21-11-2025
Accepted: 26-12-2025

Janaki Patel
Ph.D. Scholar, International
Agribusiness Management
Institute, Anand Agricultural
University, Anand, Gujarat, India

YA Lad
Professor and Head, Department
of Human Resource Development
and Personnel Development,
International Agribusiness
Management, Anand Agricultural
University, Anand, Gujarat, India

Corresponding Author:
Janaki Patel
Ph.D. Scholar, International
Agribusiness Management
Institute, Anand Agricultural
University, Anand, Gujarat, India

Cost and return analysis of soybean production in Gujarat

Janaki Patel and YA Lad

DOI: <https://www.doi.org/10.33545/2618060X.2026.v9.i1Se.4760>

Abstract

The present study was conducted to investigate input use, cost structure, and return analysis of soybean cultivation in Gujarat. The sampled farmers were selected through multistage sampling. The data were collected from 200 farmers using semi structured schedule by interview method. CACP cost concepts were used to study the cost structure and return analysis. On the overall basis among different items of cost of cultivation, the miscellaneous cost, which includes the cost of tractor and machinery, ranked first with 13.17 percent of the total cost (5272.00 ₹/ha) followed by hired labour (11.46 percent and value 4587.15 ₹/ha. Overall Cost C₂ was observed to be ₹ 40016.98 per hectare, which was highest in small farms (₹ 24790.64). Cost C₂ was inversely proportional to the farm size. The gross return was highest for large farms (94149.33 ₹/ha), followed by medium (83706.68 ₹/ha) and small farms (82186.38 ₹/ha). The benefit cost ratio over gross profit shows an increasing trend with larger farm sizes. It was 2.05, 2.09 and 2.37 for small, medium and large farms, respectively. Cost of production for small, medium and large farms were 2488.58 ₹/ha, 2433.65 ₹/ha and 2156.26 ₹/ha, respectively.

Keywords: Soybean, cost structure, return, CACP

Introduction

Soybean play significant role in global oilseed scenario because of its high productivity, profitability and important role in maintaining soil fertility. (The Soybean Processors Association of India). Worldwide, about 76 per cent of soybean production is used as low-cost, quality protein for animal feed for meat and dairy production, 20 per cent is consumed as edible oils and human food products (i.e., tofu, soy milk, and tempeh), and 4 per cent is used for industrial purposes, in the form of biodiesel or in soap making (Ritchie, 2021) ^[7]. The major soybean producing countries in the world are Brazil, the United States, Argentina, and China which produce 156.00, 116.38, 25.00, and 20.28 million metric tonnes, respectively in year 2022-23. India ranks in world soybean production is fifth. (USDA Database, 2023) ^[10].

Soybean is majorly grown in the kharif season in India, with sowing taking place after the first monsoon showers in late June or early July. Soybean has largely been responsible for uplifting farmer's economic status in many parts of the country. It usually fetches higher income for the farmers owing to the huge export market for soybean de-oiled cake (Rajasthan Agricultural Competitiveness Project, 2016) ^[6]. The Indian soybean sector is associated about 0.5 million farmers, 200 crushers and refiners, 5000 feed millers, and consumers of soybean-based products. (The Soybean Processors Association of India). Maharashtra, Madhya Pradesh, Rajasthan, Karnataka, and Gujarat are major cultivator of soybean in India. Madhya Pradesh had the highest area under cultivation of soybean (5.51 million hectares) followed by Maharashtra (4.69 million hectares) and Rajasthan (1.16 million hectares) in 2021-22. Despite having a lower area under cultivation, Maharashtra, Karnataka, Gujarat, and Telangana have more share in production because of higher yield. The yield of soybean was highest in Telangana (1716 kg/ha) followed by Gujarat (1631 kg/ha), Maharashtra (1168 kg/ha) and Karnataka (1152 kg/ha) (Agricultural Statistics at a Glance 2022, 2023). To ensure the remunerative prices to the farmers, the government announces the minimum support price for soybean. For year 2022-23 the MSP of soybean was 4600 ₹/Quintal. (The Commission for Agricultural Costs & Prices, 2024) ^[11].

The total area under soybean cultivation was 224122 ha in Gujarat 2021-22. The highest area under soybean cultivation was in Junagadh (50695 ha) followed by Aravalli (30621 ha) and Gir Somnath (25855 ha). The total production of soybean Gujarat for the year 2021-22 was 366044 MT. The production was 94029, 53563, 41549, 26396, and 26129 MT for Junagadh, Aravalli, Gir Somnath, Sabarkantha and Dahod, respectively. The yield of soybean was recorded 1630.69 kg/ha for year 2021-22. The yield was highest for Junagadh district (1854.79 kg/ha) followed by Sabarkantha (1847.32 kg/ha) and Aravalli (1749.23 kg/ha) in the year 2021-22. (Directorate of Agriculture, 2023) ^[3] The decision for allocation of area for a particular crop depends on the availability of input, availability of technology, productivity of the crop, and price of the produce. The knowledge of input use, cost structure, and return from the cultivation of a particular crop helps farmers evaluate the profitability of their crop production., Such knowledge becomes more useful for crops taken mainly for market, viz. cash crops, oilseed crops, spices crops, fruits and vegetables, and other high-value crops. It will help the farmers to know which input cost has a higher share of total cost. Keeping this in a view, the study was undertaken to study input use, costs structure and return analysis of soybean in Gujarat.

Materials and Methods

Multistage sampling has been adopted as an appropriate sampling procedure for the study. Out of 33 districts of Gujarat, the top 5 districts comprise the majority share of soybean production. So, in the first stage, the top 5 districts of soybean production have been selected purposively. In the second stage, 2 talukas from each selected district have been chosen purposively. In the third stage, 2 villages from each selected taluka have been selected purposively. In the fourth stage, 10 respondents were selected randomly from each selected village. A total of 200 farmers have been selected for the study. The data was collected using semi structured schedule with interview method.

The CACP approach was used for computation of cost of production such as Cost A, Cost B, Cost C₁, and Cost C₂. (Reddy *et al.*, 2018) ^[8].

Cost A: It includes value of hired human labour, value of hired and owned bullock labour, value of hired and owned machine labour, value of seed (both farm seed and purchased), value of manures (owned and purchased), cost of fertilizers, plant protection charges (insecticide/pesticide), irrigation charges, land revenue, interest on working capital, miscellaneous expenses and depreciation on farm building and implements.

Cost B: Cost A₁ + rental value of owned land + interest on fixed capital.

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

Cost C₂: Cost C₁ + 10 percent of cost C₁ as management cost.

Income measures

Following income measure were calculated.

Gross income: The value of gross income was calculated by considering the total production and price of product.

Farm business income = Gross income – Cost A

Family labour income = Gross income – Cost B

Farm investment income = Net income + Rental value of owned land + Interest on own fixed capital

Net income = Gross income – Cost C₂

Benefit Cost Ratio = Gross income /Cost C₂

Results and Discussion

Level of input used by farmers

For cultivation of soybean various inputs were used. Table 1 shows the level of input used by farmers for soybean cultivation. Farmers hired the labours to perform different farm operations. At the overall level the value of human labour used was 17.31 man days and the use of hired labour was 5.07 man days. The use of hired labour was highest for medium farms (18.44 man days), followed by small (17.22 man days) and large farms (16.33 man days). The use of family labour in soybean cultivation was reported highest in small (6.02 man days) farms followed by medium (5.07 man days) and large farms (3.13 man days). The use of family labour was higher for small farm as the farmers had small land handing the family labour can work in more area as compare to medium and large farms. The use of bullock labour was 0.78 pair days, 0.63 pair days and 0.58 pair days respectively for small, medium and large farms. For all the sampled farms the use of bullock labour was 0.68 pair days.

The use of seed was higher (65.05 kg/ha) for small farms, followed by medium farms (63.14 kg/ha) and large farms (62.72 kg/ha). The seed rate of small farmers was found to be higher. It may be because of sowing different variety, different method of sowing the seed like broadcasting, different equipment used for sowing like bullock driven or tractor driven and spacing of the sowing equipment. The overall seed used by sampled farms was 63.96 kg/ha.

The use of manure in soybean cultivation was higher for small farms (1516.84 kg/ha). For medium and large farms, it was 1430.41 kg/ha and 1354.61 kg/ha, respectively. The average use of manure in sample farms was 1456.00 kg/ha. The use of seed and use of manure shows a decreasing trend with increasing farm size. As the majority farmers were doing animal husbandry along with farming they had own produced manure. Farmers were applied that manure on farms. The small farmers had limited land as compare to medium and large farmers. So, per hector application of manure was higher for small farms. The total applied nitrogen in the chemical fertilizer was higher in medium farms (67.72 kg/ha). The applied phosphorus (36.12 kg/ha) and potash (3.94 kg/ha) were higher for large farmers. The fertilizer applied for the sample farmers was 64.28 kg/ha nitrogen, 33.08 kg/ha phosphorous, and 2.98 kg/ha potash. The average hours of irrigation for the sample farms were 9.07 hours/ha. It was higher (12.74 hours/ha) for large farmers, followed by medium farmers (8.05 hours/ha) and small farmers (7.88 hours/ha). The reason for higher irrigation hours for large farmers may be the ownership of own pumping system.

The use of plant protection chemicals for small, medium, and large farms was 1.64 litre/ha, 1.68 litre/ha, and 1.63 litre/ha, respectively. This shows a similar result because the dosage for the plant protection chemical was fixed, and farms applied only the required amount of the chemical to the crop because of the higher cost.

Agrawal and Singh (2014) ^[1] reported that the use of hired labour was higher for medium farms (12.99 man days/ha) and the use of family labour was minimum in large farms (0.05 man days/ha) in soybean cultivations. The use of seed for the soybean cultivation was higher for medium farms (111.13 kg/ha) followed by small (105.30 kg/ha) and large (94.44 kg/ha) farms. The manure applied by large farms was 5.52 q/ha. The use of

urea, dye ammonium phosphate and single super phosphate was 70.31 kg/ha, 37.97 kg/ha and 274.40 kg/ha, respectively. The use of plant protection chemical was 1.13 litre/ha for small farms, 1.24 litre/ha for medium farms and 1.16 litre/ha for large farms.

Table 1: Level of input used by farmers (per ha)

Particular		Small	Medium	Large	Overall
Hired Labour (Man Days)		17.22	18.44	16.13	17.31
Family Labour (Man Days)		6.02	5.07	3.13	5.07
Bullock Labour (Pair Days)		0.78	0.63	0.58	0.68
Seed (kg)		65.06	63.14	62.72	63.96
Manure (kg)		1516.84	1430.41	1354.61	1456.00
Fertilizer (kg)	N	62.05	67.24	65.25	64.28
	P	31.32	33.52	36.12	33.08
	K	2.33	3.29	3.94	2.98
Irrigation (Hours)		7.88	8.05	12.74	9.07
Plant Protection Chemical (Litre)		1.64	1.68	1.63	1.65

Source: Field survey

Cost of cultivation of soybean

Table 2 shows the cost of cultivating soybeans for different farm sizes. Different components, viz., hired labour, family labour, seed, manure, chemical fertilizer, irrigation, plant protection, working capital cost, rental value of own land, interest on fixed capital, and management cost, were included in calculating the cost of cultivation.

The total cost of cultivating soybeans per hectare was 40016.98 ₹/ha. This cost was higher for small farms (40167.30 ₹/ha),

followed by medium farms (40048.43 ₹/ha) and large farms (39688 ₹/ha). This was mainly due to higher seed costs, higher costs of plant protection chemicals, and rent on own land. Tiwari and More (2012) ^[9] reported per hectare cost of cultivation of soybean for small, large and pooled farmers. It was 30,740.85 ₹/ha, 28,466.26 ₹/ha, and 29,587.43 ₹/ha for small, large, and pooled farms, respectively. There was an inverse relationship with the size of the farm.

On the overall basis among different items of cost of cultivation, the miscellaneous cost which includes the cost of tractor and machinery, ranked first with 13.17 percent of the total cost (5272.00 ₹/ha) followed by hired labour (11.46 percent and value 4587.15 ₹/ha). The reason for the higher cost of tractors and machinery was the mechanization of soybean farms. The tractor, land leveller, thresher, and harvester were used to perform different operation in the farm. The expenditure on other input was observed on seed (11.24 per cent) followed by plant protection chemical (8.05 per cent), chemical fertilizer (6.44 per cent), manure (5.46 per cent), bullock labour (1.71 per cent), and irrigation (1.59 per cent). The highest not payable but accounted expenditure was the rent on own land (23.30 per cent), followed by management cost (9.09 per cent), family labour cost (3.48 per cent), interest on fixed capital (1.86 per cent), interest on working capital (1.81 per cent), and depreciation (1.33 per cent). Joshi (2022) ^[4] reported that in input cost of soybean major cost components were miscellaneous charges (15.56 per cent) followed by followed by hired labour (13.97 per cent), seed (9.25 per cent), fertilizer cost (5.21 per cent), plant protection chemical (2.42 per cent).

Table 2: Cost of cultivation of soybean (₹/ha)

Particular	Small	Medium	Large	Overall
	Value	Value	Value	Value
Hired Labour	4562.97 (11.36)	4886.23 (12.20)	4273.83 (10.77)	4587.15 (11.46)
Bullock Labour	710.78 (1.77)	676.83 (1.69)	648.53 (1.63)	682.94 (1.71)
Seed	4667.02 (11.62)	4280.26 (10.69)	4417.53 (11.13)	4498.17 (11.24)
Manure	2281.25 (5.68)	2145.61 (5.36)	2031.91 (5.12)	2184.00 (5.46)
Chemical Fertilizer	2424.61 (6.04)	2653.52 (6.63)	2799.91 (7.05)	2578.04 (6.44)
Irrigation	551.25 (1.37)	563.68 (1.41)	892.13 (2.25)	634.90 (1.59)
Plant Protection Chemical Cost	3233.07 (8.05)	3183.95 (7.95)	3244.79 (8.18)	3221.83 (8.05)
Miscellaneous Cost	5190.63 (12.92)	5238.60 (13.08)	5478.72 (13.80)	5272.00 (13.17)
Depreciation	447.01 (1.11)	556.01 (1.39)	676.67 (1.70)	532.04 (1.33)
Interest on Working Capital	722.06 (1.80)	725.54 (1.81)	733.92 (1.85)	725.73 (1.81)
Rent on Own Land	9464.58 (23.56)	9289.47 (23.13)	9070.21 (22.58)	9322.00 (23.30)
Interest on Fixed Capital	604.77 (1.51)	813.66 (2.03)	952.53 (2.40)	746.03 (1.86)
Family Labour	1655.73 (4.12)	1394.30 (3.48)	860.11 (2.17)	1394.25 (3.48)
Management Cost	3651.57 (9.09)	3640.77 (9.09)	3608.08 (9.09)	3637.91 (9.09)
Total Cost (C ₂)	40167.30 (100.00)	40048.43 (100.00)	39688.88 (100.00)	40016.98 (100.00)

Source: Field survey

(Note: Figure in the parenthesis shows the percentage)

Estimates of Different Cost

Estimates of different cost for soybean cultivation such as Cost A, Cost B, Cost C₁, and Cost C₂ are presented in table 3. The per hectare Cost A at overall level was 24916.79 ₹/ha. The higher per hectare costs for large farms was associated with higher costs of fertilizer and higher costs of machinery used. The higher

per hectare cost was ₹ 25197.95 for large farms, and the lowest was for small farms (₹ 24790.64). Cost B and Cost C₁ accounted for about 87.42 and 90.91 per cent of Cost C₂. Overall Cost C₂ was observed to be ₹ 40016.98 per hectare, which was highest in small farms (₹ 24790.64). Cost C₂ was inversely proportional to the farm size. Similar results were reported by Joshi (2022) ^[4].

Table 3: Estimates of different Cost

Category of Farm	Different Cost (₹/ha)			
	Cost A	Cost B	Cost C ₁	Cost C ₂
Small	24790.64 (61.72)	34859.99 (86.79)	36515.72 (90.91)	40167.30 (100.00)
Medium	24910.23 (62.20)	35013.37 (87.43)	36407.66 (90.91)	40048.43 (100.00)
Large	25197.95 (63.49)	35220.69 (88.74)	36080.80 (90.91)	39688.88 (100.00)
Overall	24916.79 (62.27)	34984.82 (87.42)	36379.07 (90.91)	40016.98 (100.00)

Source: Field survey

(Note: Figures in parentheses indicate percentage to total cost C₂)

Return measures and benefit cost ratio for soybean cultivation

Gross return, net return, and benefit cost ratio for soybean cultivation is presented in table 4. The average yield for the main product was 16.76 q/ha for soybean farmers. The highest yield was found in large farms (18.41 q/ha) followed by medium farms (16.46 q/ha) and small farms (16.14 q/ha). Higher yield levels on large farms could be attributed to the optimum level of input utilization by them along with the selection of the input

and application of input. The average price of the main product was 4767.12 ₹/ha. The large farmers reported higher prices (4783.43 ₹/ha) as they prefer to sell their produce in nearby APMC. The average yield of by-product was 22.63 q/ha, and the economic price was 243.50 ₹/q. The by-product of soybean was mainly used as fodder or as compost material in the study area. The gross return was highest for large farms (94149.33 ₹/ha), followed by medium (83706.68 ₹/ha) and small farms (82186.38 ₹/ha). The net return also shows a similar trend.

Table 4: Gross return, net return and benefit cost ratio for soybean cultivation

Particular	Small	Medium	Large	Overall
Average yield of main product (q/ha)	16.14	16.46	18.41	16.76
Average price of main product (₹/q)	4761.71	4762.77	4783.43	4767.12
Average Yield of by product (q/ha)	21.79	22.22	24.85	22.63
Average price of by product (₹/q)	244.58	239.91	245.64	243.50
Gross return (₹/ha)	82186.38	83706.68	94149.33	85421.57
Net return (₹/ha)	42019.08	43658.25	54460.45	45404.59
Farm business income (₹/ha)	57395.74	58796.46	68951.39	60504.77
Family labour income (₹/ha)	47326.39	48693.32	58928.64	50436.74
Farm investment income (₹/ha)	52088.44	53761.39	64483.20	55472.62
Net return over different cost (₹/ha)				
Cost A	57395.74	58796.46	68951.39	60504.77
Cost B	47326.39	48693.32	58928.64	50436.74
Cost C ₁	45670.66	47299.02	58068.53	49042.49
Cost C ₂	42019.08	43658.25	54460.45	45404.59
Benefit cost ratio				
Gross return	2.05	2.09	2.37	2.13
Net Return	1.05	1.09	1.37	1.13
Cost of Productions (₹/q)				
Cost A	1535.92	1513.73	1368.98	1486.42
Cost B	2159.77	2127.68	1913.50	2087.03
Cost C ₁	2262.35	2212.41	1960.23	2170.20
Cost C ₂	2488.58	2433.65	2156.26	2387.22

Source: Field survey

The family business income, family labour income and farm investment income were 60504.77 ₹/ha, 50436.74 ₹/ha, and 55472.62 ₹/ha, respectively. The net income over Cost A, Cost B, Cost C₁, and Cost C₂ were 60504.77 ₹/ha, 50436.74 ₹/ha, 49042.49 ₹/ha and 45404.59 ₹/ha. The income over Cost A, Cost B, Cost C₁, and Cost C₂ were higher for large farms and reported a decreasing trend for medium and small farms.

The benefit cost ratio over gross profit shows an increasing trend

with larger farm sizes. It was 2.05, 2.09 and 2.37 for small, medium and large farms, respectively. It was 2.13 for all the sample farmers. The benefit cost ratio over net profit shows an increasing trend with larger farm sizes. It was 1.05, 1.09, and 1.37 for small, medium and large farms, respectively. Cost of production over Cost A₁, Cost B, Cost C₁, and Cost C₂ were 1486.42 ₹/ha, 2087.03 ₹/ha, 2170.20 ₹/ha and 2387.22 ₹/ha respectively. Cost C₂ for small, medium and large farms were

2488.58 ₹/ha, 2433.65 ₹/ha and 2156.26 ₹/ha, respectively.

Agrawal and Singh (2014) ^[1] reported that the benefit - cost ratio for small farms, medium farms and large farms were 1.33, 1.69, and 1.59, respectively. Medat *et al.* (2016) ^[5] reported that the benefit cost ratio for small farms, medium farms and large farms were 1.51, 1.54, and 1.58, respectively.

Conclusion

The study has analysed the input utilization, cost structures, and profitability of soybean cultivation in Gujarat. Use of input such as seed, fertilizer, irrigation, and hired labour were higher for large farm size while use of hired labour was higher for medium farms, and use of manure was higher for small farms. Soybean cultivation was profitable for all farm groups. However, the large farm groups got higher price of the produce, higher production, and higher benefit cost ratio. The study highlights the importance of optimizing input use and adopting efficient farming practices to enhance the profitability of soybean cultivation, especially for small and medium farmers. Strategies such as improved access to quality inputs, adoption of advanced cultivation techniques, and efficient resource management can play a pivotal role in reducing production costs and increasing returns. Additionally, policy interventions aimed at providing financial support, facilitating access to modern machinery, and offering training programs on best agricultural practices can further improve the productivity and economic sustainability of soybean farming in Gujarat.

References

1. Agrawal PK, Singh OP. An economic analysis of soybean cultivation in Narsinghpur district of Madhya Pradesh, India. *Indian J Agric Mark.* 2014;48(3):185-191.
2. Ministry of Agriculture and Farmers Welfare, Government of India. *Agricultural statistics at a glance 2022.* New Delhi; 2023.
3. Directorate of Agriculture, Gujarat State. *District-wise area, production and yield of important food and non-food crops in Gujarat.* Gandhinagar: Government of Gujarat; 2023.
4. Joshi JJ. *Economic analysis of production and marketing of soybean in North Gujarat.* Dantiwada: Sardarkrushinagar Dantiwada Agricultural University; 2022.
5. Medat NR, Singh N, Kuthe S, Patel S. Input use, cost structure and return analysis of soybean in South Gujarat. *Int J Agric Sci.* 2016;52(8):2508-2510.
6. Rajasthan Agricultural Competitiveness Project. *Value chain analysis: soybean.* New Delhi: Grant Thornton India LLP; 2016.
7. Ritchie H. Is our appetite for soy driving deforestation in the Amazon? *Our World Data.* 2021.
8. Reddy SS, Ram PR, Sastry TN, Devi IB. *Agricultural economics.* 2nd ed. New Delhi: Oxford and IBH Publishing Company Pvt Ltd; 2018.
9. Tiwari J, More S. Costs, returns and resource-use efficiency of soybean cultivation in Indore district of Madhya Pradesh. *Agric Update.* 2012;7(3):214-217.
10. United States Department of Agriculture. *World production of soybean.* Washington, DC; 2023.
11. Commission for Agricultural Costs and Prices. *Government of India.* New Delhi; 2024.
12. Soybean Processors Association of India. *General information on soybean.* Indore; 2024.