An Analysis of Structural Difference and Stability of Irrigated and Un-Irrigated Farmers Producing Cotton in Thoothukudi District

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Abstract

Cotton production is an important industry worldwide, supplying the textile industry with raw fibre for the manufacturing of garments. Pressure from synthetic fibres has seen that the industry has become aware of the need for producing high yields of quality fibre in a most efficient manner. Precise management practices including fertiliser application and ground preparation play a significant role in accomplishing the superior product. Thus the aim of the present study is to examine the structural difference and stability of intercept and slope between irrigated and un-irrigated farmers producing cotton in Thoothukudi district of Tamil Nadu. Chow's test revealed that there is a difference in the amount spent for inputs between irrigated and un-irrigated farmers producing cotton. Hence, it implied that there existed structural difference between irrigated and un-irrigated farmers producing the output of cotton. The multiple regression analysis shows that there was no difference with regard to technical change in both the cases of irrigated and un-irrigated farmers producing cotton. The impact of mechanical energy on per acre output energy was found to be relatively higher in the case of un-irrigated farmers compared to irrigated farmers. The reason is that un-irrigated farmers used more mechanical energy than the irrigated farmers.

Key Words: Cotton, Energy, Irrigated and Un-irrigated.

Introduction

Cotton production is an important industry worldwide, supplying the textile industry with raw fibre for the manufacturing of garments. Pressure from synthetic fibres has seen that the industry has become aware of the need for producing high yields of quality fibre in a most efficient manner. Precise management practices including fertiliser application and ground preparation play a significant role in accomplishing the superior product. Knowledge and experience of interactions between climate, plants, soils and microorganisms is needed to improve the efficiency and sustainability of cotton production. In India, cotton is largely grown in the states of Maharashtra, Gujarat, Karnataka, Madhya Pradesh, Punjab, Rajasthan, Andhra Pradesh, Haryana and Tamil Nadu.

Cultivation of cotton poses more problems when compared to other agricultural commodities. The cultivation of cotton generally depends on fertility of soil, climatic conditions, high yielding varieties of seeds and rainfall. The farmers are facing many problems in the cultivation of cotton. Thus the aim of the present study is to examine the structural difference and stability of intercept and slope between irrigated and un-irrigated farmers producing cotton in Thoothukudi district of Tamil Nadu.

Objectives of the Study

1. To examine the structural difference for cotton in irrigated and un-irrigated farmers producing cotton in the study area.
2. To analyse the stability of intercept and slope between irrigated and un-irrigated farmers producing cotton

Methodology

Thoothukudi district is one of the important districts in Tamil Nadu and agriculture forms the backbone of the district economy. Thoothukudi district is one among the major cotton producing district of Tamil Nadu. During 2014-15 the area under cotton in Thoothukudi district was 17,265.87 hectares, which was nearly 10 per cent of area under cotton in Tamil Nadu. The production of cotton during the corresponding period was 21,040 tonnes which was about 7.3 per cent of the states production.

In the present study Thoothukudi district constitutes the universe. Kovilpatti and Vilathikulam taluks were selected. In this study Vilathikulam taluk has two blocks, namely Vilathikulam and Pudur and also Kovilpatti taluks has two blocks namely Kovilpatti and Kayathar were selected as the stratum, the revenue village as the primary units of sampling and the farmers cultivating cotton under irrigated and un-irrigated conditions as the ultimate units. It was decided to have a sample of 291 cotton cultivators in irrigated areas and 299 from un-irrigated areas. Hence, a total of 590 sample cotton cultivators were selected. The study is related to the agriculture year 2014-15 one Kharif season and one Rabi season. To test the structural difference between irrigated and un-irrigated farmers producing cotton, Chows's test was adopted. In order to identify the energy inputs which influence per acre value of output energy for irrigated and un-irrigated farmers producing cotton, log-linear multiple regression model was used.

Analysis and Interpretation

Tests for Structural Difference for Cotton Cultivation

In order to understand whether structural difference existed between irrigated and un-irrigated farmers producing cotton, Chow's test was used in Table 1to show the results.

H_0: There is no difference in the amount spent for inputs between irrigated and un-irrigated farmers producing cotton'.

Table: 1 – Structural Difference between Irrigated and Un-Irrigated

Farmers of Cotton

Residual Sum of Square	**Values**
Σe^2	0.0289
Σe^1	0.0169
Σe_2^2	0.038
n_1+n_2-2k	588
F*	21.241
$F_{0.05}$ (8, 588)	1.94
Inference	Structural difference existed between the Irrigated and Un-irrigated Farmers

From the above table, the result of Chow's test revealed that the computed 'F' value 21.24 was higher than the table 'F' value 1.94 at (8, 588) degrees of freedom and it was statically significant at five per cent level.

Therefore, the hypothesis namely 'There is no difference in the amount spent for inputs between irrigated and un-irrigated farmers producing cotton' is invalid. Hence, it implied that there existed structural difference between irrigated and un-irrigated farmers producing the output of cotton.

Tests of Stability of Intercept and Slope between Irrigated and Un-Irrigated Farmers Producing Cotton

To test whether the structural differences existed between irrigated and un-irrigated farmers at the slope level or at intercept level or at both levels the following model was estimated.

$$\text{Log Y} = \alpha_0 + \alpha_1 D + \sum_{j=i}^{7} \log X_1 \ (\beta_1 + D\delta_1 + U$$

Where,

Y = Per acre value of output energy in mega cal. i = 1 to 7

X_1 = Human energy per acre in mega cal.,

X_2 = Bullock energy per acre in mega cal.,

X_3 = Fertilizer energy per acre in mega cal.,

X_4 = Pesticides energy per acre in mega cal.,

X_5 = Irrigation energy per acre in mega cal.,

X_6 = Mechanical energy per acre in mega cal.,

X_7 = Seed energy per acre in talking mega cal.,

D_1 = Intercept dummy talking value '1' for irrigated farmer and '0' for un-irrigated farmer, and

$\alpha_0, \alpha_1, \beta_2, \ldots B_7, \delta_2 \ldots \delta_7$ are the parameters to be estimated by the method of least square.

The results of the regression analysis relating the determination of per acre output energy for cotton by the irrigated and un-irrigated farmers producing are shown in Table 2.

Table: 2 - Tests of Stability of Intercept and Slope between Irrigated and Un-Irrigated Farmers Producing Cotton

Variables	Parameter	Parameter Estimate	't' Values
Intercept	α_0	2.645	
Intercept Dummy	α_1	2.204	1.46
log X_1	β_1	0.1145*	3.78
log X_2	β_2	0.0678	1.12
log X_3	β_3	0.1781	1.49
log X_4	β_4	0.2451	1.64
log X_5	β_5	0.0894*	0.87
log X_6	β_6	0.1432*	2.89
log X_7	β_7	0.0841*	0.87
D log X_1	γ_1	0.1072	3.45
D log X_2	γ_2	0.0810	0.74
D log X_3	γ_3	0.0107	0.84
D log X_4	γ_4	0.0984	1.46
D log X_5	γ_5	0.0846	0.41
D log X_6	γ_6	0.1548*	2.03
D log X_7	γ_7	0.9712	1.89
R^2		0.9412	
F Value		467.45	
Residual sum of Squares		0.0209	
Number of Observations		590	

*Indicate significant at 5 per cent level

The table 2 reveals that coefficient of the dummy variable introduced at the intercept level was not significant and it implies that the nature of technical change was neutral for both the group of farmers. In other words, it shows that there was no difference with regard to technical change in both the cases of irrigated and un-irrigated farmers producing cotton.

. In the case of irrigated farmers, all the explanatory variables were positively related to per acre output energy. The variables such as human energy, irrigation energy, mechanical energy, and seed energy were statistically significant at 5 per cent level. It indicates that an additional percentage of these variables could increase per acre output energy by 0.1145, 0.0894, 0.1432 and 0.0841 per cent for the variables respectively. It may be noticed that structural difference between the irrigated and un-irrigated farmers producing cotton was caused by the variable mechanical energy. In other words, while one per cent increase in

mechanical energy could increase per acre output energy of irrigated farmers by 0.1432 per cent, it could increase per acre output energy of un-irrigated farmers by 0.1548 per cent. The impact of mechanical energy on per acre output energy was found to be relatively higher in the case of un-irrigated farmers compared to irrigated farmers. The reason is that un-irrigated farmers used more mechanical energy than the irrigated farmers. The F test value 467.45 being statistically significant at one per cent level implies that the model is highly significant.

Conclusion

Chow's test revealed that there is a difference in the amount spent for inputs between irrigated and un-irrigated farmers producing cotton. Hence, it implied that there existed structural difference between irrigated and un-irrigated farmers producing the output of cotton. The multiple regression analysis shows that there was no difference with regard to technical change in both the cases of irrigated and un-irrigated farmers producing cotton. The impact of mechanical energy on per acre output energy was found to be relatively higher in the case of un-irrigated farmers compared to irrigated farmers. The reason is that un-irrigated farmers used more mechanical energy than the irrigated farmers.

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