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Determinants of Improved Productivity of Okra *(Abelmoschus esculentus)* by Farmers in Lowland Areas of Ogun State, Nigeria

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Abstract: Nigeria is recognized as a country that produces a variety of vegetables. However, it has not been very successful in producing abundantly to adequately meet local consumption, talk less of penetrating overseas markets. This suggests there is still much room for improving the productivity of the country's vegetable production. This paper makes an investigation into the factors determining the production/productivity of lowland okra in Odogbolu Local Government Area of Ogun State, Nigeria. Data was collected through the use of well-structured questionnaire and field observations from 100 okra farmers selected through simple random sampling technique. The data collected were analyzed using descriptive and inferential statistics. The results show that the mean age of the respondents was 26.80 years; 78% of the respondents were male; mean years of okra production experience was 13.60 years; mean farm size cultivated by the respondents was 1.22 acres; while the mean years of education was 12.66 years. More than 70% of the respondents planted okra on a small scale; the respondents had an average household size of 4.34 members. The most significant socio-economic variables include sex, household size and frequency of contact with ADP Officials. The economic variables most significant in the course of the study were family labour, fertilizer, herbicides and variety of seeds. Farmers cultivating improved seed varieties were observed to be more productive than others cultivating local seed varieties.

Key words: Production · Productivity · Lowland · Okra · Improved variety

INTRODUCTION

Okra is a popular vegetable which originated from the hot climates of Africa. Okra (*Abelmoschus esculentus*) is one of the important vegetables grown not only in Nigeria but also in the temperate and sub-tropical region of the world. Okra was once considered as a potential large-scale grain crop in the 1940s [1], but it was bumped aside during the soybean revolution.

The need of increased food production in most developing countries becomes an ultimate goal, to meet the expansion of their populations. Okra is an important fresh delicious vegetable crop in spring and summer for cooking, also used as dry fruits, canned, or frozen for all year round cooking. In West Africa, leaves, buds and flowers are also consumed. The dried seeds provide oil, protein, vegetable curd and coffee additives or substitutes. Sharma [2] reported that okra dry seeds contain 18-20% oil and 20-25% crude protein; it has an average nutritive value of 3.21 which is higher than tomato, eggplant and most cucurbits. Okra is a vegetable crop that belongs to the genus *Abelmoschu*s, family *Malvaceae* and has two main species: *Abelmoschus esculentus* (L.) Moench. and *Abelmoschus caillei* (A. Chev.) Stevels [3]. It originates probably from East Africa and today is widely distributed in the tropics, subtropics and warmer portions of the temperate region [4]. The economic importance of okra cannot be overemphasized. Okra contains carbohydrate, proteins and vitamin C in large quantities [5]. The essential and nonessential amino acids that okra contains are comparable to that of soybean. Worldwide production of okra as fruit vegetable is estimated at six million tonnes per year. In West Africa, it is estimated at 500,000

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to 600,000 tonnes per year [6]. In Nigeria, there are two distinct seasons for okra, the peak and the lean seasons. During the lean season okra fruit are produced in low quantities, scarce and expensive to get [7]. In the peak season, it is produced in large quantities much more than what the local populace can consume. Productivity of okra, its green and seed yield and quality can be increased by improving the agricultural practices. The major factors, which contribute to the green pod yield, include both economic and socio-economic factors.

The objectives of this study include the determination of economic and socio-economic factors that influence the productivity of okra in the study area and also investigating into the productivity differentials with respect to seed variety of okra cultivated.

Studies carried out by Alimi *et al.* [8] indicated that users of commercial organic fertilizer in vegetable production in Osun State of Nigeria, applied 610kg ha^{-1} of commercial organic fertilizer which resulted in additional yield of 3, 375kg ha^{-1} and obtained rate of returns of 401% over and above the non-users of fertilizers; making the use of organic fertilizer technology was observed to be economically superior to non-use of fertilizers.

Darpeix [9] carried out a study on the impact of the labour force composition in fruit and vegetable farms on farm productivity. The share of labour force includes family labour, permanent hired labour and seasonal hired labour. A simple transformation of a Cobb-Douglas function was used to estimate the relative efficiency of each labour force. The estimation was based on specialized fruit and vegetable farms over the period 1995-2006 drawn from the French sample of the Farm Accountancy Data Network *(*FADN). He showed that the labour force composition affects the farm's productivity and that family workers are less productive than hired workers. Who also found that seasonal workers are not less productive than permanent ones although seasonal work in agriculture in the study area was synonymous with low earnings, job insecurity and absence of career development.

Abd El-Kader *et al.* [10] indicated that the growth and yield of okra were enormous in drip irrigation with chicken manure. Access to fertilizer, agro-chemicals and improved seeds/planting materials has been proven as an important driver of agricultural production and productivity among farmers in Sub-Saharan African. Using stochastic frontier model, Mbata [11] and Ogundele and Okoruwa [12] observed that the use of fertilizer increased agricultural productivity of crop farming in the dry savannah and humid forest agro-ecological zones of Nigeria. Nkonya *et al* [13] also alluded to the positive impact of fertilizer. The use of herbicides according to Mbata [11], Ogundele and Okoruwa [12] had a positive correlation with technical efficiency or productivity of farmers. However, Tella [14], using the Timmer and Kopp indices, revealed that the use of chemicals contributed to productivity negatively if not properly utilized.

The use of improved seeds/planting materials was observed to have positive impact on agricultural productivity [12, 14-16] in the humid forest, moist savannah and dry savannah agro-ecological zones of Nigeria.

Other important factors that have been empirically proven to influence productivity are credit and extension services. Obwona [17] used the translog production function to show that access to credit and access to extension services contributed positively towards the improvement of efficiency among tobacco farmers in Uganda.

Agbede and Ologunagba [18] concluded in their work on evaluation of soil properties and okra performance under methods of seedbed preparation at Owo, southwest Nigeria, that zero tillage and manual clearing were more suitable for okra production when compared with other positions of a mound or ridge, in terms of soil fertility and productivity conservation.

Katung [19] conducted a study on the productivity of okra varieties as influenced by seasonal changes in northern Nigeria. The wet season conditions were most favourable for increased growth, leaf formation and fruit yield, as compared with the dry season environment which resulted in less vegetative and reproductive growth.

MATERIALS AND METHODS

The study was carried out in Odogbolu Local Government Area of Ogun State, Nigeria. It is located in the Ogun East Senatorial District of the State. Odogbolu is found in the humid zone of the state. The predominant occupation here is farming, while other stable occupations among the people are mainly trading, craftwork, palm oil production etc. Major crops grown are okra, maize, cassava, yams and cash crops like cocoa and oil palm. Some of these farmers plant okra as mixed crop with these crops. The study area was chosen because the farmers here took advantage of the

presence of lowland to plant okra on both small and large scales, especially during dry season. It is believed this will make a fairly true representation of the study area.

The target population for this study is okra farmers. There are 100 respondents who were chosen from the population of the okra farmer through random sampling techniques. Data collection was through questionnaire method, interview and direct observation; data collected include background information of the respondents, level of okra production, methods of production and input/output information. The data collected was analyzed using descriptive statistics like mean, standard deviation and frequency distribution. Also inferential statistics like Cobb-Douglas production function and Chow test were used to test the hypothesis.

RESULTS AND DISCUSSION

Demographic Characteristics of the Respondents: With regards to the age distribution of the respondents, 56.0% of the respondents were between the ages of 20 and 29 years, 24.0% of the respondents were between the ages of 30 and 39 years, 16.0% were between 40 and 49 years, 4.0% were 50 years and above. The mean age of the respondents was 26.8 years, with a standard deviation of 8.86 years. This result indicates that the larger percentage of the respondents between 20 and 39 years. Most of the young able-bodied men and women had been involved in farming activities in the study area. The implication of this is that the future of agricultural production in the study area is promising and okra production in the study area has good prospect. Seventy eight percent of the respondents were males and twenty two percent females. Most men cultivating okra have their wives work with them on the family farms. About 10.0% of the respondents have primary education, 48.0% attended or had secondary school education, 28.0% of the respondents have OND certificate, while 14.0% have either HND or University degree. This result showed an average level of years of education to be 12.66 years in the study area.

It could be observed that 52.0% of the respondents had been in the practice of okra production for 10 years or less, 24.0% of them had been growing okra between 11 and 20 years, 16.0% had grown okra between 21 and 30 years, while 8.0% of the respondents had grown okra between 31 and 40 years. The mean years of okra production experience was 13.6 years with a standard deviation of 10.53 years. This result shows that okra production is a profession which has gained ground among the people in the study area. About 6.0% of the farmers had less than 1.0 acre, 68.0% had between 1.0 and 1.99 acres, 14% had between 2.0 and 2.99 acres, 6.0% had between 3.0 and 3.99 acres, while 6.0% had 4.0 acres or more. The mean farm size cultivated by the respondents was 1.53 acres with a standard deviation of 1.22 acres.

Thirty percent of the respondents had household size between 1 and 3 members; 64% had household size of 4-6 members; while only 6% had household size higher than 6 members. The average household size in the study area was 4.34 and the standard deviation was 1.53. Extension and credit facilities were relatively enjoyed during the production of okra for the season under consideration. Agricultural extension services reached majority of the farmers in the study area. Twelve percent of the respondents claimed they had contact with extension officers on weekly basis; 54% of the respondents claimed they had contact with extension officers on monthly basis; 12% claimed they had contact with extension officers on quarterly basis; and 22% claimed they had contact with extension officers on annual basis. The essence of the contact with extension is mainly to get advisory services. The implication of this is that production of okra had tendency to improve, since about two-thirds of the respondents had contact with the extension officers who could teach them necessary improved methods and practices.

The Results of the Analysis Showing the Factors Determining the Productivity of the Selected Okra Farmers in the Study Area

Model 1: The results of the OLS regression analysis showing the socio-economic factors that influence the productivity of the selected okra farmers in the study area

- $Y = 144.394784 + 109.451284W_1^{***} - 8.351548W_2 + 39.868258W_3^{***} + 11.289411W_4$ (110.816833) (37.893208) (19.250478) (12.682373) (12.432544) $+1.253465W_5 - 6.589034W_6 + 46.578029W_7^{***}$ (1.717659)(5.649473) (16.789568)

Where

W_1 = sex; W_2 = age (years); W_3 = household size; W_4 = farm size (acres); W_5 = experience (years); W_6 = education (years); W_7 = frequency of contact with ADP Officials; and Y = output of okra (kilogram)

Model 2: The results of the Cobb-Douglas model for all the selected farmers cultivating okra in the study area

- $\ln Y = 2.170680^{*} + 0.707934\ln X_1^{***} - 0.306505\ln X_2 + 1.201270\ln X_3^{***} - 0.585607\ln X_4^{***}$ + (1.286438) (0.262451) (0.229552) (0.344710) (0.182704) $0.068049\ln X_5 + 0.865712\ln X_6^{***}$ (0.157851) (0.294033)

Model 3: The results of the Cobb-Douglas model for all the selected farmers cultivating improved okra seed varieties in the study area

- $\ln Y = 2.502066 + 0.199419\ln X_1 - 0.041145\ln X_2 + 1.006188\ln X_3^{**} + 0.088851\ln X_4 + (2.012999)(0.284002)$ (0.310904) (0.463370) (0.222594) $0.247210\ln X_5$ (0.195799)

Model 4: The results of the Cobb-Douglas model for all the selected farmers cultivating local okra seed varieties in the study area

- $\ln Y = 1.101307 + 2.595425\ln X_1^{***} - 1.734151\ln X_2^{***} + 1.980682\ln X_3^{***} - 1.856730\ln X_4^{***}$ (1.033793) (0.314769) (0.231966) (0.319574) (0.171317) $- 0.694710\ln X_5^{***}$ (0.190432)

Where X_1 = family labour (manday); X_2 = hired labour (manday); X_3 = quantity of fertilizer (bags); X_4 = quantity of herbicides (litres); X_5 = quantity of seeds (kilogram); X_6 = variety of seeds (dummy: improved = 1; local = 0); and Y = output of okra (kilogram)

NB: ** - 10% Significant level; ** - 5% Significant level; *** - 1% Significant level*

From model 1, it could be observed that the most significant socio-economic variables contributing to improved productivity of okra farmers were sex, household size and frequency of contact with ADP Officials. From the study, male farmers tend to be more productive than their female counterparts; the farmers having larger household sizes seemed to be having better productivity than those having fewer household sizes. This could be possible because the farmers usually make use of the household members as sources of family labour. Also, it was observed that increased rate of contact with ADP officials tends to lead to improved okra productivity in the study area. Other factors include age of the farmers, farm size, farming experience and level of education of the farmer. Though not significant, all these variables tend to contribute toward improved farmers productivity except age which had an inverse relation with production levels of the farmers in the study area, hence, it could be deduced that older farmers were less productive than the younger ones.

Model 2 shows the most significant variables to be family labour and quantity of fertilizers used on farm. Others are quantity of herbicides used and the variety of okra seeds. It could be observed from this study that increase in family labour seems to have potential to improve productivity of okra farms. Also, a reasonable increase in fertilizer input seems to improve the level of productivity of the farmers; however, there seems to be an over-utilization of herbicides among the selected farmers. Moreover, farmers planting improved seed varieties were observed to have better productivity than those planting local seed varieties.

Model 3 reveals that only fertilizer input was significant when considering the production function of the farmers using improved seed varieties. Increase in fertilizer input seemed to contribute toward improved productivity among this group of okra farmers in the study area. Other inputs are family labour, hired labour, herbicides and quantity of seeds planted. However, it was observed that there was an over-utilization of hired labour input in the okra farms.

Model 4 shows the significant factors that are responsible increased productivity of local seed varieties of okra in the study area. It was observed that all the variables considered for okra production were significant. These include family and hired labour, fertilizer, herbicides and seeds. Increase in family labour and fertilizer input significantly contributed toward improved productivity in the study area. On the other hand, hired labour input, herbicides and seeds were observed to be over-utilized. It follows that there need to be a considerable reduction in the level of utilization of factors if a farmer aims at improving his productivity level or increase his output level.

The Chow test was used to test the hypothesis that there is no significant difference between the two okra varieties cultivated in the study area. The Chow test is computed thus:

$$\omega_t = \frac{(RSS_I - RSS_L) / r \sim F_{r,\, n-k}}{(RSS_L) / n\text{-}k}$$

Table 1: Socio-economic characteristics of the selected farmers

Socio-economic characteristic	Frequency	% Frequency	% Cumulative frequency	Standard deviation	Mean
Sex:					
Male	78	78.0	78.0		
Female	22	22.0	100.0		
Age:				8.86	26.80
20-29	56	56.0	56.0		
30-39	24	24.0	80.0		
40-49	16	16.0	96.0		
50 & above	4	4.0	100.0		
Educational level:				2.80	12.66
Primary	10	10.0	10.0		
Secondary	48	48.0	58.0		
OND	28	28.0	86.0		
HND/B.Sc.	14	14.0	100.0		
Experience:				10.53	13.60
1-10	52	52.0	52.0		
11-20	24	24.0	76.0		
21-30	16	16.0	92.0		
31-40	8	8.0	100.0		
Farm size:				1.22	1.53
< 1 acre	6	6.0	6.0		
1.00-1.99	68	68.0	74.0		
2.00-2.99	14	14.0	88.0		
3.00-3.99	6	6.0	94.0		
4 & above	6	6.0	100.0		
Household size:				1.65	4.34
1-3	30	30.0	30.0		
4-6	64	64.0	94.0		
7 & above	6	6.0	100.0		
Contact with extension agents:					
Weekly	12	12.0	12.0		
Monthly	54	54.0	66.0		
Quarterly	12	12.0	78.0		
Yearly	22	22.0	100.0		

Source: Field Survey, 2010

Table 2: Productivity comparison of the two okra varieties cultivated in the study area

Variety	Output/manday of family labour (kg/md)	Output/manday of hired labour (kg/md)	Output/bag of fertilizer (kg/bag)	Output/litre of herbicide (kg/litre)	Output/kg of seed input
Improved	2.5598	3.5559	1.0279	2.2385	2.0889
Local	0.9929	1.5675	0.4537	1.4402	0.6566

Source: Field Survey, 2010

Where

RRS_I = Sum of the square error of Model 3; RSS_L = Sum of the square error of Model 4;

r = number of restricted variables (i.e. 1); n = population size; k = total number of variables.

The computed F value is 59.6379, while the critical value is 3.92. Therefore, it could be concluded that there is significant difference in the levels of productivity of improved and local varieties of okra in the study area. This result confirms the productivity comparison presented in Table 2.

CONCLUSION

It could be observed that most of the okra farmers in the study area were male and less than a quarter of the population is female; most of the farmers were still in their youthful productive age. The farmers had a relatively moderate average level of education and farming experience, while majority of them operate on a small scale of production. About two-thirds of the farmers had frequent contact with the ADP officials either on weekly or monthly basis. The male farmers were

observed to be more productive than their female counterparts; farmer's household size and frequency of contact with ADP officials were observed to be the most significant socio-economic variables among the farmers in the study area. The most significant economic variables among the farmers were family labour, fertilizer input, herbicides and seed variety. The fertilizer input was observed to be the only significant input among the farmers cultivating improved okra seed varieties; while all the variables were significant among the farmers cultivating local seed varieties, but increment in the level of resource use of hired labour, herbicides and quantity of planted seeds seemed to result in decline in output. Furthermore, the improved seed varieties were observed to contribute to enhanced productivity than the local varieties.

Recommendations: In the light of the result of this study, the following could be recommended toward improving the production and productivity of okra in the study area in particular and the country in the general.

- The issue of gender imbalance should be addressed in agricultural production; women should be encouraged to be actively involved in agricultural activities which could enhance household food security.
- Efforts should be made to encourage more youths in agricultural through the provision of social amenities that would discourage rural-urban migration of the youthful agricultural forces.
- Governments at all levels should endearvour to recruit more extension agents so as to reduce farmer-extension agents ratio and thereby increase the frequency of farmers' contact with the ADP officials.
- It is necessary for the farmers in the study area to acknowledge that there is need for them to increase the level of family labour and on the other hand reduce the level of hired labour if they would achieve the aim of increased production and productivity.
- All the stakeholders in okra production should make emphasis on the importance of fertilizer in improving the productivity of the crop; it is evident from the study that there is no substitute to utilization of fertilizers among the selected farmers.
- The farmers should consider optimal utilization of resources: farmers cultivating local okra varieties should deem it fit to reduce the quantity of herbicides used and quantities of seeds sown on their farms.
- Finally, all farmers should make up their minds to adopt improved seed varieties without any reservation. Government agencies responsible for agricultural input distribution should promote circulation and successful delivery of improved seed varieties. Such should be made available and affordable to the farmers.

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