Production Constraints, Postharvest Losses and Farmers' Responses to Innovations in the Cassava Value Chain in Cameroons' South West Region

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Abstract:- **This study was carried out in Cameroons' South West region where farmer produce cassava for household consumption and income generation. Most of the production is undertaken by peasant farmers in rural areas with inadequate infrastructure for production, storage and marketing despite the vulnerability of the staple to postharvest losses. In addition majority of farmers have inadequate access to technologies that reduce food losses and increase farm incomes: while most cassava farmers operate under precarious economic, environmental and financial constraints that grossly affect production and farm incomes. In spite these constraints cassava farmers still depend on rudimentary approaches that increase postharvest losses and reduce farm incomes. It is obvious that cassava products cannot sustain demand without innovations which increase output and reduce food losses. The objective of this study is to examine the various constraints affecting cassava production, methods of storage, and reasons for farmers dependence on rudimentary approaches rather than innovation that increase farm output. A sample population of 406 farmers was selected from twenty villages using Glenn Israel (2009) estimates for determining population samples. According to the study farmers' choice of innovations are based on how adaptive or beneficial the innovations are in various socioeconomic and cultural environment in which production takes place.**

Key words: **constraints, value chain, actors, food sufficiency, extension agents, poverty alleviation**

I. INTRODUCTION

Farmers and sellers of food have been concerned about losses since the beginning of agriculture. Yet the problem of how much food is lost after harvest to processing, storage, insects and rodents, or other factor takes greater importance as population growth continues to increase accompanied by growth in food demand(FAO,2013; Njukwe *et al*.,2014). Postharvest loss creates a gap between what farmers actually produce for the market and the quantity supplied in the market. This gap has been increasing for roots and tuber crops like cassava which is highly consumed though highly vulnerable to postharvest losses. This vulnerability is accountable to the fact that cassava production, processing and marketing is done under rudimentary conditions whereby product standardization and specification are not taken to consideration (FAO, 2010; IFPRI, 2013). Moreover cassava production in Cameroon mostly takes place under precarious environmental, economic, financial and social conditions which need redress before the crop can be veritable instrument for poverty alleviation Secondly, production is dominantly done by small holders; mostly women who are not organized into cooperative societies or common initiative groups where the activity can attract funding from financial institutions and also benefit from economies of scale (Fernadez, 2014. Njukwe*et al.*, 2014). Again, farm sizes are small and implements used for production, harvesting, processing are backward as technological innovations are yet to be made available to reduce losses at all stages of the cassava value chain. Unfortunately agricultural extension education is yet to create significant impact in most farm communities producing cassava and other staples. According to Mualem and Dagne(2015) most farmers have little contact with extension services and therefore unable to acquire improved techniques for increasing production and reducing postharvest losses due to socio cultural factors which affect farmers' adoption decisions and the precarious conditions under which information is disseminated by extension workers.

A crop such as cassava which is highly consumed should attract adequate attention in the country's agricultural policies and strategies aimed at improving the country's precarious food situation, reduce hunger and malnutrition, and also significantly reduce the country's food/merchandise imports whose proportions have witnessed tremendous increases with insignificant fluctuations from 2000 to 2015. Table1represent the quantitative analysis of the country's food imports as percentage of merchandise imported into Cameroon from 2000 to 2015.

Table1. Cameroon food imports (as percentage of merchandise imports)

Year	% imports	Year	% imports
2000	18.61	2008	23.78
2001	15.46	2009	26.23

2002	18.06	2010	17.71
2003	17.61	2011	25.10
2004	18.32	2012	25.67
2005	18.01	2013	24.83
2006	17.98	2014	26.45
2007	14.87	2015	26.01

Source: World Bank staff estimates from the Comtrade database maintained by the United Nations Statistics Division.

According to Funji *et al*.,(2015) these increases in food imports to merchandise import could be averted if adequate attention is given to producers of the cassava since it can be locally processed and marketed to satisfy growing consumer demand. A country endowed with agricultural resources like Cameroon could hardly encounter mounting food deficits if greater attention could be paid on staples like cassava among others by improving efforts at production research and research in postharvest losses (FAO, 2016). Though efforts have been made by research institution like the Institute for Research and Agricultural Development (IRAD) and International Institute for Tropical Agriculture (IITA), such efforts have been limited to production research than research in postharvest to improve harvesting, storage, processing, transportation and marketing which are the greatest predicaments to achieving food security, self-sufficiency and poverty reduction (Njukwe *et al.*, 2014). Also efforts by these institution are yet to produce the desired results because there have been difficulties in disseminating scientific information for increasing production; and reducing postharvest losses due to environmental, social and cultural factors which affect both change agents and farmers already mentioned.

According to FAO (2013); Fonji *et al*.,(2017)research in postharvest losses is necessary for cassava because like other root and tuber crops its nature increases the risk of postharvest losses for the following reasons which characterize these staples:

- Contains high moisture contents (70 to 90 percent) as compared to cereals with low moisture content (10 to 20 percent), and are highly perishable in the absence of adequate methods of storage or preservation.
- Have high to very high respiratory rate compared to cereals and are in large unit sizes (5gm to 5kg).
- Heat production in tubers is generally high
- Soft texture, easily bruised in course of harvesting, packing and transportation
- Natural shelf-life is a few days(for cassava) to several months
- Losses are usually caused by rotting through bacteria and fungi infestation.
- Losses in LDC usually 15 to 50 percent compared to 10 to 20 percent for cereals like corn and rice.

Above all cassava is produced in rural areas under conditions that aggravate postharvest losses and farmers such as inadequate and rudimentary storage, poor handling practices, inadequate transport facilities and other infrastructure that affect both production, processing and distribution of farm produce to markets. Other factors that increases postharvest losses in the crop include poor preservation techniques, contamination, bad weather conditions, losses due to transaction, losses incurred from excess supply(where there are inadequate storage facilities) and through the interaction of anomalies resulting from climate change phenomenon which remains the biggest challenge to countries like Cameroon where adaptive technologies are either absent or highly rudimentary**(**MINADER, 2014. Anthanase *et al.*,2016**)** and farmers depend on backward technologies for production and processing.

The greatest disadvantage to some of these losses is that they are not covered by insurance; hence the farmer suffers the burden of loss without compensation, a phenomenon which increases poverty especially in areas where farm income depends on the production, marketing and distribution of perishable staples like cassava (Fuglie and Rada, 2013). The losses incurred frustrate farmers' aspirations due to reduction in farm incomes and aggravation of poverty; a factor that discourages most youth participation in agriculture as it encourages rural urban migration attributed to low farm incomes, and labour intensive nature of most agricultural activities (Ngoe, 2012;Ngoe and Manu, 2015). The problem of how much of these food items are lost from the period of harvesting to marketing with postharvest exigencies has been difficult to quantify, though the effects are evident and acknowledged by farmers in most and other actors in the crop value change (Mulualem and .Weldemichael 2013; Nazir*et al*.,2014);

Surprisingly little solid information exists on the precise amount and nature of loss because losses vary greatly by crop, by country and by climatic regions and there is no universally applied method for measuring losses. Consequently estimates on total postharvest food losses are controversial (Parmar*et al*.,2017). Thus, how much of the loss can be prevented, and by what degree of effort or cost, is yet unknown. Also there is no clear evidence that if losses are reduced, the food rescued will find its way to consumers because Cameroon is greatly handicapped by poor transport infrastructure which is a serious threat to food distribution and economic growth as already (Mvodo*et al*.,2016). There is little doubt that the problem of food loss is locally significant, especially where it concerns staple crops like cassava which are staples for household consumption and income generation. The vulnerability of cassava to postharvest losses and the absence of the necessary facilities and infrastructure for storage, processing and transportation could possibly have an effect on the aggregate food supply and food security given that it is the only crop grown and consumed in most agro ecological regions of Cameroon (Yuling *et al*.,2017)

Objectives

- Examine the various problems encountered by farmers in cassava production
- Identify the various methods used by farmers in addressing post-harvest losses in cassava
- Examine some sociocultural factors affecting farmers' adoption of innovations.

II. MATERIALS AND METHODS

Study area

The South West region of Cameroon is located on the western fringes of the country along the coast of West Africa sharing coastal and land boundaries with Cross river state of Nigeria. The region lies between latitude 5° 12 North and longitude 9° 18 East of the Greenwich meridian (Ngwa, 1981). It has a population of 1,481,433, covering a surface area of 25,410 square kilometers with a population density of 45.38 persons per square kilometre(45.38 persons/Km^2).The region comprises of six divisions namely: Fako, Meme, Ndian, Manyu, Kupe Mwanenguba and Libialem.

Figure 1: Map of the South West Region

Source: National Institute of Cartography- MINRESI, 2015

Cassava is grown in most of the administrative divisions of the south west region, though output differs among divisions due to locational, geographical, economic and cultural factors that determine its production. Some areas grow cassava for self-consumption while in some areas it is purely grown for both self-consumption and commercial purposes.

III. METHODOLOGY

Sample size determination

The sample size was selected among households using Glenn (2009) predetermined scientific table for determining samples sizes from given population ranges. The population of the study area was known by the 2009 Cameroon population estimates as indicated in table 8. Using Glenn (2009) predetermined scientific table a sample population of 204 respondents from each subdivision with more than a population of 60,000 has a complete representation of 7% precision and 190 respondents from subdivisions with less than 60000; while 10% of each sample population was multiplied by 4 (number of villages selected) to determine the sample size per subdivision. The subdivisions and villages .were randomly selected while the farmers and other actors were selected by purposive sampling. The total sample size population of cassava famers interviewed in the twenty villages of five subdivisions was 406.. The sample size population also included processors and some traders as there was no division of labour based on activities in the cassava value chain. Most farmers are involved in cassava production, local processing and marketing in the 20 villages covered by the study.. Table 8 is the determination of sample sizes of the selected villages in each subdivision.

Table 1: Sample size determination in the study zones

Subdivision	Total population	Number of villages per subdivision	Number of villages for study	Sample population	sample size= (10%)xsample population x 4
Mbonge	115, 982	86	4	204	82
Konye	62,892	36	4	204	82
Moyuka	118,770	32	4	204	82
Ekondo titi	56, 509	28	4	190	78
Kumba centre subdivision	144,268,	23	4	204	82
Total	468,511		20		406

Source: Cameroons' 2009 population estimates for the subdivisions.

Primary data

Primary data source was obtained by use of questionnaires, observations, and group discussion with the various actors involved in production, processing and consumption of cassava products.

Secondary data

Secondary data were obtained from text books, scientific journals, reviews, mimeographs, magazines, websites and Libraries. The secondary data was obtained between ; November 2017 to May 2018.. This information was used in building the study literature with respect to postharvest losses in cassava. Other sources of information are Ministry of Agriculture and Rural Development (MINADER), Institute of Agriculture and Rural Development (IRAD), International Institute of Tropical Agriculture (IITA), and Faculty of Agronomy and Agricultural Sciences (FASA) library of the University of Dschang.

Data analysis

Data analysis involved the systematic searching and arranging field findings for presentation. The data was organised and broken down into categories and units based on research objectives and answers given to the research question. The choice of analysis was based on how the tools are suited in the study objectives and the scale of measurement of the variables. Following data collection, data entries were done and checked for any entry errors. The quantitative data obtained from close-ended questions were analysed using quantitative techniques such as frequency tables and percentages; while qualitative data obtained from open ended questions were grouped into themes that correspond to the study objectives, transcribed and reported normatively; SPSS aided in the analysis of quantitative data.

IV. RESULTS AND DISCUSSIONS

Production constraints in cassava value chain

The study identified the following environmental, socioeconomic and financial factors which constitute a deterrent to the emergence of modern production systems and market accessibility in the cassava value chain.

Soil degradation and low use if innovative inputs that increase production

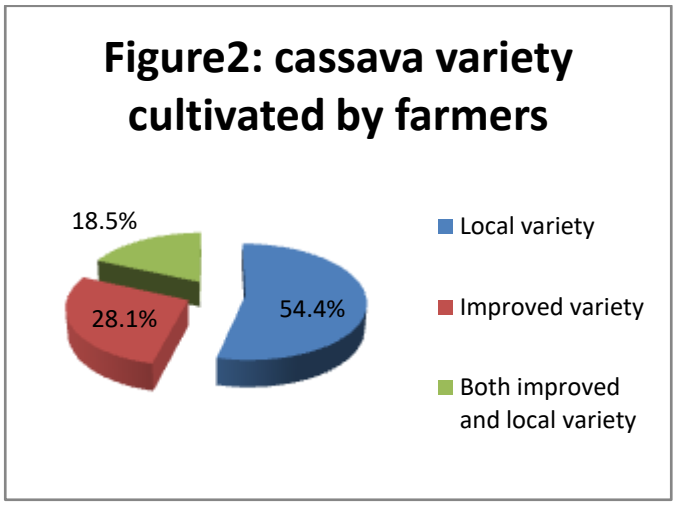
Cassava is a soil exhausting crop which requires that farmer must use other inputs to replenish the soil. Given high input prices most farmers in the study area practice crop rotation whose fallow periods differ from one study zone to the other. It was observed that in areas where land is available and there is little pressure from populations farmers practice crop rotation and the fallow periods are long enough to replenish soil nutrients. Main while in areas where there is population pressure on land fallow periods are short while farmers are induced to use fertilizers to grow cassava. In the study area the level of fertilizer use was relatively low even in areas where fallow periods were short and farmers required other inputs to replenish the soil. According to the respondents low use of soil inputs has been attributed to lack of education among farmers, scarcity, and high cost of fertilizer. In addition most farmers believe that the use of fertilizer destroys soil nutrients and makes the land less fertile. .As a result output from most areas undergoing rapid urbanization and land pressure generally experience declining output due to farmers inability to acquire farm inputs like fertilizers and other resources.

Similar observations were confirmed in earlier studies by Mulualem and Weidiemichael (2013); Mvodo *et al*.,(2015) where due to high input prices and difficult markets farmers practice crop rotation which were no long enough to replenish soil nutrients. In this study it was equally observed that only a limited number of farmers in areas undergoing rapid urbanization realized the need for fertilizer use than farmers in enclave and inaccessible areas with relatively longer fallow periods. . Also it was observed that farmers in areas threatened by urbanization and high food demand cultivated the improved cassava species which though less resistant to postharvest losses were more preferred due to relatively higher output than the traditional cassava variety with low output. However it was revealed that the short fallow periods practiced in urbanizing areas also affected the output of the new cassava varieties. This study opinion that increasing cassava yields in short fallow requires interventionist policies backed by incentive packages and subsidies to small scale producers who dominate both cassava production and processing.

Plate 1. Cassava farm in short fallow periods

Farmers' inadequate knowledge and practice of conservation techniques

The most commonly used conservation techniques identified among cassava farmers in the study area is the tuber conservation where by the farmer allows the unharnessed crop to remain in the field after maturation pending household and market demand for cassava products. It was realized that the practice of keeping cassava underground also differed among the areas based on the cassava species cultivated, market accessibility and processing facilities. According to the respondents the introduction of improved cassava variety into cassava farming system has increased cassava production in areas with market accessibility and high food demand due to higher yields. However most farmers in the study area cultivated the traditional variety of cassava due to lack of market access, low demand of cassava products, its relative resistance to postharvest exigencies and the ability to be kept underground above maturity period without root rot common to the improved variety. Figure 3 indicates farmers adoption of the two cassava varieties in the study zone.



The improved cassava species must be harvested at maturity to avoid root rot. It was also revealed that after harvest cassava processing must be done between 3-4 days after harvest to avoid the decline in quality of nutrients which normally affect the quality of processed products. However in most cassava producing areas farmers kept cassava more than four days before processing due to supply constraints and inadequate infrastructure for processing and marketing the crop.

According to the study rapid quality losses of the improved cassava variety affect farmers' adoption decision where there is limited infrastructure for processing and marketing of the fresh cassava roots. These revelations are also in line with studies by Emmanuel (2013); Ekwere *et al*.,(2014) which acknowledges that farmers take rational decisions when it concerns adoption of technology because they ignore production methods and inputs which are less profitable in the socioeconomic and cultural environment in which production takes place. It is for this reason that farmers in the study area adopted the local cassava variety (54.4%) than the improved variety(28.1%) which is high crop yielding variety. Based on the sociocultural and economic environment some farmers cultivated both crops (18.5%)

Organizational problems and structural constraints in production

The cassava value chain in the study area is highly characterized by informal sector activities which are highly uncoordinated among its multiple actors with high transactions costs attributed to inadequate or lack of infrastructure in most of the cassava producing areas of the country's southwest region. It was made known that .cassava farmers in the study area are not organized into common initiative groups and cooperative societies. This study identifies inadequate infrastructure as accountable to high quantitative and qualitative losses experienced by farmers. The weak organization of most stakeholders including market actors and the absence of cooperative societies to strengthen group sales in villages constitutes major impediments to marketing which induces high transaction costs and losses in food and incomes. This precarious situation limits cassava production and processing to smallholdings who make use of rudimentary techniques of production and processing. Secondly, most of the enclave areas in the study zone do not only lack market access but communication is highly flawed at national, regional and international level. This information asymmetry has been detrimental to actors like producers, processors and marketing agents of the crop.

Financial constraints

The cassava value chain in the Cameroons' south west region is plagued with the following constraints which affect production of the crop.

High cost of processing equipment and infrastructure for storage, processing and transport

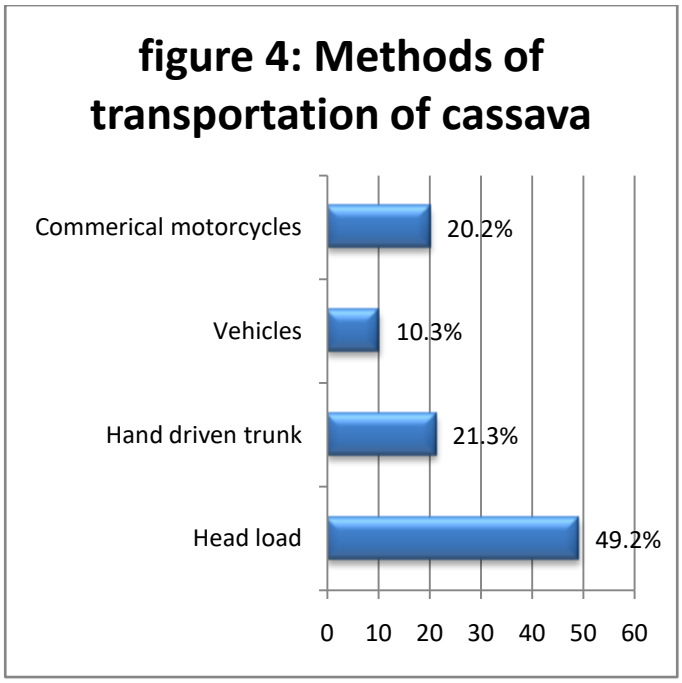
Cassava processing in the study areas takes place mostly in rural areas which lack adequate infrastructure and facilities to adequately support the activity. Most of the processing takes place mechanically using locally fabricated graters which makes the activity too labour intensive. There have been no technologies available for harvesting while most transportation is by head loads, use of hand driven trucks and the use of commercial motorcycles to transport cassava to processing units.

Figure 3: Transportation on a deplorable farm to market road in Cameroons' south west region

Source: Study on production constraints and postharvest losses in cassava value chain, August 2017

Figure 3 is the deplorable state of most farms to market roads in the south west region of Cameroon. Both commercial motor cycles, transportation vehicles, and hand driven trucks find difficulties to ply the roads during the rainy season, a reason why preference has been given to head loads in most areas. According to the study transportation by head loads (49.2%) constitutes a major component of transportation system, hand driven trucks (21.3%), transport vehicles (10.3%) and commercial motorcycles (20.2%); Figure 4

addresses the different means of transport used by farmers and actors in the cassava sector of the study area.



The deplorable state of roads linking farm communities are accountable to delay in transportation and other factors which increases cost to farmers, processors and traders or marketers. Another problem identified in the study is that farmers in most rural settings with some processing facilities face problems of maintaining equipment due to high cost of repairs and unavailability of maintenance workshops most of them located in the urban areas. It was equally observed that processing machines are very limited while farmers and other actors processing cassava outweigh the available cassava grinding machines. Most of the farmers depend on local processing while market accessibility is inadequate for the various producers of the crop.

Figure 3: An old processing machine in zone of the study area

Source: Study on production constraints and postharvest losses in cassava value chain in Cameroon, September 2017

Figure 3 shows the conversion of cassava into mash for processing into garri or water fufu. Respondents testified that this machine is one of the remaining few in a village where cassava production, processing and marketing constitutes a major occupation. These constraints constitute a major handicap in the production of cassava. Farmers in the study complained of enormous losses incurred as a result of inadequate infrastructure for production, processing and marketing despite high demand in the urban markets..

Most of the machines for crushing cassava are absolute making farmers and other actors to depend on local grating of cassava. In Dikome Balondo village in Ndian division with a population of more than three thousand cassava producers; there were only three machines run by generator fuelled by petrol. The fuel is illegally imported from neighbouring Nigeria which share boundary with the Division by sea because the road from the cassava producing areas of Ndian are inaccessible from other areas of Cameroon. As earlier mentioned these constraints induce farmers and processors to use traditional methods of processing cassava to mash for processing water fufu or garri the two major products produced from cassava in the sudy area. It was observed that most of the villages covered by the study have less than four cassava grinding machines serving processors. . Most often households who depend of grinding machines risk wasting peeled cassava due to rot, contamination and deterioration which occurs as a result of delay in processing. According to respondents individuals or households with cassava grinders hire equipment at exorbitant cost unaffordable to most actors. These results are in line with studies by Hypolyte*et al*.,(2016) stating that when processing equipment requires repairs huge hips of harvested cassava get damaged through root rot; resulting to food and income losses to actors. According to the study the high cost of hiring processing machines encourages the use of rudimentary or local processing methods which are inadequate for large scale production of the crop.

Constrained access to credit

Cassava production in Cameroon is dominantly a rural activity dominated by peasant farmers who also engage in processing of the crop. As earlier mentioned cassava farmers and processors are not organized to attract funding from financial institutions, donor agencies and the government. In this study inadequate access to credit has been identified as major factor preventing farmers from embarking on large-scale production because they are unable to purchase inputs to increase production and also reduce postharvest losses in different sociocultural environments. This situation is precarious in the country's south west region where there are neither Non-Governmental Organizations (NGO) nor donor agencies that give financial support to cassava farmers and other actors.

Inadequate working capital

Most producers of cassava are in the study area lack access to adequate credit to engage in large scale production where they can benefit from economies of scale. Production operations are mostly funded through self-financing and borrowing from the informal sector institutions. Farmers testified that capital borrowed from the informal sector is always restricted and inadequate to engage on large scale production and benefit from economies of scale. These results are in line with studies by Kelly *et al.*, (2014) on "Expanding Access to Credit in Africa" which identify inadequate working capital as the greatest impediment to large-scale production in most farm communities. Experience from this study supports that African governments are responsible for low productivity in their agricultural systems due to inability to create enabling environment for food production, storage and processing of food items. This study also identified management problems as another impediment that affects agricultural production as most farmers are unable to direct borrowed capital into productive farm activities. According to respondents most of the borrowed money is spent on ceremonies like deaths, marriage and other social obligations not related to agriculture.

Local methods and strategies used by farmers to reduce food losses in cassava

Earlier studies by Njukwe*et al*.,(2014); Muluama and Dagne (2013) and Ukechukwu*et al*., (2015) identified a number of traditional, improved and modern methods used by farmers in different tropical countries to reduce postharvest losses: storing cassava roots in the soil after maturity, storing cassava roots in clamp silos, storing fresh cassava in crates, storing fresh cassava in a deep, watering of harvested fresh roots, and storing fresh cassava roots in plastic bags. According to this study only few of these storage methods are being used to reduce postharvest losses in the study area. More than 70% of the farmers contacted in the study area have no knowledge of improved or modern methods of storage; All the storage methods used in the study area are local or traditional due to absence of modern storage for the crop. It was observed that these methods are abound because of the absence of infrastructure and facilities for use of either the improved methods or modent methods of cassava storage.

Storing cassava roots in the soil after maturity

More than 80% of cassava farmers in the study area have adopted this method of storage due to absence of processing facilities and inadequate market access. According to respondents leaving cassava roots underground without deterioration is generally used to adapt harvest to household consumption and market demand. Although studies by Njukwe*et al*.,(2014); Hypolyte *et al*.,(2015) are in support of these findings, Oguntande (2013); FAOSTAT (2013) are of the view that cassava left underground beyond maturity period becomes woody and also poses the danger of the roots being infected by pathogens like bacteria and fungi. According to respondents the system of storage leads to shortage of land for cultivation of other crops in densely populated areas where food demand is high. Also studies by Yuling (2017) have further confirmed that cassava kept underground above optimum period have unfamiliar taste, difficult to process, while the processed products are of low quality. Most of the respondents in the study areas expressed similar views about storing cassava underground beyond maturity period. The respondents cited the example of water fufu produced from deteriorating old cassava as less elastic; while garri processed from deteriorating roots has less swelling properties than from fresh roots and generally disliked by consumers.

Watering of fresh cassava

This method involveddaily watering the harvested tubers piled in hips to keep them fresh or coated with paste of mud to preserve their freshness for maximum of one week. According to the farmers the later technique for preserving cassava freshness was too labour intensive where water sources are not easily available or accessible. Respondents revealed that watering as storage or preservation method is popularly used by farmers who sell at farm gate where the cassava farms are close to water sources like spring, streams and rivers.

Figure 6: Peeling cassava roots preserved by watering

Source: Study on postharvest losses in cassava value chain; 2016

According to the farmers this method is adopted when processors and traders complete negotiation on buying the already harvested crop and when there are delays in processing and transportation. The method is also used when there are delays in processing of the cassava due to shortage of labour for activities such as peeling and grating of cassava roots.

Submerging cassava in pools or water containers

This method of storing or preserving fresh cassava was identified in several villages of the study area. According to the respondents is the oldest method used by producers prior to production of large water containers. The method is widely practiced in remote and inaccessible cassava producing areas were transportation is difficult and farmers are obliged to do processing in the farm. . According to respondents cassava stored in stagnant pools of water retains its freshness than

cassava stored under other traditional structures; especially if processing takes place within four days after harvest. The pool must not be muddy and the water must be clean and transparent. It was revealed that submerging cassava in pools takes place mostly during the dry season than rainy season because during the rainy season most farmers loss the produce through flooding. Respondents testified that the major disadvantage of submerging cassava roots in pools is that the crop is always eaten by fish, birds, monkeys and other organisms which provides opportunity for bacteria and fungi infestations and deterioration especially when the roots are left beyond the optimum period. For this reason there have been growing preference of submerging cassava for water fufu processing in large plastic containers provided with covers to protect the roots and accelerate fermentation(see appendix). These observations have also been made by Zhu *et al*.,(2015); FAO(2015) for storage and marketing of cassava in the absence of improved and modern storage methods in Sub-Saharan Africa. According to these studies cassava plunged in stagnant pools is likely to attract bacteria and fungi which affect food quality after processing.

Mixing fresh cassava roots in wood ash mixed with gamaline

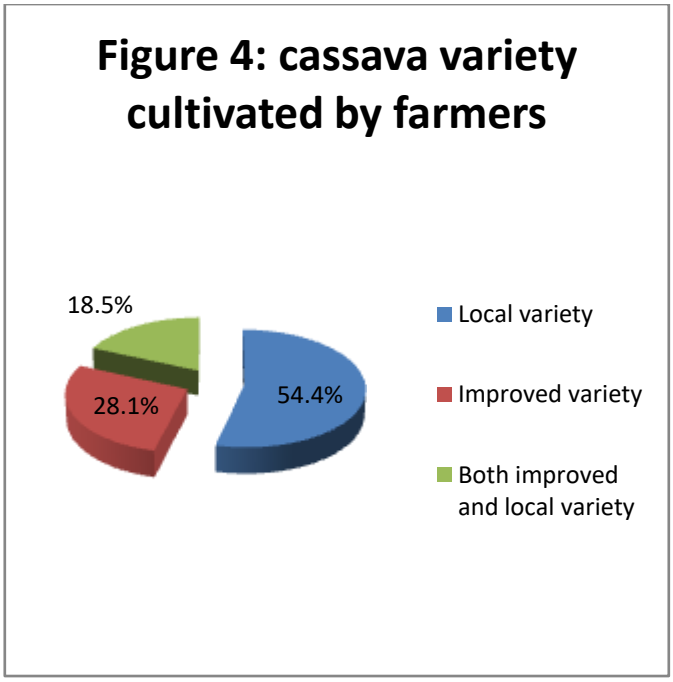
It was disclosed that some farmers prolonged the life span of cassava roots by spraying with wood ash mixed with gamaline to prevent insect' pests and growth of fungi. According to the farmers cassava sprayed with wood ash mixed in gamaline last for seven days after harvest before it could be attacked by rodents, insects, and fungi in traditional storage structures. This method of preserving cassava is adopted when cassava is left unsold, or there is inadequate labour for processing and when processing equipment became faulty and needed repairs. Respondents disclosed that the gamaline and wood ash method of preserving fresh cassava is effective when the wounded roots are separated from the unwounded ones as gamaline could contaminate the roots through the wounds making it unfit for consumption.

Farmers extension exposure and adoption of innovations

About 91.6% of cassava farmers admitted to have no contact with agricultural extension agents, while only 8.4% had sparing contacts. Respondents who have contacts with agricultural extension agents were mostly located in a limited number of accessible areas. The farmers acknowledged poor extension ratings as agents paid irregular visits even to accessible areas. It was disclosed that extension education cassava farmers receive is mostly to increase productivity and not to reduce postharvest losses. In support of productivity increase extension workers have introduced improved or high yielding crop variety of cassava with the assumption that farmers will adopt the variety; but contrary to their expectations majority of the farmers in the study area prefer the local variety which is low crop yielding.

Farmers adoption of cassava varieties

It was observed that most farmers preferred the traditional variety with comparatively low output than the later. Reasons advanced are that the traditional variety was more adaptable in the sociocultural milieu due to its resistance to postharvest losses and ability to resist root rot several months after maturity. On the other hand the improved cassava variety introduced by extension workers must be harvested after maturity as root rot occurs almost immediately after maturity. It was observed that farmers only adopt methods and innovations that are adapted to their socio economic and cultural environment in which production takes place. They are unlikely to adopt technological innovations that are not adapted and profitable to their environment. It is for these reasons that farmer adopted the local variety of cassava than the improved and high yielding species. The survey indicates that 54.4% of the farmers cultivated the traditional or local variety, 28.1% the improved variety while 18.5% cultivated both varieties of cassava. Figure 4 shows the choice of cassava variety made by farmers in the study area.



According to the study the dominance of traditional methods of storage and marketing have been attributed to absence of modern or improved methods. It was also disclosed that extension agents placed more emphasis on the cultivation of improved variety of cassava than introducing innovation that reduce postharvest losses for the crop. The reasons advanced for farmers' adoption of the local specie of cassava were that there are no processing facilities to enable them harvest the improved variety after maturity due to root rot. Secondly, the deplorable nature of farm to markets roads prevents buyers of cassava from penetrating the crop producing areas, especially during rainy season. Transportation difficulties and delays increases the advent of postharvest losses which reduces farm

incomes. The local variety was more preferable to farmers because harvesting could be postponed to march with household and market demand for cassava products.

In addition even extension education for increasing production was inadequate due to the limited number of extension workers in the study area. For example Mbonge, Konye and Kumba Central subdivision have less than ten extension agents serving more than two hundred villages most of them inaccessible; while Ndian division has less than five change agents covering its vast land mass with more than two hundred villages with inadequate access to markets and extension programmes. It was disclosed that most farmers have no contact with extension workers and therefore have no knowledge of extension education especially with respect to postharvest losses reduction. It was observed that though extension education laid emphasis to increased productivity; there are no demonstration farms to practically educate farmers on increasing productivity; talk less reducing postharvest losses. Hence farmers are placed in dilemma of inadequate education for increasing productivity; and lack of education for reducing postharvest losses in cassava, including the other root and tuber crops. The situation was seen as catastrophic especially as most farmers are small holders with limited output for a crop vulnerable to postharvest exigencies where processing depends mostly on traditional methods. Figure 5 indicates extension exposure of cassava farmers in the study area

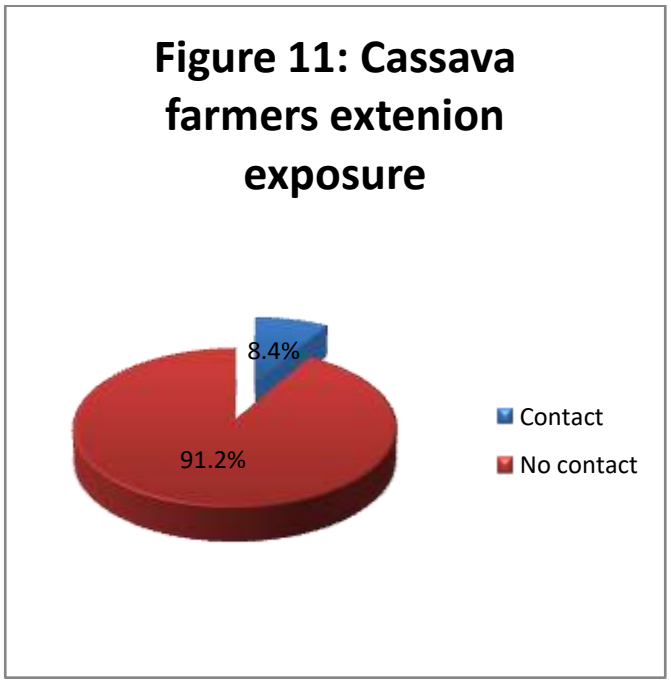


Figure 5 shows the precarious problems encountered by farmers in a country where agriculture is the mainstay of it economy. This evidence is enough to prove that extension education in general requires improvement in structure and content. From this ratio there is need to train more extension workers and improve access to farmers through good infrastructure for transport and communication as expressed by most farmers.

Problems affecting agricultural extension contacts with farmers

Change agents (agricultural extension workers) from the country's Ministry of Agriculture and Rural Development raised the following difficulties that affect dissemination of information to farmers: poor working conditions, limited number of extension workers, inadequate training for food losses, poor road infrastructure, lack or inadequate means of transportation, and lack of incentives or motivation, limited and inadequate extension programmes for farmers. These problems were viewed as endemic in the study area and unless interventionist policies are put in place to ameliorate the situation farmers and other actors may never be benefit from extension education.

Farmers raised the following problems with respect to extension workers:

- Most of the workers lived in towns and cities with their families and cared little about the farmers education
- The few visits paid by extension workers are mostly in accessible areas and mostly during the dry seasons
- Most cassava farmers have never been in contact with extension agents
- Seminars for education of farmers are few and take place only in accessible divisional and sub-divisional capitals which are not accessible to farmers in the remote areas.
- The cost of transportation to seminar venues is always prohibitive and most farmers cannot afford.
- Intra-village communication have been hampered by poor road infrastructure, high cost of transportation and absence of mobile communication network in most areas. .
- Most farmers have poor impression about change agents and strongly feel that they can carry out their activities without them.
- Poverty and lack of awareness affect farmers participation in extension programmes as some of the services formerly offered free have been commercialised as a result of recommendations from the IMF/world Bank Structural Adjustment package which gave given due advantages to corporate farmers than small farmers who dominate agricultural activities.

V. RECOMMENDATIONS

The following recommendations have been derived from the study to actors and stakeholders:

- The government should provide an enabling environment supported by adequate infrastructure for production, processing and marketing of cassava in

various agro ecological regions of the country. The present state of infrastructure does not adequately encourage production of the crop due to the multiple problems encountered by producers along the crop value chain.

- Much has to be done on farmer' education with respect to production and minimization of food losses. These areas are yet to receive the concern they deserve if cassava and other food crop producing area are not given the education, inputs and other facilities to encourage the use of innovations introduced by change agents in the study area. Presently the rather feeble innovations introduced by extension agents do not reflect the sociocultural and economic milieu in which cassava production takes place. Farmers education is ineffective because change agents are few and most farmers have never had contact with them. Farmers are there for left on their own to depend on indigenous or rudimentary system which cannot sustain product demand.
- The present environment and conditions in which extension workers are operating hinders dissemination of information and affects their contact with farmers. Adequate incentives and motivations are necessary including facilities for transport and communication with farmers who desire their services. So long as these facilities are lacking much impact cannot be created to enable farmers appreciate extension education and its outcome in the area.
- There is need to abandon the failed neoliberal policies imposed under the Structural Adjustment Programme (SAP) in the late eighties and early nineties that privatized extension education and gave advantage to corporate and rich farmers who have the financial and material resources to engage extension services. SAP policy package have deprived peasant farmers access to free extension services. There is an urgent need to employ more extension workers in the ministry of Agriculture and Rural Development (MINADER) to improve on the low farmer extension ration.
- There is an need to improve on the curriculum of agricultural colleges and universities in Cameroon. The absence of postharvest losses programmes in extension education given to farmers is clear indication of the short coming of the curricula. Postharvest losses programmes must be given priority in all agricultural institutions as this phenomenon is the greatest hindrance to increased productivity, food self-sufficiency, reducing hunger and malnutrition; and poverty alleviation in the rural areas.

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