

## EXAMINATION OF INDIGENOUS STORAGE METHODS OF COWPEA (*Vigna Unguiculata*) IN MUBI SOUTH LOCAL GOVERNMENT AREA, ADAMAWA STATE, NIGERIA

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### Abstract

The study examined the various indigenous cowpea (*Vigna Unguiculata* V. Walp) storage opportunities and their effectiveness in Mubi South Local Government Area of Adamawa State, Nigeria. Structured interview scheduled were used to obtain information from 70 respondents selected through simple random sampling techniques. Generated data were analyzed using descriptive statistics and (frequency and percentage), and inferential (Chi-square) statistics. The results revealed that (65.7%) of the respondents were males with (75.2%) below the age of 51 years. Married respondents accounted for (54.3%) while (64.3%) had one form of education or the other. Majority of the respondents representing (74.3%) were household heads. Eight indigenous storage methods were identified and the use of air tight container, neem leaves/ oil and finger pepper were found to be more effective. Chi-square test results revealed that, the coefficient for age, marital status, farming experience were significantly related to indigenous storage method of cowpea, age  $X^2=0.780, P=0.377$ , marital status  $X^2=1.739, P=0.628$  and educational level  $X^2=3.977, P=0.409$  respectively. Inadequate storage facilities, capital intensive, time consuming, labor intensive and weather conditions were the major constraints faced by the respondents. It is recommended that stakeholders should encourage researches in the areas of promoting indigenous knowledge system, safety, their potentiality and sustainability so as to improve and promote their application since it is cheaper and accessible to the people.

**Key words:** indigenous knowledge system, cowpea, storage methods

### INTRODUCTION

Traditional knowledge system (TKS is referred to as knowledge that is unique to a given culture or society and use as a basis for local level decision making in agriculture, health care, food preparation, preservation, education, natural – resources management and a host of other activities [6]. These knowledge systems are sometimes called indigenous practice, local knowledge, indigenous technologies, rural knowledge, indigenous control system as well as ethno-science or people's science [15]. The practices are linked to the communities that produce them and to some extent to their neighbours.

A traditional storage practice of beans is a systematic knowledge of individual farmers that is inherited from their fore-fathers in their

locality which they applied to their products for storage purposes. This practice is considered and seen to be affordable due to its low cost and accessibility to practice. Cowpea (*Vigna Unguiculata* V. Walp) is an indigenous African annual legume crop which is also called Southern pea, Black eye pea, Crowder pea, Labia, Niebe, Couple or Frijole [12]. The cowpea grains contain about 23% protein and 57% carbohydrate, while the leaves contain between 27 and 34% proteins. The leaves and grain are also supplied as high protein feed and fodder to livestock [16].

Cowpea is an important staple food in West Africa and it is largely produced for domestic consumption. It is an absolute source of protein and thus capable of providing solution to the protein-carbohydrate imbalance of the nutrition of Nigerians [1]. It is also an income

earner, industrial raw material and having the capacity to improve soil fertility).

Cowpea is grown in lowlands, mid altitude, low rainfall and poor soil. (Particularly in the dry savannah) sometimes as a sole crop or in mixed with cereals. The nutritional value of cowpea plants parts varies greatly depending on the variety [17]. These makes it a poor man source of protein therefore there is great need to store the grain so as to have it all year round, [8]. Production of cowpea is expanding in Nigeria although is concentrated in the northern part (Sudan Zone). Nigeria is a major producer of cowpea in the world. The increasing demand for the commodity has led to more of its cultivation in many parts of the country. Therefore, the use of improved varieties, technologies such as agro-chemicals, seeds and evolving cost effective and sustainable indigenous technologies have also encouraged farmers into cowpea production in recent years for expected yield increase and consequently economic gains. Cowpea is produced virtually in all parts of Nigeria. It is grown as a cash crop besides its value as food crop and, farmers are more into its production in the study area especially with the introduction of promising varieties and application of various and available indigenous technologies. More than 5.4 million tons of dried cowpeas are produced worldwide, with Africa producing nearly 5.2 million. Nigeria, the largest producer and consumer, accounts for 61% of the production in Africa and 58% worldwide [10].

There are several traditional methods of cowpea protection and preservation technologies being practiced by the respondents both at the farm level and storage places to protect the crops against insects infestation which is one of the most important problem against cowpea production and storage. These include regular and early harvesting of mature cowpea pods to minimize the initial infestation, separation of damaged and infested from healthy pods and grain, storage of grains in well-sealed and carefully cleaned granaries. In addition, grains are often mixed with (different plant extracts, salt or bark) several plants solutions such as the neem oil extract (*Azadirachta indica*)

among others.

Several measures have been initiated by the Nigerian Government to address some of the problems responsible for food crop losses. For instance, several silos were rehabilitated with new ones established across the geopolitical zones, with a combined storage capacity of over about 1.5 million metric tonnes for the storage of assorted grains; beans and “garri” (cassava by-products), [13]. In spite of these efforts, post-harvest food losses are still substantial and food imports bills have been rising in order to meet the shortfall in food availability. This force the farmers / marketers to look for alternatives or supplement the use of the available technologies for sustainable and cost effective products preservation to minimize losses associated with various infestation effects.

In Nigeria, Storage pest cause direct and indirect damages to stored agricultural products. Direct damages are in the form of weight loss, loss in grade of grains, lowering of harvests’ market value, contamination and damage to storage structures. Indirect damages on crops include heating and moisture migration in silos and other storage structures like the traditional African silo: ‘rumbu’ and cribs. Other indirect damages include the spreading of moulds and spores throughout the grain mass and monetary expenses in terms of having to purchase pest control chemicals. Damage and losses to stored grain, especially cowpea by insect pests is very severe. About 4 percent of total annual production of cowpea or about 30,000 tonnes valued over 30 million US dollars is lost annually to the cowpea brunched in Nigeria alone [8].

Some attempts have been made to study the effect of cowpea storage in Nigeria [8]. However, there has not been any empirical study into the indigenous cowpea storage methods in the study area. This study was therefore, conducted to provide empirical information on indigenous cowpea storage methods employ by farmers in Mubi- south Local Government Area of Adamawa State. The study was carried out to address the following research questions. What are the socio-economic characteristics of the

respondents? what are the indigenous storage methods of cowpea practiced by the respondents what are the perceived effects of the storage methods ? what are the effects of the socio-economic characteristics on the use of traditional Storage Methods of Cowpea? and what are the constraints faced by the respondents in the study area?

**Objectives of the study.** The main was to assess the indigenous storage methods of cowpea employed by the respondents in Mubi-south Local Government Area of Adamawa State. The specific objectives of the study were to:

- (i)describe the socio-economic characteristic of the respondents;
- (ii)identify the indigenous storage method of cowpea practiced by the respondents;
- (iii)examine the perceived effects of the indigenous storage methods of cowpea;
- (iv)determine the effect of socio-economic characteristics on the use of traditional storage methods of cowpea, and
- (v)identify the constraints faced by respondents in adaptation of indigenous storage methods of cowpea.

## MATERIALS AND METHODS

The study was conducted in Mubi South local Government Area of Adamawa state, Nigeria. Mubi South is located between latitude  $11^{\circ} 5'N$  and longitude  $13^{\circ} 1'E$ . It has altitude of 696 meters above sea level with annual rainfall of 1,220mm and mean temperature of  $15.2^{\circ}C$  during Hamattan period from November to February and  $39.7^{\circ}C$  in April [4]. The area has a land mass of  $1,261.24km^2$  and population density of 187.2 per square kilometres [14].The dry season begins in November and terminates in early June of the following year. The major occupations of the people in the area are farming, trading and civil service. The climate and the rich alluvial soil of the area favours the cultivation of food crops such as sorghum, millet, maize, rice and cassava. It also favours the production of local cash crops such as cowpea, groundnut, sesame and sugar cane on a large scale basis. Livestock production is also very important in the study area and is one of the largest

concentrations of cattle in Adamawa state. Fishing is a common practice among those living around riverbank.

### Sampling procedure

The data for the study was obtained through both primary and secondary source. Primary data was obtained through the administration of structured questionnaires.

Simple random sampling techniques were employed to select the respondents of the study. To ensure effective coverage of the study area, respondents were randomly selected from each of the districts that constituted the study area. 70 respondents were drawn from the list of the 210 cowpea farmers obtained from the Adamawa State Agricultural Development Program [3] proportionate to the registered cowpea farmers in the districts.

### Data Collection and Analysis

Percentages and frequency were used to analyse the socio-economic characteristic of the farmers, percentages was used to determine the perception of farmers on the effectiveness of Traditional Knowledge System of cowpea storage and Constraints. While Chi-square test was used to determine the relationship between the socio-economic characteristics of the respondents and indigenous storage methods of cowpea.

## RESULTS AND DISCUSSIONS

### Respondents' socio-economic characteristics

The result of the socio-economic analysis as presented in Table 1 shows that majority of the respondents (65.7%) were male while the females accounted for the remaining 34.3% in the study are. This implies that gender is a significant factor in agriculture because of its vital role in determining farming activities in the study area. This could influence the adaptive capacity to employ various indigenous cowpea storage methods. In addition, majority (71.4%) of the respondents were less than 50 years, and only 28.6% were over 50 years. This implies that most of the respondents are young and energetic. Therefore labor intensive methods of cowpea storage could also be employed with less stress.

On the level of education, the result shows in Table 1 that most (54.3%) are married while 45.7% are either single, separated, divorce or widowed. This implies that the farmers need to ensure proper storage of these products to meet the demand of the family. This could influence the adaptive of various method to cater for the family. The result shows that majority of the respondents have a household size of between 6 and 10 and this accounted for about 44.3%. This implies that methods that will demand the use of many hand could easily be apprehended. On the education attained shows that, 52% of the respondents attended primary school while 32% and 16% had secondary and tertiary education respectively. This implies that majority of the respondents are literate.

Table 1. Socio-economic Characteristics of the Respondents

Variable	Frequency	Percentage
<b>Age (Years)</b>		
Less than 40	32	45.7
41- 50	18	25.7
51 above	20	28.6
<b>Total</b>	<b>70</b>	<b>100</b>
<b>Gender</b>		
Male	46	65.7
Female	24	34.3
<b>Total</b>	<b>70</b>	<b>100</b>
<b>Marital Status</b>		
Married	38	54.3
Single	6	8.6
Divorced	19	20
Widowed	7	10
<b>Total</b>	<b>70</b>	<b>100</b>
<b>Household Size</b>		
Less than 5	29	41.4
6-10	31	44.3
11-15	10	14.3
<b>Total</b>	<b>70</b>	<b>100</b>
<b>Years of Experience</b>		
Less than 5	13	18.6
6 – 10	9	12.8
11 – 15	17	24.3
16 – 20	16	22.8
More than 20	15	21.5
<b>Educational Level</b>		
Primary school	13	52.0
Secondary	8	32.0
Tertiary	4	16.0
<b>Total</b>	<b>88</b>	<b>100</b>

Source: Field survey, 2016

Table 1 further expressed that 82.9% of the respondents takes farming activities as their primarily occupation and as a means of their livelihood.

### Traditional Methods of Cow Pea Storage

Table 2 captured the different methods of cowpea storage by the respondents in the study. Multiple responses were observed among the respondents. The results shows that majority of the respondents considered airtight method as their preferred approach and this accounted for 62.8% of the respondents with 21.4% using liming method as a means of their storage method. Similarly, those respondents practicing house roof and application of neem extract solution accounted for 25.7% and 50% of the respondents respectively. Application of common salts, wood ash and the preservation using finger pepper as their preferred and effective methods of traditional storage of cowpea accounted for 7.1%, 28.6, and 25.7% respectively while 21.4% of the respondents reveals frying methods as the best approach to cowpea preservation in the study area. The study implies that the respondents might be ready to use other alternatives measures to overcome the problems associated cowpea storage if opportunities are made available (affordability) this could attribute to the impact of storage in the study area.

Table 2. Distribution based on various Traditional Methods used by the respondents

Storage methods	Frequency	Percentage (%)
Air Tight	44	62.8
Lime	15	21.4
Roof House	18	25.7
Neem Extract	35	50.0
Common Salt	5	7.1
Use of Ash	20	28.6
Finger Pepper	18	25.7
Frying	15	21.4

Source: Field survey, 2016

### Perceived Effectiveness of Traditional Storage Method of Cow Pea Storage

Table 3 presents the effectiveness of indigenous storage methods of cowpea as perceived by the respondents. About 20.0% of the respondents expressed the use of air tight container as effective in storing cowpea. This may be due to insufficient air in the container

and high temperature that will make insects pests not to survive. Use of Neem leaves and oil extract from neem seed are also reported to be effective by 35.7% of the respondents. Neem leaves / oil extract are very bitter, this could be reason why insect pests do not survive when stored with it. Frying cowpea before storage was as well reported to be effective by 28.8% of the respondents. Though the respondents revealed that, the method is tedious and time consuming. The use of finger pepper for cowpea before storing is also reported to be effective by 50.0% of the respondents. Though the respondents revealed that, the method is tedious and time consuming. This make insect pest not to survive because of the gaseous emissions of irritants that makes the condition unfavorable for the pest to thrive. This implies that if extension services will be intensified in rural areas farmers will improve on their cow pea storage methods. This could be due to the effect of the services to impact on the storage methods.

Table 3. Perceived Effectiveness of Traditional Storage method

Storage Method	Very Effective	Effective	Not Effective
Air Tight	44(62.9)	14(20.0)	12(17.1)
Lime	15(21.4)	45(64.3)	10(14.8)
House roof	23(32.8)	30(42.8)	17(24.3)
Neem Leaves or oil	30(42.8)	25(35.7)	15(21.4)
Common salt	15(21.4)	35(50.0)	20(28.8)
Use of ash	15(21.4)	40(57.1)	15(2.4)
Finger pepper	21(30.0)	35(50.0)	14(20.0)
Frying	15(21.4)	20(28.8)	35(50.0)

Source: Field survey, 2016

### Effect of Socio-Economic Characteristics on Indigenous Cowpea Storage Methods

Table 4 shows that there was a significant relationship between respondents age, marital status and educational level;  $X^2 = 0.780$ ,  $P=0.377$ ,  $X^2 = 1.739$ ,  $P=0.628$  and  $X^2 = 3.977$ ,  $P=0.409$  with the use of traditional method of cowpea storage. Age of the farmer affects the farmer's knowledge and awareness on the traditional methods of storage. This indicates that the age influence the farmers capability to adopt traditional storage method. The finding supports that of [5]. Marital status is an important factor that determine the adoption

of traditional methods of cowpea storage this could be due to the fact that the farmers have family to cater for. Educational level plays an important role in the adoption of technologies. This result is in agreement with the findings of [5] who also placed much emphasis on education as a major determinant of adoption of new technologies.

Table 4. Chi-square Test between socioeconomic characteristics and Traditional Methods of Cow Pea Storage

Variables	Df	$X^2 =$ value	P – value
Age	1	0.780	0.377
Marital Status	3	1.739	0.628
Educational level	4	3.977	0.409
Total	10	100	

Source: Field survey, 2016

### Constraints to Utilization of Traditional Storage Methods

The result of the various constraints to utilization of traditional storage methods as identified and reported by the respondents are presented in Table 5. The analysis revealed that 25.8% of the respondents complained of inadequate storage facilities as their main constraints. This implies that there is no adequate facilities provided for the purpose of cowpea storage. The study also discovered materials normally being used for this purpose are difficult to get as the process of preparing it is capital intensive especially if large quantity of the product is to be stored. About 18.6% of the respondents revealed that use of indigenous methods are time consuming. Though, it has the advantage of being cheap and safe to health. This also revealed that 24.0% of the respondents complained on the labour intensiveness especially if the cowpea to be stored is in large quantity and their inability to have the resources of hiring labour during the storage process. This implies that obtaining labour during the storage process is a big problem [7]. The result also shows that 11.8% of the respondents complained about the weather condition during the cowpea storage. This implies that weather condition greatly determine the storage process. This could be improved by proving ways in such a way that the weather conditions could be controlled.

Table 5. Constraints to Utilization of Traditional Storage Methods

Constraints	Frequency	Percentage (%)
Inadequate storage facilities	58	25.8
Capital intensive	52	19.8
Time consuming	49	18.6
Labour intensive	63	24.0
Weather condition	31	11.8
<b>Total</b>	<b>263*</b>	<b>100</b>

Source: Field Survey, 2016

## CONCLUSIONS

The study revealed that majority of the respondents are well experienced in cowpea storage using traditional methods available in the area. The methods were found to be associated with series of constraints, such as weather situation during drying, in adequate storage facilities, beans pest infestation among others. The farmers prefer using this method because of its cheapness, easy accessibility and no or low cost associated with it. It is therefore recommended that:

(i)The farmers should be encouraged and given adequate capacity building in the areas of safety, environmental effect, sustainability, improvement in the technologies and quality control. Further studies need to be carried out to ensure its reliability, effectiveness and acceptability by others.

(ii)Future empowerment initiatives should take into cognizance the storage facilities constraints of rural people to reduce the amount of glut spoilage.

(iii)Similar traditional cowpea storage method should be included in various government and NGOs projects in the future to encourage safety in our storage system to minimize health associated problems.

(iv)Timely and sufficient provisions of storage facilities will facilitate the achievement of objectives of any farmer. Therefore, delays emanating from the government and donor agencies should be minimized.

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