

PERCEIVED FACTORS AFFECTING ADOPTION OF IMPROVED SOYABEAN PRODUCTION TECHNOLOGIES AMONG RURAL FARMERS IN NORTH CENTRAL NIGERIA

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Abstract

The study assessed factors affecting adoption of improved soyabean production technologies among rural farmers in North Central Nigeria. All the soyabean farmers in North Central Nigeria formed the population of the study. Multi-stage sampling techniques was used to select 320 respondents for the study. Primary data were obtained by means of structured questionnaire administered to the respondents. The data were analysed using frequency, percentage, mean score and factor analysis. The results shows that (58.9 %) of the respondents were male, many (41.0 %) of the respondents were between 21 and 40 years of age with mean age of about 36. The result also shows that many (81.3%) of the respondents were married, while (12 %) of them were single. The results further shows that (49.4 %) of the respondents had household size ≤ 6 persons. Most (95.0 %) of the respondents indicated farming as their primary occupation also, majority (92.8 %) of them were into full time farming in the pooled results. The results shows that majority (88.4%) of the respondents have high level adoption of NCRI recommended planting season of June–July as soyabean production technology, many (79.4 %) of them adopted Sam soy2, about 63.1 % of them adopted fertilizer (N.P.K) 3bags and SSP4bags/ha. Major constraints to adoption of improved soyabean production technologies were related to socio-economic, infrastructural and institutional constraints. In conclusion, the adoption of improved soyabean production technologies by farmers leads to increase in farm output Based on the results, it is recommended that farm input supply should be timely and at affordable price, there should be creation of awareness and farmers training on technology usage, there should be provision of credit and loans to farmers, more markets and good roads should be made available mostly in the rural areas.

Key words: Adoption, Improved Soyabean, Production Technologies, Farmers

Introduction

The concern of many Nigerians today is how the generality of the poor masses can be empowered to be self-reliant. The government and some non-governmental bodies have been grappling with some strategies put in place to combat poverty, so as to reduce it to the barest minimum (Fayam, 2004). The importance of agriculture to national development cannot be over-emphasized because agriculture is the major source of livelihood for man and animals. Nobody can do anything without food. Generally, all nutrients that are essential for normal growth and development of humans are derived from Agriculture. These include carbohydrates, protein, vitamins, minerals, water, fat and oil. Malnutrition, especially protein-malnutrition in young children, continues to be the first and most outstanding health problem in Nigeria. It should be noted that majority of Nigerians in rural areas, are resource-poor and hardly able to afford even their carbohydrates daily requirements talk less of protein. Protein from animal sources is unaffordable by most farm-families, hence the wide spread of preventable protein-deficiency diseases in most rural communities in Nigeria.

It was becoming increasingly necessary to supplement protein requirement of Nigerians (especially the farm-families) with relatively inexpensive plant protein (Tiamiyu et al., 2001). Soybean is a farm crop that belongs to the family of legumes. It is scientifically called (*Glycine max (L) Merrill*). It is an annual herbaceous plant which is bushy, erect and with leafy plant structure. Soyabean, popularly called the "poor man's meat", contains 40.3% protein, 20% oil and as high as 91.9% total digestible nutrient (Fukushima, 2000; Fabiyi, 2007). Health benefits of soyabean include prevention of heart diseases, cancer, high blood pressure, diabetes-related diseases and many others. Soyabean oil is rich in fatty acids and devoid of cholesterol. It is an excellent source of calcium, iron, and vitamins such as niacin, thiamin and riboflavin (World's Healthiest Foods, 2004). Consumption of food containing soyabean constituents has been associated with reduced heart disease risk factors, reduced osteoporosis; alleviation of menopausal symptoms reduced cancer risk and in a limited number of studies reduced diabetes. It also helps people to stay lean (reduced obesity

Soyabean is produced in large quantity in the Middle-belt and Northern States of Nigeria and is readily available in most markets in the Southern and Western States due to virile activities of merchants. Soyabean products and their uses have been promoted in Nigeria (Odebode, 2005), particularly in the Eastern States of Nigeria through the extension unit of the Agricultural Development Programme (Mathews-Njoku, 2005). The promotion of soyabean by the agricultural extension service (especially the women in agriculture- WIA) have lead to the emergence of several varieties of soyabean products in both rural and urban markets in Nigeria. Soybean consumption according to International Institute for Tropical Agriculture (IITA)(2003), has increased

dramatically, improving nutrition particularly among the urban, poor and middle income groups. Soybean fortified products not only have more protein and minerals than their non-fortified counterparts, they are considerably cheaper than other sources of high-protein such as fish, meats, milk and other protein-rich legumes. Many Nigerians now incorporate soybean into their diets and the Nigerian Government has declared its production and utilization a national priority (IITA, 2003). Research efforts to improve the existing soybean varieties, to expand and increase production in Nigeria were initiated in different research institutes from the mid 1970's (Misari and Idowu, 1995). The adoption of new technology has been recognized as one of the essential tools to increase agricultural productivity. This has resulted in among other measures, development and dissemination of new improved technologies by the research institutes. The National Cereals Research Institute (NCRI) Badeggi has the national mandate for the genetic improvement of soybean crop. Improved varieties released and other production and post-harvest value addition technologies of soybean recommended by NCRI in Nigeria include: TGX1448-2E, TGX1904-6F, TGX1835-10E, TG X 1485-ID, Samsoy 2, correct spacing, NPK fertilizer application, use of herbicide, use of pesticide, mono-cropping etc (Amosun *et. al.*, 2009). In spite of all efforts made by concerned agencies to bring scientific discoveries to the door steps of the targeted farmers in Nigeria, the farmers seem not to be responding much to the waves of these changes (Obinne, 1991). It is against this back ground that this work has been carried out to examine the factors affecting adoption of improved soybean production technologies among rural farmers in North Central Nigeria.

The specific objectives of the study were to i describe the socio-economic characteristics of the respondents in the study area; ii identify improved soybean production technologies adopted by rural farmers and iii ascertain the perceived factors affecting adoption level of improved soybean production technologies in the study area.

Methodology

The study was carried out in North Central Nigeria. The zone has a land area of 296, 898 km² representing nearly 32 percent of the country's total land area (NBS, 2008). There are six states in the zone and the Federal Capital Territory, Abuja. The States include Benue, Kogi, Kwara, Nasarawa, Niger and Plateau. It is located in the central part of Nigeria and in the sub-humid region of the country, and bounded to Bauchi, Kaduna, Zamfara and Kebbi States to the north; Cross-River, Ebonyi, Enugu, Edo, Ondo, Ekiti, Osun and Oyo States to the south; Taraba State and Republic of Cameroon to the east and the Republic of Benin to the west. Situated between latitudes 6° 30" - 11° 20"N and longitude 7° - 10°E, the zone has 20.36 million people with the rural population constituting

77 percent(NPC, 2006). The major ethnic groups of the study area are the Gwari, Baruba, Bargana, Nupe, Tiv, Yoruba, Igala, Idoma, Angas and Birom. According to Shaib, Aliyu and Bakshi (1997), the total arable land in the area was estimated at 24.7 million hectares, but only 6.6 million hectares were under cultivation. This indicated that the zone had substantial scope for expansion of the agricultural area as only about 25 percent of the arable land was cultivated. Further, the large inter-annual variability of rainfall subjected the area to frequent dry spells that sometimes resulted in severe and widespread drought that imposed serious socio-economic constraints (FAO, 2001). Rainfall in the zone is largely seasonal and highly variable from year to year, with mean annual rainfall of between 1500 mm and 1800 mm in north and south respectively. The population for the study include all soyabean farmers in the North Central Nigeria which include; Benue, Kogi, Kwara, Niger, Nasarawa, Taraba Plateau states and the FCT Abuja. Due to the enormity of the population of the study, a sample size of three hundred (320) respondents was selected using purposive and multi-stage sampling procedure to select respondents from the lists obtained from the Niger State Agricultural Mechanization and Development Authority (NSAMDA) and the Benue State Agricultural and Rural Development Authority (BNARDA). First, two States, namely Niger and Benue were purposely selected. Niger State was selected because NCRI headquarter is located in Badeggi Bida, Niger State where most of the improved soyabean production and post- harvest technologies are developed and disseminated to targeted farmers, while, Benue State was selected because it is the leading soyabean production State in the Zone, Secondly, two Local Government Areas from each of the three zones in the two States making twelve (12) LGAs were selected using purposive sampling technique base on the high concentration of soyabean production in those local government areas. Thirdly, from the sampling frame of each LGAs, 1% of the respondents were selected using simple random sampling techniques resulting to sample size of 320 respondents used for the study. Data for this study were collected from primary source. Primary data were collected using a well-structured questionnaire through the help of agricultural extension agents covering the selected extension circles. Frequency, percentage and mean were used to analyze objective i and ii while the exploratory factor analysis was used to analyzed objective iii.

Results and Discussion

Socio-economic characteristics of the farmers

The results as shown in table 1 shows that many (58.9 %) of the respondents were male, while 41.1% of them were female in table 1. This indicates the dominance of male in soyabean production in the

study area, which could be due to the tedious nature of farm work that requires enormous strength and energy. This result is consistent with the work of Agwu *et al* (2008) who reported that majority (81.5 %) of the farmers were male in their study. The results show that a reasonable Proportion (41.0 %) of the respondents were between 21 and 40 years age bracket, while 37.8 % were between 41 and 60 years with mean of about 36, indicating that most farmers were young and able bodied producers. indicating that most farmers were young and able bodied producers. The result agreed with the findings of Aphunu and Otoikhian (2008) that majority of the farmers in delta State belong to age bracket of 30-49 years. The results further revealed that majority (81.3 %) of the respondents were married. The analysis of the data on the level of education of respondents shows that 71.6 % of them had formal education bellow 6 years whereas 20.6 % of them had 7-12 years of education, with mean of about 5 years. This implies that farmers in the study area had low level of educational attainment which can hinder them from reading and understanding extension bulletins. Most of the farmers that are engaged in subsistence agriculture in Nigeria have low Education and poor technical knowledge about the use of agricultural inputs, due to the poor educational background (Nworgu, 2006).

The results further shows that 49.4 % of the respondents had household size ≤ 6 persons, while a reasonable (44.4 %) Proportion had household size between 7-15 persons with mean of 7. Household size in traditional agriculture determines the availability of labour and level of production (Ani *et al.*, 2004). Most (95.0 %) of the respondents indicated farming as their primary occupation. Many (92.8 %) of them were into full time farming. From the pooled results majority (75.3) of the respondents had ≥ 10 years of farming experience while 18.4 % of them had years of farming experience ranging between 4-6 with mean of 19. Implying that farmers can easily accept new technologies and utilize them properly as increase in years of farming experience tends to increase adoption level. Improved agricultural technologies tended to be accepted and adopted by experienced farmers as they understand the importance of technologies in farming (Bello *et al.*, 2011). The results further shows that most (49.7%) of them had farm size ≤ 2.5 hectares of land with mean of 3, implying that land area used by farmers in the study area is small and can hinder them from engaging in large scale farming. This result is in consistent with the findings of Agwu *et al.* (2008) who reported that most of the farmers in the country cultivate below 2 hectares, many (89.4 %) of the respondents indicated that they do not have access to credit. This could hinder farmers from carrying farm work in large scale, as capital is needed to acquire farm input. One of the reasons for the decline in the contribution of agriculture to the Nigerian economy is the lack of a stable national credit policy and paucity of credit institutions which can assist farmers (Odoemenem and Obinne, 2010). Results

on annual farm income shows that a reasonable Proportion(44.7%) of the respondents had their annual farm income of \leq ₦ 100000 while 21.6 % of the respondents had annual farm income between ₦100001 – ₦ 200000. This could mean farmers had low level of income which can hinder them from purchasing farm input in the study area. Many (50.6 %) of the respondents do not belong to farmers organization. High level of social participation leads to high innovativeness among the respondents due to group dynamic effects (Onu and Madukwe, 2002).

Table 1: Distribution of Socio-Economic Characteristics of Respondents (n=320)

Variables	Frequency	Percentage	Mean.
Sex			
Male	187	58.9	
Female	133	41.1	
Total	320	100	
Age (yrs.)			
\leq 20	24	7.5	
21 — 40	171	53.4	
41 — 60	121	37.8	
61+	4	1.2	
Total	320	100	36
Marital status			
Married	260	81.3	
Single	41	12.8	
Widow	18	5.6	
Total	320	100	
Level of formal ed.(yrs)			
\leq 6	229	71.6	
7 — 12	66	20.6	
13 — 18	25	7.8	
Total	320	100	5
Household size			
\leq 6	158	49.4	
7 — 15	142	44.4	
16 — 24	13	4.1	
25+	7	2.1	
Total	320	100	7
Primary occupation			
Farming	304	95.0	
Civil servant	4	1.2	
Trading	12	3.8	
Total	320	100	

Farming Status	Frequency	Percentage	Mean
Full	297	92.8	
Part time	23	7.2	
Total	320	100	
Farming exp.(yrs)			
≤ 3	0.0	0.0	
4 — 6	59	18.4	
7 — 9	20	6.3	
10+	241	75.3	
Total	320	100	19
Farm size (ha.)			
≤ 2.5	159	49.7	
2.6 - 5.0	144	45.0	
5.1 - 7.5	11	3.4	
7.6+	6	1.9	
Total	320	100.0	3
Access to credit			
Yes	34	10.6	
No	286	89.4	
Total	320	100	
Annual farm income(#)			
≤ 100000	143	44.7	
100001 – 200000	69	21.6	
200001 – 300000	51	15.9	
300001+	57	17.8	
Total	320	100	191063.25
Membership of co.			
Non member	162	50.6	
Member	158	49.4	
Total	320	100	

Source: Field Survey, 2019

Farmers' adoption level of improved soybean production technologies

Table 2 shows the adoption level of improved soybean production technologies by farmers. The results shows that majority (88.4%) of the respondents had high level adoption of NCRI recommended planting season of June– July and many (79.4 %) of the respondents highly adopted Sam Soy 2, this could be as a result of its high yielding potential over other varieties. Many (63.1%) of the respondents have high level adoption of fertilizer (N.P.K) 3bags and SSP 4bags /ha, indicating

the possibility of increase in crop yield as application of improved agricultural practices have positive impact on crop yield. The results of the study revealed that 54.7 % of the respondents have high level adoption of single cropping. Some (45.3%) of the respondents adopted TGX 1448-2E at high level, while 44.7 % of them adopted fusillade: 2 Lt/ha at high level. Results also shows that 37.2% of the respondents adopted Pendimethalin: 3-4Lt/ha at high level, also (36.9 %) of the respondents adopted Butachlor:2-3Lt/ha at high level and 36.6 % of them adopted TGX 1904-6F at high level. About 33.4 % of them adopted Decis at 40ml/10L of water at high level and (32.8 %) of them highly adopted Nuvacron:5ml/10L of water. The results in Table 2 further revealed that 30.3 % of the respondents adopted Karate:20ml/10L of water at high level, while 28.7 % of them adopted Weeding frequency (first: two weeks after planting and second weeding six weeks after planting) at high level. The low level of adoption of improved agricultural technologies could be due to low expected benefits from the practice or could be due to other factors such as farmers' attitude or institutional factors which may not encourage the adoption of technologies by farmers (Ajibefun, 2006).

Perceived factors affecting adoption of improved soyabean production technologies

Table 3 shows the results of the rotated factor matrix indicating the extracted factors based the responses of the respondents on the constraints to adoption of improved soyabean production technologies. It is evidence from the table that three major constraints were extracted based the responses of the respondents. Factor 1, 2 and 3 were named socio-economic, infrastructural and institutional constraints respectively. Only variables with loadings of 0.30 and above were used in naming a factor. The pooled results for the two States is presented as; socio-economic factors with high loadings on low demand for the processed products (0.761), Time consuming and tedious nature of technologies (0.798), inadequate processing skills (0.769), lack of labour for operation (0.635), lack of access to land (0.712), high cost of agricultural input (0.319), and rural infrastructural factors with high loadings on lack of access to processing facilities (0.714), non-availability of improved storage facilities (0.767), poor road network (.604). While the institutional factors with high loadings include non provision of information on agriculture (0.505), ineffective extension services and coverage (0.461) and lack of access to market (0.784).

A critical assessment of the major factors indicates interplay of items that resulted into the categories that hinder adoption of improved soyabean production technologies . Low demand for the processed products militates against technology adoption as locally processed agricultural products have low national and international demand due to low quality and poor processing

**Table 2: Soybean Production Technologies Adopted by Farmers
Pooled Result**

Type of technology	Adoption Level					T
	H	M	L	N	S	
Improved varieties	%	%	%	%	%	
Sam soy2	79.4	8.1	4.1	8.4	0.00	100
(b)TGX 1448 -2E	45.3	10.6	3.8	35.9	0.00	100
(c)TGX 1904 -6F	36.6	5.6	9.4	48.4	0.00	100
Fertilizer (N.P.K) 3ba &(SSP) 4ba.	63.1	10.3	10.6	15.9	0.00	100
Pest and Diseases control						
• Decis at 40ml/10l of water	33.4	1.3	1.4	61.0	0.3	100
• (b) Nuvacron:5ml/10L of water	32.8	2.8	5.6	57.8	0.9	100
• (c) karate:20ml/10L of water	30.3	3.1	4.7	61.3	0.6	100
(Use of herbicides)						
• (i)Pre -Emg.						
(a) Butachlor:2 -3Lt/ha	47.8	5.9	4.7	40.9	0.6	100
(b) Pendimethalin:3 -4L t/ha	37.2	4.7	7.2	50.7	0.3	100
(ii)Post -em. Fusillade: 2Lt/ha	44.7	3.4	5.6	52.8	0.6	100
Single cropping	54.7	2.8	1.9	40.0	0.6	100
Weeding frequency.	28.7	1 8.4	11.6	40.7.	0.6	100
Seed rate (40 -50 kg/ha)	10.9	3.4	9.1	76.3	0.3	100
Planting time(June – July)	88.7	8.4	1.9	0.6	0.3	100

Note; H= high level of adoption, M = moderate level of adoption, L = low level of adoption, N = Not adopted, S = stopped using and T= total

Source: Field Survey, 2019: Multiple responses recorded

techniques employed by rural farmers. The time consuming and tedious nature of technologies affect adoption level as many local farmers find it difficult to understand and operate new innovation in their farming activities. Inadequate processing skills is also a factor as many farmers are not capable of processing soyabean into final products such as soya milk and soya Akara. Lack of access to land also affects adoption as most rural farmers practice small scale farming due unavailability of land which results to low level of technology adoption. Lack of labour for operation equally militates against adoption because most rural farmers hardly take the risk of employing labour, since most of them cultivating small area of land whereby resulting to low level of technology adoption This result was in line with Fakayode *et.al.* (2008) who reported that labour employment has effect on productivity. High cost of agricultural input also affect adoption level as most farmers in the rural area are small scale farmers, so they find in difficult of purchase and apply farm inputs like improved seeds and inorganic fertilizer in their farming activities. Farmers are normally repelled to high input farming technologies owing to adoption does not sustain due to high cost involved (Kumar *et al.*, 2011).

Inadequate rural infrastructure as represented by factor 2 is a constraint to agricultural technology adoption due to lack of access to processing facilities as most rural small scale farmers cannot afford to purchase soyabean processing machines because of the high cost. Non-availability of improved storage facilities makes most soyabean produce go spoiled as a result of poor storage facilities used by rural farmers in storing their farm produce, this in turn lead to low adoption level of improved technologies. Poor road network makes marketing of processed agricultural products in the rural areas difficult. Also, institutional factors such as non provision of information on agriculture is a constraint because most rural farmers do not television and radio to listen to information passing across through these medium along side with ineffective extension services and coverage that limit the spread of information on agricultural technologies, again most rural farmers dwell in remote villages that are distance from agricultural research institutes where technologies are developed, such farmers hardly become aware and adopt new technologies. Lack of rural markets also limit adoption level since most rural communities do not have adequate market where farmers can sell their produce, as a result of this, many farmers settled on small scale farming just to feed their immediate families This result is inline with the report of [Turlough](#) (2013), who opted that barrier to adoption of agricultural technologies and innovations is multi factorial. The way that farmers receive information, and the manner in which extension personnel and scientists interact with farmers, are further key issues in extension, the nature of the technology, the way in which it is conveyed to the farmer, and the attitudes and perception that the farmer has about the technology.

Conclusion and Recommendations

The study was conducted to analyse factors affecting adoption of improved soyabean production technologies among rural farmers in North Central Nigeria. Soyabean production in the study area is dominated by male who use more of traditional methods in soyabean production stage, resulting to low level of adoption of improved soyabean production technologies. Many farmers are still carryout small scale farming which involves low capital investment, resulting to low output and income of the farmers. Farmers in the study area adopted improved soyabean production technologies such as Sam soy2, single cropping, correct planting time of June- July, and fertilizer application at high level. Adoption of improved soyabean production technologies by farmers leads to increase in farm output, In other words, income of farmers increases as a result of adopting the improved technologies introduced in the study area whereby resulting to improved social well-being of the rural farmers. Major constraints to adoption of improved soyabean production technologies were related to socio-economic, infrastructural and institutional constraints. Based on the findings of the study, the following recommendations were made: recommended farm input such as TGX1448-2E, TGX1904-6F, Sam soy 2, fertilizer, insecticides and herbicides should be made available to farmers at the right time and place, Government should subsidize price of farm input to enable farmers to purchase them at affordable price Also, agencies responsible for distribution of agricultural technologies should create awareness and training services to farmers on the use of agricultural technologies especially in the Local Government Areas where the technologies have not been introduced.

Table 3: Factor Analysis of Constraints to Adoption of Improved Soyabean Production

Constraints	Pooled Result		
	Factor 1	Fact. 2	Fact. 3
Lack of access to processing facilities	- .105	.714	-.161
Low demand for the processed products	.761	-.018	.014
Time consuming and tedious nature of technologies	.798	-.035	.003
Non provision of information on Agricultural technologies	.281	.279	.505
Ineffective extension services and coverage	-.013	.078	.461
Inadequate processing skills	.769	.007	-.101
Non-availability of improved storage facilities	.082	.767	-.015
Lack of access to market	.030	.105	.784
Poor road network	.200	.604	.034
Lack of labour for operation	.635	.019	.158
Lack of access to land	.712	.043	-.049
High cost of agricultural inputs	.319*	-.036	.273

Method: Varimax with Kaiser's Normalization

F1= Socio --economic factors, F2= Infrastructural factors and F3= Institutional factors

Source : Field Survey, 2019

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