Effectiveness of Integrating Indigenous and External Methods on Post-harvest Shelf-Life of Food Crop Preservation and Storage in the Lower Boyo, North West Region, Cameroon

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ABSTRACT

For the last three decades, about 95% of investment in agricultural research has focused more on increasing production with only about 5% on reducing post-harvest losses in Sub-Sahara Africa. This study aim at exploring the various types of indigenous knowledge systems(IKs) use on food crop preservation, storage and the extent to which they are integrated with the external methods for shelf-life extension. The study sampled eleven out of the nineteen villages that make up the Lower Boyo Division in the Northwest Region of Cameroon. A three-stage sampling techniques were employed using both purposive, random and snowball sampling techniques to arrive at the sample size of 180. Questionnaires were analysed using Excel spreadsheet and data transform into tables and pie charts. This study found that about 17 types of IKs, 07 external knowledge (EK) and 07 adaptive methods were used. Also, the integration of IKs with EK has led to the shelf-life extension of food crops with majority of farmers being able to store their food crops for more than ten months. The results of this study have help to establish a linked between IKs practices and the external EK in improving shelf-life extension in the developing countries. We therefore recommend that a participatory approach should be encouraged when it concern the integration of IKs with EK to better enhance the shelf-life extension of foodstuffs in rural areas where access to farming inputs and farming skills still remain challenging.

Keywords:*Indigenous knowledge integration, Adapted methods, Scientific methods, Shelf-life extension, Lower Boyo.*

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Highlights of this paper

- The study sampled eleven out of the nineteen villages that make up the Lower Boyo Division in the Northwest Region of Cameroon.
- This study found that about 17 types of IKs, 07 external knowledge (EK) and 07 adaptive methods were used.

1. INTRODUCTION

As in many developing countries, Chickpea present an important legume food crop in Morocco. Chickpea as the other grain legumes is considered as main source of proteins in human and animal nutrition and plays a key role in crop rotations.

The amount of food losses and food waste recorded each year is enough to feed the 870 million undernourished populations globally [1, 2]. However, most scholars and policy makers have been focusing their attention towards increasing food production especially in rural Africa without corresponding increase in food processing, preservation, and storage techniques [3]. In World Food Logistics Organisation (WFLO) [4] and Costa [5] for the last 30 years, about 95% of investment in agricultural research has been focused on increasing production with only 5% on reducing post-harvest losses in Sub-Sahara Africa. According to the The Rockefeller Foundation [6]; The Rockefeller Foundation [7] about 30-50% of production in Sub-Saharan Africa alone is lost at various points along the value chain. These huge quantities of food loses in Africa reduces the income of approximately 470 million farmers and other value chain actors by close to 15%. However, a reduction in food losses would increase farmers' income and enhance their ability to purchase improved post-harvest management technology. Notwithstanding, farmers in rural areas continue to use indigenous knowledge strategies for food crop processing, preservation, and storage which alone cannot extend the shelf-life of their food crops for reasonable duration in order to reduce losses especially when produced are much. As such, the few available improved technology of post-harvest management of food crops are only known and or use by few farmers couple with the fact that the improved technology seem to be expensive than the food lost itself.

However, Cameroon being African in miniature produces a variety of food crops but many of her citizens are still food insecure [8]. This is partly because little or no value is added to the available food crops in order to extend its shelf-life but we keep on preaching Second Generation Agriculture on papers. It is common nowadays to see heaps of spoiled food crops rotting in our regional and local markets while thousands cannot afford for two square meals a day [9]. In the North West Region of Cameroon especially in Lower Boyo Division, must farmers still depend solely on their indigenous knowledge of food preservation and storage for the extension of shelf-life of their food crops because of limited modern preservation and storage facilities [3].

The indigenous knowledge used in this community for food preservation and storage are not all effective as food cannot be stored for a longer period in order to support the household needs. This problem for the past decades was not noticed because they were still enough space and few mouths to feed but now with the increasing population, more food is needed and also space to store this food crops taking into consideration the system of construction in this community [10]. Moreover, in the past insect infestation was often a less serious problem because these farmers cultivated traditional varieties with low yields, but generally more resistance to insects and mould infection. However, with the introduction of high yielding crop varieties and the use of inorganic chemicals to this community, has resulted to increase post-harvest losses as these varieties are less resistance and difficult to be stored indigenously. Therefore, there is need for alternative ways of food preservation and storage so as to reduce or minimise the rate of food spoilage to enhance long term extension of shelf- life of food. Simple scientific and technical methods can be of help to validate and upgrade indigenous knowledge and it drives towards achieving long term food storage. Therefore this study seeks to examine the integration of indigenous knowledge with

external knowledge in food preservation and storage on the shelf-life extension and losses of food crops in the Lower Boyo.

1.1. Study Area

Lower Boyo is a political and administrative delimitation of Belo and partly Njinikom sub divisions, all found in Boyo Division in the Northwest Region of Cameroon, located about 50 km away from Bamenda city-the regional headquarters of the North West Region of Cameroon. It is located between latitude $6^{0}00$ to 6^{0} 20^{1} north and between longitude 10^{0} 11^{1} and 10^{0} 30^{1} East of the Greenwich Meridian Figure 1. The entire Sub Division covers a surface area of over 46,068 square kilometres and a population of over 40,757 inhabitants unevenly distributed in the nineteen villages [11]. Given the growth rate of 2.6% per annum, the current population figures stand at about 88,664 persons [12]. It is situated within part of the most mountainous sections of the Western Highlands of Cameroon. The choice of this locality came from the fact that it contains the entire micro climate found in the entire region and as a result nearly all the food crops that are cultivated in the region are cultivated in this agrarian landscape. This has further been instigated by the high quantity of postharvest losses of food crops recorded in this Sub-Divisions especially corn which is consumed nearly by all households as it remains to be the main staple food crop cultivated and consumed.

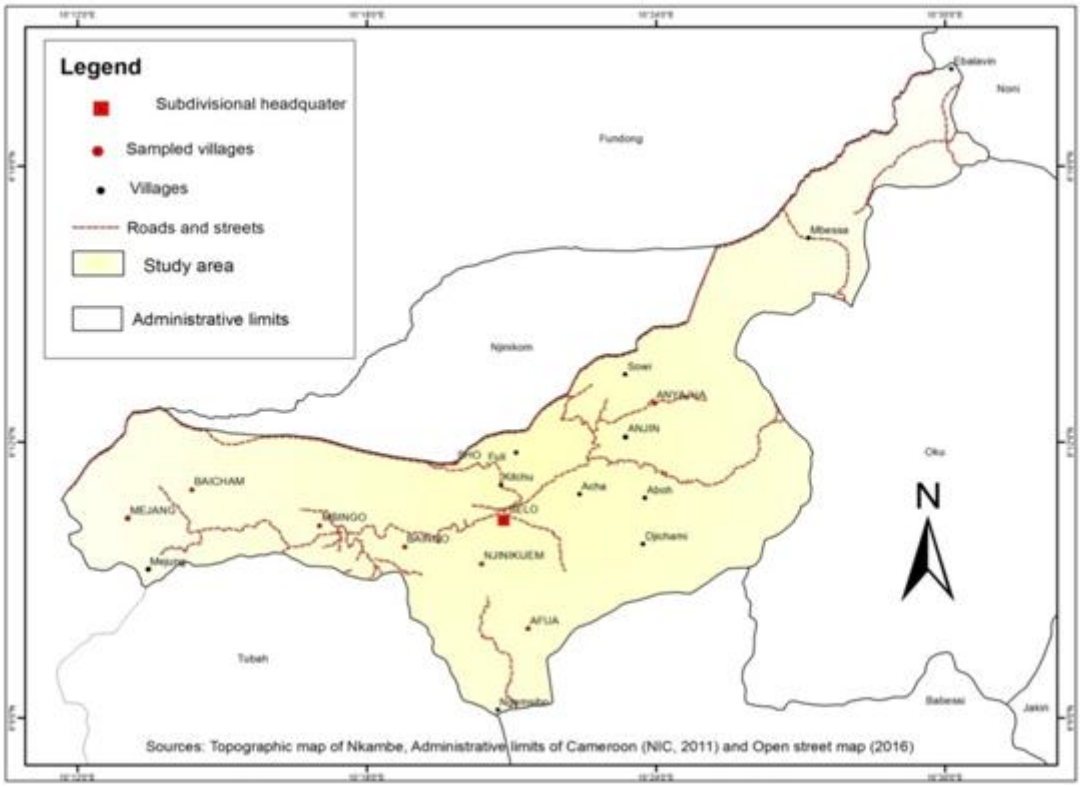

Figure-1. Distribution of the study villages in lower boyo.

Source: Nkwain, et al. [13].

2. METHOD

Preliminary, field visits and contacts were established with the indigenous farmers, Common Initiative Groups (CIGs) representatives as well as some extension agents in the field. This help to identify the various types of food crops produce and the various preservative and storage methods used. A hundred and eighty (180) open and close

questionnaires were designed and administered purposively to farmers and Common Initiative Groups (CIGs) representatives of the eleven sampled villages (Mejang, Afua, Mbingo, Baingo, Sho, Anyajua, Anjin, Njinikejem, Baicham, Mujung and Mbieni) base on their large scale production, connectivity and accessibility to the market. Furthermore, in-depth inquiries were gotten from two different focus groups discussion: one group with eleven participants and the other with nine all of both sexes and of varied age ranges. The obtained data were analyzed using Microsoft Excel spreadsheets and open source Geographical Information System-GIS (QGIS 2.18), used in designing the study area.

3. RESULTS AND DISCUSSION

3.1 Typology of Food Crops Produce in the Study Area

The variety of food crops and seedlings cultivated and preserved by the indigenous farmers are varied and many Table 1.

Table-1. Different types of food crops produced and stored in the study area.

Category	Common Names	Scientific Names	Local names
	Cassava	*manihesculenta*	*Ndong-ighang*
	Coco yams	*xanthosomasp*	*alang*
	Groundnuts	*arachishypogaea*	*boleng*
	Maize	*zea mays*	*isang*
	White yam	*dioscoreaalata*	*iyu*
	Beans	*phaseoluslunatus*	*akuyn*
	Potatoes	*solanumtuberosum*	*ndong*
	Guinea corn	*sorghum bicolor*	*Asang-abola*
	Soya beans	*glycine max*	-
	Pumpkin seeds	*cucurbita maxima*	*ngehsii*
	Bambara nut	*Vignasubterranea*	*findeng*
	Yellow yam	*Dioscoreacayenensis*	*ilim*
	Rice	*oryzasativa*	*Akuyn-a-milvi*
	Sweet potatoes	*Ipomoea batatas*	*Ndongbalah*
Food Crops	Pumpkins	*Cucurbita maxima*	*iboh*
	Okra	*Ablmoschusesculentus*	*ngvala*
	Huckleberry	*Pyrus*	*Mbass-ikwu*
	Cowpea	*Vignaunguiculata*	*aghass*
	Bitter leaf	*Vernoniaamygdalina*	*aghi*

Source: Nkwain, et al. [13] and Field survey (2019).

These varieties of food crops species according to key informant discussions Table 1, are cultivated in multiple geographical landscape. Crops such as rice are cultivated uniquely in the Mejang and Baicham valleys while potatoes are largely favoured by the steep and cold slopes of Afua, Anjin and Anyajua. It was further revealed that maize is grown in all the landscapes as it remains the main staple food while potatoes, cocoyam and sweet potatoes are used as alternatives because they strive well in all the seasons and under varied climatic stress.

3.2. Typologies of Food Preservation and Storage Methods

Table-2. Identification of the different types of food preservation and storage methods.

Indigenous knowledge methods	Adapted method	External (Scientific) Method
ikaŋ and hung bamboos	Traditional cribs	Chemical insecticides
Callabash,	Insecticidal plant (vetiver)	Modern cribs
Clay pots,	Indocin	Warehouse
Woven baskets	Metal traps	Oven
Thatched mats	Mosquito nets	Jute bags
Insecticidal plants	Plastic bottle	Metal and rubber drums
Poisonous plants	Traditional ovens	Polypropylene bags
Natural glue		
Burring in Duged-holes		
Sun drying		
Ground pepper		
Frying/Roasting		
Wood ash		
Fuel wood		
Raise platforms		
Cats and dogs		

Source: Field work (2019); Nkwain, et al. [13].

Households in the study area applied varied methods of food preservation and storage methods ranging from indigenous knowledge (IKs), indigenous adapted-local methods that are being brought-in from other areas in addition to scientific storage and preservation techniques Table 2. The outstanding use of indigenous methods maybe infer to the enclaveness of most of the villages, easily adaptable and environmental sustainability.

3.3. Integration of Indigenous Methods with Adapted And Scientific Methods of Food Preservation and Storage

Farmers integrate indigenous methods with external methods of food storage in three main ways, viz; integration for the prevention of weevils, integration for the prevention of mould and rotting and integration for the prevention of rodents' attacks.

3.3.1. Integration of Iks for the Prevention of Weevils Infestation

Table 3 reveals that about 7.22% (3.89% and 3.33%) of the sample households integrate *ikaŋ*and vetiver roots with modern cribs, insecticidal plants and chemical insecticides brand *prodrouze*, star grain, and actellic to prevent or kill weevils in their grains. Farmers sprinkled powder insecticides on corn cobs undehusked in *ikaŋ* immediately when the cobs are spread and before the corn is kept, the placed vetiver roots on the floor of the *ikaŋ*and some at the angles. Farmers believed that, this will help repel or kill the weevils transported from the farm and equally to prevent future attacks. When the corn is dried (3 to 4 months), farmers separate the corn that they can consumed for atleast three months and re-sprinkle powder insecticide on the quantity deems to preserve. This is because when these chemicals are applied, the grains can only be consummed after three months when the chemicals most have expired. Equally, these farmers applied these chemical on undehusked maize cobs because they are cautious of the fact that these chemical are poisonous when it gets in contact with the grains. Therefore this integration according to the households is less effective since the insecticide used do not actually get in contact with the niche of the weevils.

Table-3. Effectiveness of integrating indigenous methods with external methods of food preservation and storage.

Methods integrated	Frequency	Percentages (%)	Effectiveness
Integration for the prevention of weevils			
ikaŋ and vetiver roots with chemical insecticides	7	3.89	**
ikaŋ and insecticidal plants with vetiver roots	14	7.77	***
Insecticidal plants with modern cribs and chemical insecticides	6	3.33	****
Poisonous plants with Traditional cribs	3	1.67	***
Insecticidal plants with Metal and rubber drums and plastic containers	12	6.66	****
Insecticidal plants leaves with Jute and polypropylene bags,	9	4.99	***
Integration for the prevention of rodents			
ikaŋ, and natural glue with Metal traps,	10	5.55	**
Powder maize with Indocin	10	5.55	****
Integration for the prevention of mould and rotting			
Sun drying with Mosquito nets	8	4.44	****
Fuel wood with Traditional ovens	1	0.55	**
None integration of IKs and adapted methods			
Indigenous methods only	90	50.04	**
Scientific methods only	10	5.56	****
Total	180	100	

Key: Ineffective *, Less Effective **, Effective ***, Very Effective ****
Source: Field work (2019).

Also before keeping the freshly harvested undehusked corn cobs at *ikaŋ,* farmers burned insecticidal plant leaves (fresh cypress leaves) in order for the smell of the smoke to kill or repel the existing weevils in the house and also to create an unfavourable breeding environment. This is further integrated by the spreading of vetiver roots on the surface of undehusked corn alongside the burning of cypress leaves until the corn become completely dried. This method is use by majority of the farmers because it is cheaper, effective, and easily available.

Insecticidal plant leaves are integrated by about 4.99% of farmers with jute and polypropylene bags to preserved and stored their beans against weevils infestation. Farmers equally inserts fresh leaves into the beans in polypropylene and jute bags or first placing some of these leaves on the base of the bags and filling half of the bags with the beans and then placing another layer of the leaves before filling it up to the level of knitting or tying. This method is perculiar with villages such as Afua, Anjin, and Anyajua where beans does extreamly well. However, this method is effective but complaint by most household to be expensive since the jute bags are not easily available. The few farmers using this type of integration are getting the bags from coffee and cocoa dealers.

Also, farmers integrate rubber, metal drums, and plastic containers with insecticidal plants leaves to preserved and stored their grains expecially corn, beans and soybeans. This is done by mixing the grains with the fresh insecticidal leaves and puting them in the drums or grinding the dry leaves and mixing with the grains before puting them in an air-tight versels. In situations where the lids of the drums are not tight-fitting, plastic papers are placed on the lid before covering the drums or bucket Figure 2 in order to prevent the circulation of air. This integration method is very effective, easily available, durable and reduces rampant waste disposals. This because the drums and plastic containers that were initially used for different purposes like transportation of palm oil, fetching

of water are disinfected and reused as storage facilities instead of disposing them in the open environment. This is similar to Notsi [14] observations in the villages of Tsitas Nek (Lesotho) and Mabeskraal Village in South Africa where indigenous vegetables are cooked, sun dried thoroughly and stored in plastic bags or in some air-tight containers. In the similar lane, Ponge [15] in Bar-Sauri in Nyanza Province in Kenya opine that farmers integrate plastic sacks, plastic drums, metal drums and warehouses to store their grains.

Figure-2. Plastic papers and rubber drums.

Source: Field survey, 2019.

At Anyajua, farmers integrates four different insecticidal plants leaves viz; cypress, eucalyptus, lantana and *anlhim* (in kom dialect) to preserve and store their corn cobs in traditional cribs made with bamboos. These insecticidal plants are placed in any order in the cribs with one of them placed at the base of the crib before filling one-quarter of the crib with dehusked corn cobs followed by another type of insecticidal plant before filling the second quarter. The third and the fourth quarters are filled following the same procedures until the crib is completely full. According to the farmers, this method is effective for prolonging the shelf life of maize. The used of insecticidal plants in the crib especially Lantana camara is in line with Waithaka [16] observation that farmers in Mua Hill in Eastern kenya placed dried insecticidal plants on the floor of the crib and after placing the maize, similar leaves are placed on it.

3.3.2. Integration of IK For the Prevention of Mould And Rotting

From field analysis, results show that in preventing mould attack in stored food crops, food items are dried thoroughly reason why in villages like Baicham, Mejang and Mbingo where corn is produced in large quantities, about 0.55% Table 3 of the large scale farmers have adopted the use of locally made traditional oven as a drying instrument thus, integrating it with the burning of fuel wood and *ikaŋ*. The *ikaŋ* where the undehusked maize cobs are placed is thatched above the oven using nos bamboos, planks and fuel wood is chopped and slot into the oven pipe to generate heat when fire is lighted.

Mosquito nets originally fabricated for domestic use to prevent mosquito bites were used by a little less than 5% of the sample households (4.44%) of the farmers to dry egusi (pumpkin seeds) from the solar rays. According to

them, since these nets are peforated, allows water to easily drained out and the egusi gets dried faster. This method is very effective and preferred by many farmers because with little or no sunshine they can easily dry this crop since they are mostly harvested in the heart of the rainy season. Meanwhile other farmers used the nets to dry dehusked corn, beans and soya beans. These mosquito nets are washed and used as drying material only after when farmer estimate that its function of preventing mosquitoes have become less effective.

3.3.3. Integration of Iks for the Prevention of Rodents' Attact

Rats are one of the main agent of destruction to food preservation and storage in nearly all the households in Lower Boyo. Results show that among the 44.4% of farmers integrating indigenous methods with external methods of food preservation and storage, about 5.55% of them are using indocin (indomethacin: a prescription drug taken orally by humans to treat pain, swellings, and stiffness from arthritis) as rat poison. They opened 4 to 6 capsule, extract the powder, mixed it thoroughly with a half tea-spoon of corn floor or fish grind in the powder form. This mixture is subsequently divided into smaller quantities and put on patches of broken calabashes, abandoned dishes and placed at several angles of the house for rats and mice to feed on. Once rats feeds on this toxic chemicals, it affects their body metabolic sytem and leads to their extermination. Farmers holds onto it that, this method is very effective expecially when there are no esxposed food stuffs in the house for the rats to feed on as an alternative. Results further show that among those who are using *ikaŋ* as their preservation and storage facility, a less significant percentage of them are also using metal traps to catch rodents while others store food crops in buckets, rubber and metal drums to prevent rats and other rodents' destructions Figure 2. This method of using rodents' traps according to the farmers is less effective because some times the rodents do not follow the tracks where the traps are kept which further lengthen the period to which this trap has to be in a single position while destruction to foodstuffs continues.

3.3.4. Non Integration of Indigenous Methods with External Methods

Out of the total household sampled, about 50.04% of farmers were using only IKs for procesing, preserving and storing of their food crops viz; *ikaŋ*, hung bamboos, callabash, clay pots, woven baskets, thatched mats, insecticidal plants, poisonous plants and natural glue, burring in dug-holes, sun drying, ground pepper, frying/roasting of food items, wood ash, cats and dogs. The *ikaŋ* is the most use IKs in the study area Figure 3.

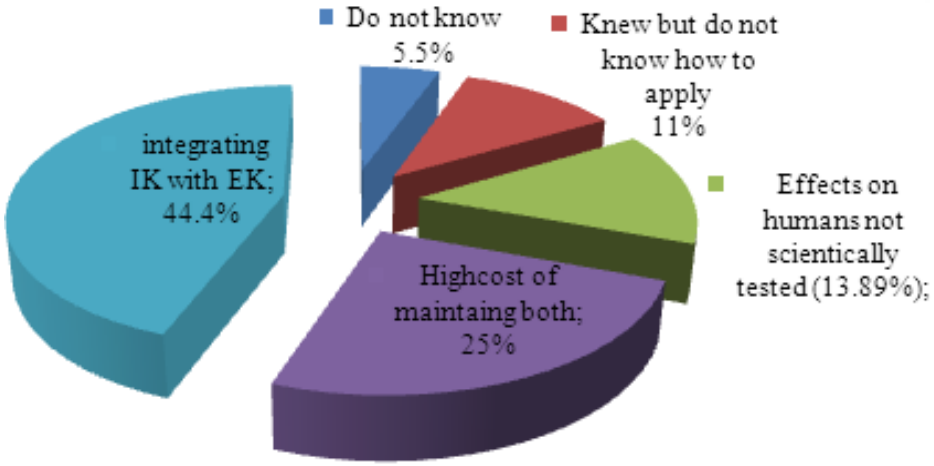

Figure-3. Reasons for the non-integration of indigenous methods with external methods.
Source: Field survey, 2019.

According to key informants discussion and field observation, these methods are less effective nowadays because of insufficient space and fuel wood, increase in cultivation of less resistance varieties of food crops and the use of inorganic fertilizers and pesticides which has rendered food crop susceptible to spoilage. In Nkwain, et al. [13] women in this community formerly used to receive firewood from their son in-laws during periods of corn harvesting in order to dry their corn but now with the advancement of modernity, this social aspect is gradually dying down as it is gradually reduced to monetary values.

3.3.5. Use of Scientific Methods Only

The lone potato warehouse located at the centre of the Sub-Division and having the capacity of ten (10) tones is owned and used by Boyo Solanium Cooperative which is made up of 27 CIGs with 424 members. This warehouse is ventilated with windows at the floor level on one side of the house. The other windows are at the gable level of the adjecent length. It contain perforated shelves where all the varieties of potatoes are being spread for short or long term preservation and storage with an estimated 10% reduction in rotting. The low application of the scientific knowledge in this community maybe linked to little or complete absence of extension workers, poor access to market, absence of ready market and the low levelof the education of the households.

3.3.6. Duration of Food Storage Before Spoilage

Households were further questioned to extimate the duration of food crops when stored using IKs only, external knowledge (EKs) only and when both IKs and EKs are used together and the results presented in Table 4.

Table-4. Duration of food storage before spoilage.

Duration with IKs only	Percentages (%)	Duration with EKs only	Percentages (%)	Duration with IKs and EKs	Percentages (%)
1- 5 months	10.00	-	-	1-5 months	3.30
6 - 10 months	33.09	6 - 10 months	5.56	6-10 months	10.00
10 months and above	6.95	-	-	10 months and above	31.10
Total	50.04	-	5.56		44.4

Source: Fieldwork, (2019).

According to Table 4, only 6.95% of the farmers using only indigenous methods could successfully store their food for ten months before it start spoiling while the only external method that is not integrated with IKs methods of food preservation and storage is the potato preservation and storage technology (potato warehouse). This technology is used by 5.56% of potato farmers to preserve and stored their potato for the period of 6-10 months before spoilage depending on the variety. However, when indigenous methods are integrated with external methods, a higher percentage of farmers, about 31% successfully preserved and stored food crops for 10 months and above before spoilage compared to the 6.95% of farmers only using indigenous knowledge. From the field investigation, the integration of indigenous methods with external methods of food preservation and storage increases the shelf-life of food crops in the study area.

4. CONCLUSION AND RECOMMENDATION

In the study area, IKs and EKs of shelf-life extension are varied and many and equally varies with the types of food crops preserved and the seasons. The harvesting season corresponds with the period of high rainfall which renders yields preservation and storage against rodents, mold and weevils very difficult for the peasant farmers. In responds to this, farmers have resort to the integration of IKs and Eks in order to extend the shelf-life of food crops

preservation and storage. The varied IKs and integration methods in study area was practice as per household and not as a community. The integration of these IKs and EKs have proven to be very effective as about 44.4% of the households were found integrating IKs with EKs. In this case, it is strongly recommended that a participatory approach should be encouraged when it concern the use of IKs and EKs to enhance the shelf-life of foodstuffs. We equally supplements that the above IKs strategies though having its own weaknesses are an integral part of the rural society and should be harness and modify, and integrated into modern scientific knowledge by extension worker inorder to improve on post harvest management of food crops [13]. With the most use IKs and EKs integration here being ikaŋ and insecticidal plants when integrated with vetiver roots, repelled or kill weevils. Others such as the integration for the prevention of mould and rodents should equally be encouraged. In this case, the farmers are part of the problem and should equally be part of the solution.

REFERENCES

[1] Deloitte, "Reducing food loss, along African agricultural, value chains," p. 29, 2015.

[2] S. J. Costa, "Taking it to scale: Post- harvest loss eradication in Uganda," Project Implementation Report. UN World Food Programme Kampala, Uganda2015.

[3] K. S. Shende and L. Y. Bernadine, "Post-harvest challenges of food crops in Jakairi Sub-Division, Cameroon- A threat to food security," *Saudi Journal of Humanities and Social Sciences*, vol. 2, pp. 974-983, 2017.

[4] World Food Logistics Organisation (WFLO), "Identification of appropriate postharvest technologies for improving market access and incomes for small horticultural farmers in Sub- Sahara Africa and South Asia," Report No. 521982010.

[5] S. J. Costa, *Reducing food losses in Sub-Saharan Africa (improving Post-Harvest Management and Storage Technologies of Smallholder Farmers)*. Uganda: UN World Food Programme Kampala, 2013.

[6] The Rockefeller Foundation, *Food waste and spoilage initiative strategy template*. Nairobi: The Rockefeller Foundation., 2013.

[7] The Rockefeller Foundation, *Food waste and spoilage initiative strategy template*. Nairobi: The Rockefeller Foundation, 2017.

[8] H. P. Momba, A. Kkoagne, and J. Bamenjo, "Emergence without hunger in Cameroon by 2035? Advocacy for the Full realization of the right to food for all in Cameroon, RELUFA," p. 24, 2014.

[9] D. Drame and T. Lolo, *Dynamics of losses in different commodity chains: Cameroon food loss case studies*. Nairobi: Food and Agricultural Organisation, 2014.

[10] J. Aulakh and A. Regmi, "Post-harvest food losses estimation-Development of consistent methodology," in *Proceedings of the Agricultural & Applied Economics Association's 2013 AAEA & CAES Joint Annual Meetin*, Washington, DC, USA, 2013.

[11] BUCREP, "Updated directory of villages of Cameroon," *Tome 7*, vol. 4, 2005.

[12] Council Development Plan-Belo, "Elaborated with the support of the National Community Driven Development Program-PNDP, Cameroon," p. 225, 2011.

[13] T. K. Nkwain, N. T. Lengha, and A. T. Gam, "Assessment of indigenous knowledge strategies on post-harvest food crops storage in Belo Sub- Division," *International Journal of Research and Innovation in Social Science*, vol. 3, pp. 239-250, 2019.

[14] L. Notsi, "African indigenous farming methods used in the cultivation of African indigenous vegetables: A comparative study of Tsitas Nek (Lesotho) and Mabeskraal Village (South Africa)," presented at the Conference on Strategies to Overcome Poverty and Inequality: Towards Carnegie III at University of Cape Town, South Africa, 2012.

[15] A. Ponge, "Integrating indigenous knowledge for food security: Perspectives from the millennium village project at Bar-Sauri in Nyanza Province in Kenya," presented at the Conference Paper Presented at the Imperial Royale Hotel in Kampala, Uganda on 16 – 17 November 2013, 2013.

[16] M. Waithaka, "The role of indigenous knowledge in sustainable food production: A case of post-harvest practices in maize preservation in Mua Hill location, Eastern Kenya," Research Project Submitted to Van Hall Larenstein University of Applied Sciences in Partial Fulfilment of the Requirement for the Awards of Master's Degree in Master of Development Specializing in Rural Development and Communication, 2011.