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Constraints to Increasing Soybean Production and Productivity in Benue State, Nigeria

Mary. O. Agada[1*]

[1]Knowledge, Innovation and Extension Programme, Institute of Food Security, University of Agriculture, P.M.B. 2373 Makurdi, Nigeria.

Author's contribution

The sole author designed, analyzed and interpreted and prepared the manuscript.

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ABSTRACT

Apart from its industrial uses, soybean is a cheap plant food source that the low-income population in Nigeria depends on for protein and nutrient needs, but there is a decline in its production and productivity. Identifying the production constraints is critical to formulating policies and programmes that would boost soybean output for domestic and industrial utilization. This study was undertaken in twelve villages of Benue State, Nigeria where a random sample of 120 soybean farmers was interviewed using a structured questionnaire. Data was analyzed using descriptive statistics and factor analysis. The findings showed that the average age of the farmers, mean household size and mean soybean farming experience were 43 years, 12 persons and 16 years respectively. Also, the mean farm size was 2.1 hectares with an average annual soybean farm income of 61,758 Nigerian Naira (US$385.99). The study further found that the constraints of marketing, production and linkages hampered the increased production and productivity of soybean in Benue State. In the light of the above, there is need for training and re-training of extension workers to effectively disseminate soybean improved technologies to farmers. In addition, extension agents should provide soybean farmers marketing information, establish viable links between respondents and relevant stakeholders in order to improve access to inputs and modern technologies while the local

**Corresponding author: E-mail: maryagada59@gmail.com;*

and state governments establish rural markets with good marketing infrastructure and good rural roads to enable farmers have high returns on soybean investment.

Keywords: Constraints; production; productivity; soybean farmers.

1. INTRODUCTION

Improved diet and nutrition are important factors in the promotion and maintenance of good health throughout life. Their role in reducing chronic non-communicable diseases is well established and therefore occupies a prominent position in prevention activities [1]. In Nigeria, 60% of deaths are related to protein-energy malnutrition (PEM), particularly among children [2]. The average Nigerian consumes about 3.2 grams of animal protein daily as against the minimum requirement of 35 grams per person per day [3]. Due to the dearth of animal protein, the low-income population increasingly depends on plant food sources such as soybeans to meet their protein and other nutrient demands [4]. Soybean (*Glycine max*) is an important source of high quality and inexpensive protein and oil. It is a cheap protein-rich grain and contains 42.8% high quality protein, 22.8% edible vegetable oil, 33% carbohydrate and a good balance of amino acids [5]. Soybean oil is 85% unsaturated and cholesterol free when compared with other legumes and other animal sources [6]. This indicates that the crop has a tremendous potential to improve the nutritional status and welfare of the families of resource poor farmers [7]. Soybean is also medicinal and is extremely useful for treatment of malnutrition, particularly among children, and in the fight against diseases such as heart disease, cancer, diabetes, high blood pressure, stroke, ulcer as well as the loss of body mass among people living with HIV/AIDS [8-10]. The promotion of soybeans is valuable in countries such as Nigeria where other sources of high quality protein are too expensive and the purchasing power of a large percentage of the population is low.

Nigeria is Africa's leader in soybean production [11]. Benue State is the largest producer of soybeans in Nigeria, producing about 175, 000 metric tons out of the estimated national production of 437,000 metric tons in 2007 [12], the period for which data is available. Soybeans are used for human consumption as well as animal feed. It is also used in the industries as anti-corrosion agent, core oil, and bio-fuel due to less or no nitrogen element in the oil, and as disinfectant, in pesticides, printing inks, paints, adhesives, antibiotics and cosmetics [13].

Government policies to increase food production, including soybean production and to boost agricultural output for industrial and domestic utilization in Nigeria are in place. These include support for food security, import restrictions or outright ban on some commodities including vegetable oil, fish and poultry products [14]. Despite these policies, the country recorded about 10% decline in soybean production between 2006 and 2007 [12]. The decline may be attributed to the production problems being encountered by farmers in the state acclaimed as the largest producer of the crop in Nigeria. Hence, the purpose of this study was to determine the constraints militating against soybean production and productivity in Benue State and suggest possible strategies for solving the problems in order to meet the increasing demands for the crop for both domestic and industrial uses.

2. METHODOLOGY

The study was conducted in Benue State, Nigeria, which lies between Latitude 6º30 N and 8º10 N and Longitude 6º35 E and 10º E. Geographically, the State lies within the southern Guinea savannah agro-ecological zone of Nigeria and has an estimated population of 4.22 million [15] and 413,159 farm families [16].

The population for the study comprised all the soybean farmers in Benue State. In this study, the multi-stage sampling technique was used for sample selection. The State is divided into three agricultural zones viz: Eastern, northern and central zones. The northern zone which is made up of 14 extension blocks and 112 cells was purposively selected for this study because it constitutes the zone where soybean is most extensively grown [7]. Using simple random sampling technique, 4 extension blocks were selected from the 14 blocks in the zone while 3 cells were selected from each block giving a total of 12 cells. Finally, 10 soybean farm households

were randomly selected from each of the 12 cells giving a total sample size of 120 soybean farmers. Data was collected mainly from primary sources using a structured questionnaire between April and May, 2011. Data was analyzed using descriptive statistics such as frequency and percentage. The Rotated Factor Matrix was used to isolate the constraint factors to soybean production and productivity in Benue State. The factor loading under each constraint (beta weight) represents a correlation of the variables (constraint areas) to the identified constraint factor and has the same interpretation as any correlation coefficient. However, only attributes with loadings of 0.40 and above (10% overlapping variance) [17] were considered in naming the factors.

3. RESULTS AND DISCUSSION

3.1 Socio-Economic and Demographic Characteristics of Respondents

The descriptive characteristics for survey respondents are reported in Table 1. Men constitute the majority (70%) for this study. This is consistent with an earlier report that soybean was traditionally a male crop in Benue State [7]. Most (59.2%) respondents were in the age bracket of 31-50 years followed by 51-70 years (25.0%) and 21-30 years (15.8%) with an average age of 43 years. About 85% were married, 10.8% were widowed and 4.2% were single (never married). Majority of the respondents being married implies that household heads could access extra financial support as well as physical inputs from their spouses in the form of labour provision in soybean production thereby boosting production and productivity. The educational levels of respondents were 35.9% for those at the basic level which was the highest, followed by secondary level (27.5%), higher level (10.8%) and non formal education (25.8%) respectively. This implies that majority (84.2%) of soybean farmers were educated. Although formal education is thought to create a favourable mental attitude for the acceptance of new practices, especially information-intensive and management-intensive practices [18], this study showed that the education of soybean farmers did not translate into increased crop production as evidenced in small farm holdings. Furthermore, the minimum number of persons per household was 1-5 (14.2%) while the maximum was 6-10 persons (47%) with an average household size of 12 persons. The large household size is an advantage for labour provision in soybean production.

Table 1. Distribution of producer characteristics across demographic variables (n=120)

Characteristics	Percentage	Mean
Gender		
Male	70	
Female	30	
Age (years)		
21-30	15.8	
31-40	32.5	
41-50	26.7	**43.3**
51-60	17.5	
61-70	7.5	
Marital status		
Married	85	
Single	4.2	
Widow	10.8	
Educational status		
No formal education	25.8	
Primary education	35.9	
Secondary education	27.5	
Tertiary education	10.8	
Household size (number of persons)		
1-5	14.2	
6-10	46.6	
11-15	18.4	**12**
16 and over	20.8	
Soybean farming experience (years)		
1-10	17.5	
11-20	39.2	
21-30	27.5	**16**
31-40	11.6	
41 and over	4.2	
Soybean farm size (ha)		
0.01-1.00	34.2	
1.01-2.00	39.2	
2.01-3.00	18.3	**2.1**
3.01-4.00	5.0	
> 4.00	3.3	
Sources of soybean farm labour		
Family	18.3	
Hired	4.2	
Both family and hired	77.5	
Annual soybean farm income (₦)		
< 50000 (US$312.51)	50	
50001-100000	35.8	**₦ 61, 758.00**
100001-200000	11.7	(US$385.99)
> 200000 (US$1250.00)	2.5	

The findings also show that the minimum soybean cropping experience was 1-10 years (17.5%) while the maximum was more than 41 years (4.2%) with an average of 16 years. The long years of soybean farming experience is an advantage for increased investment, productivity and technological capability since acquisition of technological capabilities is essentially a learning process [19]. The minimum area of cultivation

was 1-2 hectares cultivated by majority (73.4%) of the respondents while the maximum farm size was more than 4 hectares with a mean farm size of 2.1 hectares. This indicates that majority of the respondents were small-scale farmers. This finding is different from earlier studies which reported an average soybean farm size of 1.1 hectares in Gboko, a city in Benue State and 0.5 hectares in areas further away from Gboko [20]. The mean soybean farm size for improved varieties was 0.95 hectares [21]. Furthermore, the study revealed that the minimum annual income from soybean cultivation was less than 50, 000 Nigeria Naira (US$312.51) for half of the respondents while the maximum was more than 200,000 Nigeria Naira (2.5%) (US$1250.00) with an average annual soybean income of 61,758 Naira (US$385.99). Again, this shows that majority of the respondents are small-scale producers. This finding confirms earlier research which showed that soybean is a smallholder crop in Benue State [22].

3.2 Farmers' Perception of Constraints to Soybean Production and Productivity

A total of three factors were extracted to give a clear picture of the extent of the constraints. The extracted factors, in order of importance, were marketing problems, production problems and linkage problems (Table 2).

3.2.1 Marketing problems

An assessment of the loadings showed that marketing problems was dominated by insufficient working capital (0.552) which is often a result of inadequate or poor access to credit and farmers' inability to earn sufficient income and save adequately for investment. This implies that the majority of the respondents were poor farmers who do not have adequate financial resources to boost production. As a result of inadequate capital, many small-scale farmers may not be able to expand their scale of production and/or take advantage of profitable packages of technology to boost productivity. The implication of this finding is that agriculture departments and extension agencies at the local, state and federal levels should link farmers to sources of credit for improved soybean production and productivity.

The high cost of farm inputs, or even its unavailability, was the next problem reported in the study (0.522). This is in line with the finding that the adoption of many improved packages of technology has been compromised by the lack of availability of other complimentary farm inputs [23]. The implication of poor access to farm inputs by farmers is that agricultural extension agencies should link farmers to agro-inputs to enable them purchase vital inputs at the right time and at reasonable prices. Another problem was that of inefficient marketing arrangements characterized by the activities of the middlemen (0.510). This finding corroborates with a report that soybean farmers in Benue State operate through middlemen because most buyers of the produce are located outside the State [22]. This could result to low returns on soybean investment for farmers as the traders share in farmers' profit. Consequently, farmers may not earn adequate income to purchase vital inputs which could increase production and productivity. This was followed by high cost of transportation (0.496) arising from poor road infrastructure and lack of adequate market infrastructure such as stalls, toilets, water, etc. (0.433). However, FAO observed that a good marketing infrastructure, maintenance of rural roads and marketing services have profound effects on food availability, market prices and physical access to food at the community level [24]. Conversely, poor marketing infrastructure, particularly market stalls limit the length of time that the crops can be stored, thereby resulting in low returns on investment for farmers.

3.2.2 Production problems

The finding of this study revealed that majority of soybean farmers were educated and have poor knowledge of improved production techniques (0.712), which could hamper adoption and transfer of innovation. The poor knowledge of good practices could be attributed to inadequate training opportunities for farmers (0.588) as a result of insufficient numbers of extension workers who are skilled in training and agricultural information dissemination. It is important to note that an adequate number and quality of human resources with practical experience, skills and aptitude is a factor that enhances technological capabilities in developing countries such as Nigeria [25]. It is therefore imperative for extension agency in Benue State to strengthen the inherent capacities of soybean producers through workshops and in-farm training to enable them to solve their problems and make appropriate farming decisions. Shortage of farm labour (0.619) was a major problem of soybean production, though majority of the respondents were married with large

household sizes. This may mean that the available labour was inadequate to take care of the needed labour. This finding corroborates with a report that shortage of labour is a major problem of agricultural production in Nigeria, especially at the peak periods of labor demand (during land preparation, planting, weeding, and harvesting) due to the increasing migration of able-bodied youths from rural to urban areas [26]. The shortage of labour reported in the study area could also be attributed to lack of access to labour-saving technologies for soybean production and processing (0.568). This is consistent with the findings that non-availability of improved and modern technologies for agricultural production, including soybean production, which are time and energy saving is one of the main constraints in agricultural production in Nigeria [26,27]. The implication for the government is to provide farmers with modern technologies at subsidized rates that will reduce the drudgery in soybean farming. Other problems identified included low soil fertility (0.533), incidence of insect pests and diseases (0.483) and weak or non-existence farmer groups (0.418). It was observed that soils in Africa have become exhausted because of the population pressure on the land and mineral fertilizers are too expensive for the resource-poor farmers to afford in quantities sufficient for sustainable agricultural intensification [28]. Furthermore, it was reported that a variety of pests such as insects, fungi, nematodes and viruses have devastating effects on the agronomics and economics of soybean production, affecting both yield and quality of grain and seed [29]. Similarly, soybean diseases caused by fungi, bacteria and viruses result in major yield losses in Nigeria [30]. These findings have implications for soybean researchers to develop resistant varieties of soybean for increased productivity.

3.2.3 Linkage problems

This factor was dominated by the problem of poor extension agent-farmer contact (0.594). Extension service in Nigeria is focused on improving productivity and production in line with the focus of government agricultural development programmes on improving food security. However, extension service has become ineffective due to the problems of insufficient number of extension workers who are skilled in training and in the dissemination of agricultural information [31]. In addition,

Table 2. Factors constraining soybean production and productivity in Benue State

Constraints	Factors*		
	1	2	3
Inadequate training opportunities for farmers	0.220	0.588	-0.083
Insufficient working capital	0.552	0.179	0.100
Lack of farmer participation in technology generation	-0.010	0.184	0.318
Low soil fertility	0.154	0.533	-0.068
Poor pricing of produce	0.387	0.267	0.178
Inefficient marketing arrangements characterized by activities of the middlemen	0.510	0.153	0.385
Lack of access to labour-saving technologies	-0.031	0.568	0.196
Shortage of farm labour	0.223	0.619	0.152
High market tolls	0.018	0.061	0.367
Lack/poor market infrastructure (stalls, toilets, water, etc.)	0.433	0.037	0.274
Incidence of insect pests and disease attack	-0.048	0.483	0.173
Poor produce advertisement	0.031	0.268	0.021
Unavailability and high cost of farm inputs (seeds, agro-chemical, fertilizers)	0.522	0.001	-0.288
Poor extension-farmer contacts	0.186	0.189	0.594
Poor knowledge of improved production techniques	0.163	0.712	0.038
Poor access to credit facilities	-0.425	0.200	0.489
Weak or non-existence of farmer groups	0.367	0.418	-0.002
Lack/weak linkage with external organizations	0.306	-0.265	0.522
High cost of transportation	0.496	0.112	0.352
Inadequate market information	-0.615	0.189	0.067

**Factor 1= Marketing problems; Factor 2= Production problems; Factor 3= Linkage problems*

the lack of motivation for the field staff could hamper their effectiveness. The implication of this finding is for agriculture departments and extension agencies at the local, state and federal levels to place emphasis on training and re-training of extension workers. In addition, efforts should be made by the local and state governments to ensure that the salaries and allowances of these workers are paid regularly. The problem of poor linkage with external organizations (0.522) was second under factor three. This may have contributed to the problem of poor access to credit facilities (0.489) reported by farmers. This has implication for extension organizations in Benue State to strengthen the link between soybean producers and extension agents as well as to promote the establishment of viable links between farmers and other external organizations such as educational institutions, financial organizations and research institutes and improve the effectiveness of farm-level soybean innovation strategies.

4. CONCLUSION

This study has revealed that soybean is still predominantly produced by males in Benue State. It also showed that the advantages of soybean producers being educated and in their productive age group with large family sizes and long years of farming experience have not translated into increased crop production as evidenced in small farm holdings. The constraints of marketing, production and linkages were found to hamper soybean production and productivity in Benue State.

In view of the foregoing conclusions, therefore, the following recommendations are made: (1) Extension agencies in Benue State should train and re-train extension workers to effectively transfer soybean improved technologies to farmers; (2) Extension workers should provide farmers with marketing information; (3) Governments at the local and state levels should establish rural markets with good marketing infrastructure and good rural roads to enable farmers access markets for the sale of their produce and have a high return on their soybean investment; (4) Governments at the local and state levels should encourage soybean consumers such as Taraku Mills Nigeria Ltd, Grand Cereals Ltd and Nestle Foods Nigeria PLC to provide farmers with modern technologies at subsidized rates to reduce the drudgery in soybean farming while research institutes like National Cereals Institute, Zaria and IITA, Ibadan develop resistant varieties of soybean for increased production; and (5) Extension agencies in Benue State should strengthen the link between soybean producers and other stakeholders for increased access to training, credit, inputs and improved technologies for soybean production.

COMPETING INTERESTS

The author has declared that no competing interests exist.

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