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Socio-economic attributes of growers and non-growers of the soybean variety MAUS-612

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Abstract
The economic effects of the enhanced soybean variety MAUS-612 are examined in this study among 160 producers and 160 non-growers in the Marathwada district of Maharashtra. According to demographic data, middle-aged people make up 56.88 per cent of farmers, whereas elderly people make up a larger percentage of non-growers (32.5%). According to educational attainment, compared to 18.75 per cent of non-growers, 28.13 per cent of farmers have a degree. According to family structures, 60.63 per cent of growers are part of joint families. With 96.88 per cent male representation in both categories, there is a clear gender gap. The economic feasibility of the crop is demonstrated by the income distribution, which shows that 65 per cent of growers earn between ₹1 and ₹3 lakh, compared to 66.68 per cent of non-growers.

Introduction

Soybean (*Glycine max*), an annual legume from the Fabaceae family, is a globally important crop native to East Asia, particularly China. Known for its high protein content and nitrogen-fixing ability through symbiosis with Rhizobium bacteria, it enhances soil fertility and supports sustainable agriculture. Soybean is used in food (e.g., tofu, soy milk), animal feed, and industrial products (e.g., biofuels, cosmetics). Leading producers like the USA, Brazil, and Argentina dominate global production. Soybeans account for 25 per cent of global vegetable oil production and two-thirds of protein concentrate used in animal feed, with the majority of output processed into oil and meal. The crop's adaptability to diverse climates, coupled with its role in crop rotations, improves soil health, reduces pest pressure, and enhances climate resilience.

Ecologically, soybeans improve soil fertility through biological nitrogen fixation and mitigate the need for synthetic fertilizers. They also support water retention and carbon sequestration. Economically, the soybean sector has expanded significantly due to rising demand for plant-based protein and oil, with global production increasing 15-fold since the 1950s. Soybean oil is used in food and industrial applications, while soybean meal is a critical component of livestock and aquaculture feed. Soybeans are also rich in protein, oil, carbohydrates, and bioactive compounds, contributing to human health, especially in vegetarian diets.

Soybean farming intersects with agricultural economics, including production economics, market analysis, trade, policy, and sustainability. Economic evaluations consider profitability, cost-benefit analysis, and financial modeling, while market studies assess price dynamics and trade flows. Socioeconomic research focuses on the crop's impact on rural livelihoods, gender equity, and food security. The study on MAUS-612, an improved soybean variety, aims to assess its economic impact in Maharashtra's Marathwada region, addressing production costs, technology adoption, and challenges to inform policy and enhance cultivation to meet rising global demand and mitigate climate change impacts.

Materials and Methods

The primary data was collected for the study pertaining to agriculture year 2022-23. The data was collected through personal interview method with the help of pre-tested comprehensive schedule for soybean crop from sample farmers. Secondary data needed for the study that is year

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wise and district wise for area, production and productivity was obtained from different sources *viz.* Directorate of Statistics and Evaluation, Websites of Government of Maharashtra and AICRP Soybean Research Station, VNMKV Parbhani.

- **Socio-economic characteristics of MAUS-612 soybean variety growers and non growers**

The relevant information for the study was collected from the sample soybean growers through pre determined interview schedule by using Simple tabular analysis and descriptive statistics like averages & percentage was employed to study the socio-economic status.

Results and Discussion:
The study highlights that farmers' socio-economic status serves as a critical determinant of their standard of living, technology adoption, and receptiveness to innovations. Key influencing factors include age, education level, occupation, family size and type, and farming experience, all of which collectively impact both adoption behavior and the overall financial condition of the farmers.

1. Distribution of MAUS-612 variety growers and non-growers according to Age

Table 1 presents the age distribution of soybean growers and non-growers, each consisting of 160 individuals, categorized as "Young," "Middle," and "Old." Both groups show a similar demographic trend, with the majority in the "Middle" age group: 56.88 per cent (91 growers) and 55 per cent (88 non-growers), indicating that middle-aged individuals are more engaged in agriculture due to economic stability and experience. The "Young" group comprises 14.37 per cent (23 growers) and 12.5 per cent (20 non-growers), suggesting a slight preference for farming among younger individuals, likely due to entrepreneurial interest. The "Old" group includes 28.75 per cent (46 growers) and 32.5 per cent (52 non-growers), reflecting decreased participation, possibly due to physical limitations or retirement. These findings align with previous research linking farming experience to productivity and age-related engagement patterns.

Table 1: Distribution of MAUS 612 variety growers and non-growers according to Age

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Young	23	14.37	20	12.5
2	Middle	91	56.88	88	55
3	Old	46	28.75	52	32.5
	Total	160	100	160	100

2. Distribution of MAUS 612 variety growers and non-growers according to Occupation

Table 2 presents a comparative analysis of primary occupations among 160 soybean growers and 160 non-growers. Agriculture emerged as the dominant occupation in both groups 84.38 per cent of growers and 88.13 per cent of non-growers underscoring its central role in rural livelihoods regardless of cultivation status. Business and service sectors accounted for a minor share: 7.5 per cent and 8.12 per cent among growers, and 6.24 per cent and 5.63 per cent among non-growers, respectively. This limited diversification suggests constrained access to non-agricultural employment, though gradual shifts are occurring due to enhanced education, market integration, and economic transitions. These patterns align with findings by Kamble *et al.*

(2024) [6].

Table 2: Distribution of MAUS 612 variety growers and non-growers according to Occupation

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Agriculture	135	84.38	141	88.13
2	Business	12	7.5	10	6.24
3	Service	13	8.12	9	5.63
	Total	160	100	160	100

3. Distribution of MAUS 612 variety growers and non-growers according to Education Level

Table 3 outlines the educational profile of 160 soybean growers and 160 non-growers across five categories. Illiteracy was lower among growers (13.75%) compared to non-growers (20%), while a higher proportion of growers attained graduate-level education (28.13%) versus non-growers (18.75%), indicating a positive correlation between education and agricultural adoption. Non-growers showed slightly higher representation at the high school (23.75%) and higher secondary (18.13%) levels, possibly due to the educational requirements of non-farm employment. These patterns affirm findings by Singh B.P. (2018), highlighting education as a key factor in the adoption of improved agricultural practices.

Table 3: Distribution of MAUS 612 variety growers and non-growers according to Education Level

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Illiterate	22	13.75	32	20
2	Up to primary	39	24.37	31	19.37
3	Up to high school	30	18.75	38	23.75
4	Up to HSC	24	15	29	18.13
5	Up to graduate	45	28.13	30	18.75
	Total	160	100	160	100

4. Distribution of MAUS 612 variety growers and non-growers according to Family Type

Table 4 presents family type distribution among 160 soybean growers and 160 non-growers. Nuclear families predominated in both groups 60.63 per cent among growers and 58.75 per cent among non-growers. Joint families constituted 39.37 per cent of growers and 41.25 per cent of non-growers. The slightly higher prevalence of nuclear families among growers suggests a possible link to improved resource management and independent decision-making, facilitating adoption of varieties like MAUS-612. These patterns align with Singh B.P. *et al.* (2018), indicating nuclear family dominance across rural adopter groups.

Table 4: Distribution of MAUS 612 variety growers and non-growers according to Family Type

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Joint	63	39.37	66	41.25
2	Nucleus	97	60.63	94	58.75
	Total	160	100	160	100

5. Distribution of MAUS 612 variety growers and non-growers according to Gender

Table 5 presents gender-wise distribution among 160 soybean growers and 160 non-growers. Males constituted 96.88 per cent of growers and 96.25 per cent of non-growers, while females

accounted for only 3.12 per cent and 3.75 per cent, respectively. This marked gender disparity reflects entrenched socio-cultural norms and labor divisions, wherein males dominate formal and physically demanding agricultural tasks. Consistent with Patel R.R. *et al.* (2023) and Okeke-Agulu & Onogwu (2014), the data highlights systemic barriers limiting women's formal participation in agriculture despite their informal contributions.

Table 5: Distribution of MAUS 612 variety growers and non-growers according to Gender

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Male	155	96.88	154	96.25
2	Female	5	3.12	6	3.75
	Total	160	100	160	100

6. Distribution of MAUS 612 variety growers and non-growers according to Marital Status

Table 6 shows that married individuals constituted the majority in both groups 90 per cent among growers and 90.62 per cent among non-growers indicating demographic uniformity. This marital predominance, as supported by Yadav (2013) [10], reflects rural socio-cultural norms linking marriage with economic stability and shared responsibilities. While marital status may facilitate agricultural adoption among growers, it also supports stable non-farm engagement among non-growers. The marginal difference in unmarried individuals suggests marital status is not a key differentiator between the groups.

Table 6: Distribution of MAUS 612 variety growers and non-growers according to Marital Status

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Married	144	90	145	90.62
2	Unmarried	16	10	15	9.38
	Total	160	100	160	100

7. Distribution of MAUS 612 variety growers & non-growers according to Experience in Soybean Cultivation

Table 7 compares farming experience among growers and non-growers, categorized as <10 years, 10-15 years, and >15 years. A higher proportion of growers (55%) had long experience (>15 years) versus 43.75 per cent of non-growers, indicating stronger retention in agriculture. Non-growers showed a greater share (30.62%) with <10 years' experience, suggesting early exit from farming, likely due to economic shifts or alternative livelihood options. Medium experience levels were similar across groups. The data implies that sustained farming engagement is linked to experience, with growers demonstrating greater agricultural persistence.

Table 7: Distribution of MAUS 612 variety growers & non-growers according to Experience in Soybean Cultivation

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Less Experience (<10 yrs.)	33	20.63	49	30.62
2	Medium Experience (10-15 yrs.)	39	24.37	41	25.63
3	Long Experience (>15 yrs.)	88	55	70	43.75
	Total	160	100	160	100

8. Distribution of MAUS 612 variety growers and non-growers according to Land Holding

Table 8 presents landholding distribution among MAUS 612 growers and non-growers. Growers were predominantly semi-medium (35.63%) and small farmers (26.87%), followed by medium (21.25%), large (9.37%), and marginal (6.88%) holders. Non-growers had higher proportions of small (32.5%) and semi-medium (30.63%) farmers. Adoption was concentrated among small to semi-medium landholders, indicating their responsiveness to improved varieties. Lower adoption among marginal holders may reflect resource constraints. These findings align with literature, emphasizing the role of land size and support systems in technology uptake.

Table 8: Distribution of MAUS 612 variety growers and non-growers according to Land Holding

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Marginal	11	6.88	24	15
2	Small	43	26.87	52	32.5
3	Semi-medium	57	35.63	49	30.63
4	Medium	34	21.25	28	17.5
5	Large	15	9.37	7	4.37
	Total	160	100	160	100

9. Distribution of MAUS 612 variety growers & non-growers according to Caste

Table 9 compares caste-wise distribution among soybean growers and non-growers (n=160 each). General category had the highest share in both groups 49.38 per cent in growers and 50 per cent in non-growers indicating better access to resources. OBC representation was higher among growers (31.25%) than non-growers (24.37%), suggesting stronger agricultural engagement. SC and ST groups were more prevalent among non-growers (17.5% and 8.13% than growers (12.5% and 6.87%), indicating limited access to agricultural assets and greater reliance on non-farm livelihoods. Findings reflect caste-linked disparities in resource distribution and livelihood opportunities, aligning with Yadav (2013) [10].

Table 9: Distribution of MAUS 612 variety growers and non-growers according to Caste

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	GENERAL	79	49.38	80	50
2	OBC	50	31.25	39	24.37
3	SC	20	12.50	28	17.5
4	ST	11	6.87	13	8.13
	Total	160	100	160	100

10. Distribution of MAUS 612 variety growers and non-growers according to Livestock

Table 10 compares livestock ownership between soybean growers and non-growers, with total livestock counts of 628 and 669, respectively. Cows were the predominant species in both groups 41.72 per cent among growers and 37.35 per cent among non-growers due to their dual utility in milk and manure. Goats, buffaloes, and bullock pairs followed in varying proportions. Goats and buffaloes were similarly distributed across groups, while bullock ownership was slightly higher among non-growers (14.59%), possibly due to reduced mechanization. Livestock serves as a key supplementary income source, especially in the off-season, with ownership patterns reflecting livelihood strategies and resource access. These findings align with Thombre *et al.* (2020) [7], emphasizing livestock's role in rural economic resilience.

Table 10: Distribution of MAUS 612 variety growers and non-growers according to Livestock

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Bullock Pair	84	13.37	75	14.59
2	Cow	262	41.72	192	37.35
3	Buffalo	137	21.82	122	23.74
4	Goat	145	23.09	125	24.32
	Total	628	100	669	100

11. Distribution of MAUS 612 variety growers and non-growers according to Annual Income

Table 11 compares annual income levels of soybean growers and non-growers across three brackets: ≤₹1 lakh, ₹1-3 lakh, and >₹3 lakh. Most individuals in both groups earned ₹1-3 lakh (65% growers, 66.88% non-growers), reflecting typical rural income patterns. However, a higher share of growers (23.13%) earned >₹3 lakh compared to non-growers (13.12%), indicating better earnings from agriculture. Conversely, more non-growers (20%) fell into the ≤₹1 lakh bracket, suggesting limited income opportunities. These trends underscore the income advantage of growers and point to the need for targeted livelihood interventions for non-growers.

Table 11: Distribution of MAUS 612 variety growers and non-growers according to Annual Income

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
1	Up to ₹ 1 Lakh	19	11.87	32	20
2	₹ 1 - 3 Lakh	104	65	107	66.88
3	Above ₹ 3 Lakh	37	23.13	21	13.12
	Total	160	100	160	100

12. Distribution of MAUS 612 variety growers and non-growers according to Cropping Pattern

Table 12 compares cropping patterns, gross cropped area, and cropping intensity between growers and non-growers. Growers had a gross cropped area of 4.0 hectares and a cropping intensity of 141.34 per cent, higher than the non-growers' 3.79 hectares and 130.69 per cent, indicating more intensive land use. *Kharif* crops dominated both groups, with soybean being the most cultivated, though non-growers had slightly higher shares of cotton and pigeon pea, suited for marginal lands. *Rabi* crops were also significant, with wheat occupying more area for non-growers, suggesting a preference for staple crops. Summer crops, particularly groundnut, were more prominent among growers due to its lower water needs. Non-growers allocated more area to sugarcane, reflecting its high profitability, while growers invested more in perennial fruit crops. These patterns suggest growers focus on long-term profitability and diversification, while non-growers prioritize stability and lower management complexity. Policy support for irrigation, credit, and market access is crucial to enhance sustainable cropping practices.

Table 12: Distribution of MAUS 612 variety growers and non-growers according to Cropping Pattern (Area in ha)

Sr. No	Particulars	Growers		Non - Growers	
		N=160	Percent	N=160	Percent
Kharif					
1	Soybean	1.43	36.10	1.20	31.71
2	Maize	0.03	0.82	0.01	0.20
3	Cotton	0.38	9.65	0.42	11.14
4	Bajra	0.04	0.92	0.07	1.85
5	Pigeon Pea	0.20	5.00	0.35	9.19
6	Green Gram	0.08	1.95	0.07	1.85
7	Black Gram	0.07	1.66	0.07	1.89
	Sub Total	2.2	56.09	2.19	57.83
Rabi					
1	Rabi Jowar	0.27	6.75	0.01	0.28
2	Wheat	0.43	10.75	0.71	18.78
3	Safflower	0.10	2.45	0.02	0.53
4	Gram	0.46	11.71	0.40	10.43
5	Maize	0.00	0.11	0.01	0.29
6	Vegetables	0.01	0.21	0.00	0.07
	Sub Total	1.26	31.98	1.15	30.38
Summer					
1	Groundnut	0.06	1.58	0.04	1.10
2	Cattle Grass	0.02	0.51	0.00	0.12
	Sub Total	0.08	2.09	0.05	1.22
Annual					
1	Soybean	0.06	1.52	0.09	2.26
2	Sugarcane	0.11	2.85	0.28	7.49
	Sub Total	0.17	4.37	0.37	9.75
Perennial					
1	Fruit crops	0.22	5.47	0.03	0.82
	Sub Total	0.22	5.47	0.03	0.82
	Gross crop area	4.0		3.79	
	Net sown area	2.83		2.90	
	Cropping intensity	141.34		130.69	

Conclusion

1. Both growers and non-growers are predominantly middle-aged, with agriculture as the primary occupation for both groups. However, growers have a slightly higher proportion of younger individuals, while non-growers have more older individuals, possibly due to retirement or physical constraints.
2. Growers exhibit higher educational attainment, particularly at the graduate level, and show a preference for nucleus families, likely linked to better resource management. Non-growers have higher illiteracy rates and a slightly larger proportion in joint families.
3. Growers have better access to land resources, particularly semi-medium landholders, enabling greater agricultural innovation. Income analysis shows growers earning higher incomes, with a larger share in the above ₹3 lakh category, while non-growers are concentrated in lower income brackets.
4. Livestock ownership is essential for both groups, with cows being the most commonly owned livestock. Growers exhibit higher cropping intensity, indicating more intensive agricultural practices compared to non-growers.

Policy Implications

- Develop specialized training programs on advanced agronomic practices, agribusiness, and technology dissemination, targeting middle-aged and semi-medium farmers; implement vernacular-based participatory education models for non-growers to address literacy gaps.
- Initiate youth-centric agripreneurship schemes, including startup incubators, innovation grants, and rural entrepreneurship hubs, to rejuvenate the farming demographic and ensure generational continuity.
- Promote nucleus family farming through enhanced access to custom hiring centers, shared assets, and group farming models; integrate precision agriculture and ICT-based farm management tools for resource optimization.
- Foster integrated farming systems (IFS) integrating crop-

livestock enterprises; strengthen livestock value chains via dairy cooperatives and agro-processing units to boost farm income and cropping intensity.

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