Determinants of Soybean production in Southwestern Nigeria

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Abstract

This study investigated the socioeconomic determinants of farm size allocated to soybean production in the new agroecological zone of Southwestern Nigeria. Data were collected by rapid rural appraisal (RRA) techniques. The data obtained were analysed using a multiple regression model. The results showed that only 35 per cent of the variance on the plot size was found to have been explained by the retained independent variables. The significant variables included the sex of the household head, the number of years since the farmer had been introduced to the soybean crop and the time the crop is harvested. The study concluded that the high rate of adoption of the crop is due largely to the media blitz that accompanied its introduction and the unprecedented support given the crop by external agencies

Keywords: New agroecological zone; soybean; production; Southwestern Nigeria.

INTRODUCTION

The soybean, *Glycine max,* is an herbaceous annual legume with a bushy, erect and rather leafy plant structure. It originated from China around 1100 to 1700 BC but was introduced into Europe only in the 17th century (Sinclair and Backman, 1989). It has since acquired a world-wide importance as a primary source of vegetable oil and protein. Benefits of soybean over other grain legumes commonly grown by smallholders, such as groundnut, *Arachis hypogaea*, cowpea, *Vigna unguiculata,* and common bean, *Phaseolus vulgaris*, include lower susceptibility to pests and disease, better grain storage quality, a large leaf biomass, which gives a soil fertility benefit to subsequent crops and a secure commercial market for the crop (Mpepereki *et al*, 1996).

Nigeria is the largest producer of soybeans for food in West and Central Africa. Soybeans were first introduced into Nigeria in 1908 (Fennel, 1966), but the first successful cultivation was in 1937 with the Malayan variety, which was found suitable for commercial production in Benue State in Central Nigeria (Nyiakura, 1982; Knipscheer and Ay, 1982, Oyekan, 1985 and Root *et al*, 1987). These producing areas of Central Nigeria have been responsible for a large proportion of the domestic requirement of this cheap source of plant protein. Following the ban on the importation of soybean and its derivatives in 1984, an increased production of the crop was observed both within and outside its traditional producing areas immediately afterwards (Smith *et al*, 1993).

With the ban, therefore, many growers started putting more land and resources into soybean production.

Though still largely regarded as a relatively new crop, soybean has made a successful incursion into the diet of many Nigerians, particularly children and nursing mothers. Soybean derivatives such as soy-gari, soymilk, soy-ogi and soy-lafun have been developed and found to be good substitutes for ersatz, more conventional food ingredients like melon, cow milk and cowpea (Osho, 2003). However, studies by Ogundipe and Osho (1990) and Osho *et al* (1994) have shown that despite the high nutritional value of soybean relative to other legumes, lack of knowledge of its uses has limited its adoption and production in non-traditional areas of cultivation.

To bridge this gap, numerous efforts have been undertaken by research Institutes and NGO's and industry to promote the production of the crop in Nigeria (Adjebeng-Asem and Osho, 1992; Osho, 1994). Of special interest to the authors is the UNICEF/IITA (1987) research on soybean production and utilisation technologies. An appreciable proportion of this research was concentrated in the densely populated parts of Southwestern Nigeria with the immediate aim of integrating it into the existing farming system and with the broader aim of seeing how it could alleviate the nutritional status of the people, particularly the women and children (Osho, 1987). The objective of this paper, therefore, is to investigate the relationship between the socioeconomic characteristics of the soybean farmers and the determinants of the adoption of the crop (as measured by plot size put to production) in the new agroecological zone of Southwestern Nigeria.

METHODOLOGY

Area of Study: The area of study is Southwestern Nigeria. The study area lies between latitudes 4^0 and 14^0 south and longitude 2^0 and 8^0 east and covers 114,271 km. This area is approximately 12 % of Nigeria's total land area. The zone covers an area ranging from swamp forests to derived savannah. In between are rain forests and deciduous forest/savanna mosaic. Most of the inhabitants of the area are engaged in subsistence farming and trading. The major crops cultivated are maize, cassava, cocoyam, yam and edible fruits. Soybean cultivation is one of the emerging agricultural activities in the area. There is also significant husbandry of small ruminants as a means of food security and a livelihood-hedging practice.

Sampling Technique: The study was conducted in Oyo, Ogun, Ondo, Osun and Lagos States of Southwestern Nigeria. Three (3) sites were purposively selected from each state. The choice of these sites is based on the intensity of soybean cultivation in the areas. For each location, the Department of Agriculture at the local government headquarters supplied the list of participants in the previous soybean projects. The local agricultural officers also helped in contacting the participants who constituted the core respondents in this survey. A total of 299 respondents were sampled for the study.

Data Collection: Data collection was by rapid rural appraisal (RRA) techniques using a checklist cum interview schedule. The structured instrument was used to collect both qualitative and quantitative data on the socioeconomic background of the respondents. The data were collected between June and November, 2002 since this is the period when most soybean growers plant and harvest their crop.

Methods of Data Analysis: Descriptive statistics comprising the use of frequencies, means, standard deviations and percentages were computed using SAS Software (1985). Furthermore, a multiple regression analysis was run to estimate the determinants of soybean production in Southwestern Nigeria. The model specification is as follows:

$$W = \beta_0 + \beta_I V_i + e_i$$

Where;

W = Plot size under soybean cultivation (ha)

β_0 = Intercept

β_i = Parameter estimates for the i explanatory variable

v_i = explanatory variable i (i = 1, 2, …,16).

e_i = error term

The analysis was performed for those who had grown the crop since 1994. The size of plot was used as an indicator of soybean expansion and as such was taken as the dependent variable of the model. The list and unit of data collected on the explanatory variables used in the analysis are as seen in Table 1.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of Respondents: Data in Table 2 show the socioeconomic distribution of the respondents. Of the 299 respondents interviewed, 50.5 per cent were males while 49.5 per cent were females with an age range of 15-85 years. The breakdown of the socioeconomic characteristics by state shows some discrepancies. Most respondents in Lagos (82 %), Ogun (62 %) and Ondo (68 %) were female and they were mainly processors or traders. In Oyo (68 %) and Osun (54 %), the majority of respondents were male soybean growers. The respondents can be divided roughly into three age categories: The young (15-35 years) represent 37 per cent, the middle aged (36-55 years) 40.4 per cent and the old (56 – 85 years) 22.7 per cent. The median age of all respondents is 45 years. Majority of the respondents (87.6 %) are married. Most of the growers were found to be in the middle-aged category and married. The question on the number of children though reluctantly answered by the respondents presented a general picture of a wide range between 1 and 10 children per grower. About 15 % gave no response at all to this question. This high proportion is attributable to the prevailing cultural practice in the study area where it is a taboo to disclose the numbers of one's children to strangers and non-family members. Table 1 also shows that most respondents have farming as their main occupation (54.5 %), followed by trading (24.4 %). Almost all the respondents who had farming as main occupation were soybean growers. The ethnic and religious compositions of the respondents reflect that a larger proportion is Yoruba (93.3 %) and Christian (62.9 %). The predominant level of educational attainment is primary level (24.7 %) while the majority of respondents (52.8 %) did not have any formal education. Only 11.4 % of the respondents had been to secondary school.

Determinants of Soybean Production: The results of the multiple regression analysis indicate that much of the variance on the plot size was not explained by the retained independent variables because the adjusted coefficient of multiple determinations accounted for only 35 % of the change in the dependent variable, as seen in Table 3. However, five variables (the number of wives, the number of years of formal education, the sex of the household head, the number of years of introduction of the farmer to soybean production and the time of harvest of the crop) significantly affect the size of soybean plot at 5 per cent and 10 per cent levels of significance.

The coefficient of the number of wives variable is significant but negative, indicating an inverse selected the model because it is a relationship with the plot size. That variable was for inclusion in social indicator in the area of overall homestead wealth. However, this finding does suggest that soybean is primarily adopted by the poor rather than wealthy farmers in the new area of Southwestern Nigeria. At first look, such conclusion

goes against previously held opinions by researchers such as Polson and Spencer (1991) and Grisley (1994) that the probability of adopting technologies increases with the level of economic resources available to subsistence farmers. Personal correspondences with the farmers indicate that the spread of soybean among smallholders has been facilitated by the transfer of risk associated with the adoption of the technology from farmers to the public sector. The educational level variable has a negative relationship with the plot size, the crop being adopted mostly by farmers with a low level of education.

This reinforces the role of less-wealthy farmers in the spread of soybean in Southwestern Nigeria especially when compared against the fact that poor farmers were the focus of agencies that were promoting theadoption of soybean as an alternative source of cheap protein. These findings are therefore consistent with the broader aim of the project and are indicators of the positive impact of the project. However, the sign of the sex variable is somewhat at discrepancy with the other findings of the research and it is the first variable to show that less marginal members of the society did adopt soybean as a crop. Men adopted soybean production more readily than women farmer since the relationship with the plot size is negative. This result would mean that the project's expected benefits "for especially women and children" are shared by the family as a whole, with a probable risk of these benefits being enjoyed more by the men folk, given the existing dynamics of household structures in the study area where the satisfaction of the well being of the household head, in most cases the man, is pursued at the expense of other household members. The true extent of the last statement is best appreciated in the light of the paucity of resources available to the household as a whole.

The coefficients of the time-effect variables (years of introduction to soybean production and time of harvest) have a positive relationship with the dependent variable. Indeed, farmers who have been growing soybean continuously for a long period have better knowledge of the crop and are likely to expand the cultivated area more readily than newcomers would. Long exposure to a new (complex) technology increases farmers' skills thus reducing the risk of failure associated with the adoption of the technology. Availability of a good risk bearer (the public sector, either national or international, NGOs, or private companies), may increase the possibility of adoption of technology among these resource-poor farmers. The delay in harvesting time had a positive effect on the expansion of the area put to the production of the soybean crop as well. Farmers who harvest in November, i.e., those who planted in late July/early August cultivated more soybean than those who harvested early in October. The soybean crop is well known for pod shattering which reduces farmers' income. Early planting in early July demands early

harvesting in October to avoid losses at harvest. October is however the month for the last rains of the second cropping season and high relative humidity in Southwestern Nigeria. An early harvest in October does not make it easy for farmers to dry and process high-quality seeds with low moisture content, thus making adequate storage extremely difficult. Rot, fungi attacks and mould develop on the seeds (raw materials) which deteriorate the quality of soybean-based products. This leads to price falls in the market and sometimes the product is rendered unsuitable for human consumption. Therefore late harvesting, i.e. after planting in late July-early August, is a strategy that originated from the farmers to produce soybean-based products of good quality for the market. Early planting in early July might be recommended for late-maturing varieties or only if improved varieties with low to nil pod shattering are made available by agricultural research centres and released to the farmers.

While it is noteworthy that cultural practices such as fallow period and continuous cultivation, alternative methods of harvest and storage, crop disposal and constraints on soybean production did not exert any significant effect on soybean spread in the studied area, it might be a result both of soybean's relative newness in Southwestern Nigeria (and the inevitable experimentations to determine best practices) and the many assistances given by external agencies during this period which would have helped to offset some of the shocks to the farmers arising from the relative newness of soybean in the study area.

CONCLUSION

Soybean is a relatively new crop in Southwestern Nigeria compared to the traditional growing areas in the middle belt of the country. The expansion has been facilitated by factors such as the unprecedented awareness campaigns targeted at farmers' to the end that soybean is a source of cheap high quality protein for those who represent the majority of the rural settlers; low pressure from pests and diseases as a result of the fact that soybean is a new crop in the area compared to cowpea, an indigenous crop with several on- and off farm insects pests and diseases; guaranteed market caused by both a low supply/demand ratio and a diversity of soybean-based products available to the consumers. Also of importance to the adoption of soybean in Southwestern Nigeria is the fact that the risk associated with the adoption of the technology was adequately covered by external agencies. This highlights the role of appropriate groundwork and support in launching a new crop for small-scale farmers in a non-traditional growing area. To this end, a well articulated plan of action is a must in the successful promotion of the adoption of the soybean crop in a new growing area. Lastly, farmer-to-farmer transfer mechanisms are crucial to determining the

successful spread of a new crop after the first action has been initiated by policy makers to introduce it to the farmers. There is the need for the policy implementers to embark on economic analysis to quantify both the benefits for the rural households involved in the production of the new crop as well as the social cost induced by external agencies interventions if the spread of soybean production, is to be sustained.

Table 1: Explanatory Variables for the Regression Model

Variable	Description	Unit
Age	Age of respondent	Years
Wives	Number of wives	Numbers
Child	Number of children	Numbers
Educ.	Level of education	Dummy
Sex	Sex of respondent	Dummy
Yr. Intr.	Number of years of introduction to soybean	Years
Problems	Problems of soybean production	Dummy
Yr. Cult.	Number of years of continuous cultivation on soybean plot	Years
Yr. Fallow	Number of years of fallow on soybean plot	Years
Harvest T.	Time of soybean harvest	Dummy
Harvest H.	Method of soybean harvest	Dummy
Nr. People	Number of other people known to be growing soybean	Numbers
Output	Farmers' estimate of output	Bags of 1.5 kg threshed bean
Soyatime	Time of planting	Dummy
Soy-farmer	Whether growers regarded themselves as soybean farmers	Dummy
Storemeth Dummy	Soybean storage method	

Table 2: Socioeconomic Characteristics of Respondents (in per cent)

State	Oyo (77)	Osun (63)	Lagos (34)	Ogun (69)	Ondo (56)	Total (229)
Sex						
Male	86	54	18	38	32	50.5
Female	14	46	82	62	68	49.5
Age Category						
15-35	32	33	44	26	20	37.0
36-55	60	54	32	46	45	40.3
56-85	8	13	24	28	35	22.7
Marital Status						
Married	86	92	82	84	93	87.6
Widow/widower	-	-	-	4	-	1.0
Single	6	3	6	10	4	6.0
No Response	8	5	12	2	3	5.4
Main Occupation						
Farming	81	57	18	38	59	54.5
Trading	51	30	62	29	16	24.4
Others	10.1	13	14.1	27.2	21.4	17.4
No Response	3.9	-	5.9	5.8	3.6	3.7
Ethnic Group						
Yoruba	97.4	96.8	85.3	92.8	89.2	93.3
Igbo	1.3	-	2.9	1.4	1.8	1.3
Hausa	-	-	-	-	1.8	0.3
Others	-	1.6	2.9	-	3.6	1.3
No Response	1.3	1.6	8.8	5.8	3.6	3.7
Religion						
Christian	51.9	58.7	52.9	56.5	96.4	62.9
Muslim	45.5	39.7	38.2	37.7	3.6	33.8
Others	1.3	-	2.9	1.4	-	1.0
No Response	1.3	1.6	5.9	4.3	-	2.3
Education						
No Formal	46.8	65.1	38.2	47.8	62.5	52.8
Primary School	29.9	19.0	26.5	26.1	21.4	24.7
Others	20.8	15.9	29.4	20.2	16.1	19.7
No Response	2.5	-	5.9	5.8	-	2.7

Source: Computed from Survey Data, 2002. Figures in parentheses are number of respondents

Table 3: Determinants of Soybean Production

Variable	Parameter	S.E.	T for H_0	Prob > (T)
Intercept	1.553697	0.97639981	1.591	0.1159
Age	0.004932	0.0114199	0.432	0.667[ns]
Wives	-0.613638	0.25182763	-2.437	0.0173**
Child	0.055459	0.04911333	1.129	0.2626[ns]
Education	-0.317091	0.14835483	-2.137	0.0360**
Sex	-1.034424	0.43569948	-2.374	0.0203**
Year Introduced	0.213931	0.11260269	1.900	0.0615*
Problems	-0.012422	0.06335215	-0.196	0.8451[ns]
Year Cultivated	0.092935	0.07409109	1.254	0.2138[ns]
Years Fallowed	-0.024104	0.12385679	-0.195	0.8462[ns]
Harvest Time	0.309385	0.18527678	1.670	0.0993*
Harvest Type	0.022366	0.25633216	0.087	0.9307[ns]
No. of People	0.066225	0.07600727	0.871	0.3869[ns]
Output	-0.006468	0.04542702	-0.142	0.8872[ns]
Soya-time	0.173724	0.10677725	1.627	0.1081[ns]
Soy-farmer	-0.001338	0.01051824	-0.127	0.8991[ns]
Storage Method	-0.016934	0.12402747	-0.137	0.8918[ns]
Adjusted Coefficient of Multiple Determination = 0.3545				

Source: Computed from Survey Data, 2002.
*** Significant at 5 per cent** *** Significant at 10 per cent** *ns = not significant*

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