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YIELD GAP ANALYSIS OF COTTON PRODUCTION IN ADAMAWA STATE, NIGERIA

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ABSTRACT: ***This study analyzed the relationship between cotton farmers output and their socio-economic characteristics as well as total yield gap in cotton production in Adamawa State, Nigeria. Descriptive statistics was used to analyze the data collected from 120 cotton farmers using multi-stage sampling technique. The results point out that cotton production was male dominated (91.7%), while only few of the respondents (25%) had tertiary education with holdings ranging from 0.5 to 3 hectares. Yield of the respondents ranges from 401kg/ha to 1,750kg/ha with majority (57.5%) having between 851-1300kg/ha. The study further revealed a total yield gap of 942.67kg/ha in Guyuk and 1,050.91kg/ha in Demsa LGAs. The study suggested a need for awareness campaign by the state ministry of Agriculture with a view to update farmers on recommended technology practices aimed at reducing total yield gap in the study area.***

Keywords: Yield gap, cotton farmers, cross tabulation, potential yield, research station

Introduction

Cotton (Gossipium SPP) is a plant grown in warm countries that has a soft white hair around its seed used in textile industries and of great importance in international trade (C.D.C, 2005). It remains an important fiber of the 20th Century that contributed to the development of the Nigerian economy. Commercial Cotton production began in Nigeria in 1910 under the auspices of the British Cotton Growers Association (BCGA) which was an effort to find new sources of cotton for textile industries in Britain (Ogunlela and Echekwu, 1989).

Cotton is produced in twenty four out of the thirty six states of the country under rain-fed condition. The seed cotton is produced mainly by rural farmers with small holdings and mostly as a cash crop (Onu, 2006). Production is labour intensive with most field operations manual and frequently carried out by smallholder farmers faced by inadequate capital.

Farmer's yield is negatively affected by rise in crop competition for land and farm operations (high cost and shortage of labour) resulting in delayed cultural operations (Amaza et al., 2001). Adamawa State is an important cotton producing area in Nigeria which is situated in the North eastern part of the country. The total Cotton planted

area increased from 7.09 thousand hectares in 1995 to 18.63 thousand hectares in 2013 (National Bureau of Statistics, Nigeria).

Similarly, total cotton production in the state rose from 6.47 million metric tons to 17,500 million metric tons within same period. Thus, farmers' average yield is around 900 kg/ha in Adamawa State as of 2013 which is low compared to a yield of about 2,000kg/ha realized in the research station. In lieu of the above, this paper analyzed the yield gap in cotton production and the influence of farmers' socio-economic characteristics on output.

Methodology

Description of the Study Area

This study was conducted in Adamawa State, Nigeria. The State was created in 1991 from the then defunct Gongola, State and shares boundary with Taraba State in the South, Gombe State in the North West and Borno State from the North. Adamawa State is also bounded by Cameroon Republic along its eastern border. The state consist of about 38,741 square kilometers of land and is divided into 21 Local Government Areas. It also has a population of 3,161,374 people (NPC, 2006)

Data collection and Sampling Technique

Primary data was used for the study. The data was obtained using structured questionnaire administered to cotton farmers face-to-face by the researcher and trained enumerators. Data obtained covered 2016-17 cropping season. The study adopted a multi-stage sampling technique. The 1st stage involved purposive selection of Guyuk and Demsa Local Government Areas (LGAs) out of the Twenty one LGAs in the state because they have the largest area under cotton cultivation. In the second stage, two villages having the highest concentration of cotton farmers were purposively selected from each LGA making a total of four villages. A list of cotton growers was obtained from at Guyuk and Demsa LGAs Agricultural Development Programme (ADP) Offices. In the final stage, thirty cotton farmers were randomly selected from each village, thus a total of one hundred and twenty farmers were included in the study.

Method of Data Analysis

Descriptive statistics involving frequency, percent and cross tabulation was used to achieve the first objective. The yield obtained by the farmers was converted to per hectare and divided in to three categories (401-850kg/ha, 851-1300kg/ha and 1301-1750kg) which was cross tabulated against farmers' socio-economic characteristics such as gender, farm size and educational status. Yield gap in cotton production was estimated using the methodology developed by International Rice Research Institute (IRRI) as used by Singh (2015).

TYG = YG I + YG II

Where, TYG = Total yield gap

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YG I = Yield gap I

YG II = Yield gap 2

YG I = Yp – Yd

Yp = Potential Yield (Per hectare crop yield realized on the research station)

Yd = Potential farm yield of the demonstration plot.

YG II = Yd – Ya

Yd = Potential farm yield of the demonstration plot (Per hectare yield realized on the demonstration plot).

Ya = Actual farm yield realized by the farmers (per hectare yield realized by farmers on their field). Yield gap I and II was converted to percentages and then summed. This gave the total yield gap in percentage for Adamawa State, Nigeria.

Results and Discussion

The results in Table 1 revealed that majority (91.7%) of the respondents were male out of which 30.0%, 57.5% and 12.5% obtained cotton output between 401-850kg/ha, 851-1300kg/ha and 1301-1750kg/ha respectively. The results further revealed that only 8.3% of the respondents were female out of which 0.8%, 5.8% and 1.7% obtained cotton output between 401-850kg/ha, 851-1300kg/ha and 1301-1750kg/ha respectively. Going by this result, gender of the respondents doesn't guarantee larger output.

The results of crosstab between cotton farmers' educational level and their output showed that 23.4% of the total respondents had no formal education out of which 5%, 16.7% and 1.7% obtained cotton output between 401-850kg/ha, 851-1300kg/ha and 1301-1750kg/ha respectively. The findings further revealed that 25.8% of the farmers had primary education out of which 3.3%, 19.2% and 3.3% had output between 401-850kg/ha, 851-1300kg/ha and 1301-1750kg/ha respectively. Also, 25.8% of the farmers had secondary education out of which 9.2%, 10.8% and 5.8% had output between 401-850kg/ha, 851-1300kg/ha and 1301-1750kg/ha respectively. Furthermore, 25% of the total respondents had tertiary education out of which 12.5%, 10.8% and 1.7% had output between 401-850kg/ha, 851-1300kg/ha and 1301-1750kg/ha respectively. Going by this result, 57.5% of the respondents obtained average output (between 851-1300kg/ha) out of which majority (40.8%) had one form of education or the other. This implies that educational level to some extend have a positive effect on their output. This corroborates with the findings of Ahmed et al. (2013) who reported that educational status has a positive influence on maize farmers output in Girei LGA of Adamawa State, Nigeria.

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The result in Table 3 shows that 30.8% of the cotton farmers had farm size of between 0.1-1.0 ha out of which 11.7%, 15.8% and 3.3% obtained yield which ranged from 401-850kg/ha, 851-1300kg/ha and 1301-1750kg/ha respectively. Also, 50.8% of the total respondents cultivated between 1.1-2.0ha of farmland out of which 15.8%, 28.3% and 6.7% had output between 401-850kg/ha, 851-1300kg/ha and 1301-1750kg/ha respectively. Similarly, 18.3% of the cotton farmers had between 2.1-3.0ha of farmland out of which 2.5%, 13.3% and 2.5% obtained yield between 401-850kg/ha, 851-1300kg/ha and 1301-1750kg/ha respectively. This clearly shows that among the 18.3% of the farmers that cultivated 2.1-3.0ha of farmland, only 2.5% obtained above average yield (1301-1750kg/ha). This implies that large farm size doesn't necessarily guaranty larger yield.

The result in Table 4 depicts the yield gap of cotton production in Guyuk and Demsa LGAs of Adamawa State, Nigeria. The study revealed that yield gap I was lower in Guyuk (350kg/ha) as compared to Demsa (580kg/ha) whereas yield gap II was higher in Guyuk (592.67kg/ha) as compared to Demsa (470.91kg/ha). The total yield gap was found to be 942.67kg/ha in Guyuk and 1050kg/ha in Demsa. This implies that there is a scope of decreasing the total yield gap by 53.42% and 62.16% in Guyuk and Demsa respectively. This supports the findings of Yahaya (2012) who reported low yield among cotton farmers in Gassol and Lau LGAs of Taraba State, Nigeria.

Table 1: Farmers' output relative to their gender

Output range (kg/ha)	**Sex of the respondents**		**Total (%)**
	Female	Male	
401-850	1(0.8)	35(29.2)	30.0
851-1300	7(5.8)	62(51.7)	57.5
1301-1750	2(1.7)	13(10.8)	12.5
Total (%)	8.3	91.7	**100**

Source: Field Survey, 2017. Figures in parenthesis represents percentage of total

Table 2: Farmers' output relative to educational level

Output range (kg/ha)	**Educational level**				**Total (%)**
	No formal education	Primary Education	Secondary education	Tertiary Education	
401-850	6(5.0)	4(3.3)	11(9.2)	15(12.5)	30.0
851-1300	20(16.7)	23(19.2)	13(10.8)	13(10.8)	57.5
1301-1750	2(1.7)	4(3.3)	7(5.8)	2(1.7)	12.5
Total (%)	23.4	25.8	25.8	25	**100**

Source: Field Survey, 2017. Figures in parenthesis represents percentage of total

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Table 3: Farmers' output relative to their farm size

Output range (kg/ha)	**Farm size (ha)**			**Total (%)**
	0.1-1.0	1.1-2.0	2.1-3.0	
401-850	14(11.7)	19(15.8)	3(2.5)	30.0
851-1300	19(15.8)	34(28.3)	16(13.3)	57.5
1301-1750	4(3.3)	8(6.7)	3(2.5)	12.5
Total (%)	30.8	50.8	18.3	**100**

Source: Field Survey, 2017. Figures in parenthesis represents percentage of total

Table 4: Yield gap in the study area

Local Government Area	Station Yield (kg/ha)	Demonstration plot (kg/ha)	Yield gap I (kg/ha)	Yield gap I (%)	Farmers Yield (kg/ha)	Yield gap II (kg/ha)	Yield gap II (%)	Total yield gap (kg/ha)	Total Yield gap (%)
Guyuk	2,000	1,650	350	17.5	1,057.33	592.67	35.92	**942.67**	**53.42**
Demsa	2,000	1,420	580	29	949.09	470.91	33.16	**1,050.91**	**62.16**

Source: Field Survey, 2017

Conclusion and Recommendations

The study revealed that cotton production in the study area is dominated by male as all the respondents are smallholder farmers with relatively low level of education. Total yield gap in the study area is high suggesting a need to come up with measures aimed at bridging this gap. Based on these results, the following recommendations were made;

I. Agricultural development programmes affiliated to the State ministry of agriculture should engage on more awareness campaign in order to update farmers on the appropriate technological practices in order to improve their yield which will help in reducing the yield gap in the study area.

II. Effort should also be made by the state government to improve the educational status of the farmers. This will aid them in accepting the recommended practices and be better managers of their farms.

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