Technical Efficiency of Cotton Crop Production in Southern Zone of India

Snehaa K[*], Mary Louis L[**]

*1Year BSc. Mathematics, **Professor

Department of Mathematics, Kumaraguru College of Liberal Arts and Science, Coimbatore- 49

Abstract

The present study aims to identify and measure the technical efficiency of cotton crop production in southern states of India (Tamil Nadu, Karnataka, Telangana, and Andhra Pradesh). The corresponding inputs for cotton productivity (output) were area used, production in cotton crop, and rainfall. Based on the secondary data collected results showed that the mean efficiency of raising cotton crop production is 0.9995772. The result is analysed using stochastic frontier production function model which was processed from the software Frontier 4.1. The absolute values for T-ratio for area, production, rainfall is 1.03, 1.03, 0.01. All the three factors have the values for T below 1.74 implying that each factor has 10% level of significance in influencing cotton crop production. The result also showed that the productivity of cotton crop production in southern states of India is partially increasing.

Keywords: Yield, Production, Technical efficiency, Total Productivity, Stochastic frontier production model, T-ratio, level of significance.

Introduction

Cotton is a soft, fluffy staple fibre that grows in a boll, or protective case, around the seeds of cotton plants of the genus *gossypium* in the mallow family Malvaceae. The fibre is almost pure cellulose. Under natural conditions, the cotton bolls will increase the dispersal of the seeds.Cotton in India provides a direct lovelihood to 6 million farmers and about 40 to 50 million peoples are employed in the cotton trates and its processing. (Reference: https://www.agrifarming.in/cotton-farming-guide)

India has the largest area under cotton cultivation. it is the world's first largest producer of cotton before China and USA currently it is grown over 6% of the net sown area there has been partially no increase in area under cotton except in the decade between 1951-52 and 1961-62 when it increased from 5.8 million hectares in 1951-52 to 7.6 million hectares in 1961-62 some increase in area under cotton cultivation was recorded in 1996 and it reached the maximum of 9.3 million hectares in 1998 to 1999. (Reference: Cotton and Exports, Cotton Sector, Top 10 Cotton producing states in India)

Methodology

Study is based on the area used for cotton crop, production, and rainfall, where output being productivity. Secondary data of Area, production, and annual rainfall of four southern states of India [from 2008-2009 to 2017 -2018] are collected and analysed using the software frontier 4.1. The technical efficiency has been done using the formula

$$\ln y_{it} = \sum \beta_n \ln x_{nit} + v_{it} - u_i$$

$$(i=1,2,.....,n)$$
$$(t=1,2,.....,t)$$

where,

y_{it} = observed output quantities of the i-th unit in year t,

x_{it} = observed inputs quantities of the i-th unit in year t,

u_{it} = non negative time-invariant random variables capturing time-invariant technical inefficiency,

v_{it} = random variables of i-th unit in year t reflecting effect of

statistical noise.

Data and Analysis

The secondary data related to cotton crop production from the year 2008-2009 to 2017-18 is collected for four different states namely Tamil Nadu, Karnataka, Telangana and Andhra Pradesh (Reference: State Wise/ Year Wise Area, Production and Yield in India)

With the data obtained the output was fixed as total productivity of the cotton crop in southern states of India and the corresponding inputs were the area used, production and annual rainfall. The summary statistics of the data used in given in table 1. Technical efficiency was calculated using the software FRONTIER 4.1 and given in table 2.
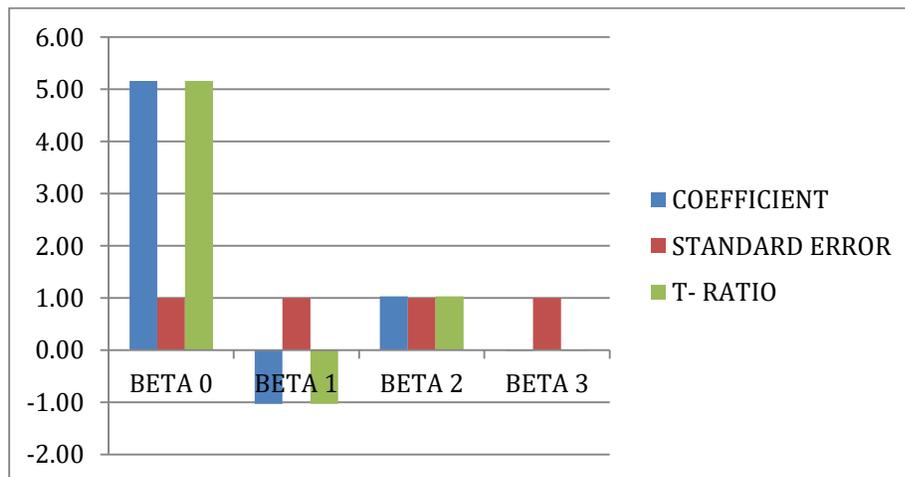
TABLE 1: summary statistics

MAX	0.99965475
MEDIAN	0.99956856
AVERAGE	0.999577195
RANGE	0.00014951
STANDARD DEVIATION	4.45902E-05

TABLE 2: Technical efficiency

VARIABLE	PARAMETER	COEFFICIENT	STANDARD ERROR	T- RATIO
CONSTANT	BETA 0	5.16	1.00	5.16
AREA	BETA 1	-1.03	1.00	-1.03
PRODUCTION	BETA 2	1.03	1.00	1.03
RAINFALL	BETA 3	-0.01	1.00	-0.01

Fig 1: Bar graph

RESULTS AND DISCUSSION

The result showed that all the three factors(area used, production, and rainfall) are directly connected to the productivity of cotton crop. The obtained t-ratio for area, production, and rainfall is -1.03, 1.03, and -0.01. If the rate of annual rainfall and the area used for cotton crop production is further increased it may increase the final productivity of the cotton crop.

CONCLUSION

Consistent decline in area under cotton cultivation has been noticed from 9.1 million hectares in 2001, 7.6 million in 2003-04 however they have been four-and-a-half-fold increase in production and three-and-a-half-fold increase in each between 1950 - 51 and 2003-04. This clearly describes the source in efforts to increase production and productivity without any addition to area under cotton cultivation. This has made possible due to large scale commercial cultivation of high yield hybrid varieties in long and extra-long staples. In spite of threefold increase in the ill are killed of 397 kg per hectare is just half of the world's average and below ill of 731 kg per hectare in USA 1756 kg per hectare in Pakistan and age 16 kg per hectare in Egypt almost 65% of the area under cotton is Reigns with erratic and poly distributed rain during the cropping session.(Reference : Less water same Texas Cotton)

It is subjected to severe attack of pests and diseases despite the increase in production of cotton for quite some time is experiencing a plateau in productivity which needs to be broken. Thus, we can see a Straight step down in cotton crop yield in the forthcoming years. In order to strengthen the growth of cotton crop growth habit of cotton should be changed. they should be properly protected. Thus, decrease in deforestation, proper utilisation of natural resources will allow in better quantity of rainfall, resulting in good yield of cotton crop production.

REFERENCE

Stochastic Frontier Analysis of Technical Efficiency, Insights from Smallholder Cotton Farmers in the Northern Region of Ghana : Awal Abdul-Rahaman , Global Science Research Journals, ISSN No. 2408-5480, Vol. No. 4(1), January 26, 2016

Efficiency Analysis of Cotton Production: A Case Study of Gassol and Lau Local Government of Taraba State, Nigeria: Muhammad Bala et all, E3S Web Conferences 52, 00030 (2018)