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Resource Use Efficiency on Cotton Production under Contract and Non-Contract Farming in Kallakkurichi District of Tamil Nadu, India

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A B S T R A C T

Cotton is the king of fiber, usually called White gold and is considered to be an industrial commodity of worldwide importance. Contract farming can be understood as a firm lending "inputs" such as seed, fertilizer, credit or extension to a farmer in exchange for exclusive purchasing rights over the specified crop. The objectives of the study is (1) to analyse the resource use efficiency of cotton production on contract and non-contract farming situation and (2) to study the problems faced by the contract farmers and non-contract farmers in the study area. Kallakurichi district was purposively selected for the present study since it occupied the large position in area and production of Cotton and this district has black soil which is suitable for cotton production. The R^2 value of 0.77 indicates that about 77% of the variation in cotton yield by contract farming was influenced by the explanatory variables and the R^2 value of 0.94 indicates that about 94% of the variation in cotton yield by contract farming is influenced by the explanatory variables included in the model. High rate of input cost was ranked first with of 95%, followed by lack of credit facility for production, frequent power cuts, farmers facing difficulty in meeting the quality requirements (70%). The constraints in non-contract farming method of Cotton cultivation were Low quality input of seeds, pesticides, fertilizers etc., and Price volatility and an uncertain market (91.66%) together ranking first followed by other constraints.

Introduction

Cotton is a soft, fluffy fibrous material which belongs to Malvaceae family. Cotton is the king of fiber, usually called White gold and is considered to be an industrial commodity of worldwide importance. Cotton is one of the principal crops of India and plays a vital role in the country's economic growth by providing substantial employment and making significant contributions to export earnings. In India, there are ten major cotton growing states which are divided into three zones viz. the north zone (Punjab, Haryana and Rajasthan) the central zone (Maharashtra, Madhya Pradesh and Gujarat), and the southern zone (Andhra Pradesh, Karnataka and Tamil Nadu). There are four

cultivated species of cotton viz. *Gossypium arboretum, G.herbaceum, G.hirsutumm and G.barbadense.*

The Indian cotton exports for the March'20 was reported much lower around 2.94 lakh bales and around 50,000 bales of organic Cotton. The exports were higher around four lakh bales in the previous month. In March'20, the shipments were halted due to the outbreak of covid-19 virus in various countries and trade of 20 days was reported in March month. During the time, Bangladesh was the largest importer of 1.54 bales at an average FOB of 1.57/kg followed by China importing around 1 lakh bales at an average FOD of 1.62/kg almost similar quantity was exported in the February month. The other export destinations of India were Indonesia (9,883 bales at 1.29/kg), Vietnam (6764 bales at 1.62/kg).

The top Cotton producing countries include China, India, and the United States respectively. Within the United States, the Southern States traditionally harvest the largest quantities of Cotton. This region was formerly known as the 'Cotton Belt', where Cotton was the predominant cash crop from the 18th to the 20th century. China was the leading importer of cotton worldwide in 2019/2020. Here India ranks seventh place in cotton import among worldwide.

The global cotton import was 42.20 million bales (480 lb each) in MY 2019/2020. It is anticipated to surge to 44.50 million bales in MY 2019/2021 with a growth of 2.29 percent from my 2019/2020. China imports are projected higher in MY 2020/2021.

Cotton Scenario in India

As on 26th September 2019, area under cotton during 2019-2020 was 127.67 lakh ha as against 121.05 lakh ha in 2018-2019 i.e., 5.46 per cent more than the previous year. Among the states, Maharashtra was reported as leading in cotton acreage (44.05 lakh ha) followed by Gujarat (26.66 lakh ha), Telangana (18.59 lakh ha), Haryana (7.01 lakh ha) and Rajasthan (6.44 lakh ha).

Contract Farming

Contract farming can be understood as a firm lending "inputs" such as seed, fertilizer, credit or extension to a farmer in exchange for exclusive purchasing rights over the specified crop. Thus, a useful starting point is the recognition that contract farming sits somewhere between fully vertically integrated investments (when a firm is involved in all the nodes of the value chain, from production, through processing to marketing) and spot markets (where price determination is a function of supply and demand).

Contract Farming is one viable mechanism to overcome high risk and build up long viable partnership for better marketing. In this context contract farming will give a great solution and also it encourages Indian farmers to compete with very large, rich and highly indirectly subsidized western farmers. Hence, contract farming defined as legal agreement between the farmer (producer) and sponsor (buyer) at a predetermined price at a specific time.

The main objectives includes to study the resource use efficiency of cotton production on contract and non-contract farming situation. And also to study the problems faced by the contract farmers and non-contract farmers in the study area and the sponsoring agency in the implementation of contract farming.

Materials and Methods

Kallakurichi district was purposively selected for the present study since it occupied the large position in area and production of Cotton and this district has black soil which is suitable for cotton production. Here farmers are following contract farming for cultivation of cotton and some of the farmers are not following contract farming (non-contract farming) for cotton cultivation. Among the ten blocks in Kallakurichi district, Chinnasalem (2973.375 ha) and Thiagadurugam block (2474.910 ha) was selected purposively for the present study based on area under cotton production and Maximum number

of Non-contract Cotton growers. The total number of respondents (Cotton growing farmers) are 120 members here 60 farmers selected as each group based on the contract farming and non-contract farming and also based on blocks it is divided into 60samples.

Resource-Use Efficiency

To analyse the Resource -use efficiency and resource productivity of different inputs, the production function analysis was conducted. The Cobb-Douglas production function was selected to establish the input-output relations without put (yield) of the crop as the dependent variable and human labour, farm power, fertilizer, irrigation and plant protection measures were adopted as the independent variables. It was applied in the form of equation-

$$Y=ax_1^{b1}x_2^{b2}x_3^{b3}x_4^{b4}x_5^{b5}x_6^{b6}x_7^{b7}x_8^{b8}U$$

Where,

Y=Crop yield(kg/ha)

a = Constant

b1-8 = Regression coefficient

X1 = Human labour (Rs/ha)

X2 = Farm power (Rs/ha)

X3= NPK (kg/ha)

X4= Irrigation (No.)

X5= Plant protection (Rs/ha)

U= Random error term

Garrett's Ranking Technique

Garrett's Ranking Techniques was used to rank the preference indicated by the respondents on different factors. As per this method, respondents have been asked to assign the rank for all factors and the outcomes of such ranking have been converted into score value. Garrett's Ranking Technique was employed in the present study to examine the various Constraints in the order of their importance. The respondents were asked to rank the problems in Cotton production. In the Garrett's ranking technique these ranks were convened into percent position by using the formula,

$$\text{Percent position}=\frac{100\ (R_{ij}-0.50)}{N_j}$$

Where,

Rii = Ranking given to the i^{th} attribute by the j^{th} individual

Ni= Number of attributes ranked by the i^{th} individual.

By referring to the Garrett's Table, the percent positions were estimated and converted into scores. Then the scores of the various respondents for each of factor were added and the mean values were estimated. The mean values thus obtained for each of the attributes were arranged in descending order. The attributes with the highest mean value were considered as the most important one, followed by others in that order.

Results and Discussion

Resource Use Efficiency for Cotton Contract Farming

To calculate the Resource use efficiency in Cotton crop cultivation Yield was taken as dependent variable and the value of human labour, machine labour, fertilizer, manure and plant protection chemicals are taken as explanatory variables.

Table 1 shows that coefficient of multiple determinations R^2 was 0.77 revealing that the

production function model was a good fit. The R^2 value of 0.77 indicates that about 77% of the variation in cotton yield by contract farming was influenced by the explanatory variables included in the model. In log linear production function, the coefficient is representing the production elasticity of the resources used.

The co-efficient for the variable, Human of labour, indicated that a one percent increase in the value of human labour, would increase the yield of cotton production under contract farming by 36% *ceterisparibus.* The co-efficient of variable, manure indicated that one percent increase in the manure would increase the production of cotton crop under contract farming by 27% *ceteris paribus.*

The co-efficient of the variable machine labour indicated that a one percent increase in the value of fertilizer would decrease the yield of cotton crop under contract farming, situation by 9% *ceteris paribus.* The co-efficient of the variables plant protection chemicals indicated that a one per cent increase in the plant protection chemicals would increase the yield of cotton production under contract farming by 20% *ceterisparibus.*

Hence, there is the scope of increasing the production of cotton by the efficient use of this factor as of production the sum of elasticity of production was 1.04 which indicate the constant return to the scale prevalent in the sample farms in the production of cotton under contract farming situation.

Resource Use Efficiency for Cotton Production under Non-Contract Farming

To calculate the Resource use efficiency in Cotton crop cultivation Yield was taken as dependent variable and the value of human labour, machine labour, fertilizer, manure and plant protection chemicals were taken as explanatory variables. It could be seen from the Table 2 that coefficient of multiple determinations R^2 was 0.94 revealing that the production function model was a good fit. The R^2 value of 0.94 indicates that about 94% of the variation in cotton yield by contract farming is influenced by the explanatory variables included in the model. In log linear production function, the coefficient is representing the production elasticity of the resources used.

The co-efficient of the variables, Machine of labour indicated that a one per cent decrease in the value of machine labour, would decrease the yield of cotton production under contract farming by 37% *ceterisparibus.* The co-efficient of variable, manure indicated that that one per cent decrease in the manure would increase the production of cotton crop under contract farming by 32% *ceteris paribus.*

The co-efficient of the variables plant protection chemicals indicated that one per cent decrease in the plant protection chemicals would increase the yield of cotton production under contract farming by 22% *ceteris paribus.* The sum of elasticity of production was 0.95 which indicate the decreasing return to the scale prevalent in the sample farms in the production of cotton under non-contract farming situation. Hence, there is a chance of decreasing the production of cotton by the in-efficient use of these factors as of production.

Garrett Ranking Techniques

Based on the information given by the farmers, the constrains faced by the farmers in practicing contract farming and problems being faced by non-contract farmers were ranked and prioritized by Garrett's ranking method and have been recorded in Tables 3 and 4 respectively. Table 3 shows that the high rate of input cost was ranked first with the mean score of 95%, followed by lack of credit facility for production (83.33 score), frequent power cuts (75 score), farmers facing difficulty in meeting the quality requirements (70%).

Table.1 Resource Use Efficiency for Cotton Contract Farming

S. No	Variable	Cotton Contract Farming			
		Regression co-Efficient	Standard Error	t-value	Significance
1.	Intercept	-7.68	1.46	-5.25	**2.21 $E^{-0.5}$(NS)**
2.	Human labour (in Rs)	0.36	0.16	2.27	**0.03 (**)**
3.	Machine labour (in Rs)	0.09	0.04	2.13	**0.04 (**)**
4.	Manure (in Rs)	0.27	0.09	2.82	**0.009 (***)**
5.	Fertilizers (in Rs)	0.10	0.10	0.98	**0.33 (NS)**
6.	Plant protection chemicals (in Rs)	0.20	0.10	1.90	**0.06 (*)**
7.	**R^2**	**0.77**			
8.	**AdjustedR^2**	**0.28**			
9.	**F-ratio**	**16.98**			
10.	**Returns to Scale**	**1.04**			

***Significant at 1 percent level; **Significant at 5 percent level
*Significant at 10 percent level; NS Non- Significant

Table.2 Resource use Efficiency for cotton Non-Contract farming

S. No	Variable	Non-Contract Cotton Farming			
		Regression Co-efficient	Standard Error	t-value	Significance
1.	Intercept	-6.20	0.46	-13.33	**1.37 E^{-12} (NS)**
2.	Human labour (in Rs)	0.01	0.03	0.36	**0.72 (NS)**
3.	Machine labour (in Rs)	0.37	0.19	1.89	**0.06 (*)**
4.	Manure (in Rs)	0.32	0.18	1.75	**0.09 (*)**
5.	Fertilizers (in Rs)	0.02	0.03	0.54	**0.58 (NS)**
6.	Plant protection chemicals (in Rs)	0.22	0.10	2.09	**0.04 (**)**
7.	**R^2**	**0.94**			
8.	**AdjustedR^2**	**0.93**			
9.	**F-ratio**	**81.87**			
10.	**Returns to Scale**	**0.95**			

***Significant at 1 percent level; **Significant at 5 percent level
*Significant at 10 percent level; NS Non- Significant

Table.3 Ranking of Various Constraints Faced by Farmers in Contract Farming

S. No	Constraints	Score	Rank
1.	Provision of input at higher rate	95.00	**I**
2.	Lack of credit facility for crop production	83.33	**II**
3.	Frequent power cutting	75.00	**III**
4.	Difficulty in meeting quality requirements	70.00	**IV**
5.	Delayed payment	68.33	**V**
6.	Land constraints	66.66	**VI**
7.	Bollworm attack	58.33	**VII**
8.	Lack of transport facility	41.66	**VIII**
9.	No fund allotment during Natural calamities	33.33	**IX**
10.	**Scarcity of labour during peak period**	**25.00**	**X**

Table.4 Ranking of Various Constraints Faced by Farmers in Non-Contract Farming

S. No	Constraints	Score	Rank
1.	Price volatility and an uncertain market	91.66	**I**
2.	Low quality inputs (seeds, pesticides, fertilizers etc.,)	91.66	**I**
3.	Water Scarcity due to lack of rainfall	85.00	**II**
4.	High rate of inputs	76.66	**III**
5.	Lack of labour availability	75.00	**IV**
6.	Transport charge	73.33	**V**
7.	High rate of rent for Machineries	63.33	**VI**
8.	Pest attack	53.33	**VII**
9.	Lack of provision for rainfed crop	33.33	**VIII**
10.	**Lack of subsidies**	**33.33**	**VIII**

In the survey most of the farmers expressed that delayed payment from company with the mean score of 68.33 %, some of the farmers faced land constraints (66.66%), Boll worm attack is the major pest in cotton cultivation in the early stages, at present cotton contract farmers are following some plant protection methods, even though they are facing problems in cotton cultivation with a mean score of 58.33, Lack of transport facility (41.66%) followed by other constraints.

Table 4 shows that the constraints in non-contract farming method of Cotton cultivation were Low quality input of seeds, pesticides, fertilizers etc., (91.66%) and Price volatility and an uncertain market (91.66%) ranking first in constraints, Non-contract farmers were mainly facing the problem such as Water scarcity due to lack of rainfall (85.00%), High rate of inputs with low quality (76.66%), Lack of labour availability during peak period such as harvesting time, crossing time etc., (75%),Transport charge(73.33%), High rate of rent for machineries (63.33%) Pest attack was a major problem in cotton cultivation (53.33%), Lack of provision for cotton rainfed crops (33.33%), Lack of subsidies for cultivation for cotton by non- contract farmers.

Most of the Cotton contract farmers learned to use various resources efficiently like fertilizer, pesticides and most importantly they are getting in some cases. Contract farmers benefited through a guaranteed minimum price contract is very useful tool to manage their market risk, price fluctuation is the major problem faced by non-contract farmers. In this study also resulted that the contract farmers are

benefited through assured price than the Non-contract cotton farmers. Therefore, Cotton contract farming practices brings an additional profit and also help in bringing stability in the ecosystem by reducing the use of chemicals. Hence, Contract farming system is considered as eco-friendly, economical and socially acceptable, particularly in cotton cultivation. This study also concluded that Cotton contract farmers are getting more profit than non- contract Cotton farmers.

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