

# Studies on the Background of Cowpea Seeds from Trained Community Based and Licensed Seed Producers in Three States of Nigeria

**Iyorkaa Nater<sup>1, 3, \*</sup>, Kamara Alpha Yaya<sup>4</sup>, Omoigui Lucky Osabuohein<sup>1, 3, 4</sup>,  
Odo Peter<sup>1</sup>, Teryima Iorlamen<sup>2, 3</sup>, Ekeruo Godspower Chibuike<sup>1, 3</sup>**

<sup>1</sup>Department of Plant Breeding and Seed Science, College of Agronomy, Federal University of Agriculture Makurdi, Makurdi, Nigeria

<sup>2</sup>Department of Crop Production, College of Agronomy, Federal University of Agriculture Makurdi, Makurdi, Nigeria

<sup>3</sup>Molecular Biology Laboratory, Federal University of Agriculture Makurdi, Makurdi, Nigeria

<sup>4</sup>International Institute of Tropical Agriculture (IITA), Kano Station, Kano, Nigeria

## Abstract

The survey was carried out to compare two main sources of cowpea seed, Community Based Seed Producers (CBSP) and Licensed Seed Producers (LSP) for their source of seeds, seed production and storage systems across the three states of Benue, Kano, and Jigawa. Seed producers were interviewed during seed collection using multiple-choice questions that were divided into three main categories to enable the researcher to get information on the following parameters; background of the seed or planting material of the seed producers, seed production and Seed storage background. Questionnaires were administered to Ninety (90) respondents each from both community based seed producers (CBSP) and licensed seed producers (LSP) across the three states to give a total of 180 respondents with the help of extension agents who were trained by the researcher in order to ensure consistency in response of the questions from the respondents. Copies of the questionnaires administered to the respondents were collected immediately from respondents after completion. Data collected from seed producers interview was presented in percentages using bar charts, histogram, line graphs, pyramids and radar webs using Minitab, version 2017 statistical software. The result showed that most of the community-based seed producers adapt to the technology introduced to them by the Tropical Legume III project. Community based seed producers are comparable with the licensed seed producers in most of the seed production practices and post-harvest handling. Community based seed producers are comparable with the licensed seed producers in most of the seed production practices and post-harvest handling. Most of the community based seed producers also adapt to the technology introduced to them by the TLIII project. We therefore, concluded that community based seed producers can be used as an alternative source for seed multiplication and distribution within their environs under good training and minimum inspection as there are comparable to the licensed seed producers in most seed production and post-harvest handling.

## Keywords

Cowpea, Community Based Seed Producers, Licensed Seed Producers, Tropical Legume III, Bar Charts, Histogram, Line Graphs, Pyramids, Radar Webs

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\* Corresponding author

E-mail address: [nateriyorkaa@gmail.com](mailto:nateriyorkaa@gmail.com) (I. Nater)

## 1. Introduction

Cowpea (*Vigna unguiculata* L. Walp) is high in protein content, ability to adapt to different types of soils and intercropping systems, its tolerate drought, ability to improve soil fertility and prevent soil erosion makes it economically important in many developing countries [1]. The grain is rich in protein (25%), carbohydrates, vitamins, and minerals. This complements the mainly cereal diet in countries that grow cowpea as a major food crop. In addition, to the grain, the haulms (biomass) from the plant provide important nutritious fodder for ruminant animals especially during the dry season. In Nigeria, farmers' were found to have increased their annual income by 25% from cowpea produce [2].

The importance of seed to any crop-based production system cannot be overemphasized. It is the fundamental unit of any production system since it is the source of life. Improving the quality of seed of any preferred variety is the basis for agricultural productivity improvements [3]. Use of good quality seed would results in increased yields and crop quality [4]. Therefore, improving the availability of high quality seeds of well-adapted varieties is important to boost farmers' productivity, leading to higher farmer's income and improved food security [5].

Despite the existence of a formal seed system, cowpea seed supply in Nigeria has remained largely informal. The most distinct feature about this system is that it follows several localized pathways including own saved seed, neighboring farmers, local grain market (open-air assembly market) among other sources. Unfortunately, the quality of cowpea seed exchanged through this system is believed to be compromised. This could likely be due to their seed production and post-harvest handling background. However, these seed background has not been assessed. The study was conducted to compare two main sources of cowpea seed, Community Based Seed Producers (CBSP) and Licensed Seed Producers (LSP) for their source of seeds, seed production and storage systems.

## 2. Materials and Methods

### 2.1. States and Seed Source Used for the Study

The study was carried out on seed companies and community based seed producers across the three states of Kano, Benue and Jigawa. The survey was targeted of the seed farmers who received their training from Tropical Legume Seed Systems (TLIII) in each location and seed companies marketing cowpea seeds in those states.

### 2.2. Procedure to Compare Two Seed Sources of Cowpea for Their Seed Background

Community based and licensed seed producers in three states of Nigeria were interviewed using a structured interview schedule. The main focus was to gain some insight on the background, cultural management and seed quality strategies employed by the seed producers under the following headings:

- a) Seed background including source and multiplication recycling
- b) Field cultural management strategies
- c) Seed storage background and storage material used

### 2.3. Validation of the Questionnaires

The questionnaire (interview schedule) was subjected to validation by a seed systems specialist from International Institute of Tropical Agriculture (IITA), Kano. The seed systems specialist was served with a copy of the questionnaire to ascertain the clarity, correctness and suitability of the items of the questionnaire.

### 2.4. Administration of the Questionnaire

Questionnaire was administered to Ninety (90) respondents each from both community based seed producers (CBSP) and licensed seed producers (LSP) across the three states of Jigawa, Benue and Kano to give a total of 180 respondents. The questionnaire was administered to the respondents with the help of extension agents who were trained by the researcher in order to ensure consistency in response of the questions from the respondents. Copies of the questionnaires administered to the respondents were collected immediately from respondents after completion.

### 2.5. Data Analysis

Data collected from seed producers interview was presented in percentages using bar charts, histogram, line graphs, pyramids and radar webs. All data analysis was carried out using Minitab, version 2017.

## 3. Results

### 3.1. Source of Cowpea Seed Used for Multiplication

Figure 1 shows the responses of seed producers regarding where they sourced their seeds for multiplication. The result showed that in Benue state 66.67% of licensed and 6.67% of community based seed producers obtained their seeds for multiplication from research institutions, respectively. In Jigawa and Kano states only licensed seed producers got

their seeds from research institutions with mean values of 80% and 66.67%, respectively. The result also revealed that 33.33%, 20% and 33.33% licensed seed producers got their seeds for multiplication from tropical legume seed systems project of Benue, Jigawa and Kano states, respectively. Meanwhile, 93.34%, 86.67% and 70% of the community based seed producers in Benue, Jigawa and Kano states respectively obtained their seeds from tropical legume seed systems project. Figure 1 again showed that none of the licensed seed producers in the three states of Benue, Jigawa and Kano got seeds from seed institutions. Figure 1 also showed that 30% and 13.34% community based seed producers got their seeds from seed companies in Kano and Jigawa states respectively with none from Benue state. The result showed that none of the seed producers obtained their seeds from farmers or neighbours.

### 3.2. Seed Recycling by CBSP and LSP in Benue, Jigawa and Kano

Figure 2 presents the response from CBSP and LSP regarding the number of times they recycle their seeds for sale. The result showed that 100%, 100% and 83.34% of

licensed seed producers from Kano, Jigawa and Benue recycle their seeds by 3 times while none of the community based seed producers in the three states recycle his or her seeds for up to 3 times. The result also showed that 23.33%, 20% and 13.34% community based seed producers from Kano, Jigawa and Benue states respectively recycle their seeds by 2 times while only 16.67% of licensed seed producers from Benue recycle their seeds by 2 times with none from Kano and Jigawa states. Figure 2 showed that 76.67%, 80% and 86.67% community based seed producers from Kano, Jigawa and Benue respectively seed samples was from cycle 1 while none of the licensed seed producers had seeds from 1 cycle across the three states.

### 3.3. Weeding Frequency Among CBSP and LSP in Benue, Jigawa and Kano States

Weed control among seed producers indicated that 93.33%, 93.33% and 80% of LSP from Kano, Jigawa and Benue states respectively weeded their cowpea fields only once while, 96.67%, 80% and 80% of CBSP from Kano, Jigawa and Benue states respectively, weeded their fields once

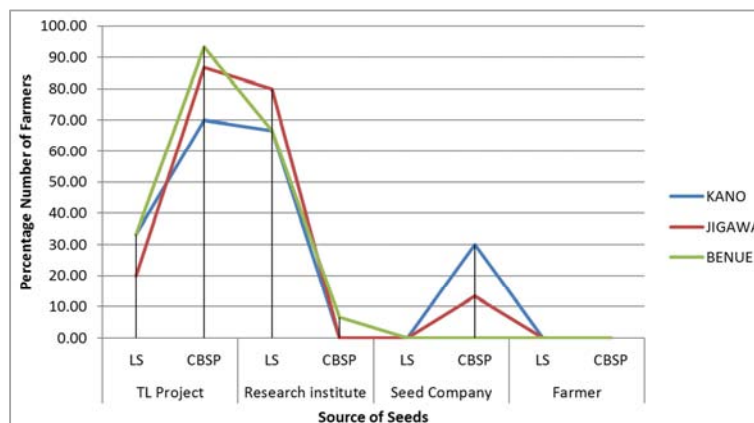


Figure 1. Source of Seeds used for Multiplication by CBSP and LSP.

KEY: CBSP = Community Based Seed Producer, LS = Licensed Seed Producer and TL = Tropical Legumes

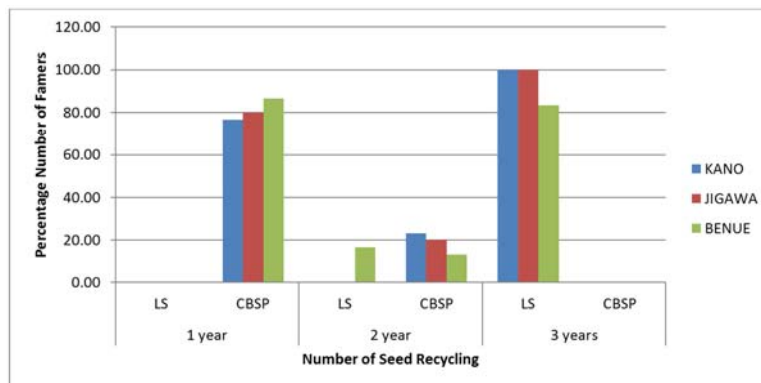


Figure 2. Number of Seeds Recycling by CBSP and LSP in Benue, Jigawa and Kano.

KEY: CBSP = Community Based Seed Producer and LS = Licensed Seed Producer

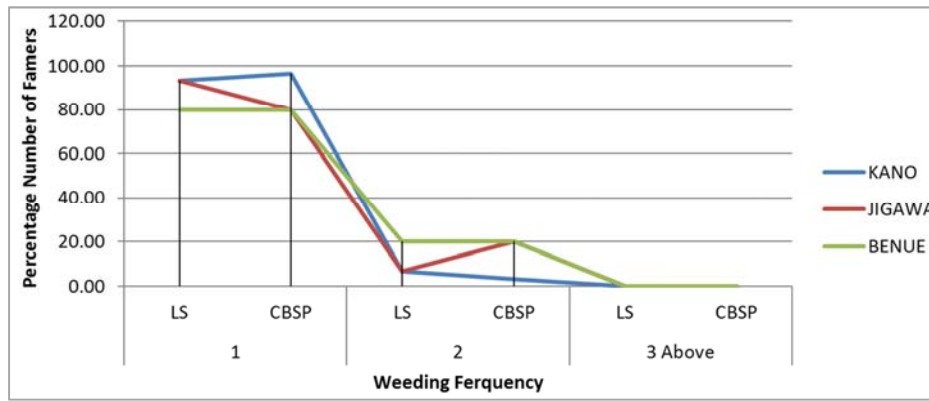


Figure 3. Weeding Frequency among Seed Producers in Benue, Jigawa and Kano States.

KEY: CBSP = Community Based Seed Producer and LS = Licensed Seed Producer

(Figure 3). Again very low percentage of farmers weeded their fields twice given that 6.67%, 6.67% and 20% licensed seed producers from Kano, Jigawa and Benue states, respectively weeded their farms. In case of CBSP, Benue, Jigawa and Kano had 20%, 20% and 3.34%, respectively. The result revealed that none of the seed producers weeded their field 3 times across the three states (figure 3).

### 3.4. Roguing Intervention Between CBSP and LSP in Benue, Jigawa and Kano States

The result of the responses from seed producers regarding

rouging of their off type plants in three states of Nigeria is presented in figure 4. The result showed that 100% of the licensed seed producers across the three states routinely rogued their fields while 83.33%, 66.67% and 70% of community based seed producers respectively from Kano, Jigawa and Benue rogued their cowpea farms. The result again showed that 16.67%, 33.33% and 30% of community based seed producers did not rogue their fields from Kano, Jigawa and Benue states respectively.

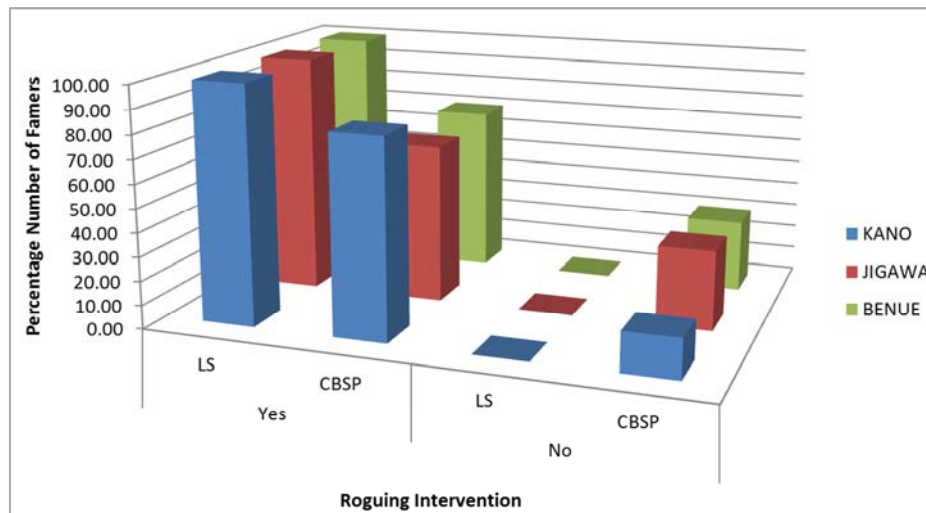


Figure 4. Roguing Intervention by CBSP and LSP in Benue, Jigawa and Kano States.

KEY: CBSP = Community Based Seed Producer and LS = Licensed Seed Producer

### 3.5. Insecticide Spraying Frequency Among CBSP and LSP in Benue, Jigawa and Kano States

The result of the responses from seed producers regarding insecticide spraying frequency of their cowpea fields in three states of Nigeria is presented in figure 5. The result showed

that all the licensed seed producers across the three states sprayed their fields up to 3 times while 80%, 93.33% and 86.67% of community based seed producers respectively from Benue, Jigawa and Kano states sprayed their cowpea farms up to 3 times. The result again showed that 20%, 13.33% and 6.67% of community based seed producers

sprayed their fields 2 times from Benue, Jigawa and Kano states respectively. None of the farmers sprayed cowpea field only 1 time across the three states as shown in figure 5.

producers in Kano, Jigawa and Benue states respectively had their cowpea seeds stored in PICS sacks. In a similar direction, community based producers respectively from Kano, Jigawa and Benue states had their cowpea seeds stored in PICS sacks with mean values of 96.67%, 100% and 93.34%.

### 3.6. Use of Storage Devices by CBSP and LSP

The result showed that 100%, 100% and 100% of licensed seed

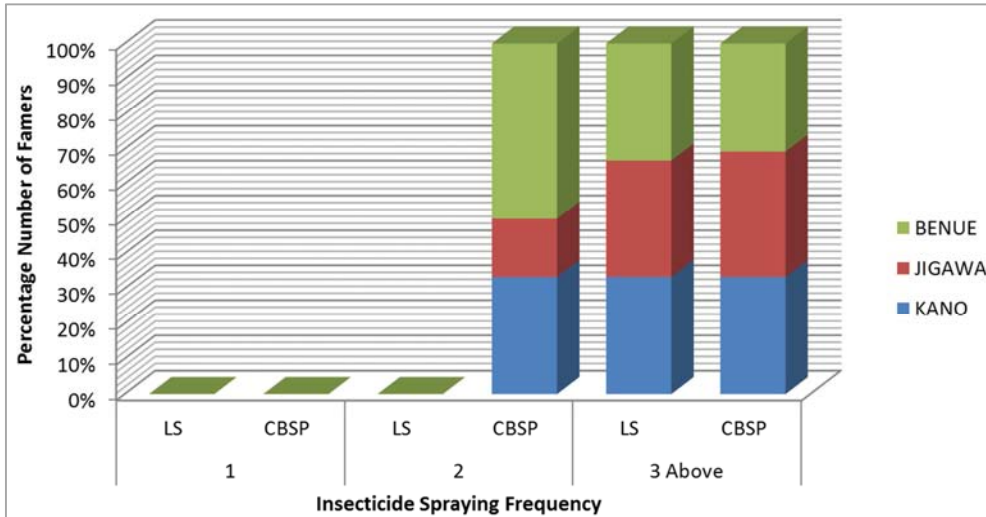


Figure 5. Insecticide Spraying Frequency among CBSP and LSP in Benue, Jigawa and Kano States of Nigeria.

KEY: CBSP = Community Based Seed Producer, LS = Licensed Seed Producer and PICS = Purdue Improved Cowpea Storage

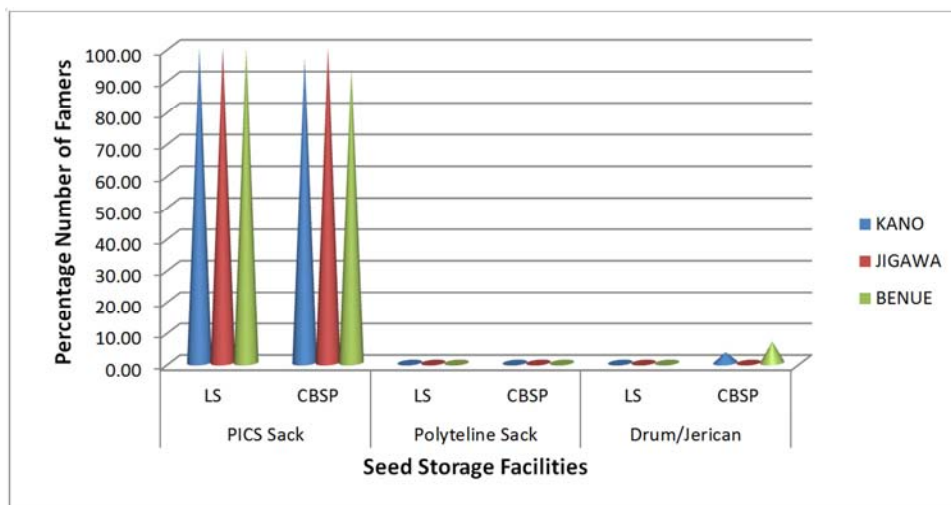


Figure 6. Use of Storage Facilities by CBSP and LSP.

KEY: CBSP = Community Based Seed Producer, LS = Licensed Seed Producer and PICS = Purdue Improved Crops Storage

Figure 7 again showed that 3.34% and 6.67% of community based seed producers from Kano and Jigawa states respectively stored their cowpea seeds in Drum or Jerican.

### 3.7. Storage Temperature of Seeds by CBSP and LSP in Benue, Jigawa and Kano States of Nigeria

The result showed that cold storage facility was employed by the LSP in Kano State by 33.33% of respondents. All the other seed farmers including CBSP and LSP in Benue and Jigawa states stored their seeds at ambient temperature. Similarly, the CBSP in Kano also stored their seeds under ambient temperature (figure 7).



Figure 7. Storage Temperature of Seeds by CBSP and LSP.

## 4. Discussion

Background of cowpea seeds used for multiplication by CBSP and LSP from three states of Nigeria differed significantly. Most of the community based seed producers sourced their seeds from tropical legume seed systems project while, the licensed seed producers obtained their seeds from the research institutions that had mandate for cowpea seed improvement and dissemination. The result of the community based seed producers could be as a result of the TLIII intervention in those states. The result also proved that before TLIII intervention in those states, farmers were not aware of the improved cowpea varieties. The findings agreed with Van-Gastel [6] who reported that majority of smallholder farmers in developing countries depend on seed exchange from fellow farmers or on their own seed saved from previous season harvest. The result from the licensed seed producers proved that not all the seed companies in Nigeria are aware of the improved cowpea varieties from the research institutions as some of the companies obtained their seeds from TLIII project. The outcome from community based seed producers again proved that seed companies and extension based institutions were not doing justice in the area of awareness creation to farmers on the new technologies by the breeders. Onyeka *et al.* [7]. stated that licensed seed companies have shown little interest in seed multiplication for self-pollinating crops and crops with high seeding and low multiplication rates. The outcome from the structured interview showed that seed companies were not updating their seeds by obtaining new seeds from the breeders but instead kept recycling their old seed varieties. The lapse could be the reason for the number of abnormal seedlings observed in the samples of LSP. The findings opposed that of Amaza, *et al.* [8], who reported that farmer's seeds are characterized with recycling for several seasons which negatively affected the seed quality. According to Biemond *et al.* [9], combination of new infections in the growing season in addition to infection from infected seeds can lead to a

build-up of pathogens after each season of seed recycling. Another author Amaza, *et al.* [8], added that continued seed recycling would lead to low seed quality which would contribute to poor yields. He [8] also considered seed recycling to be one of the problems causing low yields of cowpea, describing that the farmer seed source delivered seeds that were exhausted after generations of recycling, because the system does not replace the seed frequently with foundation or certified seed.

The response showed that a very high percentage of seed producers both community based and licensed actually weeded their fields once but a few number of them weeded their fields twice. The result could be possible if most of the seed producers used pre emergence herbicides to control weeds on their fields. It also showed that community based seed producers actually adapted the standard practices introduced to them by the TLIII team to always keep their fields weed free even if they had the first weeding to reduce the amount of inert matter during seed cleaning. The result could be the reason why the number of inert matter from both seed sources was reduced within the recommended range for certification in Nigeria. Another author [10] concluded that weed management is the most important aspect while producing good quality seed and maximizing crop yields. The weed seed contaminants in crop produce causes quality deterioration and weed seeds in grain crops perpetuate when the seed is replanted. The higher percentage of community based seed producers with positive response regarding roguing their cowpea fields showed that they actually adapted the seed production techniques introduced to them by TLIII team. Roguing of seed fields prior to the stage at which they could contaminate the crop is recommended for seed purity maintenance in self-pollination crops seed multiplication according to Phil [11], To ensure that the crop retains its integrity as regards certain physical attributes, such as color and shape, individual plants that exhibit differing traits are removed according to Colley and Micaela [12], The percentage number of community based seed producers with

positive response regarding spraying their cowpea fields only twice could be due to financial difficulties faced by farmers in rural areas.

Post-harvest handling background of cowpea seed produced by CBSP and LSP in three states of Nigeria showed that a higher percentage of seed producers from both seed sources used PICS sacks for their seed packaging and storage. The result proved that community based seed producers adapted the training they had been received from TLIII project. According to [13] indoor storage of bag stacks of rice, maize and soybeans within sealed plastic enclosures under high CO<sub>2</sub> atmosphere can control pest infestation effectively and prevent quality deterioration of seeds when done correctly. [14] Observed that PICS bags effectively arrest insect development and thereby limited seed damage while having no adverse impact on germination rates. The removal of oxygen by respiration is the main factor leading to death of insect in sealed container as revealed by many researchers [13]. According to Hillary [15], all cowpea genotypes irrespective of the storage materials declined in germination percentage over time. In Ghana, most smallholder farmers store their seeds in various containers/materials including: pieces of cloth, black polyethylene bag, clay pots, plastic containers, mostly under ambient conditions. This resulted in loss of seed viability over a short period of time depending on the type of crop seed [16, 17]. Additionally, several studies have indicated the effect of storage containers/materials on the quality of seeds in terms of germination and viability over a period of time. In a study conducted by Bortey *et al.* [17], they indicated that tomato seeds stored in pieces of cloth and tin containers resulted in low percentage germination and vigour compared to seeds stored in glass containers. This suggests that the amount of light penetration in stored seeds in glass containers could have a positive attributes when compared with seeds in piece of cloth and containers that prevent light penetration.

The result showed that almost all the cowpea seed producers from both sources used ambient temperature for their seeds storage. The result could be the reason for the variations in the germination and vigour test results among seed producers and states because the temperatures and relative humidity in their stores was not controlled. Simic *et al.* [18] stated that some of the factors that affect the longevity of seeds in storage could be the genotype of seed, initial seed quality, storage conditions, and moisture content among others. Within the same plant species, different varieties may exhibit different storing abilities either from genetic variations or other external factors. However, irrespective of the initial seed quality, unfavorable storage conditions, particularly air temperature and relative humidity contribute to accelerating seed deterioration [19]. High relative humidity and

temperature cause high moisture content in seeds and result in low germination at the end of storage [20]. However, it has been reported that the intensity of quality decrease of stored seed under different storage techniques differ among plant species and within plant species [21, 22].

## 5. Conclusion

Community based seed producers are comparable with the licensed seed producers in most of the seed production practices and post-harvest handling. Most of the community based seed producers also adapt to the technology introduced to them by the TLIII project. We therefore, concluded that community based seed producers can be used as an alternative source for seed multiplication and distribution within their environs under good training and minimum inspection as there are comparable to the licensed seed producers in most seed production and post-harvest handling.

## References

- [1] Hall AE, Cisse N, Thiaw S, Elawad HOA, Ehlers JD, Ismail AM, Fery RL, Roberts PA, Kitch LW, Murdock LL, Boukar O, Phillips RD, McWatters KH (2003) Development of cowpea cultivars and germplasm by the bean/cowpea CRSP. *Field Crops Res* 82: 103–134.
- [2] Dugje, I. Y., Omoigui, L. O., Ekeleme, F., Kamara, A. Y., and Ajeigbe, H. (2009). Farmers' guide to cowpea production in West Africa. International Institute of Tropical Agriculture, Ibadan, Nigeria (IITA), Ibadan, Nigeria, 20: 12-14.
- [3] Louwaars, N. P., and de Boef, W. S. (2012). Integrated Seed Sector Development in Africa: A conceptual Framework for Creating Coherence between Practices, Programs, and Policies. *Journal of Crop Improvement*, 26 (1), 39-59. <https://doi.org/10.1080/15427528.2011.611277>
- [4] Matthews S, Noli E, Demir I, Khajeh-Hosseini M. and Wagner, M. H. (2012). Evaluation of seed quality: from physiology to international standardization. *Seed Science Research*, 22: 69-73.
- [5] Abdoulaye T, Sanogo D, Langyintuo A, Bamire SA, Olanrewaju A, (2009). Assessing the constraints affecting production and deployment of maize seed in DTMA countries of West Africa. International Institute of Tropical Agriculture, Ibadan, Nigeria.
- [6] Van-Gastel TJG, Gregg BR, Asiedu EA, (2002). Seed Quality Control in Developing Countries. *Journal of New Seeds* 4, 117-30.
- [7] . Oyekale, K. O.; Denton, O. A. and Adebisi, M. A. (2014). Seed Management Systems in Nigeria: The Gap and the Bridge. Paper presented at the Agric Business Trade Show and Conference ('Nigeria at 100' Programme), International Conference Centre Abuja, 26 – 28 August, 2014.
- [8] Amaza, P., Udoh, E., Abdoulaye, T. and Kamara, A. (2010). Analysis of technical efficiency among community-based seed producers in the savannahs of Borno State, Nigeria. *Journal of Food, Agriculture and Environment*, 8: 1073-1079.

- [9] Biemond, P. C., Stomph T. J., Kamara A., Abdoulage T., Hearne S. and Struik P. C. (2012). Are investments in informal seed systems for cowpeas a worthwhile endeavour? *International Journal of Plant Production*, 6 (3): 367-386.
- [10] Dennis, S. C., Refeal, M. B., Marco, E. S (2013). Weed Management and its relation to yield and Seed Physiological Potential in common bean cultineans. e-ISSN 1983-4062-[www.agro.ufg.br/](http://www.agro.ufg.br/)
- [11] Phil, R. (2010). Piny Rice Knowledge Bank Handout Series [www.philrice.gov.ph](http://www.philrice.gov.ph)
- [12] Colley and Micaela (2009). *Selection and Roguing in Organic Seed Production.* Organic Seed Alliance. Archived from the original on 2013-04-14. Retrieved 2009-06-25.
- [13] Dramani, K. 2010 Comparative Study of Cowpea Storage in different Storage Structure.
- [14] Sanon, A., Dabiré-Binso, L. C. and Ba, N. M. (2011). Triple bagging of cowpeas within high density polyethylene bags to control the cowpea beetle *Callosobruchus maculatus* F. (Coleoptera: Bruchidae). *Journal of Stored Products Research*, 47: 210-21.
- [15] Hillary Mireku Bortey, Alimatu Osuman, Sadia & James Yaw Asibuo (2016). Influence of Seed Storage Techniques on Germinability and Storability of Cowpea (*Vigna unguiculata* (L) Walp) *Journal of Agricultural Science*; Vol. 8, No. 10; 2016 ISSN 1916-9752 E-ISSN 1916-9760.
- [16] Barua, H., Rahman, M. M., & Masud, M. M. (2009). Effect of storage containers environment at different storage period on the quality of chilli seed. *Int. J. Sustain. Crop Prod.*, 4 (4), 28-32.
- [17] Bortey, H. M., Olympio, N. S., & Banful, B. (2011). Quality of farmer-saved tomato (*Lycopersicon esculentum* Mills.) seeds and its effect on fruit yield in Ghana. *Ghana Journal of Horticulture*, 9, 25-33.
- [18] Simic B., Popoviæ, R., Sudaric, A., Rozman, V., Kalinovic, I., & Cosic, J. (2007). Influence of Storage Condition on Seed Oil Content of Maize, Soybean and Sunflower. *Agriculturae Conspectus Scientificus*, 72 (3), 211-213.
- [19] Heatherly, L. G., & Elmore, R. W. (2004). Managing inputs for peak production. In H. R. Boerma, & J. E. Specht (Eds.), *Soybeans: Improvement, production and uses* (3rd ed., pp. 451-536). Wisconsin, USA.
- [20] McCormack, J. H. (2004). *Seed Processing and Storage*. Principles and practices of seed harvesting, processing and storage: An organic seed production manual for seed growers in the Mid-Atlantic and Southern U.S.
- [21] Al-Yahya, S. A. (2001). Effect of Storage Conditions on Germination in Wheat. *Journal of Agronomy and Crop Science*, 186, 273-279. <http://dx.doi.org/10.1046/j.1439-037x.2001.00402.x>.
- [22] Guberac, V., Maric, S., Lalic, A., Drezner, G., & Zdunic, Z. (2003). Hermetically Sealed Storage of Cereal Seeds and its Influence on Vigour and Germination. *Journal of Agronomy and Crop Science*, 189, 54-56. <http://dx.doi.org/10.1046/j.1439-037X.2003.00596.x>.