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Effectiveness of contract farming: evidence from cultivators of onion in Maharashtra

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Abstract The present paper attempts to quantify the benefits of contract farming on farmers' income and examines the determinants of participation in contract farming. The study is based on a survey of 180 farmers engaged in cultivation of onion. The study reveals that contract farming, by connecting smallholders to high-end international markets, ensures them with higher returns to the tune of Rs. 12.5 per kilogram. Access to institutional credit, extension services, farm-size, own transport, and migration significantly affected farmers' participation in contract farming.

Keywords Contract farming, onion, income,

JEL codes M11, M12, I38

Contract farming (CF) has played important role in promoting modernization and commercialization of agriculture, globally. It has long been well established in the developed countries; and has been receiving considerable attention in developing countries. Contract farming has come up as a key component in the process of agricultural transformation that facilitates direct firm-farm linkages. Contract farming may help farmers in overcoming the high transaction costs in marketing of their produce. It provides farmers with opportunity for non-spot transactions, which are useful when the transaction costs are high or markets fail. Markets fail due to factors like imperfections in credit market, economies of scale in transportation and marketing, asymmetric information about market prices, and lack of capacity for smallholders to absorb risk. Further, spot markets, mainly due to problems of asymmetric information, have lower ability to deliver efficient solution to quality and food safety issues than CF. A number of studies show that CF can increase agricultural productivity, profitability, farmers' income, and reduce food insecurity (Kumar et al. 2016). Even though potential benefits of CF are considered significant for both contractors and contracted, particularly when quality and safety are critical issues, its role and possible impacts in the developing countries are still controversial. A contentious issue in CF is the threat of exclusion of smallholders, particularly when the higher transaction cost, along with stringent demand for quality and safety, may prevent participation of small and marginal farmers in CF. India has gone through significant rural transformations and institutional changes that have shaped today's agricultural sector and agricultural policies. According to Chand (2005), CF's benefits to smallholders, who represent about 80% the rural population, include access to credit, inputs, and extension services; another benefit is the linkage between input markets and providers and the international markets by organizing the production of high-value food crops (HVF).

The evidence of CF's impact in the context of India has been mixed. For instance, Dev and Rao (2005), Nagaraj et al. (2008), Kumar and Kumar (2008), Birthal, and Joshi (2006), Singh, and Singh (2005), Birthal, (2005), Kalamkar (2012) and Kumar (2006) all found that contract producers earned more profits than independent producers, due to higher yields and

assured output prices. On the other hand, Singh (2002) found negative impact of CF on the environment, welfare of farmers, and the power structure between contractors and farmers. This study is aimed at identifying the factors that motivate farmers' participation in contract farming and also assesses its impact on farmers' economic welfare.

Methodology

The study is based on the data from a survey of 180 farmers cultivating onion. The survey was conducted in Maharashtra during 2018. The list of contract farmers in Nashik and Jalgaon districts was obtained from a contracting firm (henceforth the sample firm). Farmers from Jalgaon had formal contracts for the production and supply of white onions with Jain Farm Fresh Foods Limited. Contract onion farmers were from Vadali, Pasardi, Nashirabad Wakadi and Shirsoli villages. Independent farmers were selected from Nashik district, adjacent to the Jalgaon district. Nashik is the largest onion-producing district, contributing more than 25% of the state onion production. Jalgaon and Nashik are located in the same agro climatic zone i.e. Western Maharashtra Scarcity Zone. Data were collected from 90 contract onion growers and 90 independent onion growers. For selection of independent farmers, we randomly identified three blocks from Nashik district, namely Lasalgaon, Niphad and Sinnar, and a sample of 30 farmers was drawn from each block. Then we selected five villages from each block. Finally, we chose sample households in proportion to the village population for detailed investigation.

The econometric analysis conducted to identify the factors which motivate farmers' participation in contract farming and to assess impacts of contract farming on the farm profitability. We estimated OLS and 2SLS regressions. We employed a 2-Stage Least Squares (2SLS) model with instrumental variables: (i) to examine the impact of factors associated with a farmer's willingness to opt for contract farming (in the first stage of regression); and (ii) assessed the impact of participation in contract farming on farmers' profitability (in the second stage of regression). The equation for the 2SLS regression is $\pi i = \alpha + \delta di + \gamma Xi + \varepsilon i$ (1) where, πi is the net profit per kg for a farm household involved in cultivation of onion, di is a dummy variable that equals 1 if a farmer is under contract and 0 if not under contract, Xi is a vector of farmer characteristics and εi is the error-term.

Results and discussion

Characteristics of contract and independent sample onion growers

Table 1 presents average values of key household characteristics of onion farmers.

The average age of farmers 47 years and 97 % of the households are male-headed. Contract farmers are more educated. Farming is the main occupation for almost all households. There is little difference in farming experience of contract and independent farmers. The average size of family farmers is around 6. The average farm size is 1.8 ha. About half of onion farmers have access to institutional credit. One third of sample farmers are members of a cooperatives.

Close to 71 % of onion growers have their own means of personal transport. Some characteristics exhibit significant differences between contract and independent farmers. For example, contract and noncontract farmers of onion differed in terms of education, operational holding size, access to institutional credit, membership of cooperatives, crop insurance, number of annual visits by private extension official and own means of personal transport;

Table 2 presents data on yield, production cost, output prices, and profits of both contract and independent onion farming households.

The average onion yield is higher for contract growers (243.2 qtl/ha) than noncontract producers (192.6 qtl/ha) and it differs significantly at 1 per cent level. Additionally, the average price realized by onion contract farmers (Rs. 815.5/qtl) is significantly higher vis-à-vis noncontract farmers (Rs. 690/qtl). The cost of onion cultivation is significantly lower for contract farmers (Rs. 595/qtl) than non-contract farmers (Rs 766/qtl). The higher yields, better prices and lower cost of production for contract farmers made onion cultivation more profitable. Further, the prices for onions had crashed in open market due to increased production in 2018. Therefore, the independent onion growers incurred a loss of Rs 75/qtl. The contract farmers got cushion against price fluctuation due to price fixed in contract and earned a profit of Rs 220/qtl.

Table 1 Household characteristics of farmers

Household characteristics	All	Contract	Independent	difference	t-statistic
Age household head (years)	47.5	45.5	48.3	-2.8	0.6146
Gender -head (%) (male=1, otherwise=0)	99.8	100.0	99.8	0.2	0.4214
Education -head (years)	9.4	11.2	9. 2	2.0***	5.2335
% farmers with farming as main occupation (%)	99.5	100.0	99.4	0.6	0.7778
Experience in farming (years)	20.0	21.9	20.9	1.0	0.7738
Household size	5.8	6	5.7	0.3	0.4947
Dependency ratio	0.62	0.56	0.64	0.08	0.7410
Operational land (ha)	1.8	3.1	1.4	1.9***	7.0284
Access to institutional credit (%)	49.6	69.4	46.1	23.3***	4.1185
Membership of cooperative or other organization (%)	30.2	51.2	24.7	27.1***	5.4185
Crop insurance (%)	5.6	21.8	1.5	20.3***	7.8921
No of visits per annum by Private companies	1.8	5.9	0.9	5.0***	10.2567
Own means of personal transport (%)	69.9	65.4	74.5	9.1**	2.6334

Source Field survey
Notes ***, ** and * represent significance at 1%, 5% and 10% levels, respectively.

Table 2 Economics of cultivation of onion for contract and independent farmers in Maharashtra

Economics of cultivation	All	Contract	Independent	Difference
Yield (q/ha)	199.8	243.2	192.6	50.6***
	(75.6)	(75.7)	(74.02)	
Price (Rs/q)	752.7	815.5	690.0	125.5***
	(190.3)	(392.5)	(888.6)	
Cost of production (Rs/q)	680.5	595.2	765.8	170.6***
	(220.3)	(185.2)	(244.3)	
Profit (Rs/q)	72.25	220.3	-75.8	296.1***
	(272.5)	(289.6)	(246.7)	

Source Field survey (2016)
Notes ***, ** and * represent significance at 1%, 5% and 10% levels, respectively. Figures in bracket represent standard deviation.

Determinants for farmers' participation in CF

Table 3 presents the results of the first stage of 2SLS regression that shows the determinants of farmers' participation in contract farming for onion cultivation. Farm size, access to institutional credit, number of visits by government extension official, number of visits by private extension official, and own personal transport, have significant positive influence on participation in contract farming. On the other hand, migration of household members has negative impact on participation in contract farming.

Impact of contract farming on farmers' profit

Table 4 shows results of the impact of contract farming on profits of onion cultivators. It gives outcomes of the second stage of 2SLS regression along with OLS regression. Unlike OLS regression, the 2SLS regression takes care of the unobserved factors in regression and gives true impact of CF on farmers' profit. The results in Table 4 show that contract farming has a significant positive impact on the profits. The participation in contract enhances farmers' profit by Rs 12.5/kg. Migration has negative impact on the profits.

Table 3 Determinants for onion farmers' participation in Contract farming

Dependent variable: Participation in contract farming (yes=1/no=0)

Variable	Coefficient	S.E.
Socio-Demographic variables ln(Age of the household head) (Years)	-0.151	(0.895)
Square of ln(Age of the household head)	0.0231	(0.129)
Gender of household head (Male=1, 0 otherwise)	0.0820	(0.0890)
ln(Years of education of the household head)	-0.0384	(0.0673)
Square of ln(Years of education of the household head)	0.0173	(0.0218)
ln(Number of economically active family members)	0.00612	(0.0175)
Migration (Yes=1, 0 otherwise)	-0.119***	(0.0501)
Ln(Operational land) (Ha)	0.0364**	(0.0168)
Own personal transport (Yes=1, 0 otherwise)	0.0847**	(0.0428)
Economic variables		
Main occupation (Farming=1, Other=0)	-0.00185	(0.135)
Access to institutional credit (Yes=1, 0 otherwise)	0.0752***	(0.0229)
Ln (No. of visits by government extension officer)	0.0670**	(0.0314)
Ln (No. of visits by private extension officer	0.0348**	(0.0160)

Table 4. Impact of contract farming on profits for onion cultivators in Maharashtra

Dependent variable: Unit profit in production of onion

Variable	OLS		2SLS	
	Coefficient	S.E.	Coefficient	S.E.
Contract Farming (Yes = 1, 0 otherwise)	1.728***	(0.330)	13.51**	(4.950)
Socio-Demographic variables				
Ln(Age of the household head) (Years)	-41.43	(32.43)	-42.33	25.70)
Square of ln(Age of the household head)	5.512	(4.148)	6.554	(3.550)
Gender of household head (Male=1, 0 otherwise	-2.612	(3.237)	-3.662	(4.550)
Ln(Years of education of the household head)	-0.411	(1.335)	0.155	(1.554)
Square of ln(Years of education of the household head)	0.8599	(0.847)	0.688	(0.812)
Ln(No. of economically active family members)	0.781	(1.301)	0.655	(1.169)
Migration (Yes=1, 0 otherwise)	-7.789*	(3.180)	-6.548*	(2.325)
Ln(Operational land) (Ha)	0.188	(0.494)	-0.292	(0.778)
Own personal transport (Yes=1, 0 otherwise)	-2.853*	(1.347)	-5.010	(1.899)
Economic variables				
Main occupation (Farming=1, Other=0)	5.988	(3.195	6.125	3.145)
Access to institutional credit (Yes=1, 0 otherwise)	0.145	(0.521)	-0.621	(0.695)
Ln (No. of visits by government extension officer)	0.818	(1.231)	-0.195	(0.621)
Ln (No. of visits by private extension officer)	1.743	(0.910)	1.254	(0.741)
No. of observations				
R-squared	0.224		0.178	
Root MSE	13.987		13.828	

Source Authors' analysis based on field survey (2016)

Notes Standard errors in parentheses; ***, ** and * represent significance at 1%, 5% and 10% levels, respectively.

Conclusions

This paper has assessed determinants of participation in contract farming and estimates its impact on profits. Access to institutional credit, extension facility, ownership of transport, and farm size has positive effect on farmers' participation in contract farming. The contract farmers earn significantly higher profits. The higher profit comes mainly from higher yield and lower cost of production along with assured price. These findings have several important policy implications. The benefits of contract farming are product and contract specific, and therefore policymakers should design appropriate strategies and mechanisms to promote Contract farming in several agricultural commodities, especially in high value crops. A need is suggested for better institutional mechanism to make contract farming more inclusive and sustainable.

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Annexure

Table A.1 The economics of cultivation of onion by sample contract and independent farmers

(Rs per ha)

Particulars of cost of cultivation	Contract	Independent	Difference
Labour	24,865	20,770	4,095***
Inputs			
Seed	11,890	21,150	-9,260***
Fertilizers	14,755	13,120	1,635*
Irrigation	30,952	28,630	2,322
FYM	6,250	9,244	-2,994***
Pesticides	10,450	12,921	-2,471***
Other costs	0	22	-22
Rent for bullock pair / machinery	7,510	10,880	- 3,370***
Marketing costs	9,544	9,741	- 197
Total cost of cultivation	116,216	126,478	- 10,262**

Source Field survey (2018)

Notes ***, ** and * represent significance at 1%, 5% and 10% levels, respectively.