UNDER PEER REVIEW

Original Research Article

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

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

Keywords: constraints, production, productivity, soybean farmers

1. INTRODUCTION

The nutrition situation in Nigeria has continued to demonstrate the existence of protein-energy malnutrition, particularly among children [1]. The average Nigerian consumes about 3.2 grams of animal protein daily as against the minimum requirement of 35 grams per person per day [2]. 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 [3]. Soybean (*Glycine max*) is a cheap protein-rich grain and contains 42.8% high quality protein, 22.8% edible vegetable oil, 33% carbonate and a good balance of amino acids [4]. Soybean oil is 85% unsaturated and cholesterol free when compared with other legumes and other animal sources [5]. This indicates that the crop has a tremendous potential to improve the nutritional status and welfare of the families of resource poor farmers [6]. Soybean is also medicinal and is extremely useful in the fight against heart disease, cancer and diabetes, as well as in the prevention of body wasting among people living with HIV/AIDS [7]. 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.

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 [8]. 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 [9]. Despite these policies, the country recorded about 10% decline in soybean production between 2006 and 2007 [8].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

UNDER PEER REVIEW

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. Benue State lies between Latitude $6^0$30 N and $8^0$10 N and Longitude $6^0$35 E and 10^0 E with an elevation of 79kms above sea level. The climate of the State is generally described as tropical, with two clear differentiated seasons-wet and dry seasons. The wet or rainy season begins in April and ends in October while the dry season commences in November and ends in March. The annual rainfall ranges from 508 mm to 1006 mm while the annual temperature ranges from 21^0c to 35^0c. Geographically, the State lies within the southern Guinea savannah agro-ecological zone of Nigeria and has an estimated population of 4.22 million [10] and 413,159 farm families [11]. This State is predominantly rural with an estimated 75 percent of the population engaged in rain-fed subsistence agriculture. Popularly known as the "Food Basket" of the Nation, the State produces such crops as rice, sorghum, millet, yams, cassava, cocoyam, sweet potato, pigeon pea, soybeans and groundnuts as well as tree crops like citrus, mango, oil palm, guava, cashew, cocoa and *Avengia spp* [12] .

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 [6].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 were collected mainly from primary sources using a structured questionnaire. Data were analyzed using descriptive statistics such as frequency and percentage.

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 [6]. Most (59.2%) respondents belonged to the age of 31-50 years followed by the age of 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). This implies that the majority of the farmers could have access to extra financial support as well as physical inputs from their spouses in the form of labour provision in soybean production. The educational status shows that most respondents had primary education (35.9%) and others had secondary education (27.5%) and higher education (10.8%) while 25.8% had no formal education. This implies that majority (84.2%) of the soybean farmers were educated. This is an advantage for adoption and transfer of innovation since there is a positive correlation between level of education and acceptance of new ideas by farmers [13]. Thus, efforts to promote soybean production technologies should target educated farmers. Furthermore, most (47%) of the respondents had a household size of 6-10 persons, 20.8% had above 16 persons, 18.4% had 11-15 persons and 14.2% had 1-5 persons with an average household size of 12 persons. The large household size is an advantage for labour provision in soybean production.

The findings also show that about 39.2% of the respondents had 11-20 years soybean cropping experience, 27.5% had 21-30 years, 17.5% had 1-10 years, 11.6% had 31-40 years while 4.2% had above 41 years with an average soybean cropping experience 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 [14]. Majority (73.4%) of the respondents cultivated between 01and 2.00 hectares of soybean;18.3% planted between 2.01 and 3.00 hectares, 5% cultivated between 3.01 and 4.00 hectares while 3.3% had farms above 4.00 hectares with a mean farm size of 2.1 hectares. This indicates that the 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 and 0.5 hectares in areas further away from Gboko [15]

UNDER PEER REVIEW

and the mean soybean farm size of 0.95 hectares of improved varieties [16]. Furthermore, the study revealed that 50% of the respondents earned below 50, 000 Nigeria Naira per annum from soybean cropping with an average annual soybean income of 61,758 Naira ($398.44.00). Again, this shows that majority of the respondents are small producers. This finding concurs with earlier research which showed that soybean is a smallholder crop in Benue state [17].

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)		

UNDER PEER REVIEW

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	50	
50001-100000	35.8	
100001-200000	11.7	**61, 758**
> 200000	2.5	

3.2 Farmers' Perception of Constraints to Soybean Production and Productivity

The Rotated Factor Matrix of constraints to soybean production and productivity in the study area is depicted in Table 2. 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.

3.2.1 Marketing Problems

An assessment of the loadings showed that marketing problems was dominated by inadequate market information (-0.615). Farmers need information on where they could sell their produce to enable them to take appropriate production decisions. This was followed by insufficient working capital (0.552) which is often a result of inadequate or poor access to credit and the 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 for the agriculture departments and extension agencies at the local, state and federal governments and

UNDER PEER REVIEW

the corporate organizations such as Taraku Mills Nigeria Ltd, Grand Cereals Ltd and Nestle Foods Nigeria PLC is to 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 of that the adoption of many improved packages of technology has been compromised by the lack of availability of other complimentary farm inputs [18]. The implications for the three tiers of government and corporate bodies is to 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 that of who reported that soybean farmers in Benue State operate through middlemen because most buyers of the produce are located outside the State [17]. This results in low soybean prices most years, due to the tendency of the middlemen to eat deeply into the profit of the typical farmer. It was also reported that reliance on middlemen contributes to cost of production [19]. This was followed by lack of adequate market infrastructure such as stalls, toilets, water, etc. (0.433) and the high cost of transportation (0.496) arising from poor road infrastructure. 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 [20]. 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 shortage of farm labour dominated production problems (0.619). This corroborates the report of IITA that a major problem of agricultural production in Nigeria is the seasonal labour shortage, 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 [21]. This was followed by inadequate training opportunities for farmers (0.588). The implication for all levels of government is the need to recruit sufficient numbers of extension workers skilled in training and agricultural information dissemination. This is important because 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 [22]. Additionally, the extension agency in Benue State should strengthen the inherent capacities of soybean producers through workshops and in-farm training to enable them solve their own problems and make appropriate farming decisions. Another problem under this factor was lack of access to labour-saving technologies for soybean production and processing (0.568). This is consistent with the findings ~~of IITA and Asoegwu and Asoegwu~~ 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 [21, 23]. The implication for the government is that there is the need 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 of 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 [24]. Furthermore, it was reported that a variety of pests such as weeds, 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 [25]. Similarly, soybean diseases caused by fungi, bacteria and viruses result in major yield losses in Nigeria [26]. 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 [19]. In addition, 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 has implication for extension organizations in Benue State to strengthen the link between

UNDER PEER REVIEW

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.

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

UNDER PEER REVIEW

4. CONCLUSION

This study has revealed that soybean is still predominantly a male crop 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 conclusion, therefore, the following recommendations are made: (1) extension workers should provide farmers with marketing information; (2) agriculture departments and extension agencies at the local and state levels should establish rural markets with good marketing infrastructure and good rural roads to enable farmers have a high return on their soybean investment; (3) governments at the local and state levels and soybean consumers such as Taraku Mills Nigeria Ltd, Grand Cereals Ltd and Nestle Foods Nigeria PLC should be encouraged 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 (4) extension agencies in Benue State should strengthen the link between soybean producers and other stakeholders for increased access to training, inputs and improved technologies for soybean production.

COMPETING INTERESTS

The author has declared that no competing interests exist.

REFERENCES

1. Federal Ministry of Agriculture and Rural Development (FMARD). Report on the National Special Programme for Food Security (NSPFS) Extension Phase Project 2006-2010, FMARD, Abuja. 2006; 1-7.
2. Abu OA, Onifade AA, Abanikannde OTF, Obiyan RI. (2008). Status and promotional strategies for rabbit production in Nigeria. Available at: http://world-rabbit-science.com. Accessed 06:11: 2009.
3. Owolabi AO, Mac-Inegite JO, Olowoniyan FO, Chindo HO. A comparative study of the nutritional status of children in villages in northern Nigeria using and not using soybeans. Food and Nutrition Bulletin. 1996; 17(1): 42-48.
4. Raw Material Research and Development Council. Technical brief on agricultural commodities in Nigeria: Soybean No. 1. Federal Ministry of Science and Technology, Abuja; 2005.
5. International Institute for Tropical Agriculture. An effort to promote the production and consumption of soybeans as a means of improving nutrition in Nigeria. IITA/IDRC Soybean Utilization Programme Phase II Final Report. 1998.
6. Sanginga PC, Adesina AA, Manyong VM, Otite O, Dashiell KE. Social impact of soybean in Nigeria's southern Guinea savanna. International Institute for Tropical Agriculture, Ibadan; 1999.
7. Obatolu V. Impact of soybean utilization project on nutritional status of under five children. Pakistan Journal of Nutrition. 2006; 5 (4): 348-354.
8. Federal Ministry of Agriculture and Water Resources (FMAWR). Report of the 2007 Agricultural Production Survey (APS). National Food Reserve Agency (NFRA); 2008.
9. Raw Material Research and Development Council. Report on survey of agro-raw materials in Nigeria: Soybean. Federal Ministry of Science and Technology, Abuja, Nigeria; 2004.
10. National Population Commission (NPC). The 2006 Population Census Official Gazette (Extraordinary), Lagos. 2007; 94 (4): 52.
11. BNARDA. Crops Area and Yield Survey. Report by Benue agricultural and Rural Development Authority, Makurddi.1998.
12. Benue Agricultural and Rural Development Authority (BNARDA). Implementation Completion report on National Special Programme for Food Security (NSPFS), Makurdi, Nigeria. 2005.
13. Ajala AA. Factors associated with adoption of improved practices by goat producers in southeastern Nigeria. Research Monograph No.5. 1992.

UNDER PEER REVIEW

14. Oyelaran-Oyeyinka B. Technological capacity of system of innovation: Concepts and perspectives. Institute for New Technology. United Nations University. Proceedings of the Second Annual National Conference of Agricultural Extension Society of Nigeria. 2003; 92-97.
15. Woodworth J, Smith J, Dashiell A. Survey and crop season study of soybean in Benue State, Nigeria. Tropical Oil Journal. 1992; 1:75-76.
16. Smith J, Woodworth JB, Dashiell KE. Government policy and farm level technologies: Expansion of soybean in Nigeria. Research No.1, International Institute for Tropical Agriculture, Ibadan. 1995; 14-18.
17. Ater PI. Information on soybeans in Benue State. Makurdi: UNITAS Consultants 2006.
18. Falusi AO. (1997). Agricultural development and food production in Nigeria. In B . Shaib B, Adedipe NO, Aliyu A, Jir MM, editors. Integrated agricultural production in Nigeria: Strategies and mechanisms for food security. Proceedings of the National Workshop on Nigeria's Position at the World Food Summit Abuja, Nigeria. July 31st –August 2nd 1996. Monograph 5, National Agricultural Research Project (NARP), 1997.
19. Shaib B, Adedipe NO, Aliyu A, Jir MM. Integrated agricultural production in Nigeria: Strategies and mechanisms for food security. Proceedings of the National workshop on Nigeria's position at the World Food Summit. Monograph 5, National Agricultural Research Project, Abuja. 1997; 15-70.
20. Food and Agriculture organization of the United Nations. Agriculture, food and nutrition for Africa. A resource book for teachers of agriculture. Rome, 1997.
21. Namusonge GS. The Role of Financial Institutions in the Acquisition of Technological Capabilities by Small and Medium Enterprises in Kenya. ATPS Working Paper Series No. 41, African Technology Policy Studies Network, Nairobi, Kenya; 2004.
22. International Institute for Tropical Agriculture. Agriculture in Nigeria: Identifying opportunities for increased commercialization and investment. IITA, Ibadan. 2005.
23. Asoegwu SN, Asoegwu AO. An overview of agricultural mechanization and its environmental management in Nigeria. Agricultural Engineering International: The CIGR Ejournal. 2007; 9(6): 6-18.
24. Chianu JN, Ohiokpehai O, Vanlauwe B, Adesina A, De Groote H, Sanginga N. Promoting a versatile but yet minor crop: Soybean in the farming systems of Kenya. Journal of Sustainable Development in Africa. 2009; 10 (4): 324-344.
25. Conner T, Pascha EH, Barbero A, Johnson E. The challenges and potential for future agronomic traits in soybeans. AgBioForum. 2004; 7(1&2):47-50.
26. Dugje IY, Omoigui LO, Ekeleme F, Bandyopadhyay R, Lava-Kuma P, Kamara AY. Farmers' Guide to Soybean Production in Northern Nigeria. IITA, Ibadan, Nigeria. 2009.