

1 **What determines farmers' participation in the Farmer Producer** 2 **Organizations: Empirical evidence from India**

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3 4 **Abstract**

5 Farmer Producer Organizations (FPOs) are seen as an effective way to mobilize small and
6 marginal farmers and overcome the problems associated with small holdings. The success of FPOs
7 is constrained by various individual, social, environmental, and organizational factors, low level of
8 farmers' participation is important among them. An increasing number of FPOs in the country
9 suggests that more small farmers join FPOs, but little evidence is available regarding their
10 participation in the activities of FPOs and their determinants. We examined these aspects
11 empirically, by interviewing 200 members of FPOs from Telangana and Andhra Pradesh states of
12 India, considering both member-related and organizational factors. Ordinal logit regression results
13 showed that individual-related factors like education, access to formal credit, and training attended
14 had a significant positive relationship with the participation of farmers in the overall activities of
15 the FPOs. Farmers' participation was also affected by technical and organizational rationalities that
16 are to be addressed by the FPOs. Heterogeneity in determinants of participation in different
17 activities like meetings, financial matters, and decision-making was observed. The study suggests
18 that both member characteristics and FPO characteristics need to be taken into account to ensure
19 the high participation of farmers in FPO activities.

20 **Keywords:** Small and marginal farmers, Level of participation, Ordinal Logit Regression,
21 Determinants.

22 23 **1. Introduction**

24 Small and marginal farmers account for 86.08 percent of the total holdings in India (GoI, 2019).
25 The small-holder-led economy is obstructed by low quantities of marketable surplus, low
26 bargaining power, lack of market access, scarcity of capital, market imperfections, and poor
27 infrastructure and communications (Barham and Chitemi, 2009; Teshome et al., 2009). Mobilizing
28 the farmers into Farmer Producer Organizations (FPOs) is considered to be one of the most

29 effective strategies to overcome these constraints. NABARD (2015) defined Farmer Producer
30 Organizations (FPOs) as one type of producer organization where the members are farmers and
31 they are the shareholders in the organization. FPOs can be registered under the Cooperative Society
32 Act or Indian Companies Act or Indian Trust Act, or Society Registration Act; those registered
33 under Indian Companies Act becoming popular among farmers, with more than 20000 FPOs in the
34 country. They help in the collective procurement of inputs, providing market access to different
35 channels, increasing bargaining power, decreasing middlemen, and thus enhancing members'
36 income (Herck, 2014; Abokyi, 2013; Mishra et al., 2004; Latynskiy and Thomas, 2016; Nikam and
37 Singh, 2016; Gurung and Choubey, 2021). Therefore, the government is giving special emphasis
38 on the formation of FPOs through different programs and schemes.

39 Despite various documented and empirical benefits of FPOs, their potential is marred by various
40 organizational challenges, low participation of farmers is prominent among them. This, in turn,
41 affects the viability and sustainability of the business model of FPOs, and ultimately the success of
42 the FPOs in the country (Business Standard, 2020; Kumar et al., 2021). Though few studies have
43 analyzed the farmers' participation in FPOs, it is only from a member's point of view, neglecting
44 FPOs-related factors that fail to provide a complete picture. As much emphasis is given to
45 establishing FPOs in developing countries like India and the participation of farmers has a bearing
46 on the success and sustenance of FPOs, the study of important determinants of the farmers'
47 participation in FPOs activities would help in promoting a better policy environment to enhance
48 the participation. Against this backdrop, the study analyzed the farmer's participation in the
49 activities of the FPOs by taking into account member-related and FPO-related factors, in Telangana
50 and Andhra Pradesh state of India, using the Ordinal Logistic Regression method.

51 52 **2. Study framework**

53 The study framework is illustrated in Fig 1. Farmers' participation in the study referred to the
54 extent of involvement of member farmers in FPOs activities like financial matters, training,
55 meetings, and decision making of the FPOs. The study is conducted on the farmers who have
56 already joined the organization (already members). Farmers' participation in FPO activities is
57 affected by push factors (individual related) and pull factors (FPO related). As literature related to
58 the participation of farmers in FPO's activities is scarce, a review related to determinants of joining
59 is also included here. In a few studies, participation is referred to as joining the organizations.
60 Personal factors such as age and sex, in addition to their human capital i.e. education level and

61 farm experience, may affect farmers' participation in the FPOs. Younger farmers were more likely
62 to participate in the FPO's activities (Singh and Vatta, 2019; Mwambi et al., 2020; Wang et al.,
63 2019; Bernard and Spielman, 2009; Tolno et al., 2015; Chagwiza et al., 2015; Hosamani, 2019).
64 Male farmers are likely to participate more in FPO activities because of the dominance of the
65 patriarchal system and heading households by them (Wang et al., 2019). The education level may
66 affect decisions to participate in FPOs because highly educated farmers were more likely to be
67 aware of the potential benefits of the FPOs (Dung, 2020; Singh and Vatta, 2019; Wang et al., 2019;
68 Bernard and Spielman, 2009; Tolno et al., 2015; Chagwiza et al., 2015; Hosamani, 2019). Wang
69 et al. (2019) indicated that the probability of farmers' participation in the FPOs increases with farm
70 experience.

71 The economic factors of farm operations include landholding, percent of irrigated area, nonfarm
72 income, and formal credit accessibility. Land operated and percent of the irrigated area positively
73 influence their level of participation in the FPOs (Dung, 2020; Bernard and Spielman, 2009; Tolno
74 et al., 2015; Chagwiza et al., 2015; Hosamani, 2019; Das and Mandal, 2021). Tolno et al. (2015)
75 and Hosamani (2019) found that nonfarm income significantly and positively affects the
76 participation of members in the FPOs. It is justifiable for people to participate in FPOs activities if
77 they had access to credit (Dung, 2020; Tolno et al., 2015; Bernard and Spielman, 2009).

78 Social factors include family size, membership in village organization, access to extension and
79 mass media contacts, and training attended. Family size accounts for the supply of family labor
80 and may have a significant impact on participation in the FPOs if it provides labor efficiently
81 (Chagwiza et al., 2015; Tolno et al., 2015; Hosamani, 2019). Membership in village organizations,
82 access to information through extension agency contact, mass media, and training were the
83 essential factors in motivating farmers to participate in the FPOs (Dung, 2020; Tolno et al., 2015).
84 Few physical factors such as distance from the FPOs office and soil fertility status were expected
85 to show a significant effect on the participation of the members in the FPOs as less distance aids
86 in convenience and soil fertility affects the yield of the farmers.

87 The capacity of the FPOs includes regular contact of the staff with the farmers, availability of
88 physical infrastructure, and vehicles in the FPOs. Based on Pagan's (2003) fivefold typology and
89 new institutional economics principles, institutional features such as clarity of objectives,
90 scalability, adaptiveness, and compliance were expected to show a significant relationship with
91 participation. Based on the management theory of organizational design, and governance

92 (Ackroyd, 2002; Groth, 1999; Nystrom and Starbuck, 1981) the rationalities such as technical,
93 organizational, and political rationality that need to be addressed by the effective institution to
94 ensure participation were identified. Institutional features and rationalities have an impact on
95 performance (North, 1990). Hence, we assume that there must be a relationship between
96 institutional features and rationalities with farmers' participation. The description and
97 measurement of these variables is given in Table 2.

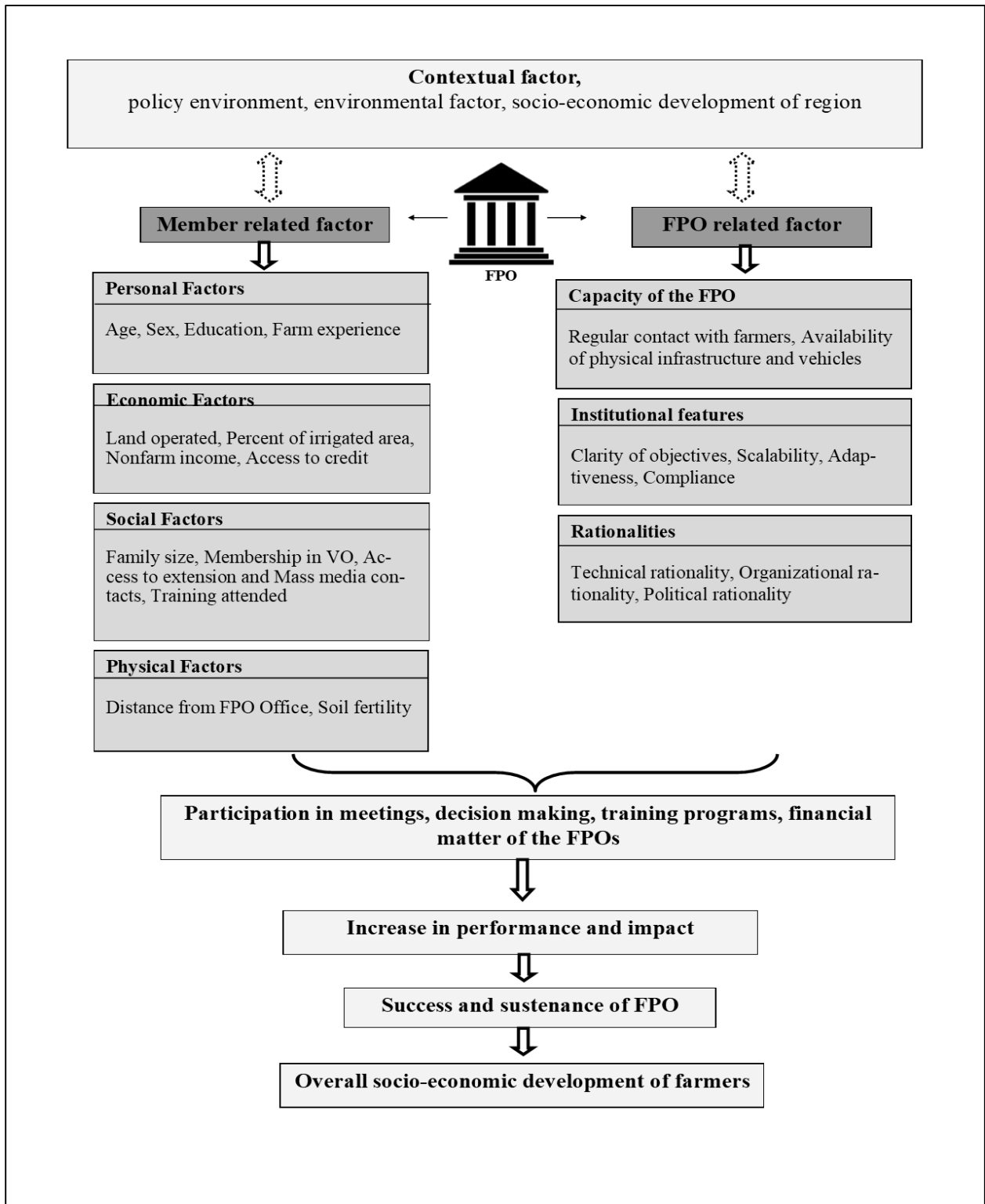


Fig. 1. Framework showing factors influencing participation in the FPO activities. (Source: Authors).

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103 3. Materials and Methods

104 Study area

105 The study was conducted in Telangana and Andhra Pradesh states of India, located in the southern
106 part of the country. Telangana has the fourth-largest number of FPOs (460 which is 6.5 percent of
107 the country's total) and similarly, Andhra Pradesh has 399 FPOs which is about 5.6 percent of the
108 country's FPOs (GoI, 2022). Fig. 2 shows the study area and sampling.

109 Sampling and Data Collection

111 Khammam and Nalgonda districts of Telangana and Krishna and West Godavari districts of
112 Andhra Pradesh were randomly selected for this study. From each selected district, a list of all
113 FPOs was obtained and five FPOs were selected randomly with three inclusion criteria- firstly, the
114 FPO is working for more than 3 years, secondly, the FPO having more than 300 members and
115 thirdly the FPO providing more than one type of service (knowledge services, economic and
116 advisory services, input supply services, processing services, financial services, training and
117 capacity building services, networking services, procurement, and packaging services). At the FPO
118 level also, a list of all members was obtained from the officials and ten respondents were selected
119 randomly from each FPO. Details of the sampling are presented in Table 1. Primary data were
120 collected from members and officials of FPOs by using a structured questionnaire to generate
121 quantitative data on selected member-related and FPO-related factors during April-May 2022.

122 **Table 1.** Distribution of sample size.

State	Districts	Number of selected FPOs	Selected respondents
Telangana	Khammam	05	50
	Nalgonda	05	50
Andhra Pradesh	Krishna	05	50
	West Godavari	05	50
Total		20	200

123 Source: Authors' survey with households, 2022.

124 Variable selection

125 The dependent and independent variables used in the study are described in Table 2. Participation
126 of farmers in different activities of the FPOs was a dependent variable, elicited by asking members
127 about their involvement in FPO's activity at three levels of participation (LP): LP1-(No
128 participation), LP2-(Sometimes participation), and LP3-(High participation). This was done by
129 providing statements regarding their level of participation in meetings, decision-making, training
130 programs and financial matter. Independent variables (personal, economic, social, physical,

131 institutional, and rationalities) mentioned in the conceptual figure and Table 2 were obtained
132 through a review of the literature and expert opinions.

133
134 **Analytical method**

135 As the dependent variable (level of participation categories) was an ordinal categorical variable,
136 and the independent variable comprises not only continuous variables but also categorical
137 variables, we used the ordered logit regression model (OLOGIT) to find the factors that influence
138 their level of participation and the analysis process was achieved by Stata 15.0. The ordered logistic
139 model (Cameron and Trivedi, 2005) is specified below:

140
$$\Pr(Y_i > j) = \frac{\exp(\alpha_j + X_i\beta_j)}{1 + [\exp(\alpha_j + X_i\beta_j)]} \quad j = 1 - 3$$

141 Where Y_i = the dependent variable reflecting the 3 categories of level of participation (LP1, LP2,
142 and LP3) by sampled farmers

143 $Y_i = 1$; Farmers who are having no participation (LP1)

144 $Y_i = 2$; Farmers who reported sometimes participation (LP2)

145 $Y_i = 3$; Farmers who are having high participation (LP3)

146 α_j = the intercept term, β_j vector of the parameter to be estimated, and X_i denotes independent
147 variables as mentioned in Table 2.

148 The marginal effect is an informative way to summarize how a change in the level of participation
149 is related to a change in any covariate. The marginal effect of an explanatory variable X on the
150 probability of making choice 3 (i.e., being the farmer having high participation), is evaluated at a
151 mean of X .

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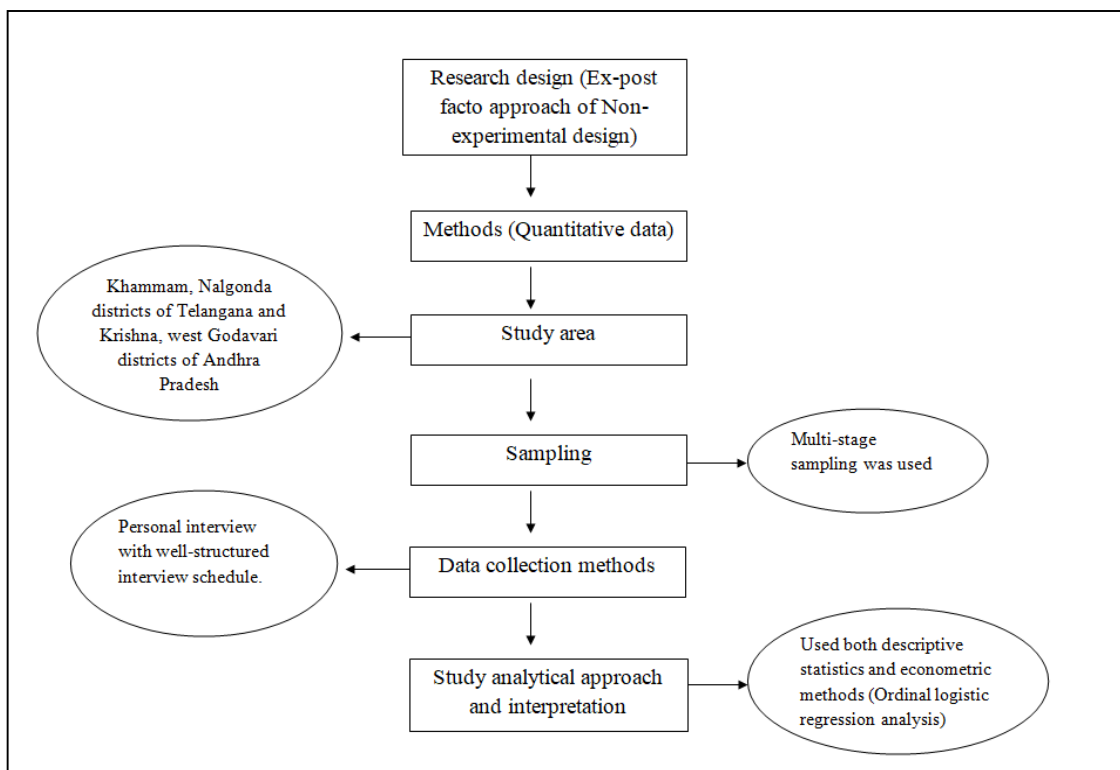
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162 **Fig. 2.** Flowchart of the key components of the research design and procedures. Source: Authors' analysis.
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165 **4. Results and discussion**

166 *Description of variables used in the study*

167 Table 2 summarizes and presents the selected characteristics of the respondents of pooled sample
 168 and FPOs characteristics. The average age for the pooled data was 44.55 years. Around 80.5
 169 percent of the pooled data were male respondents and 19.5 percent were female respondents. On
 170 average the respondents were having 18.53 years of experience in farming and 8.31 years of formal
 171 education. The family size was 3.8 members. The average distance from the FPO office to the
 172 house was 7462.55 meters. Nearly half (56.5%) were having access to formal credit. Around 90
 173 percent of the respondents had attended any formal training related to agriculture. Around 57.5
 174 percent of respondents were members of village organizations. The majority of the respondents
 175 (68.5%) had access to extension agencies and mass media (70.5%). Only 25.5 percent of the
 176 respondents had non-farm sources of income. On average respondents' operated land holding was
 177 6.13 acres. The average percentage of the irrigated area was 89.24 percent. Only 33 percent of the
 178 members possessed highly fertile soil. The average normalized scores for regular contact with
 179 farmers and availability of physical infrastructure and vehicles were 0.70 and 0.47 respectively.

180 The median scores for the institutional features such as clarity of objectives, scalability,
 181 adaptiveness, and compliance were 4, 3, 3, and 4 respectively. The median scores for rationalities
 182 such as technical, organizational, and political rationality were 3, 4, and 4 respectively.

183

184 **Table 2.** Variables considered to study the determinants of farmers' participation in the FPOs.

S.N.	Variables	Description and measurement	Mean values
Dependent variable			
1	Farmers' overall participation	Farmer's overall participation in the activities conducted by the FPO including meetings, decision making, training, and financial matter.	LP1-0.04 LP2-0.42 LP3-0.55
2	Participation in the meetings	Farmer's level of participation in meetings conducted by the FPO.	LP1-0.07 LP2-0.36 LP3-0.57
3	Involvement in decision making	Farmer's level of involvement in the decision making process related to the procurement of inputs, marketing, and taking up any new activity.	LP1-0.18 LP2-0.46 LP3-0.37
4	Participation in the training programs	Farmer's level of participation in training programs/awareness programs/ exposure visits.	LP1-0.09 LP2-0.42 LP3-0.50
5	Involvement in the financial matter	Farmer's level of involvement in the activities such as benefits allocation, maintenance cost, the appointment of CEO/consultant, etc.	LP1-0.35 LP2-0.38 LP3-0.28
Independent variable			
A) Member related variables			
1	Age	Chronological age of the members (in years)	44.55
2	Sex	If the member is female then 1, 0 otherwise.	0.195
3	Education level	Number of years of formal education	8.31
4	Land operated	Land owned by the members (in acres)	6.13
5	Irrigated area	Percentage of land having irrigation availability	89.24
6	Soil fertility status	Quality of soil in term of fertility; Average=1, fertile=2, highly fertile=3	0.33
7	Family size	Number of family members in the household	3.8
8	Nonfarm income	Whether members have any source of non-farm income, if yes then 1, 0 otherwise	0.255
9	Farm experience	Number of years engaged in farming	18.53
10	Access to formal credit	Whether members have obtained loans from formal sources, if yes then 1, 0 otherwise	0.565
11	Membership in village Organization	Whether members are a member of any village organization like a self-help group, farmers interest group, farmers club, village panchayat, or cooperative society; if yes then 1, 0 otherwise	0.575
12	Access to FPO	Distance from FPO office to member house, in meters	7462.55
13	Extension agency contact	Whether members access information from public institutions and officials then 1, 0 otherwise	0.685
14	Training attended	Whether member attended any training related to agriculture, if yes then 1, 0 otherwise	0.90

15	Access to Mass media for agriculture-related information	Whether the farmer accessed agriculture information from television, radio, farm publications, social media, etc. if yes then 1, 0 otherwise	0.705
B) FPO-related variables			
16	Regular contact with farmers	Whether FPO personnel contact farmers at regular intervals, if yes then 1, 0 otherwise	0.70
17	Availability of physical infrastructure and vehicles	Availability of infrastructure like cold storage, training hall, etc. Very high (5)/ high (4)/ moderate (3)/ low (2)/ very low (1)	0.47
18	Clarity of objectives	Objectives are known to the farmers, FPOs plan regularly, and there are no deviations from the FPO objectives.	4
19	Scalability	Membership, commodities, land cover, and the range of activities undertaken by FPO are optimum.	3
20	Adaptiveness	The scale of operation of FPO, and MOU changes with the external environment.	3
21	Compliance	Rules and regulations are followed by the FPOs, compliance with agreements of promoting institution (PI) and federation, and provisions of company/cooperative act.	4
22	Technical rationality	Requirements include adaptivity to the technology, adequacy of machinery and equipment, staff availability, market intelligence, sound location of FPOs, and optimum production.	3
23	Organizational rationality	The participation rate of farmers in elections, and General Body Meetings (GBM). Frequency of organizing meetings and competency of the directors.	4
24	Political rationality	Adequate representation of youth, women, and politically able leaders and their perception of fairness and justice	4

185 * LP1, No participation; LP2, Sometimes participation; LP3, High participation. For item 18-24 in column 1, related
186 statements were given to respondents and their response was obtained on a five-point Likert scale. SA-strongly agree,
187 A-agree, U-undecided, DA-Disagree, SDA-Strongly disagree. The value of the median is given for items 18 to 24 in
188 the last column.

189
190 ***Determinants of farmers' overall participation in FPO activities***

191 Ordinal Logit coefficients and the marginal effect of each of these variables on farmers'
192 participation are given in Table 3. Education level had a positive significant relationship with
193 farmers' overall participation. A one percent increase in education level increased the probability
194 of farmers' participation by 2.2 percent. It could be justified that the more the level of education of
195 the farmers, the more chances to understand and calculate the benefits of FPOs which leads to
196 increased participation in the FPOs. These research findings are in line with Dung, 2020; Singh
197 and Vatta, 2019; Wang et al., 2019; Hosamani, 2019; Gurung and Choubey, 2023 etc. There was
198 a 16.5 percent and 36.3 percent increase in the probability of farmers' participation with a one
199 percent increase in access to formal credit and training attended respectively. It can be inferred that
200 greater access to formal sources of credit (banks and SHG) is reflected in the greater participation

201 of farmers in FPO activities. Similar findings were also obtained by Dung (2020); Tolno et al.
 202 (2015), and Bernard and Spielman (2009). The respondents who attended any formal training
 203 related to agriculture were more likely to participate in the FPOs. The reason might be that the
 204 training programs organized by facilitating agencies might have exposed the FPO members to the
 205 need and importance of the FPOs. Further, the training also might allow interaction and knowledge
 206 sharing among the farmers, which in turn developed their behavior and facilitate them to participate
 207 in the FPOs.

208 From FPO-related variables, technical and organizational rationality showed a positive and
 209 significant influence on the farmer's participation in the overall activities of the FPO. Those FPOs
 210 with adequate infrastructure, adaptive to technology, having sufficient staff, and at an appropriate
 211 distance from the members were attracting more participation from the members. FPOs with more
 212 participation rate of farmers in elections, General Body Meetings (GBM), frequency of organizing
 213 meetings, and competency of the directors ensure the members' participation and contribution in
 214 FPO's overall activities.

215 **Table 3.** Variables determining Farmers' overall participation in the FPOs' activity.

Variables	Ordinal Logit coefficient		Marginal effect	
	Coeff.	SE	(dy/dx)	SE
A) Member related variables				
Age	0.015	0.028	0.003	0.005
Sex	-0.643	0.508	-0.116	0.091
Farm Experience	0.004	0.025	0.001	0.005
Education level	0.120***	0.043	0.022***	0.007
Family size	0.071	0.128	0.013	0.023
Access to FPO	0.000	0.000	0.000	0.000
Access to formal credit	0.912**	0.372	0.165**	0.064
Training attended	2.001***	0.596	0.363***	0.100
Membership in village Organization	0.324	0.377	0.059	0.068
Extension agency contact	0.220	0.391	0.040	0.071
Access to Mass media	0.171	0.396	0.031	0.072
Nonfarm income	0.516	0.483	0.094	0.087
Land operated	-0.022	0.043	-0.004	0.008
Percent of irrigated area	0.003	0.010	0.000	0.002
Soil fertility status	0.270	0.290	0.049	0.052
B) FPO related variables				
Regular contact with farmers	-0.039	0.367	-0.007	0.067
Availability of physical infrastructure and vehicles	-0.290	0.192	-0.053	0.034
Clarity of objectives	0.327	0.316	0.059	0.057
Scalability	-0.183	0.254	-0.033	0.046
Adaptiveness	-0.053	0.178	-0.010	0.032
Compliance	0.546	0.440	0.099	0.079

Technical rationality	0.536**	0.271	0.097**	0.048
Organizational rationality	0.713*	0.375	0.129*	0.066
Political rationality	0.336	0.259	0.061	0.046

Notes: ***p < 0.01, **p < 0.05, *p < 0.1. SE- standard error.

Determinants of farmers' participation in the meetings conducted by the FPOs

Education level had a positive significant relationship with farmers' participation in the meetings conducted by the FPOs. Distance from the FPO office had a significant negative relationship with farmers' participation in the meetings conducted by the FPOs. **Similar findings were also obtained by Manaswi (2018).** It can be inferred that farmers who have to travel long distances from their houses to avail of services were less likely to participate in the FPO meetings. Training attended irrigated areas, and soil fertility status had a positive significant relationship with farmers' participation in the meetings conducted by the FPOs. Any formal training in agriculture increased farmers' chances of attending the FPOs meetings. It was also observed that farmers with good soil fertility status and with the more irrigated area would attend training more than the farmers with a low resource base.

In FPO-related factors, it was seen that compliance had a positive significant relationship with farmers' participation in the meetings conducted by the FPOs (Table 4). One percent increase in a cumulative score for compliance increased the probability of farmers' participation in the meetings conducted by the FPOs by 14 percent. Hence, more FPO members participate in the meetings when the organization is compliant with the rules and regulations.

Table 4. Variables determining participation in the meetings conducted by the FPOs.

Variables	Ordinal coefficient		Marginal effect	
	Coeff.	SE	(dy/dx)	SE
A) Member related variables				
Age	0.009	0.027	0.002	0.005
Sex	-0.365	0.518	-0.069	0.098
Farm Experience	-0.007	0.024	-0.001	0.005
Education level	0.081**	0.040	0.015**	0.007
Family size	0.084	0.126	0.016	0.024
Access to FPO	-0.000*	0.000	-0.000*	0.000
Access to formal credit	0.26	0.364	0.049	0.069
Training attended	2.518***	0.571	0.478***	0.095
Membership in village Organization	-0.086	0.375	-0.016	0.071
Extension agency contact	0.403	0.375	0.077	0.071
Access to Mass media	0.648	0.388	0.123	0.072
Nonfarm income	-0.441	0.462	-0.084	0.087
Land operated	0.005	0.042	0.001	0.008
Percent of irrigated area	0.023**	0.010	0.004**	0.002

Soil fertility status	0.760***	0.284	0.144***	0.051
B) FPO related variables				
Regular contact with farmers	-0.344	0.359	-0.065	0.068
Availability of physical infrastructure and vehicles	-0.247	0.175	-0.047	0.033
Clarity of objectives	0.157	0.295	0.030	0.056
Scalability	-0.239	0.243	-0.045	0.046
Adaptiveness	0.134	0.179	0.025	0.034
Compliance	0.738*	0.434	0.140*	0.081
Technical rationality	0.351	0.263	0.067	0.049
Organizational rationality	0.229	0.350	0.043	0.066
Political rationality	0.156	0.242	0.030	0.046

235 Notes: ***p < 0.01, **p < 0.05, *p < 0.1. SE- standard error.

236 *Determinants of farmers' involvement in the decision making*

237 As evident from Table 5, access to FPO and access to formal credit had a positive significant
 238 relationship with farmers' involvement in decision making. Unlike for meetings and other
 239 activities, a positive sign of the distance indicated that distance does not matter for a farmer to
 240 involve in the decision making of the FPOs. It was observed that farmers who have more access to
 241 formal sources like banks, and SHG were more likely to involve in the decision making in the
 242 FPOs. Earlier studies like Dung, 2020; Tolno et al., 2015; Bernard and Spielman, 2009 etc.
 243 obtained similar findings. Contrary to the expectation, the percentage of the irrigated area and soil
 244 fertility status had a significant negative relationship with the farmers' participation in FPO
 245 meetings. Non-farm sources of income of farmers significantly and positively affected the farmers'
 246 participation in the decision making of FPOs (Tolno et al., 2015; Hosamani, 2019). Thus those
 247 farmers who had income sources other than agriculture, tend to involve more in the FPOs' decision
 248 making process than those who were dependent on agriculture. Among FPO-related variables, no
 249 variable significantly affected the farmers' participation in FPO's decision making. Thus, individual
 250 factors play an important role in participation in the decision making of FPOs than the FPO
 251 characteristics.

252 **Table 5.** Variables determining farmers' involvement in the decision making.
 253

Variables	Ordinal Logit coefficient		Marginal effect	
	Coeff.	SE	(dy/dx)	SE
A) Member-related variables				
Age	0.024	0.024	0.004	0.005
Sex	-0.564	0.468	-0.104	0.085
Farm Experience	-0.030	0.022	-0.006	0.004
Education level	0.040	0.038	0.007	0.007
Family size	0.103	0.115	0.019	0.021
Access to FPO	0.000**	0.000	0.000**	0.000
Access to formal credit	0.574*	0.336	0.105*	0.061

Training attended	0.480	0.491	0.088	0.090
Membership in village Organization	-0.172	0.344	-0.032	0.063
Extension agency contact	-0.244	0.358	-0.045	0.065
Access to Mass media	0.244	0.357	0.045	0.065
Nonfarm income	1.004***	0.414	0.184***	0.073
Land operated	0.029	0.039	0.005	0.007
Percent of irrigated area	-0.022***	0.009	-0.004***	0.002
Soil fertility status	-0.521*	0.266	-0.096*	0.048
B) FPO-related variables				
Regular contact with farmers	0.308	0.324	0.057	0.059
Availability of physical infrastructure and vehicles	-0.015	0.163	-0.003	0.030
Clarity of objectives	0.367	0.289	0.067	0.052
Scalability	0.027	0.233	0.005	0.043
Adaptiveness	0.045	0.165	0.008	0.030
Compliance	-0.247	0.378	-0.045	0.069
Technical rationality	0.141	0.249	0.026	0.046
Organizational rationality	0.092	0.313	0.017	0.057
Political rationality	-0.120	0.227	-0.022	0.042

Notes: ***p < 0.01, **p < 0.05, *p < 0.1. SE- standard error.

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256 ***Determinants of farmers' participation in the training programs conducted by the FPOs***

257 Training attended and soil fertility status had a positive significant relationship with farmers'
 258 participation in the training programs conducted by the FPOs. There was an 80.0 percent and 6.7
 259 percent increase in the probability of farmers' participation in the training programs conducted by
 260 the FPOs with a one percent increase in training attended and soil fertility status. The respondents
 261 who attended any formal training related to agriculture were more likely to participate in the
 262 training programs conducted by the FPOs. Gaining awareness in the training programs conducted
 263 by different agencies related to agriculture, farmers were more likely to participate in the training
 264 programs conducted by FPOs. As most of the training at the FPO level are related to crop
 265 production, soil, and fertilizer management; those farmers with good fertility status tend to attend
 266 more training. Like decision making, for training programs also, FPO related factors had a limited
 267 role in deciding farmer's participation.

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273 **Table 6.** Variables determining farmers' participation in the training programs conducted by the
 274 FPOs.

Variables	Ordinal Logit coefficient		Marginal effect	
	Coeff.	SE	(dy/dx)	SE
A) Member-related variables				
Age	0.017	0.026	0.003	0.005
Sex	-0.456	0.471	-0.092	0.094
Farm Experience	-0.009	0.023	-0.002	0.005
Education level	0.066	0.039	0.013	0.008
Family size	-0.018	0.120	-0.004	0.024
Access to FPO	0.000	0.000	-0.000	0.000
Access to formal credit	0.433	0.346	0.088	0.069
Training attended	3.953***	0.686	0.800***	0.134
Membership in village Organization	-0.011	0.359	-0.002	0.073
Extension agency contact	0.503	0.360	0.102	0.072
Access to Mass media	0.118	0.368	0.024	0.074
Nonfarm income	0.290	0.426	0.059	0.086
Land operated	-0.009	0.042	-0.002	0.008
Percent of irrigated area	0.003	0.010	0.001	0.002
Soil fertility status	0.333*	0.267	0.067*	0.053
B) FPO-related variables				
Regular contact with farmers	0.145	0.339	0.029	0.068
Availability of physical infrastructure and vehicles	0.124	0.166	0.025	0.034
Clarity of objectives	0.055	0.294	0.011	0.059
Scalability	0.096	0.236	0.019	0.048
Adaptiveness	-0.172	0.167	-0.035	0.033
Compliance	0.292	0.390	0.059	0.079
Technical rationality	0.187	0.247	0.038	0.050
Organizational rationality	0.111	0.325	0.023	0.066
Political rationality	0.207	0.236	0.042	0.048

275 Notes: ***p < 0.01, **p < 0.05, *p < 0.1. SE- standard error.

276 ***Determinants of farmers' involvement in the financial matter***

277 Farm experience, percentage of the irrigated area, and organizational rationality had a positive
 278 significant relationship with farmers' involvement in the financial matter. One percent increase in
 279 a cumulative score for farm experience and percentage of the irrigated area increased the
 280 probability of farmers' involvement in the financial matter by 1.3 and 0.3 percent, respectively. It
 281 can be justified that the farmers with a high level of farm experience and resource-rich farmers are
 282 contributing more to decisions related to financial matters. This finding is in concordance with
 283 Wang et al. (2019). As organizational rationality showed a positive and significant relationship
 284 with the farmer's participation in the financial matter, it can be inferred that the competency of the
 285 board of directors and the frequency of organizing meetings affected the farmers' participation in
 286 the financial matter of the FPOs.

Table 7. Variables determining farmers' involvement in the financial matter.

Variables	Ordinal Logit coefficient		Marginal effect	
	Coeff.	SE	(dy/dx)	SE
A) Member-related variables				
Age	-0.046	0.026	-0.008	0.004
Sex	-0.027	0.451	-0.004	0.074
Farm Experience	0.078***	0.022	0.013***	0.004
Education level	0.055	0.037	0.009	0.006
Family size	0.011	0.116	0.002	0.019
Access to FPO	0.000	0.000	0.000	0.000
Access to formal credit	0.343	0.325	0.057	0.053
Training attended	-0.116	0.495	-0.019	0.082
Membership in village Organization	0.002	0.338	0.000	0.056
Extension agency contact	0.231	0.350	0.038	0.057
Access to Mass media	-0.283	0.344	-0.047	0.056
Nonfarm income	-0.165	0.405	-0.027	0.067
Land operated	-0.033	0.037	-0.005	0.006
Percent of irrigated area	0.018***	0.009	0.003***	0.002
Soil fertility status	-0.163	0.256	-0.027	0.042
B) FPO-related variables				
Regular contact with farmers	0.435	0.317	0.072	0.052
Availability of physical infrastructure and vehicles	-0.258	0.159	-0.042	0.026
Clarity of objectives	0.168	0.276	0.028	0.045
Scalability	0.124	0.221	0.020	0.036
Adaptiveness	0.073	0.156	0.012	0.026
Compliance	0.090	0.375	0.015	0.062
Technical rationality	0.130	0.238	0.021	0.039
Organizational rationality	1.124***	0.326	0.185***	0.051
Political rationality	-0.024	0.220	-0.004	0.036

Notes: ***p < 0.01, **p < 0.05, *p < 0.1. SE- standard error.

290 5. Conclusions and implications

291 The study identified different member-related and FPOs related variables affecting their
 292 participation, taking leads from new institutional economic principles and organizational
 293 rationality. A heterogeneity was observed in the determinants of participation in different activities.
 294 Significant determinants of farmers' overall participation in the FPOs were education level, access
 295 to formal credit, and training attended related to agriculture. Access to FPO, percentage of irrigated
 296 area, soil fertility status, non-farm income, and farm experience were the other important
 297 determinants of farmers' participation in different activities of the FPOs. In FPO characteristics,
 298 technical rationality and organizational rationality played a significant role in farmers' participation
 299 in the overall activities of FPO. In addition to this, compliance was reported as significantly
 300 determining farmers' participation in meetings of the FPOs. Thus, more variables from member

301 characteristics affected the participation of farmers in FPO activities than the FPO characteristics.
302 Further studies are suggested to explore the effect of FPOs characteristics on participation.

303 The study makes an addition to the existing literature on factors responsible for farmers'
304 participation in an organization in general and FPOs in particular. From a policy perspective, the
305 finding emphasizes the development of human capital, particularly by providing education and
306 training related to agriculture to farmers. Increasing access to credit can serve as an incentive for
307 farmers to participate in FPOs. Access to FPO in terms of distance was an important determinant
308 in participation in meetings, therefore, while establishing FPOs, care should be taken that it
309 comprised members from the same or adjoining villages. Though the percentage of irrigated area
310 and soil fertility status cannot be changed easily, these things need to be kept in mind by promoting
311 institutions before the establishment of FPOs. Technical and organizational rationalities must be
312 strongly addressed by the FPOs to ensure a high level of participation. Compliance at the
313 organizational level can be strengthened to promote farmers' participation. Thus, both member
314 characteristics and FPO characteristics need to be taken into account to ensure the high
315 participation of farmers in FPO activities, which is crucial for the successful performance and
316 impact of FPOs.

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397 **Annexure I**

398 **Table 1. Farmer producer organizations selected for the study**

S.No	Name of the district	Name of the FPO
1	Krishna	Srivigneswara Farmer Producer Company Limited
2		Chinaogirala Farmer Producer Company Limited
3		Suryasai Farmer Producer Company Limited
4		Go Adharitha Prakruthi Vyavasayadarula Mutually Aided Cooperative Society Limited
5		Ramakoti SHG Women Farmer Producer Company Limited
6	West Godavari	Tribal Cashew Farmer Producer Company Limited
7		Jeelugumilli Cashewnut Farmer Producer Company Limited
8		M. Nagulapalli Vegetable Farmer Producer Company Limited
9		Haritha Mithra Farmer Producer Company Limited
10		Manasaputrika Village Vegetable Farmers Producer Company Limited
11	Nalgonda	Nakrekal Farmer Producer Company Limited
12		Thipparthi Farmer Producer Company Limited
13		Maredu Farmer Producer Company Limited
14		Pedaoora Farmer Producer Company Limited
15		Kattangur Farmer Producer Company Limited
16	Khammam	Haritha Agri Farmer Producer Company Limited
17		Padipanta Agro Farmer Producer Company Limited
18		Srivennela Farmer Producer Organization
19		Sambhadri Farmer Producer Company Limited
20		Nayakangudem Farmer Producer Company Limited

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