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Factors influencing the coffee growers for membership in farmer producer organizations in tribal areas in Alluru Sita Rama Raju district in Andhra Pradesh

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Abstract
The research conducted in selected mandals of Araku Valley, Chinthapalli and Paderu in Alluri Sita Rama Raju Distrcit due to their high concentration of coffee production and Farmer Producer organisations (FPO) activity. A sample of 160 Coffee growers comprising 80 FPO beneficiaries and 80 FPO non beneficiaries from three notable FPOs. A binary logistic regression model identified the key determinants of FPO membership. Land holding size, frequency of extension contact and social participation were all positive and highly significant at 1% predictors of a farmer joining an FPO. Where as education identified as positive and significant factor at 5% level. Variables like age and distance to the FPO were found to be statistically insignificant. By providing collective access to inputs, technology and logistics, FPOs enabled beneficiary farmers to slash their establishment costs by a remarkable 29 percent. This efficiency gain, coupled with a 66 percent increase in yield and a 46 percent improvement in price realization, culminated in a transformative increase in profitability. Farmers who are more resourceful (larger landholdings), better connected (extension contact, social groups) and more informed (education) are more likely to join FPOs. FPO membership fundamentally reshapes the economic calculus for tribal coffee farmers.

Keywords: Coffee growers, farmer producer organisations, membership, beneficiary, tribals

Introduction

Andhra Pradesh has emerged as a high-growth region for coffee cultivation. The area expanded significantly from 71.96 to 97.53 thousand hectares between 2013-14 and 2022-23, registering a robust CAGR of 3.44 percent, showing higher than the national average. This was increased by a remarkable 25.12 percent annual growth in 2017-18, attributed to government schemes. Production showed an even more impressive CAGR of 5.32 percent, though it was marked by extreme fluctuations, including a 101.59 percent surge in 2015-16 and sharp declines in other years. Productivity improved at a CAGR of 1.84 percent, yet the absolute yield (0.099 MT/ha) remains significantly lower than the national average. Andhra Pradesh demonstrates strong potential as a non-traditional coffee-growing state, with policy support successfully driving expansion. Robusta coffee is generally cultivated at lower elevations (500-1000 meters) with slightly warmer temperatures (20°C to 30°C). It also thrives in gentle slopes to fairly level fields with similar soil and humidity requirements as Arabica. Robusta needs slightly less rainfall (100-200 cm annually) with blossom showers occurring in February-March and backing showers in March-April, followed by a fruiting period of 160-195 days. However, Robusta is less tolerant to diseases, experiences a higher rate of flower drop and yields approximately 500-900 kg/ha.

Coffee farmers in the high-altitude tribal mandals of Araku, Chintapalli and Paderu predominantly cultivate Arabica coffee under shade-grown, rain-fed conditions. Paderu Revenue Division in Alluri Sita Rama Raju District stands out as the heart of coffee cultivation. Its high elevation, rich forest cover and concentration of functional FPOs and SHGs make it an ideal location for research. FPOs in the ASR district have successfully established foundational governance and operational structures. Three Functioning FPOs from the three selected mandals are identified such as Dhimsa Natural Farming FPO in Araku Valley, Paderu Farmers Producer Company Ltd in Paderu and Maa Thota Tribal Farming & Marketing Producer Co. Ltd in Chinthaplle. However, their performance and impact are directly correlated with their age, scale of operations and financial mobilization. FPOs attract and empower more progressive farmers, creating a positive feedback loop of improved access to resources and knowledge.

Joining a Farmer Producer Organization (FPO) can provide opportunities for coffee farmers, giving them access to quality inputs, training, finance and better markets. These benefits help smallholders overcome challenges of scale and bargaining power. The choice to become a member often depends on factors like age, education, land size, awareness, extension support and how close the farmer lives to the FPO. Understanding these influences can guide strategies to encourage more farmers to join, strengthening FPOs and making coffee farming more profitable and sustainable. The present research paper analyse the reasons that makes coffee growers to become member in FPOs in ASR district.

Materials and Methods

Alluri Sita Rama Raju district has 40 sanctioned and 32 operational FPOs which are playing a key role in the region's agricultural economy primarily focusing on coffee, turmeric and pepper. Three mandals Araku Valley, Chinthapalli and Paderu were selected purposively as shown iu Table 1 based on their large area under coffee cultivation, high production volumes and significant membership of coffee farmers in FPOs.

Table 1: Details of Sampling framework & sample Size

District	Revenue Division	Mandals	Name of FPO	No. of FPOs	Respondents
Alluri Sita Rama Raju District	Paderu	Paderu	Paderu Farmers Producer Company Ltd	1	FPO Beneficiaries (n=80) & FPO Non-Beneficiaries (n=80)
		Araku	Dhimsa Natural Farming Farmer Producer Company Ltd	1	
		Chintapalli	Maa Thota TribalFarming and Marketing Producer Company Ltd	1	
Total		3		3	160

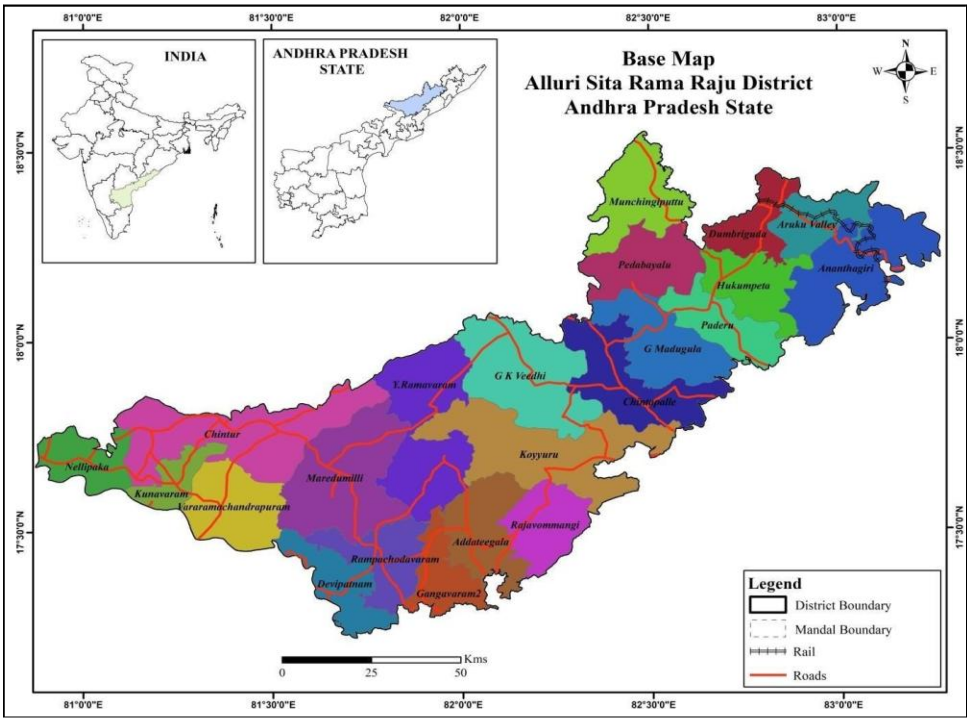

Fig 1: Map showing ASR District in Andhra Pradesh

Binary Logit Analysis

To achieve the objective of analysing the factors that influence coffee farmers' decisions to join Farmer Producer Organizations (FPOs), a Binary Logit Model will be employed. This econometric model is suitable when the dependent variable is dichotomous, such as membership in an FPO (yes = 1, no = 0).

The model estimates the probability of a farmer being an FPO beneficiary based on selected socio-economic and institutional factors. The general form of the logit model is:

Thus,

$$ln\left(\frac{p}{1-p}\right) = \beta_0 + \sum_{i=1}^{k} \beta_k X_{ki}$$

Where,

p = probability of an event occurring for an observed set of variables Xi,

(1-p) = probability of non-beneficiary.

X_k = independent variables

β_0, β_k = regression coefficients

This tool will help identify the key socio-economic and institutional variables that significantly influence coffee farmers' participation in FPOs, thus providing insights into targeting and mobilizing more farmers into such organizations.

Socio-economic Profile of coffee farmers in ASR District

Understanding the socio-economic profile of coffee farmers is essential to assess their participation in Farmer Producer

Organizations (FPOs), especially in tribal regions like Alluri Sitarama Raju district. Table 2 shows clear differences between FPO beneficiaries and non-beneficiaries across various aspects. FPO beneficiaries are generally younger, with an average age of 41 years compared to 45 for non-members. A higher share of beneficiaries falls in the working-age group (26-45 years) indicating that younger farmers are more engaged with FPOs. They also have slightly smaller families (average 5.8 members and 6.3) and better education levels, with an average of 6.2 years of schooling compared to 4.1 among non-beneficiaries. fewer FPO members are illiterate (38 and 48). Landholding is larger among beneficiaries (1.75 acres and 1.3 acres) and access to institutional credit is significantly better (70 percent and. 36.3 percent), showing the supportive role of FPOs in improving financial inclusion. Members also live closer to FPO centres, with an average distance of just 2.4 km, compared to 5.6 km for non-members, a factor that likely improves participation.

In terms of coffee production, FPO members gain higher yields (525 kg/acre and 440 kg/acre), better prices (Rs 520/kg and Rs 502/kg) and higher net incomes (Rs 42,500 vs. Rs 30,200 per acre). Marketing through FPOs is prominent (85 percent), while non-members mostly rely on middlemen (72.5 percent). Beneficiaries also use collective storage and transport more often (66.3 percent and 21.3 percent). Awareness and support services are better among FPO members. Their awareness of input supply is higher (4.3 and 2.6 on a 5-point scale), they have more frequent extension contact (2.5 and 1.1 visits/month) and a significantly larger share has received training on coffee practices (81.3 percent and 13.8 percent).

Table 2: Socio economic characteristics of FPO Beneficiary and Non- Beneficiary (N=160)

Particulars	**FPO**	
	Beneficiary (N = 80)	**Non-beneficiary (N = 80)**
A. Demographic and Household Characteristics		
Average Age of Respondent (Years)	41	45
18-25	3	1
26-35	20	12
36-45	32	24
46-55	21	28
Above 55	4	15
Average Family Size (No.)	5.8	6.3
Average Years of Schooling	6.2	4.1
Illiterate	38	48
Primary School	16	14
High School	12	10
Intermediate/Diploma	11	7
Degree and above	3	1
Scheduled Tribe Households (%)	100	100
B. Land and Institutional Access		
Particulars	**Beneficiary (N = 80)**	**Non-Beneficiary (N = 80)**
Average Landholding (acres)	1.75	1.3
Access to Institutional Credit (%)	70	36.3
Distance to Nearest FPO (km)	2.4	5.6
C. Coffee Production and Marketing Profile		
Particulars	**Beneficiary (N = 80)**	**Non-Beneficiary (N = 80)**
Average Yield (kg/acre)	525	440
Price Realized (/kg)	520	502
Net Income from Coffee (/acre)	42,500	30,200
Marketing through FPO (%)	85	-
Marketing through Middlemen (%)	18	72.5
Use of Collective Storage/Transport (%)	66.3	21.3
D. Access to Services and Information		
Particulars	**FPO Beneficiary (N = 80)**	**Non-Beneficiary (N = 80)**
Awareness of Input Supply (Score out of 5)	4.3	2.6
Extension Contact (visits/month)	2.5	1.1
Received Training on Coffee Practices (%)	81.3	13.8
E. Social Participation		
Particulars	**Beneficiary (N = 80)**	**Non-Beneficiary (N = 80)**
Participated in SHGs / Groups (%)	67.5	38.8
Attended Village / FPO Meetings (%)	81.3	23.8

Social participation is also stronger among FPO beneficiaries. Over two-thirds (67.5 percent) are involved in SHGs or other groups and 81.3 percent have attended village or FPO meetings much higher than non-members (38.8 percent and 23.8 percent) respectively. Together these patterns suggest that FPOs are attracting more informed, resource-seeking farmers and are playing a vital role in improving access, productivity and collective strength among tribal coffee growers. The findings are similar with Soniya (2022) [11] in their studied about 13 FPOs in Kurnool district Andhra Pradesh, involving 120 beneficiaries and 60 non-beneficiaries and Siddalingaswamy (2023) [10] in their conceptual analysis of FPOs about socio-economic empowerment in rural India.

Production and marketing of coffee by FPO beneficiary and Non-beneficiary

The coffee plantation crop requires 4 to 5 years to mature and reach to harvesting stage. Once after harvesting the coffee raw beans will send to processing centres by coffee farmers. The farmers invest for Initial Four years and profits obtained from 5th

year. The total cost incurred by FPO Beneficiary for four years is Rs.2,12,500 and non-beneficiary is Rs. 3,00,500 as shown in Table 3. The total yield obtained at 5th year to FPO beneficiaries is 3400 Kg/hectare where as for the non-beneficiary is 2050 Kg/hectare. The average selling price by FPO beneficiary to consumers is Rs.700 per Kg which is higher than selling price by non- beneficiaries (Rs.480). The percentage of profit margin for beneficiary is 91.07 whereas for the non-beneficiary is 69.46. FPO beneficiaries reported better yields, income, training and access to markets after joining. These results match the findings of Soniya (2022) [11] and Tarun *et al*. (2022) [13], who showed that FPOs help improve both productivity and profitability over time.

Table 3: Production and marketing of coffee by FPO beneficiary and Non-beneficiary (N=160)

S. No.	Particulars	FPO			
		Beneficiary N=80	Non-Beneficiary N=80	Difference	Remarks
		(1)	(2)	(1-2)	
1	Total Cost (Sowing to Coffee bearing stage from 4 years)	212500.00	300500.00	-88000.00	The cost of production was higher for Non beneficiary
2	Total Yield (Kgs per Hectare) started reaping from 5th year	3400.00	2050.00	1350.00	The yield, selling Price, Total Income, net returns, ROI and Profit margin obtained was higher for FPO beneficiary when compared to Non beneficiary
3	Average selling price to consumer (Rs/Kg)	700.00	480.00	220.00	
4	Total Income (Rs)	2380000.00	984000.00	1396000.00	
5	Net Returns (Rs)	2167500.00	683500.00	1484000.00	
6	Return on Investment (Rs) on net returns	10.20	2.27	7.93	
7	Profit margin (%)	91.07	69.46	21.61	

Impact of FPO membership on the economic and financial status of beneficiary coffee farmers (N=80).

The analysis clearly shows positive impact of FPO membership on the economic and financial status of beneficiary coffee farmers. There are improvements in key indicators such as crop yield (from 460 to 525 Kg/acre), price realization (Rs/Kg.490 to 520 Rs/Kg) and net income per acre (Rs.32,000 to 42,500). Access to institutional credit (40 to 70 percent) and extension services also improved significantly, leading to better farm productivity and financial inclusion. Additionally, increased participation in collective marketing, training programs (20 to 81.30 percent) and SHGs reflects enhanced social capital and institutional engagement. These collective improvements indicate that FPO membership has led to greater economic resilience, enhanced market access and overall improvement in the livelihood security and well-being of tribal coffee-growing households in the study area. FPO beneficiaries reported better yields, income, training and access to markets after joining. These results match the findings of Soniya (2022) [11] and Tarun *et al*. (2022) [13], who showed that FPOs help improve both productivity and profitability over time.

Table 4: Socio economic characteristics of FPO membership (Pre and Post)

A. Demographic characters of FPO Beneficiaries		
Particulars	**Pre - FPO**	**Post FPO**
Average Family Size (No.)	6.2	5.8
Average Years of Schooling	4.5	6.2
Illiterate (%)	55	47.5
Primary School (%)	15	20
High School (%)	10	15
Intermediate/Diploma (%)	7	13.75
Degree and Above (%)	1	3.75
B. Land and Institutional Access		
Particulars	**Pre - FPO**	**Post FPO**
Average Landholding (acres)	1.5	1.75
Access to Institutional Credit (%)	40	70
Distance to Nearest FPO (km)	5	2.4
C. Coffee Production and Marketing		
Particulars	**Pre - FPO**	**Post FPO**
Average Yield (kg/acre)	460	525
Price Realized (Rs/kg)	490	520
Net Income from Coffee (/acre)	32,000	42,500
Marketing through FPO (%)	-	85
Marketing through Middlemen (%)	65	18
Use of Collective Storage/Transport (%)	25	66.3
D. Access to Services & Information		
Particulars	**Pre - FPO**	**Post FPO**
Awareness of Input Supply (Score out of 5)	2.8	4.3
Extension Contact (visits/month)	1.2	2.5
Received Training on Coffee Practices (%)	20	81.3
E. Social Participation		
Particulars	**Pre - FPO**	**Post FPO**
Participated in SHGs/Groups (%)	35	67.5
Attended Village/FPO Meetings (%)	30	81.3
Pre-FPO: Coffee farmer before joining the Farmer Producer Organization (FPO)		
Post-FPO: Coffee farmer after joining the Farmer Producer Organization (FPO)		

Comparison of FPO beneficiaries and non-beneficiaries' coffee farmers by using with and without approach

To understand how Farmer Producer Organizations (FPOs) have influenced the lives of coffee farmers in the study area by using With and Without approach. The comparison is organized into five broad areas like economic performance, access to services, marketing practices, social involvement and educational awareness. This approach offers a clearer picture of how collective efforts through FPOs can improve productivity, income levels, service utilization and farmer participation in both community and market activities.

Table 5: Comparison of FPO Beneficiaries and Non-Beneficiaries

Category	Indicators	Beneficiary		Non-Beneficiary	
		Number	Percent (%)	Number	Percent (%)
Economic Indicators	Higher yield (≥ 500 kg/acre)	60	75	28	35
	Price realized ≥ 510/kg	55	68.75	20	25
	Net income ≥ 40,000/acre	58	72.5	18	22.5
	Access to institutional credit	56	70	29	36.3
Access to Services	Awareness on input supply	68	85	30	37.5
	Extension contacts (>1 visit/month)	64	80	22	27.5
	Received training on coffee practices	65	81.3	11	13.8
	Used collective storage/transport	53	66.3	17	21.3
Marketing Behaviour	Sold produce through FPO	68	85	-	-
	Sold produce through middlemen	14	18	58	72.5
Social Participation	Participated in SHGs / groups	54	67.5	31	38.8
	Attended village / FPO meetings	65	81.3	19	23.8
Education and Awareness	Schooling above 5 years	62	77.5	35	43.75

The data clearly highlights the positive impact of FPO membership on various aspects of coffee farming. A significantly higher proportion of FPO beneficiaries (75 percent) reported better yields (≥500 kg/acre), higher prices and greater net income compared to non-members.

Access to institutional credit (70 percent) was also better among beneficiaries, indicating that being part of an FPO helps farmers tap into formal financial channels more effectively.

In services, a majority of FPO beneficiaries were more aware of input supply systems (85 percent), had regular contact with extension personnel (80 percent) and received training on improved coffee cultivation practices (81.30 percent). This access to technical support likely contributed to better productivity and profitability. Collective storage and transport facilities were also more commonly used by members, helping them reduce marketing and logistics costs.

Marketing behaviour also showed a clear distinction, while 85 percent of beneficiaries marketed their produce through the FPO, non-members relied heavily on middlemen, often leading to lower price realization. Social participation was stronger among FPO beneficiaries (67.50 percent) as well, with higher involvement in SHGs and village meetings, indicating the role of FPOs in building community engagement and collective action.

In terms of education, a greater number of FPO beneficiaries had schooling beyond five years (77.50 percent), which may have influenced their ability to access services, understand market trends and adopt better practices. These findings are in line with the work of Abhishek M.P. (2020), Gummagolmath (2022) [7] and Adhikari *et al.* (2021) [2], who emphasized that FPOs help improve production, reduce input costs and enhance market access for smallholder farmers.

Factors influencing the coffee farmers for membership in Farmer Producer organization.

Identifying these determinants is essential for encouraging farmer collectivization, particularly in remote and tribal regions in ASR district. The socio-economic characteristics of the farm household determine the membership of FPO. The results of the logit analysis showed (Table 6) that landholding, extension contacts and social participation variables positively shows significant influence on membership and join in FPO at 1% level significance with coefficient values of 1.5359, 0.7597 and 3.5216.

An increase in the land holding size extension contacts and social participation by scientist contributed to an increased probability of the participation in FPO. An increase in the land holding size contributed to an increased probability of the adoption of adaptative strategy in the study area Farmer always wish to bring more area under cultivation with variety of crop cultivation if their farm size is large.

The variable such as education showed significant at 5% level. The other socio-economic factors like distance to FPO and family showed negatively influence on membership but not significant. Age showed positive influence on FPO membership but not significant either at 1%, 5% and 10%. Similar patterns were found by Patel *et al.* (2024) [9] and Grashuis and Skevas (2022) [6], confirming that informed and resource-ready farmers are more likely to join FPOs.

Table 6: Factors influencing the coffee farmers for FPO membership (N=160)

S. No	Independent Variables	Coefficients	Std. Error	P > |z|	Odds Ratio
1	Age	0.2083	0.0238	0.820	1.2316
2	Family Size	-0.0359	0.4582	0.938	0.9647
3	Land Holding	1.5359***	0.4479	0.001	4.6456***
4	Education	1.4408**	0.5854	0.014	4.2240**
5	Distance to FPO	-0.1046	0.3065	0.767	0.9006
6	Extension Contact	0.7597***	0.2106	0.001	2.1377***
7	Social Particulars	3.5216***	0.600	0.000	0.2955***
Number of Observations		160			
Pseudo R²		0.6615			
Significance level at *10%, **5% and ***1%					

Conclusion

FPO membership has a significant role in enhancing economic outcomes, service access and social involvement among tribal coffee farmers. FPO beneficiaries consistently outperformed non-members in yield, price realization, access to services and marketing. The chasm between the net returns of beneficiaries (Rs21,67,500/ha) and non-beneficiaries (Rs6,83,500/ha) provides powerful, empirical validation of the FPO model as a critical pathway out of subsistence farming. The study also found that FPOs act as hubs for progressive farmers, attracting and empowering individuals who are younger, better educated and more socially connected, thereby creating a virtuous cycle of knowledge dissemination and collective action.

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Conflict
This is to declare that there is "No conflict of interest" among researcher

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