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Impact of farmer producer organization on organic chilli production in Telangana, India

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Input intensive modern agriculture is adversely affecting human health and environment. Farmers of Telangana state have taken up organic chilli production with the assistance of FPOs. Primary data was collected from 120 farmers comprising 60 members and 60 non-members of FPO from two districts of Telangana through semi-structured interviews. The study found that the shift to organic chilli cultivation led to decrease in input use by 9.06% and yield by 23.4%. However, the gross return from organic chilli farming was 13.85% higher over that realised by non-members due to the efforts of FPOs. DEA analysis revealed that a higher proportion of member farmers (48%) had technical efficiency of more than 60% as compared to non-members (18%). FPOs were instrumental in reduction of transaction cost and number of intermediaries leading to the realization of a higher proportion of producer's share in consumer's rupee (65%). Discriminant function analysis revealed that the FPO promoting institutions (44%), ease of doing business (16%) and infrastructure facilities like storage, irrigation, electricity and credit have high influence on performance of the states with respect to FPOs.

Keywords: Discriminant function analysis, Data envelopment analysis, Farmer producer organisation, Impact of technology, Organic chilli production, Technical efficiency

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Modern farming involving greater use of synthetic agrochemicals such as fertilizers and pesticides is having serious impacts on human health and the environment[1,2]. The certified organic agriculture can reduce reliance on agrochemical inputs as well as make agriculture environmentally and economically sound[3]. The economic benefits of organic farming are direct benefits to farmers from production and sales; benefits from the reduction in negative externalities from agriculture and public benefits in the form of ecosystem services[4]. However, conversion to organic systems involves significant transition costs, as ecological systems are more labour-intensive and require more time for operations management[5]. The yields for organic cereal production are 30–40% lower than those obtained under conventional systems in Central and Western Europe[6]. Organic farming is 62% more profitable, assuming current organic premium prices, and 36% more profitable when selling products in conventional markets. However, without the Common Agricultural Policy and regional payments and with conventional prices, the profitability of organics falls below that of conventional production[7]. In the USA, the United States Department of Agriculture found annual average prices for organic vegetables to be generally double those of conventional vegetable[5]. In Europe, prices for organic wheat are 50 to 200% higher than prices for conventional production[6].

India is bestowed with a lot of potentials to produce a variety of organic products due to its agro-climatic regions. Globally, organic farming is cultivated in an area of 57.80 million ha. However, India accounts for just 2.59% of the area. The organic farming is followed in India in almost all the regions with three states Madhya Pradesh (34.34%), Maharashtra (13.19%) and Rajasthan (11.67%) accounting for about 59% of the total organic area of the country. The cultivated land under certification has substantially increased from 1.74 lakh ha in the year 2005-06 to 1.78 million ha in the year 2017-18[8]. The farmers are encouraged to adopt eco-friendly

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farm techniques under the *Paramparagat Krishi Vikas Yojana* (PKVY) programme launched in 2015 by the Government of India[9]. India exported 4.58 lakh tonnes of organic food products and realised Indian Rupees (Rs) 34.5 billion of value realisation. Poor policy measures, rising input costs and limited market are affecting the growth of organic farming in the country. The report on Doubling of Farmers' Income by Ashok Dalwai committee, too, echoes the concern of the farmers who claim up to 30% drop in yields when embracing organic[10]. Though exports of organic products are rising as the number of players in the market has grown in the past few years, much potential is constrained due to factors like non-recognition of Participatory Guarantee Scheme (PGS) or self-certification by Agricultural and Processed Food Products Export Development Authority (APEDA), which insists on third-party certification for exports while the agriculture ministry grants subsidy to PGS certified products[11]. The studies have revealed presence of alarming levels of insecticide ethion in chilli[12]. The Saudi Arabia even banned the import of green chilli over substandard export of chilli[13].

The collectivisation of farmers through producer organisations (PO) can benefit from economies of scale, increased bargaining power and reduced information costs[14,15]. In addition, through enhanced economies of scale and bargaining power, farmers are able to negotiate better terms of trade[16,17]. The POs can provide farmers with a number of input and output services, such as access to market information, technology and innovation[18-20]. POs can also reduce farmers' costs of compliance with quality standards and participation in procurement systems by overcoming volume and coordination problems[21].

Chilli (*Capsicum annum L.*,) is also known as chilli pepper. It is used in India either as green (fresh) or dried form, the dried chillies are often ground into powder. Green chillies are used as flavour in most curries and dry dishes. It is typically lightly fried with oil in the initial stages of preparation of dish. India has the largest share of area (43%) and production (33%) of chillies. Chilli is grown in almost all states with Telangana having the second largest area of Chilli and contributes about 12.32% of area and 13.02% of production[22]. Telangana is one of the emerging states in India based on the performance of farmer producer organization (FPO) under organic cultivation of chilli, which accounts for 0.50% of the total area and a total of 6366 farmers who were practicing organic farming. The study would reveal the impact of FPO on adoption of organic chilli cultivation technology, profitability and efficiency. This would help in evolving strategies to improve the functioning of FPO and help in expansion of area under organic farming. The study was undertaken with following specific objectives: (a) to examine the performance of FPOs and factors influencing it; (b) to evaluate the adoption and economics of organic chilli production by members of FPO; (c) to analyse technical efficiency of organic chilli cultivation; and (d) to assess the constraints in participation of FPO programme and suggest suitable policy measures.

Data and methodology

The data regarding the number of FPOs registered in the country and number of farmers linked to FPOs were collected from Small Farmers' Agribusiness Consortium (SFAC) and National Bank for Agriculture and Rural Development (NABARD)[23,24]. The data on ease of doing business was compiled from Business Action Plan 2017[25]. The data on Kisan credit card (KCC), gross cropped area, electricity consumption in agriculture, storage capacity, rural literacy and number of operational holding was obtained from 'Agricultural statistics at a glance'[26]. The data on the value of output of agriculture and allied sectors was compiled from 'State wise and item-wise estimates of value of output from agriculture and allied sectors'[27].

Purposive and multi-stage stratified sampling technique was used to collect the information on the identified variables from the Siddipet and Janagaon districts of Telangana state of India as these districts have a larger area under organic chilli. It was observed that 4 out of 94 FPOs of the state, namely, Enabavi Producer Company Ltd., CROPS Farmer Producer Company Ltd, Suraksha Farmer Producer Company Ltd. and Kotilingala Farmer Producer Company Ltd. are operating in these 02 sample districts and have a collective farmer membership of 1432. Further, Mulugu and Siddipet rural blocks from Siddipet district and Lingalaghanpur and Jangaon rural blocks from Janagaon district were selected based on the functioning of the FPOs. A cluster of villages comprising 2 to 3 villages were selected from each of the blocks based on membership of FPOs. From each selected cluster of villages, 15 members and 15 non-members of FPOs of organic chilli

growers were selected randomly leading to a total sample size of 120 farmers. Primary data on socio-economic characteristics, input use and returns from organic chilli cultivation, farmers' perception about the functioning of FPOs etc. were collected using well-structured questionnaire through personal interviews.

To analyse the performance of FPOs, the study employed discriminant function analysis that enables to analyse the gap between the high and low performing states with respect to the functioning of the FPOs.

The model[28] used is as follows:

$$Y = D_i X_i \quad \ldots (1)$$

where 'Y' serves as a discriminant value for classification. D_i is the unknown weights assigned to different characteristics. X_i is the value of output in agriculture and allied activities (Rs. hundred thousand), FPOs promoting institutions (number per hundred thousand operational holding), electricity consumption in agriculture (gigawatt-hour), Gross irrigated area (%), cropping intensity (%), Kisan credit card (Rupees per account outstanding), storage capacity (hundred thousand tons), rural literacy rate (%), ease of doing business (%) were selected to classify the states into either high performing or low performing groups (Table 1). The 'D' coefficients are calculated by $d_i/\sqrt{s_{ii}}$ (i= 1,2,…, 5) with d_i being the distance between the means of the two groups, good and bad performers, for the i^{th} character and s_{ii} being the pooled variance from the two groups for the i^{th} character.

Then Y_j values are computed for groups, j =1 & 2

$$Y_j = \sum_{i=1}^{5} D_i X_{ji} \quad \ldots\ldots (for\ group\ j = 1\ \&\ 2) \quad \ldots (2)$$

where, X_{ji} are considered as their respective mean levels. Next, the discriminatory or criterion value Y is calculated as:

Table 1 — Contribution to distance between two groups of states based on performance of FPO due to greater disparity in mean values of variable of the two groups

Variables	Description about the variable	Expected sign of contribution
Value of output of agriculture and allied sectors (Rupees hundred thousand)	It is the sum of the value of goods and services from four sectors i.e., (a) Crop sector (b) Livestock sector; (c) Forestry and (d) Fisheries for the year 2015-16 computed on base year price of 2011-12	-ve
Electricity consumption in agriculture (Giga Watt-hour)	Number of units of electricity consumed in agriculture sector during the year 2013-14.	+ve
Rural Literacy (%)	Per cent of rural population which is literate as per 2011 census, usually done once in 10 years	+ve
Gross irrigation area (%)	It is the ratio of gross irrigated area to gross sown area cultivated land. The data pertains to the year 2013-14	+ve
Cropping intensity (%)	It is the ratio of total cropped area to net sown area. The data pertains to 2013-14.	+ve
Ease of doing business (EODB index) (%)	The ease of doing business index is a ranking system established by the World Bank Group. In the EODB index, 'higher ranking' indicate better, usually simpler, regulations for businesses and stronger protections of property rights. The data pertains to the year 2017-18	+ve
FPO promoting institutions (Number per lakh of operational holding)	The nodal agencies responsible for promotion of FPOs like NABARD, SFAC and state governments have engaged/ recognised FPO promoting institutions to form FPOs. These institutions receive fund/grants for forming FPOs. Number of FPO promoting institution pertains to year 2016 while operational holding is for year 2010-11 based on census.	+ve
Storage capacity (lakh tons)	These are godowns/ warehouses of public sector institutions like Food Corporation of India, Central Warehousing Corporation, and State Warehouse Corporation of the types own and hired, covered and cap storage. The data is in lakh tons and pertains to year 2016.	+ve
Kisan Credit Card (KCC) in Rupees per account	It is a bank pass book which guarantees the farmer to take loans from banks. The KCC once issued is valid for 5 years. The rate of interest applicable is 7% and is subsidized by 3% by central government and many states give further subsidy of 4% thus making a net interest rate of 0% for those who repay in stipulated time period. The limit for loan is decided based on land holding and crops being taken by the farmer. The data used is amount of loan outstanding per account (Rs per account) issued as on 31 March 2016.	+ve

$$\bar{Y} = \frac{\bar{Y_1} + \bar{Y_2}}{2} \quad \text{... (3)}$$

Finally, for each state, the classificatory Y values were calculated as:

$$Y_1 = \sum_{i=1}^{p} D_i X_{1i} \quad \text{... (4)}$$

where, X_{1i}'s are the observed values of the parameter of the state. If the individual 'Y_i' value is less than Y value, the state is classified in group 1, i.e., low performing state. If 'Y_i' value is more than 'Y' value, the state is classified in group 2, i.e., high performing state.

The impact of FPOs on organic chilli production technology was assessed in terms of changes in input use, yield, income and efficiency.

The data envelopment analysis is a non-parametric linear programming method which was used for evaluating the performance of sample farms[29]. The technical efficiency is calibrated on the basis of estimated best practice or efficient frontier or envelopment surface made up by a set of pareto efficiency of sample farms (efficiency score=1). The efficiency of the firms is calculated in relation to this and gets the efficiency score between 0 and 1. Considering sample farms i=1, 2, N and assuming that there are K inputs and M outputs. Let x_i and y_i denote, respectively, the input and output vectors for the i^{th} sample farm. The K⨯N input matrix X and the M⨯N output matrix Y, represent the data of all N sample farms.

To estimate the technical efficiency, the linear programming model is expressed as:

$$\begin{aligned} &min_{\theta,\lambda}\ \theta, \\ &stubject\ to - y_i + Y\lambda \geq 0, \\ &\theta x_i - X\lambda \geq 0, \end{aligned} \quad \text{... (5)}$$

where θ is a scalar and λ is a N× 1 vector of constraints. This envelopment form involves fewer constraints than the multiplier form [(K+M) < (N+1], the value of θ is the efficiency score for the i^{th} sample farms. It will satisfy $\theta \leq 1$, with a value of 1 indicating a point on the frontier and hence technically efficient sample farms[30].

To calculate cost efficiency, prices of all the inputs were used to study the behavioural objective, such as cost minimization or profit maximization. For this, the mathematical form of cost minimization DEA as represented in equation (6) can be used

$$\begin{aligned} &min\ \lambda_{x_i^*} w_i' x_i^*, \\ &subject\ to - y_i + Y\lambda \geq 0, \\ &x_i^* - X\lambda \geq 0, \\ &\lambda \geq 0, \end{aligned} \quad \text{... (6)}$$

where, w_i is a vector of input prices for the i^{th} sample farms and x_i* is the cost minimizing vector of input quantities for the i^{th} sample farms, given the input price w_i and the output level y_i. The total cost efficiency (CE) or economic efficiency of the i^{th} sample farms is calculated by equation (7)

$$CE = w_i' x_i^* / w_i' x_i \quad \text{... (7)}$$

It is the ratio of minimum cost and observed cost. The allocative efficiency (AE) can be calculated as:

AE=CE/TE

The discriminant function analysis and data envelopment analysis were analysed using SPSS software V.22.0 (IBM Corp., Armonk, New York, USA) and DEAP Software v. 2.1 (Coelli T.J of Department of Econometrics, University of New England, Australia) respectively.

Result and discussion

Status of Farmer Producer Organisations in India

Farmer Producer Organisation is a legal entity comprising of any type of primary producers viz. agriculture, handicrafts, forestry etc. based on the recommendations made by Y K Alagh committee in 2001. The Government of India amended the Companies Act, 1956 to include collectivisation of large section of primary producers to function as independent companies. Small Farmers' Agribusiness Consortium (SFAC) is recognised as the nodal agency by the Government of India in the promotion of FPOs in the country. Different state departments and central level agencies are involved in the act of mobilising the primary producers into producer organisations under various schemes like *Paramaparagat Krishi Vikas Yojana* (PKVY), *Rashtriya Krishi Vikas Yojana* (RKVY), Vegetable initiative for Urban Cluster (VIUC), etc. Among the central level institutions, SFAC and NABARD are the major institutions taking up the task of promoting FPOs in the country. The number of farmers mobilised towards FPOs are highest in Karnataka with 176133 farmers (Table 2). The figures reveal that more than fifty per cent of total mobilised farmers belongs to four states namely Karnataka, Madhya Pradesh, Tamil

Table 2 — State-wise number of FPOs and farmers linked

States	Farmers	FPO	Farmer/FPO
Andhra Pradesh	37056	113	328
Arunachal Pradesh	1853	3	618
Assam	17603	52	339
Bihar	38112	126	302
Chhattisgarh	50284	80	629
Goa	1914	2	957
Gujarat	53403	135	396
Haryana	30383	73	707
Himachal Pradesh	10626	59	129
Jammu & Kashmir	8143	14	582
Jharkhand	31295	73	429
Karnataka	176133	303	581
Kerala	50077	105	477
Madhya Pradesh	172472	295	585
Maharashtra	111870	203	551
Manipur	7152	9	795
Meghalaya	4399	12	367
Mizoram	4716	16	295
Odisha	65320	141	463
Punjab	10889	74	147
Rajasthan	79457	183	434
Sikkim	16924	33	513
Telangana	41007	94	436
Tamil Nadu	101488	181	561
Tripura	2954	5	591
Uttarakhand	32148	59	545
Uttar Pradesh	48877	147	332
West Bengal	100422	216	465
Others	55815	104	537
All India	1321785	2816	469

Source: Government of India (2018b) and Government of India (2018c).

Nadu and West Bengal. Karnataka also has the largest number of FPOs, i.e., 303 out of total 2816 which accounts for 10.7% of the total FPOs registered throughout the country.

On the whole, the number of farmers linked to FPOs are the highest in Karnataka (1.76 lakh) and is followed by Madhya Pradesh (1.72 lakh), Maharashtra (1.2 lakh), Tamil Nadu (1.01 lakh), West Bengal (1.00 lakh) etc. The number of FPOs formed in different states ranges from 2 in Goa to 303 in Karnataka. The states like Karnataka, Madhya Pradesh, Maharashtra and West Bengal account for about 50% of the total number of FPOs formed in the country. The number of farmers linked to each FPO ranges from 129 in Himachal Pradesh to 957 in Goa. In Telangana 0.41 lakh farmers were linked to 94 FPOs formed in the state. The number of farmers linked to each FPO is substantially high at about 436 revealing the strength of FPOs in technology dissemination, market access and empowerment of farmers.

Table 3 — Performance of states in promotion of FPOs

High performing states		Low performing states	
States	FPOs (Number per hundred thousand of operational holding)	States	FPOs (Number per hundred thousand of operational holding)
Sikkim	44.04	Gujarat	2.76
Mizoram	17.41	Arunachal Pradesh	2.74
Telangana	17.24	Jharkhand	2.69
Andhra Pradesh	14.63	Rajasthan	2.66
Punjab	7.03	Goa	2.56
Uttarakhand	6.46	Tamil Nadu	2.23
Himachal Pradesh	6.14	Chhattisgarh	2.14
Manipur	5.98	Assam	1.91
Meghalaya	5.73	Kerala	1.54
Haryana	4.51	Maharashtra	1.48
Karnataka	3.87	Jammu & Kashmir	0.97
Madhya Pradesh	3.32	Tripura	0.86
West Bengal	3.03	Bihar	0.78
Odisha	3.02	Uttar Pradesh	0.63

Source: Government of India (2018b) and Government of India (2018c).

Factors affecting the performance of FPOs

The factors influencing the performance of states was analysed using the linear discriminant function analysis. The states were classified into two groups' i.e., high performing and low performing groups using the standardised indicator for measurement of performance of FPO taken as a number of FPOs per hundred thousand of operational holding (Table 3). It is observed that Telangana has emerged as one of the high performing states. The results revealed that nine factors were discriminating the states into two groups to the maximum extent. It can be inferred from Table 4 that the FPO promoting institutions per hundred thousand operational holding has a high influence on the performance of the two groups of states and accounting for 44% of the total distance. Further, the variables like storage capacity (30%), gross irrigated area (21%), ease of doing business (16%), KCC (12%), rural literacy (9.26%), electricity consumption in agriculture (6.9%) contributed to the

Table 4 — Factors influencing performance of states in promotion of FPOs

Variables	Units	Coefficient of Discriminant function	Strength of the variable (%)
Value of output of agriculture and allied sectors	Rs hundred thousand	-0.831	-41.59
Electricity consumption in agriculture	Giga Watt hour (GWh)	0.138	6.91
Rural literacy	Per cent	0.185	9.26
Gross irrigation area	Per cent	0.424	21.22
Cropping intensity	Per cent	0.023	1.15
Ease of doing business	Per cent	0.327	16.37
FPO promoting institutions	(Number per hundred thousand operational holding)	0.887	44.39
Storage capacity	hundred thousand tons	0.604	30.23
KCC cards	Rupees per account outstanding	0.241	12.06

maximum extent towards the gap between the high and low performing states with respect to the performance of FPOs in the country. The poor performing states should engage more number of FPO promoting institutions who would form FPOs and handhold them in their formative stage. These states should focus on creating infrastructural facilities like storage structures, irrigation, electricity etc, which will help the start-up business entity like FPOs from production to marketing. The ease of doing business index reflects the business environment of a state which is very crucial for growth performance of the FPOs.

The KCC is a reflection of the ease with which the credit is offered to the farmers that is very crucial for the adoption of new technology and purchase of modern farm inputs. Thus, the states should create facilitative environment to do business in order to be able to move from poor performing group to the high performing group. It is inferred that the states should engage more number of FPO promoting institutions which will help in the formation of more number of FPOs. The states should pay attention to infrastructure development in terms of storage capacity, generation and supply of electricity in rural areas, irrigation infrastructure, etc. The states should also create a favourable climate and work towards minimising red tapism so that the business entities like FPO can flourish.

Socioeconomic characteristics of the sample farmers

Marginal farmers accounted for the highest percentage (37%) of the total sample farmers, followed by large (23%) and semi-medium (17%). Whereas, in the case of non-members of FPO, the marginal farmers were the dominant group comprising 50% of the total farmers (Table 5). The other categories of the farmers with a considerable share were small (22%) and semi-medium (11%). It is revealed that all size class of farmers had access to become members of FPO. Out of all the member farmers under study, it was found that 30% of them have education up to primary level, followed by high school (34%) and higher secondary (20%). In case of non-members of FPO, it was found that 45% of the total sample farmers were found to be educated up to primary level, followed by high school (37%) and higher secondary (13%). It is observed that members of FPO were relatively better educated than non-members. The education facilitates the adoption of new technology and helps in understanding the nuances of FPO programme. The major proportion of organic farms is owned by backward and disadvantaged communities (88%). This may be due to their low resource endowment that it is easy and convenient to come into the fold of organic farming group propagated by FPOs. Further, this table shows that the number of farmers dependent on agriculture alone was higher for non-members (83%) compared to the members (68%).Whereas, the per cent of the farmers with the off-farm income was found to be higher for the members (32%) compared to non-members (10%). It can be stated that the off-farm income serves as a cushion against risk and helps the farmers to give up subsistence farming and take up commercial crops advocated by FPOs.

Adoption of chilli production technology

Among the members of FPO, the cultivation practices like spacing, seed treatment, and weed management were adopted by highest per cent of the farmers which accounted for 78.3, 76.6, and 76.6% respectively (Table 6). The new cultivation practices

Table 5 — Socio-economic characteristics of the sample farmers

Particulars	Members of FPO			Non-members of FPO		
	Janagaon	Siddipet	Total	Janagaon	Siddipet	Total
1. Land holdings						
a. Marginal (< 1 ha)	10	12	22(37)	14	16	30(50)
b. Small (1-2 ha)	5	4	9(15)	7	6	13(22)
c. Semi- medium (2-4 ha)	7	3	10(17)	3	4	7(12)
d. Medium (4-10 ha)	0	5	5(8)	4	1	5(8)
e. Large (>10 ha)	8	6	14(23)	2	3	5(8)
2. Average age (Years)	42.08	41.56	41.82	46.16	48.23	47.19
3. Educational status						
i. Primary	8	10	18(30)	12	15	27(45)
ii. High school	11	13	24(40)	10	12	22(37)
iii. Higher secondary	9	3	12(20)	7	1	8(13)
iv. Degree	2	4	6(10)	1	2	3(5)
4. Caste composition						
a) Backward classes	14	23	37(62)	17	19	36(60)
b) Scheduled castes	9	5	14(23)	7	6	13(22)
c) Scheduled tribes	2	0	2(3)	3	1	4(7)
d) Others	5	2	7(12)	3	4	7(12)
5. Occupation						
I. Agriculture	22	19	41(68)	26	24	50(83)
II. Agriculture + Others	8	11	19(32)	4	6	10(10)

Note: Figures in parenthesis indicate percentage to the total.

Table 6 — Adoption of chilli production technologies by members and non-members of FPO

Chilli production technology	Extent of adoption				
	Non-members of FPO		Members of FPO		Difference
	f	%	*F*	%	%
Soil Testing	20	33.3	32	53.3	20.0
Ploughing	43	71.6	42	70.0	-1.6
Variety	34	56.6	36	60.0	3.4
Seed Rate	46	76.6	45	75.0	1.6
Seed Treatment	48	80.0	46	76.6	-3.4
Spacing	45	75.0	47	78.3	3.3
Time of Sowing	26	43.3	28	46.6	3.3
Inter-cultivation	38	63.3	44	73.3	10.0
FYM	24	40.0	38	63.3	23.3
Weed Management	27	45.0	46	76.6	31.6
Pheromone Traps	12	20.0	37	61.6	41.6
Bio- Fertilizers	28	46.6	42	70.0	23.4
Grading	11	18.3	33	55.0	36.7

related to organic farming such as soil testing (53.3%), pheromone traps (61.6%) and grading (55%) were adopted by a higher percentage of member farmers. Organic farming involves a reduction in the use of chemicals and more use of organic inputs and mechanical or biological control of pests and weeds. This is revealed through a proportionately higher number of farmers using organic inputs like pheromone traps (41.6%), weed management (31.6%), bio-fertilizers (23.4%) and Farm Yard Manure (FYM) (23.3%). The FPOs were instrumental in convincing the farmers about the ecological and environmental benefits of organic farming, providing technical backstopping and ensuring timely supply of inputs needed for organic cultivation.

Economics of chilli production

It is observed that the shift to organic chilli cultivation lead to reduction in yield by 23.4%. This is primarily due to reduction in input use which is seen to be 9.06% (Table 7). The sustainability of organic chilli cultivation depends on how good the price is realized by the farmers. This in turn depends on whether the farm produce is sold as differentiated product. It also depends on whether the product is able to find niche market. The FPOs have been successful in achieving the above pre-condition resulting in realization of higher price for organic chilli by the member farmers. Therefore, the gross return from organic chilli farming was 13.85% higher over that realised by non-members from chemical-intensive traditional farming. The B:C ratio for members of FPO was 2.7 and was much higher than that of non-members (2.16). It is

Table 7 — Input costs in cultivation of chilli of members and non- members of FPO

Particulars	Marginal	Small	Semi Medium	Medium and Large	All
Members of FPO					
Total Input Costs (Rs./ha)	1,47,523	1,41,698	1,35,558	1,37,495	1,40,568
	(-8.45)	(-8.75)	(-10.96)	(-8.13)	(-9.06)
Yield(Kg/ ha)	13,983	13,840	13,715	13,648	13,798
	(-23.19)	(-23.47)	(-23.43)	(-23.52)	(-23.40)
Gross Returns (Rs./ha)	3,84,520	3,80,600	3,77,163	3,75,308	3,79,398
	(14.17)	(13.76)	(13.81)	(13.68)	(13.85)
B-C ratio	2.61	2.69	2.78	2.73	2.70
Non-members of FPO					
Total Input Costs (Rs./ha)	1,61,135	1,55,280	1,52,238	1,49,660	1,54,578
Yield(Kg/ ha)	18205	18,085	17,913	17,845	18,013
Gross Returns (Rs./ha)	3,36,793	3,34,573	3,31,383	3,30,133	3,33,233
B-C ratio	2.09	2.15	2.18	2.21	2.16

Note: Figures in the parenthesis are percentage change over non-members.

Table 8 — Classification of sample farms according to economic efficiency

Range	Non-members of FPO (%)			Members of FPO (%)		
	Technical efficiency	Allocative efficiency	Economic efficiency	Technical efficiency	Allocative efficiency	Economic efficiency
<0.40	17	100	100	13	95	98
0.41-0.60	65	0	0	38	3	0
0.61-0.80	15	0	0	30	0	0
>0.8	3	0	0	18	2	2
Mean efficiency	0.610	0.292	0.176	0.701	0.341	0.230

observed that shift to organic farming is profitable to all size class of farmers. The result is consistent with the findings from previous studies which indicated an average reduction in total costs of up to 20%[6]. Although the labour input is 15% higher in organic farming systems, the net economic return is often equal to or 62% higher than that of the conventional system due to realisation of a premium price[2,7]. Increasing health consciousness and increasing disposable income among Indians is increasing the demand for organic food. The prime market for Indian organic food industry lies in USA & Europe[31]. Moreover, majority of farmers are opting for this practice motivated by attractive markets and price margin[32].

Efficiency of chilli production

Data Envelopment Analysis (DEA) was used to estimate the efficiency of organic cultivation of chilli. Member farmers were found to have higher technically efficiency (0.701) than non-member farmers (0.610) (Table 8). It is also observed that only 18% of the non-member farmers have technical efficiency of more than 60%, while 48% of the members were lying in this group. This revealed that the farmers with the adoption of organic cultivation practices, with the assistance of FPO, were able to minimize the cost and thereby resulting in improvement of technical efficiency. However, organic chilli output of members could be further increased upto 29.9% with the existing resource use combination. This provides ample opportunities for FPOs to improve their functioning to further enhance the efficiency of organic chilli. The extent of improvement in allocative efficiency among the members was not much as compared to non-members. This may be because the benefits in terms of physical output from organic cultivation are taken for computation of efficiency. The other set of benefits in terms of ecological and environmental benefits from organic cultivation are usually non-monetized and often are not accounted. It is also because the price of organic chilli that the farmers realize is much lower due to market imperfection and asymmetric information.

Marketing channel of chilli

The marketing channels followed by chilli cultivators for disposal of the farm produce is

depicted in Table 9. The marketing channel I and II are followed by the non-members, while channel III is adopted by the members of FPO. The marketing channel III involved two FPOs, FPO I assists the members in the collection of produce, grading, packaging, storage and transportation. FPO II is the FPO promoting institution which has taken a lead role in propagating the organic cultivation among the farmers of the region. It is assisting the FPOs to access the niche markets of located in metropolitan cities. The producer's share in consumer's rupee is found to be highest in case of marketing channel III (65%). With the assistance of FPOs, the transaction cost in marketing and number of intermediaries have been reduced. The member farmers are able to access niche markets o f organic products located in metropolitan cities.

Farmers' participation in FPOs

Farmers are the owners of the FPO and therefore their participation plays crucial role in the functioning and performance of the FPOs. Most of the members (45.87%) participated in production and marketing related activities of the FPO (Table 10). Participation of farmers was higher in general body meetings (58%) and procurement of produce (53%). The proportion of members participating in business planning (8%) and board meetings (11%) were low.

Table 9 — Marketing channels of chilli adopted by members and non-members of FPO

	Marketing channels				Producer's share in consumer's rupee (%)
I	**Farmer** (PR=1750; MC=168)	→ **Wholesaler** (MC=332; MM=728)	→ **Retailer** (MC=268; MM=252)	→ **Consumer** (PP=3500)	55
II	**Farmer** (PR= 1790; MC=60)	→ **Village Merchant** (MC=264; MM=366) → **Wholesaler** (MC=332; MM=338)	→ **Retailer** (MC=268; MM=82)	→ **Consumer** (PP=3500)	53
III	**Farmer** (PR=2750; MC=62)	→ **FPO I** (MC=128; MM=122)	→ **FPO II** (MC=672; MM=828)	→ **Consumer** (PP=4500)	65

Note: PR= Price received (Rs/quintal); PP= Price paid (Rs/quintal); MC= Marketing cost (Rs/quintal); MM= Marketing margin (Rs/quintal).

Table 10 — Nature and level of participation under different activities of FPO

SL No	Type of activity	No of activities conducted by FPO (nos.)	No of farmers participated (Nos.)	Participation (%)
A. Organisational activities				
1	Board meeting	12	7	11
2	General body meeting	2	35	58
3	Business planning	4	5	8
4	Decision making activity	1	7	12
	Weighted average (A)		*9.53*	*15.88*
B. Production & marketing activities				
5	Bio- inputs	3	29	48
6	Pest control traps	1	25	42
7	Procurement of produce	18	32	53
8	Grading	5	11	18
	Weighted average (B)		*27.52*	*45.87*
C. Extension activities				
9	Organic certification	3	20	34
10	Extension meeting	5	16	27
11	Field inspection	26	19	31
12	Field demonstration	10	10	16
	Weighted average (C)		*16.68*	27.8
	Overall Average		*17.91*	29.85

Table 11 — Perception of stakeholders of FPOs about its benefits and constraints

Stakeholders perception	Average Score	Rank
Members of FPO		
Higher price realisation	69.42	1
Timely availability of inputs	66.21	2
Extension services	65.02	3
Higher quality of inputs	62.84	4
Non-members of FPO		
FPO not located in the village	74.40	1
Land requirement for membership	72.82	2
High membership fees	71.50	3
Inefficient performance of FPO	68.64	4
FPO is not buying the produce	66.81	5
Inadequate input supply	59.25	6
NGOs of FPO		
Insufficient funds	4.38	1
Lack of awareness among the farmers	3.41	2
Lack of volunteerism	2.76	3
Inadequate trained staff	2.35	4
More administrative controls	1.84	5

Overall participation of members is much lower at 29.85%. FPOs must sensitize the members about the benefits of the organization and appraise their roles in improving its health and performance through greater involvement in its activities.

Perception of Stakeholders about FPOs

The members of FPOs have realized a higher price for the produce (Table 11). FPOs ensured the availability of good quality of inputs at a fair price to the members. FPOs coordinated with the line departments and State Agricultural University (SAU) to provide timely extension services to the farmers. While, in the case of non-members, non-establishment of FPO, lack of ownership and the higher membership fee have emerged as major constraining factors inhibiting their participation in FPO programme. The FPOs need to be sensitized to accept tenant farmers to become members and contribute to their growth. The NGOs have reported that lack of sufficient funds, lack of awareness and lack of volunteerism among the farmers are the limiting factors of their performance in formation and promotion of FPOs in the region.

Conclusion

The growth of FPOs across country and regions has not been uniform with more than 50% of total mobilised farmers belonging to four states namely Karnataka, Madhya Pradesh, Tamil Nadu and West Bengal. The FPO promoting institutions (44%), ease of doing business (16%) and infrastructure facilities like storage, irrigation, electricity and credit have a high influence on the performance of the states with respect to FPOs. Proportionately higher number of member farmers was using organic inputs such as pheromone traps (41.6%), weed management (31.6%), bio-fertilizers (23.4%) and FYM (23.3%). The shift to organic chilli cultivation led to reduction in yield by 23.4%. This is primarily due to reduction in input use which is seen to be 9.06%. However, the gross return from organic chilli farming was 13.85% higher than realised by non-members due to the efforts of FPOs. The higher proportion of member farmers (48%) had technical efficiency of more than 60% as compared to non-members (18%). The FPOs were instrumental in reduction in transaction cost and the number of intermediaries leading to realization of the highest proportion of producer's share in consumer's rupee (65%). The overall participation of members in various activities of FPOs is much lower at 29.85%. The FPOs must sensitize the members about the benefits of the organization and appraise their roles in improving its health and performance through greater involvement in its activities. The factors constraining non-participation in FPOs programme were its location, land requirement for the membership and the higher membership fee.

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