FUDMA Journal of Agriculture and Agricultural Technology
ISSN: 2504-9496
Vol. 4 No. 2, December 2018: Pp 140-145

DETERMINANTS OF ALLOCATIVE EFFICIENCY OF NON-CONTRACT COTTON FARMING IN KATSINA STATE, NIGERIA

Adamu[1], H. D., *Umar[2], A. S. S. and Yakubu[3], S. A.

[1]: Department of Agricultural Economics and Rural Sociology Ahmadu Bello University, P.M.B.1044, Zaria, Nigeria
[2]: Department of Agricultural Economics, University of Maiduguri, P.M.B.1069, Maiduguri, Borno State, Nigeria
[3]: Department of Agricultural Economics and Extension, Faculty of Agriculture and Agricultural Technology, Kano University of Science and Technology, Wudil, Kano State, Nigeria
Corresponding author: email: sidiumar@yahoo.com Phone No. 08065728871 & 08029112728

ABSTRACT

This study analyzed the allocative efficiency of non-contract cotton production in Katsina State. Multi-stage sampling technique was used to select 184 non-contract cotton farmers. Primary data used for the study was collected with the aid of structure questionnaire. Descriptive statistics and stochastic frontier analysis was used to analyze the data collected. The result revealed a mean allocative efficiency of 0.45, with minimum and maximum of 0.13 and 0.66 respectively, implying that cotton farmers in the study area were allocatively inefficient in their production systems. The maximum likelihood estimates of the stochastic cost frontier function revealed that the coefficients of seeds, hired labour, agro-chemicals and inorganic fertilizer were positive and statistically significant at varying levels. This indicates that a 1% increase in the quantity of these inputs would increase output by the corresponding value of the coefficients. The inefficiency model revealed that age, household size, educational level, membership of cooperative society and crop diversification were found to increase allocative efficiency of the farmers. The study therefore recommends that cotton farmers should form strong cotton producers cooperative association and government should establish effective marketing and price control boards as well as extension services to cotton farmers to further improve their level of efficiency.

Keywords: Determinants, Allocative, Efficiency, Non-Contract, Cotton Farming, Katsina

Introduction

Agriculture was the mainstay of the nation's economy prior to the discovery of petroleum in the early 60's. Traditionally, agriculture has been the cornerstone of Nigeria's economy accounting significantly towards Gross Domestic Product (GDP) and total export earnings as well as supplying the manufacturing sector's raw materials. Approximately 60 % of the economically active population depends on the subsector for food and employment (Rukuni, e*t al.*, 2006).

The importance of any commodity to the nation depends on its usefulness to the development and growth of the economy. Cotton contributed substantially to the agricultural share of the GDP, (Manyong *et al*., 2005; Rukuni, e*t al.*, 2006). Over 70% of Nigeria population is engaged in agriculture (Umar and Ibrahim, 2014). It was also estimated that about 0.8 million farmers grow cotton on a total estimated farmland of between 700,000 and 800,000 hectares (Olukosi and Isitor, 2007; Adeniji, 2007). It is the one of the major commercial crop grown in the nation, mainly produce in the northern part of the country. The main cotton producing state include katsina, Kano, Jigawa, Borno, Yobe, Bauchi, Gombe and Sokoto State (Adamu, *et. al.,* 2016 b). The peasant farmers were responsible for about 70 % of the nation's cotton yield. The output of cotton in the nation is still low in spite of the various initiatives undertaken in order to cope with the declining productivity of the crop. Among such initiatives was contract farming scheme which is contractual agreement between a firm and the farmer. The contracting firm provide farmer with inputs such as chemicals, seed, fertilizer and in some cases money to pay for labor while the farmer agrees to sell his output to the contracting firm.

Cotton contract farming ensures guaranteed markets to their farmers which is instrumental to the success of agricultural production (Esterhuizen, 2004). The major firms that embraced the initiative are the West African Cotton Company Ltd (WACCOT) and OLAM Nigeria Ltd. However, the majority of small-scale farmers have no access to the contract farming scheme. As result of which they were force to finance

their farming operation. They compete for the same scarce farm inputs with their counterpart that could operate under the farming scheme. Under such situation, it is essential for the farmers to efficiently utilize their scarce financial resources to produce as much output as possible.

There is dearth of literatures on cotton production in the study area. Few studies on cotton production dwells on adoption (Adeneji, 2002), constraints to improved production (Adeneji, 2002), and value chain (Kudi, *et al.*, 2007). While others on cost and return (Adamu, *et al*, 2016 a) and technical efficiency (Adamu and Umar; 2016; Adamu, *et. al.*, 2016 b). Hence, it was against this background that this study was conducted to examine the allocative efficiency and its determinants of non-contract cotton farming in Katsina State, Nigeria with a view of providing empirical information that could guide in formulating policies to increase its production in the nation.

Materials and methods

The Study Area

The study was conducted in Katsina State, which lies between longitudes 11^0 and13^0East of Greenwich meridian and latitudes 6^0 and 9^0 north of the equator. It covers a land mass of 23,938 square kilometers with a population of 5,792,578 (NPC, 2006) which is projected to be 8,723, 845 for 2019 base on 3.2 per cent annual population growth. The state shares boundary with Kaduna in the south, Niger Republic to the north, Zamfara to the west and Jigawa and Kano States to the east (Adamu, *et. al.*, 2016 b).

The weather in Katsina State generally varies according to the season of the year. It is generally cool in the morning, hot in the afternoon and cool in the evening. The Harmattan period (November-February) is usually cooler, windy and dust as a result of northeast trade wind (KTG, 2000). The crops grown in the area include cotton, cowpea, sorghum, millet, groundnut, maize and some vegetables. Livestock such as cattle, sheep, goat and poultry are also kept. Katsina State is also blessed with agro-allied industries such as flour mills, cotton crushing companies, cotton ginneries and oil mill (Kudi *et al.*, 2007) and favorable for cotton production (Adeniji, 2007).

Sampling procedure and Data Collection

A pre-survey was conducted to identify the cotton farmers under contract and those under conventional farming system so as to establish complete sampling frame and afterwards, a pilot survey was conducted to pre-test the questionnaire in order to help detect any fault that may surface in the questionnaire administration and sample designs. The target populations were the cotton farmers in all the cotton producing areas of the State.

Multi-stage sampling technique was employed. Kastina State is divided into three agricultural Zones of the ADP namely Zone I Ajiwa, Zone II Funtua and Zone III Dutsin-ma. In the first stage of sampling, Zone II of Katsina State Agricultural Development Authority (KTARDA) which comprises of eleven local government areas namely Bakori, Danja, Dandume, Funtua, Faskari, Kafur, Kankara, Malumfashi Musawa, Matazu and Sabuwa was the purposive selection of because of its predominance in cotton production. In the second stage, six local government areas namely; Bakori, Danja, Faskari, Funtua, Kankara and Malumfashi were randomly selected. The third stage purposive sampling was use to selection of four (4) villages from each LGA based on intensity of cotton farming. These villages are; Bakori, Kakumi, Guga, and Kurami from Bakori LGA., Danja, Kahutu, Dabai and Unguwar-Balarabe from Danja LGA., Faskari, Maigora, Yankara and Sheme from Faskari LGA., Funtua, Makwalla, Maigamji and Dukke from Funtua LGA., Kankara, Tudu, Danmarke and Burdugau from Kankara LGA., and Malumfashi, Dayi, Unguwar-Wanzamai and Maraba-Kankara from Malumfashi LGA.

The fourth stage sampling involved the use of systematic randomly selection of 12% of non-contract cotton farmers from each of the 24 villages making a sampling frame of 184 cotton farmers out of 1597 non-contract cotton farmers. This was done with the use of the table of random digits. The comprehensive list of cotton contracted farmers of the study area was collected from KTARDA zone II and West Africa Cotton Company Ltd (WACCOT). Local leaders were used in contacting the farmers and this helped to create confidence in the minds of the farmers.

Primary data was used for the study which was collected with the aid of structured questionnaire. Data were collected on the socio-economic variables of the farmers such as age, household size, years of experience educational qualification, access to credit and extension contact. Others are information on costs of inputs used and outputs prices.

Stochastic Frontier Cost Function Analysis

The stochastic cost function was used for estimating the allocative efficiency of the cotton farmers. Following Coelli *et al.*, 2005) the cost function was expressed as:

$C_1 = g\ (P_i\ \delta)\ \exp\ (vi + Ui)$…… equa 1

Where:

C_1 = the total input cost of the ith farms

G = Suitable functional form

P_i = the vector input prices employed by the ith farm

α = the vectors of parameters estimated
Vi and Ui = are the random error terms

The Cobb-Douglas cost frontier function for the cotton farms was explicitly specified as follows:

$$\ln C = \alpha_0 + \alpha_1 \ln P_1 + \alpha_2 \ln P_2 + \alpha_3 \ln P_3 + \alpha_4 \ln P_4 + (V_i + U_i) \ldots \text{equa 2}$$

Where:

C = Total input cost of production of the cotton farm (Naira)
α_0 = Intercept or constant term
P_1 = Cost of labour (₦)
P_2 = Average cost of seeds (₦)
P_3 = Average cost of fertilizers (₦)
P_4 = Average cost of agro-chemicals (₦)
In = Natural logarithm
α_1-α_5 = parameters estimated

The allocative inefficiency effects U_i are affected by:

$$U_{ij} = \delta_1 Z_1 + \delta_2 Z_2 + \delta_3 Z_3 + \delta_4 Z_4 + \delta_5 Z_5 + \delta_6 Z_6$$

Where:

U_{ij} = Allocative inefficiency of the i^{th} farmer
Z_1 = Level of education (number of years spent in formal school)
Z_2 = Household size (number)
Z_3 = Farming experience (years)
Z_4 = Cooperative Membership (yes = 1, no = 0)
Z_5 = Credit (Dummy, where 1= credit use and 0= otherwise)
Z_6 = Extension contact (number of extension contacts)
δ_1 - δ_6 = Coefficients estimated

Result and Discussions

Maximum Likelihood Estimates of Parameters of Stochastic Frontier Cost Function

The parameter of the maximum likelihood estimates of the stochastic frontier cost function was presented in Table 1. The estimated sigma squared (0.613) was significant ($p< 0.05$), indicating a good fit and the correctness of the specified distributional assumption of the composite error terms in the model. The value of gamma (0.362) was significant ($p< 0.01$) suggesting that about 36% variation in cost of cotton production from the frontier was due to the cost inefficiencies and not as result of random variability. The farmers could greatly enhance their allocative efficiencies and reduce their cost since these factors were under their control

The coefficient of labour cost (0.099) was positive and significant ($p< 0.01$), implying that unit increase in the cost of labour leads to about 9 unit increases in the total cost of cotton production. This is plausible as labor is very important factor in cotton production. Longer hours of man days are required to efficiently perform the various routine farm operations for improved output. This agrees with the finding of Bifarin *et al*. (2011) who also reported a positive and significant influence of labour cost on total cost of production.

The coefficient of fertilizer cost (0.303) was significant and positively related to total cost of cotton production. This suggest that I unit increase in the cost results in 30% increase in the cost production. The positive relationship between the costs of fertilizer could be attributed to the ever increasing cost of inputs in nation. Fertilizer is the important input in agricultural production due to declining of the inherent fertility of most land in Nigeria. Farmers usually spent large amount of money to improve the productivity of their land.

The coefficient of cost of agro-chemicals (0.019) was also positive and significant, indication that a unit increase in the cost agro-chemicals will leads to 1.9 unit increase in the cost of cotton production in the study area. This agrees with the study of Asogwa *et al*. (2011) who posited similar result of positive but insignificant influence of agrochemical cost.

Table 1: MLE of the Parameter of the Stochastic Frontier Cost Function of Non-contract Cotton Farmers

Variables	Parameter	Coefficient	SE	t-value
Intercept	βo	6.658	0.909	7.566
Cost of Seed	β_1	0.122	0.014	1.939**
Cost of Labour	β_2	0.099	0.130	7.338***
Cost of Fertilizer	β_3	0.303	0.205	2.480**
Cost of Agro-chemicals	β_4	-0.019	0.153	2.328**
Inefficiency Model				
Intercept	Z_0	-0.187	0.961	2.195**
Education	Z_1	0.822	0.361	2.275**
Household size	Z_2	-0.220	0.118	3.862***
Experience	Z_3	-0.133	0.195	2.862***
Cooperative Membership	Z_4	0.003	0.005	3.579***
Credit	Z_5	-0.013	0.083	2.918***
Extension	Z_6	-0.551	0.245	2.625**
Variance parameters				
Gamma	**γ**	**0.362**	**0.1442**	**2.708*** **
Sigma square	**δ^2**	**0.613**	**0.3178**	**1.929****
Log Likelihood Function		**144.415**		
LR test		**6.3877**		

Source: Field Survey 2014, NB: * P < 0.1, ** P < 0.5, *** P < 0.01

Frequency Distribution of Allocative Efficiency of Non-Contract Cotton production

The result revealed a mean allocative efficiency of 0.45 with a minimum and maximum of 0.13 and 0.66 respectively. This implies that there exists the scope of improving allocative efficiency by about 55% by adopting the production practices and techniques of the average farmer in the study area

.

Table 2: Frequency Distribution of the Allocative Efficiency of Non-contract Cotton Farmers

Efficiency	Frequency	Percentage
0.10-0.19	26	14.2
0.20-0.29	37	20.0
0.30-0.39	31	16.7
0.40-0.49	58	31.7
0.50-0.59	18	10.0
0.60-0.69	14	7.5
0.70-0.99	-	-
Total	**184**	**100**
Minimum	**13**	
Maximum	**66**	
Mean	**45**	

Source: Field Survey 2014

Determinants of Allocative inefficiency of Cotton Farmers

The socio-economic variable affecting inefficiency parameters were examined and these include age, household size, farming experience, educational level, cooperative membership, credit availability and extension contact. A negative value coefficient indicates that the parameter has a positive effect on efficiency and vice versa.

The sources of the allocative inefficiencies of the cotton farmers are presented in table 2. The coefficient of education (0.822) was positive and significant ($p< 0.05$). This can be attributed to the fact that highly educated farmers are more involved in their highly paid main occupation than the day to day operations of their farms. They mainly rely more on unsupervised hired labour for their farm operations, thus the inefficiency. This finding is in line with those of Ahmed *et al*. (2002) among wheat producers in Pakistan.

The coefficient of family size (-0.220) was negative and significant ($p< 0.01$), implying that an increase in the size of the family tends to decrease the allocative inefficiencies of the cotton farmers. This could be due to the tendency for family labour force to increase as the family size increases thereby reducing the cost of hired labour and invariably the cost of production.

The coefficient of farming experience (-0.133) was negative and significant ($p< 0.10$). This is in line with Ashagidigbi *et al*. (2011) which also found a negative relationship between farming experience and allocative inefficiency. Extension contact (-0.551) was negative and significant ($p< 0.05$). This result implied that as the extension contact increases, their allocative inefficiencies decreases. This finding agrees with that of Bifarin *et al.* (2010) that extension contact lead to higher levels of efficiency. This is plausible because extension contact enable farmers to easily understand simple manual on the use of the various farm inputs. This could reduce over usage of such inputs by the farmer and hence, allocative efficiency.

Conclusion and Recommendations

This established that non –contract cotton producers in the Katsina State is allocatively inefficient in the use of their inputs given their average efficiency level of 0.45. They could be able to reduce the cost of their inputs by about 55% through adopting the technique and practices of their most efficient counterpart in the study area.

The study recommends that cotton farmers should form strong cotton producers cooperative association that would represent their interest rather than to be individualistic. To control the glut, Pre-risk and exploitative activities of middlemen which always lead to low price, government should established effective marketing and price control boards. Also, government should facilitate contracting by encouraging agribusiness firms to initiate new

contracts and providing support to cotton farmers to make them suitable for contract selection. Workshop should be organized to enlighten and educate cotton farmers on the needs to participate in contract farming in the study area. These measures will also go a long way in enhancing and improving the profitability of cotton farming in the study area.

References

Adamu, D. H. and Umar, A. S. S. (2016). Technical efficiency differentials among contract and non-contract cotton farmers in some selected local governments of Katsina State, Nigeria. *Maiduguri Journal of Arts and Social Sciences*, 13(1), 195–201.

Adamu, D. H., Umar, A. S. S. and Yakubu, S. A. (2016). Analysis of technical efficiency and its sources in non-contract cotton production in Nigeria, *Journal of Applied Management and Investments*, 4(2), 58-64.

Adamu, D. H., Umar, A. S. S. and Yakubu, S. A. (2016). Comparative analysis of cost and returns in cotton production with and without contract farming scheme in Katsina State, Nigeria. *Journal of Sustainable Development*, 13(1), 82-86.

Adeniji, O.B. (2002). Adoption of improved technologies for cotton production in Katsina state, Nigeria. Unpublished Ph.D. Thesis. Department of Agricultural Economics and Rural Sociology, Ahmadu Bello University, Zaria.

Adeniji, O.B. (2007). Constraints to improved cotton production in Katsina State, Nigeria. *Journal of Applied Science*, 7 (12), 1647-1651.

Ahmad, M., Chaudry, G.M and Iqbal, M. (2002).Wheat productivity, efficiency and sustainability: a stochastic frontier analysis. *The Pakistan Development Review*, 41(4), 643-663.

Ashagidigbi, W.M., Sulaiman, S.A. and Adesiyan, A. (2011). Technical and allocative efficiency of poultry egg producers in Nigeria. *Agricultural Journal*, 6(4), 124-130.

Asogwa, B.C., Umeh, J.C. and Penda, S.T. (2011). Analysis of economic efficiency of Nigerian small scale farmers: A parametric frontier approach. *Journal of Economics*, 2(2), 89-98.

Bifarin, J. O., Alimi T., Baruwa, O.I. and Ajewole, O.C. (2010). Determinant of technical, allocative and economic efficiencies in the Plantain (Musa spp.) production industry, Ondo State, Nigeria. In: Proceeding of International Conference on Banana & Plantain in Africa pp 199 - 210.

Coelli, T., Rao, D.S.P, O'Donnell, C.J and Battese, G.E. (2005*). An introduction to efficiency and productivity analysis*. Springer Science and Business Media, New York, pp 343.

Esterhuizen, E. (2004). Competition and Coordination in Zimbabwe Cotton Sector 2001-2004.Retrieved from www.aec.msu.edu[accessed September, 2013].

Katsina State Government (KTG) (2000). Ministry of information Katsina, Nigeria.

Katsina State Ministry of Agriculture (2012). Report of Workshop on cotton production in Katsina, April 24 http://www.fibre2fashion.com.Visited on 23/03/2013.

Kudi T.M., Akpoko J.G., and Z. Abdulsalam (2007). Assesment of cotton industry using the global commodity chain analysis approach in Katsina State, Nigeria. *Journal of Applied Science*, 7(22), 3557-3561.

Manyong, V.M., A. Ikpi, J.K. Olayemi, S.A. Yusuf, V. Okaruwa and F.S. Idachaba, (2005). Agriculture in Nigeria: Identifying Opportunities for Increased Commercialization and investment. IITA, Ibadan, Nigeria, pp 159.

NPC (2006).Report of National Population Census. National Population Commission of Nigeria. 233-243.

Rukuni, M., P. Tawonezvi, C., Eicher, H.M., Munyuki and Matondi, P. (2006). Zimbabwe's agricultural revolution revisited, University of Zimbabwe Publications, Harare. pp 31-39.

Olukosi, J.O. Isitor, S.U. and Ode, M.O. (2007*).* Agricultural marketing and prices: principles and application. Living Bookshop Series Gu Publications, Abuja, FCT. pp 78 – 85.

Umar, A. S. S. and Ibrahim, U. W. (2014). Allocative efficiency and its determinants in Watermelon production in Borno State, Nigeria. *Journal of Arid Agriculture*, 22, 67-72