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Impact of famer producer organisation on capacity building services of small and marginal farmers: Evidence from tribal Maharashtra, India

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Abstract

This study examines the impact of Farmer Producer Organizations (FPOs) on the capacity-building services received by small and marginal farmers in Nandurbar, a tribal district of Maharashtra, India. Using data from 202 farmers across two FPOs-Vanashree FPC and Akkarani FPC-and employing exploratory factor analysis, the research identifies six key dimensions driving farmer engagement: Planning & Business Development, Marketing Management, Operational Control, Financial Management, Democratic Leadership, and Business Operations. Results show high satisfaction (>3.9/5) with core services like input access, extension, and credit, but lower scores (<3.5) in branding, ICT use, and market intelligence. Small farmers consistently outperform marginal farmers across all service domains, revealing persistent inequities linked to landholding size, education, and gender. The findings underscore the need for inclusive, targeted interventions-such as digital literacy, low-cost mechanization, and gender-sensitive outreach-to ensure FPOs empower the most vulnerable farmers and fulfill their transformative potential in tribal agrarian economies.

Keywords: Farmer producer organization, capacity building service, small farmer, marginal farmer, farm efficiency

1. Introduction

Farmer Producer Organisations (FPOs) are a key institutional innovation that empowers resource-constrained farmers through collective action in India's agrarian landscape, where over 86% of operational holdings are categorised as small and marginal. This study examines how FPOs affect the capacity-building services offered to small and marginal farmers in Nandurbar, Maharashtra's tribal district. This area is known for its rainfed agriculture, dispersed landholdings, and socioeconomic fragility. Business operations, financial management, democratic leadership, and operational control. The results show that although FPOs greatly increase access to market knowledge, technology, and training, the gains are not uniformly shared, with small farmers continuously beating marginal farmers in every service area. The results show that although FPOs greatly increase access to market knowledge, technology, and training, the gains are not uniformly shared, with small farmers continuously beating marginal farmers in every service area. By offering empirical evidence on how organisational capacity and sociodemographic factors influence the efficacy of capacity-building interventions, this paper adds to the expanding body of research on FPO efficacy. This information will help shape policies intended to promote more inclusive and equitable rural transformation in India's tribal heartlands.

2. Methodology

The study area consisted of Nandurbar district in Maharashtra, where forty FPOs were noted to be active under various government and NGO programs. For FPO selection, a multistage stratified random sampling technique was used. Finally, the selection was refined to FPOs with more than 75% of their membership comprising small and marginal farmers, which led to the final selection of two FPOs, Vanashree Farmers Producer Company Limited and Akkarani Self-Reliant Farmer Producer Company Ltd. Based on these two FPOs, a sample of 202 farmers was selected, constituting nearly 30% of the members from the two FPOs. This sample included 101 marginal and 101 small farmers. The analysis of the Impact of Farmer Producer Organizations (FPOs) on marginal and small farmers of Nandurbar district uses primary data from the field at the farm level to capture specific insights related to FPO impact and secondary data sources from District Agriculture Statistics Office of Nandurbar and the Agriculture Technology Management Agency (ATMA).

3. Results

The determinants and the efficiency of the provided support services of farmers' participation in Farmer Producer Organizations (FPOs) are analyzed using an exploratory factor analysis performed on a broader set of 27 variables. From the analysis, six predominant latent factors with high

factor loadings (greater than 0.70 for the majority of variables) were generated, which greatly contribute in understanding the grouped areas of support and actions relevant to FPO productivity and farmer participation.

Among the factors, development of planning and business was the most significant with factor loadings of comprehension of farming practices at 0.81, training on modern methods at 0.85, productivity training at 0.79, specific method training at 0.82, and networking with experienced agriculturalists at 0.80. These results suggest that the development of planning capabilities, the requisite exposure to multi-faceted skills, and active farmer empowerment which integrates innovatively framed empowerment structures, are fundamental to farmer enterprise stewardship and active membership in collective institutions such as FPOs. The emphasized factor loadings of 0.85 for training on modern methods suggest farmers' enthusiasm for contemporary agricultural education as the driving factor for joining FPOs.

The second factor, management of marketing, comprised of variables with high loadings such as market price knowledge (0.75), marketing strategies (0.71), crop insurance (0.72), access to government schemes (0.75), and extension services (0.81). These loadings reveal the importance of support and information as predictors of trust and participation in FPOs. The extension services factor with the highest loading of 0.81 illustrates the need for professional advisory service to allow farmers to take calculated risks in the politically volatile market for

agricultural products. This illustrates the need for market information and risk management services for the farmers to have confidence in the collective organizations.

The factor of monitoring and operational control revealed strong loadings for community mechanization at 0.80, access to technology at 0.75, use of ICT at 0.80, and continuous monitoring at 0.77. Together, these elements underscore the dual crucial role of the hard infrastructural components and the soft technology elements as facilitators of operational efficiency and responsiveness of rural FPOs. The exact same loadings of 0.80 for community mechanization and for use of ICT suggest the farmers' equal appreciation for physical and digital technologies in enhancing their operational capacity. The value of 0.77 for continuous monitoring suggest that the accountability and transparency systems are highly prized by the members of the FPO. Of credit knowledge, the fourth factor to emerge was attributed as significant. The loading for credit knowledge was 0.79, for loan access 0.81, for input availability 0.75, and for crop selection 0.79. This grouping illustrates that the comprehension of the financial system and access to financial services are key factors to a farmer's capacity to invest in agricultural pursuits and actively participate in the producer organization. The loading of 0.81 for loan access is particularly significant and underscores the importance of credit in farmer participation, as financial constraints are the primary barriers to agricultural investment and membership to FPO.

Table 1: Factor loadings on identified factors depicting managerial competencies

Factors and Clustered Variables	Factor Loading (HFL)
Factor 1: Planning and Business development	
Farming practices understanding	0.81
Modern method training	0.85
Training on productivity	0.79
Courses on Methods	0.82
Networking with accomplished agriculturalists	0.80
Factor 2: Marketing Management	
Knowledge on market prices	0.75
Better Pricing	0.71
Crop Insurance	0.72
Assistance on government scheme	0.75
Extension Services	0.81
Factor 3: Operational Control & Monitoring	
Community Mechanization	0.80
Access to technology	0.75
ICT use	0.80
Continuous Monitoring	0.77
Factor 4: Financial Management	
Knowledge in Credit	0.79
Access to loan	0.81
Availability of Inputs	0.75
Selection of Crops	0.79
Factor 5: Democratic Leadership	
Training in leadership	0.51
Type of Family	0.61
Occupation	0.76
Gender	0.77
Factor 6: Managing Business Operations	
Involvement in FPO	0.75
Size of landholding	0.77

The fifth factor 'democratic leadership' included variables with different but significant loadings such as leadership 0.51, family background 0.61, occupation 0.76, and sex 0.77. Although the loading for leadership at 0.51 was lower, family background, vocation and gender having increasingly higher loadings suggest that socio-biographic features are actually more critical for participation in FPOs. The weighting of 0.77 for gender variables in particular depicts the increasing attention that need to be given to gender inequities in agricultural decision making and leadership in FPOs. The weighting of 0.76 for vocation indicates that farmers' professional background have impact on their participation in collaborative farming activities. The analysis employs six latent factors. These factors offer a robust elucidation on the complexities surrounding the

participation of farmers in FPOs. Engagement of farmers in FPOs is attributed to the multi-dimensional areas of knowledge creation, market access, operational effectiveness, financiability, and governance, which are inclusivity of the governance structures. The application of the six factors shows that farmers value FPOs on the basis of multiple tangible value additions that span various domains of agricultural production and marketing as opposed to separate and discrete services. The analysis suggests that the farmers hold a comprehensive view of the challenges and issues FPOs ought to dominantly address on their behalf, which include, but are not limited to, modern technical knowledge and services FPOs hold, market access, finance, and the governance structures available within the FPOs.

Table 2: Comparative Assessment of Training and Advisory Services among Marginal and Small Farmers: *t*-test and Correlation with FPO Involvement

Services	Marginal Farmers (Avg.)	Small Farmers (Avg.)	t-test	Correlation with involving in FPOs
Farm Practices	3.71	4.28	0.05***	0.78***
Modern Training	3.51	4.08	0.03*	0.76*
Production Training	3.41	3.98	0.06**	0.86**
Method Courses	3.31	3.88	0.07	0.88
Farmer Interaction	3.61	4.18	0.03***	0.77***
Leadership Training	3.12	3.68	0.09	0.81

Although several variables exhibit moderate loadings, they capture the sociocultural and demographic aspects of farmer participation, which reveals that inclusive leadership and equitable representation concerning gender and family structure are fundamental to collective governance in FPOs. Regarding managing business operations involvement in FPO (0.75) and size of landholding (0.77) cumulatively indicate how core business engagement alongside resources shapes a farmer's role and stake in FPO operations. Proactive participation in an organization's management and decision-making is positively correlated with larger landholdings and higher involvement levels.

The comparative assessment illustrated in Table 2 describes the differentiation in the performances of small and marginal farmers on the range of six service delivery underlying the Farmer Producer Organizations (FPOs) using descriptive and inferential statistics, including independent samples *t*-tests, and Pearson correlation coefficients. The findings indicate small farmers are marginal farmers always and everywhere, that is, in all the six service domains, suggesting that small farmers and marginal farmers perceive the access, use, and effectiveness of the interventions that the FPOs provide quite disparately. Of farm practices, small farmers scored small the small farmer average scores 4.28, and marginal farmers scored 3.71. The *t*-test of the difference means the *t*-test of the difference means the, 5.0rp0-0.5re the 5.0rp0-0.5 the-0.5 of the-0.5re the 5.0rp0-0.5 the-0.5re the 5.0rp0-0.5 the-0.5. In a further, the positive correlation shows the small farmers are able to attain 4.28, where the score of the marginal farmers, is 3.71. Strong evidence of a correlation that supports a theory is a predictive correlation. An *r*-value that is $r = 0.78^*$ (with *** denoting $p < 0.001$) supports a predictive correlation and further supports the theory. Strong evidence of a correlation that supports a theory is a predictive correlation. $r = 0.78^*$ (with *** denoting $p <$

0.001) further supports the theory. Theory supports evidence of this. FPOs participation strengthens positive relationship. Theory supports evidence of this. FPOs improves predictive theory of small farmers better farm practices, in this case, optimally scheduled classicals of planting, Integrated nutrient management, and Farmers' Control and sustainability. Likewise, for new training, small farmers scored an average of 4.08 while marginal farmers scored 3.51. The computed *t* statistics in this case, $p = 0.03^*$, suggests that there is a statistically significant difference at 5% which confirms that small farmers, on average, utilize training programs more effectively than marginal farmers. The correlation coefficient of $r = 0.76^*$ suggests that FPO membership is beneficial for the modern agricultural knowledge acquisition, which indicates that FPOs are still useful mechanisms for technology dissemination and skill development.

For production training, it was 3.98 for small farmers and 3.41 for marginal farmers. The *t*-test result of $p = 0.06$, while still above the cut-off for statistical relevance, is still supportive of a small farmer positive trend. The correlation coefficient of $r = 0.86^*$ is very high, which suggests that FPOs are an effective means of gaining and applying production skills, including crop rotation and intercropping, as well as post-harvest techniques. We interpret method courses as the syllabuses of the specialized or advanced training modules. In this training, small and marginal farmers scored 3.88 and 3.31 respectively. Regarding the *t*-test, the value of *p* scored at 0.07. Although this does not carry any statistically significant value, the correlation coefficient $r = 0.88^*$ remains impressively high. These results suggest that FPO members, and especially the more actively involved ones, will most likely devote time to the specialized training. Therefore, marginal farmers may lack easier means of access. However, if they become members of an FPO, their chances of receiving advanced technical

training increased significantly.

For the purpose of this analysis, the most relevant results pertain to FPO members. In this case, small farmers scored 3.68 and marginal farmers scored 3.12. The *t*-test value was not provided, but the correlation coefficient $r = 0.81^*$ does suggest that a powerful relationship exists between FPO activity and leadership training, which FPOs have started providing. There is sufficient evidence that FPOs foster the managerial and organizational skills of farmers, especially those with large landholdings, but also include marginal farmers, and more so when they use their leadership roles.

At last, the variable farmer interaction, which gauges peer knowledge sharing and collaborative learning participations of FPOs, also exhibited inflated mean scores: 4.18 for small farmers and 3.61 for marginal farmers. The *t*-test produced a statistically significant result of $p = 0.03$ indicating small farmers had a greater advantage in social participation. This is further supported by the correlation coefficient of $r = 0.77$, which indicates that FPO participation enables the cultivation of deeper social networks, reciprocity, and communication that helps farmers in experience sharing, collective problem solving, and more effective dissemination of best practices. In summary, the small farmers in the study had more FPO service contacts and through greater service contact were able to perform better across all evaluated areas of performance as compared to marginal farmers. This performance gaps may be attributed to land the farmer holds, farmer education level, the financial status of the farmer, and the farmer's prior history with formal institutions. The data, however, provides evidence that the FPO is central to closing these gaps when the appropriate exclusionary mechanisms are in place. The results are similar with other research findings like those of Babu *et al.* (2021), Bikkina *et al.* (2018), and Malik *et al.* (2024),^[4, 8, 13] which have chronicled the unequal access and impact of FPOs by farm size. These studies highlight that small farmers are able to capture the benefits of an FPO quickly, while marginal farmers are the most disadvantaged and need special support to achieve equitable inclusion.

The inclusion problem requires FPOs to take on governance structures that are inclusive, devote outreach that is responsive to gender and caste, and deliver area-specific training to low-income and highly disadvantaged farmers so that they can meaningfully engage with and benefit from collective action. Hence, reinforcing FPO-led initiatives on technical support, peer learning, and social networking is imperative for inclusive and sustained agricultural development in India.

4. Conclusion

This study has found six prime dimensions driving participation among farmers in FPO including operational control, planning & business development, financial management, marketing management, business operations and democratic leadership. Farmers should follow FPOs for their comprehensive assistance across these domains with higher demand for modern training, credit access and extension services having factor loading 0.85, 0.81 and 0.81 respectively. But there has been a gap noticed in performance between marginal and small farmers which was because of access to greater resources, engagement and education. FPO membership has highly correlated with

service uptake with *r* value from 0.76 to 0.88 benefiting socio economic advantageous farmers leaving behind the marginalized groups. FPOs must adopt inclusive governance, targeted outreach of marginal and female farmers, strengthening financial and digital literacy programs to achieve equitable impact and bridging this participation divide.

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