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STATUS OF POSTHARVEST PROCESSING OPERATIONS OF SOYBEANS IN RURAL NIGERIA: A CASE STUDY OF BENUE NORTH-WEST SENATORIAL ZONE

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ABSTRACT

This study was conducted to investigate the level of technology used for the postharvest processing and handling of soybeans in rural Nigeria using Benue North-West Senatorial Zone as case study. The approach for carrying out the study was the Participatory Rural Appraisal (PRA) technique. Data were collected using focus group discussions and questionnaires to obtain information from soybean farmers on their methods and level of technologies of postharvest processing. A purposive random sampling approach was used for selecting farmers for participation in the study. Accordingly, a structured questionnaire was designed and administered to 800 farmers from amongst who there were 591 respondents. More information was collected from eight groups of farmers who were organized into focus groups of discussants. Each focus group comprised between eight and twelve members, giving a total of 87 discussants across the study area. A total of 36 research questions were contained in the structured questionnaire while 12 questions were asked during the group discussions. Data were analyzed using descriptive statistics. The results from the research indicated that all the postharvest processing operations of soybeans namely; threshing, cleaning, drying, chemical treatment, packaging, transporting and storing were performed manually. However, a very small proportion of the farmers engaged in mechanized threshing (5.2%) and cleaning (0.3%), respectively. In certain communities such as Abwa-Mbagen in Buruku Local Government Area, some farmers did not remove broken and infected soybeans before bagging. The use of manual processing methods in the study area impacts negatively on the quality and quantity of soybeans that finds its way to the market. This constitutes a disincentive to farmers as they are unable to maximize their gains from their production efforts.

INTRODUCTION

Soybean (*Glycine max* [L.] Merrill) is a leguminous plant belonging to the family *fabaceae* and is widely grown for its numerous dietary and industrial applications. Nigeria is Africa's largest producer of soybean, producing about 437,000 metric tons annually: out of which Benue State produces about 175,000 metric tons, and making it the largest producer in the nation (Agada, 2014)..

Soybean has numerous industrial and domestic applications engaging several players in the production, processing and marketing chain. The plant is one of the most nutritious crops in the world. It is an important source of protein and amino acids for humans and livestock because of its well-balanced amino acid profile (Singer *et al.*, 2019). It is said to contain at least 100% more proteins than any other common crop and yields 5-10 times more protein per unit area than other crops (Iwuchukwu and Beeior, 2018). Soybean also has the capacity to improve the nutritional status of households, improve incomes, and enhance productivity of other crops (Idrisa *et al*., 2010).

Soybean is a highly versatile grain having about 365 applications in the formulation of both human and animal foods and other industrial uses. It is used in the manufacture of soy flour, infant foods and instant foods such as breakfast foods, snacks and other confectioneries. The oil, upon extraction, is used in the manufacture of skin lotions, margarine and infant foods (Omotayo *et al*., 2007).

Soybean is considered to be physiologically mature when the seed turns yellow. Thereafter, it must be harvested within 2-3 weeks during which it dries from about 50 percent moisture content to 14-15 percent. In the soybean growing areas of Nigeria, the crop is harvested manually by uprooting the stem with the bean in pods that contain them. At the time of harvest, soybean seeds are often at high moisture content and contain trash and other impurities such as immature seeds, weed seeds and debris. The seed must therefore be processed after it has been

harvested to dry the seeds to safe moisture level and remove the various undesirable materials in the harvested lot.

Postharvest processing of soybeans plays an important role in its distribution in the sense that it helps in reducing spoilage and wastage and stabilizes seasonal fluctuations in the supply of the crop. Processing operations for soybeans include drying, threshing, cleaning, sorting, packaging, storing and transporting. Technologies of varying degrees of sophistication are available for these operations which include mechanical dryers, threshing machines, winnowing machines, grain sorters, specific gravity separators and vibratory screens.

The methods of postharvest processing and handling of soybeans have tremendous consequences on the quality of the beans that reach the market. For example, improper processing and handling could lead to deterioration of seeds during storage, reduce the supply of high-quality seeds and become a limiting factor in soybean production. In addition, the physical parameters of seeds such as seed coat color and seed size arising from the processing and handling employed may also affect their shelf life (Susilawati *et al*., 2019).

Agada (2014) carried out a study of the technological capabilities among soybean producers in Benue State and found that all the respondents used indigenous tools such as hoes and cutlasses in soybean production. It is important to also evaluate the level of technology used for processing so that Nigeria's soybean production could compete favourably in the international market space and thereby maximize the economic potentials that the crop offers. Therefore, this survey was undertaken to determine the level of technology used in the post-harvest possessing operations of soybean in Benue North-West Senatorial Zone, with a view to establishing gaps in its postharvest processing in the study area for which improved technologies should be adopted.

MATERIALS AND METHOD

Study area

The study area for this investigation is the North-West Senatorial Zone of Benue State. Benue State lies between longitudes 7° 47' and 10° 0' East of the Greenwich meridian and between latitudes 6° 25' and 8° 8' North of the Equator. It is bounded on the south by Cross River, Ebonyi and Enugu States; on the west by Kogi State; on the north by Nasawara State; and on the northeast by Taraba State. On the southeast the State has a common border of less than 40 km with the Republic of Cameroon.

The State is predominantly agrarian with an estimated 75 percent of the population engaged in rain-fed subsistence agriculture. According to Agada (2014), 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, Irvingia *spp.* (locally known as Ogbonno). Other crops also grown in substantial quantities are shea nuts, cotton and maize.

Benue State comprises three Senatorial Zones namely; Benue South, Benue North-East and Benue North-West (Figure 1). The survey was conducted in the Benue North-West Senatorial Zone which comprises seven Local Government Areas (LGAs) namely; Makurdi, Gboko, Tarka, Buruku, Guma, Gwer East and Gwer West LGAs (Figure 2).

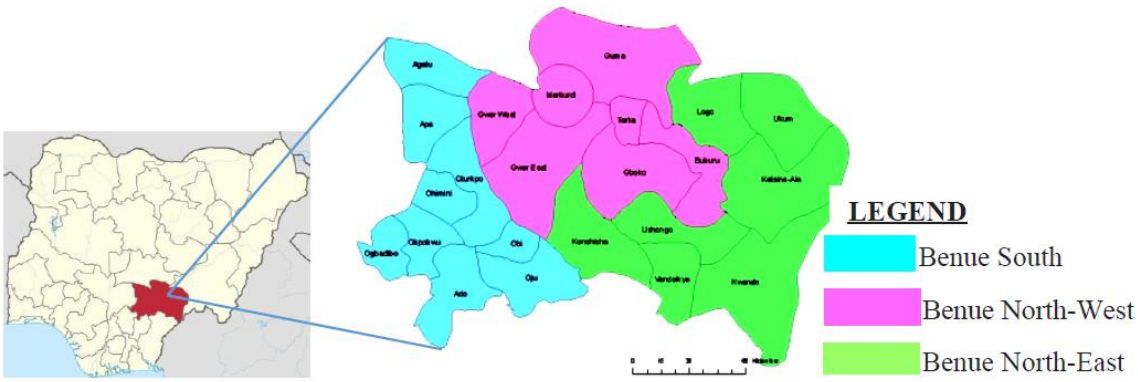

Figure 1: Map of Benue State showing its three Senatorial Zones

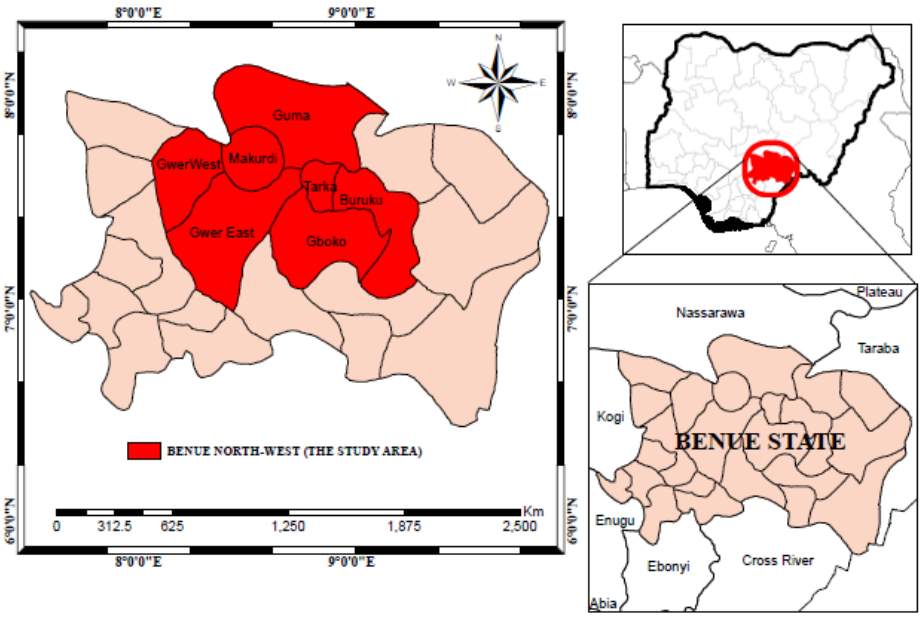

Figure 2: Map of Benue State showing the study area

Methodology and Data Collection

The study was carried out using a Participatory Rural Appraisal (PRA) technique to collect information from randomly selected soybean farmers as regards postharvest processing of soybeans in the study area. Four of the seven LGAs in the Senatorial Zone were randomly selected for the study. These are Gboko, Tarka, Buruku and Gwer East LGAs.

Data were collected using Focus Group Discussions (FGD) and a questionnaire to obtain information from the farmers on the methods and level of technologies they use for postharvest processing of soybeans. Accordingly, a purposive random sampling approach was used for selecting farmers for participation in the study. A structured questionnaire was designed and administered to 200 farmers per LGA making a total of 800 farmers from amongst who were 591 respondents. More information was collected from eight groups of soybeans farmers who were organized into focus groups of discussants. Two FGDs were created in each LGA: one all-male group and one all-female group. There were, therefore, eight groups of discussants comprising between eight and twelve members in each group. This gave a total of 87 discussants across the study area. A total of 36 research questions were contained in the structured questionnaire while 12 questions were asked during the group discussions.

Data Analysis

Data generated from the soybean farmers were analyzed using statistical tools such as frequency, mean and percentages. Frequency and percentage were used in analyzing the levels of technologies employed by respondents for postharvest processing operations of soybeans and the challenges in its processing.

RESULTS AND DISCUSSION

Harvesting and Drying of Soybeans in Benue North-West Senatorial Zone

In the study area, soybean is harvested entirely by manually uprooting the stem. The uprooted stems, with the soybean seeds in pods, are arranged such that all the pods are in the same direction. They are then spread in thin layers on a paved or bare floor and are left to dry in the sun for five hours. Thereafter, the pods begin to shatter by explosive mechanism and are considered ready for threshing. From the survey it was gathered that 97% of the soybeans farmers dry their soybeans by direct sun drying, whereas only 2 % make use artificial dryers to dry their produce.

Threshing of Soybeans in the Study Area

The demographic distribution of soybeans farmers on the basis of methods of soybeans threshing is shown in Table 1. The table shows that majority (89.7%) of the farmers in the study area thresh their soybeans by

manual techniques which involve the use of wooden sticks to beat the soybeans on threshing floors. Conversely, only 5.2% of the farmers practice mechanized threshing. The few farmers who claimed to practice mechanized threshing are probably the respondents at the Akperan Orshi College of Agriculture Yandev in Gboko LGA who have access to locally fabricated threshing machines.

The low level of mechanized threshing in the study area is attributable in part to non-availability of threshing machines and partly to non-affordability where at all a machine is available. One of the consequences of manual threshing is that a lot of losses do occur due to breakages of the seeds. Islas-Rubio and Higuera-Ciapara (2002) recommended that threshing be done with care to avoid breakage of the beans or protective hulls and attendant reduction in the product's quality and subsequent losses from the action of insects and moulds.

The modal class of the respondents (34.2 %) indicated that threshing is the most difficult task of all the soybeans processing operations (Table 2). It is performed mainly outdoors in the sun because drying and threshing are done simultaneously. During the focus group discussions some of the farmers stated that they consider drying and threshing as a single process.

Next to threshing, the other operations which soybean farmers consider laborious are winnowing (4.7%) and transportation from the farm to their homes (1.5%). On the other hand, the female farmers considered harvesting and drying as the second and third most difficult processes respectively next to threshing. According to them, winnowing is less laborious than drying especially if there is natural air draft that helps to separate the beans from the chaff when tossed against the wind.

Table 1: Methods of soybeans threshing in the study area

Method of soybean threshing	Number of respondents	Percent
Beating with sticks in the sun on threshing floors	530	89.7
Beating in bags	1	0.2
Use of mechanical threshers	31	5.2
Pounding in mortar	3	0.5
Abstention	26	4.4
Total	591	100.0

Table 2: Ranking of the Tedium of Soybeans Postharvest Processes in the study area

Postharvest operation	Number of respondents	Percent
Harvesting	13	2.2
Threshing	202	34.2
Winnowing	28	4.7
Handpicking	37	6.3
Oil extraction	46	7.8
Transporting	9	1.5
Storage	8	1.4
Milk making	75	12.7
Cultivating and sowing	60	10.2
Flour milling	2	0.3
Total respondents	480	81.2
Abstention	111	18.8
Total	591	100.0

Cleaning of Soybeans in the Study Area

Table 3 shows the incidence of soybeans cleaning in Benue North-West Senatorial Zone. From the table, it was observed that 78.7 % of the soybeans farmers in the study area cleaned their soybeans after threshing before direct consumption, sale or storage. Even then, cleaning was done majorly by manual winnowing, manual sieving, handpicking of chaff and stalk and by washing (Table 4). Winnowing of soybeans was performed mostly by the women folk who made use of two basins for the operation. The process involved placing the soybeans and the unwanted materials in one basin which they raised above the head and tilted slightly to allow its content fall gradually by gravity. In the process, the chaff that was mixed with the soybean seeds was blown away by the wind while the clean seeds were collected in the other basin placed on the floor.

Additional cleaning of soybeans was done by handpicking small stones as well as broken and insect-infected seeds. Furthermore, sieving was done to remove soil particles that mixed with the soybeans threshed on bare floors. One of the discussants said that "if the threshing was done on an unpaved floor, we use '*chakela*' (a tray-like basket) to separate the stones and sand from the seeds".

Table 3: Incidence of Soybeans Cleaning in Benue North-West Senatorial Zone

Incidence of Soybeans Cleaning	**Number of respondents**	**Percentage**
Number of respondents who cleaned their soybeans	465	78.7
Number of respondents who did not clean their soybeans	122	20.6
No response	4	0.7
Total	591	100.0

Table 4: Methods of Cleaning Soybean in Benue North-West Senatorial Zone

Methods of Cleaning	Number of respondents	Percentage
Manual Winnowing	199	47.2
Manual sieving using basin or baskets	120	28.4
Handpicking	40	9.5
Washing	60	14.2
Mechanized Winnowing	3	0.7
Total	422	100.0

Sorting of Soybeans in the Study Area

Sorting of soybeans was done by loading about 1.0 - 1.5 kg of threshed and winnowed soybean seeds onto a tray or basin, and manually vibrated. By so doing all unwanted broken and infected seeds migrated, due to density differential, to one side of the container. The unwanted seeds were then handpicked and discarded. In the process of sorting the unwanted from desirable seeds, stones, debris and other impurities were also removed.

This study showed that 56% of the soybeans farmers who participated in the survey carried out sorting of their soybeans. According to the farmers they engaged in sorting because they learnt that stones when mixed with soybean seeds do damage machines used for further processing of the soybeans.

On the other hand, a considerable proportion (41.6 %) of the participants admitted to not upgrading their soybeans after the basic cleaning. One of the discussants in the all-males group in Abwa-Mbagen Buruku LGA explained that their choice not to upgrade was based on the fact that some of the infected beans are blown away during winnowing due to buoyancy effects. Discussants at Tiortyu in Tarka LGA explained further that soybean seeds hardly break during threshing and therefore need no

further upgrading beyond winnowing. Rather they simply packed their soybeans in bags in readiness for the market. However, some of the farmers claimed they removed stones from the soybeans but only if the soybean threshing was carried out on an unpaved floor.

Failure of soybean farmers in the study area to upgrade has dire consequences on the quality of their produce. The presence of stones as well as immature and infected seeds in their consignments reduces the quality indices of soybeans such as the physical appearance. Similarly, seeds that were mechanically damaged during harvesting and threshing lose their germination capacity more rapidly than the undamaged seeds, and as a result the seedling percentage decreases (Goli *et al*., 2016). Reduction in quality parameters such as physical appearance and germination capacity of the soybeans in turn leads to a reduction in their price in international markets. Therefore, soybean farmers in the study area need to upgrade their produce by sorting in order to optimize returns on their labour and investment.

From this survey, it was observed that the choice made by some of the soybean farmers not to upgrade their soybeans by sorting was basically attitudinal occasioned by the absence of machines in the area for screening or sieving. Most of the farmers engaged in sorting by manual picking or sieving to upgrade their produce. However, manual sorting is laborious, time consuming and often leads to drudgery. This is especially so as most of the farmers produced tens of bags, and would like to dispose of their produce within a limited time frame so as to raise money to meet their numerous needs. Therefore, soybean farmers in the study area expressed willingness to upgrade their processing operations by acquiring sorting machines such as vibratory screens and specific gravity separators if they are able to access funds to buy them.

Transportation and logistics processes for soybeans in the Study Area

The results of the survey show that transportation of soybeans in the study area is usually done in segments: from the harvest fields to the threshing floor or drying site. From there, they are moved to storehouses or to collection centers, from where they are transported to bigger warehouses or to the processing industries. Wholesalers transport them from the industries or warehouses for final marketing. The type of transportation systems used for moving soybeans depends on the quantity of beans and distance travelled.

3.5.1 Transportation of Soybeans from farm gate to home stores

The various modes of transportation used for moving soybeans in the study area are presented in Table 5. From the table, the predominant mode (39.8 %) of transporting soybeans from farm gate to home stores is the use of wheelbarrows. This was followed by use of motor vehicles (22.7 %) and head porterage (19.9 %). Discussants in all the discussion groups also corroborated the responses obtained from the use of questionnaires. They identified the use of head porterage as the main and exclusive means of conveying their soybeans from the farm gate to the storage at home. This finding is similar to those of Ikejiofor and Ali (2014) and Satimehin *et al*. (2019) who reported that head porterage is used extensively as a means of agricultural transportation in rural Nigeria.

There are many reasons for using wheelbarrows and head porterage in transporting soybeans from the farm to the storehouses. Firstly, majority of the soybeans producers are rural dwellers whose farms are remotely located from the major towns and cities, but close enough to residence to allow for transportation of their commodities by wheelbarrows and head porterage. Secondly, the road network is undeveloped and the rural roads are in deplorable conditions. Transportation by means of cars and trucks are uneconomical. As a result of the state of rural roads in the country, Gbam (2017) opined that adequate transportation network and efficient carrier services operation are crucial to efficient distribution of agricultural products. Unavailability of these facilities hinders the transportation of agricultural products to the major cities and other areas. Road transport plays a significant role in directing mobility and accessibility of places (Ikejiofor and Ali, 2013). In addition, it provides the diffusion of new technology and techniques, increase production, reduce marketing cost, increase spatial interaction and increase link access to education and health facilities. It also increases mobility and reduce isolation.

Table 5: Modes of transporting soybeans from the farm gate to store and market

Means of transportation	Travel pattern of the soybeans			
	From farm gate to home store		From home store to market	
	Number of respondents	Percentage	Number of respondents	Percentage
Motorcycle	53	9.4	38	6.7
Wheelbarrow	224	39.8	69	12.3
Head porterage	112	19.9	9	1.6
Carts	46	8.2	7	1.2
Motor vehicles	128	22.7	454	80.6
Total respondents	563	100.0	563	100.0

Transportation of Soybeans from home stores to the market centers

Table 5 again shows that transportation of soybeans from store to market places in the study area is predominantly (80.6 %) by means of motor vehicles such as cars, vans and trucks. This observation is similar to that of Ikejiofor and Ali (2014) who reported that 94 % of agricultural produce in Nsukka LGA of Enugu State is moved by means of pick-up vans and buses to market. The study showed that wheelbarrows are used to a lesser extent for transporting the beans to market centers (12.3 %) while head porterage is used sparingly (1.6 %).

Some of the soybeans farmers in the study area have no access to motorable roads to allow for transportation of their produce from the home store to market. This category of farmers first transports their soybeans by means of head porterage, wheelbarrows or carts to the roadside; and from there the soybeans are transported to the market centers by means of motor vehicles. In addition, farmers who live within close proximity of the market centers also use wheelbarrows (12.3 %) and motorcycles (6.7 %) as means of transporting their produce to market. These methods of transportation of soybeans to the market centers corroborate with the response from the FGDs. Discussants from the all-females group at Mbaabi in Gwer-East LGA and Tiortyu in Tarka LGA said that "we use commercial vehicles except if the quantity is not much and the market is not far then we use our heads, wheelbarrow or motorcycles".

On the other hand, middlemen who have the wherewithal make use of trucks on feeder roads to convey the soybeans from the farmers' home stores to warehouses in the larger towns, from where they are moved to the industries in bigger cities.

3.6 Chemical Treatment of Soybeans

The results of the study showed that most (51.1 %) of the soybean farmers in Benue North-West Senatorial Zone carried out chemical treatment of the beans before storage. However, a substantial proportion (46.7 %) of the farmers did not apply chemicals in the beans. From Table 6, it was observed that 80 % of the farmers that carried out chemical treatment of their beans explained that they did so to prevent spoilage and keep the beans safe from insects and other pests. However, it is important to state here that discussants at all the FGDs across the study area disagreed with the concept of chemical treatment of soybeans. According to them, they stored them for two years or longer without any insect attack, and only had to worry about rats which they control effectively by mechanical means (by use of rat traps) and biological means (by keeping cats) in and around the storehouses.

Table 6: Reasons for Chemical Treatment of Soybeans in the Zone

Description of reasons for treating soybeans	Number of respondents	Percentage
To keep beans longer for future use	31	10.3
To prevent spoilage and keep beans safe from insects and other pests	240	80.0
Beans look neater and attracts higher prices	29	9.7
Total	300	100.0

Packaging of Soybeans in Benue North-West Senatorial Zone

In the study area, soybeans were generally packed in polyethylene and jute bags of various sizes depending on the quantity to be packaged. The results from the questionnaires showed that 96.1 % of the farmers in the zone made use of bags for packing their soybeans while only 1.7 % stored them in tins and metal cans. This finding was confirmed by the responses obtained from the FGDs. However some of the focus group discussants expressed reservations concerning the use of polyethylene bags for a long period of time. According to them, mouldiness occurs in soybeans stored for a very long time in the polyethylene bags. This is to be expected because aeration of the beans is limited in the polyethylene bags. Accordingly, hot spots and condensation of moisture develop leading to mould formation on the beans. Soybean seeds in which moulds have developed take a longer time to germinate if at all they do.

Soybean farmers in the study area gave various reasons for packaging their soybeans (Table 7). The reason given by most (41.1 %) of the respondents for storing their beans was to make soybeans available for domestic consumption at a future date particularly when soybeans production is off season. Some others (21.9 %) explained that they package their beans in order to take advantage of higher prices at a later date of scarcity. Other reasons the respondents gave for packaging their soybeans are shown in Table 7.

Table 7: Reasons for Packaging Soybeans in Benue North-West Senatorial Zone

Reasons for Packaging Soybeans	Number of respondents	Percentage
For easy movement to store and market	31	8.2
To take advantage of higher prices at a later date	83	21.9
To prevent damages by insect pests	42	11.1
To keep beans safe from rain and animals	5	1.3
To keep clean beans from recontamination	48	12.7
To store for future consumption	156	41.1
To determine the number of bags of soybeans harvested	14	3.7
Total	379	100.0

Soybeans Storage in Benue North-West Senatorial Zone

This survey revealed that storage of soybeans in the study area was done mostly at the domestic level in home stores (Table 8). The table shows that 75 % of the farmers stored soybeans at home while only 0.4 % stored in silos. Farmers in the study area do not practice on-farm storage or store in silos because the farms are remotely located from cities where silos are situated. Rather, they store their beans in plastic or metal barrels because it is cheap to do so. This observation is similar to those of Mobolade *et al.* (2019) who also stated that metal or plastic barrels used for organic solvents, petroleum products, vegetable or palm oil storage are used to provide

hermetic storage of food grains in India and Nigeria. The authors pointed out however that one major disadvantage of grain storage in a barrel is that the barrel must remain sealed for it to be effective because insects could easily resume physiological activities at the slightest inlet of oxygen each time the barrel is opened.

The results obtained from the survey indicated that majority (88.3 %) of soybean farmers in Benue North-West Senatorial Zone store their produce for various reasons and lengths of time. Table 9 shows that 34.2 % of the farmers store soybeans for future use, followed by 29.9 % who store to sell when the market value peaks. However, many (52.1 %) of the farmers, especially in Gwer-East and Tarka Local Government Areas, admitted to storing their soybeans only for a short duration after threshing. They claimed they have to sell the beans immediately after threshing to settle end of year debts and to meet such other needs like Christmas expenses. The other reasons soybeans farmers gave for selling their beans immediately after threshing are contained in Table 10.

The main factor militating against long term storage of soybeans in the study area is that most of the soybean farmers are subsistent farmers and low income earners who depend solely on the crop for livelihood. As a result, they are not able to wait for the price to appreciate before selling it. Some of the farmers explained that they need to pay their children's school fees and other school expenditures, buy clothes, repair their motorcycles and pay their loans amongst other needs. Therefore, over 50 % of the crop is sold within the first three months of harvest, with only about 6 % stored beyond seven months after harvest.

Table 8: Methods of Soybeans Storage in the Study Area

Storage method	Number of respondents	Percentage
In temporary containers and basins	76	14.6
Home stores	390	75.0
Lock-up stores in local markets	16	3.1
Warehouses	36	6.9
Silos	2	0.4
Total	520	100.0

Table 9: Reasons for soybeans storage in Benue North-West senatorial zone

Reasons for storage	Number of respondents	Percentage
For future use	202	38.7
For sale when market prices increase	181	34.7
As a means of savings to meet future needs	16	3.1
To prevent pests and pilfering	79	15.1
To ensure availability of seeds for next planting season	44	8.4
Total	522	100.0

Table 10: Reasons for sale of Soybeans immediately after harvest

Reasons for storage	Number of respondents	Percentage
To provide for the family at Christmas time	5	1.2
When soybeans prices appreciate	40	9.6
To meet immediate financial needs	308	73.7
When demand for soybeans is high	3	0.7
Due to lack of storage space	13	3.1
To minimize damage	49	11.7
Total	418	100.0

CONCLUSION AND RECOMMENDATIONS

The study revealed that postharvest processing and handling of soybeans in Benue North-West Senatorial Zone are generally performed by means of manual techniques. Threshing is done by using wooden sticks to beat the soybeans on threshing floors, and drying is by direct sun-drying on paved or bare floors. Most of the threshed soybeans are cleaned by manual winnowing, sieving, and handpicking of chaff and stalk, while sorting is carried out by manually vibrating small quantities of the beans in a tray or basin to remove contaminants and foreign materials with a view to improve seed quality. Though soybean farmers in the study area are aware that machines exist for the postharvest operations, they are confronted with the challenge of inadequate funds to buy the necessary processing machinery. In addition, most of the rural roads are in deplorable conditions thereby constituting a major bottleneck in the transportation of soybeans from farm gate to market and processing centers. In order to be able mechanize soybeans processing in Benue North-West Senatorial Zone, extension organizations should facilitate farmers' access to credit and enlighten them on how to organize themselves into cooperative societies to enable the purchase of processing equipment which otherwise could be beyond the financial capacity of individual farmers. Cluster processing facilities should be established at the community level in the Zone and all the other soybean producing areas of the State. At community processing centers, processors would be able to carry out their processing operations for a token fee without necessarily owning the equipment. Rural roads and market infrastructure should be better developed to enable farmers have good return on their investment.

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