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Full-Length Research Paper

Cowpea infestation and effects of crop-storage relationship at Dawanau International Market, Kano State, Nigeria

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ABSTRACT: This study was carried out at Dawanau International Market in Dawanau town, Dawakin Tofa Local Government Area, Kano State. To investigate the pest-crop-storage relationship of cowpea storage and marketing, forty questionnaires were distributed to wholesalers (20) and retailers (20). Data from structured questionnaires were analyzed using descriptive statistics, and the results show that packing structures, storage location, tonnage stored, and structure condition have proportional effects on pest-crop-storage dynamism on cowpea (37.5%). Poor sanitary measures at the store, the cost of triple bagging, and the scarcity of jute bags all contribute to the international market's dynamism of pest and pest challenges. It is critical that government intervention and non-governmental organizations (NGOs) collaborate with marketers to effectively develop modern storage to improve cowpea storage and handling practices and prevent the misuse of synthetic pesticides that lead to the development of killer beans.

Keywords: Dynamism, killer bean, purposive, pest, pesticide

INTRODUCTION

Central and West Africa are the primary producers of cowpeas, accounting for approximately 89% of total global production. Nigeria, Nigér, Mali, Burkina Faso, Senegal, Cameroon, and the Democratic Republic of the Congo are among the leading producers (FAO, 2008).). According to conservative estimates, more than 12.5 million hectares of the crop are planted each year around the world. The total global production of dry grain is estimated to be around 3.3 million tons (Singh and Ajeigbe, 2000). According to NAERLS and NFRA (2000), cowpea production in Nigeria accounted for 58 percent of total global output, making Nigeria the largest producer with an output of 2.9 million metric tons. . The North East of Nigeria has the highest production (703.13 metric tons/ha), followed by the North West (519.51 metric tons/ha) and the North Central (166.58 metric tons/ha). The most common stabilizer used by marketers and farmers in most crop production areas is the use of synthetic crop protection products, which are costly and potentially harmful to both the environment and consumers (Murray, 2000; Ilesanmi and Gungula, 2010). However, the use of synthetic crop protection products to control cowpea pests is discouraged due to health risks to humans and environmental concerns, among other

things (Pattnaik et al., 2012).

The postharvest infestation of the cowpea beetles seed bruchid therefore, constitutes a major problem contributing to huge food shortage and loss of food value in tropical and subtropical countries of the world. The bruchid causes the loss of produce mainly due to the consumption of cowpea seed cotyledons by larvae, resulting in reduced seed weight, aggravating mold growth due increase in moisture content level, increased seed perforation, decreased seed viability, and renders reduction in market value and apathy by consumers (Dabiré *et al.* 2008; Deshpande *et al*., 2011). The shelf life of the stored cowpea is generally affected by the cowpea seed bruchid which predisposes agribusiness to determine the selling price of the product investment. This poses an increase in demand and attracts food insecurity with reference to food preparation and consumption which have a direct consequence on locally processed products, raw and processed cowpea packaging and a year-round price volatility affecting its availability, quality, quantity and health wise at the international market. There has been continued increase in price of cowpea during the lean season every year with incessant cries from consumers at national level and international level from Kano metropolis and its surrounding communities which make it difficult to satisfy the demand and supply requirement due to escalating cost of cowpea. Majority of the cowpea farmers are small scale with intermediate low or no postharvest knowledge and technology which affect the quality of pods and beans harvested as well as the processed produce. This research seeks to explore and investigate the pest structure at Dawanau International Market, Kano, Nigeria with particular reference to cowpea which will judiciously have effects on cost, preservation, health and control of cowpea pest for safe consumption.

METHODOLOGY

Dawakin Tofa Local Government Area (LGA) is one of the 44 LGA in Kano State with its headquarter in Dawakin Tofa (or Dawaki). The area has a total landmass of 479 km^2 and a population of 342,500 as of 2016 population projection (*www.population.gov.ng* retrieved 16/8/2020). Its geographical coordinates are 12° 6' 13" North, 8° 19' 52" East and Dawanau International Market is situated in the LGA along A9 road. However, for the purpose of this study, the methodology employed was the survey and non-survey designs. The primary data was collected using a well-structured questionnaire targeting socio economic characteristics of the respondents, structures use in controlling insect pest in cowpea, management system of cowpea marketing as well as constraints that militate against cowpea quality in the study area. Secondary data were also used to support some important information. The population of the study comprises majorly wholesalers and retailers of cowpea at Dawanau International Market, Kano State where forty active cowpea value chain wholesalers (20) and retailers (20) were involved in the study and the data collected were analyzed using descriptive statistic.

RESULTS AND DISCUSSION

Table 1 showed that 30% of the respondent were between 15-25 years of age and 27.5% of the respondent were 26-30 years, 30% were between 36-40 years these show that majority of the respondent involved in cowpea marketing are youth as the result shows that only 24% of the respondent are above 45 years of age. The results presented in table showed that about 87.5% of the respondents were male while 12.5% were female; these indicated that the majority of the cowpea agribusiness in the study area was male. The above table shows that 10% percent of the respondents were married and 42.5% were single. The result in the table presented shows that 35.0% of the respondents had tertiary education, 27.5% secondary education; however, those with primary education and Quranic education were 25.0% and 12.5%, respectively. Table depicted that 57.5% of the respondent were members of cooperative society while 42.5% of the respondent do not belong to any cooperative group. In Table 2, 57.5% of the respondent used synthetics chemical to control pests of cowpea at the storage area while 22.5% of the respondent used botanical method which involve the use of plants parts such as pepper, American basil, clove etc. However, 20% of the respondents were using the improved triple bagging (PIC). From the analysis it showed that the majority of the respondents were using synthetic chemical method in storing cowpea. This could be the major reason why the cowpea marketing at international level has fallen down because of the pesticide residues which were found to be above safe limit and label Nigerian cowpea as a slow killer. Varieties of cowpea stored by cowpea merchants at the Dawanau International Market are var. Kanannado, var. Dan misira, var. Dan Damina biyu (local varieties) and improved varieties such as SAMPEA and IITA. As shown in (Table 3), 35.0% of the respondents' stored local varieties of cowpea, 25.0% of the respondents stored improved varieties, while 40% of the respondent stored both local and improved varieties of cowpea. This is because some international merchants have specifications of the varieties needed for domestic or international marketing of cowpea. The cowpea storage also contributes much to the flexibility, protection, fumigation and marketing of cowpea in the study area. As shown in (Table 4), results

Table 1: Socio economic characteristics of the respondent.

Parameters	Frequency	Percentage
Age of the respondents		
15-25	11	27.5
26-30	12	30.0
36-40	07	17.5
45 above	10	25.0
Total	40	100
Sex of the respondents		
Male	35	87.5
Female	05	12.5
Total	40	100
Marital status of the respondents		
Single	12	30.0
Married	24	60.0
Divorced	04	10.0
Total	40	100
Level of education the respondents		
Quranic	10	25.0
Primary	05	12.5
Secondary	11	27.5
Tertiary	14	35.0
Total	40	100
Year of experience of the respondents In the business		
1-5 years	08	20.0
6-10 years	07	17.5
11-15 years	06	15.0
16-20 years	05	12.5
More than 20 years	14	35.0
Total	40	100
Membership of respondents in Cooperative Association		
Yes	23	57.5
No	17	42.5
Total	40	100

Source: Field survey 2019

Table 2: Respondents habits of cowpea pest control.

Method of Control	Frequency	Percentage
Synthetic Chemical	23	57.5
Botanical	09	22.5
Triple bagging	08	20.0
Total	40	100

Source: Field survey 2019

Table 3: Respondents types of varieties of cowpea stored.

Value	Frequency	percentage
Local variety	14	35.0
Improved variety	10	25.0
All of the above	16	40.0
Total	40	100

Source: Field survey 2019

revealed that majority 57.5% of the respondents in the study area store their cowpea in the warehouse, while some store their cowpea at the market venue (32.5%) and 10.0% of the respondents store at home. Some of the respondents who stored at market and such stores were completely sealed as a protection against

Table 4: Distribution of the respondents according to places of storage being use.

Place of storage	Frequency	Percentage
At market	13	32.5
Warehouse	23	57.5
At home	04	10.0
Total	40	100

Source: Field survey 2019

Plate 1: A sealed store for cowpea at Dawanau International market.

insect infestation as shown in (Plate 1). The type of storage use could be a dependant source of insect's vulnerability, moisture migration, pests attack and disease infestation (most especially fungal) which have a direct bearing on food security. Packaging structures obtained in the study area shows that 37.5% of the respondent used polyethylene bags in storing cowpea and 30.0% use a combination of all the storage structures, those using jute bags have a proportion of 25.0% with the least among them using triple bagging having a percentage of 20.0% and other respondent's uses combination of all of the above storage packaging structures in storing their cowpea at the study area (Table 5 and Figure 1). The packing of cowpea in any of the packing structure has a direct bearing on the quality, asphyxiation, pest infestation of the cowpea and fumigation; this is because slight traces of moisture in a polyethylene bag will have a negative consequence of the quality of cowpea whereas in jute bag, the consequences are insignificant. The use of triple bagging does not need any fumigation during storage of cowpea but might affect the germinability of the cowpea, seed vigor and so on. From the graph (Figure 2), it showed that the cowpea bruchid is the most serious problem

Table 5: Respondents awareness of waiting period of post application of crop protection products.

Value	Frequency	percentage
Yes	34	85.0
No	06	15.0
Total	40	100

Source: field survey 2019

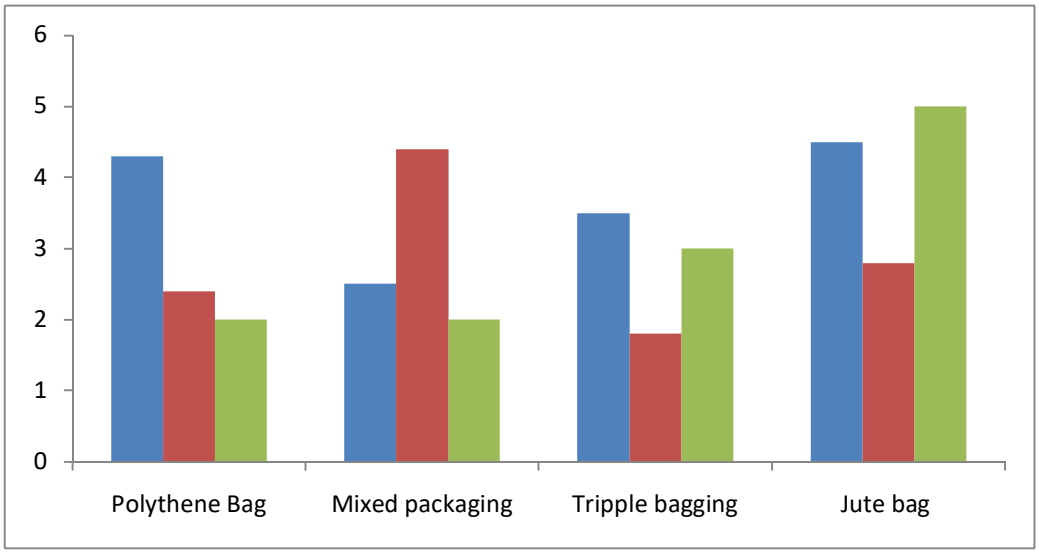

Figure 1: Distribution of the respondents according to packaging structure being used.
Source: Field survey 2019

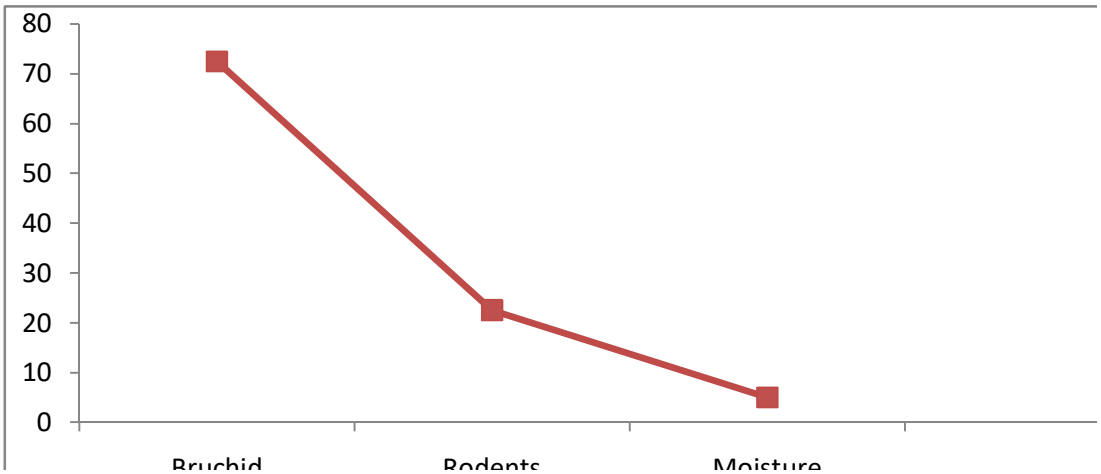

Figure 2: Respondents ranking of problems encountered during cowpea storage.
Source: Field survey, 2019

encountered during storage of the cowpea which amounts to 72.5%, However, other respondents attributed the main problem encountered being rodent infestation which accounts for 22.5%, Others respondents opinioned that pilfering was the most challenging aspect of storage and this accounts for 2.5%. Based from the analysis above, results revealed that that majority of the respondent had serious problem of

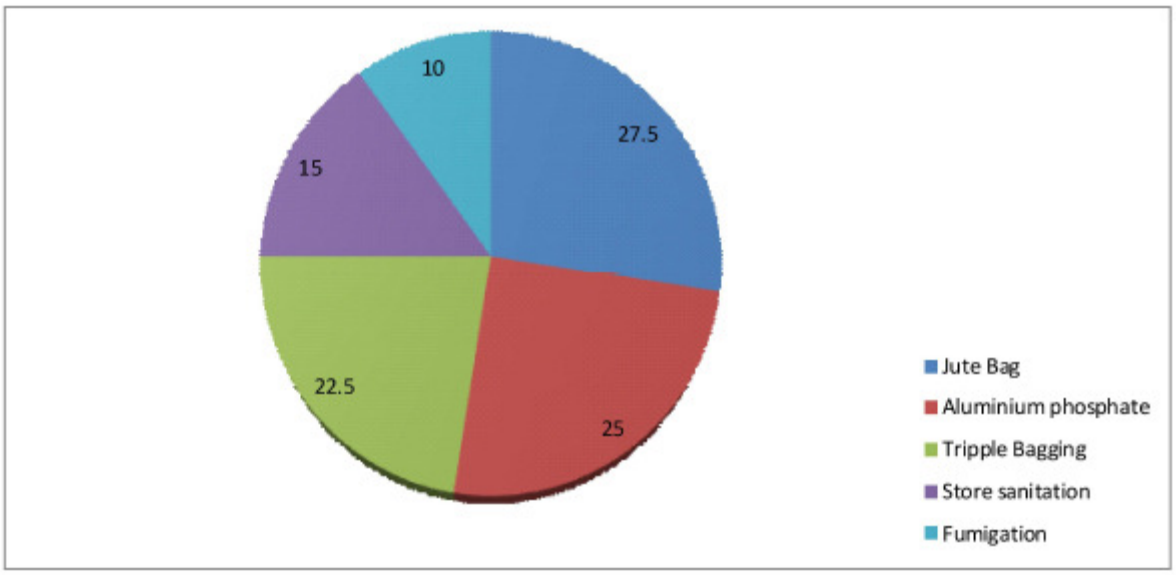

Figure 3: Marketers' perceptions of reducing the cowpea pest problem.
Source: Field survey, 2019.

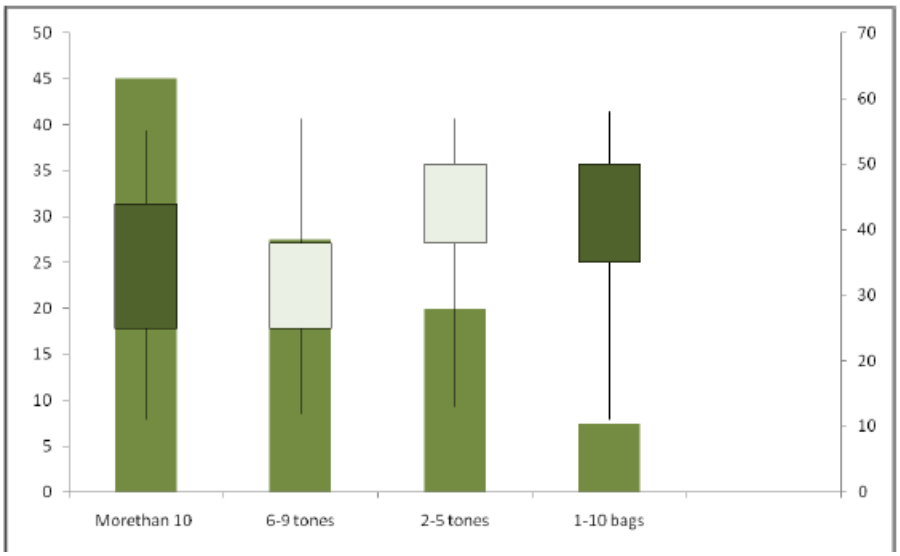

Figure 4: Distribution of the respondents according to number of bags stored.
Source: Field survey 2019.

cowpea bruchid infestation in the study area. As depicted in (Figure 3) the results obtained revealed that, some respondents believed that using of jute bag 27.5 percent could be the best way to reduce the problems of pest infestation during cowpea storage whereas some respondents believe that using of Aluminum phosphide 25.0 percent could reduce the preponderance of pest infestation in the study area. Also from the above the figure some marketers are of the opinion that the use of triple bagging could help a lot to check mate pest infestation in the study area which constitutes 22.5%. As shown from the figure, it shows that some of the respondents believed that the use of pesticide is one of the best way for reducing the problems of cowpea insect pest in the study area. The results presented in (Figure 4) showed that majority of the respondents 45.0%, stored

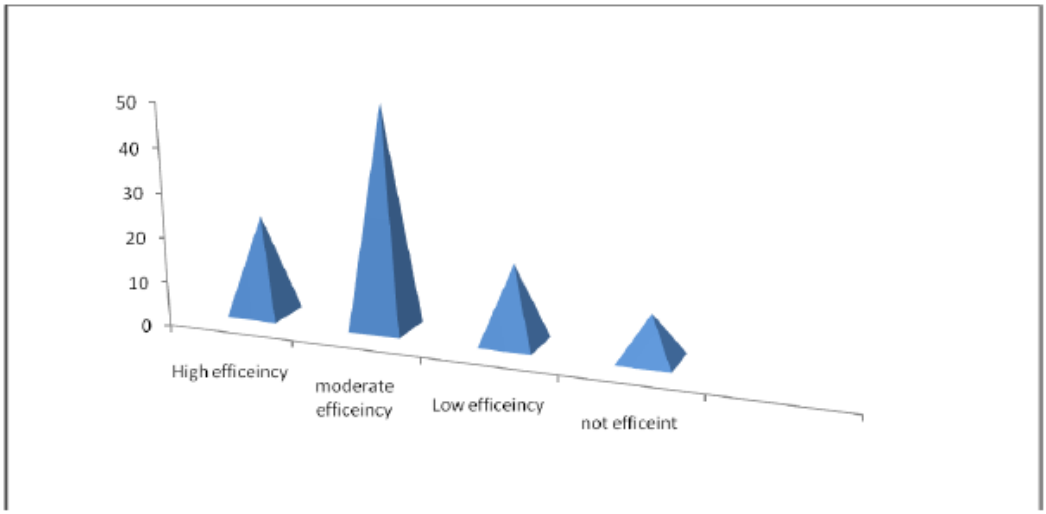

Figure 5: Respondent's experiences on the efficiency of the warehouse and environment in mitigating pests attack. Source: Field survey 2019

Table 6: Respondents reaction on first-in-first-out, last-in-last-out of cowpea.

First-in-first-out/last-in-last-out	Frequency	Percentage
Practiced (Yes)	21	52.5
Practiced (No)	07	17.5
Not aware	12	30.0
Total	40	100

Source: field survey 2019

Table 7: Respondents awareness on reading the label of pesticide before application.

Value	Frequency	Percentage
Yes	34	75.0
No	06	15.0
Total	40	100

Source: Field survey 2019

more than 10 toes of cowpea, while others stored between 6-9 tons constituting 27.5%, and 20% of the respondents store between 2-5 toes whereas only 7.5% of the respondents store between 1-10 bags. This shows that majority of the respondents are wholesalers of the cowpea in the market. The distribution of the respondents in respect of the storage facilities efficiency in mitigating pest attacks revealed that 50.0% of the respondents indicated that the use of warehouses operates at a moderate capacity. 22.5% of the respondents revealed that when warehouse operates at a higher capacity while 17.5% of the respondents disclose that the efficiency of the warehouse is low and 10% of the respondents lamented that the warehouse is not efficient in mitigating pest infestation. The results analysis showed that the majority of the respondents opinioned that using warehouse in the study area can be source of mitigation against pest infestation. This could mean location, design, operation, maintenance of the warehouse could all counts to the efficiency of the warehouse. Table 6 showed that majority of the respondents (85.0%) observed waiting period on post application of crop protection products. 15% of the respondents did not observe waiting period after application of crop protection products on the cowpea. The non-observance of waiting period might be attributed to the high pesticide residue found on cowpea which results to outright rejection by some exporting countries and cause economic downturn to the country source of foreign exchange and equally short change farmers. The results as presented (Table 7) showed that 52.5% of the respondent observed first in first out/last in last out (FIFO/LILO) when they store their

cowpea at their various storage places, 30.0% of the respondents reported not aware of the practice of FIFO/LILO while only 17.5% did not use the principle. This could have a negative impact on food security, food health and food hygiene as this predisposes consumers to different stomach disorders, exposing them to carcinogenic tendencies and sometimes death to the consumer due to the carefree and consumption of cowpea not properly evacuated in the store. The results of the awareness of respondents to reading and observation of instructions on pesticide labels before use is presented in (Table 7).The results showed that 75.0% of the respondents read the label of most of the pesticide products before application, while 15% of the respondents did not. The analysis, it clearly indicated that majority of the respondents read the crop protection products label and follow the instructions before using the crop protection products. This depends entirely according to their level of education and understanding of the products and sensitization by friends or crop protection Products Company.

Recommendations

(a) To reduce post-harvest food losses, there is the need for increased investment in post-harvest technology research and development, so as to develop modest storage and packaging structures that can be used within the level of the marketers to control losses and safe guard life. The purchase and use of silo can be of significant importance to farmers most especially if they work in cooperative groups to store their cowpea unadulterated. It is also important if triple bagging can be subsidized so that it will be affordable to most of them.

(b) More sensitization and alternative usage of green pesticide and organic materials should be encouraged particularly on methods of controlling pest in cowpea due to weevils, rodent, moisture, and storage structures.

(c) The aspect of chemical used in storage should be improved through sensitization and workshop to those in cowpea Agribusiness so as not undermine the waiting period of crop protection products and First-in-First-out (FIFO) and Last-in-Last-out (LILO).

REFERENCES

Dabiré CLB, Niango MB, Sanon A (2008). Effects of crushed fresh Cleome *viscosa L.* (*Capparaceae*) plants on the cowpea storage pest, *Callosobruchus maculatus* Fab. (Coleoptera: Bruchinae). *International Journal of Pest Management* 54: 319–326.

Deshpande VK, Basavaraj M, Deshpande SK, Sateesh A, Salimath PM (2011). Quantitative and Qualitative Losses Caused by *Callosobruchus Maculatus* in Cowpea during Seed storage. *Plant Archives* 11(2). 723-731.

FAO Food and Agriculture Organization (2008). Agricultural production status. http://www.fao.org/faostat

Ilesanmi JO, Gungula DT (2010). Preservation of cowpea (*Vigna unguiculata* (L.) Walp) grains against cowpea bruchids (*Callosobruchus maculatus*) using neem and moringa seed oils. *International Journal of Agronomy*. : http://dx.doi.org/10.1155/2010/(8 pp)

Murray BL (2000). Plant essential oils for pest and disease management. *Crop Protection* 19:603-608.

NAERLS and NFRA (2000). Annual Agricultural Performance Survey Report of Nigeria National Research Council. 2000. The Future Role of Pesticides in US Agriculture Washington, DC: Natl. Acad. Press, 2009; 301.

Pattnaik MM, Kar M, Sahu RK (2012). Bioefficacy of some plant extracts on growth parameters and control of diseases in *Lycopersicum esculentum*, *Asian Journal of Plant Science and Research*, 2 (2):129-142.

Singh BB, Ajeigbe HA (2002). Improving cowpea cereal based cropping systems in the dry savannah of West Africa. In: Fatokun CA, Tarawali SA, Singh BB, Kormawa PM, Tamo M (Eds.) (2002). Challenges and Opportunities for Enhancing Sustainable Cowpea Production. Proceeding of the world cowpea conference iii held at International Institute of Tropical Agriculture, (IITA), Ibadan, Nigeria, 4-8 September 2000. IITA Ibadan, Nigeria. Pp.278-286.

www.population.gov.ng retrieved 16/8/2020).