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Technological Capabilities among Soybean Producers in Benue State, Nigeria

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Abstract
The utilization of soybean in local diets and local industries across Nigeria, as well as the contribution to export, has increased the demand for the crop over the years. However, small-scale farmers have not been able to significantly increase their production and productivity to meet these demands. The study assessed the technological capabilities of small-scale soybean producers in Benue State, Nigeria in 2010. A random sample of 120 soybean farmers was interviewed using a structured questionnaire. Data were analyzed using descriptive statistics. The majority (84.2%) of the farmers had informal training in soybean production and all the respondents invested personal savings in soybean production with a mean investment per hectare of ₦6, 489.00 ($41.60) for labour, ₦4, 815.00.00 ($30.87) for fertilizer and ₦2, 166.00 ($13.88) for seeds. All farm operations were carried out with indigenous implements (hoes and cutlasses) and 65% produced less than the average grain yield of 1.2 metric tons per hectare recommended by the Benue Agricultural and Rural Development Authority. Additionally, all farmers modified the recommended two rows at 75 cm inter-rows plant spacing and manual weeding, 88.3% modified the bed preparation of 1m wide flattened top beds and 82.5% fertilizer application while 87.5% sold their produce through middlemen at distant markets. The link between soybean producers and stakeholders was weak and chemical weed control constitutes farmers' most important training need. The majority of the respondents were smallholder producers with low formal and informal training, limited resources for scaling up production that will meet market demands, low crop yields per hectare, poor linkages and undeveloped marketing channels. In view of this, farmers' capacities should be strengthened through continuous training in soybean management practices and marketing and provision of labour-saving devices at subsidized rates. In addition, farmers should be facilitated to access credit for the purchase of vital inputs for increased soybean production and productivity.
Keywords: soybean farmers, investment, learning, linkage, marketing, production, technical, capabilities

1. Introduction

Ensuring food security is one of the greatest challenges facing the world community today. The situation is especially critical in sub-Saharan African (SSA) countries as it is the only continent in the world experiencing chronic food insecurity. The deepening food crisis in developing countries, especially those of SSA remains the concern of many researchers, planners, donors and international development agencies. Undernutrition, defined as the condition of people whose food consumption is continuously below a minimum dietary energy requirement for maintaining healthy life, affects over 925 million people worldwide and 239 million adults in SSA (WHES, 2011). This is largely because of the dependence on rain-fed agriculture in spite of the great advances in the agricultural science and technology (African Technology Policy Studies Network [ATPS], 2003). Although Nigeria had a low level of undernourishment in 2006/2008, (about 9.4 million were undernourished according to FAO, 2011), the food available does not ensure food accessibility at the household and the national levels; hence a significant proportion of Nigerians is food insecure. Moreover, about 71.5 percent of the population lives below the poverty line (National Bureau of Statistics [NBS], 2012) and are, therefore, most vulnerable to food insecurity. In addition, the country's nutrition situation has continued to show the existence of protein-energy malnutrition, particularly among children (FAO, 2006). Furthermore, the average Nigerian consumes about 3.2 grams of animal protein daily as against the minimum requirement of 35 grams per capita per day (Abu, Onifade, Abanikannda & Obiyan, 2008). As a result of the dearth of animal protein, the low-income population increasingly depends on plant food sources such as soybean to meet their protein and other nutrient demands (Owolabi, Mac-Ignite, Olowoniyan & Chindo, 1996).

Soybean has a tremendous potential to improve the nutritional status and welfare of the families of resource poor farmers (Sanginga, Adesina, Manyong, Ofite, & Dashiell, 1999; Obatolu, 2006). This is because it contains 42.8% high quality protein, 22.8% edible vegetable oil, 33% carbonate and a good balance of amino acids (Raw Material and Research Development Council, 2005). In addition, soybean oil is 85% unsaturated and cholesterol free when compared to other legumes and animal sources (International Institute for Tropical Agriculture [IITA], 1998).

Currently, Nigeria is Africa's largest producer of soybean, producing about 437,000 metric tons and Benue State, producing about 175, 000 metric tons, is Nigeria's largest soybean producer (Federal Ministry of Agriculture and Water Resources [FMAWR], 2008). The utilization of soybean in local diets and local industries across Nigeria, as well as the contribution to export, has increased the demand for the crop over the years. However, small-scale

farmers, who are the major producers of the crop, have not been able to significantly increase their production and productivity to meet these demands. This could be attributed to the low adoption of soybean production technologies by farmers as a result of poor technological capabilities. According to Kaindaneh (2003), to significantly increase the productivity of small-scale farmers in developing countries such as Nigeria, farmers' technological capabilities must be improved.

Technological capability is defined as the variety of skill and knowledge which firms need so that they can acquire, assimilate, use, adapt, change and create technology (Ernst, Mytelka & Ganiatsos, 1994). It encompasses learning, investment, production, technical change (major and minor), linkage and strategic marketing (Ernst, Mytelka & Ganiatsos, 1994; Biggs, Manju & Srivastava, 1995). The purpose of the study, therefore, was to determine soybean farmers' existing technological capabilities in order to suggest strategies for enhancing their capacities to meet the increasing demand for the crop.

2. Materials and Method

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 (National Population Commission [NPC], 2009) and 413,159 farm families (Benue Agricultural and Rural Development Authority [BNARDA], 1998). 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* (BNARDA, 2005).

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 (Sanginga *et al.,* 1999).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

3.1 Farmers' learning capabilities

The skills acquired by soybean farmers, method of skill acquisition and sources of training are reported in Table 1. The results revealed that 85% of the respondents acquired skills in fertilizer use, 83% in planting, 72% in land preparation, 68% in harvesting and 66% in site selection. Overall, 74.7% of the respondents were skilled in soybean production but most (84.2%) of them acquired the skills through informal training (in-farm or on-farm). Only 11.6% received training through both formal and informal means while 4.2% were trained in the school. The respondents reported that the main source of training was co-farmers (55.8%). This indicates that the strength of farmers learning capabilities is through farmer-farmer dissemination of information on skills acquired.

3.2 Farmers' investment capabilities

Analysis of the capital invested in soybean production indicates that all the respondents invested personal savings. The findings in Table 2 show that the maximum labour investment in soybean production per hectare was 20, 700 Nigerian Naira ($125.45) and an average of 6, 489 Naira ($39.33), indicating limitation in high cultivation for export and local industries but sufficient for farm family utilization for improved nutrition and food security; and the maximum capital injection in fertilizer per hectare was 10,500 Naira ($63.64) and an average of 4,815 Naira ($29.18). The mean investment in soybean seeds was 2, 166 Naira ($13.13) only.

3.3 Farmers' soybean production capabilities

The production capabilities of soybean farmers are depicted in Table 3. The findings revealed that all the respondents used indigenous tools such as hoes and cutlasses in soybean production and the farm implements were sourced from the open markets. Also, about 77.5% and 60.8% of the farmers acquired fertilizer and seeds respectively from the open markets. The yield of soybean per hectare for the majority (65%) of the respondents was less than 1000 kilograms; 31.7% had a yield of 1001-2000 kilogrammes per hectare while 3.3% had a yield

of above 3000 kilogrammes and an average yield of 1008 kilogrammes (i.e., 1.01metric tons) per hectare (Table 4). The result revealed that 65% of the respondents produced less than 1 ton per hectare of soybean.

3.4 Farmers' technical capabilities

The modifications that the farmers made to the soybean recommended practices are shown in Table 5. The findings revealed that all the respondents adapted plant spacing and manual weeding practices to suit their needs. A greater proportion (88.3%) of the respondents modified top bed preparation into sizes that ranged between 75cm and 95cm as against the recommended size of 1metre. The study also revealed that all the farmers who used fertilizer on their farms (82.5%) applied single super phosphate (SSP). However, BNARDA (2000) recommended the application of a combination of 22kg UREA or 37 kg CAN with 200kg (4 bags) of SSP to obtain the recommended 10kg of nitrogen, 36kg of phosphorus and 20kg of potassium. The findings further showed that 35% of the respondents used less than 40kg of soybean seeds while about 0.8% planted from late July-early August as against the recommended planting date of late June–early July.

3.5 Farmers' linkage capabilities

The sources of contacts which soybean farmers had in the preceding cropping season and the linkage activities are presented in Table 6. The study revealed that soybean farmers related with one another in information sharing (67.8%) and in the exchange of soybean seeds (32.2%). The majority (78.3%) of the respondents who related with input dealers purchased seeds, fertilizer and farm implements while extension organisations supplied 14.1% with fertilizer and 12.1% with seeds. The majority (62.5%) sold their produce to soybean traders ("middlemen") while 37.5% obtained price information from traders. The study also showed that slightly more than half (51%) of the respondents participated in field days while 23.2% were involved in farm visits/demonstrations organized by extension agents.

3.6 Farmers' strategic marketing capabilities

The present study investigated the strategic marketing capabilities of soybean producers by examining the point of sale, marketing channels, sources of marketing information, storage facilities and product advertisement. The study revealed that the majority (73.3%) of the respondents sold their produce at distant markets while 26.7% sold at the farm gate. Also, a greater percentage (87.5%) of the respondents sold the produce to the middlemen; 7.5% to wholesalers; 4.2% to retailers and 0.8% to final consumers. The findings also showed that 46.4% of the respondents relied mainly on neighbours for soybean marketing information. Other sources of information included friends (39.2%), family (9.6%) and personal contact with buyers (4.8%). The study revealed that the main storage facility for soybean included sacks and rooms and the main channel of produce advertisement by the majority (96.7%) of the respondents was through personal contact with buyers (Table 7).

3.7 Farmers' training needs and preferred training providers

The study showed that about 37.5% of the respondents identified chemical weed control as the most important training need. The limitation on knowledge and skills need on weed control may have contributed to the low yield of soybean identified in this study. Other training needs included fertilizer use (18.3%), plant spacing (10.8%), improved storage methods (8.3%), pest and disease control methods (5.8%), varietal identification (5.8%), improved threshing methods (5.8%), seed rate (4.2%), and soil identification (1.7%). The preferred training providers by the majority (90%) of the respondents' were the extension agents. Others included the educational institutions (8.4%) and the research institutions (1.7%) (Table 8).

4. Discussion

The majority of the farmers acquired knowledge and skills in soybean production through informal training by co-farmers who had first contact with researchers and extension agents. However, Oyelaran-Oyeyika (2003) observed that technology acquisition demands both formal and tacit (informal) knowledge for mastery. In view of this, continuous training of soybean farmers is required to improve their production capabilities, thereby increasing their levels of investments and profits over time (Biggs, Shah & Srirastave, 1995). This can be accomplished through workshops and in-farm training by extension agencies and relevant institutions to enable them to solve their own problems and to make appropriate farming decisions. Over time, this would increase their levels of investments and profits in soybean enterprises.

Capital is often a constraint to agricultural production and productivity in Nigeria. The findings on sources of capital for soybean production are consistent with those of an earlier study by Shaib, Adedipe, Aliyu & Jir (1997) who observed that the bulk of capital injection into agricultural enterprises, including soybean production, is from farmers' own personal savings and informal traditional credit sources. The high labour investment could be attributed to high rural-urban migration of youths prevalent in the area. The investment of 10,500 Naira in fertilizer per hectare is low when compared with the market price of 16,625 Naira for the recommended 22kg of UREA or 37kg of CAN mixed with 200kg (4 bags) of SSP per hectare (BNARDA, 2000). The low investment in fertilizer is probably a reflection of the high cost of the product (3, 500 Naira per 50kg bag) as well as poor access to credit facilities. The finding revealed the low level of investment in soybean production in Benue State which could inhibit the adoption of improved practices by farmers. The extension

organizations should facilitate farmers' access to credit facilities through group formation while the local and state governments develop the rural credit schemes for easy access to credit facilities for increased soybean production and productivity.

The use of basic implements suggests that the respondents were mainly smallholder producers. This corroborates the observations of Shaib *et al.* (1997) that the bulk of food production in Nigeria still takes place in smallholders' farms using such tools as hoes, cutlasses and machetes. Additionally, farmers had no access to appropriate labour-saving devices and machines due to poor financial base. The local and state governments and the corporate organizations that use soybeans as part of their raw materials should facilitate the provision of labour saving farm equipment such as tractors, harvesters and threshers to farmers for hire at subsidized rates in order to improve their scale of production and also the quality of produce. Research organizations should step up research on intermediate mechanical power to relieve the drudgery in soybean farming operations.

Findings also revealed that majority of the producers acquired soybean farm inputs from the open markets because input markets were either not available or inadequate. Poor rural infrastructure also prevents suppliers from taking their goods to the rural areas, particularly during the rainy periods. Thus, the low soybean yield may be related to the unavailability and high cost of inputs prevalent in the study area. It is, therefore, expedient for both the local and state governments to develop rural roads to allow farmers have easy access to farm inputs.

The study showed that soybean farmers modified some of the recommended practices for different reasons. For instance, farmers reported that they used random dibbling with unspecified inter-rows for plant spacing to obtain a higher plant population while the high cost of labour and canopy formation accounted for the practice of single weeding. Similarly, the modification of the top bed preparation into different sizes was to ensure land maximization and higher plant population. In addition, farmers attributed the use of SSP alone and the reduced rate of fertilizer application to the high cost of the product prevalent in the study area. Furthermore, the farmers reported that the use of low seed rate was to obtain proper plant spacing while the need to produce quality seeds and shortage of farm labour accounted for the late planting. The modification to some of the recommended practices by the soybean producers might have contributed to the low soybean output which was only 1.01 metric tons per hectare as against the average grain yield of 1.2 metric tons per hectare recommended by the Benue Agricultural and Rural Development Authority, the organization with the mandate for agricultural extension activities in the state (BNARDA, 2008). Although the adaptation of some soybean recommended practices did not result in higher yield, the use of modified forms of the practices by some farmers is an indication of the acquisition of some technical capabilities (Kaindaneh, 2003; Massaquoi, 2003). In the light of this finding, further research should be conducted by the research and extension scientists in Benue State to ascertain the reasons why the adaptation to soybean recommended practices by farmers did not yield the required results and to suggest what could be done by the relevant stakeholders in the industry to improve its production and productivity.

The poor linkage between soybean producers and their stakeholders, particularly, extension organizations and the absence of linkage with other potential stakeholders such as financial and research organizations could be attributed to inadequate manpower, lack of motivation of the front line extension personnel and poor funding for extension activities which could contribute to the limited effectiveness of farm-level innovation strategies for soybean production. In this light, both local and state governments should endeavour to adequately fund extension activities, pay the salaries and allowances of the front line extension workers promptly and establish strong linkages between the farmers, extension organizations, financial and research organizations in and outside Benue State.

The low price that the farmers get for the sale of soybeans could be attributed to the fact that they sell to the middlemen at the farm gate. This corroborates the findings in an earlier study by Ater (2006) that most buyers of soybeans are located outside Benue State and as such the farmers must operate through the middlemen. This practice results in low prices of soybeans most years, thereby eating deeply into the farmers' profit. The local and state governments should develop rural roads and market infrastructure that would enable farmers to store their goods and sell them directly to the consumers at approved prices. In addition, soybean processing companies should organize farmers into groups, monitor and facilitate their acquisition of production inputs such as improved seeds, fertilizer and herbicides for improved soybean production, which can then be purchased by the companies at prices acceptable to both parties.

5. Conclusions and Recommendations

The study has identified some gaps in farmers' technological capabilities (low formal and informal training, limited resources for scaling up production that will meet market demands, low crop yields per hectare, poor linkages and undeveloped marketing channels) in order to increase their level of soybean production and to improve on agronomic practices that will increase yield of soybean. The study revealed that the strength of farmers' learning capabilities is through farmer-farmer dissemination of information on knowledge and skills acquired. It also revealed that the maximum labour investment in soybean production per hectare is ₦20,700

($125.45) and the average reported was ₦6,489 ($39.33), indicating limitation in high cultivation for export and industries by the poor resource farmers. In addition, the study revealed that 65% of soybean farmers produce less than one ton per hectare despite high labour investment, thus the gaps in knowledge and skills need in weed control identified in this study demands urgent training intervention at farmers' level for increased soybean production. The low level of investment in soybean production in this study may have contributed to the low adoption of improved soybean practices by farmers. In view of this, farmers should be encouraged to improve their capabilities through training in all aspects of soybean management practices and business skills and the provision of labour-saving devices and machines. In addition, the extension organizations should facilitate farmers' access to credit facilities and farm inputs while the local and state governments develop the rural roads and market infrastructure to enable farmers have good return on their investment

References

Abu, O.A., Onifade, A.A., Abanikannde, O.T.F., & Obiyan, R.I. (2008), *Status and promotional strategies for rabbit production in Nigeria.* [Online] Available from: http://world-rabbit-science.com. [Accessed: 6th June 2010].

African Technology Policy Studies Network (2003), *Science and technology and food security in Africa*. Technology Policy Brief 11. [Online] Available from: http://www.atpsnet.org. [Accessed: 16th December 2010].

Ater, P. (2006), Information on soybeans in Benue State. Makurdi, UNITAS consultants.

Benue Agricultural and Rural Development Authority (2008), *2008 Agricultural Production Survey Report.* Makurdi, Nigeria.

Benue Agricultural and Rural Development Authority (2006), *Trends in Soybean Production in Benue State (1996-2005)*. Planning, Monitoring and Evaluation Department, Makurdi.

Benue Agricultural and Rural Development Authority (2005), *Implementation completion report on National Special Programme for Food Security,* Benue State, Nigeria.

Benue Agricultural and Rural Development Authority (2000), *Agricultural production recommendations for Benue State, Extension Bulletin, No. 3*. Makurdi, Nigeria.

Benue Agricultural and Rural Development Authority (1998), Crops Area and Yield Survey Report. Makurdi, Nigeria.

Biggs, T., Shah, M. & Srirastave, P. (1995), *Technological capabilities and learning in African Enterprises. Technical paper 288*. African Technical Department Series. The World Bank, Washington D.C.

Ernst D, Mytelka, L & Ganiatsos, T. (1994), Technological capabilities in the context of export-led growth: A conceptual framework. In: Ernst, D *et al.* (Eds.) *Technological Capabilities and Export Success in Asia:* 5-35. Routlegde.

Federal Ministry of Agriculture and Water Resources (2008), 2007 Agricultural Production Survey Report. National Food Reserve Agency, Abuja.

Food and Agriculture Organization of the United Nations (1998), Knowledge and information for food security in Africa: From traditional media to internet, Sustainable Information Department, Rome, Italy.

Food and Agriculture organization of the United Nations (1997), *Agriculture, food and nutrition for Africa. A resource book for teachers of agriculture*. FAO, Rome, Italy.

International Institute for Tropical Agriculture (IITA). (1998), 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. International Development Research Centre Publication.

Kaindaneh, P.M. (2003), Technology transfer from adaptive crop research and extension project in Sierra Leone. *IDRC publication*, No-30813.

Massaquoi, J.G.M. (2003), Technological modifications: A case study of rice and cassava processing in Sierra Leone, *IDRC publication.* No. 30780.

National Population Commission (2009), 2006 National Population Census Official *Gazette (Extraordinary),* ***94***(4):52.

Owolabi, A.O., Mac-Ignite.O., Olowoniyan, F.O. & Chindo, H.O. (1996), A comparative study of the nutritional status of children in villages in northern Nigeria using and not using soybeans. *Food and Nutrition Bulletin,* **17**(1):42-48.

Oyelaran-Oyeyinka, B. (2003), "Technological capacity of system of innovation: Concepts and perspectives'', *Proceedings of the Second Annual National Conference of Agricultural Extension Society of Nigeria*, 92-97.

Raw Material Research and Development Council (2005), Technical brief on agricultural commodities in Nigeria: Soybean No. 1. Federal Ministry of Science and Technology, Abuja, Nigeria.

Sanginga, P.C., Adesina, A, A., Manyong, V.M., Otite, O. & Dashiell, K.E. (1999), Social impact of soybean in Nigeria's southern Guinea savanna. *Quarterly Journal of International Agriculture*, (30), 109-124.

Shaib, B., Adedipe, N.O., Aliyu, A., & Jir, M.M. (1997), "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*'', National Agricultural Research Project (NARP), *Monograph,* ***5***, 15-70.

World Bank (1998), *Nutritional status and poverty in sub-Saharan Africa*. [Online] Available from: xye@worldbank.org/. [Accessed: 12th February 2009].

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Table 1: Distribution of respondents according to skills acquired, method of skill acquisition and sources of training

Variables	Frequency (n=120)	Percentage (%)
*Type of skills acquired:		
Site selection	79	65.8
Land preparation	86	79.7
Method of planning	100	83.0
Fertilizer application	102	85.0
Method of harvesting	81	67.5
Mean		*74.7*
Method of skill acquisition:		
Formal training	05	4.2
Informal training (in-farm or on-farm)	101	84.2
Both formal and informal training	14	10.0
*Sources of training:		
Co-farmers	67	55.8
Extension agent	58	48.3
Educational institution	12	10.0

**Multiple responses recorded*

Table 2: Summary of statistics on investment in soybean production

Variable	Minimum (₦/ha)	Maximum (₦/ha)	Mean (₦/ha)	Standard Deviation
Cost of seeds	550	4500	2166	728
Cost of fertilizer	0.0	10500	4815	2483
Land rent	0.0	5000	267	941
Cost of hoes	120	1650	680	278
Cost of cutlasses	0.0	800	349	204
Man-day cost/ha	0.0	20700	6489	4464
Cost of packaging	240	2530	931	421
Cost of transportation	0.0	2100	778	362

Table 3: Percentage distribution of respondents by sources of input (n=120)

*Source	Inputs		
	Farm implements	Seeds	Fertilizer
Open market	100	60.8	77.5
Co-farmers	0.0	20.0	2.5
Extension organization	0.0	19.0	15.0

**Multiple responses recorded*

Table 4: Distribution of respondents by soybean yield (kg/ha) (n=120)

Soybean yield (kg/ha)	Percentage	Mean	Standard Deviation
Less than 1000	65.0	1008	1059
1001-2000	38.0		
More than 2000	4.0		

Table 5: Percentage distribution of respondents by adaptation to soybean recommended practices (n=120)

Recommended practices	Farmers' practice	% of farmers who adapted recommended practices
Recommended varieties: TGX 536-02D; TGX 1448-2E; TGX 923-2E& TGM 344	TGX 1448-2E & TGX 536-02D	0.0
Land preparation: 1m wide flattened top beds	75-95cm wide flattened top beds	88.3
Planting date: late June-early July	Late July-early August	0.8
Method of planting: Broadcasting or sewing with hand or hoe	Sewing with hoe	0.0
Plant spacing: 2 rows at 75cm inter-row	Random dibbling with unspecified inter-rows	100
Seed rate: 40-50 kg/ha	Less than 40kg/ha	35.0
Fertilizer application, N10 P36 K20 kg/ha (i.e.22 kg ($^1/_2$bag) of UREA or 37 kg (^{3}/4 bags) of CAN mixed with 200 kg (4 bags) of SSP)	Used SSP alone	82.5
Timely weeding (manual) = 2 or 3 weeding	1 weeding only	100

Table 6: Percentage distribution of respondents by linkage activities

Stakeholder/linkage activity	Frequency (n=120)	Percentage (%)
*Fellow farmers:		
Information exchange	116	67.8
Seed exchange	55	32.2
Input dealers/suppliers:		
Input purchase	94	78.3
*Soybean traders:		
Price information	69	37.5
Produce sales	115	62.5
Extension organization:		
Farm visits/demonstrations	23	23.0
Farmer field days	50	50.5
Seed supply	12	12.1
Fertilizer supply	14	14.1

**Multiple responses recorded*

Table 7: Percentage distribution of respondents according to marketing capabilities

Variable	Frequency (n=120)	Percentage (%)
*Point of sale:		
Farm gate	36	26.7
Distant market	99	73.3
Marketing channels:		
Retailers	06	5.0
Middlemen ('Baranda')	105	87.5
Wholesalers	09	7.5
*Sources of marketing information:		
Friends	65	39.2
Neighbours	77	46.4
Family	16	9.6
Personal contact with buyers	08	4.8
Storage facilities:		
Sacks/rooms	119	99.2
Sacks/market stalls	01	0.8
Method of product advertisement:		
Personal contact with buyers	116	96.7
Fellow producers	04	3.3

**Multiple responses recorded*

Table 8: Percentage distribution of respondents according to training needs and preferred training providers

Variable	Frequency (n=120)	Percentage (%)
Training needs:		
Soil identification	02	1.7
Varietal identification	07	5.8
Plant spacing	13	10.8
Fertilizer application	22	18.3
Pest and disease control	09	7.5
Seed rate	05	4.2
Chemical weed control	45	37.5
Improved threshing method	07	5.8
Improved storage method	10	8.3
Preferred training providers:		
Extension agents	108	90.0
Educational institutions	10	8.3
Research institutes	02	1.7

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