



SEM approach to assess self-efficacy and social capital of producer's organizations in Chhattisgarh

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ABSTRACT

Farmer-producer organizations are typified by farmer groupings that are structured with the intention of turning a profit by leveraging economies of scale and functioning similarly to corporate entities. The creation and advancement of farmer collectivization can offer farmers a forum for obtaining essential information, exchanging knowledge, sharing production and marketing risks, and embracing market-driven agricultural product production. Compared to the individual method, grassroots initiatives on the collectivization of marginalized rural communities can enhance their support for livelihood in terms of income, self-respect, negotiating power, etc. The current study was carried out in the state of Chhattisgarh in order to propose a model by combining two schools of thought; the function of social capital, and self-efficacy that influence the perceived performance among the members of farmer producer organizations (FPOs). This study was set out to determine and investigate the fundamental causes of the farmers' groups' performance in producer businesses that are operating quite successfully on the ground. Findings reveal that self-efficacy was a key player as a partial mediator in the social capital formation that affected FPO performance. The size of mediating effect was analysed and observed highly significant with 45.77% effect size.

Keywords: Farmer producer company, Group performance, SEM approach, Social capital formation

In India, producer organizations in the farming sector are legalized as Producer Companies (PC). They are one of the legal entities among others which is relatively new for any agricultural produce, artisanship, forest producer or any other primary activity or service which promotes the interest of farmer/producers and consumers. PC as a special case of producer organization is registered under the Section IX-A of the Companies Act 1956, reference section 465(1) of the Companies Act, 2013. The Department of Agriculture, Cooperation and Farmers Welfare, Government of India (2013) introduced a National Policy for Farmer Producer Organization (FPO) and identified PC as the most appropriate entity to mobilize farmers and build their capacity to improve access to investments, technology, inputs, markets and to address the many challenges faced by farming community (NIAM Ministry of Agriculture 2013).

As significant studies have documented the numerous benefits of collectivization of farmers (Barghouti *et al.* 2004, Agarwal 2010, Trebbin 2014, Kumar *et al.* 2015, Bikkina

et al. 2018 and Deepa *et al.* 2018). It is also evident that FPOs are encountering various problems such as lack of vision, lack of professionalism, weak planning etc. (Joshi and Choudhary 2018). Furthermore, a smaller number of successful links between producer organizations and retail chains were also observed in India (Shah 2016).

In present study, total of 26 registered FPCs that were in the state involved in production and selling of fruits and vegetables collectively, input supply, input dealership and bulk purchase of inputs and their sales to members, milk production, mushroom and its value-added products, vermicompost and non-timber forest produces were listed. Out of these, 5 performing FPCs were chosen for the study to have a proportionate sampling of the state geography with a sample size of 363 members thereof. The major businesses of FPOs in the region was found to be production and marketing of fruits and vegetables collectively, input supply, the dealership in inputs and bulk buying of inputs and their sales to members for milk production, mushroom and its value-added products, vermicompost and NTFPs, etc. (Joshi *et al.* 2018). The purpose of this study was to identify and examine the underlying factors responsible for performance of farmers' group in producer companies which are performing fairly well on the ground. This study demonstrates the effect of member farmer's groups on-farm performance and indicates that they are more likely to be

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early adopters of technology and improve farm productivity (Ainembabazi *et al.* 2017).

MATERIALS AND METHODS

In this study, FPO performance indicators were taken from the study of Bikkina *et al.* (2018) based on seven performance criteria i.e. financial services, input supply services, procurement and packaging services, marketing services, insurance services, technical services and networking services. Chhattisgarh state is divided into 3 sub agroclimatic zones namely northern hills, central plains and Bastar plateau. Looking to the concentration of FPCs in the three zones, 1 FPC from northern hill zone, 2 from central plains and 2 from Bastar plateau were selected for the study. Accordingly, a 10% proportionate sample of total member farmers was taken from the FPCs resulting in a total sample size of 336.

To investigate the impact of social capital on the progressive FPC of Chhattisgarh, the following hypothesis was formulated to investigate the impact of demonstrates the effect of member farmer's groups on farm performance.

H1: Social capital has a positive impact on the Performance of PC: The unidimensional General Self-Efficacy scale (GSE) was used in this study to predict participant behaviour, providing a quick yet reliable instrument for reaping the potential advantages of General Self-Efficacy in organisational research (Schwarzer and Scholz 2000).

H2: Social capital has a positive impact on self-efficacy: The importance of self-efficacy as a mediating factor in the link between social capital and PC performance was also investigated, as was the following hypothesis.

H3: Self-efficacy mediates the relationship between social capital and performance of PC

Statistical diagram of the conceptualized model: In the proposed model, based on moderation mediation on Hayes' process model (2013) two consequent variables, (i.e. Self-efficacy (M) and Perceived Performance of PC (Y)) and two antecedent variables (i.e. Social Capital (X) and Self-efficacy (M)) with Social capital (X) casually influencing Y and M, and M casually influencing Y. variable X is influencing Y through two pathways. One path is directly from X to Y called as Direct effect of X on Y and denoted as C' , second path is passing through mediator and known as Indirect effect of X on Y through M. It first passes from antecedent X to consequent M and then from antecedent M to consequent Y (Fig. 1).

The statistical diagram represents two equations

$$\begin{aligned} M &= i_1 + aX + e_M \\ SE &= i_1 + a \times SC + e_M \end{aligned} \quad (1)$$

$$\begin{aligned} Y &= i_2 + bM + c^1X + e_y \\ PFPO &= i_2 + b \times SE + c^1 SC + e_y \end{aligned} \quad (2)$$

The direct effect of X on Y: In equation (2), c' estimates the direct effect of X on Y; The indirect effect of X on Y: $a \times b$; The total effect of X on Y: It is equal to the sum of

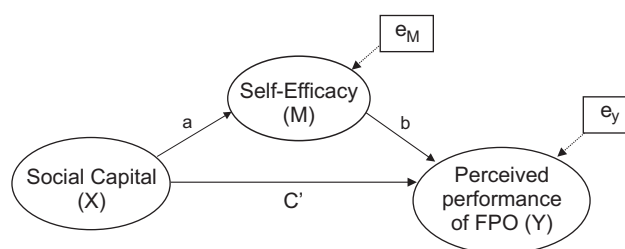


Fig. 1 Mediating effect of self-efficacy on social capital and perceived performance.

the direct and indirect effects of X: I.e; C' (total effect) = $c' + a \times b$

It can be further illustrated by combining equation no. (1) with (2), the final equation derived is as follows:

$$\begin{aligned} Y &= i + (c^1 + ab)X + e_y \\ \text{i.e. PFPO} &= i + (c^1 + ab) SC + e_y \end{aligned} \quad (2)$$

The performance of producer company was measured using a unidirectional construct with an 18-item inventory (Supplementary Table 1) from the literature (Bikkina *et al.* 2018). These variables were spread across financial services, marketing services, and technical services. The responses were measured using a 5-point Likert Scale (1, Strongly disagreed; 5, Strongly agreed). Additionally, the data on demographic, socio-economic variables and business performance were also collected to find the correlation between parameters and the performance of FPC. Since all the variables were measured at the same time and from the same individual, the measurement may cause common method bias. Thus, the procedural and statistical control was kept in the consideration. Data thus collected from producer company members was then analysed using R software package. Total number of farmers interviewed for the study were 363 across the 3 sub agroclimatic zones of the state.

Structural equation modelling (SEM): SEM analysis was performed to assess the linkage between social capital, self-efficacy and perceived performance. In structural equation modelling, chi-square statistic and several fit indices i.e. chi-square test statistic, root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker–Lewis index (TLI) are commonly obtained to assess the model data-fit.

RESULTS AND DISCUSSION

Major descriptors of FPCs were age of the FPC, legal forms, nature of POPI (Producer organization promoting institutions), years of involvement with farmers prior to FPC promotion, number of shareholders, authorised capital (₹lakhs), major commodities of FPC, yearly board meeting and yearly annual general meetings conducted. Produce Company Korea Agro Producer Company Limited (KAPCL) dealt with multi-commodities and have maximum number of members. The turnover of KAPCL was 44.00 (₹lakhs) with profit of 19.00 (₹lakhs). Bhumgadi Mahila Krushak Producer Co. Ltd (BMKPCL) had the highest turnover of

428.49 (₹lakhs) and profit of 88.48 (₹lakhs). This producer company also had the maximum number of shareholders. Brief profile and business performances of selected FPCs are presented in Supplementary Table 2 and Supplementary Table 3.

Descriptive statistics (DS) of socio-economic characteristics: The socio-economic parameters of selected FPCs comprises of age, education, landownership, experience, respectively (Table 1). Fig. 1 and Supplementary Table 4 shows the histogram distribution and descriptive statistics of the socio-economic parameters. It demonstrates that both the maximum and minimum number of respondents belongs to age group 19–85 years. However, mean values indicate that maximum number of respondents falls between age range of 31–40 years which represents a fairly young population. Furthermore, for gender, most of the respondents were male with an education level of at least graduate and having an average experience of farming association with the group ranging between one to two years. For land-ownership respondents ranged from 1–5 ha with average land holding of 2 ha. The experiences among respondent ranged from 1–9 years with average experience of 3 years. Comparably, Amitha *et al.* (2021) presented the analysis of profile of FPOs and its members in Medak District of Telangana. The profile characteristics of FPOs and its members were; in terms of age and education, in terms of farm size, income and other important governance parameters. Conversely to present study, their results revealed that under group composition, majority were small farmers with middle age (55.5%), primary school education (35.5%), with medium farming experience (47.7%) and with medium annual income (60.0 %).

Correlation analysis (CA) and principle component analysis (PCA): The variables selected and studied as independent variables are input supply and assistance (INSA), price negotiation for input (PNI), extension and advisory service provision (EAS), agricultural productivity changes (APC), market Access (MA), price increase for produce (PIP), bargaining Power (BP), risk management (RM), reduction in transaction cost (RTC), economy of scale (ES), vertical integration (VI), processing and value addition (PVA), joint use of equipment and storage (JUE), quality assurance (QA), social cohesion (SC), trust and

partnership among members (TP), special skill development (SCD), entrepreneurship culture (ENT). The mean value of respondents for all the variables are shown in Supplementary Table 5.

Fig. 2 shows the selected variables are sufficiently correlated for variables to be reduced to a smaller number of components. The variables now can be reduced to few factors explaining much of the actual data, more economically. The PCA have identified underlying four factors from an array of seemingly important variables. The PCA reduces the data complexity and identifies the actual underlying drivers/variable of the FPC performance. These factors are extracted by computation of eigen value. Eigen value determines the amount of variation explained by the factor.

The factor rotation matrix depicted in Supplementary Table 6 gives the loading of each variable on each of the extracted factors. The matrix shows the factors associated with the original variable. The factor 1 can be said as the linear combination of variable APC, MA, PNI, JUE, PIP, EAS as they have the highest loading (close to 1). Similarly, the factor 2 is the amalgamation of variables SCD, TP, RTC, SCO with loading of 0.856, 0.687, 0.672 and 0.668, respectively while factor 3 is the merger of variables 0.882 and 0.664. Moreover, the factor 4 is explained by only one variable i.e. RM.

From Table 2 it can be concluded that the four factors extracted account for 62.43% of the total variation (information contained in the original 18 variables). After PCA, significant variables with maximum loading were selected and data associated with variables is displayed through radar chart (Supplementary Fig. 1). Radar chart illustrates the region-wise i.e. Northern Hills, Central Plains, Baster Plateau distribution of respondents for most significant variables. All the estimated variables in central plains are farther towards the end of the spike showing the largest value followed by baster plateau and northern hills. This explains the significance of the variables as most influential towards the performance of the group. As evident from the loading values of the agricultural productivity changes, market access, quality assurance were the most influential variables for FPCs in the central plains whereas agricultural productivity changes, quality assurance, and market access were the most influential for the FPCs of the Bastar plateau. For the FPC of the northern hill zone, special skill development, agricultural productivity changes and trust and partnership were the most influential variables. It is evident from the research outcome that region alters the importance of the variables as the needs and priorities of the farmers and agriculture pattern changes from one place to another hence varied expectations in performance. The findings revealed that one should pay more attention to the performance variables indicated in the study to achieve desirable performance outcome. A strong sense of building these variables will help policy makers on the focus shift towards group performance variables. Capacity building programmes must be formulated in such a way that group performance and perceived

Table 1 Demographic summary of respondents

Age	Actual age of respondent at the time of interview
Experience	Less than 3 years = 61%; 4–5 years = 27%; and more than 5 years = 12 %
Gender	Women and Men
Education	Primary, Senior secondary, higher secondary, Graduation and postgraduation
Land-ownership	Marginal Farmers (<0.5 ha) = 27.9%; Small Farmers (0.5–1 ha) Medium Farmers (1–2 ha) and large farmers (>2 ha)

Table 2 Total variance explained

Extraction sums of squared loadings			Rotation sums of squared loadings
Total	% of variance	Cumulative %	Total
7.249	40.272	40.272	6.143
1.676	9.309	49.581	4.417
1.239	6.883	56.464	2.748
1.076	5.975	62.439	1.656

Extraction method, Principal component analysis.

performance variables responsible should be identified and efforts should be made to enhance them. Similar study was conducted by Kavin *et al.* (2023) on the value addition factors influencing the performance of the performance of farmer producer organizations. The investigation yielded a conclusion that entailed the extraction of three components, each displaying eigen values surpassing value of one. The cumulative variance accounted for the set of factors amounted to 56.06%. Conversely, four components with a cumulative variance of 62.439% were extracted in the current investigation.

Structural equation modelling (SEM) and mediation analysis: In the mediation analysis total effect of social capital on perceived performance was found significant ($\beta=0.651$; $z=10.90$; $P<0.001$; (95% confidence; CI, 0.034–0.346)). Impact of SC on PFPO was significant ($\beta=0.353$; $z=4.693$; $P<0.001$) The indirect effect of SC on PFO through SE was found significant ($\beta=0.298$; $t, 6.207$; $P<0.001$) (Table 3). The proven hypothesis 1, 2 and 3 for present study is visualized in Fig. 3 and Supplementary Fig. 2.

SEM analysis was performed to assess the linkage between social capital, self-efficacy and perceived performance. In structural equation modelling, chi-square statistic and several fit indices i.e. chi-square test statistic, root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker–Lewis index (TLI) are commonly obtained to assess the model data-fit. RMSEA is an absolute fit index, in that it assesses how far a hypothesized model is from a perfect model. The effect of social capital on perceived performance was partially mediated via the self-efficacy. As Fig. 3 illustrates, the regression coefficient between social capital and perceived performance and the regression coefficient between self-efficacy and perceived performance were 0.53 and 0.63, respectively which indicates the significant results. Furthermore, the regression coefficient between social capital and perceived performance was 0.06 indicating the weaker influence of predictor on the outcome variable. The size of mediating effect is analyzed (=indirect

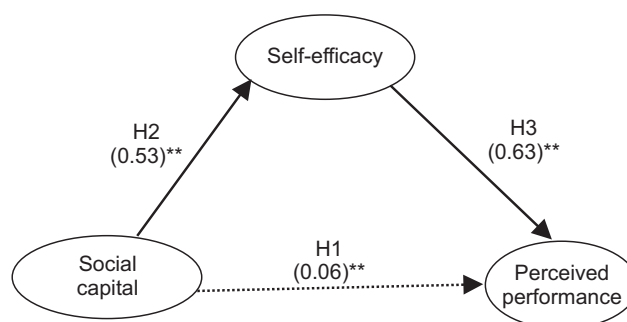


Fig. 3 Structural equation model with standardized path coefficient.

*, Significant at 0.05 level; **, Significant at 0.01 level.

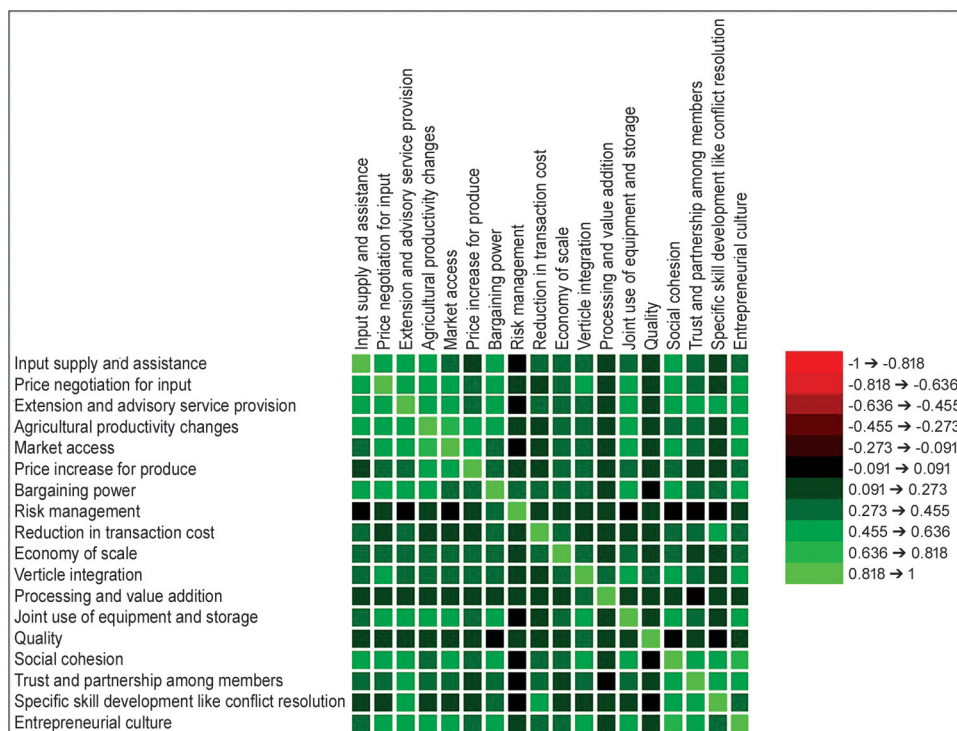


Fig. 2 Correlation heat map of estimated variables.

effect/total effect $\times 100$) and found it highly significant with 45.77% effect size. Significance of direct and indirect effect was tested using bootstrapping procedures. Unstandardized direct and indirect effects were computed for each of 2,000 bootstrapped samples. The bootstrapped unstandardized indirect effect at 95% confidence interval ranged from 0.192–0.389. Thus, the indirect effect was statistically significant ($P<0.001$).

The result showed that social capital has significant role in predicting performance of FPO. These outcomes are in line with various other empirical studies on social capital and performance (Ha and Nguyen 2020). Moreover,

Table 3 Structure equation modelling and mediation analysis

Path	β	SEm	Z	p	Bootstrap interval
Direct effect (Social capital→ Perceived performance) (c')	0.353	0.075	4.693	0.000**	0.191–0.534
Social capital →Self efficacy (a)	0.596	0.047	12.818	0.000**	0.410–0.731
Self-efficacy → Perceived performance (b)	0.499	0.070	7.095	0.000**	0.362–0.635
Indirect effect (Social capital→Self efficacy →Perceived performance) ($a \times b$)	0.298	0.048	6.207	0.000**	0.192–0.389
Total effect (c)	0.651	0.123	10.90	0.000**	

Fit indices: Relative χ^2 (χ^2/df), 5.00; CFI, 1.000; TLI, 1.000; SRMR, 0.000; RMSEA, 0.000; *, Significant at 0.05 level; **, Significant at 0.01 level.

the relationship between social capital and self-efficacy was analysed and found significant positive result which shows that the self-efficacy beliefs of farmers will increase the social capital level of FPOs. These findings support similar study outcome in different context (Develi *et al.* 2022).

Results also indicated that an individual who have a set of high self-efficacy has a high social capital thereby leads to higher performance. In practice, based on the findings of the study, one should pay more attention in the development of self-efficacy along with social capital development and strong sense of efficacy can save individual in the adverse situation while people having low sense of it may not achieve targeted goals. Uphoff and Wijayaranta (2000) developed social capital construct and studied its impact as an asset in the farmer groups. They found that out of two groups the farmer organizations which had social capital reinforced from external sources performed better than the other groups. Svendsen and Svendsen (2000) analyzed social capital as a new production factor, which must be added to the conventional concepts of human and physical capital. They concluded that formalized economic relations must not be isolated from the informal, social relations between people belonging to the same local community. Social capital must be added as an important production factor when considering economic growth and the net outcome of any economic solution such as economies of scale and centralization of production.

The findings of present study revealed that agricultural productivity changes, market access, quality assurance were the most influential variables for FPCs in the central plains whereas agricultural productivity changes, quality assurance, and market access were the most influential for the FPCs of the Bastar plateau. For the FPC of the northern hill zone, special skill development, agricultural productivity changes; and trust and partnership were the most influential variables. It is evident from the research outcome that region alters the importance of the variables as the needs and priorities of the farmers and agriculture pattern changes from one place to another hence varied expectations in performance. It can be concluded that one should pay more attention to the performance variables indicated in the study to achieve desirable performance outcome. A strong sense of building these variables will help policy makers to shift

the focus towards group performance variables. Capacity building programmes must be formulated in such a way that group performance and perceived performance variables responsible should be identified and efforts should be made to enhance them.

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