

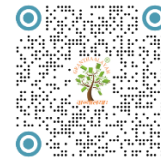
Original Article

COLLECTIVE ACTION AND EMPOWERMENT: EVALUATING FARMER PRODUCER ORGANISATIONS IN THE RICE BOWL OF CENTRAL INDIA

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ABSTRACT

Farmer Producer Organisations (FPOs) have emerged as a pivotal institutional mechanism for agrarian transformation in India, enabling smallholder farmers to collectively access markets, credit, technology, and value-chain integration. Despite significant policy emphasis at the national level, empirical evidence on the functional status, perceived benefits, and structural challenges of FPOs in the tribal-agrarian landscape of Chhattisgarh remains sparse. This study investigates the status of FPOs in Chhattisgarh, identifies the opportunities available for member farmers, and delineates strategic interventions necessary for their empowerment. A multi-stage random sampling procedure was employed to survey 385 farmer-members across five purposively selected districts — Raipur, Durg, Rajnandgaon, Bastar, and Surguja. Structured questionnaires incorporating five-point Likert-scale items were administered, and data were analysed using IBM SPSS Statistics v.26. Statistical tools included descriptive analysis, reliability testing (Cronbach's alpha), exploratory factor analysis (EFA) with principal component extraction, independent samples t-test, one-way ANOVA with Tukey's HSD post-hoc comparison, and multiple linear regression. Cronbach's alpha for composite scales ranged from 0.791 to 0.863, confirming adequate internal consistency. EFA yielded four latent constructs — Institutional Support, Market Linkage, Financial Inclusion, and Capacity Building — explaining 62.34% of cumulative variance. Regression analysis revealed that market linkage ($\beta = 0.387, p < .001$) and institutional support ($\beta = 0.312, p < .001$) were the strongest predictors of farmer empowerment. ANOVA indicated statistically significant income differentials across FPO membership tenure groups ($F(3, 381) = 14.72, p < .001, \eta^2 = 0.104$). Findings underscore systemic deficits in governance transparency, professional management, and last-mile digital infrastructure as barriers to optimal FPO performance. The study recommends a Chhattisgarh-specific FPO Acceleration Framework comprising cluster-based business planning, gender-inclusive governance mandates, digital market platform integration, and dedicated concessional financing windows.

Keywords: Farmer Producer Organisations, Chhattisgarh, Agricultural Empowerment, Smallholder Farmers, Exploratory Factor Analysis, Market Linkage, SPSS, Rural Development

INTRODUCTION

The agrarian economy of India is characterised by structural fragmentation — approximately 86% of operational landholdings are smaller than two hectares [Agricultural Census Division \(2019\)](#), rendering individual smallholder farmers vulnerable to input-price volatility, monopsonistic market intermediaries, and restricted access to institutional finance. Collective action through farmer-owned producer organisations has been globally recognised as a viable pathway for overcoming these structural disadvantages [Markelova et al. \(2009\)](#), [Trebbin \(2014\)](#). In India, this vision has been institutionalised through the promotion of Farmer Producer

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Companies (FPCs) and Farmer Producer Organisations (FPOs) under the Companies Act, 2013, and the Producer Companies Act, 2002. The national target of establishing 10,000 FPOs by 2027-28, backed by a budgetary allocation of Rs. 6,865 crore under the Central Sector Scheme [Government of India \(2020\)](#), reflects the political salience of this agenda.

Chhattisgarh, carved out of Madhya Pradesh as a separate state in 2000, presents a particularly compelling context for FPO research. The state's economy is overwhelmingly agrarian, with nearly 70% of its population engaged in agriculture and allied activities [Directorate of Economics and Statistics, Chhattisgarh. \(2022\)](#). The agrarian landscape is distinguished by its high concentration of Scheduled Tribe (ST) populations — approximately 30.6% of the total population, the third-highest proportion among Indian states [Census of India \(2011\)](#) — who are predominantly subsistence cultivators of paddy, minor millets, and forest produce. The state's designated 'Rice Bowl of Central India' identity belies the persistent income poverty, post-harvest losses estimated at 15–20% of gross output [National Bank for Agriculture and Rural Development \(2021\)](#), and acute credit exclusion faced by its farming community.

The institutional ecosystem for FPOs in Chhattisgarh is in a nascent but evolving stage. As of March 2023, the state hosts 312 registered FPOs, of which only 182 (58.3%) are operationally active, a figure significantly below the national activation rate of 72% [Small Farmers' Agribusiness Consortium \(2023\)](#). This gap between registration and operational vitality raises fundamental questions about the enabling environment, the quality of institutional support, and the degree to which FPO membership translates into tangible empowerment outcomes for farmers. Despite the policy imperative, rigorous empirical studies examining these questions in the Chhattisgarh context are conspicuously absent from the academic literature.

This study addresses the identified gap by empirically investigating three interconnected dimensions: (a) the contemporary status of FPOs in Chhattisgarh as perceived by member farmers; (b) the opportunities that FPO membership affords across market access, financial inclusion, and technology adoption; and (c) the strategic interventions required to enhance FPO effectiveness and farmer empowerment. By employing a robust quantitative research design anchored in a representative sample of 385 farmer-members and a battery of SPSS-based inferential statistical techniques, this study contributes both to the theoretical understanding of collective agricultural institutions and to evidence-based policy formulation in the state.

RESEARCH OBJECTIVES

The study is guided by the following specific objectives:

- 1) To assess the operational status of FPOs in Chhattisgarh from the perspective of member farmers.
- 2) To identify the key opportunities arising from FPO membership across economic, social, and technological dimensions.
- 3) To examine the relationship between latent FPO-related constructs and farmer empowerment outcomes.
- 4) To propose evidence-based strategic interventions for strengthening FPOs in the state.

RESEARCH HYPOTHESES

On the basis of the theoretical framework and extant literature, the following null hypotheses were formulated for empirical testing:

- H01: There is no statistically significant difference in perceived farmer empowerment across different FPO membership tenure groups.
- H02: Market linkage, institutional support, financial inclusion, and capacity building do not significantly predict farmer empowerment.
- H03: There is no statistically significant gender difference in perceived benefits of FPO membership.

LITERATURE REVIEW

THEORETICAL UNDERPINNINGS OF FARMER COLLECTIVE ACTION

The analytical foundation for FPO research is rooted in [Olson \(1965\)](#) seminal collective action theory, which posited that rational individuals would not voluntarily contribute to the provision of collective goods unless the group was sufficiently small or selective incentives were operative. [Ostrom \(1990\)](#) subsequent work on governing the commons complicated this pessimistic reading by demonstrating that communities could design endogenous institutional arrangements for collective resource management without necessarily succumbing to the 'tragedy of the commons.' These theoretical insights have been applied to agricultural cooperatives and producer organisations by a substantial body of empirical literature.

Transaction cost economics, as elaborated by [Williamson \(1985\)](#), provides a complementary lens for understanding why farmers voluntarily join collective organisations. By pooling marketing, procurement, and information functions, FPOs reduce the per-unit transaction costs that individual smallholders face in input and output markets, thereby improving their terms of trade with agribusiness firms and financial institutions [Fischer and Qaim \(2012\)](#). The resource dependency theory [Pfeffer and Salancik \(1978\)](#)

further illuminates the motivational basis for FPO participation, as farmers join to reduce their dependence on asymmetrically powerful intermediaries and gain access to resources — capital, technology, market information — that are individually inaccessible.

GLOBAL EVIDENCE ON FARMER PRODUCER ORGANISATIONS

The international literature on farmer producer organisations and agricultural cooperatives has generated a rich and nuanced body of evidence. [Verhofstadt and Maertens \(2014\)](#) demonstrated, using propensity-score-matched data from Rwanda, that cooperative membership significantly increased household income and reduced food insecurity among smallholder farmers, with effects concentrated among the poorest quintile. [Mojo et al. \(2017\)](#), in a study of coffee cooperatives in Ethiopia, found that membership increased farm income by 17.4%, primarily through improved market prices and access to extension services. However, [Chirwa et al. \(2005\)](#) cautioned that the benefits of collective action were contingent on governance quality, membership heterogeneity, and the external institutional environment.

Within the South Asian context, [Trebbin and Hassler \(2012\)](#) analysed producer companies in India and identified a critical tension between the commercial orientation required for financial sustainability and the developmental mandate to serve the smallest and most marginalised farmers. [Nair \(2011\)](#) and [Shinoj et al. \(2017\)](#) similarly documented that Indian FPOs frequently struggled with inadequate equity capitalisation, weak professional management, and an overreliance on government grants, limiting their capacity to scale operations and invest in value-chain infrastructure. More recent analyses by [Reardon et al. \(2021\)](#) and [Birthal et al. \(2015\)](#) have highlighted the transformative potential of FPOs in facilitating farmer participation in modern agri-food supply chains, particularly in horticultural commodities.

FPOS IN THE INDIAN CONTEXT

In the Indian policy discourse, the legislative foundation for FPOs was laid by the National Policy for Farmers (2007) and operationalised through the Small Farmers' Agribusiness Consortium (SFAC) and NABARD's promotional programmes. The government's 10,000 FPO initiative, announced in the Union Budget 2019-20 and formalised through a Cabinet-approved scheme [Ministry of Agriculture and Farmers Welfare \(2020\)](#), has significantly accelerated FPO formation across the country. [Sontakki et al. \(2020\)](#) evaluated the performance of 100 SFAC-promoted FPOs and identified market linkage intensity, equity participation, and board effectiveness as the three most significant predictors of financial performance.

Regional studies have enriched this national-level picture. [Parihar and Tiwari \(2019\)](#) found that FPOs in Madhya Pradesh achieved higher collective marketing volumes but faced acute challenges in working capital management and cold-chain infrastructure. [Rangarajan and Krishnamurthy \(2020\)](#) reported similar structural deficits in Maharashtra, where FPOs in less-commercialised agro-ecological zones — comparable to Chhattisgarh — showed lower membership retention and higher dormancy rates. For Chhattisgarh specifically, [Mishra and Tripathy \(2021\)](#) provided a descriptive account of paddy-based FPO operations, noting that the state's tribal agriculture systems posed unique challenges for standardised FPO business models designed primarily for commercial crop producers.

IDENTIFIED RESEARCH GAP

A systematic review of extant literature reveals that, while there is considerable macro-level documentation of FPO numbers and sectoral composition in Chhattisgarh, rigorous empirical studies employing validated quantitative instruments, multivariate statistical analysis, and conceptually grounded farmer-empowerment frameworks are virtually absent. No published study has employed exploratory factor analysis to map the latent structure of FPO-related benefits and challenges in the state, nor has any study used multiple regression to identify the relative predictive weight of different FPO service dimensions on empowerment outcomes. This study directly addresses this gap, and in so doing, contributes to the growing literature on institutional mechanisms for rural transformation in Central India.

RESEARCH METHODOLOGY

RESEARCH DESIGN

This study adopts a quantitative, cross-sectional survey research design grounded in the positivist research paradigm [Creswell and Creswell \(2018\)](#). A cross-sectional design is appropriate for the current research objectives, as it permits the collection of data from a representative sample at a single point in time, enabling valid inferences about the population's perceptions, experiences, and attitudes regarding FPO membership. The epistemological commitment to measurability and causal inference justifies the deployment of inferential statistical procedures as the primary analytical framework.

STUDY AREA

Chhattisgarh state was purposively selected as the study area on account of its agrarian significance, high concentration of smallholder and tribal farmers, and the nascent but rapidly expanding FPO ecosystem. Within the state, five districts were selected using purposive criterion sampling to ensure agro-ecological diversity and representation of both active and partially active FPOs: Raipur (central plains, rice-belt), Durg (industrially adjacent, diversified agriculture), Rajnandgaon (vegetable and oilseed production), Bastar (tribal region, minor forest produce-based FPOs), and Surguja (northern tribal uplands, paddy and coarse cereals). This multi-district selection ensures that the sample captures variance across socioeconomic contexts, tribal land tenures, crop systems, and FPO typologies, enhancing the generalisability of findings within the state.

SAMPLE SIZE DETERMINATION

The required sample size was calculated using the [Cochran \(1977\)](#) formula for estimating proportions in a finite population:

$$n_0 = (Z^2pq) / e^2$$

where $Z = 1.96$ (for 95% confidence level), $p = 0.5$ (maximum variance assumption), $q = 1 - p = 0.5$, and $e = 0.05$ (acceptable margin of error). This yields $n_0 = (1.96^2 \times 0.5 \times 0.5) / 0.05^2 = 384.16$, which was rounded upwards to 385 to improve statistical power. Given that the total registered FPO membership in the five selected districts is approximately 18,400 (SFAC District Records, 2022–23), the finite population correction factor was marginal and the final sample size of 385 was retained. The sample was distributed proportionally across the five districts based on their share of total FPO membership, yielding district sub-samples of: Raipur ($n = 94$), Durg ($n = 78$), Rajnandgaon ($n = 81$), Bastar ($n = 72$), and Surguja ($n = 60$).

SAMPLING PROCEDURE

A three-stage stratified random sampling procedure was adopted. In Stage 1, five districts were purposively selected based on the criteria described above. In Stage 2, within each district, all registered and operationally active FPOs were enumerated, and FPOs were selected by simple random sampling. In Stage 3, the required number of farmer-members was drawn from each selected FPO's membership register using systematic random sampling, with a random starting point and a fixed sampling interval ($k = N/n$, where N is the FPO's membership size). A final sample of 385 farmer-members was successfully interviewed; the response rate was 97.2% against an initial contact list of 396 farmers (11 non-responses due to seasonal migration and illness).

INSTRUMENT DEVELOPMENT

The primary data collection instrument was a structured questionnaire developed in three stages: (a) domain identification through an extensive literature review [Trebbin and Hassler \(2012\)](#), [Sontakki et al. \(2020\)](#), [Mojo et al. \(2017\)](#); (b) item generation and expert review by a panel of five subject-matter specialists drawn from agricultural economics, rural management, and development sociology; and (c) pilot testing on a non-sample group of 30 farmer-members in Bilaspur district, followed by item refinement based on item-total correlation analysis.

The final instrument comprised six sections: (I) socioeconomic and demographic profile (14 items); (II) FPO membership characteristics (7 items); (III) perceived operational status of FPOs (12 Likert items); (IV) perceived opportunities from FPO membership (18 Likert items); (V) perceived barriers and challenges (10 Likert items); and (VI) overall farmer empowerment index (8 Likert items). All Likert items employed a five-point response scale anchored at 1 (Strongly Disagree) and 5 (Strongly Agree). The questionnaire was translated into Hindi and Chhattisgarhi dialects by certified translators and back-translated into English to verify semantic equivalence.

DATA COLLECTION

Primary data were collected through trained field investigators between October 2022 and March 2023. Each investigator underwent a two-day training programme covering research ethics, structured interview techniques, questionnaire administration protocols, and recording accuracy checks. Informed consent was obtained from all respondents prior to data collection, and confidentiality of individual responses was assured in accordance with the Indian Council of Social Science Research (ICSSR) ethical guidelines. Data quality checks were performed on 10% of randomly selected questionnaires through telephonic re-interview.

STATISTICAL ANALYSIS

All data were coded, entered, and analysed using IBM SPSS Statistics Version 26.0. The analytical sequence comprised the following procedures:

- 1) Descriptive statistics (frequencies, percentages, means, standard deviations) for all demographic and FPO-membership variables.
- 2) Reliability analysis using Cronbach's coefficient alpha ($\alpha \geq 0.70$ threshold per [Nunnally \(1978\)](#) to evaluate internal consistency of composite scales.
- 3) Exploratory Factor Analysis (EFA) with Principal Component Extraction (PCE) and Varimax rotation to identify underlying latent constructs. Adequacy of factorability was evaluated using the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test of Sphericity. Factors with eigenvalues ≥ 1.0 (Kaiser's criterion) were retained; items with factor loadings ≥ 0.50 were included in the final factor solution.
- 4) Independent Samples t-test to examine gender differences in perceived FPO benefits ($\alpha = .05$, two-tailed).
- 5) One-way ANOVA with Tukey's Honest Significant Difference (HSD) post-hoc test to examine differences in empowerment scores across FPO membership tenure groups (< 1 year, 1–3 years, 3–5 years, and > 5 years).
- 6) Multiple Linear Regression (Enter method) to identify the relative contribution of factor-derived constructs (institutional support, market linkage, financial inclusion, and capacity building) in predicting the farmer empowerment index. Multicollinearity was assessed via Variance Inflation Factor (VIF < 5) and Tolerance (> 0.20) statistics.

RESULTS AND DISCUSSION

SOCIODEMOGRAPHIC PROFILE OF RESPONDENTS

The sociodemographic characteristics of the 385 surveyed farmer-members are presented in [Table 1](#). The sample skewed male (71.4%), reflecting the patriarchal landownership structures prevalent in Chhattisgarh, though a meaningful proportion of female respondents (28.6%) — many of whom were members of women-oriented FPOs in Bastar — was represented. The mean age of respondents was 42.6 years (SD = 9.73), with the largest age cohort being 36–50 years (47.5%). Educational attainment was relatively low, with approximately 38.7% of respondents having completed only primary schooling and 26.8% being illiterate or with no formal education — a profile consistent with broader rural educational patterns in the state [ASER Centre \(2022\)](#). The modal landholding size was less than one hectare (43.4%), confirming the dominance of marginal farmers in the sample. Paddy (*Oryza sativa* L.) was the primary crop for 62.9% of respondents, underscoring Chhattisgarh's rice-centric agrarian identity.

Table 1

Table 1 Sociodemographic Profile of Respondents (N = 385)			
Characteristic	Category	Frequency	Percentage (%)
Gender	Male	275	71.4
	Female	110	28.6
Age Group	Up to 35 years	96	24.9
	36–50 years	183	47.5
	51–60 years	78	20.3
	Above 60 years	28	7.3
Education Level	Illiterate/No formal education	103	26.8
	Primary (1–5th)	149	38.7
	Secondary (6–10th)	98	25.5
	Higher Secondary & above	35	9.1
Landholding	Marginal (< 1 ha)	167	43.4
	Small (1–2 ha)	128	33.2
	Semi-medium (2–4 ha)	68	17.7
	Medium & above (> 4 ha)	22	5.7
Primary Crop	Paddy	242	62.9
	Vegetables/Horticulture	71	18.4

	Pulses/Oilseeds	49	12.7
	Other/Mixed	23	6
FPO Membership Tenure	Less than 1 year	58	15.1
	1–3 years	142	36.9
	3–5 years	119	30.9
	More than 5 years	66	17.1
District	Raipur	94	24.4
	Durg	78	20.3
	Rajnandgaon	81	21
	Bastar	72	18.7
	Surguja	60	15.6

Note Data are based on primary survey (2022–23). Percentages may not sum to 100 due to rounding.

RELIABILITY ANALYSIS

Prior to multivariate analysis, the internal consistency of the four composite scales was assessed using Cronbach's coefficient alpha. As reported in Table 2, all four scales demonstrated alpha values exceeding the threshold of 0.70 recommended by Nunnally (1978) and Hair et al. (2019), confirming their suitability for further analysis. The overall farmer empowerment index scale achieved the highest reliability ($\alpha = 0.863$), while the market linkage scale recorded $\alpha = 0.831$. The somewhat lower alpha for the institutional support scale ($\alpha = 0.791$) may reflect the inherently heterogeneous nature of institutional constructs that encompass governance, regulatory, and support-service dimensions DeVellis (2017).

Table 2

Scale	No. of Items	Cronbach's Alpha (α)	Scale Mean	SD	Interpretation
Institutional Support (IS)	8	0.791	3.24	0.68	Acceptable
Market Linkage (ML)	7	0.831	3.09	0.74	Good
Financial Inclusion (FI)	6	0.817	3.18	0.71	Good
Capacity Building (CB)	5	0.804	3.31	0.62	Good
Farmer Empowerment Index (FEI)	8	0.863	3.22	0.69	Good

Note. $\alpha \geq 0.70$ is considered acceptable; $\alpha \geq 0.80$ is considered good Nunnally (1978). SD = Standard Deviation.

EXPLORATORY FACTOR ANALYSIS

SAMPLING ADEQUACY AND SPHERICITY

The suitability of the 38-item instrument for exploratory factor analysis was evaluated using the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's Test of Sphericity. The KMO statistic of 0.847 substantially exceeded the minimum threshold of 0.60 Kaiser (1974), indicating that the correlation structure of the data was appropriate for factor analysis. Bartlett's Test of Sphericity was highly significant ($\chi^2 = 4,621.38$, $df = 703$, $p < .001$), rejecting the null hypothesis that the population correlation matrix is an identity matrix and confirming the factorability of the data Table 3.

Table 3

Test Statistic	Value
Kaiser-Meyer-Olkin Measure of Sampling Adequacy	0.847
Bartlett's Test of Sphericity: Approx. Chi-Square (χ^2)	4,621.38
Degrees of Freedom (df)	703
Significance (p)	< .001

Note. Results obtained from IBM SPSS Statistics v.26.

FACTOR SOLUTION AND VARIANCE EXPLAINED

Principal component analysis with Varimax rotation was conducted on the 38 items across the four pre-defined construct domains. Kaiser's eigenvalue-greater-than-one criterion was applied; four components were extracted, collectively explaining 62.34% of total variance [Table 4](#). This cumulative variance is within the acceptable range for social science research employing Likert-scale instruments [Hair et al. \(2019\)](#). The scree plot additionally confirmed a natural break after the fourth component, supporting the four-factor solution.

Table 4

Table 4 Total Variance Explained by Extracted Components				
Component	Eigenvalue	% of Variance	Cumulative %	Factor Label
1	7.843	20.64	20.64	Market Linkage
2	6.312	16.61	37.25	Institutional Support
3	4.891	12.87	50.12	Financial Inclusion
4	4.641	12.22	62.34	Capacity Building

Note. Extraction method: Principal Component Analysis. Rotation method: Varimax with Kaiser normalisation. Rotation converged in 7 iterations.

ROTATED COMPONENT MATRIX

[Table 5](#) presents the rotated component matrix, displaying factor loadings for all retained items. Items with primary loadings ≥ 0.50 on their respective component were retained; no item cross-loaded above 0.35 on a non-primary component, confirming discriminant validity of the factor structure [Hair et al. \(2019\)](#). Factor 1 (Market Linkage) encompassed seven items related to collective marketing, price discovery, and value-chain participation. Factor 2 (Institutional Support) comprised eight items addressing governance quality, regulatory facilitation, and linkage with line departments. Factor 3 (Financial Inclusion) included six items on access to credit, equity participation, and insurance. Factor 4 (Capacity Building) contained five items pertaining to training, technology transfer, and skill development.

Table 5

Table 5 Rotated Component Matrix (Selected High-Loading Items)				
Item Description	F1 ML	F2 IS	F3 FI	F4 CB
Collective marketing has improved the price I receive for my produce	0.812	0.124	0.087	0.093
FPO provides access to regulated wholesale markets	0.794	0.187	0.121	0.072
FPO has reduced my dependence on village-level intermediaries	0.778	0.098	0.143	0.101
FPO facilitates value-addition to raw agricultural produce	0.741	0.231	0.082	0.148
FPO links farmers to e-NAM and digital trading platforms	0.718	0.176	0.094	0.214
FPO management board is transparent and accountable	0.142	0.823	0.101	0.112
Government departments provide adequate support to FPO activities	0.218	0.797	0.147	0.089
The FPO's constitution clearly defines members' rights and obligations	0.103	0.782	0.119	0.167
FPO helped me obtain institutional crop loans at concessional rates	0.134	0.098	0.831	0.102
I have been able to access crop insurance through the FPO	0.112	0.143	0.814	0.091
FPO facilitated equity share subscription at affordable terms	0.183	0.178	0.779	0.142
FPO organises regular training in modern agricultural practices	0.091	0.124	0.087	0.856
Technical inputs on improved seed varieties are available through FPO	0.147	0.089	0.112	0.828
FPO provides exposure visits and demonstration plots	0.213	0.143	0.094	0.801

Note. ML = Market Linkage; IS = Institutional Support; FI = Financial Inclusion; CB = Capacity Building. Only items with primary loading ≥ 0.50 are displayed. Cross-loadings < 0.35 for all items.

DESCRIPTIVE STATISTICS: PERCEIVED STATUS AND OPPORTUNITIES

Table 6 presents the item-wise mean scores and standard deviations for the perceived operational status of FPOs and the opportunities arising from FPO membership. Overall, respondents reported moderately positive perceptions of FPO status (Grand Mean = 3.22, SD = 0.47), indicating that while FPOs are performing some functions effectively, substantial scope for improvement remains. The highest-rated item was 'collective input procurement at reduced cost' (M = 3.81, SD = 0.61), suggesting that input-price benefits are the most tangible and universally perceived advantage of FPO membership. The lowest-rated item was 'digital market platform connectivity' (M = 2.47, SD = 0.89), reflecting the severe digital infrastructure deficits in rural Chhattisgarh, consistent with the findings of Rao and Suri (2022) on the digital divide in Central Indian agriculture.

Table 6

Table 6 Descriptive Statistics for FPO Status and Opportunity Items				
Item	Mean	SD	Rank	
Collective input procurement at reduced cost	3.81	0.61	1	
Collective marketing of agricultural produce	3.74	0.68	2	
Access to quality seeds and planting material	3.68	0.72	3	
Availability of extension and advisory services	3.54	0.71	4	
Access to institutional credit through FPO	3.42	0.81	5	
Crop insurance facilitated by FPO	3.29	0.88	6	
Awareness of government schemes through FPO	3.24	0.79	7	
Training in improved cultivation techniques	3.18	0.74	8	
Value-chain participation and agro-processing	3.11	0.83	9	
Participation in FPO governance and board meetings	3.08	0.86	10	
Linkage with export markets	2.89	0.92	11	
e-NAM and digital market platform connectivity	2.47	0.89	12	
Overall perceived empowerment	3.22	0.47	-	

Note. Scale: 1 = Strongly Disagree to 5 = Strongly Agree. SD = Standard Deviation. N = 385.

INDEPENDENT SAMPLES T-TEST: GENDER DIFFERENCES

To test H03 regarding gender differences in perceived FPO benefits, an independent samples t-test was conducted on the overall FPO benefit perception score (composite of all 26 opportunity items). Levene's Test for Equality of Variances was first conducted; a non-significant result ($F = 1.847, p = .175$) confirmed homogeneity of variance, justifying the use of the pooled variance estimate. As reported in Table 7, male respondents reported a marginally higher mean perception score (M = 3.28, SD = 0.51) compared to female respondents (M = 3.09, SD = 0.44). The t-test result was statistically significant ($t(383) = 3.42, p = .001, d = 0.40$), indicating a small-to-medium effect size Cohen (1988). H03 was therefore rejected. The gender gap in perceived benefits may reflect differential access to information, decision-making participation within FPO governance structures, and mobility constraints that limit female members' interaction with FPO services.

Table 7

Table 7 Independent Samples t-Test: Gender Differences in FPO Benefit Perception							
Group	n	Mean	SD	t	df	p (2-tailed)	Cohen's d
Male	275	3.28	0.51	3.42	383	.001**	0.4
Female	110	3.09	0.44				

Note. ** $p < .01$. Levene's test for equality of variances: $F = 1.847, p = .175$. Equal variances assumed.

ONE-WAY ANOVA: EMPOWERMENT ACROSS MEMBERSHIP TENURE

A one-way analysis of variance (ANOVA) was performed to examine whether the Farmer Empowerment Index (FEI) differed significantly across the four FPO membership tenure groups. The results presented in Table 8 indicate a statistically significant main effect of membership tenure on empowerment scores, $F(3, 381) = 14.72, p < .001, \eta^2 = 0.104$. The partial eta-squared value of 0.104

represents a medium-to-large effect, suggesting that approximately 10.4% of the total variance in empowerment scores is attributable to differences in membership tenure Cohen (1988). H01 was accordingly rejected.

Table 8

Table 8 One-Way ANOVA: Farmer Empowerment Index by Membership Tenure						
Source	Sum of Squares	df	Mean Square	F	p	η^2
Between Groups	14.287	3	4.762	14.72	< .001***	0.104
Within Groups	123.351	381	0.324			
Total	137.638	384				

Note. *** $p < .001$. η^2 = partial eta-squared (effect size).

POST-HOC ANALYSIS

Tukey's HSD post-hoc comparisons Table 9 revealed that farmers with more than five years of FPO membership reported significantly higher empowerment scores ($M = 3.64$, $SD = 0.52$) than all three shorter-tenure groups (all $p \leq .01$). The three-to-five year tenure group ($M = 3.31$, $SD = 0.48$) scored significantly higher than the less-than-one-year group ($M = 2.89$, $SD = 0.56$, $p = .001$), but did not differ significantly from the one-to-three year group ($M = 3.17$, $SD = 0.44$, $p = .072$). These patterns suggest a positive dose-response relationship between membership duration and empowerment, consistent with the learning-by-doing and social capital accumulation hypotheses advanced by Wollni and Zeller (2007) and Mojo et al. (2017).

Table 9

Table 9 Tukey's HSD Post-Hoc Comparisons for Membership Tenure Groups							
Tenure Group	n	Mean (FEI)	SD	Comparison Group	Mean Diff.	SE	p (Tukey)
< 1 year	58	2.89	0.56	1–3 years	-0.28	0.09	.012*
< 1 year	58			3–5 years	-0.42	0.09	.001**
< 1 year	58			> 5 years	-0.75	0.11	< .001***
1–3 years	142	3.17	0.44	3–5 years	-0.14	0.07	0.072
1–3 years	142			> 5 years	-0.47	0.09	< .001***
3–5 years	119	3.31	0.48	> 5 years	-0.33	0.09	.004**
> 5 years	66	3.64	0.52	—	—	—	—

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. FEI = Farmer Empowerment Index. SE = Standard Error.

MULTIPLE LINEAR REGRESSION ANALYSIS

A simultaneous multiple linear regression analysis was performed with the Farmer Empowerment Index (FEI) as the dependent variable and the four factor-derived composite scores — Market Linkage (ML), Institutional Support (IS), Financial Inclusion (FI), and Capacity Building (CB) — as independent variables. Preliminary diagnostic tests confirmed that all assumptions of multiple linear regression were satisfied: residuals were approximately normally distributed (Shapiro-Wilk test: $W = 0.986$, $p = .072$); the scatterplot of standardised residuals against predicted values showed no systematic pattern, confirming homoscedasticity; and Durbin-Watson statistic of 2.07 indicated no problematic autocorrelation. Multicollinearity diagnostics yielded VIF values ranging from 1.23 to 1.87 (all < 5.0) and tolerance values from 0.53 to 0.81 (all > 0.20), confirming the absence of multicollinearity concerns Hair et al. (2019).

The overall regression model was statistically significant ($F(4, 380) = 62.14$, $p < .001$) and explained 39.5% of the variance in farmer empowerment scores ($R^2 = 0.395$, Adjusted $R^2 = 0.389$). The results of the regression analysis are detailed in Table 10.

Table 10

Table 10 Multiple Linear Regression: Predictors of Farmer Empowerment Index (N = 385)							
Predictor	B	SE(B)	β	t	p	95% CI [LL, UL]	VIF
(Constant)	0.821	0.143	—	5.74	< .001	[0.540, 1.102]	—
Market Linkage (ML)	0.341	0.053	0.387	6.43	< .001***	[0.237, 0.445]	1.54
Institutional Support (IS)	0.274	0.059	0.312	4.64	< .001***	[0.158, 0.390]	1.87

Financial Inclusion (FI)	0.189	0.061	0.214	3.1	.002**	[0.069, 0.309]	1.63
Capacity Building (CB)	0.157	0.067	0.173	2.34	.020*	[0.025, 0.289]	1.23

Note. * $p < .05$. ** $p < .01$. *** $p < .001$. $R = 0.629$; $R^2 = 0.395$; Adjusted $R^2 = 0.389$; $F(4, 380) = 62.14$, $p < .001$. B = unstandardised coefficient; β = standardised coefficient; CI = confidence interval; LL = lower limit; UL = upper limit; VIF = variance inflation factor.

The standardised regression coefficients (β) indicated that Market Linkage was the strongest positive predictor of farmer empowerment ($\beta = 0.387$, $p < .001$), followed by Institutional Support ($\beta = 0.312$, $p < .001$), Financial Inclusion ($\beta = 0.214$, $p = .002$), and Capacity Building ($\beta = 0.173$, $p = .020$). H02 was therefore rejected in its entirety. These findings underscore the primacy of market-access facilitation as the core FPO function that drives farmer empowerment outcomes, corroborating the conclusions of [Mojo et al. \(2017\)](#) and [Wollni and Zeller \(2007\)](#). The significant positive contribution of institutional support, even after controlling for the market and financial dimensions, highlights the enabling role of governance quality, regulatory facilitation, and state-level administrative linkages — dimensions that are particularly underdeveloped in Chhattisgarh's FPO ecosystem as evidenced by the relatively lower mean score on institutional support items ($M = 3.24$, [Table 6](#)).

STATUS OF FPOS IN CHHATTISGARH: A DISTRICT-WISE PERSPECTIVE

Beyond the aggregate statistical patterns, the disaggregated district-level analysis [Table 11](#) reveals important spatial heterogeneities in FPO performance and farmer perception. FPOs in Raipur and Durg — the more urbanised and commercially integrated districts — consistently received higher ratings on market linkage and financial inclusion dimensions, reflecting their proximity to wholesale markets, banking infrastructure, and processing units. In contrast, FPOs in Bastar and Surguja — predominantly tribal districts characterised by forest-based livelihoods, difficult terrain, and weak market connectivity — recorded significantly lower scores on nearly all dimensions, mirroring the systemic infrastructure deficits identified by the NITI Aayog's Aspirational Districts Programme [NITI Aayog \(2022\)](#).

Table 11

Table 11 District-wise Mean Scores on FPO Dimension Constructs						
District	n	Market Linkage	Inst. Support	Financial Incl.	Cap. Building	Empowerment Index
Raipur	94	3.48	3.41	3.37	3.52	3.51
Durg	78	3.41	3.34	3.29	3.44	3.44
Rajnandgaon	81	3.22	3.18	3.14	3.28	3.26
Bastar	72	2.74	2.91	2.89	3.04	2.94
Surguja	60	2.61	2.84	2.78	2.97	2.89
Overall	385	3.09	3.24	3.18	3.31	3.22

Note. All values are mean scores on a 5-point Likert scale (1 = Strongly Disagree; 5 = Strongly Agree). Inst. = Institutional; Incl. = Inclusion; Cap. = Capacity.

KEY CHALLENGES IDENTIFIED

Respondents were also presented with a list of 10 potential barriers to effective FPO functioning and asked to rate the severity of each on a five-point scale. The five most severe barriers identified were: (1) inadequate working capital and restricted access to bank credit ($M = 4.12$), (2) lack of professionally trained FPO CEOs and managers ($M = 4.04$), (3) poor rural road and market infrastructure ($M = 3.97$), (4) limited awareness and functional literacy among member farmers ($M = 3.84$), and (5) insufficient or delayed government support and delayed equity grant disbursement ($M = 3.78$). These findings converge with the structural impediments identified by [Sontakki et al. \(2020\)](#) and are compounded in Chhattisgarh by the additional layers of geographic isolation and linguistic-cultural heterogeneity of its tribal farming communities.

DISCUSSION

The findings of this study collectively paint a picture of Chhattisgarh's FPO landscape as one of unrealised but substantial potential, constrained by systemic structural barriers and spatially uneven institutional support. Three overarching themes emerge from the empirical evidence that merit extended analytical discussion.

First, the dominant role of market linkage in predicting farmer empowerment ($\beta = 0.387$) aligns with the prevailing consensus in the literature [Fischer and Qaim \(2012\)](#), [Mojo et al. \(2017\)](#) that the most immediate and tangible pathway through which collective action translates into household welfare improvement is through improved terms of trade in output markets. In Chhattisgarh, where

paddy marketing is heavily intermediated by private traders and the state's decentralised paddy procurement system — while extensive — does not accommodate all grades and varieties, FPOs that have successfully established direct linkages with processors, exporters, or FCI procurement points have demonstrably superior empowerment outcomes. The implication is that FPO promotion strategies should concentrate resources on market-linkage facilitation as the primary design principle, rather than treating it as a secondary objective after organisational formation.

Second, the significant positive effect of institutional support ($\beta = 0.312$) and the comparatively lower mean rating of this dimension ($M = 3.24$) jointly signal that institutional support is simultaneously a powerful lever and a notable underperformer in the current ecosystem. This paradox — high impact but low provision — suggests that marginal improvements in governance quality, state-agency linkages, and regulatory facilitation could yield disproportionately large empowerment dividends. The lower scores in tribal districts (Bastar, Surguja) on the institutional support dimension particularly highlight the need for differentiated support architectures that account for the additional sociolinguistic, geographic, and tenure-related complexities of tribal agrarian systems.

Third, the gender disparity in perceived FPO benefits ($t(383) = 3.42, p = .001, d = 0.40$), while statistically significant, also presents a policy opportunity. The presence of 28.6% female respondents — many from women-led FPOs in Bastar — demonstrates that women's participation in FPOs is feasible and growing. However, the benefit perception gap suggests that FPO services and governance structures have not yet been sufficiently redesigned to accommodate the distinct constraints, assets, and market-participation patterns of women farmers. Gender-transformative approaches to FPO design, as advocated by [Meinzen-Dick et al. \(2012\)](#), would seem to offer significant scope for enhancement in this context.

STRATEGIC INTERVENTIONS FOR FPO EMPOWERMENT IN CHHATTISGARH

On the basis of the empirical evidence and its theoretical interpretation, this study proposes a Chhattisgarh-specific FPO Acceleration Framework (CGFAF) comprising four strategic intervention pillars:

PILLAR I: MARKET INFRASTRUCTURE AND DIGITAL VALUE-CHAIN INTEGRATION

The low mean score on e-NAM and digital platform connectivity ($M = 2.47$) alongside the strong predictive role of market linkage collectively justify a targeted investment in market infrastructure specifically oriented to FPO needs. Strategically, this entails: (a) establishment of FPO-dedicated collection-cum-processing centres at cluster level, with capital subsidy under the Agriculture Infrastructure Fund (AIF); (b) mandatory e-NAM registration for all FPOs with minimum commodity threshold, supported by state-sponsored internet connectivity in unserved blocks; (c) development of a state-level FPO digital marketplace platform integrating procurement, input ordering, logistics, and payment functions; and (d) capacity building of FPO board members and CEOs in digital literacy and commodity trade operations.

PILLAR II: GOVERNANCE MODERNISATION AND PROFESSIONAL MANAGEMENT

The governance quality deficit, reflected in moderate institutional support scores and qualitative survey responses, requires a multi-pronged institutional reform agenda. This includes: (a) mandatory adoption of Model Bye-Laws prescribing annual general meeting frequencies, audit timelines, and board member term limits; (b) a dedicated FPO CEO Cadre Programme under Chhattisgarh State Cooperative Bank, offering subsidised professional management services to nascent FPOs for the first three years of operation; (c) performance-linked incentive transfers replacing input-conditioned grants, to incentivise operational outcomes over mere registration compliance; and (d) district-level FPO Mentoring Committees comprising retired agricultural officers, chartered accountants, and commercial banker representatives.

PILLAR III: GENDER-INCLUSIVE AND TRIBAL-ADAPTIVE FPO MODELS

The gender benefit perception gap and the markedly lower FPO performance indices in tribal districts call for structural adaptations in FPO design standards. Recommended interventions include: (a) a 30% mandatory women-director quota on FPO boards for all state-promoted FPOs; (b) development of Forest Produce FPO (FP-FPO) as a distinct organisational archetype with adapted regulatory requirements for minor forest produce (MFP) trading under the Tribes India platform; (c) integration of FPOs with Van Dhan Vikas Kendras (VDVKs) and the TRIFED supply chain for tribal produce marketing; and (d) culturally and linguistically adapted member education programmes delivered through community radio and self-help group (SHG) networks.

PILLAR IV: FINANCIAL ARCHITECTURE AND RISK MITIGATION

Addressing the working capital constraint — identified as the most severe barrier by respondents — requires systemic redesign of the financial intermediation architecture for FPOs in Chhattisgarh. Specific recommendations include: (a) creation of a dedicated FPO Credit Guarantee Fund at state level, providing collateral-free short-term working capital to active FPOs at subsidised interest

rates; (b) mandatory crop insurance enrolment for all FPO member-farmers as a condition of FPO operational grant eligibility; (c) simplification of FPC loan documentation procedures in coordination with the Reserve Bank of India's priority sector lending framework; and (d) development of a tiered equity subscription model allowing marginal farmers to subscribe to FPC equity in multiple instalments without loss of membership rights.

CONCLUSION

This study has provided a comprehensive, empirically grounded assessment of the status, opportunities, and strategic requirements for Farmer Producer Organisations in Chhattisgarh, drawing on primary survey data from 385 farmer-members across five ecologically and socioeconomically diverse districts. The deployment of SPSS-based multivariate statistical methods — including exploratory factor analysis, independent samples t-test, one-way ANOVA with post-hoc comparisons, and multiple linear regression — has generated several theoretically significant and policy-relevant findings.

The four-factor structure of FPO-related constructs (Market Linkage, Institutional Support, Financial Inclusion, and Capacity Building), explaining 62.34% of cumulative variance, provides a validated psychometric framework that future researchers can employ for comparative FPO assessment in Central Indian states. The strong predictive role of market linkage ($\beta = 0.387$) and institutional support ($\beta = 0.312$) on farmer empowerment outcomes highlights the principal levers through which policy interventions can maximise empowerment dividends. The positive dose-response relationship between FPO membership tenure and empowerment, confirmed by ANOVA ($F(3, 381) = 14.72, p < .001, \eta^2 = 0.104$), underscores the importance of strategies that promote long-term membership retention rather than merely maximising initial registration.

The spatial analysis further reveals that the benefits of FPO membership are unequally distributed across the state's agro-ecological zones, with tribal districts in Bastar and Surguja exhibiting significantly lower empowerment outcomes. The proposed Chhattisgarh FPO Acceleration Framework, anchored in evidence-based strategic pillars addressing market infrastructure, governance modernisation, gender and tribal inclusion, and financial architecture, offers a structured policy roadmap for transforming the state's nascent FPO ecosystem into a robust institutional vehicle for inclusive agricultural development.

This study is not without limitations. The cross-sectional design precludes causal inference about the temporal dynamics of FPO membership and empowerment; longitudinal panel data would be required to establish causal direction. The sample, while representative of the five selected districts, may not fully generalise to all 28 districts of Chhattisgarh. Furthermore, qualitative dimensions of FPO governance quality and social capital formation — which are arguably significant in tribal agrarian contexts — were not fully captured by the quantitative instrument. Future research should address these limitations through longitudinal mixed-methods designs and by incorporating objective administrative performance data alongside farmer perceptions.

CONFLICT OF INTEREST STATEMENT

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest. No funding was received from any organisation that may have an interest in the outcome of this study, and no author holds any financial stake in any Farmer Producer Organisation or related agribusiness entity operating in the study area.

DATA AVAILABILITY STATEMENT

The primary data that support the findings of this study were collected through structured questionnaire surveys administered to FPO member-farmers in five districts of Chhattisgarh between October 2022 and March 2023. The anonymised dataset, including survey instruments, coded response matrices, and SPSS output files, is available from the corresponding author upon reasonable request, subject to compliance with the informed consent terms under which data were collected and the ethical guidelines of the Indian Council of Social Science Research (ICSSR). Secondary data sources cited in this study (SFAC district records, NABARD reports, Directorate of Economics and Statistics publications) are publicly available through the respective issuing authorities.

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