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Effect of Socio-economic Characteristics on Pomegranate Productivity of Farmer Producer Organizations Member Farmers

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

The Investigation was carried out during 2022 to study the socio-economic status of Farmer producer organizations member farmers. The multistage sampling method was used for selection 26 samples from the Western Region of Maharashtra. The results revealed that, Overall Average age of the farmers was 39.98 years with 8.76 years of experience. The education level of farmer was up to higher secondary i.e.,10.53 years. The average family size was 6.94 number of person with land holding of 3.56 years. Study showed that, the explanatory parameters successfully explained 99.8% of the overall variance in the pomegranate yield, with random errors accounting for the remaining 1%. The findings indicated that age, education, income, and investment all played crucial roles in increasing productivity, while other socio-economic factors including land ownership, experience, and family size did not show significant affect on yield.

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1. INTRODUCTION

A Farmers Producer Organization (FPO) serves as an example of a Producer Organization (PO), comprising farmers as its members. To encourage the establishment of FPOs, the Small Farmers' Agribusiness Consortium (SFAC) provides support. A Farmer Producer Company can be formed by a group of 10 or more primary producers, two or more producer institutions, or a combination of both. These companies, established under the 2013 Indian Companies Act, operate under democratic governance, ensuring that each producer or member holds an equal number of voting rights, irrespective of their shareholding.

To secure a farmer's sustainable income, Farmer Producer Organizations (FPOs) play a pivotal role. These key institutions facilitate the rapid dissemination of knowledge and technology through extensive networks of small-scale farmers. Ensuring the long-term viability of FPOs necessitates strategic government intervention [1,2]. Enhancing the capacity of management teams, fostering internal learning and development within FPOs, expediting credit allocation, and establishing post-harvest infrastructure are among the various approaches to fortify the FPO ecosystem [3,4].

FPOs are established to assist farmers in achieving higher returns through collective input purchases, marketing, and processing, as well as improving productivity by accessing better inputs and adopting better management practices. Member-based FPOs provide an effective solution to various challenges faced by farmers, particularly small-scale producers. By leveraging their collective strength and bargaining power, FPO members can access financial and non-financial input services, appropriate technologies reduce transaction costs, tap into high-value markets, and form equitable partnerships with private entities.

FPOs offer a means of aggregation that is not dependent on individual land titles, allowing for collective planning in production, procurement, and marketing to enhance the value of members' produce. Given the challenges posed by the fragmentation of land holdings due to generational transfer, FPOs play a crucial role in addressing these issues. Global and national Experiences demonstrate the effectiveness of FPOs, highlighting the importance of policy support for member-based farmer organizations to gain market share, mitigate risks, and progress along the agricultural value chain.

2. METHODS

A Multistage sampling design was adopted for the selection of samples, in which the Western region of Maharashtra was selected as leading state in number of FPOs. From western region of Maharashtra Pune, Sangli, Satara, and Solapur were purposefully chosen for the research. As the farmer producers' organizations were established earlier in this district. These institutes were established in these areas, the main goal of improving the economic condition of farmers, thus it was necessary to examine how well they were performed. From above selected district total seven farmer producer organizations was selected purposefully because these FPOs were completed five years of establishment. In total seven FPOs three from Pune district, two from Sangli District, one from Satara district and one from Solapur district were selected, as they were adequately represented by successful and assessable case studies. Eighteen member farmers were selected from each FPO, thus total 126 sample farmers were selected for the study.

2.1 Collection of Data

Cross sectional data were collected from the member farmers of FPOs by personal interview method with the help of pre-tested schedule. Data pertained for the year of 2022.

2.2 Analysis of Data

Statistical tools the arithmetic mean and multiple linear regression model was used to analyze the socio-economic status and its effect on the productivity of FPO members.

Multiple Linear Regression Model:

$$Y = f(x_1, x_2, x_3 \ldots\ldots\ldots\ldots x_n)$$
$$Y = a + b_1x_1 + b_2x_2 + \ldots\ldots\ldots\ldots + b_nx_n + e_i)$$

Where,

1. Y= Per hectare productivity of pomegranate in quintals.

2. a= Intercept.
3. b_i=Partial regression coefficient of the respective resource variable (i= 1, 2, 3,……..,6)
4. X_1= Age of farmers in years
5. X_2= Educational level in number of years
6. X_3=Family size in number of members in family
7. X_4=Land holding in hectares
8. X_5 = Income in rupees from Pomegranate
9. X_6=Investment in rupees on pomegranate.
10. e_i= Error term

3. RESULTS AND DISCUSSION

3.1 Socio-Economic Characteristics

Numerous economic and demographic traits that differentiate individuals or groups within a society are referred to as socioeconomic characteristics. These characteristics enable perceptions of the social and economic standing of specific individuals, households, or places. Typical socio-economic traits include education, age, family structure, occupation, land holding, income etc. Socio-economic characteristics are often used in research, policy-making and social analysis to understand the disparities, access the impact of policies and design interventions to address the socio-economic challenges. It provides a comprehensive picture of an individual within the society. So, the attempt was made to study the effect of socio-economic characteristics of the productivity of member farmers of FPOs and reported in tables 1 and 2 respectively.

3.2 Socio-Economic Status of FPO Member Farmers

The socio- economic factors would play important role in improving the production of pomegranate. It could have a critical influence on the efficiency and productivity. So, the socio-economic characteristics like age, education, land holding, experience family size and investment were analyzed using average.

The Table 1 reported a comparative analysis of socio-economic characteristics of small, medium, and large member farmers within FPOs (Farmers Producer Organizations) and an overall mean for all farmers. The Coefficient of Variation (CV) is also provided for each characteristic, which indicates the degree of variability within each group.

The result showed that, on an average, large farmers had the highest level of education (10.94 years), followed by small (10.9 years) and medium (9.85 years) farmers. The overall mean education level for all FPO member farmers was 10.53 years which mean that member farmers acquired education up to higher secondary level. The coefficient of variation for education was highest among medium farmers, indicating a wider variation in education levels within this group.

The average age of member farmers was highest among medium farmers (42.38 years), followed by small (39.26 years) and large farmers (38.31 years) and All FPO member farmers had an average age of 39.98 years which categorized in young group. Hence as active age group, farmers had more working efficiency and active labour hand to carry out different cultivation practices in pomegranate filed, which will helpful to increase in productivity. The similar results were found by Femi Oluwatusin and G. Shittu [5] in which he stated that young age group of farmers was active and helpful in increasing in productivity. Large farmers had the lowest age coefficient of variation, indicating a lower level of age variation within this group.

The largest average landholding belonged to large farmers (5.39 hectares), followed by medium (3.527 hectares) and small (2.22 hectares) farmers. 3.54 hectares was the average amount of land owned by FPO member farmers as a whole. It was inferred that, FPO member farmers were from small and medium farmers, the reason was mostly small and medium farmers had disadvantages in marketing and bargaining. Similar results were found by Singh et al. [6] in which she stated that, small and medium farmers were willing to work collectively in group to increase the bargaining power. Small farmers had the highest coefficient of variation for landholding, which suggested that there was a greater range of land sizes within this category.

Table 1. Socio-economic Status of FPO Member Farmers

Sr. No.	Particular	Small		Medium		Large		Overall	
		Mean	CV (%)	Mean	CV (%)	Mean	CV (%)	Mean	CV (%)
1	Education	10.9	55.15	9.85	44.44	9.94	49.13	10.53	49.76
2	Age (Year)	39.26	13.89	42.38	12.34	38.31	15.91	39.98	13.95
3	Land Holding (ha)	2.22	35.18	3.527	25.49	5.39	38.04	3.54	51.54
4	Experience in Year	8.62	51.72	9.075	38.61	8.71	53.63	8.76	47.93
5	Family size (No.)	6.42	27.99	7.025	32.95	7.56	30.58	6.94	31.09
6	Income in ₹ from Pomegranate	1107270	10.69	1156077.5	15.58	1192182.02	19.47	1154311.67	15.41
7	Investment in₹on Pomegranate	703479.23	6.41	700491.59	4.79	678287.77	2.11	694086.20	17.64
8	Yield of Pomegranate (T)	13.677	11.06	14.185	15.49	14.628	19.82	14.11	15.71

The average number of years in pomegranate farming experience was 8.71 for large farmers, followed by 9.075 for medium farmers, and 8.62 for small farmers. All FPO member farmers had an average of 8.76 years in pomegranate farming experience, which will helpful to increase in productivity. Among small farmers, the coefficient of variance for agricultural experience was largest. Kavin and Divya [7] reported that, experience and exposure to the changing trends would influence the performance of FPOs.

The average family size was the biggest among large farmers (7.56), followed by medium (7.025) and small (6.42) farmers. The average family size of member farmers was 6.9 which belong to large family size which might be due to joint family. Small farmers had the lowest coefficient of variance for family size, indicating less diversity in family sizes within this category.

Large farmers had the highest average income from pomegranate cultivation, followed by medium and small farmers. The overall mean income from pomegranate for all FPO member farmers was ₹1,154,311.67. The coefficient of variation for income from pomegranate was highest among large farmers.

The average amount invested in pomegranate by small, medium, and large producers was highest. For all FPO member farmers, the mean annual investment in pomegranate was ₹ 694,086.20. Medium farmers had the lowest coefficient of variance for investment in pomegranate.

Pomegranate yields were generally steady among small, medium, and large producers, with the lowest coefficient of variance occurred among the latter two. For all FPO member farmers, the average pomegranate output was 14.11 tons per hectare.

The findings showed significant differences in socioeconomic traits among small, medium, and large member farmers in the FPO. Large farmers typically had better education, larger land holdings, and higher pomegranate farming income. Small farmers, on the other hand, had higher levels of pomegranate investment and less variation in family size. These findings were affected PO support plans and policy. For instance, small and medium farmers might benefit from initiatives to improve education and access to resources, while large farmers might find value in programs to increase yield and revenue diversification. To encourage equitable development within the FPO, it was critical to understand and solve the unique demands and difficulties faced by various farmer types. Additionally, factors like education among medium farmers and income from pomegranate among large farmers, which contribute to the increased variability in some characteristics.

3.3 Effect of Socio-Economic Characteristics on productivity of overall FPO Member Farmer

The effect of socio- economic characteristics was analyzed using the multiple linear regression. The Table 2 demonstrated that 99.8 percent of the overall fluctuation in the output of pomegranate produced was satisfactorily described by the explanatory factors, while the remaining 1 percent was attributed to random errors. This showed that 99 percent of variation in yield of pomegranate produced in the study area was explained by Education (X_1), age (X_2), Farm size (X_3), farming experience (X_4), family size (X_5), incomes level (X_6) and investment (X_7). Moreover Education, age, Farm size, farming experience (X_4) and incomes level have positive coefficients. This implies that a unit increase (decrease) in each of the variables will decrease (increase) the output of pomegranate in study area. Similar results were obtained by Femi Oluwatusin and G. Shittu [5] that, R^2 was 0.99.

In regard to individual socio-economic characteristics, education level and income have shown positive contribution at one percent level of probability, age have shown positive contribution at ten percent level of significance, whereas investment shown negative contribution at one percent level of probability. The remaining variables did not show any contribution to yield of pomegranate.

The positive coefficient for education revealed that for every additional year of schooling, the yield of pomegranates was anticipated to rise by about 0.0085 units. The finding was statistically significant at the 1 percent level, which indicates that a more advanced education exerts a beneficial impact on pomegranate productivity. [8,9,10,7].

The farmer's predicted pomegranate production was anticipated to rise by approximately 0.0049 units as the average age of member farmer increases by one year, pursuant to the

Intercept (a) = -1.0734
Standard Error of Y estimated = 0.1525
R^2 = 99.8 %
No of observations = 126
Degrees of freedom = 125

Notations:

*** Significant at 1 percent level
* * Significant at 5 percent level
* Significant at 10 percent level

The egression equation is

Yield (T) = -1.0734 + 0.008479 Education (year) + 0.004907 Age (year) + 0.008598 Land holding (ha.) + 0.000960 Experience (year) -0.001602 Family size (No.) + 0.00001229 Income in ₹ from -0.0000099 Investment in ₹

positive age coefficient. Furthermore, this result is statistically significant at the 1percent level, demonstrating that older farmers often produce more pomegranates. Similar results were found by Kavin and Divya in 2019, that age is positively significant in increasing performance of FPOs.

The regression coefficient of income was 0.00001229, and it was positive and significant at the 1 percent level. This indicated that a higher income of the farmer was associated with higher productivity. In other words, farmers who earned more income from their pomegranate crops tended to have higher levels of productivity. This finding was important as it suggested that increasing income might have been a key driver of enhanced productivity in pomegranate farming. With reference to a study by Kolekar *et al.* in 2011 found similar results related to milk yield and the income of farmers.

An inverse association between pomegranate yield and investment in pomegranate cultivation was indicated by the negative coefficient (-0.0000099). In other words, pomegranate production tended to decline as increase in investment on pomegranate cultivation. Investment was negatively significant at 1 percent level of significance. This might be due to improper resource allocation, overcapitalization and environmental factors like droughts or adverse weather conditions can affect productivity, and increased investment alone might not necessarily mitigate these risks. Haral and Pawar (2013) found similar results in regards investment which was negatively significant in yield of custard apple.

The remaining variables land holding (0.008598), experience (0.000960) and family size (-0.001602) did not show any contribution to yield of pomegranate, as rest all variables were statistically non-significant. The results concluded that; age, education, income, and investment played pivotal roles in enhancing productivity, other socio-economic characteristics such as age, land holding, experience, and family size did not exhibit significant impacts. These findings provided valuable insights for farmers and policymakers who sought to optimize pomegranate farming productivity by focusing on key factors like education, income, and strategic investments.

Table 2. Effect of Socio Economic Characteristics on productivity of overall FPO Member Farmer

Sr. No.	Particulars	Regression Coefficient	Standard Error	't' Value
1	Education	0.008479***	0.002865	2.96
2	Age (Year)	0.004907*	0.003388	1.45
3	Land Holding (ha)	0.008598	0.009946	0.86
4	Experience in Year	0.000960	0.004589	0.21
5	Family size (No.)	-0.001602	0.005667	-0.28
6	Income in ₹ from Pomegranate	0.00001229***	0.00000008	156.15
7	Investment in₹on Pomegranate	-0.0000099***	0.00000014	7.08

4. CONCLUSION

The findings of the regression study that examined how socio-economic factors affected the pomegranate productivity of farmers provided several significant insights. In the beginning, pomegranate farmers' boosted output was significantly impacted by education. This conclusion highlighted the importance of knowledge and expertise in contemporary agriculture and indicated that expenditures in education and training initiatives for farmers could have a favorable impact on productivity. Furthermore, as shown by the highly significant positive regression coefficient, income from pomegranate farming correlated significantly with increased productivity. This suggested that efforts to boost farmers' income, such as improving market accessibility, crop quality, or pricing structures, could have had a significant effect on the sector's overall productivity. It was interesting to note that productivity and investment in pomegranate cultivation had a slightly illogical relationship. Even though it was statistically significant, there was still room for more research about the negative correlation between investment and productivity. This could have implied that resources were not being allocated efficiently or that investments were not being used to their full potential. It was necessary to look more closely at investment strategies and how they actually affected agricultural operations. The size of the landholding, the number of years of experience, and the size of the family did not seem to be significant influences on pomegranate productivity in the present research.

Overall, these findings provided insightful information for pomegranate farming policymakers and practitioners. So, the government can take steps to improve the efficiency and performance of FPOs. The policy makers could have scope to improve the FPOs efficiency and productivity as member farmers were educated, young and active and experienced. Strategies to increase productivity were advised to take into account the value of education, the link between income and productivity, and the need for a more in-depth comprehension of how investments affected outcomes. To increase the sustainability and effectiveness of pomegranate farming practices, further research and field evaluations were recommended to offer deeper insights and direct focused actions. The similar studies were conducted by PrishilaKajur et al. [11], Kavin and Divya [7], Deepa Singh [6], Kolekar et al. [12], Kakade et al. [9] in different area and in different crops.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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