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Impact of Contract Farming in Gherkin on Maize Production Function: An Empirical Study in Kudligi Taluk of Bellary District

Economics

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Sri. S. B. Bommanahalli — Research Scholar, Department of Economics Kuvempu University, P. G. Centre Shivagangothri Campus, Davangere-577002 Karnataka

Dr. K.B.Rangappa — Associate Professor, Department of Economics Kuvempu University P. G. Centre Shivagangothri Campus, Davangere-577002 Karnataka

ABSTRACT

This study has been undertaken to analyse the spillover effect of Gherkin contract farming on the production function of maize. For this purpose maize production function of 'Gherkin contract' and 'non-contact farmers' of selected villages from Kudligi taluk of Bellary district were compared. Primary data collected from these villages were used. Cobb-Douglas production functions were fitted to the maize yield obtained by the Gherkin contract farmers and noncontract farmers of these villages. The estimated production functions observed to be good fit and significant. Plant nutrients and human labour have greater influence on maize yield. Differences in the agronomic practices adopted in the maize production as well as difference in the quantity of plant nutrients used were mainly responsible for difference in maize yield between contract and non-contract farmers. Contract farmers found to beusing improved farming practices in maize production.

Contract Farming, in recent decades, has emerged as an institutional innovation for coordinating the agriculture production, processing and marketing operations carried out by different functionaries like farmers, agro-processing firms and marketing agencies. According to Catelo and Costales (2008) contract farming could be defined as a 'binding arrangement between a firm and an individual farmer in the form of a 'forward agreement' with well-defined obligations and remuneration for tasks done, often with specifications on product properties such as volume, quality, and timing of delivery'. It is a case of bringing the market to the farmers, which is navigated by agribusiness firms (Christensen and Scott, 1992). Contract Farming system not only meets the needs of the farmers and agro-processing firms but also empirical research proved that contract farming enhance the agriculture productivity and production.

There has been diversification of Indian diets away from food grains to high value products like milk, meat products, vegetables and fruits. The new economic policy adopted in 1991 has also enlarged the export opportunities for high value processed food products from India. On the supply side, these commodities generate higher returns per unit of land and labor compared to food grains. Demand-driven growth in high-value food production is expected to create significant income and employment opportunities for producers/farmers. But most of the high-value food commodities are perishable, and they are subject to high post-harvest losses. Such commodities need immediate transportation to the markets or consumption centers; others may require cold storage or processing into a less perishable form. Local rural markets for high value commodities in India are scarce, and post-harvest infrastructure is inadequate. Furthermore, sales in distant urban markets increase transaction costs. These costs are higher for smallholders who often have small marketable surpluses, sale of which in distant markets is costly. Thus, production of high-value food commodities require more capital, quality inputs, improved technologies, and extension support, and smallholders face problems in accessing these inputs.

In the changing economic environment there is an apprehension that small farmers may be marginalized from the high value agribusiness activities and hence unable to derive the benefits due to their uneconomic size of holdings and inadequate access to external inputs. On the one hand, the small and marginal farmers find it difficult to cultivate lucrative and new processable crops as the scale of economies assume increasing importance for profitable crop production on the other hand the procurement of raw materials with right quantity and quality, minimum cost and time poses a serious problem for the food processing industries (Asokan and Singh, 2003). Contract farming is considered to be an institutional initiative undertaken in recent years to address the production and marketing problems faced by the farmers and also the procurement problems faced by the processing industries.

Contract farming approach helps the Contract Sponsoring Companies (CSC) to reduce much of the uncertainty in procuring the needed raw materials. The farmers, on the other hand, are insulated against volatility of market and assured of stable income (Ashokan, 2005). CSC, besides providing resources for productive investment, can benefit the locals in employment, technology transfer, and incremental technical knowledge, especially at the farmers level (Goldsmith, 1985). World Investment Report 2009 stated that contract farming with smallholders eases financial constraints, can act as a form of collateral for lenders, and improves the incomes and investment capabilities of smallholders (UNCTAD, 2009). Further, contracts that provide credit, technology, inputs, information, extension services, and risk mitigation help producers to improve production efficiency; develop commercial culture; augment income and employment (Glover and Kusterer, 1990).

Government of India has taken several initiatives to promote contract farming in the country. A good number domestic as well as multinational agro processing industries are sponsoring contract farming in different crops. Provisions of contract may ranges from market specification to management specification. In the market specification contract farming CSC and farmers may agree for future sales and purchase of agriculture product whereas in management specification contract farming farmers agree to follow the recommended package of practices for crop cultivation. A good number of research studies have reported that the contract farming helps in increase the agriculture productivity. Contract sponsoring companies could ensure increased agriculture productivity through the promotion of improved farming practices among their contract farmers. Thus, in the process of contract farming CSC transfer improved technology to the contract farming households. Technical staff of CSC promotes the skill of improved farming practices among their member farmers through their extension services.

Extension services provided by the CSC and exposure of farming community to the corporate culture through the contract farming is expected to increase the technical knowledge among the contract farmers. Increased technical knowledge may not limit to the 'production of contract crop'. The benefit improved technical knowledge may also extend to the production of non-contract crops of the contract farmers which could be considered as spillover effect of contract farming. In this backdrop, this study has been undertaken to analyse the spillover effect of contract farming on the production function of 'non-contract crop' of 'contract farmers'.Gherkin, small Cucumber, is one of the high value agriculture products with huge export potentiality. It is a much sought after delicacy in the US and in Europe. Karnataka has more than $3/4^{th}$ share in India's gherkin exports. Gherkin is being produced in Hassan, Tumkur, Haveri, Bellary and Bagalkot district of Karnataka state. One of the units of Blossom Showers Agro is located in Kudligi taluk of Bellary district. It is promoting Gherkin contact farming in different villages of the taluk. This study has been conducted in selected villages of Kudligi taluk of Bellary district.

2. Methodology

A cluster of villages comprising of Amlapura, Kyasanakere and Siddanahatti located in Kudligi taluk of Bellary district has been selected for this study. Technical staffs of the Blossom Showers Agro were consulted while selecting this cluster of villages. Gherkin Contract farming is wide spread in this cluster of villages. Besides Gherkin, Maize which accounts for nearly 50 percent of gross cropped area of this cluster constitute the principle crop of these villages. Farmers of this village who are growing Gherkin under contract arrangement are considered as 'contract farmers' and Gherkin as 'contract crop'. Farmers who are not growing Gherkin or any other crop under contract arrangement are considered as 'non-contact farmers'. Maize one of the principle crop of this village is being grown under non-contract condition. The impact of Gherkin contract farming on the production function of maize has been analysed by comparing the maize production function of 'Gherkin contract' and non-contact farmers of these villages. List of farmers from this cluster of villages who have undertaken the contract farming in Gherkin has been prepared by taking the help of technical staff of Blossom Showers Agro. From this list 40 farmers have been randomly selected. Equal numbers of farmers who are not involved in contract farming have been randomly selected form the same cluster of villages. Primary data has been collected form the randomly selected farmers by using pre-tested well-structured schedule. Survey has been carried out during November and December month of 2014.

Cobb-Douglas type of production function for contract farmers' maize yield was specified as

$$Y_1 = A_1 X_{11}^{b11} X_{12}^{b12} X_{13}^{b13} X_{14}^{b14} e_1 \quad ...1$$

Cobb-Douglas type of production function for non-contract farmers' maize yield was specified as

$$Y_2 = A_2 X_{21}^{b21} X_{22}^{b22} X_{23}^{b23} X_{24}^{b24} e_2 \quad ...2$$

In the equation 1 and 2

Y_i= per hectare gross income from Maize

X_{i1} = expenditure on seeds (□/ac)

X_{i2}=expenditure on plant nutrients (□/ac)

X_{i3} =expenditure on human labour (□/ac)

X_{i4} = expenditure on bullock labour & machineries in rupees (□/ac)

A_i =Intercept, Scale parameter

ei = Error term

bij= Production elasticities of respective inputs

i =1 and 2 represents contract and noncontract farmersrespectively.

Cobb-Douglas types of production function specified above were converted into log linear form and the parameters were estimated by using the Ordinary Least Square (OLS) technique. Statistical significance of the estimated regression co-efficients were tested by using the t test at the chosen level of probabilities. R^2 values were calculated to measure the goodness of fit of these functions. Overall significance of the regression equations were tested through the ANOVA. Log-linear form of production function for contract farmers' maize yield was converted from the equation 1 and given below:

$$\ln Y_1 = \ln A_1 + b_{11} \ln X_{11} + b_{12} \ln X_{12} + b_{13} \ln X_{13} + b_{14} \ln X_{14} + e_1 \quad ... 3$$

Log-linear form of production function for non-contract farmers' maize yield was converted from the equation 2 and given below;

$$\ln Y_2 = \ln A_2 + b_{21} \ln X_{21} + b_{22} \ln X_{22} + b_{23} \ln X_{23} + b_{24} \ln X_{24} + e_2 \quad ...4$$

The decomposition model for analysing the productivity difference between contract farmers' maize yield and non-contract farmers' yield was obtained by taking the difference between the equation (3) and (4) and performing slight algebraic manipulations and rearranging some terms. The decomposition model so obtained was specified as:

$$[\ln Y_1-\ln Y_2]=[\ln A_1-\ln A_2]+[(b_{11}-b_{21})\ln X_{21}+(b_{12}-b_{22}) \ln X_{22}+(b_{13-}b_{23}) \ln X_{23}+(b_{14-}b_{24})\ln X_{24}]+[b_{11}(\ln X_{11}-\ln X_{21})+b_{12}(\ln X_{12}-\ln X_{22})+b_{13}(\ln X_{13}-\ln X_{23})+b_{14}(\ln X_{14}-\ln X_{24})]+ [e_1-e_2] \quad ... 5$$

The summation of first and second bold bracketed terms in the right hand side of this model represent the productivity difference between the contract farmers maize yield and non-contract farmers maize yield attributable to the difference in the techniques of production. The third bold bracketed term provide the productivity difference attributable to the difference in the inputs use level. And the last one is the random term, which the model could not take into account.

3. Results

Results of Cobb-Douglas types of production function fitted to maize yield of Gherkin Contract Farmers (GCF) and Non Contract Farmers (NCF) is are summarised in table-1. A perusal of the table reveals the significance of maize production functions fitted to GCF as well as NCF of the study area. It is because F values calculated to these functions found to be statistically significant at 1 percent probability level. The coefficient of determination (R^2) for GCF (87.6 per cent) and NCF (90.9 per cent) production function indicated a fairly high degree of 'goodness of fit'. It means 87.6 percent of maize yield, in terms of gross income, of GCF and 90.9 percent of NCF has been explained by the four independent variables included in this model.

Table-1: Maize Production Function of GCF and NCF in Kudligi Taluk

Sl. No.	Particulars	GCF	NCF
1	Intercept	4.550 (6.743)*	4.994 (6.651)*
2	Expenditure on Seeds	0.073 (1.162)	0.071 (1.318)
3	Expenditure on Plant Nutrients	0.521 (5.438)*	0.442 (3.961)*

4	Expenditure on human Labour	0.143 (2.080)**	0.294 (2.909)*
5	Expenditure on bullock Labour & Machineries	-0.035 (0.419)	-0.176 (1.107)
6	Coefficient of Determination (R^2)	0.876	0.909
7	'F' Values	44.231*	68.026*
8	Number of Observations (n)	30	32

Note: 1. Figures in Parentheses are calculated 't' values

* and ** indicate significance at 1 and 5 per cent level respectively.

The regression coefficients of plant nutrients and human labour were positive and significant in both production functions. The coefficient of plant nutrient was found to be statistically significant at one percent probability level for both production functions. The coefficient of human labour was statistically significant at one percent probability level for production function fitted to NCF whereas it was significant at five percent probability level for the function fitted to GCF. In both the production functions, regression coefficients of seeds were positive but they were not significant. Similarly regression coefficients of bullock labour and machineries were negative but not significant. In the Cobb-Douglas production function, regression coefficients are equivalent to production elasticities. The production elasticities of all the inputs were less than unity showing the diminishing marginal productivity with respect to each of the inputs. The geometric mean value of inputs used per acre of maize is given in table-2.

Table-2: Geometric Mean Values of Inputs used by GCF and NCF in Kudligi Taluk

Sl. No.	Particulars	GCF	NCF	t value
1	Expenditure on Seeds (□/ac)	815.5	824.6	0.506
2	Expenditure on Plant Nutrients (□/ac)	1833.5	1530.1	7.665*
3	Expenditure on Human Labour (□/ac)	2412.4	2495.9	1.030
4	Expenditure on bullock Labour & Machineries (□/ac)	2558.7	2513.1	0.837
5	Gross Income (□/ac)	17747.3	15216.4	8.873*

*indicates significance at 1 per cent level

Geometric mean value of expenditure on plant nutrient was found to be significantly more among the GCF compared to NCF. Such significant difference could not be found for other inputs. The amount spent on bullock labour and machineries was slightly more among GCF (2558.7) compared to NCF (2513.1) but the difference was not significant. Similarly NCF found to be spending slightly more on seeds and human labour compared to NCF but it is not statistically significant. The gross income per acre of maize was significantly more among GCF compared to the NCF. Sources of Maize productivity difference between GCF and NCF in Kudligi taluk has been computed by using the production function results as well as geometric mean values of inputs and results are summarised in 3.

Table-3: Sources of Maize Productivity Difference between GCF and NCF

Sl. No.	Sources of Maize Productivity Difference	Values in Percentage
1	Due to Difference in Techniques of Production	6.60
2	Due to Difference in Inputs Use Level	8.79
	a) Seeds	-0.08
	b) Plant Nutrients	9.42
	c) Human Labour	-0.49
	d) Bullock Labour & Machineries	-0.06
3	Total Estimated Difference in Productivity	15.39
4	Total Observed Difference in Productivity	16.63

Gross income per acre of maize was observed to be more among GCF compared to NCF by 16.63 percent out of which decomposition analysis capture 15.39 percent of productivity difference between these two groups of farmers. GCF obtained 6.6 percent of higher gross income per acre of maize compared to NCF due to difference in the techniques of production adopted by these farmers. The maize productivity difference attributable to the difference in input use was 8.79 percent. The maximum difference in the maize productivity difference between these two groups of farmers is attributable to difference in the use of plant nutrients. The contribution of Seed, human labour and bullock labour, and machineries to maize productivity difference is very low. The difference in techniques of production comprises of differences in various cultural practices, which are not explicitly included in the model. It includes, among others, the difference in variety of seeds, plant population, method of fertilizer application, weed management, plant protection measures and time of operations like sowing, inter-cultivation and so on. Yield difference attributable to the difference in the techniques of production could be minimized by adopting better cultural practices which entailed practically little or no additional cost.

4. Conclusions

Maize productions functions fitted to GCF as well as NCF were found to be 'good fit' and statistically significant. Production elasticities of expenditure on plant nutrients and human labour were found to be positive and statistically significant. It means they are having greater influence on maize productivity. Geometric mean value of per acre expenditure on plant nutrient was found to be significantly more among GCF compared to NCF and same kind of difference could be found for gross income from maize. Gherkin contract farmers were found to be getting higher maize yield, in terms of gross income, mainly because of adoption of improved farming practices and use of relatively higher quantity of plant nutrients.

REFERENCE

Asokan, R.S. and Singh, G., (2003), "Role and Constraints of Contract Farming in Agro Processing Industry", Indian Journal of Agricultural Economics, Vol. 58 (3), Pp566-575 | Asokan, S.R. (2005), "A Perspective of Contract Farming with Special Reference to India," Indian Journal of Agricultural Marketing, Vol.19 (2) | Catelo, M. O. and A. Costales, (2008), 'Contract Farming and Other Market Institutions as Mechanisms for Integrating Smallholder Livestock Producers in the Growth and Development of the Livestock Sector in Developing Countries', PPLPI Working Paper, No 45. | Glover, D and Kusterer, K (1990), "Small Farmers, Big Business-Contract Farming and Rural Development, Macmillan: London. | Goldsmith, Arthur, (1985), The Private Sector and Rural Development; Can Agribusiness helps the small farmers? World Development, Vol.13 (10-11). | UNCTAD (2009), 'World Investment Report 2009 on Transnational Corporations, Agricultural Production and Development', United Nations, New York. |