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DEPARTMENT OF DEVELOPMENT STUDIES

CASSAVA VALUE ADDED CHAIN: AN ASSESSMENT OF CONSTRAINTS AND OPPORTUNITIES OF SMALL HOLDER FARMERS IN THE NORTH WEST REGION OF CAMEROON

A Project Report submitted to the Department of Development Studies, in Partial Fulfilment of the Requirements for the Award of a Bachelor of Science (BSc) degree in Environment and Agriculture

By

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BUEA, DECEMBER 2015

RESEARCH PROJECT FINAL SUBMISSION FORM

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DEDICATION

I dedicate this work to the Anoh's and Tarke's family.

STATEMENT OF ORIGINALITY

This is to certify that, the study on "**Cassava value added chain: an assessment of constraints and opportunities of small holder farmers in the North West Region of Cameroon**" has been done by Mah O. Tarke, PAIDWA00032 of Pan African Institute for Development West Africa (PAIDWA) Buea. Department of Development studies, Environmental Science and Agriculture, in partial fulfillment of the award of a Bachelor of Science (BSc) under the supervision of Dr Uwem Essia.

I certify that the intellectual content of this project is the product of my own work and that all the assistance received in preparing this research project and sources have been acknowledged.

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I hereby declare that the work on "**Cassava value added chain: an assessment of constraints and opportunities of small holder farmers in the North West Region of Cameroon** "is my own except for quotations and summaries which have been duly acknowledged. The thesis has not been accepted for any degree and is not concurrently submitted for award of other degree.

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ABSTRACT

This study focused on the cassava value added chain; it associated constraints and opportunities faced by small farm holders in Momo, Mezam and Ngoketunjia Divisions of the North West Region of Cameroon. Specifically, the study identifies the various products and by-products of cassava. It determines the cost and benefits of cassava products along the value-added chain, identified the key determinants of cassava production and by- products along the chain. It also identifies the constraints faced, and the associated opportunities abound in the sector for Investment. Two hundred and ten questionnaires were purposively distributed to farmers, drivers, processors and traders, based on availability. Data was analyzed using descriptive statistics, inferential statistics with the aid of GenStat3 and Microsoft Excel 2013 software complemented by narration. The findings showed that there are seven major products of cassava (garri, water fufu, kumkum, chip, miyodo, macala and starch) in the studied area. The total annual revenue of cassava production by the 91 farmers was estimated at 76,652,000 FCFA and the total cost was estimated at 33,170,000 FCFA, giving a gross margin of 43,482,000 FCFA. Prediction of the output of cassava using the multiple regressions was significant with an R^2 value of 0.862. Output/ha = 0.252 + 1.987 F + 1.735 T– 0.785D + 1.560 MT+ 2.679 Tr + 1.175 V. Gari processing cost weekly was 4,804,000 FCFA, weekly revenue of 10,140,000FCFA giving a gross margin of 5,336,000FCFA? Constraints faced by farmers included: the poor link between farmers and extension worker, lack of training on the use of improved varieties, pest and diseases, effects of climate, low technology, limited access to land, fluctuation in prices, and perishability of products. Despite these constraints, opportunities exist for small holder farmers in the study area which include; increasing market demands, new government policies to promote smallholders. Because cassava is an important food and commercial source, there is the need to extend study in other areas of the Region.

Keywords: *Cassava chain and cassava value added chain*

PREFACE

Cette étude est portée sur la valeur ajoutée à la chaîne de production du manioc consommé sous différentes; il s'agit d'une association de différentes contraintes et d'opportunités rencontrés par les petits exploitants agricoles dans le département de Momo, de Mezam et de Ngoketunjia dans la région du Nord-Ouest Cameroun. Plus précisément, l'étude identifie les différents produits et sous-produits du manioc. Elle détermine le coût et les bénéfices obtenus tout au long de la chaîne de production de ce tubercule, identifie les principaux éléments déterminants dans la production du manioc et des autres produits obtenus le long de la chaîne de production. Il identifie également les contraintes rencontrées et les possibilités abondantes rencontrés dans le secteur lorsque l'on investit dans le secteur. Deux-cents dix questionnaires ont été distribués aux agriculteurs, chauffeurs, les transformateurs et les commerçants, en fonction des disponibilités. Les données ont furent analysées à l'aide d'in certain nombre de statistiques descriptives, statistiques d'inférence ceci à l'aide d'GenStat3 et du logiciel Microsoft Excel 2013 complétée par un texte narratif. Les résultats ont montré qu'il y a sept principaux produits faits à base de manioc à savoir : le gari, le water fufu, le kumkum, du chip, miyodo, les beignets et de l'amidon, tout ceci dans la zone étudiée. Le revenu total annuel du manioc produit par 91 cultivateurs est estimé à 76 652 000 FCFA, tandis que le coût total est de 33 170 000 FCFA, laissant une marge de 43 482 000 FCFA. Les prévisions des récoltes du manioc suivant une étude comparative des différents résultats était assez remarquable, et d'une valeur de R^2 sur 0.862. La production par hectare = 0.252 + 1.987 F + 1.735 T– 0.785D + 1.560 MT+ 2.679 Tr + 1.175 V. Le coût de la transformation du Gari par semaine est de 4 804 000 FCFA, le revenu par semaine étant de 10 140 000 FCFA laissant une marge de 5 336 000 FCFA. Le chiffre d'affaires annuel total de la production de manioc dans un hectare de production est de 842 330 FCFA et le coût total du traitement a été estimé à 364 506 FCFA, soit une marge brute de 477 824 FCFA. Les prédictions de la production de manioc suivant les mon échelle d'étude a été significative avec une valeur R2 de 0,862. Les difficultés rencontrées par les agriculteurs sont : le manque de liaison entre les agriculteurs et les agents de vulgarisation, le manque de formation sur l'utilisation des variétés améliorées de produits, ravageurs et les maladies, les effets du climat, de la technologie inappropriée, l'accès limité à la terre, la fluctuation des prix, et la putréfaction des produits. Malgré ces contraintes, il existe bel et bien des opportunités

et avantages pour les petits exploitants agricoles dans la zone d'étudiée ;une demande croissante du marché, les nouvelles politiques gouvernementales pour promouvoir les efforts de ces petits exploitants. Parce que le manioc est un aliment important qui contribue considérablement à l'économie, il est donc nécessaire d'étendre les champs d'étude dans d'autres zones de la région.

Mots clés: *chaîne de production du manioc et la chaîne de production du manioc avec une valeur ajoutée.*

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ACRONYMS AND ABBREVIATION

ADB	African Development Bank
ACGSF	Agricultural Credits, Guarantee Scheme Fund
ADP	Agricultural Development Program
CMP	Cassava Multiplication Program
FAO	Food and Agricultural Organisation
FAOSTAT	Food and Agricultural Statistics
GDP	Gross Domestic Product
GP-DERUDEP	Grassfield Participatory and Decentralised Rural Development Project
GM	Gross Margin
HQCF	High-Quality Cassava Flour
IFAD	International Funds for Agricultural Development
IITA	International Institute of Tropical Agriculture
INADES	Institut Africain pour le Développement Économique et Social - Centre Africain de. Formation
MINADER	Ministry of Agriculture and Rural Development Ministère de l'Agriculture et du Développement Rural
NEPAD	New Partnership for African Development
NW	North West
NGOs	Non-Governmental Organization
RTEP	Root and Tuber Expansion Programme
SSA	Sub Saharan Africa
SSP	Species
PNDRT	National Program for Roots and Tuber Development (Programme National de Développement des Racines et Tubercules)
VCA	Value Chain Analysis
WFR	World Fall Report

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

Cassava (*Manihot spp)* is a root tuber crop that belongs to the family *Euphorbiacae*. In the Sub-Sahara African (SSA) region, cassava is an important and cheap source of carbohydrate (FAO, 2004). It is indeed the third largest source of calories in the tropics, after rice and maize (FAO, 2002). Globally, it is a staple for over 600 million people. According to (World Bank, 2012), millions of people depend on cassava in Africa, Asia, and Latin America for food and industrial use. There are two varieties: sweet and bitter cassava (*Utilissima* and *Palmata),* depending on the level of toxicity of cyanogenic glucosides. Sweet cassavas are usually consumed directly while bitter cassavas are used as feed or processed into industrial inputs such as starch and chips (Vessia, 2007).

Cameroon is ranked 16th for worldwide cassava production. Cassava is one of the leading crops regarding annual yield both for cash and food crop categories. It contributes 1.7 percent of the GDP (FAOSTAT, 2015). Promoting the production of cassava in Cameroon is one amongst government priorities for increased agricultural productivity (FAOSTAT, 2015). Cassava is cultivated in the East, West, South, South West, Centre and the North West Regions of Cameroon. In the North West Region, cassava is grown in the seven Divisions, namely; Momo, Mezam, Noketunjia, Donga Mantung, Boyo, Bui, and Menchum. The present study focuses on three communities, namely; Bafut (Mezam), Mbengwi (Momo), and Ndop (Ngoketunjia) where cassava cultivation and processing have remained the people's economic mainstay and a primary source of livelihood.

International Institute for Tropical Agriculture (IITA), (2007), notes that a staple food is one that provides a significant proportion of the population's food and source of income. Cassava serves this function as it can be consumed raw upon maturity or in processed form as garri, water fufu, and more. Cassava has a carbohydrate content of approximately forty times higher than rice and twenty percent more than Maize (Nyerhovwo, 2004). Cassava, therefore, plays a role in the country's food security and

its contribution to the food basket increases significantly when the value chain is well extended.

Value addition plays an important role in the economies of agricultural products. Those with great potentials of processing give additional avenues for improved domestication when recognized and vulgarized. If value is added to cassava, the farmer stands to gain more income like is achieved in Thailand, China and other advanced and industrializing economies. In Cameroon, cassava cultivation and production are concentrated in the hands of resource-poor smallholders who generally cultivate less than 2 hectares of land using rudimentary tools. Most traditional cultivators produce for domestic consumption. A greater percentage of cassava produced in the North West Region is directly consumed with little or no processing and does not meet current demand. Only a small fraction is processed into primary raw materials, and very little into secondary raw materials.

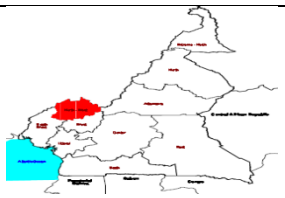
1.1.1. Description of the study area

The North West (NW) Region is one of the largest of the Republic of Cameroon. It lies in latitude 5^0 55 N and 6° 30′ North of the Equator and longitude 10°30′E and 10^0 67^0 East. It is bounded on the North and West by the Federal Republic of Nigeria, to the South by South West Region, South East by Western Region and North West by Adamawa Region. The NW Region has an area of about 17.910km^2 with an estimated population of approximately 1.85 million people. Bamenda, the central agglomeration, and headquarters of the Region, is both a modern and traditional town. It is an important shopping center and the crossroads of the whole region. Administratively the area is divided into seven Divisions and thirty- four (34) Subdivisions.

The topography of the area is mountainous and undulating, characterized by an abrupt escarpment, towering mountain, peaks, deep valleys and broad alluvial plains. The highest point in the region is Mount Oku (in the Bui Division with an altitude of 3011 meters) while the lowest being Mbembe plain with an altitude of 211 meters above sea level. The peculiar topography of the Region explains the difficulties encountered in the attempt to reach a greater part of the region either by vehicle or even foot. Some areas are still enclave and not accessible by road. The vegetation is predominantly savanna with dotted shrubs. However dense forest of the tropical nature can be found in certain parts of Menchum and Momo Divisions, Mofane forest in Oku Bui Division,

Ako in Donga Mantung Division, and patches of the forest along the valleys and riversides especially on the border with Nigeria. The seven division of the North West region and the cool parts that describe the study area are as shown on the Map below.

LOCATION OF CAMEROON IN AFRICA



LOCATION OF NW IN CAMEROON

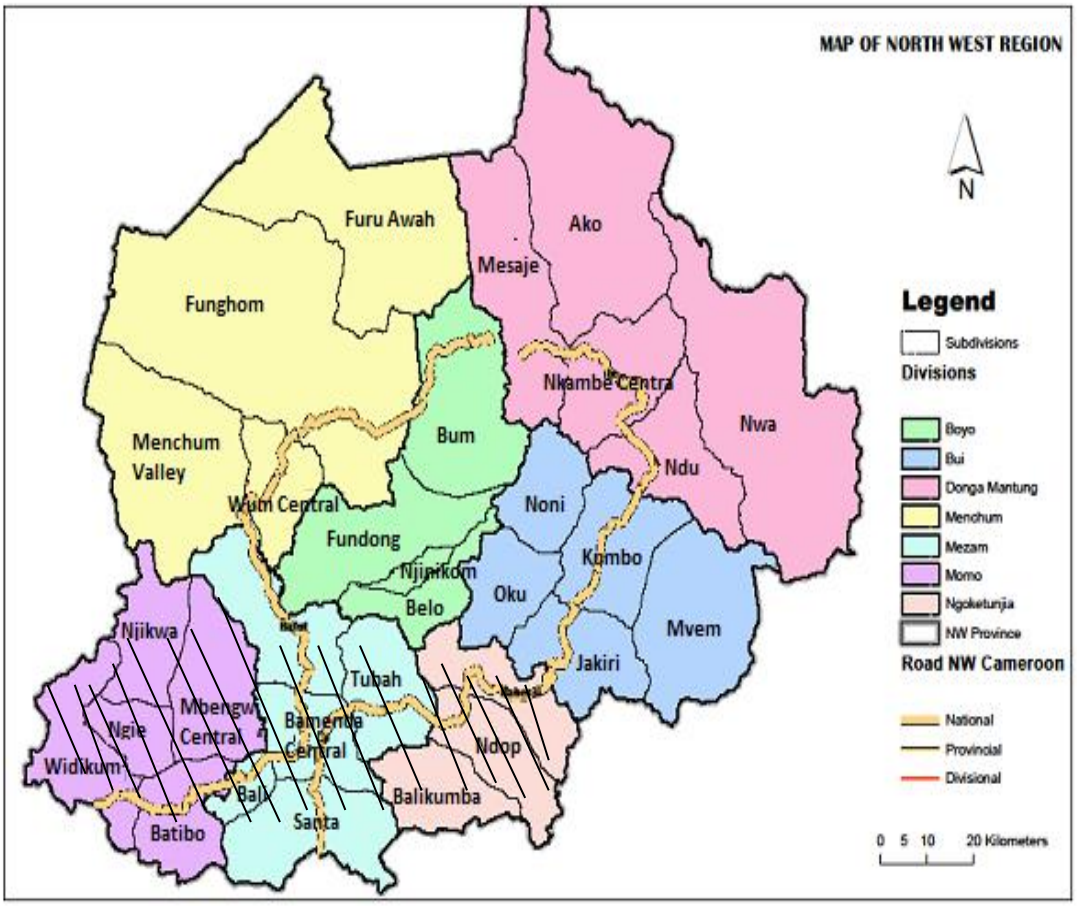


Figure 1.1: Map of the North West Region showing sampled areas of cassava production. *Source: GP DERUDEP project manual, 2015.*

The population of the North West is estimated at 1.85 million inhabitants according to the National Census figures of 2005. Mezam is rank first with a population of 547088 and highest density of 268.7/INH/$Km^{2.}$ However, Mezam has a smaller surface area

when compared with Menchum whose surface area is 4,684 a population of 169095 people/thousand and the lowest densities of 36.1INH/km^2. That implies that there are many more mouths to feed in Mezam since it also inhabits the principal town of the North West region (Bamenda). The estimated population per administrative division is as shown in Table 1 below.

Table 1.1: Population of the North West region

Division	Area	Population	Pop Rank	Densities(INH/km$^{2)}$
Mezam	2036	547088	1	268.7
Bui	2,419	3.60794	2	138.9
Donga Mantung	4,535	281, 756	3	62.1
Ngoketunjia	1339	195,555	4	146
Menchum	4,684	169,095	5	36.1
Momo	1929	144,769	6	75
Boyo	358	134887	7	64.1
Region	17,900	1,804,695	7	104.3

Source: *GP DERUDEP, Sectoral Project Manual, 2015.*

Cassava cultivation and necessary processing is a significant traditional economic activity of people in the North West Region. However, current production is still at the subsistence level with very little secondary and tertiary processing. Cassava is frequently transformed into chips, garri, water fufu, kumkum and cassava flour. The North West people thus have different indigenous knowledge for converting cassava for food. However, few studies have so far determined the quantity of cassava produced and how it is transformed into primary, secondary, and tertiary produce for consumption and industrial uses. As rightly noted by Kawano (2003), identifying the produce chain is an important step for policy interventions because primary produce are often perishable and may rot away. These products are sold at unreasonable prices if they remain in the hands of the farmers for too long. The value chain may vary from place to place. In some cases, the farm produce is carried from the fields by the

producers to the markets directly, while in other instances it may go through several stages of processing before the final consumer is reached.

Today, the cassava sector in Cameroon has attracted a lot of research interest (Nagib and Antonio, 2006; Essono *et al.*, 2008; Njukwe *et al*., 2014). But very few empirical works have paid particular attention to the cassava value added chain. This paucity of scholarly works is, even more, acute in the North West Region, where cassava plays an important socio-economic role. Furthermore, cassava production and transformation involves a lot of participants and events, but few studies have documented the various actors and activities in the cassava production and processing chain. Moreover, cassava production and processing require considerable financial, material and human investment. But cost-benefit analyzes studies to assess production and processing input and corresponding output along the various segments of the cassava production, processing and marketing chain are few. Similarly, there is limited literature on the constraints and opportunities in the cassava subsector in Cameroon. This study, therefore, seeks to enrich the literature on cassava value chain in Cameroon generally and the NW Region in particular.

1.2. Statement of the problem

Trade in cassava and its associated products constitute an important source of livelihood for agricultural dependent households and the lifeblood of some local economies (Lancaster *et al*., 198). Despite the considerable efforts of farmers, local development organizations, and government, current production levels are very low and unable to meet current demands (PNDRT, 2005; Njukwe *et al.*, 2014). Although cassava is an essential dietary staple, it has remained a subsistence crop because of its rapid spoilage after harvest, caused by an inadequate/irregular supply to feed the few processing facilities and inefficient processing methods for the market (Njukwe *et al.*, 2012). Traditional processing methods of cassava are characterized by high cost and reduced quality, which prevents products of small-holders from entering local or regional markets (Markelova *et al.*, 2009). Ultimately, the harvested cassava is usually sold at farm gate due to its bulky nature and short shelf life; causing significant wastes during harvest periods (Sanni *et al.*, 2010). These post-harvest and market constraints hamper the development of cassava trade (Bakia *et al.*, 1999). Currently,

there is increasing interest in interventions that build cassava value chains and at the same time improve the income of smallholder farmers. Unfortunately, smallholders cassava processing in Momo, Mezam and Ngoketunjia Divisions, as leaders in cassava production in the NW Region is characterized by technical, financial, institutional and infrastructural setbacks which adversely affect the sector (Njukwe *et al.*, 2014). Therefore, there is the need for information about the feasibility of raising cassava as a commercial crop in Cameroon. Hence, the documentation of challenges and opportunities can enhance the existing literature on how to improve the production and trade of cassava products and its by-products.

1.3. Objectives of the study

The overall objective is to assess the cassava value added chain; the constraints and opportunities of smallholder farmers in the North West region of Cameroon.

1.3.1. Specific objectives

1. To identify the various products and by-products of cassava sector in the NW Region.
2. To determine the cost and benefits of the cassava value added chain in the NW Region.
3. To identify the key determinants of cassava productions that influences the output of the cassava chain in the NW Region.
4. To identify the constraints faced and the associated opportunities abound in the cassava value chain in the NW Region.

1.4 Research questions

1. What are the various products and by-products of the cassava sector in the NW Region of Cameroon?
2. What are the costs and benefits of the cassava products and by-products along the value added chain in the NW Region of Cameroon?
3. What are the key determinants of cassava production in the NW Region?
4. What major constraints do participants of the cassava business face and what opportunities abound for investment in cassava value addition in the NW Region of Cameroon?

1.5. Significance of the Study

The study has theoretical and practical significance.

Theoretically, the study seeks to add value to the existing knowledge of cassava value added chains in the Cameroon generally and the NW Region in particular. Researchers and scholars working on cassava and other farm produce chains will find this report useful as a reference material.

Practically, the result of the study will also help in understanding the opportunities abound of cassava cultivation, processing, and marketing. Potential investors, business development advisers, marketing organizations will find the suggestions on how to improve the cassava value added chain useful. The information will also support the formulation and implementation of agricultural development policies and programs that seek to address the problems associated with cassava cultivation, processing, marketing and value added chains.

1.6. Organizational Structure of the Study

This work is composed of five chapters; the first chapter is the introduction, Chapter Two is the literature review and conceptual framework, and Chapter Three the methodology of the study. Chapter Four presents the findings and analysis of data. Lastly, Chapter Five is a summary of findings, conclusion, and recommendations. Suggested areas for further research are also provided in Chapter Five.

1.7 Definition of terms

Value chain

Value chain" describes the full range of value adding activities required to bring a product or service through the different stages of production. It include procurement of raw materials and other inputs, assembly, physical transformation, acquisition of required services such as transport or cooling, and ultimately the response to consumer demand (Kaplinsky and Morris, 2002). A value chain links the steps that a product takes from the farmer to the consumer. It constitute research and development, the farm input suppliers and finance. The farmer combines these resources with land, labour and capital to produce commodities.

Value added

To increase value to agriculture (cassava) means changing the physical state or manner in which the agricultural commodity or product is produced and segregated (through processing, marketing,) etc. Valorisation leads to increase in customer base or demand for the product. Adding value or otherwise called value added is an important strategy for transforming farming from an unprofitable venture into a profit one (INADES, 2012 P.26).

Cassava value added chain

Cassava value added chain is a means of describing the way that commercial businesses tend to generate additional benefits or costs during the course of their usual operation. In most cases, the chain of events functions as a supply chain that provides raw materials for some businesses that are then used in the manufacturing of various goods and services purchased by commercial or individual consumers. The general idea of the cassava value added chain is that there is always some additional benefit in terms of generating revenue. Since the buyer uses the acquired goods to create something that is ultimately sold at a profit and earns income for the company.

The only one constant with a value added chain is that every stage or phase in the chain generates additional benefits to those concerned

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

2.1. Literature Review

2.1.1. Types of cassava products and by-products

Generally, due to it bulkiness and perishability, cassava is preferably consumed in its processed forms. Within the SSA region, about 80 different transformed cassava products have been identified (Anonymous, 1992). A wide variety of food products and beverages are traditionally prepared from cassava tubers using local technologies (Lancaster *et al*., 1982). Cassava leaves consumed like other vegetables, either in soups or served as a sauce (Affran, 1968; Doku, 1969; Dovlo, 1973; Favier *et al*., 1971; Goode, 1974; Whitby, 1972). Cassava flour is use in making pastries and tasty cuisines (Whitby, 1972; Alberto, 1958). The most widely consumed cassava products are gari and foofoo.

At the secondary and tertiary levels cassava is processed into several products and raw materials for paper, textiles, adhesives, beverages, confectionery, pharmaceuticals and building materials (Chang, 2000). Cassava starch exhibits an excellent clarity and bland flavor. It has good film forming characteristics with resistance to cracking and chipping. It may be used at a concentration of twenty per cent. The film-forming property of cassava, dextrin, makes it useful as a replacement for gum Arabic in the pan coating of confections. Dextrin is mostly used as a non-tacky glaze for cakes, doughnuts, fruit, nuts and candies.

Starch can be prepared indigenously (native) or modified. Native starches have limited usage, mainly in the food industry, because they lack other desired functional properties. The native starch granules hydrate more easily when heated in water. They swell and gelatinize. The viscosity increases to a peak value, followed by a rapid decrease, yielding weak-boiled, stringy and cohesive pastes of poor stability. The poor tolerance to acidity, with little resistance to shear pressure, as commonly employed in modern food processing (Chang, 2000). There are pockets of the cottage along with scanty large- scale industries of cassava starch in Africa especially Nigeria, Ghana and South Africa (Sanni *et al.,* 2004). Noodles are a long thin extruded food product made from a mixture of flour, water, and eggs usually cooked in soup or boiling water (Sanni

et al, 2004). At 12.5 percent cassava starch and flour forms an integral part of the final product. The figure 2.1. Show some diverse products from cassava like flour which is above and other products.

Figure 2. 1. Some different products and importance of cassava (Byung G. Lee, 2013)

Modified starch and dextrin have successfully replaced caseinates in meat emulsions, coffee whiteners, and imitation cheeses. Modified dextrin is also used to replace butterfat in ice cream and ice milk, vegetable oil in salad dressings and shortening in icings. Changing cassava to other forms plays a very crucial role in cost reduction efforts. However, Cameroonians are yet to do extensive research and applications on modified starch from cassava. Cassava starch and cassava roots are used in Malaysia and some other countries for the production of yeasts for animal feed, the human diet, and baking. The Medium high glucose syrup - 63 DE – has also replaced sugar in marmalade and jam. Starch products are used as crystal and texture controller in ice cream. *Cassava* specialty dextrins replace from 20 percent to 40 percent of gum Arabic in some hard gum candies.

Some products from modified cassava starch in Africa include Monosodium glutamate (MSG). This product is used extensively in many parts of the continent in powder or crystal form as a flavoring agent in foods such as meats, vegetables, sauces and gravies. Cassava starch and molasses are the primary raw materials used in the manufacture of MSG in the Far East and Latin American countries. The starch is usually hydrolyzed into glucose by boiling with hydrochloric or sulfuric acid solutions in closed converters and under pressure. The glucose is filtered and converted into the glutamic acid through the process of bacterial fermentation. The resulting glutamic acid is refined, filtered and treated with caustic soda to produce monosodium glutamate.

In Cameroon, cassava products include chips, flour, starch, fufu, kumkum, bobolo, garri, etc. The diversity of cassava products have not been fully exploited in the country and particularly in the NW Region. This research seeks to identify the cassava value added chain thereby assessing the constraints and opportunities of smallholder farmers in order to meet the identified gap.

2.1.2 Cost and benefits of cassava products along the value added chain

According to Anaekwe (2012), agriculture is characterized by considerable regional and crop diversities that feature among other trees and food crops, forestry, livestock and fishery which incur diverse costs and benefits. Cassava is one of such crops that is commonly grown in the tropics. As noted earlier, it is a raw material for the starch industry (Nweke, 2004), and an extremely efficient source of calories compared to other food crops (Hahn, 1984). With particular reference to Cameroon, root crops are well adapted to the diverse traditional farming methods. An average farmer's yields have witnessed a considerable increase from between 5 to 10 t/ha to about 20 to 40 t/ha from the seventies as compared to the nineties (Brecklbaum *et al*., 1997; NRCRI, 1982-1992; IITA, 1976-1996, 1989-1993). Besides, cassava has a legitimate resistance to many pests and diseases, thus, making it an important food crop to enhance food security. Products from cassava, such as garri and fufu are very easy to prepare. They are also traditionally considered as lasting relatively longer time to digest as compared to other foods. Of additional importance is the use of cassava as raw material for the production of alcohol, gums, pharmaceuticals and confectionaries.

Given the benefits of cassava highlighted as aforementioned, efforts are being intensified towards increasing cassava production in the country to the level of self-sufficiency. One of such commitments was the pronouncement of the Minister of Agriculture and Rural Development to increase cassava production to a level that will support industrial production in Cameroon. African Development Bank (ADB) is currently sponsoring a nineteen-hectare project on cassava production in the Widikum antenna of the Grassfield Participatory and Decentralized Rural Development Project Phase two (GP-DERUDEP). This aim at enhancing returns for the project area GPDERUDEP (2015). However, farmers' use of indigenous knowledge in the production of cassava for immediate economic returns and continuous revenue generation calls for critical evaluation. Value chain analysis is essential to an understanding of markets, their relationships, the participation of different actors, and the critical constraints that limit the growth of agricultural production and consequently the competitiveness of smallholder farmers. It will also help us to know much money can made and what costs exist in the sector Porter, (1985).

For any profitable venture, it is beneficial for revenue to exceed the cost of production. Smallholder farmers can improve their margins and as a strategy for coping with agricultural food price volatility through innovations within the chain. Therefore, the focus of this study is to assess the constraints and opportunities abound for smallholder farmers in the North West Region of Cameroon.

2.1.3 Factors that determine the output of cassava production

Cassava thrives across a wider range of ecological zones and is available all year round. Cassava (*Manihot eculenta Crantz*) is an important staple cash crop that fits well into the smallholder farming systems. It is a perennial food crop which produces roots that are harvested 12 months after planting, and its leaves are used as complementary food source rich in protein (Nassar and Antonio, 2006; Njukwe *et al*., 2014). Some environmental and economic factors affect the cassava production in less developed countries generally and Cameroon in particular.

Firstly, smallholder farmers face enormous technological constraints. In countries where commercial cultivation of cassava has reached an advance stage such as Thailand, Costa Rica and Brazil, the technology has been developed to make planting,

harvesting and post-harvest processing more effective and efficient (Hillocks *et, al*. 2001). Storage technology is also a major constraint especially since industrial demand for raw cassava is still low (Markelova *et al*., 2009). Research on cultivars improvement has always been the back bone of every cassava development endeavors in SSA. Also, planting materials has been reported as one of the most important determinant of productivity (Crawford, 1993). In addition to the post-harvest deterioration of produce due to poor storage technology and low level of processing, weak market- making mechanisms were also reported (Njukwe *et al*., 20012b).

Secondly, cassava is produced mainly by small-holders farmers whose coverage cultivated area does not exceed one hectare. Such farms are usually established on marginal land, and the farmers are poorly exposed to extension services (Akinbade *et al.*, 2010).

Thirdly, there are challenges with post-harvest functioning facilities and infrastructures such as roads, means of communication and inputs supply systems. Equally, the farmers are poorly organized causing them to compete unfavorably among themselves instead of complementing each other (Bukia *et al*., 1999). Poor access to the required finance is another constraining. Anyanwu (2011) argues that credit availability and efficiency of utilization in smallholder farming system are two sides of the same coin. When credit is inaccessible by the smallholder due to the existence of structural rigidities in credit administration, the needed economic development will not be realized. Omankwue (2007) also notes that restricted access to finances and inadequate technological knowledge are among the factors responsible for low agriculture growth and development.

In a nutshell, smallholders cassava production and processing in Cameroon are influenced by technical, financial, institutional and infrastructural setbacks which adversely affect the sector, Due to its rapid spoilage, inadequate transportation, and few processing facilities, raising cassava as a commercial crop has not been feasible. This research examines the cassava value added chain; assesses the constraints face by small-holders farmers in the NW Region of Cameroon and the opportunities they have along the chain.

2.1.3.1 Cassava processing characteristics

Cassava like other crops is characterized by seasonality, perishability, bulkiness and transportation. Cassava has registered diversity in its products across the Sub-Saharan area of Africa (Anonymous, 1992) Increasing evidence has been raised to suggest that from one product to another, differences exist in technologies used in cassava transformation between farmer and between similar or different ecological zones. While this trend is not unprecedented in the history of food transformation it remains necessary to understand the value added chains so as to explain farmers' behaviors and profitability. Such an understanding is central in both cassava production and processing for providing critical inputs that could be helpful to assist farmers, especially in the formulation of practical recommendations for cassava cultivation and its further processing.

According to Hahn (1989), in almost all the cassava growing communities of the SSA region, cassava chips rank first in prevalence among transformed products. Chips are the dried products of fresh roots of cassava obtained following their fermentation, drying, and subsequent storage. The past and current studies suggest that several forms of cassava chips exist. The existing forms are solely related to feeding reference of local population, their usual appearance, and their potential end uses (Essono, *Unpublish data).* These forms may only be related to particular factors such as the traditional pattern of nutrition market purposes and cooking characteristics of the cassava variety grown by farmers in a given setting (Nweke,1998). It is hypothesized that the preferred criteria adopted by farmers both in cassava chips production and cassava cultivation can strongly vary in a given community as local environment and socio- economic parameter changes. And as they do the forms of chips, produced may become more or less valued from the cassava growing community to another. Likewise, the resulting constraints are also likely to shift due to the parameters mention above as well as the way the farmers manage their actual agro-ecosystems.

Several studies on farmer's practices and handling strategies in production and processing related aspects of cassava have been carried out. The earlier work by Hand (1989), understanding the potentials of cassava as animal and human food mainly focused on processing methods. By shedding light on varietal preference associated with farmers in cassava- based systems of Tanzania, Kapinga *et al*., (1997) highlighted

the increasing use of bitter variety in that country and elucidated the related farmer perceptions.

According to Okorji *et al*.,(2003) cassava contains substances known as (*cyanogenic glycocides*) which break down into hydrocyanic acid(HCN) after the plant is harvested. This acid makes cassava very poisonous for animals and human consumption (Cooke and Coursey, 1981). Processing of cassava is to remove this poison; reduce its toxicity, increase it palatability and storage life. Rural based processing offers opportunities in terms of employment, adds value to products, reduces waste due to spoilage, improve acceptability, extends storage life and encourage the development of technical and marketing skill of villagers (Ifediora, 1993). Chinsman and Friegeen (1987) reported that proper processing and preservation of harvest produce minimize post-harvest losses and thus help to offset the shortage in food security.

Cassava processing involves several operations; Kwatia (1986) identified three major classes of cassava processing technologies. These are technology based on drying and dried products with or without fermentation, technology based on fermented cassava dough and minor processing techniques. Karrunwi and Ezumah (1988) observed that 84 percent of processors are women and that garri is in many cases the primary end product. Cassava root processing in the NW Region has been done mostly by the traditional methods which require that the root is peeled with a knife, washed, and then followed by the application of each operation to arrive at the desired end product. For instance in the production of garri, the peeled cassava are grater after washing. The grating is manually done on a metal grater locally made (fabricated) out of tin- zinc sheet material. The product which is marshy is poured into a sack before dewatering ,by putting large wood on top and allowing it to stand for a few hours, after which the semi -dried marsh, is then feast tied on sticks to finish the drying process. This last for two days and mash in the sack is sieved to separate the fibers from the granulated pulp. The latter is fried (patched) in an open iron cast, frying pan to produce gari.

2.1.3.2 Tracing market routes of cassava value added chain

Agricultural products often go through many hands before they reach the final consumer stage WFR (2006). Some authors have identified that products may be carried from the farms by the producers to the markets directly while some require several intermediaries before the final consumer is reached. Between the farmer and the ultimate consumer, there are at least three different intermediaries – the processor, the semi-wholesaler and the retailer (Enete, 2009). Over eighty percent of the fresh tubers pass through the traditional channel while just about 10 percent go through the large-scale production channel (PIND, 2011). According to IITA (2007), wholesalers can be group into two; the first group are those that travel to the various rural markets, buy cassava (fresh or processed) from the farmers or processors, and transport the produce to urban markets (IITA, 2005). The second group buys cassava produce in bulk from the itinerant wholesale traders and eventually sells to retailers.

The study of value chains comprises of two key concepts, namely; value and chain. The term value is the synonym to "value added" in the Value Chain Analysis (VCA). It is made the incremental value of a resultant product produced from processing of a product. For agricultural commodities, value addition can also take place through differentiation of a product based on food safety and food functionality. The Price of the resultant products shows its additional value. The term chain is a supply chain indicating that, the process and the actors involved in the lifecycle (from conception to disposal) of cassava product (Hawkes and Ruel, 2011). Hence, Kaplinsky and Morris (2001) defined value chain as a study of the "full range of activities which are required to bring a product or service from conception, through the different phases of production. This involves a combination of physical transformation and the input of various producer services delivery to final consumers, and final disposal after use. Sanogo (2010), further that in addition to the movement of a product from one stage to another and identification of the actors, the firms and their services also adds analysis of the institutional support to production at various stages to VCA. The objective of a value chain is to produce value added products or services for a market, by transforming resources and by the use of infrastructures – within the opportunities and constraints of its institutional environment.

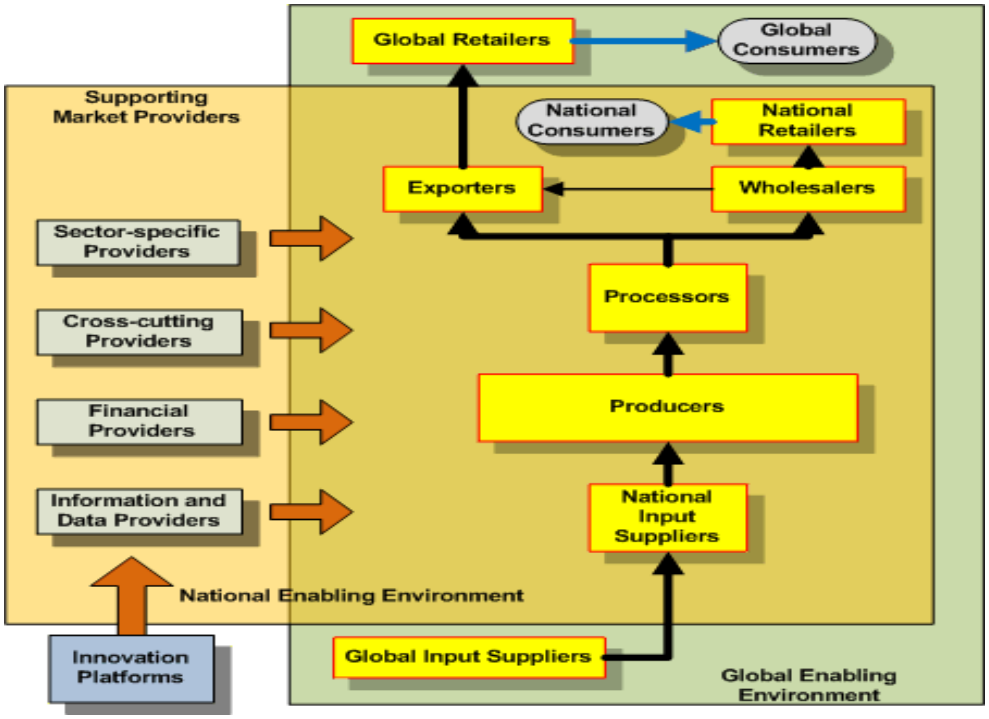
According to Lawal and Jaiyeola (2007), value addition improves the shelf value of agricultural products and gener income for the participants. As a business progresses, understanding the value added chain makes it possible to identify how much profit can be generated while still remaining competitive in the marketplace. For this reason, it makes economic sense to secure materials that are of high quality as well as low price. This will maximize the potential for turning the materials into high quality products, selling them at the highest price that the market will bear, and actually increasing the value earned from the process.

Hence, in a partnership agreement with PNDRT, IITA adopted the value chain approach in research-for-development that guarantees the coverage of production to consumption and considers all groups from farmers to consumers. This includes; traders, transporters, processors, industrial users and the export sector. The project developed variety of cassava processing techniques to broaden the range of products derived from cassava. The partnership arrangement led to shared resources, facilities, materials and knowledge in collaboration with universities and national agricultural research and extension systems, international and national NGOs and farmer associations for the purpose of generating new technologies and fostering innovations across Africa Njukwe *et al* (2014)

The development of multi-stakeholders' platform in Cameroon created the pathway for intervention. These actors were involved to better understand their roles in cassava value-chain development by linking agricultural technologies and best practice developments to market demand. It also created linkages with other national and regional initiatives and programs to improve communication and information exchange.

This work focuses on cassava value added chain, assessment of constraints and opportunities that can benefit farmers in particular and the economy in general. Investment along the entire cassava value chain is crucial to maximize benefits gained from improvement in crop yields. The overall idea of the cassava value added chain is that there is always some additional benefit in terms of generating revenue, since the buyer uses the acquired goods to create something that is ultimately sold at a profit and

earns income from the business. Figure 2.1.3 shows actors of the global value added chain of any business endeavors as depicted below.



Figure; 2.1.3 Adapted from World Report Fall 2006*: The Value Chain Approach; Strengthening Value Chains to Promote Economic Opportunities*

2.1.4 Constraints and opportunities of cassava production

The key long-standing challenge of the smallholder farmers have been low productivity stemming from poor access to modern inputs, improved varieties, lack of access to credit, poor infrastructure inadequate access to market, land and environmental degradation, inadequate research, and extension services and technology (Ouma and Jagwe, 2010). The crucial role of financial resources as a factor of production is to induce economic growth and the development as well as need to channel these resources to the agricultural sector of the economy for economic empowerment. Anyanwu (2011) puts forward that credit availability and efficiency of utilization of smallholder farming system are two sides of the same coin. It has been argued that poor agricultural technique is among the factors responsible for low agriculture growth and development (Omankwue, 2007). It implies that cassava productivity in Momo, Mezam

and Ngoketunjia division may be hampered by poor farm techniques and small credit (finance) necessitating production at subsistence level.

Constraints on value chain development are in this view related to market access (local, regional, international) and market orientation (Grunert *et al.,* 2005), available resources and physical infrastructures (Porter 1990) and institutions regulative; cognitive and normative (Scott 1995). Recently, this challenge has been compounded by the volatile food and energy prices and the global financial crisis (Westby, 2008). In Cameroon, the major challenge for farmers to capitalize on the potentials of cassava as a reliable source of income is attributed to poor organization and planning (Njukwe *et al*., 2014)

However, production is mostly by smallholders with poor access to credit and markets and the bulk of harvested cassava is sold at farm gate due to its bulky nature and short shelf life causing major wastes during harvest periods (Kawano, 2003). Once the roots are harvested they need to be processed and consumed within a couple of days. The same applies to peels that need to be processed into feeds, and the cuttings are to be planted within a few weeks after harvesting. Moreover, most cassava producing areas in Cameroon often lack good post-harvest facilities and infrastructure such as means of communication and input supply systems while farmers on their part are poorly organized.

These post-harvest and market constraints hinder the development of cassava trade and lead to surplus beyond the immediate home consumption. The excess becomes waste and farmers are not motivated to produce more than what is needed to feed themselves and their dependents. Meanwhile cassava is seen to have the potential to be transformed from subsistence into a commercial crop that can be used for industrial purposes. (Sanni, 2007). It has been established that where cassava farmers have access to markets, they tend to adopt productivity-enhancing technologies (Nweke, 2008).

Many development oriented policies have been implemented in Cameroon especially in agricultural sector since independence. The government has made some institutional and policy reforms targeted at improving the socio-economic status of small-holders farmers. These include Agricultural Credits, Guarantee Scheme Fund (ACGSF), Agricultural Development Program (ADP) and Cassava Multiplication Program

(CMP). The root and tuber expansion such as cultivation marketing, processing etc., are covered by the Agricultural Development Programme (ADP). Nnannu (2010) submits that the Root and Tuber Expansion Programme (RTEP) is a farmer oriented programme whose beneficiary are poor household and smallholder farmers but the overall objective of RTEP is to enhance national food self-sufficiency, and improve rural households food security and income for the poor farmers within the cassava sub-sector in Cameroon.

Cassava production, processing and marketing have significant social and economic role to play in most developing countries including Cameroon and more specifically the NW Region. The crop is perceived as a catalyst for sustainable development because of its contribution to food security, poverty alleviation, improvement in income distribution and gender equity (Henry, 2000). Cassava is one of the most reliable and cheapest sources of food (IFAD) and FAO, 2000). Fuglie (2002) notes also that cassava is a competitive input for the production of starch, gari and animal feed. The use of cassava from 1999-2020 is predicted to increase by about 1.74 percent per annum in Asian region (Iyagba and Anyanwu, 2012).

The farmer also faced with the problem of inadequate exposure to extension worker. Such poor extension contact deprives the farmers of access to information on latest research finding and experience which are supposed to be converted to field accomplishment. Inadequate extension contact with farmers has adverse effects on farmer's productivity in Africa.

Planting materials have been reported as one of the most important determinant of productivity (Crawford, 1993). Lack of planting material is a limitation to adoption of agro forestry in Southern Africa (Kwesiga *et al.,* 2003), Plant breeding programme have developed improved cultivars that have increased productivity or maintain productivity in the face of worsening environmental condition

Total world cassava utilization is projected to reach 275 million tons by 2020 (Westby, 2008) with some researchers estimating the number closer to 291 million tons. Cassava can be converted into a large number of products ranging from traditional and novel food products, to livestock feeds, ethanol, starch and its numerous derivatives (Nagib

and Nassar, 2006). The demand across Africa for cassava by–products such as cassava cake, high-quality cassava flour (HQCE), starch and glucose is expected to rise due to urbanization and global increase in grain prices (Markelova *et al*., 20009). In addition, these factors have convinced stakeholders along the value chains to note that cassava can be used as a substitute for other more expensive raw materials. This is an opportunity for small-holders to expand from subsistence cultivation to meeting the market needs (Markelova. *et al*., 2009)

Other interventions to promote cassava production are capacity building in small scale processing of cassava into flour and chips for sale to milling industries. This market opportunity is rapidly changing the role of cassava from a traditional fresh human food commodity to an efficient crop for agro-industrial processing in the South countries (Essono *et al*., 2008).

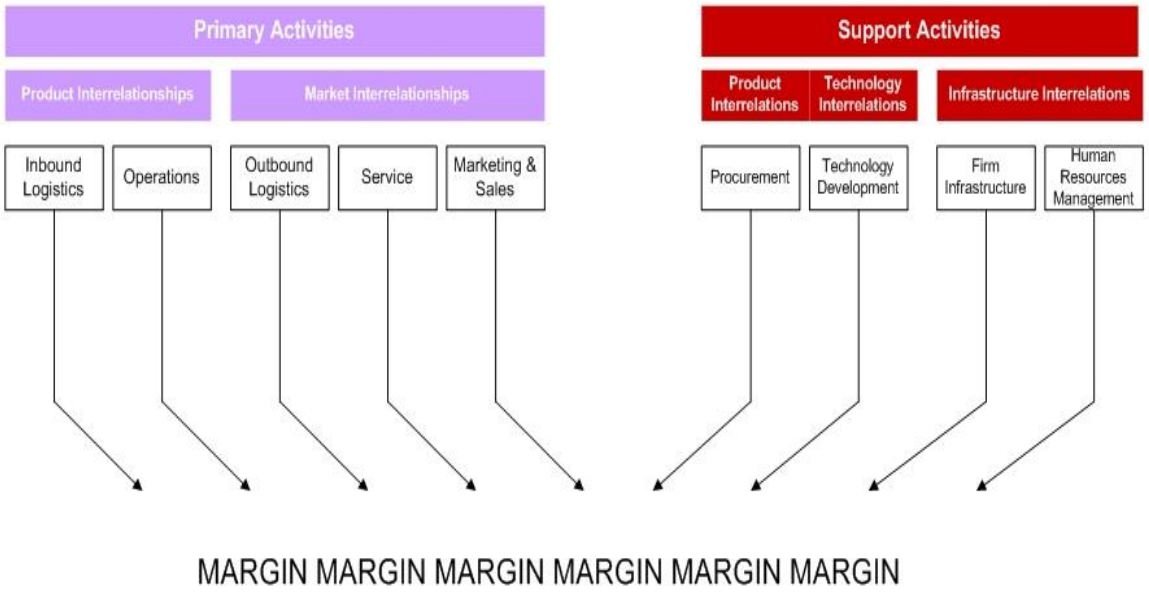
The New Partnership for African Development (NEPAD) has also recognized cassava as a crop which can reduce poverty in Africa and has recommended a Pan-African Cassava Initiative based on a broad based strategy which emphasizes better markets, better organization of producers for collective action, and better participation by the private sector. The International Funds for Agricultural Development (IFAD) sponsored National Program for Roots and Tuber Development (PNDRT), coordinated by the Ministry of Agriculture and Rural Development (MINADER), is intended to increase production of cassava in Cameroon by supporting producers and their organizations to overcome some of the problems that constrain yields and improving access to more efficient processing methods Njukwe *et al*., (2014).

2.2 Conceptual Framework

The study adopts the concept of value chain analysis articulated in Porter (1985). Basically, Michael Porter suggests that activities within an organization add value to the service and products that the organization produces, and all these activities should be run at optimum level for the organization to gain any real competitive advantage.

This concept, if adopted will add value to the service and products of cassava producers in the Region. If they are run efficiently the value obtained should exceed the costs of running them i.e. customers should return to the producers and transact freely and

willingly. Value chain is the steps (activities) linking a production from conception to consumers. The activities of these producers are split in two primary and support activities as shown in Figure 2.2. This figure shows that to add value to a product, primary activities of product interrelation and market interrelation most be examine. Support services which include technology, infrastructure is enhance for value to be made. This value addition is reflected in the margins as shown below. Gross margins are the benefits of production.



VALUE CHAIN ANALYSIS

Figure: 2.2.Concept of value chain analysis adapted from Michael Porter (1985).

2.2.1. Primary Activities

Inbound Logistics: Refers to products (goods) being obtained from the individual farmer, group or organization's suppliers and to be used for producing the end product.

Operations: Raw materials and goods are manufactured into the final product. Value is added to the product at this stage as it moves through the production line.

Outbound Logistics: Once the cassava products have been manufactured they are ready to be distributed to distribution centres, wholesalers, retailers or customers. Distribution of finished goods is known as outbound logistics.

Marketing and Sales: Marketing must make sure that the cassava product is targeted towards the correct customer group. The marketing mix is used to establish an effective strategy; any competitive advantage is clearly communicated to the target group through the promotional mix.

Services: After the cassava products have been sold what support services does the individual farmer, group or organization offer customers? This may come in the form of after sales training, guarantees, warranties and packaging. With the above activities, any or a combination of them are essential if the individual farmer, group or organization are to develop the "competitive advantage" which Porter talks about in his book.

2.2.2. Support Activities

Support activities assist the primary activities in helping the individual farmer, group or organization achieve its competitive advantage. They include:

Procurement: This department must source raw materials for the business and obtain the best price for doing so. The challenge for procurement is to obtain the best possible quality available (on the market) for their budget.

Technology Development: The use of technology to obtain a competitive advantage is very important in today's technological driven environment. Technology can be used in many ways including production to reduce cost thus add value, research and development to develop new products and the internet so customers have 24/7 access to the individual farmer, group or organization.

Human Resource Management: The individual farmer, group or organisation will have to recruit, train and develop the correct people for the business to be successful. Staff will have to be motivated and paid the 'market rate' if they are to stay with the business and add value. Within the service sector such as the airline industry, employees are the competitive advantage as customers are purchasing a service, which is provided by employees; there isn't a product for the customer to take away with them.

Firm Infrastructure:

Every business needs to ensure that their finances, legal structure and management structure work efficiently and helps drive the business forward. Inefficient infrastructures waste resources, could affect the firm's reputation and even leave it open to fines and sanctions. As you can see the value chain encompasses the whole business. It looks at how primary and support activities can work together to help the individual, group or organization create a superior competitive advantage. If an activity is performed well it is said to add value.

This conceptual frame work is relevant for value addition studies. It links producers to marketers and exhibits how profit margins are obtain given a number of inputs and processes.

2.3. Gaps Identified in the Literature

Cassava is a valued product of food importance novel industrial use (transformed to alcohol and pharmaceutical products necessary for economic development). In most parts of the developed world, issues pertaining to the production and commercialization of this product have been well documented. However, in many developing countries including Cameroon, limited information exists on cassava value added chain development. Information of how the various socio-economic and environmental factors functionally affect the product and trade (production function) is yet to be well made known. This work is therefore an attempt to throw more light of these burning issues.

CHAPTER THREE

METHODOLOGY OF THE STUDY

3.1. Model Specification

To determine profitability, the following model was used, explicitly stated as

$GM = GFI_i - TVC_i$

Where GM is gross margin

GFI is gross farm income from the i^{th} item

TVC is the total variable cost spent on the i^{th} item

If GM > 0 (greater than 0), then it is profitable

If GM < 0 (less than 0), then it is not profitable

If GM = 0 (equal to 0), then it breaks even

To determine the factors that affect production, an augmented production function (Cobb and Douglas ,1928) was adopted and explicitly stated as

$O = \beta_o + \beta_1 F + \beta_2 T + \beta_3 L + \beta_4 D + \beta_5 MT + \beta_6 N + \beta_7 Tr + \beta_8 V$

Where:

O is the output per hectare

β_o is the intercept term

F is farm size and β_1 is the regression coefficient for farm size

T is Technology and β_2 is the regression coefficient for technology

L is labour and β_3 is the regression coefficient for labour

D is Distance and β_4 is regression coefficient for distance

M is means of transportation and β_5 is regression coefficient for transportation

N is nature of roads and β_6 is the regression coefficient for nature of roads

Tr is training and β_7 is the regression coefficient for training

V is cassava variety and β_8 is the regression coefficient of variety

3.2. Descriptions of Variables n the Model

3.2.1 Dependent variable

The dependent variables is cassava product output (O) expressed in tons per hectare.

3.2.2 Independent variable

The independent variables were

i. Farm size (**F**)

The farm size was measured in hectares (ha). It was measured as a dummy variable with 1 for Less than 0.5ha, 2 for 0.5-1 ha, 3 for 1-1.5ha, 4 for 1.5-2 ha and above 2 ha. Increase in farm size or acreage has been shown to increase agricultural production and vice versa (Ogisi *et al*, 2003).

ii. Types of technology used (**T**)

The type of technology used was measured as a dummy variable with 1 for rudimentary farming tools and 2 for advanced farming tools. Technology has been shown to play an important role in agriculture production (Enwerem and Ohajianya, 2013)

iii. Type of labour (**L**)

The type of labour was measured as a dummy with 1 for family labour, 2 for hired labour and 3 for both hired and family labour.

iv. Distance between farm and nearest distribution center (**D**)

The distance between farm and nearest distribution center was coded as a dummy variable with 1 for less than 1km, 2 for 1 to 2km, 3 for 2 to 3km and 4 for above 3km. Distance between farm and sales points have been shown to affect production (Ogisi *et al*, 2003).

v. Means of transportation (**M**)

The means of transportation denoted the ways of hauling fresh cassava from farm to farm gates. It was measured as a dummy variable with 1 for headload, 2 for bicycle, 3 for motor cycle, 4 for trucks, 5 for vehicle.

vi. Nature of roads (**R**)

The nature of the road was measured as a dummy variable with 1 for footpath, 2 for graded earth road and 3 for tarred road.

vii. Training in cassava production (**Tr**)

Training and cassava production was measured as a dummy variable with 0 for no training and 1 for training in cassava production.

viii. Cassava variety used (**V**)

The cassava variety used denoted the type of cassava cultivars used for planting. It was measured as a dummy variable with 1 for local variety, 2 for improved variety and 3 for both. The type of cultivars used has been shown to determine output (Njukwe et al, 2013)

3.3. Study Design

3.3.1 Sampling Strategy

The study adopted a multi stage sampling technique (Figure 3.1). In the initial stage, the three (3) divisions highly involved in the cassava business in the region were purposefully selected. These included Momo Division, Ngoketunjia Division and Mezam Division. From these, the most important cassava producing villages were identified and two villages were randomly selected from each selected division using balloting. These villages included Bome, Ngyenmbu, Bafut, Mankon, Baba 1 and Bamunka. From these selected villages, opportunistic and availability sampling (based on the individual's willingness to participate) was employed to select the study population as shown on (Figure 3.1)

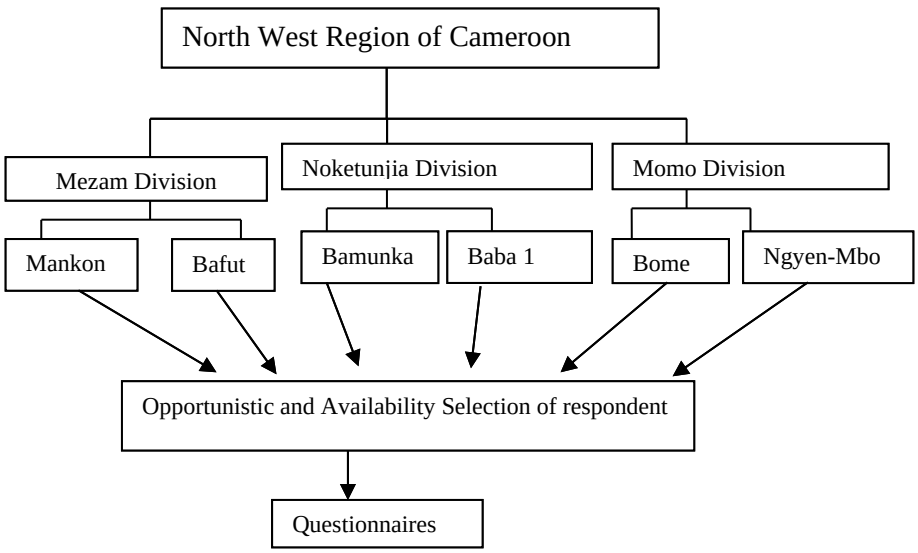


Figure 3.1Sampling Strategy

3.3.2. Sample population

The study population consisted of individuals involved in cassava production, processing, transportation and marketing in the study area.

3.3.2.1. Sample size

A total of 210 respondents from the chosen localities were selected from 600 farmers and distributed among the six villages as shown in Table 3.1.

Table 3.1: Distribution of respondents

Division	Village	Count	Percent
	Ngen –Mbo	34	16.7
Momo	Bome	32	15.8
	Bafut	33	16.3
Mezam	Mankon	34	16.7
	Baba I	35	17.2
Ngoketunjia	Babungo	35	17.2

3.3.3 Data Collection

3.3.3.1 Primary Data

Primary data were obtained by means of a structured questionnaire containing close-ended questions on the respondent's socio-demographic characteristics, types of cassava by-products, cassava production, processing, marketing inputs and outputs, and barriers encountered in the cassava value added chain. A total of 210 questionnaires were administered. At the end of the exercise, 7 were discarded for incomplete or imprecise answers.

Key informant interviews were conducted using the questionnaire as a guide. A total of 10 interviews were conducted with knowledgeable and experience persons involved in cassava production, processing and marketing. Finally, participant observations and field visits were made to collect relatively objective first-hand information of cassava value added chain.

3.3.3.2 Secondary Data

Secondary data were gathered from published and unpublished materials such as journal articles, magazines, theses, website publications, books, reports, and newspaper articles.

3.4 Analytical Approach

The data from the questionnaire were analyzed using both descriptive statistics (such as counts, percentages, and mean standard deviation etc), inferential statistics (such as Pearson's correlation chi- square, Spearman correlation, students t- test statistics, and F-test statistics and production functions) and narrations. These analyses were carried out using GenStat 3 and Microsoft Excel 2013 softwares. Tables and Figures (Charts and pictures) were used to enhance illustrations.

3.5 Validation of Results

The study took active steps to ensure the reliability of the research instruments and veracity of the responses. To ensure the reliability of the questionnaire, pilot tests were conducted in three of the study communities prior to the study. Vague, irrelevant and non-essential questions were either rephrased or discarded completely.

Individual responses to specific questions on the questionnaire or interview guide were triangulated with other data sources to ensure the trustworthiness of the responses.

All statistical tests were conducted at the 0.5 significance level. At this 95 percent confidence interval, (or otherwise stated) the error margin is relatively low and the results can be easily generalized to the total population.

CHAPTER FOUR

PRESENTATION AND ANALYSIS OF DATA

4.1 Socio-demographic characteristics of respondents

The socio-demographic profile of the 203 respondents that constituted the study is shown in Table 4.1.

Table 4.1: Socio-demographic characteristics of respondents

Characteristics	Count	Percent	Characteristics	Count	Percent
Location			**Gender**		
Ngyen-Mbo	34	16.7	Male	71	34.9
Mankon	34	16.7	Female	132	65.1
Bafut	33	16.3			
Babungo	35	17.2	**Age group**		
Baba 1	35	17.2	< 29 years	31	15.3
Bome	32	15.8	30-39 years	39	19.2
			40-49 years	62	30.5
Level of education			50-59 years	46	22.7
No formal	19	9.4	≥ 60 years	25	12.3
Primary	148	72.9			
Secondary	32	15.8	**Primary Occupation**		
Tertiary	4	2	Civil service	15	7.4
			Student	5	2.5
Marital Status			Farming	132	65
Married	150	73.9	Arts and Craft	1	0.5
Single	37	18.2	Trading	30	14.8
Separated	3	1.5	Driver	20	9.9
Widowed	10	4.9			
Divorced	3	1.5	**Role**		
			Producer	91	44.8
Religion			Processor	48	23.6
Christian	172	84.7	Transporter	21	10.3
Muslim	12	5.9	Marketer	43	21.2
African Traditional religion (ATR)	19	9.4			

Source: Field Work, 2015

4.1.1 Location

Out of the 203 respondents that made up the study, 34 (16.7 percent) were from Ngwen-Mbo, 34 (16.7%) were from Mankon, 33 (16.3%) were from Bafut, 35 (17.2%)

were from Babungo, 35 (17.2%) were from Baba and the rest (32 or 15.8%) were from Bome.

4.1.2 Gender

From this total population, 71 (34.9%) were male while the rest (132 or 65.1%) were female. This female dominance of the cassava value chain in Cameroon has been reported extensively (Essono *et al*, 2008; Shioya, 2013; Njukwe *et al*., 2014).

4.1.3 Level of education

The majority (148 or 72.9%) of the study population had primary school level education. This low level of education has been shown to be a major characteristics of the actors in the cassava value chain in Cameroon (Shioya, 2013).

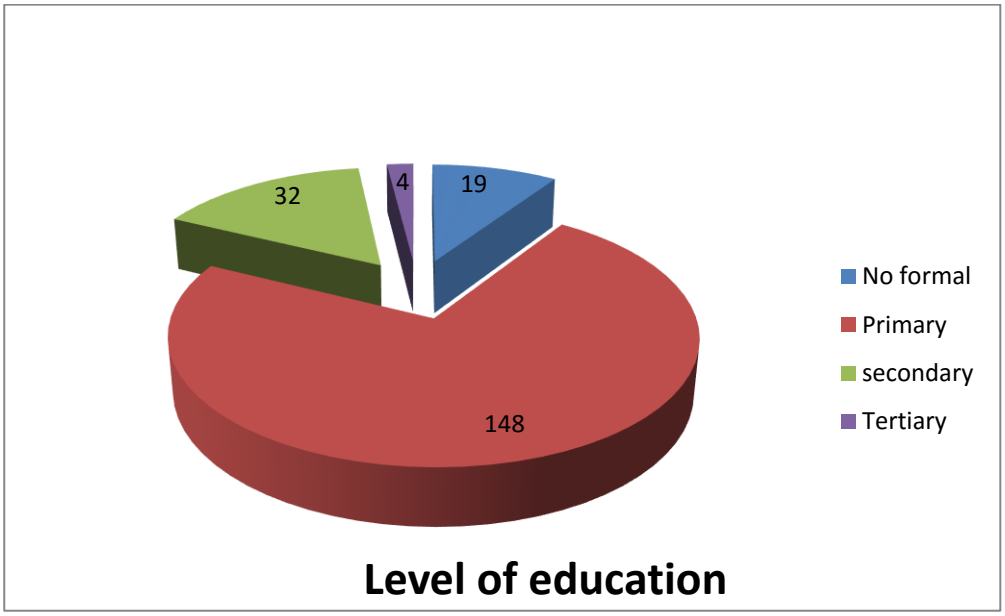


Figure 4.1.3 Level of education

4.1.4 Age **group**

Most (133 or 65.5%) were 40 years and above. This ageing nature of the population has been reported in similar studies (Essono *et al*, 2008) and has been shown to be a major constraint in the cassava value chain in Cameroon (Njukwe *et al*., 2014).

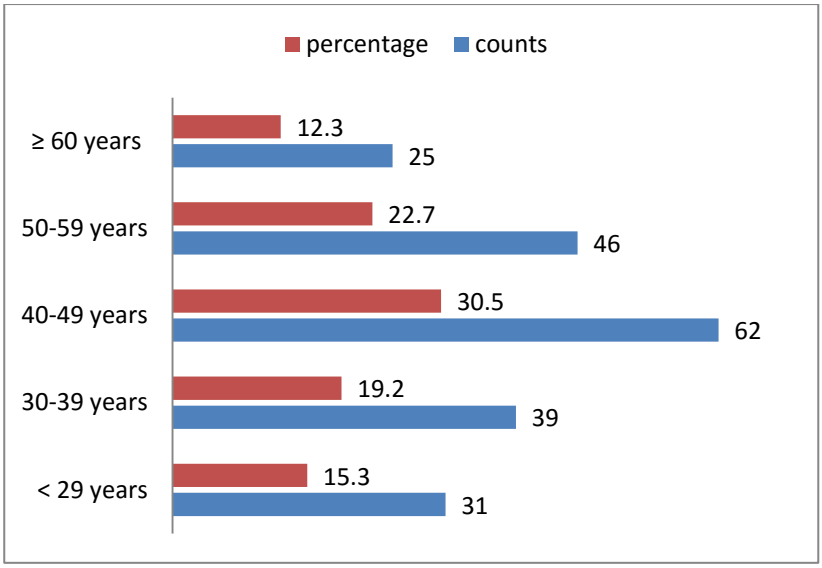


Figure 4.1.4: Age group of Respondents
Source: *Field data,* 2015.

4.1.4 Primary Occupation

The primary occupation of most of the participants in the cassava value chains was farming (132 or 65%). A significant number of the respondents were also involved in trading (30 or 14.8%).

4.1.5 Marital Status

Most of the respondents were married (150 or 73.9%), 37 (18.2%) were single, 10 (4.95) were widowed.

4.1.6 Religious background

Most of the respondents were Christian (172 or 84.7%), 12 (5.9%) were Muslim and 19 (9.4%) practiced the African Traditional Religion

4.1.7 Role in the Cassava chain

In the study area, 91 (44.5%) were producers of cassava, 48 (23.6%) were processors or transformers of cassava, 21 (10.3% were transporters, and 43 (21.2%) were marketers (retailers or wholesalers of cassava and cassava by-products)

4.2.1 Results for objective 1

4.2.1.1 Types of Cassava products and byproducts in the North West region of Cameroon

In the study area, all (203 or 100%) of the respondents identified garri (roasted cassava granules), 154 (73.3%) identified water fufu (fermented wet cassava paste), 147 (70%) identified kumkum (dried fermented cassava paste), 52 (24.8%) identified myondo (baton or bobolo), 39 (18.6%) identified cassava chips, 7 (3.3%) identified starch and 32 (16.2%) identified macalah (*beignet manioc*) as the major cassava bi-products found in the North-west region of Cameroon.

The limited number of cassava products identified in the study area attest to the fact that there is still room for expansion since there are so many different by-products of this starchy root tuber in the world. Changes in technology and consumer preferences are a necessary first step for this happen.

Across the six study villages, garri (97%) was scored as the most important cassava bi-products. Water fufu (96%) was ranked next to garri in importance. This was followed by kumkum (89%), myondo (67%), cassava chips (65%), macalah (62%) and starch (61%) (Figure 4.1).

There was no statistically significant ($p>0.05$) variations in the rankings scores of the different cassava by-products particularly for garri across and within the six villages that constituted the study. These imply that similar measures can be applied in the various communities to improve the production, processing and commercialization of these products.

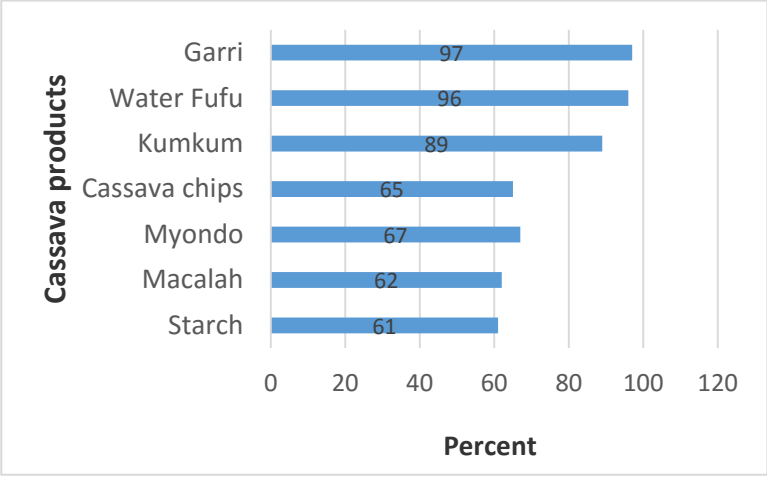


Figure 4.2.1.: Rankings of Cassava products in the NW region of Cameroon

The dominance of garri among cassava bi-products in the North West region of the country has been reported by Njukew *et al*., (2014). Similar findings have been shown in Nigeria, Sierra Leone and Benin (Sanni *et al*., 2008). This dominance of garri is related to the fact it is relatively cheap and easy to prepare and can be eaten with a variety of vegetables.

However, other studies in the central and southern parts of Cameroon has shown that baton (*ebobolo, bobolo* or *chikwangue*) is the dominant by-products of cassava (Essono *et al*, 2008; Shioya, 2013)

4.2.2 Results for objective 2

4.2.2.1 Cost and revenue of Cassava production along the value added chain

The total annual revenue of cassava production by the 91 farmers was estimated at 76,652,000 FCFA and the total cost was estimated at 33,170,000 FCFA, giving a gross margin of 43,482,000 FCFA (Table 4.2).

The benefit-cost ratio (a measure of profitability) for cassava production in the selected localities was estimated at 2.31 clearly indicating that cassava production is a profitable activity. This high profitabilty ratio in cassava production has been documented in Cameroon (Njukwe *et al*., 2013) and Bangladesh (Afeen and Haque, 2014).

Disparities in estimated annual cost and revenues were observed in the different localities. Cassava production was shown to be more profitable in Bafut than in most of the other localities. A reason for this may the easy access to the main distribution center in the region, notably the Bamenda and Baffousam markets which are logistical hubs for export to countries in the Central African sub region.

Table 4.2.Estimated annual cost and revenue of cassava production in selected es in the North West Region of Cameroon.

Location	**Revenue (FCFA)**	**Total cost (FCAF)**	**Gross Margin (FCFA)**
Ngwen-Mbo	10,480,000	4,912,000	5,568,000
Baba I	8,020,000	4,702,000	3,318,000
Bafut	21,570,000	6,803,000	14,767,000
Mankon	8,160,000	4,064,000	4,096,000
Bome	13,870,000	5,629,000	8,241,000
Babungo	14,552,000	7,060,000	7,492,000
Total	**76,652,000**	**33,170,000**	**43,482,000**

Source: Field data, 2015.

4.2.3.2 Cost and revenue of Cassava processing

The 48 processors reported a total monthly production of 992 buckets (approximately 10 tons) of garri per month. The monthly average production was estimated at 19.2 (±9.6) buckets (Table 4.3)

Table 4.3. Descriptive statistics of cassava processing in selected localities in the North West Region of Cameroon

Sum	992
Minimum	4
Maximum	43
Mean	19.21
Standard deviation	9.6

Source: Field data 2015.

The total weekly cost of processing cassava for garri production reported by the 48 processor was estimated at 1,352,000FCFA and total revenue at 3,413,000FCFA, given a gross margin of 2,061,000 FCFA (Table 4.4).

The benefit-cost ratio for garri processing was estimated at 2.5. It also showed that cassava processing for garri was a profitable enterprise.

Significant disparities in gross margins were observed among the different localities. Babungo was shown to have a higher gross margin than others.

Table 4.4 Annual estimated cost and revenue of Cassava processing in selected localities in the North West Region of Cameroon.

Location	Revenue (FCFA)	Total cost (FCAF)	Gross Margin (FCFA)
Ngwen-Mbo	723,000	295,200	427,800
Bafut	307,000	109,000	198,000
Baba I	560,500	261,000	299,500
Mankon	773,000	328,000	445,000
Bome	528,500	195,800	332,700
Babungo	521,000	163,000	358,000
Total	**3,413,000**	**1,352,000**	**2,061,000**

Source: Field data, 2015**.**

4.2.3.3 Cost and revenues of Cassava bi-product transportation

The 21 transporters that constituted the study reported transporting an estimated of 230 bags of garri a week. They reported an estimated weekly cost (fuel, labour and other transactional costs) of hauling these goods of 1,799,000FCFA for a gross margin of 2,208,500FCFAF (Table 4.5).

The benefit-cost ratio was estimated at 2.27. It is an indication that cassava by-product transportation is profitable. However, variations in the benefit-cost ratios were observed across the various localities. Areas with the least gross margins were Mankon and Ngwen-Mbo. The relative short distance in Mankon and the bad nature of the roads in Bome can explain this low gross margin.

Table 4.5: Annual estimated cost and revenue of cassava by-product transportation in selected localities in the North West Region of Cameroon.

Location	**Revenue (FCFA)**	**Total cost (FCAF)**	**Gross margin (FCFA)**
Ngwen-Mbo	535,000	254,000	281,000
Bafut	1,027,500	389,000	638,500
Baba 1	1,100,000	576,000	524,000
Mankon	270,000	111,000	159,000
Bome	340,000	120,000	220,000
Babungo	735,000	349,000	386,000
Total	**4,007,500**	**1,799,000**	**2,208,500**

Source: Field data, 2015.

4.2.3.4 Cost and revenue of Gari marketing

The 41 marketers (retailers or whole traders) of the study reported weekly sales of 133 buckets of garri. They reported a total weekly cost of 4,804,000 FCFA, weekly revenue of 10,140,000FCFA and a gross margin of 5,336,000FCFA. (Table 4.6).

The benefit-cost ratio was estimated at 2.1. As has been shown by other studies, garri marketing (a by-product of cassava) is a profitable activity.

However, variations in the gross margins were observed across the different localities with Mankon having the highest gross margin. This may be due to the fact that mankon is in the regional capital with a huge population and a large demand for garri.

Table 4.6: The estimated annual cost and revenue of garri marketing in selected localities in the North West Region of Cameroon.

Location	Revenue (FCFA)	Total cost (FCAF)	Income (FCFA)
Ngwen-Mbo	1,480,000	843,000	637,000
Bafut	1,680,000	860,000	820,000
Baba	1,380,000	690,000	690,000
Mankon	3,500,000	1,374,000	2,126,000
Bome	1,100,000	544,000	556,000
Babungo	1,000,000	493,000	507,000
Total	**10,140,000**	**4,804,000**	**5,336,000**

Source: Field data, 2015.

4.2.3.1 Key determinants of Cassava production output per hectare

Estimated Annual production per hectare

The 91 producers of cassava that made up the study reported an estimated total cassava production of 996.5 tons with an average annual production of 10.96 (±6.594) tons per hectare (Table 4.7).

Table 4.7: Descriptive statistics of cassava production in the North West Region of Cameroon

Sum	996.5
Minimum	0.5
Maximum	25
Mean	10.96
Standard deviation	6.594

Source: Field data, 2015.

This annual cassava production per hectare is less than the national average which was estimated at 13.3 tons/hectare (Njukwe *et al*, 2014). This finding is consonant with the latter which postulated that the North West Region of Cameroon is among the least producing cassava antennas of the country. The nature of the soil (Jones *et al*., 2013), the altitudes (Njukwe *et al*., 2013), population pressure on land (Njukwe *et al*., 2012), disease (Masiga *et al*., 2004). These among others have been advanced as the principal factors for the low cassava production in this part of the country.

Factors that affect output per hectare

Reported annual cassava production output per acre was regressed on some selected factors of production such as size of farm, types of technology, distance between farms and nearest center, etc. The results showed that variations in size of farm, type of technology used, distance between farm and nearest distribution centre, means of

transportation, training in cassava production and cassava variety used, statistically significantly ($F_{(df=6;\alpha=95\%)}$=94.573, p<0.05). Predicted estimated annual cassava production per hectare of the 91 cassava producers in the study see (Table 4.8).

Table 4.8: ANOVA statistics for cassava production in NW region of Cameroon

Sum of Squares	Df	Mean Square	F	Sig.
3049.67	6	426.202	94.573	0.00

Source: Field data, 2015.

The above factors accounted for 87.1% of the variation in estimated annual cassava production per hectare as shown on (Table 4.9).

Table 4.9: Regression model summary of cassava production in selected production localities in the North-West Region of Cameroon

R^2	R^2	Adjusted R^2	Std. error of estimate
0.933	0.871	0.862	2.451

As shown in Table 4.10, the regression model for predicting estimated annual cassava production output per hectare was given as

Output/ha = 0.252 + 1.987 F + 1.735 T– 0.785D + 1.560 MT+ 2.679 Tr + 1.175 V.

Table 4.10: Regression Statistics for cassava production in selected localities in the North West Region of Cameroon

Variables	**Coefficients**		**Sig.**
	Unstandardized	**Standardized**	
Constant	0.252		0.861
Size of farm (F)	1.987	0.339	0.000
Type of technology used (T)	1.735	0.146	0.016
Type of labour used (L)	0.111	0.401	0.783
Distance between farm and nearest center (D)	-0.785	-0.137	0.008
Means of transportation (M)	1.56	0.119	0.031
Nature of roads (N)	0.109	0.439	0.804
Training in cassava production (Tr)	2.697	0.203	0.006
Cassava verity used (V)	1.175	0.175	0.011

Source: Field data, 2015

The results showed that one (1) unit increase in the size of farm led to an increase of 1.987 tons per hectare of cassava production when all other independent variables were held constant. Increases in acreage (size of farm) have been shown to be positively correlated with agricultural output in Guinea- Bissau (Fakayode *et al.*, 2008), Nigeria (Agom *et al*., 2012; Ogisi *et al.*, 2013) and Cameroon (Kimengsi and Tasom, 2013). The increase in farm size provides more space for crop cultivation.

When all other factors were held constant, changes in technology (from rudimentary farm tools to some form of advance method) increase output by 1.735 tons per hectare. The use of technology has been shown to increase agricultural production (Agom *et al.*, 2012). It is so because technology reduces drudgery and improves efficiency in agricultural production.

Cassava production was shown to decrease by 0.785 tons per hectare for every unit increase in distance of the farm from the nearest distribution centres when all other factors were held constant. Distance of farm from major sale centre has been shown to be inversely correlated with production output in other studies in cassava production in Cameroon (Essono *et al.*, 2008). The effort required to transport agricultural products from remote farms to points of sale or consumption acts as a deterrent to many small-scale farmers who rely mostly on headloads and other labour intensive means of transportation.

Changes in the means of transportation from headloads to mechanical or motorised methods (motorcycle, vehicles) was shown to increase production by 1.56 tons per hectare, everything being equal. Motorized means of transportation reduces farmers' efforts in carrying cassava over long distances and act as an incentive for increase production.

Training in the advanced method of cassava production was shown to increase production by 2.679 tons per hectare, every other factor of production held constant. IT is in consonant with the findings of Adesina and Zinnah (1999). Training exposes farmers to improved methods of farming and the application n of these acquired skills and knowledge consequently increases productivity.

Changing from local to an improved variety of cassava increased production by 1.175 tons per hectare, everything been equal. The used of High Yielding Variety (HYV) of

cassava has been shown by other studies (Ngeve, 2001) to increase production output in Cameroon.

However, changing from family to hired labour and changes in the nature of the roads were shown to increase production per hectare, but these changes were not statistically significant.

These results indicate that if those factors of production that statistically significantly influence productions are enhanced or improved, cassava production in the selected localities will also improve, consequently improving food security and livelihood.

4.2.4 Results of objective 4

4.2.4.1 Constraints and opportunities in the Cassava value chain

4.2.4.1.1 Constraints in Cassava production

From the response of the 91 producers of cassava, most (67 or 73.6%) reported limited access to inputs (high yielding cultivars, fertilizers, pesticides) as their major constraints. Access to farm inputs has also been shown in similar studies covering three West African countries as the major limiting factor in cassava production (Saani *et al.*, 2008).

44 or 48.3% reported Pest and disease as another major constraint to cassava production. Pathogens, particularly the cassava fungal tubers rot has been shown to be a major constraint to cassava production in other areas of Cameroon (Messiga *et al.*, 2004) and Nigeria (Sanni *et al.*, 2008). It 0can be explained by the fact that cassava is highly susceptible to pathogens and farmers have limited access to pesticides and training in crop protection.

Poor extension contacts and lack of training in improved cassava production practices were reported by 40 or 43.9% of the farmers as limiting their productivity. Inadequate extension contacts and limited opportunities for training in farming methods have been shown to impair cassava production in the Oyigbo local government area in River State, Nigeria (Iyagba and Anyanwu, 2012).

Limited institutional support from the government and other Civil Society Organisations (CSOs) was reported by 34 or 37.3% of the farmers as a constraint. Bessong (undated) reported that government support in the form of cassava cuttings supplied to farmers in some areas of the South -West region of Cameroon during the

1997-2001 period increased production by 3188.7 tons and generated income estimated at 510, 183, 200 FCFA. In the South-South of Nigeria, IITA support to farmers in the form of high- yielding cassava cutting distribution has been shown to increase production (Saani *et al.*, 2008). Institutional support can help farmers off-set some of the cost associated with sustainable cassava production.

Some (33 or 36.2%) of the farmers in the area reported climatic variability as a limiting factor for cassava production. They indicated that uncertainties in the onset and cessation of rains had impaired their ability to plan their production activities. Also changing climate has fostered the emergence of new forms of disease and pest. Climatic variability has been shown to be a major constraint to agricultural production in Cameroon (Mulua and Lambi, 2008; Defang *et al.*, 2014).

Limited access to land was reported by 32 or 35.2% of the farmers as another constraint on cassava production. In these localities cassava is mostly cultivated in marginal and sub-marginal land susceptible to soil erosion and rapid fertility loss. This results is congruent with the findings of Njukwe *et al.,* (2014), which in a similar study in Ebolowa, South Cameroon, identified access to suitable land among other factors as a challenge to most farmers involved in cassava production.

Spatial variations in the constraints based on an urban-rural dichotomy were observed across the study localities. There was statistically significant difference ($p<0.05$) in the responses of producers in the areas close to urban centers (mankon and Bafut) and those in predominantly rural areas (Babungo, Baba, Bome and Ngwen-Mbo). Most of those who reported high on constraints such as access to inputs, extension contact and training and institutional support, were from rural areas while those who reported high on access to land were from urban areas. Spatial variations in farmer's perception of constraints to production have been documented in similar studies in Sierra Leone (Adesina and Zinnah (1999). The poor rood network explains these variations in rural areas and high competition for land in urban areas.

Table 4.1: Constraints to cassava production in selected localities in the NW region of Cameroon

Description	Counts
Limited access to inputs	67
Pest and disease	44
Poor extension contacts and lack of training	40
Limited institutional support	34
Climatic variability	33
Limited access to land	32

Multiple response

Source: Field data, 2015.

4.2.4.1.2 Constraints on Cassava processing

Thirty-six (75%) of the 48 processors that constituted the study reported the lack of processing machines as their major constraint to cassava processing. They are a limited number of motorized grinders and pressors in most of the localities particularly in the predominantly rural areas like Bome, Baba 1, Babungo and Ngwen-Mbo. It causes the processors to resort to traditional hand graters and local pressing methods which are labour intensive and inefficient. Poor access to processing technology has been shown to be a limiting factor in Cassava processing in Ebonyi State in Nigeria (Ogisi *et al.*, 2013). On the other hand, mechanization of peeling, washing, grinding and pressing of cassava has been shown to improve productivity in Thailand, Bangladesh and Nigeria (Mvondo and Liang, 2012).

Limited training in cassava processing has been reported by 35 or 72.9% of the processors as another major constraint to cassava processing. Lack of training in improved methods of processing has been shown to reduce productivity by almost 20% as compared those who receive some form of training in a rural district in Benin (Sanni *et al.*, 2008).

The increase in the price of cassava was reported by 29 or 60.4% of the processors as a major challenge in cassava processing. Processors of garri now compete with household consumers of fresh cassava, producers of other local cassava products, local industries transforming cassava into flour and starch and those who export to other countries in the Central African sub-region. This competition has inexorably culminated in the increase price of cassava in the market which more often are not within the reach of most processors.

Also, increase in the cost of fuelwood, particularly to areas proximity with urban localities was reported by 27 or 56.2% of the processors as a limiting factor to garri production. This is in line with the work of Njukwe *et al.*, 2014). Fuelwood constitutes a significant input in garri processing in the region, and the supply of this valuable form of fuel has been in decline in most areas in the NW region of Cameroon over the past decades (Table 4.12)

Table 4.12: Constraints on cassava processing in selected localities in the NW region of Cameroon

Description	**Counts**
Lack of processing machine	48
Lack of training	35
Increase in price of cassava	29
Increase in the cost of fuelwood	27

Source: Field data, 2015.

4.2.4.1.3 Constraints to Cassava transportation

According to 20 or 95.2% of the 21 transporters, the poor state of the roads is a major constraint to cassava and cassava by-product transportation in the selected networks. Except Mankon and Bafut, the road linking the farms and the major distribution centers in the selected localities are generally in poor states. These infrastructural challenges in cassava production and transportation have also been shown by Mvondo and Liang (2012).

The increase in the cost of fuel recorded over the years was reported by 15 or 71.4% of the transporters. Efforts by these transporters to pass on the expenses of this increase in fuel to producers and buyers of cassava have been met with stiff resistance.

Also, 12 or 57.4% of the transporters reported corrupt practices by officers of law enforcement on the major transportation itinerary as another major constraint (Table 4.13).

Table 4.13: Constraints to cassava and cassava by-product transportation in selected localities in the NW region of Cameroon

Description	Counts
Poor states of road	20
Increase in the cost of fuel	15
Corrupt practices by law enforcement officers	12

Multiple response

Source: Field data, 2015.

4.2.4.1.4 Constraints to Cassava/ cassava by-product marketing

Inadequate infrastructures were reported by 32 or 74.4% of the 43 respondents involved in the commercialization of cassava and cassava by-product as a major difficulty. In most of the local and major markets in the selected localities, cassava and cassava byproduct marketing is done in open air in some cases in makeshift sheds. Also, there are inadequate facilities for storage in markets that have been constructed. Infrastructural difficulties have also been shown to constrain cassava marketing in Ebony State in Nigeria (Ogisi *et al.*, 2013).

The highly perishable nature of cassava and some of its byproduct such as water fufu, myondo etc was identified by 33 or 76.7% as marketing constraint. Except garri, cassava chips and kumkum, the shelf life of cassava and most cassava products are very short. This short shelf life limits the timeframe available to the marketer to sell the product. Similar studies carried in the south region of Cameroon has shown the perishable nature of cassava and its byproduct as a major constrain in its marketing (Essono *et al.*, 2008).

The old varieties get mature at two –year, and the improve varieties get mature between eight to twelve months the bitter, or poisonous (*Manihot esculenta*), and the Sweet, or non-poisonous (*Manihot dulcis).* There is als, *(Manihot Utilissima, Manihot Palmata)* Bitter and Sweet respectively but mature at 12 months. Since most of the farmers are still using the old variety, it takes long for the cassava to get mature.

Fluctuations in market prices for most of cassava product were reported by 25 or 58% of the marketer another major constraint to cassava and b-product marketing.

Fluctuations in market according to the actors hamper their ability to plan their purchase and sales as shown in the table below (Table 4.14).

Table 4.14: Constraints to cassava and cassava byproduct marketing in selected localities in the NW region of Cameroon

Description	Counts
Inadequate infrastructures	32
Perishable nature of goods	33
Fluctuation in market prices	25
Multiple response	

Source: Field data, 2015.

4.2.4.2. Opportunities in cassava production, processing and marketing

As shown in Table 4.15, there is a host of opportunities for cassava production, processing and commercialization in the region.

Table 4.15: Opportunities in cassava production, processing and marketing in NW region of Cameroon

Description	Count
Market demand	120
New government policies	57
Improved varieties	48
Training opportunities	48
New technology	55
Multiple response	

Source: Field data, 2015.

Increasing market demand for cassava and its associated byproduct was reported by 120 or 87% of the study respondents as a major opportunity for the sector. The increase in the prices of such staples food as rice, corn, plantain, cocoyam and yams among others have caused most household to resort to cassava as a valuable source of

carbohydrate. Also, cassava is rapidly changing from a traditional fresh human food commodity to an efficient crop for agro-industrial processing in Cameroon.

The emergence of new methods and technologies in cassava planting, weeding, harvesting, washing, grinding, pressing and drying was reported by 57 or 41.3% of the respondent as another major opportunity in the sector. If these methods and technologies are made accessible to and used by farmers, it will greatly automate activities across the value chain and boost production.

New government policies on agriculture were identified by 57 or 41.3% of the respondents as another major opportunity in the cassava subsector. A renewed government interest in the agricultural as the primary non-oil driver of growth has brought about the crafting of new agricultural policies aimed at boosting agricultural production. Such policies among other things address issues related to credits, inputs, incentives and training.

The availability of improved cassava varieties was reported by 48 or 34.8% of the respondents as a great opportunity. The national program for roots and tubers development (PNDRT) of the Ministry of Agriculture and Rural development in partnership with the International Institute for Tropical Agriculture (ITTA) have developed improved varieties of cassava cultivars adapted to subsistence and smallholder farmers.

The proliferation of the number of training initiatives in cassava production, processing and marketing was reported by 48 or 34.8% of the respondents as another important opportunity in the sector. The Ministry of Agriculture and Rural Development through the national program for roots and tubers development (PNDRT) and some Civil Society Organisations (CSOs) in Cameroon are multiplying the number of training programs for actors in the cassava value chain.

4.3. Implications of results

Review of the literature indicates that there are over 80 products that are obtained from cassava. Primary data reveals that cassava value chains have not been well extended in the study area, as only seven products of cassava were identified. An opportunity for actors to grab and invests in the cassava sector. The cost benefit- ratio indicated that all participants along the value chain do make profits from their various activities, but they

could even benefit more if technological innovations are adopted. If the principal determinants of production are addressed productivity will increased. Though the value added chain has a constraint, there are opportunities abound in the sector that can take care of the challenges such growing demand, government policies toward smallholder farmers and more. This study provides very vital data that should be used by other scholars or researchers to carry out further enquiries. The results will be useful for policy makers, farmers and NGOs for implementation of projects. The result could be replicable to other areas of the country facing similar challenges.

4.4 Limitation

Communication constraint: 72.9% of the population had only primary education and could not read or write this made communication and understanding of questionnaires tedious as in some cases farmers had to speak in their local languages. The Pidgin West African English was a common language that was adopted to collect data. Thus, the research process went very slowly as the researcher had to spend time explaining to make sure that the respondents understood what was required. However, the researcher was patient enough in the entire six villages just to collect correct data.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATIONS

5.1 Summary of findings

The study sought to assess the constraints and opportunities of the cassava value chain in selected localities in the North West Region of Cameroon.

5.1.1 Summary of findings for research question 1

The study found that there were seven products from cassava. Garri, water fufu and kumkum were the most prevalent and important products of cassava in the study area.

5.1.2 Summary of findings for research question 2

Measures of benefit-cost ratio showed that cassava production, processing, transportation and marketing were highly profitable ventures in the area

5.1.3 Summary of findings for research question 3

Annual average cassava production was estimated at 10.96 tons per hectares and changes in the size of farms, type of technology, distance between farm and nearest distribution centre, means of transportation, training in cassava production and cassava variety used, statistically predicted 87.1% of the variations in cassava production.

5.1.4 Summary of findings for research question 4

Limited access to inputs, poor extension contact and lack of training, inadequate infrastructures, pest and disease, lack of processing machines among others were the challenges to cassava production, processing, transportation and marketing. However, the study found that some opportunities for improving cassava production, processing, marketing exist in the selected localities and include high demand for cassava and associated products, new government policies, availability of improved varieties, etc.

5.2 Conclusion

The study concluded that; there are seven products from cassava in the NW and that there is still room for diversification of products from this crop. Cassava production, processing, transportation and marketing are highly profitable ventures and contribute considerably to the livelihoods of most household and socio-economic development of

the area. However, this contribution to livelihood and development is constrained by a host of challenges. But fortunately, there are opportunities for enhancing the activities along the cassava value chain in the North West Region of Cameroon.

5.3 Recommendations

By this studies finding, the following recommendations were made.

5.3.1 Recommendation for objective 1

- The farmers in the North West Region should adopt and replicate the Numerous (over 80) products and by-product in other countries like Nigeria, Costa Rica, Thailand and Brazil were cassava commercialization have been vulgarised.

- Farmers should form networks that will enable them to gain knowledge of how to produce new products of cassava from other countries. They can write to organisations that are involved in value addition on cassava like INADES Formation to help in training them.

5.3.2 Recommendation for Objective 2

- Farmers should form net works that will enable them to improve their benefits. The networks will also reduce their cost of production and to benefit more than the are doing. This can be done through holding of "njangi's" specially made for cassava farmers.

  These networks can also be on product development, capacity building which will also enhance value addition of cassava.

  The Government should give Incentived to small hoder farmers to reduce their cost of production.

5.3.1.4 Recommendation for Objective 3 and 4

The government policy should give women more access to land since they are the ones who are mostly involve in cassava farming so that output can be increase.

Improved access to inputs

The government should develop policies and legislative measures that increase farmers access to inputs such as cassava cuttings, pesticides and insecticides, fertilizers. This

should be done by involving the local authorities like chiefs, leaders of women group that are involve in cassavavalue adding activitie. This policy measure will improve agricultural productivity.

Access to credits

The governemnt should enact policies that ensure greater access to agricultural credits for those in the agricultural sector. This policies that takes the form of agriculture banks and other microfinance schemes.

Infrastructures

The government should develop policies that promotes the development of roads and market infrastructures in rural areas. Road and market infrastructures will improve production and commercialisation of cassava products. A processing factory should be inplanted in the North West Region just like in Mbalmayo (Center). This will employ many more people especially the youths and reduce drudgery.

Construction of markets in rural areas will help to bring the market closer to the farmers thereby reducing the expensive encored on transportation.

The government should go closser to the people to distribute the improved variety of cassava cuttings. Since most the farmers don't yet use the improved variety

Farm-level recommendations

New technologies

Farmers should adopt new technologies in harvestiing, peeling, grinding, washing and processing of cassava. This will ensure the automation of the cassava value chain and consequently, improve productivity.

Agricultural extension and training

Extension services and training in cassava production, processsing and marketing should be organized. This will enhance farmers access to new ideas and methods of cassava production, post-harvest loss reduction, prooduct processing and marketing.

Market information system

Market information systems should be develop that will ensure farmers timely access to market information on price of produce, the price of inputs, etc. This market information system will enable actors in the cassava value chain to make inform choices during production, processing and marketing.

The farmers are acceptive to increase the number of products in cassava processing so NGOs should exploit this oppoturnity and training farmer on diversification/product development.

5.3.3 Research Suggestion.

Further research should be carried out on the socio-demographic factors that determine the adoption of improved and new production, processing technologies by farmers and processors of cassava. Findings from such a study will enable policy-makers and other governmental agencies to devise appropraite strategies for the diffsuion and adoption of these new ways and methhods of production and processin

Further research should be carried out on the effects of climate variability on cassava to prove if the current pest infestation is a new or a known on One.

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CHAPTRE CINQ

RESUME DES RESULTATS, CONCLUSION ET RECOMMANDATIONS

5.1 Le Résumé des Résultats

L'étude avait pour but d'évaluer les difficultés et les opportunités liées à la production aux diverses transformations du manioc dans certaines localités de la région du nord-ouest Cameroun

5.1.1 Le Résumé des Résultats pour le premier questionnaire

D'après les recherches menées, il existent sept, soient le gari, le water fufu, le kumkum, sont les plus utilisés dans la région

5.1.2 Le Résumé des Résultats pour la deuxième question

Le taux du bénéfice réalisé a montré que la production, la transformation, le transport et la vulgarisation étaient hautement bénéfiques dans la zone.

5.1.3 Le Résumé des Résultats de la troisième question

La moyenne de production annuelle fut estimée à 10.96 tonnes par hectare et change en fonction de l'espace utilisé pour la culture, de la technique agricole employée, la distance entre la plantation et le centre de distribution le plus proche, les moyens de transport, la formation en production du manioc, et la variété de manioc utilisé. Selon les statistiques, 87,1% des varietes sont produits.

5.1.4 Le Résumé des Résultats pour la qutrième question

Un accès limité aux productions, manque de liaison et de formation, infrastructures inappropriées, infections, manque de machines pour la transformation des produits entre autres, furent les défis à relever en matière de production de la tubercule de manioc. La transformation le transport et la vulgarisation. Qu'à cela ne tienne, l'étude nous a permis de constater que certaines opportunités se présentent pour améliorer la production du manioc. La transformation aussi bien que la vulgarisation a bien lieu dans les localités choisies, y compris la grande demande pour le manioc ses sous-produits. La nouvelle politique du gouvernement, la disponibilité de la variété des produits etc.

5.2 Conclusion

L'étude nous emmène à conclure qu'il existent sept produits provenant du manioc dans la region du nord-ouest, et qu'il y a encore espoir pour ce qui est de la diversification dans chaine de production de cette tubercule. La production, la transformation, le transport et la vulgarisation du manioc constituent des activités assez profitables, contribuent considérablement à l'amélioration du train de vie et des activités socio-économiques aussi bien de la zone que des populations qui ont choisi la culture et la transformation du manioc comme activité principale. Cependant, l'apport des activités liées à la production du manioc au quotidien des population ne se fait pas sans embuche. Mais heureusement, ils existent des opportunités pour le renforcement des activités le long de la chaîne de production de cette tubercule dans la région du nord-ouest Cameroun.

5.3 Recommandations

Sous la base des études menées et des résultats obtenus, les recommandations suivantes ont été faites :

5.3.1 Recommandation pour l'objectif numéro 1

- Les cultivateurs de la region du nord ouest doivent adopter et mettre en oeuvre le nombre de produits et sous produits (80) de la tubercule de manioc tel que le font les pays tels que le Nigeria, le Costa Rica, la Thaïlande, et le Brésil. Il s'agit là des pays qui sont assez avancés en matière de vulgarisation.
- Les agriculteurs devraient former des réseaux qui leur permettront d'acquérir des connaissances sur la façon de produire de nouveaux produits à base de manioc tel que le font d'autres pays. Ils peuvent écrire aux organisations qui font dans la valeur ajoutée liée au manioc, à savoir l'INADES pour les aider dans leur formation.

5.3.2 Recommandation pour l'objectif numéro 2

- Les agriculteurs devraient réseaux qui leur permettront d'améliorer leurs prestations. Le réseaux aura également pour but, de réduire leur coût de production et de bénéficier plus qu'ils en font présentement. Cela peut être fait en organisant des "tontines" spécialement conçus pour les cultivateurs de manioc ..

- Ces réseaux peuvent aussi contribuer à améliorer la qualité du produit, le renforcement des capacités, qui permettra également d'améliorer la valeur ajoutée du manioc.
- Le gouvernement devrait encourager les jeunes agriculteurs et détenteurs de plantations, dans la réduire du coût de production.

5.3.1.4 Recommandation pour Objectif numéro 3 et 4

- La politique du gouvernement doit donner aux femmes un meilleur accès à la terre car elles sont le plus souvent impliquées dans la culture du manioc.

Faciliter l'obtention des crédit auprès des banques.

Le gouvernement devrait élaborer des politiques et des mesures législatives qui donnent aux agriculteurs l'accès aux crédits agricoles tels que les boutures de manioc, les pesticides les insecticides et les engrais. Cela devrait être fait en impliquant les autorités locales comme les chefs traditionnelles, les dirigeants des groupe des femmes qui sont impliquer dans chaîne de production du manioc. Cette mesure de la politique permettra d'améliorer la productivité agricole.

L'accès aux crédits

Le gouvernement devrait adopter des politiques qui garantissent un meilleur accès aux crédits agricoles pour ceux dans le secteur agricole. Ces politiques qui s'appliquent sous forme de banques de l'agricole et de micro finance.

Les Infrastructures

Le gouvernement devrait élaborer des politiques qui favorisent la construction et la maintenance des réseaux routiers et aussi la construction des marchés dans les zones rurales. Tout ceci permettra d'améliorer la production et la commercialisation des produits dérivés du manioc. Une usine de transformation devrait être implantée dans la région du Nord-Ouest comme à Mbalmayo (Centre). Cela va employer de nombreux jeunes en particulier les jeunes et réduire les corvées.

Construction des marchés dans les zones rurales aidera à mettre sur le marché plus proche des agriculteurs, réduisant ainsi le coûteux bisser sur le transport.

Le gouvernement devrait aller Closser aux gens de distribuer la variété améliorer des boutures de manioc. Comme la plupart des agriculteurs n'utilisent pas encore la variété améliorer

Recommandations au niveau de la ferme

Les Nouvelles technologies

Les agriculteurs devraient faire usage des nouvelles technologies dans la récolte , l'épluchage, le broyage, le lavage et la transformation du manioc. Cela permettra d'assurer l'automatisation du mécanisme de transformation du manioc et aussi l'amélioration par conséquent de la productivité.

La vulgarisation agricole et de la formation

Les services de vulgarisation et de formation dans la production du manioc, la transformation et la commercialisation devraient être organisées. Cela permettra d'améliorer la culture, et l'agriculteurs pourra avoir accès à de nouvelles idées et méthodes de production du manioc, la réduction des pertes après la récolte, la transformation et la commercialisation du produit.

Le Système d'Information dans le marché du manioc

Les systèmes d'information du marché du manioc devraient être développé, ce qui assurera aux agriculteurs un accès rapide à l'information du marché sur le prix des produits, des prix des intrants, etc. Ce système d'information dans le marché du manioc permettra aux acteurs de la chaîne de production du manioc de faire éclairer les choix en cours de production, transformation et commercialisation.

Les agriculteurs ont accepté d'augmenter le nombre de produits dans la transformation du manioc reste aux ONGs d'exploiter cette opportunité et de former les agriculteurs en matière de développement, et de diversification des produits.

La politique gouvernementale permettre aux femmes d'avoir plus d'acces aux terres, etant donne qu'elles forment la couche la plus impliquee dans cette production du manioc, et donc mieu placee.

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APPENDIX

Appendix 1

Questionnaires for cassava value chains assessment in the North West Region of Cameroon

I am Mah O. Tarke a research student of the Pan African Institute for Development West Africa (PAID -WA) Buea. I am carrying out a research on "Cassava value added chains: an assessment of constraints and prospects of small holder farmers in the North West Region of Cameroon in partial fulfillment for the Award of a BSc degree.

You have been selected as one of respondents to provide information on the issue, your response to the question will be highly appreciated. The work is strictly for academics and whatever information you give will be confidential and will not be used for other purpose than the stated.

Instructions: In section A please tick (√) against the answer appropriate to you in the box

SECTION A: Bio data information

1. Location: a) Bome [ ] b) Ngyembo [ ] c) Mankon [ ] d) Bafut [ ] e) Bamunka [ ] f) Baba 1 [ ]
2. Gender: a) Male=1 [ ] b) Female =2 [ ]
3. Age group: a) 20-29 [ ] b) 30-39 [ ] c) 40-49 [ ] d) 50-59 [ ] e) 60 and above [ ]
4. Marital status: a) Married [ ] b) Single [ ] c) Separated [ ] d) Widowed [ ] f) Divorced [ ]
5. Educational: a) No formal education [ ] b)Primary [ ] c) Secondary [ ] d) Tertiary [ ]
6. Religious affiliation: a). Christian [ ] b). Moslem [ ] c) ATR [ ] d) Others [ ]
7. What is your major concern in the cassava business? Production [ ] Transformation [ ] Transportation [ ] Marketing [ ]
8. Other Occupational : a) Civil service [ ] b) Student [ ] c) Farming [ ] d) Arts and craft [ ] f)Trading

Section B: Cassava products and by-products

1. What are the different types of cassava products and by products in your area?
   a) Garri [ ] b) Water fufu [ ] c) Kumkum [ ] d) Cassava chips [ ] e) Starch [ ] f) Bio-fuel [ ] g) Flour h) Animal feeds [ ] i) Compost [ ] g) Others…….

2. Could you please rank (using numbers) the various products in order of importance?
   b) Garri [ ] b) Water fufu [ ] c) Kumkum [ ] d) Cassava chips [ ] e) Starch [ ] f) Bio-fuel [ ] g) Flour h) Animal feeds [ ] i) Compost [ ] g)Others…….

Section C: Cost, benefits and productivity functions

C.1: Production Section

1. What is the size of your farm? a) < 0.5 ha b) 0.5-1 ha c) 1-1.5 ha d) 1.5- 2ha e) >2ha
2. What is your yearly output? ……..
3. What is your total input (rents, labor, cuttings, fuels, etc) ……..
4. What input constitute the major proportion of your cost……..
5. Types of technology used? 1) Rudimentary tools [ ] 2) Advanced [ ] 3) Both [ ]
6. Labor type: 1) Hired [ ] 2) Family [ ] 3) Both [ ]
7. Distance between farm and nearest distribution center: a) <1km [ ] b) 1-2km [ ] c) 2-3km [ ] d) > 3km [ ]
8. Means of transportation: a) Headload [ ] b) Bicycle [ ] c) Motor cycle [ ] d) Trucks [ ] e) Vehicles [ ] f) Others (specify)……..

9. Nature of farm-to-market roads: a) Footpath [ ] b) Earth [ ] c) Tarred [ ]

10. Have you received or been receiving any training in cassava production? a) Yes [ ] b) No [ ]

11. Type of cassava variety use? Local [ ] Improved [ ] and both [ ]

C2: Processing

1. What quantity of cassava do you use to produce a bucket?.....
2. How many buckets of garri do you produce a month?.....
3. How much does a bucket of garri cost to produce?.....
4. What input other than the purchase of cassava constitutes the major proportion of your cost? a) Peeling [ ] b) Grinding [ ] c) Frying [ ] d) Fuel [ ] e) Transportation [ ]
   f) Others (specify)…….
5. Do you produce starch from garri processing? a) Yes [ ] b) No [ ]
6. If yes, do you sell? a) Yes [ ] b) No [ ]
7. If yes, does it constitute a major source of income? a) Yes [ ] b) No [ ]

C3: Transportation

1. How much do you transport a bag of cassava product or by-product?_____
2. How many bags do you transport in a week?._____
3. How much does it cost?_____

C4: Marketing

1. Mode of sale(s): Retail [ ] b) Whole [ ] c) Both [ ]
2. How many buckets of garri do you sell a week? a) Whole …….. Retail…….

Between farmers, transporters, processers and marketers, who benefit the most? ……..

Section D: Constraint in the cassava value chain

D1: Production

1. What are your major constraints or factors limiting production?: a) Lack of inputs [seeds ( ), fertilizers ( ), manure ( ), technology ( ), credit ( ),] b) Land access [ ] c) Training [ ] d) Infrastructure [ ] e) Institutional support [ ] f) Climate [ ] g) Cultural barriers h) Others (specify)……

D2: Processing

2. What are your major constraints? a) Increasing fuel cost [ ] c) Lack of processing machines [ ] d) Training [ ] e) Inadequate raw material f) Others (specify)……

D3 Transportation

3. What are your major constraints? a) Increasing fuel cost [ ] b) Road infrastructure [ ] c) Law enforcement officers harassment [ ] d) Insecurity [ ] e) Others (specify)…….

D4 Marketing

4. What are your major constraints? a) Highly Perishable [ ] b) Inadequate infrastructure [ ] c) Consumer behavior [ ] d) Public perception of garri [ ] e) Fluctuation in market prices [ ] f) Others…….

Opportunities

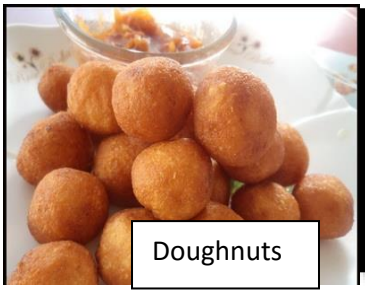
5. What opportunities are available to improve or keep on cassava production
   a) Market demand [ ] b) New government policies [ ] c) Improved varieties [ ] d) Training opportunities [ ] e) Improved governance f) New technology [ ] Others (pecify)

What do you think is a constraint to cassava value added chain (probes)

What do think can be done to add more value to the cassava in this region?

Appendix 2

Pictures of cassava products and by-products.



Vegetable (cassava leaves

Cakes