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Backward Integration: Impact on Resource Use Efficiency and Problems Under Chilli Farming

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ABSTRACT

The present study focussed on the impact of backward integration on resource use efficiency and problems faced by the chilli farmers.Under integrated chilli farming, human labour and irrigation are showing a positive significant effect on output. whereas, fertilizers and plant protection chemicals are showing a negative significant effect on output. Under non-integration chilli farming, seed, manures and irrigation are showing positive significant effect on output. whereas, human labour, manures and plant protection chemical are showing negative significant effect on output.Difficulty in meeting quality parameters, low/excess production of chilli and pressure for maintaining quality of produce are the major problems faced by the integrated farmers.The major problems faced by chilli firms are farmers negligence in maintaining quality, frequent price fluctuation in the market and low productivity. The major problems faced by the non-integrated farmers are low production, high cost of cultivation and non-availability of quality seed.

Keywords: *Backward integration, chilli farming, Resource use efficiency*

Backward integration is a strategy where a firm gains control over ownership or increased control over its suppliers. Backward integration strategy is beneficial when firm's current supply is expensive, unreliable or cannot supply the required raw material and it is popular in agricultural industry. It basically comprises of four components, pre-agreed price, quality, quantity and time. It was an approach that can bring income for farmers and profitability for companies. The major agribusiness industries like ITC and Synthite are practicing backward integration to get on 'clean spices' and to meet this challenge, efforts are to be made to prevent contamination of pesticides during harvest, processing and storage. In this study, backward integration involves between ITC and Synthite companies and chilli farmers.

Chilli is one of the most important commercial crop of India. Itcontributes 36 per cent to total world's production and remained in first position in terms of international trade. Chilli is the major spice contributing 42-44 per cent by volume and 20-22 per cent by value to total spices exported from India (Spice Board of India, 2018).In India, Andhra Pradesh ranked first in area and production of chilli, accounting to 2.09 lakh hectares with a production of 9.93 lakh tonnes and productivity of 4,743 kg/ha during 2016-17(Agricultural Statistics at a Glance 2016-17).In Prakasam district the major players like ITC and Synthite are providing customised solutions to diverse challenges of chilli farmers through backward integration by providing integrated pest management practices assured highest price prevail in the market, purchases their product in time, technical support given by them increases farmers output quantity,transport facilities, packing materials and storage facilities in Prakasam district of Andhra Pradesh.

The main objective of the study is to study the resource use efficiency of chilli farming with and without backward integration and also to identify the constraints under practicing backward integration.

MATERIAL AND METHODS

The farmers who are adopting backward integration are integrated farmers. The farmers other than integrated farmers are mentioned as non-integrated farmers. Multistage random sampling technique was adopted for selection of sample at different levels. In Andhra Pradesh, Prakasam district was selected purposively as the integrated chilli farmers of both ITC and Synthite are present in Prakasam district only. Four mandals were selected and two villages from each mandal were selected based on the presence of highest number of integrated chilli farmers. From each village, eight integrated farmers and eight non-integrated farmers were randomly selected, making a total sample of 128 farmers constituting 64 integrated and 64 non-integrated farmers.

Cobb-Douglas Production Function

The Cobb-Douglas production function was found to be best fit to estimate the resource use efficiency of chilli cultivation under backward

integration and non-integration condition. The Cobb-Douglas type of production function was most appropriate form to explain the relationship between various inputs and the yield. The Cobb-Douglas production function is specified in the following form for both integrated and non- integrated chilli farming as

$\ln Y = \ln a + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + \mu$

where,

Y = Yield (kg/ha);
X1 = Seed (kg/ha);
X2 =Human labour (man-days/ha);
X3 =Machine power (hrs/ha);
X4 =Manures (kg/ha); X5 =Fertilizers (kg/ha)
X6 =Plant protection chemicals (L/ha);
X7 =Irrigation (hrs/ha);
a = Intercept
μ = Stochastic disturbance term

Garrett's Ranking Technique

To compute the constraints under practicing backward integration, Garrett's ranking technique was used. The respondents were asked to rank the problems encountered by them in chilli production and marketing. These ranks were converted into per cent position by using the formula,

$$\text{Percentage position} = \frac{100\,(R_{ij} - 0.5)}{N_j}$$

Where,

Rij = Rank given for the i^{th} item by the j^{th} individual,
Nj = Number of items ranked by the j^{th} individual.

The per cent position of each rank is converted to scores by referring table given by Garret and Woodworth (1969). By referring to the Garrett's table, the per cent positions estimated were converted into score. Thus, for each problem the mean score was estimated. The problem with the highest mean value was considered as the most important one and the others followed in that order.

RESULTS AND DISCUSSION

Resource Use Efficiency

Resource use efficiency was analyzed by using Cobb-Douglas production function. The resource use efficiency of integrated and non-integrated chilli farming is estimated and the results are presented in Table 1.

Table 1. Cobb douglas production function

S. No.	Particulars	Integrated farming (N=64)	Non-Integrated farming (N=64)	Total (N=128)
1	Intercept (a)	5.4924***	9.2196***	6.7892***
		(0.84)	(0.80)	(0.55)
2	Seed X_1 (Kg/ha)	0.0291	0.0433**	0.0438**
		(0.02)	(0.02)	(0.02)
3	Human Labour X_2 (man-days/ha)	0.5992***	-0.1950**	0.2616**
		(0.08)	(0.08)	(0.05)
4	Machine power X_3 (hours/ha)	0.0942	-0.0137	0.1252
		(0.09)	(0.10)	(0.08)
5	Manure X_4 (kg/per)	0.0167	0.0675**	0.0635
		(0.02)	(0.03)	(0.08)
6	Fertilizer X_5 (kg/ha)	-0.1518**	-0.0802	-0.1174**
		(0.07)	(0.05)	(0.05)
7	Plant Protection Chemicals X_6 (liter/ha)	-0.1596*	-0.2583***	-0.3074***
		(0.09)	(0.07)	(0.05)
8	Irrigation X_7 (no. of hours/ha)	0.1481***	0.2399**	0.2357***
		(0.05)	(0.09)	(0.04)
9	R^2 - value	0.76	0.7	0.62

Note: ***Significant at 1% level of significance, **Significant at 5% level of significance, *Significant at 10% level of significance, figures in parenthesis are standard error

The R^2 value indicates the proportion of total variation in output explained by the independent variables.The co-efficient of multiple determination (R^2) value of integrated farming was 0.76 and for non-integrating farming 0.70. It indicated that about 76 per cent and 70 per cent variations in the output were explained by the explanatory variables (X_1 to X_7) of integrated and non-integrated chilli farming respectively.The high percentage value of R^2 shows a better representation of the relationship between farm output and the explanatory variables.

In case of integrated chilli farming, human labour, fertilizers, plant protection chemicals and irrigation are showing significant effect on output. Under non-integration chilli farming, seed, human labour, manures, plant protection chemicals and irrigation are showing significant effect on output.

Seed quantity positively influenced the output at 5 per cent level of significance in non-integrated chilli farming, it means one per cent increase in seed quantity, increases output by 0.0433 per cent. Where as in integrated chilli farming, there is no significant effect of seed on output. Human labour showed a positive influence on output in integrated and negative in non-integrated chilli farming at one per cent and five per cent level of significance. The result indicated that one per cent increase in human labour will lead to 0.5992 per cent increase in output in integrated farming and 0.1952 per cent decrease in non-integrated farming. This is due to the excess usage of human labour in non-integrated farming production. Machine power does not show a significant impact on production in both integrated and non-integrated chilli farming. Manure application positively influenced the output at 5 per cent level of significance in non-integrated farming, whereas it does not show significant effect on integrated chilli farming. A one per cent increase in manure application results in 0.07 per cent increase in output in non-integrated farming. Fertilizer was negatively significant at five per cent level in integrated chilli farming. This indicates one per cent level of increase in fertilizer application will lead to 0.1518 per cent decrease in the output and it was negative and non-significant in non-integrated chilli farming. The coefficient of plant protection chemicals was negative and significant at 10 percent and 1 per cent level in integrated and non-integrated chilli farming respectively. This indicates that one per cent increase in the use of plant protection chemical in production will lead to decrease in output by 0.1596 and 0.2583 per cent in integrated and non-integrated chilli farming respectively. Irrigation was positive and significant at one per cent and five per cent levels in integrated and non-integrated chilli farming respectively. The one per cent increase in irrigation in the production leads to increase in the output by 0.1481 and 0.2399 per cent in integrated and non-integrated chilli farming respectively. These findings are similar to Sridhara (2010), Velayutham and Damodaran (2015). Sridhara (2010) who reported that chilli farmers who are under contract farming using excess manures and plant protection chemicals and these are showing negative and showed significant decrease in efficiency of chilli cultivation. Velayutham and Damodaran (2015) reported that human labour (0.40%) and irrigation (0.04%) had a significant positive influence on chilli farming. Both farming types were positively influenced by irrigation and negatively influenced by plant protection chemicals.

The resource use efficiency analysis was also done for the pooled sample of 128 chilli farmers. R^2 were 0.62, which indicated that the seven resource variables included in the production function have explained 62 per cent of the total variation in the production of chilli. At the overall level, regression coefficients of seed, human labour and irrigation were found positive and significant. The variables like Fertilizers and plant protection chemicals were negative and significant. The manures and machine power were positive and non-significant which indicates no scope to increase their use in production of chilli. If we increase seed, human labour and irrigation by one percent, the output will be increased by 0.04, 0.26 and 0.23 percent, respectively.

Constraints Under Practicing Backward Integration

The constraints faced by the integrated farmers in practicing backward integration were ranked by using Garrett's ranking method. Table 2 shows that meeting quality parameters was one of the major problems faced by the sample integrated farmers. Farmers should cultivate with utmost care because they should reduce the pesticide residue on produce, otherwise company won't buy their produce. Low/excess production of produce was the second major problem faced by the farmers. Low production results in less income and with excess production, they have to sell produce to Guntur market which is far way for them and so, some are selling their produce to traders/brokers. These traders are not paying fair price to farmers. Pressure for maintaining quality produce, was the third major problem faced by the farmers. To obtain less pesticide residue and quality of produce the firm forces farmers to use recommended practices only. Delayed payment for produce was the fourth constraint for the farmers. Firm paying payment after they receive produce from the farmers and extra payment was given at the beginning of the next season crop. Non-availability of quality inputs was the fifth

constraint given by the farmers. Integrated farmers were using costly pesticides and micronutrient fertilizers compared to non-integrated farmers, that may not be available at their village level. High rejection rate and poor service delivered by firm were given last ranks. The rejection rate is high by the firm when the quality of the produce is less. Sowjanya and Kumari (2017) reported that high cost of plant protection chemicals and non-availability of inputs, difficulty in adopting technologies are the major constraintsfaced by the farmers.

Table 3 indicates problems faced by firms are farmer negligence in maintaining quality was the major problem. Pesticide residue on chilli product will lead to rejection of the produce in international market and decrease in value of the product. Frequent chilli price fluctuation in the market was the second major problem faced by the firm. The third major problem reported was low productivity of chilli farmers. From the last few years, productivity of the chilli was reduced so, they were getting lesser produce than the targeted quantity.Climatic factors emerged as fourth important problem. High temperature and low rainfall would reduce the quality of the produce.Illiteracy of farmers was the fifth problem. For using green labelled pesticide, the farmers should have knowledge about them. If the farmers are illiterate, there is a chance to use more number of pesticides. Selling of produce to market and lack of extension/technical personnel was the last but not the least problem faced by the contracting firm.Similar results were reported by Agarwal *et al.* (2005) and Rajput *et al.* (2018). Agarwal *et al.*(2005) reported that less number of extension officers, frequent fluctuations in market prices, scarcity of transportation vehicles and farmers negligence to maintain quality of the produce are the main problems faced by the company.

Table 2. Constraints faced by the integrated farmers (N=64)

S. No	Constraint	Garett's mean score	Rank
1	Pressure for maintaining quality of produce	54.36	3
2	Difficulty in meeting quality parameters	68.48	1
3	Delayed payment of produce	50.11	4
4	High rejection rate	38.7	6
5	Poor service delivered by the firm	33.23	7
6	Non-availability of quality inputs	44.14	5
7	Low/excess production of produce	60.97	2

Table 3. Constraints faced by the firms (N=2)

S.No	Constraint	Garett's mean score	Rank
1	Frequent chilli price fluctuation in market	73.0	2
2	Farmers negligence in maintaining quality	74.5	1
3	Selling of produce to market	33.5	7
4	Low productivity	70.5	3
5	Climatic factors	54.0	4
6	High rate of rent for hiring transport vehicles	46.5	6
7	Non-availability of extension staff	26.5	8
8	Illiteracy of farmers	53.5	5

CONCLUSION

Under integrated chilli farming, human labour and irrigation are showing positive significant effect, while fertilizer and plant protection chemicals showing a negative significant effect on output. Under non-integration chilli farming, seed, manures and irrigation are showing positive significant effect, human labour and plant protection chemicals are showing negative significant effect on output. Advantage in participating in the backward integration was efficient use of human labour will lead to reduce in cost of cultivation and price for their product was high finally, the income earned by them was higher than non-integrated farmers. Difficulty in meeting quality parameters was

the major problem faced by the integrated farmers. Farmers negligence in maintaining quality was the major problem faced by sample firms. Creating awareness on optimum use of inputs for non-integrated farmers by Agricultural department can help the non-integrated farmers by reducing the excess usage of fertilizers and plant protection chemicals could decrease the cost of cultivation. The problem of rejection rate and maintenance of quality of produce can be overcome by providing technical support and creating awareness among farmers from sowing to harvest in an integrated manner through extension services.

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