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Assessing the economics and problems of soybean growers: A study of Buldhana District

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Abstract

This research explores the economic returns and production challenges associated with soybean cultivation in the Deulgaon Raja and Sindkhed Raja tehsils of Buldhana district. The study primarily aims to evaluate the Benefit-Cost (B:C) ratio of soybean farming and to identify major production-related problems faced by farmers using the Garrett Ranking method. Data were collected from 90 soybean growers through structured interviews. The B:C ratio was calculated to assess the profitability of cultivation, which showed that soybean farming is economically viable but subject to variations due to input costs and environmental factors. Production constraints were ranked by farmers, and the Garrett Ranking technique was applied to determine their severity. The results indicated that unfavorable weather conditions and shortage of labor during peak periods were the most significant problems. Other concerns included limited access to quality seeds, pest attacks, and inadequate credit facilities. The study concludes that although soybean is a profitable crop in the region, addressing these key production issues is essential to improve farm productivity and ensure sustainable income for cultivators.

Keywords: Buldhana district, Garrett ranking, deulgaon raja, sindkhed raja, soybean cultivation, benefit-cost ratio, production problems, farm economics, agricultural constraints, farmer perception

Introduction

Soybean (*Glycine max*) is one of the most important oilseed crops cultivated across the globe due to its wide range of uses and high economic value. In India, soybean has gained prominence over the past few decades, especially in central and western states, due to its adaptability to varied agro-climatic conditions, relatively short growing period, and suitability for mechanized farming. Among the oilseed crops, soybean plays a pivotal role not only in enhancing farmers' income but also in contributing to the national oil economy. The crop is valued for its high protein and oil content and is widely used in food products, animal feed, and industrial applications.

In Maharashtra, soybean is extensively cultivated in several districts, including Buldhana, which lies in the western Vidarbha region. Buldhana district has emerged as a key soybean-producing region due to its favorable soil and climatic conditions. Within this district, the tehsils of Deulgaon Raja and Sindkhed Raja are significant contributors to soybean production. The majority of farmers in these areas rely on soybean cultivation as a primary source of income, particularly during the kharif season. However, despite its potential, soybean farming in this region is often challenged by a range of production and marketing problems that hinder optimal profitability.

Understanding the economic viability of soybean cultivation is essential for framing effective agricultural policies and extension strategies. The Benefit-Cost (B:C) ratio is one of the most widely used measures to evaluate the economic performance of crop production. It compares the gross returns received by the farmer with the total cost incurred, providing a clear picture of profitability. A B:C ratio greater than one indicates that the farming activity is economically profitable, while a ratio less than one implies financial loss. Therefore, assessing the B:C ratio of soybean farming can provide valuable insights into the financial health of farmers and the sustainability of soybean cultivation in the study area.

Alongside profitability, it is crucial to identify and prioritize the key production problems that affect soybean farmers. In regions like Deulgaon Raja and Sindkhed Raja, farmers often face issues such as erratic rainfall, non-availability of labor during critical periods, rising input costs, lack of access to quality seeds and fertilizers, pest infestations, and limited institutional support. These constraints reduce both the yield and profitability of the crop. To effectively address these challenges, it is important to understand them from the farmers' perspective. The Garrett Ranking Technique offers a reliable method for ranking problems based on the importance assigned by respondents, allowing policymakers and agricultural planners to focus on the most pressing issues.

This research is undertaken to evaluate both the benefit-cost ratio of soybean cultivation and the major production problems faced by farmers in Deulgaon Raja and Sindkhed Raja tehsils of Buldhana district. By combining economic analysis with farmer perception data, the study seeks to present a comprehensive understanding of the profitability and constraints associated with soybean farming in the region. The findings are expected to aid in the formulation of practical recommendations that can help farmers improve productivity, reduce risks, and achieve better returns from soybean cultivation.

The study gains further significance in the context of changing agricultural dynamics, where increasing costs of cultivation, market fluctuations, and climate variability are making traditional farming more uncertain. A clear understanding of the cost-benefit structure and a prioritization of field-level problems can help in developing effective extension services, subsidy plans, and input delivery systems tailored to local needs. Moreover, it can assist in directing government support towards those areas that require urgent attention, thereby enhancing the sustainability and resilience of soybean-based farming systems in rural Maharashtra.

Objective of study:

To study economics and problems of soybean production

Hypothesis:

- **Null Hypothesis (H₀):** Soybean Production is not profitable.
- **Alternate Hypothesis (H₁):** Soybean Production is profitable.

Methodology

This research was conducted in Buldhana district of Maharashtra, focusing on two major soybean-producing tehsils Deulgaon Raja and Sindkhed Raja. These tehsils were purposefully selected due to their prominence in soybean cultivation. From each tehsil, five villages were carefully chosen based on their area under soybean production and active involvement in farming activities, making a total of ten villages for the study. To ensure balanced representation, a random sampling technique was used to select 90 soybean farmers from these villages.

Primary data were collected through direct interviews using a well-structured, pre-tested questionnaire. The questionnaire covered various aspects such as landholding, input use, labor, yield, production cost, market prices, and challenges faced during cultivation. The Benefit-Cost (B:C) ratio was used to assess the economic returns of soybean farming. This ratio was calculated by dividing the gross

income obtained from soybean sales by the total expenditure incurred during the crop cycle. The cost included all relevant components such as seeds, fertilizers, pesticides, labor, machinery, irrigation, and land preparation.

To systematically analyze the production-related problems faced by farmers, the Garrett Ranking Technique was applied. Farmers were asked to list and rank the most common constraints they experienced during soybean cultivation. These rankings were then converted into scores using Garrett's conversion formula. The average scores for each issue were calculated to determine their relative importance and severity as perceived by the farming community.

In addition to the primary data, relevant secondary information was gathered from published reports, government records, agricultural department sources, and previous studies. Data analysis was performed using simple statistical tools like averages, percentages, and ranks to derive meaningful conclusions. The combined use of economic evaluation and farmer-based problem ranking helped in understanding both the profitability and practical barriers associated with soybean cultivation in the selected tehsils of Buldhana district.

Analytical Tool

Cost Concept

The standard cost concepts i.e. Cost A, Cost B, and Cost C will be used and different marketing cost concepts were used for the present study.

- **Cost 'A':** It includes the actual paid out costs viz; expenditure on seed, manures, fertilizers, hired human labour, bullock labour, land revenue, irrigation charges, machinery charges, interest on working capital and depreciation on farm implement and incidental charges.
- **Cost 'B':** Cost A + Rental Value of owned land + interest on fixed capital (excluding land) @ 10%. Rental value of land = $1/6^{\text{th}}$ Gross product - Land revenue
- **Cost 'C':** Cost B + Imputed value of family labour. The probability of crop production cannot be justified completely unless benefit cost ratio were worked out. This is the ratio which represents returns obtained per rupee of investment. It is worked out by dividing gross return by the total cost. It is calculated at cost A, cost B and cost C as Gross Income.

Benefit-cost ratio at cost 'A' = Gross Income / Cost A

Benefit-cost ratio at cost 'B' = Gross Income / Cost B

Benefit-cost ratio at cost 'C' = Gross Income / Cost C

Garrett Ranking

Percentage position = $100(R_{jj} - 0.5)/N_j$

- **R_{jj}:** Rank given for the *i*th risk statement by the *j*th respondent.
- **N_j:** Number of risk statement ranked by the *j*th respondents

Results and Discussion

Soybean is one of the most important oilseed and pulse crops grown in India, known for its high protein content, soil-enriching properties, and wide range of uses in food, feed, and industry. It plays a crucial role in improving farm

income and promoting sustainable agriculture due to its relatively low input requirements and nitrogen-fixing ability. Understanding the economics of soybean cultivation is essential for farmers, researchers, and policymakers to improve production efficiency and profitability. The table presents a detailed cost and income analysis of soybean cultivation per acre and per hectare. It begins with the breakdown of various input costs such as hired human labour, machinery use, seed, manure, fertilizers (NPK), micronutrients, irrigation, and plant protection measures. Labour costs for male and female workers together amount to ₹5,400 per acre or ₹13,338 per hectare. Additional costs include ₹2,000 per acre for machinery, ₹1,500 for seed, ₹9,000 for manure, and ₹1,480 for fertilizers. Charges for micronutrients, irrigation, and plant protection are also included, along with weeding, harvesting, and transportation expenses. The total of all these variable inputs, referred to as Cost A1, is ₹28,880 per acre or ₹84,671.60 per hectare. Interest on working capital is calculated at 10% of Cost A1, which amounts to ₹2,888 per acre or ₹8,467.16 per hectare. This leads to Cost A2, which includes Cost A1 and interest, totaling ₹31,768 per acre or ₹93,138.76 per hectare. Further fixed costs such as the rental value of land (₹10,000 per acre or ₹24,700 per hectare) and interest on fixed capital like machinery (₹850 per acre or ₹2,099.50 per hectare) are added to compute Cost B. This results in ₹42,618 per acre or

₹1,19,938.26 per hectare.

To determine the complete cost of cultivation, the imputed value of family labour is included, calculated at ₹1,200 per acre or ₹2,964 per hectare. Therefore, Cost C, which represents the total cost including all actual and imputed expenses, amounts to ₹43,818 per acre or ₹1,22,902.26 per hectare.

The income side of the analysis reveals a production of 11 quintals per acre (approximately 27.5 quintals per hectare), resulting in gross income of ₹44,000 per acre or ₹1,60,000 per hectare. Subtracting Cost C from gross income gives a net profit of ₹182 per acre and ₹37,097.74 per hectare. The benefit-cost ratio (BCR) is also calculated, with a result of 1.004 per acre and 1.30 per hectare, indicating that for every ₹1 invested, the farmer earns ₹1.30 in return. This suggests that while profits per acre are marginal, soybean cultivation becomes more profitable when scaled to a per-hectare basis.

B:C Ratio Calculation per acre or per hectare

The table clearly shows that soybean cultivation involves significant input costs, especially for labour, manure, and fertilizers. Total cost of cultivation (Cost C) is ₹43,818 per acre and ₹1,22,902.26 per hectare. The gross income generated is ₹44,000 per acre and ₹1,60,000 per hectare. Net profit remains very low on a per acre basis but is much higher per hectare.

Table 1: cost of cultivation and income analysis per acre and per hectare

Sr. No.	Particulars	Qty.	Amount (t/Acre)	Amount (t/hectare)
I.	Hired Human Labour	-	-	-
	a) Male	8	2,400	5,928
	b) Female	10	3,000	7,410
2.	Total Human Labour	18	5,400	13,338
3.	Bullock Power	0	0	0
4.	Machinery (Hrs.)	1	2,000	4,940
5.	Seed Cost	25	1,500	3,705
6.	Manure (Ton)	3	9,000	22,230
7.	Fertilizers (NPK) in Kg	80	1,480	3,655.6
8.	Micronutrient charges	-	1,000	2,470
9.	Irrigation charges	-	500	1,235
10.	Plant protection charges	-	2,000	4,940
II.	Incidental charges	-	500	1,235
12.	Repairs charges	-	200	494
13.	Weeding Charges	-	1,000	2,470
14.	Harvesting+Threshing Charges	-	4,000	9,880
15.	Transportation Charges	-	300	741
16.	Production in quintal	II	44,000	1,80,000
17.	Gross income	-	44,000	1,80,000
18.	Total Variable Cost (Cost A1) = Sum of above	-	28,880	84,671.6
19.	Interest on working capital (10% of A1)	-	2,888	8,467.16
20.	Cost A2 = A1 + Interest	-	31,768	93,138.76
21.	Rental value of land	-	10,000	24,700
22.	Interest on fixed capital (machinery etc.)	-	850	2,099.5
23.	Cost B = A2 + Land rent + Interest	-	42,618	1,19,938.26
24.	Family labour	4	1,200	2,964
25.	Cost C = Cost B + Family labour	-	43,818	1,22,902.26

• B:C Ratio per Acre

The Benefit-Cost Ratio (B:C) analysis for soybean cultivation per acre highlights the profitability at different levels of cost consideration. The B:C ratio on Cost A1, which includes only variable costs such as labour, seed, fertilizers, and other operational inputs, is 1.52, indicating that the farmer earns ₹1.52 for every ₹1 spent. This reflects a good return when only direct production expenses are

considered. However, when moving to Cost B, which also includes the rental value of land and interest on fixed capital, the B:C ratio drops to 1.03, suggesting a much lower profit margin. Finally, the B:C ratio on Cost C, which includes all costs including the imputed value of family labour, is further reduced to 1.01. This means that after accounting for all actual and imputed costs, the farmer earns just ₹1.01 for every ₹1 invested, showing a very narrow

profit margin. Overall, while soybean cultivation appears profitable at a basic input level, the inclusion of fixed and

family labour costs significantly lowers the economic returns.

Table 2: Benefit-Cost Ratio (B:C Ratio) based on different cost concepts

B:C Ratio Type	Formula		Value
B:C Ratio on Cost A1	44,000 /	28,880	1.52
B:C Ratio on Cost B	44,000 /	42,618	1.03
B:C Ratio on Cost C	44,000 /	43,818	1.01

• B:C Ratio for per hectare

The Benefit-Cost Ratio (B:C) analysis for soybean cultivation per hectare presents a clearer picture of profitability on a larger scale. The B:C ratio on Cost A1, which includes only variable or operating costs, is 1.88, indicating that the farmer earns ₹1.88 for every ₹1 spent on basic inputs. This reflects a strong return on investment when only direct cultivation expenses are considered. When the analysis is extended to Cost B, which adds the rental value of land and interest on fixed capital, the B:C ratio

reduces to 1.33, still showing a reasonably good profit. Finally, including Cost C, which accounts for the imputed value of family labour as well, the B:C ratio stands at 1.30. This demonstrates that even after considering all economic costs both paid and unpaid soybean cultivation remains profitable per hectare. Overall, these values indicate that soybean farming is more economically viable when cultivated at the hectare level, offering better returns compared to per acre analysis.

Table 3: Benefit-Cost Ratio (B:C Ratio) Based on Different Cost Concepts (Per Hectare)

B:C Ratio Type	Formula	Value
B:C Ratio on Cost A1	180000/84671 6	1 88
B:C Ratio on Cost B	180000/119938.26	1 33
B:C Ratio on Cost C	180000/12290226	1 3

• Marketing Problems

Marketing problems in agriculture, especially in soybean farming, significantly impact farmers' income and sustainability. Farmers often struggle with inadequate access to fair pricing, timely markets, and reliable buyers. Lack of

proper storage facilities and high transportation costs add to their burden. Many are unaware of market trends and government support schemes due to poor market knowledge. These issues create instability and reduce the profitability of soybean cultivation.

Table 4: Production problems

Particular	Garrett Score	Frequency	Percentage	Ranking
Impact of weather	54.6	12	13.33	I
Non-availability of labour at needed time	51.53	11	12.22	II
Inadequate loan supply by the financial institutions	51.62	11	12.22	III
Higher cost of agro - chemical	50.02	11	12.22	IV
knowledge about soybean cultivation	49.79	11	12.22	V
Difficulties in pest and disease control	49.79	11	12.22	VI
Non-availability of input on time	49.44	11	12.22	VII
Poor quality of input	49.3	10	11.11	VIII
Total		90	100	

Table presents the major challenges encountered by farmers during soybean production, ranked using Garrett Ranking Method. Among the various issues, the impact of weather was found to be the most significant constraint, with the highest Garrett Score of 54.6, and ranked I. This highlights how irregular or unpredictable weather conditions severely affect crop yield. The non-availability of labour at the needed time was ranked second (Score: 51.53), reflecting the seasonal labour shortages that hinder timely farming operations. Other critical problems included inadequate loan supply by financial institutions (Rank III), high cost of agro-chemicals (Rank IV), and lack of knowledge about soybean cultivation (Rank V). Additional issues such as pest and disease control difficulties, non-availability of inputs on time, and poor quality of inputs were also reported, though with slightly lower scores and rankings from VI to VIII. Overall, the table indicates that climatic factors, financial constraints, and timely availability of labour and inputs are key obstacles in soybean production.

Conclusion

The analysis of Benefit-Cost (B:C) ratios and production problems in soybean cultivation reveals important insights into the economic viability and challenges faced by farmers. The B:C ratio per acre, when calculated on Cost C (which includes all actual and imputed costs), is just 1.01, indicating a marginal profit. However, the ratio improves significantly at the hectare level, reaching 1.30 on Cost C, suggesting that larger-scale cultivation offers better economic returns. On the other hand, production-related problems continue to hinder profitability. The most severe issues identified by farmers include the impact of unpredictable weather, shortage of labour during critical periods, and limited access to institutional credit. High input costs and insufficient knowledge about soybean cultivation further reduce efficiency and output. These challenges directly influence the cost structure and yield, which in turn affect the overall benefit-cost ratio. Therefore, addressing production constraints through better support systems,

timely input supply, training, and financial assistance is essential to improve both productivity and profitability in soybean farming.

Suggestion

- Farmers should adopt weather-resilient farming techniques and climate-smart agricultural practices to reduce the impact of unpredictable weather conditions.
- Timely availability of labour and agricultural inputs should be ensured through efficient supply chains and the promotion of farm mechanization.
- Access to institutional credit must be improved by simplifying loan procedures and increasing the outreach of financial institutions.
- Regular training programs and extension services should be provided to educate farmers on modern soybean cultivation methods and pest management.

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