Indian Journal of Agricultural Sciences **89** (11): 1850–4, November 2019/Article
https://doi.org/10.56093/ijas.v89i11.95313

Impact of Farmer Producer Organisations on organic chilli (*Capsicum frutescens*) production in Telangana

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Received: 18 December 2018; Accepted: 23 July 2019

ABSTRACT

There has been a substantial improvement in the performance of Farmer Producer Organisations (FPOs) in India in several aspects including access to technologies, markets, and value addition to agricultural produce. In this paper, an in-depth analysis has been done to understand the performance of FPOs for organic chilli in Indian state of Telangana based on the primary data collected from 60 farmers associated with FPOs and 60 non-FPO farmers from Siddipet and Janagaon, Telangana. The study employed empirical techniques, viz. tobit model, decomposition analysis and marketing efficiency to evaluate the impact of FPOs. The findings indicate that the input use in production of chilli was much less for the members of FPOs due to adoption of low inputs organic farming practices. Despite a lower yield, the members could realize 13.86% higher gross returns primarily attributed to FPOs providing access to technology and markets. The farmers in the study regions were following three marketing channels for disposal of their produce. The channel that involved FPOs with member farmers on the one end and consumers on the other is found to have the highest marketing efficiency in organic chilli.

Key words: Factors of adoption, FPOs, Impact analysis**,** Marketing efficiency, Organic chilli, Tobit regression

Following the recommendations of the Y K Alagh committee (2000), the Government of India amended the Companies Act (1956) to facilitate formation of farmer producer organizations (FPOs) to shorten value chains by connecting farmers directly to markets and reducing the intermediaries between farmers and consumers (Lanting 2005). Since then, there has been a substantial increase in the number of FPOs; a total of 2816 FPOs are registered in the country. The state of Telangana has 94 FPOs with a membership of 41007 farmers (Government of India 2018a, 2018b). Realising the adverse effects of chemicalization on soil and human health, a few farmers in Telangana have taken up organic farming. The Centre for Sustainable Agriculture (CSA) took the lead in implementing organic farming in Telangana through technical support, capacity building programmes, research, campaigns, and marketing (Nair 2009). A few institutions, e.g. CSA, Centre for Rural Operations Programmes Society (CROPS) and Access Development Services (ADS) have seen considerable prospects of mobilizing organic producers through FPOs so as to bridge the knowledge gap on organic cultivation. This study was undertaken to evaluate the impact of FPOs on farmers' adoption of technology and their income, and to estimate the marketing efficiency and constraints in functioning of FPOs.

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MATERIALS AND METHODS

The study was conducted in the Siddipet and Janagaon, Telangana during January–February 2018. A multi-stage stratified sampling was followed to select sample farmers for the study. Four blocks, namely Janagaon rural, Lingalaghanpur, Siddipet rural and Mulugu were selected based on membership of FPOs. In subsequent stratification, cluster of villages comprising two to three villages from each block was selected randomly. Thus, 60 farmers associated with FPOs and 60 non-FPO farmers were selected from four blocks for detailed survey using well designed questionnaire. Finally, the enumeration of chilli producers was taken up to elicit information on socio-economic characteristics, level of adoption of production technology, input use, returns and marketing efficiency.

The level of technology adopted by the farmers is measured using composite technology adoption index (CTAI) as;

$$CTAI_i = \sum w_{ij} x_{ij},$$

where x_j, adoption of recommended technologies, viz. soil testing, ploughing, variety, seed rate, seed treatment, spacing, time of sowing, inter cultivation, FYM application, weed management, pheromone traps, biofertilizers, grading (Anonymous 2017). The technology for which the farmer was following the recommended package of practice is given a score of '1' and '0' otherwise.

The w_j, the weight assigned to production technology and was computed through principal component technique.

Tobit model can be described in terms of a latent variable CTAI*. $CTAI_i$* is observed when $CTAI_i$*>0 and $CTAI_i$* is not observed when $CTAI_i$*≤0 (Amemiya 1985, Maddala 1992, Johnston and Dinardo 1997). So the observed $CTAI_i$ is defined as;

$$CTAIi = \{CTAII^* = \beta Xi + Ui, \text{ if } CTAIi^* > 0\} \text{ or } \{0, \text{ if } CTAIi^* \leq 0\}$$

where $CTAI_i$, adoption index of i^{th} farmer; X_i, vector of factors affecting adoption; β_i, vector of unknown parameters; U_i, error term normally distributed with mean 0 and variance σ^2.

Cobb-Douglas production function of the form $Y=aX_1b_1 + x_2b_2 + ...X_nb_n$ was employed. Where, Y is the gross returns in rupees per acre, X_i is seed, FYM, poultry manure, labour, machinery, fertilizers/organic manures, irrigation and plant protection/bio pesticides taken in value terms (₹/acre).

The contribution of technology and input use in increasing gross returns of chilli production of members was assessed using decomposition analysis (Solow1957, Bisaliah 1977).The model was derived by taking difference between the Cobb-Douglas production function of members and non-members of FPO.

RESULTS AND DISCUSSION

Socioeconomic characteristics of sample farmers: Marginal farmers accounted for highest percentage (37%) of total sample farmers, followed by large (23%) and semi-medium (17%) among the members of FPO. Whereas, in case of non-members, the marginal farmers were dominant group comprising 50% of the total farmers. It is revealed that the FPOs were accessible to all size class of farmers. However, slightly higher proportion of large size farmers was from members of FPO who provide strong leadership, capital, and land needed for running its various activities. Out of all the members of FPO under study, it was found that 30% of them have education up to primary level and is followed by high school (34%) and PUC (20%) respectively. 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 and is followed by high school (37%) and PUC (13%). Education does not seem to be barrier for getting associated with FPOs though members were observed to be slightly higher educated than non-members. It is observed that the proportion of farmers with the off-farm income was found to be higher among members (32%) compared to non-members (17%). The off-farm income serves as cushion against risk involved in any new enterprise, the farmer intends to adopt. It also provides capital to procure new technology.

Extent of adoption of chilli cultivation technology: The proportion of farmers falling in adoption category of medium and above was more in case of members (66.6%) as compared to non-members (43.3%). Thus it is revealed that the association with FPO has enabled the members to adopt the improved chilli cultivation practices. However, the FPOs need to organise more number of trainings for the farmers to improve their adoption score, as a significant proportion (33.2%) of members fall in the adoption category of low and very low.

The factors influencing technology adoption in chilli was analysed using tobit regression model with CTAI as dependent variable. The membership in FPO and proportion of irrigated area were found to be significant and positively influencing the adoption of technology while, the distance from the FPO was found to be negatively influencing (Table 1). So it is suggested that the farmers should join FPOs which will enable them to adopt latest production technology of commercial crops like chilli. Similarly the FPOs should be sensitised to open their office or collection centres within the villages so that the farmers can have better access to the activities of the FPOs.

Economics of chilli production: The members of FPO were trained in organic method of cultivation of chilli, while the non-members were following chemical intensive method involving use of purchased inputs. The difference in production practices has implications on input use as revealed from higher proportion of expenses going towards labour (52.87%), FYM (16.08%), organic fertilizers (4.09%), biofertilizers (3.02%) for members (Table 2). These inputs have beneficial impact on quality of output which is revealed from higher prices realized for organic chilli produced and marketed through FPOs. The organic cultivation of chilli is dependent on farm raised inputs and therefore, the cost of cultivation of chilli for members is 9.06% lower than that of non-members. Similar results of lower cost cultivation of organic chilli were observed by Naik *et al.* (2012) while, increase in cost of cultivation was

Table 1 Factors influencing the adoption of chilli production technology by farmers in Telangana

Parameter	Coefficients	Std error
Education (Years)	0.001	0.003
Irrigated area ratio	0.013**	0.002
Household size (No)	0.006	0.004
Distance from FPO (Kms)	-0.010*	0.002
Extension service (Yes=1, Otherwise=0)	0.009	0.030
Membership in FPO (Yes=1, Otherwise=0)	0.07***	0.034
Constant	0.373*	0.01
Sigma	0.15	0.01
Number of observations	120	

*, ** and ***indicates significance at 1, 5 and 10 per cent level, respectively

Table 2 Cost of cultivation of chilli of members and non-members of FPO (₹/acre)

Particulars	Members of FPO	Non-members of FPO	% change over non members
Family labour	7,639 (13.59)	7,254 (11.73)	5.31
Hired labour	22,084 (39.28)	19,765 (31.97)	11.73
Machinery	2,212 (3.93)	2,993 (4.84)	-26.09
Seeds	4,809 (8.55)	5,007 (8.10)	-3.95
FYM	9,043 (16.08)	5,244 (8.48)	72.44
Poultry manure	2,509 (4.46)	1,194 (1.93)	110.13
Organic/chemical fertilisers	2,302 (4.09)	8,855 (14.32)	-74.00
Irrigation	3,040 (5.41)	3,876 (6.27)	-21.57
Bio-pesticides/PPC	1,701 (3.02)	6,100 (9.87)	-72.11
Others	889 (1.58)	1,544 (2.50)	-42.42
Total input costs	56,227 (100)	61,831 (100)	-9.06
Yield (kg/acre)	5,519	7,205	-23.40
Gross returns	1,51,759	1,33,291	13.86
B:C ratio	2.69	2.16	

Figures in parenthesis indicate percent to the total

Table 3 Estimates of Cobb-Douglass production function for members and non-members of FPO

Parameter	Members of FPO		Non-members of FPO	
	Coefficients	Std Error	Coefficients	Std Error
Intercept	3.593*	0.466	2.350*	0.661
Seeds	0.201*	0.066	0.254**	0.113
FYM	0.081**	0.038	0.104**	0.044
Poultry manure	0.011	0.015	0.002	0.007
Labour	0.399*	0.072	0.085***	0.047
Machinery	0.017	0.040	0.259*	0.082
Fertilisers/ organic fertilizers	0.032	0.041	0.195***	0.106
Irrigation	0.166*	0.040	0.022	0.087
Plant protection/ bio pesticides	0.049	0.020	0.178*	0.033
R- squared	0.811		0.860	
Adj R- squared	0.782		0.839	
Prob> F	0.001		0.001	

*, ** and ***indicates significance at 1, 5 and 10 per cent level, respectively

observed by Sial *et al.* (2016).

Owing to resource intensive nature of production practice followed by non-members, the yield is much higher (23.40%) as compared to members. However, the gross return realised by the members of FPO for chilli was 13.86% higher than that realised by non-members. It is further revealed that the B:C ratio (2.16) of the non-members is much lower than that of members of FPO (2.69). Similar results of increase in income of members of FPO were observed by Naik *et al.* (2012) and Cherukuri and Reddy (2014).

Resource use efficiency: It was observed that in case of non-members, the expenditure on inputs like seeds, FYM, labour, machinery, chemical fertilizers and plant protection chemicals significantly influenced the returns (Table 3). Similarly, in case of members it was the expenditure on seeds, FYM, labour, irrigation that significantly influence the returns from chilli cultivation. It was observed that seeds, labour, FYM and irrigation are sub-optimally used by the members. While in case of non-members seeds, FYM, labour, machinery, fertilizers and plant protection chemicals were sub-optimally used. Thus there is further scope to enhance the gross returns by increasing the use of these set of inputs.

Sources of changes in gross returns: The gross return of the members from chilli crop was 13.86% higher than that of non-members. The increase in gross returns was due to input use (9.71%) and production technology (7.09%) (Table 4). This switchover to organic cultivation of chilli was facilitated by FPOs. The FPOs ensured availability of timely and good quality inputs, technical knowhow and access to niche markets thus, leading to realisation of higher returns from cultivation of organic chilli. The FPOs helped the farmers to understand and implement the Participatory Guarantee System of certification of organic farming.

Constraints in functioning of FPOs: The members of FPO perceived that lack of government support in terms of provisioning of grants, seed money and participation in government scheme work as the major constraint in the functioning of the FPOs. The other factors constraining

Table 4 Contribution of technology and inputs in increase in gross returns from chilli crops of members

Sources of productivity difference	Percentage Contribution
Total observed difference in returns	13.86
Due to difference in production technology	7.09
Non-neutral component	-49.50
Neutral component	56.60
Due to difference in input expenditure	9.71
Seed	-0.97
FYM	2.96
Poultry manure	1.58
Labour	8.68
Machinery	-0.61
Fertiliser	4.70
Irrigation	-5.81
Plant protection	-0.83
Changes due to other factors	1.50
Total estimated difference in returns	16.80

Table 5 Marketing cost and efficiency of different marketing channels involved in sale of chilli (₹/quintal)

	Intermediary	Particular	Channel I	Channel II	Channel III
A.1	Farmer	Price received	1920	1850	2750
2		Marketing cost	168	60	82
3		Net price or margin	1752	1790	2688
B.1	Aggregator	Purchase price		1850	
2		Marketing cost		164	
3		Sale price		2480	
4		Net margin		466	
C.1	Whole Saler	Purchase price	1920	2480	
2		Marketing cost	332	332	
3		Sale price	2980	3150	
4		Net margin	728	338	
D.1	Retailor	Purchase price	2980	3150	
2		Marketing cost	268	268	
3		Sale price	3500	3500	
4		Net margin	252	82	
E.1	FPO I	Purchase price			2750
2		Marketing cost			128
3		Sale price			2950
4		Net margin			72
F.1	FPO II	Purchase price			2950
2		Marketing cost			492
3		Sale price			4200
4		Net margin			758
G	Purchase price of consumers		3500	3500	4200
H.1	Producers share in consumers' rupee (%)		55%	53%	65%
2	Value added (G – A3)		1748	1710	1532
3	Total marketing cost		768	824	702
4	Total marketing margin		980	886	830
Marketing efficiency					
I.1	Shepherd's approach: G/(H3+H4)		2.00 (iii)	2.05 (ii)	2.74 (i)
2	Ratio of output to input (H2/H3)		2.28(i)	2.07(iii)	2.18 (ii)
3	Acharya's method {A3/(H3+H4)}		1.00 (iii)	1.05 (ii)	1.74 (i)
	Average ranking {(I1+I2+I3)/3}		1.76 (ii)	1.72 (iii)	2.22 (i)

Figures in parenthesis are ranking of marketing channel based on efficiency score

the efficient functioning of FPOs are lack of adequate capital, lengthy procedural formalities, sub-optimal effort by promoting institutions, etc. The staff of the FPOs lacked the professional expertise and therefore resulted in improper business planning. The skill of personnel FPO need to be improved through participation in training programmes. The efficient FPO promoting institutions need to be recognised and rewarded so as to incentivise others to come forward and improve their performance. The government schemes could be routed through the FPOs so as to infuse capital into the system. This will also provide the opportunities for FPO members to involve in the various activities of the FPO.

The FPOs of Telangana have collectivised farmers to take up organic chilli production. The proportion of farmers falling in technology adoption category of medium and above was more in case of members (66.6%) as compared to non-members (43.3%). The organic cultivation of chilli is dependent on farm raised inputs and therefore, the cost of cultivation of chilli for members was 9.06% lower than that of non-members. The members of FPO were reaping lower yield from organic cultivation of chilli, however, they were accomplishing 13.86% higher gross returns. The increase in gross returns from cultivation of organic chilli by members over non-members was contributed by changes in input use (9.71%) and adoption of new production technology (7.09%) facilitated by FPOs. The marketing channel III

involving the FPO through which the members were routing their produce was the most efficient. The producers share in consumer's rupee was the highest (65%) in this channel. The factors constraining the performance of the FPOs were poor fund support, lack of adequate capital, lengthy procedural formalities, suboptimal effort by promoting institutions, poor skill of FPOs staff etc. Therefore, it is suggested that the states should engage more number of FPOs promoting institutions to improve their performance. The farmers need to be sensitized to become members of FPOs and at the same time FPOs should open their offices and intervention facilities in villages so as to have mutual affinity for sustenance.

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