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URBAN MARKETS-LINKED CASSAVA VALUE CHAIN IN MOROGORO RURAL DISTRICT, TANZANIA

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ABSTRACT

This study was conducted to examine cassava value chain to determine strategies for enhancing profitable farmers' participation in the cassava value chain for reducing poverty in Tanzania. Data were collected from 150 farmers from three villages of Morogoro rural district. Profit and marketing margins along the cassava value chain were computed. Linear model was estimated whereby farm size, experience, total family labour, group participation, non-crop livelihood sources and food insecurity were the main determinants of profitability. Therefore farmers' participation in profitable cassava value chain strands by strengthening coordination, using improved cassava varieties and introduction of cassava processing technologies was recommended.

Keywords: Cassava, Value chain, Profitability, Smallholder farmers, Strands

INTRODUCTION

Cassava (*Manihot esculenta* Crantz) is a perennial, vegetatively propagated shrub, grown throughout the lowland tropics. It is a drought resistant crop grown mainly in dry areas and contributes significantly to the nutrition and livelihood of many farmers. It is also said to be more productive per unit of land and labour than even the high yielding cereals and the highest producer of carbohydrate (Nweke, 2003).

In some African countries, cassava is being more and more perceived not only as a food security crop, but also as a raw material for various types of industries. Cassava can be converted into a large number of products ranging from traditional and novel food products, to livestock feeds, ethanol and starch and its numerous derivatives. In such countries, there are concerted efforts on cassava development being initiated, sometimes with strong political support at the highest level (Nang'ayo *et al.,* 2007). For example special presidential initiatives on cassava exist in Nigeria and Ghana to make cassava the engine for economic growth. The New Partnership for African Development (NEPAD) has also recognized cassava as a crops which can reduced 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.

Tanzania is one of the largest cassava producers in Africa. About 655,700 ha of land are under cassava with a total annual production of about 1,795,400 tons. Cassava is a staple food crop in most of the semi-arid and the frequently drought stricken

areas (Lazaro *et al.* 2007). Moreover the crop is still perceived as a food security crop rather than a raw material for other industries. Cassava contributes to an average of 15% in the national food production basket and is second to maize, which is the leading staple food crop for many Tanzanians (Mtambo, 2007). Moreover, for countries where majority of the people still live below the poverty line as Tanzania (ASDS, 2001), cassava could be used to bridge the income poverty gap.

This study sought to fill the gap and contribute to increased understanding of how individual cassava farmers act in the price formation, their relationship with other actors and their respective farm returns at the micro level. The outcome of the knowledge can provide clues on how farmers can be helped to participate effectively and efficiently in upgrading cassava products and marketing practices to enhance commercialization of cassava that offers significant potential for improving farmers' incomes, food security and reduce poverty in the rural areas.

The objective of the paper was to examine the value chain for cassava in order to determine strategies needed to enhance profitable participation of smallholder farmers in the cassava value chain for reducing income poverty in Morogoro rural district.

In agricultural development, product upgrading focuses on the introduction and delivery of new products within the value chain. In recent years, most of the cassava farmers have been involved in the starch, High Quality Cassava Flour (HQCF) and chips for animal feeds value chain (Tuan *et al.,* 2005). Process upgrading is defined as improvement in the efficiency of production process. In the agricultural sector, this refers to the utilization of more inputs or the introduction of new cultivation techniques (Schmitz, 2005). Farmers experiencing significant change in cultivation techniques, in harvesting or post-harvesting practices have been very limited. However, this is related to the characteristics of cassava farming system which is relatively simple and low-input. It is important to notice that the lack of process upgrading has characterized the cassava value chain irrespective of territorial and geographical characteristics.

STRUCTURE OF VALUE CHAIN

The structure of a value chain includes all the firms in the chain and can be characterized in terms of five elements. These are end market opportunities, business and enabling environment, vertical linkages, horizontal linkages and supporting markets.

The end-markets are the starting point of the value chain analysis. End-markets are people, not a location. These determine such characteristics as price, quality, quantity and timing of a successful product or service (Dunn *et al.,* 2006). End-market buyers are a powerful voice and incentive for change. They are important sources of demand information, can transmit learning, and in some cases are willing to invest in firms further down the chain or support activities further upstream. End-market analysis assesses current and potential market opportunities through interviews with current and potential buyers, and takes into consideration trends, prospective competitors and other dynamic factors. Chains also operate in a business enabling environment that can be all at once global, national and local and include norms and customs, laws, regulations, policies, international trade agreements and public infrastructure (roads and electricity) as documented by ECAPAPA (2006).

Linkages can be vertical or horizontal where vertical linkages between firms at different levels of the value chain are critical for moving a product or service to the end market. Vertical cooperation reflects the quality of relationships among vertically linked firms up and down the value chain. More efficient transactions among firms that are vertically related in a value chain increase the competitiveness of the entire industry. Odeyale (2007) and FAO (2004) pointed out that when a vertically integrated market develops there are three clusters of producers – those who are already competitive, those that can be helped to make it, and those who will never make it, who will either remain in the informal market or need other sources of income.

But horizontal linkages (formal and informal) between firms at all levels in a value chain can reduce transaction costs, create economies of scale and contribute to the increased efficiency and competitiveness of an industry. Such linkages also facilitate collective learning and risk sharing, while increasing the potential for upgrading (Dunn *et al.,* 2006). For this study three paths of upgrading (processes, products and functional) are of importance.

In order to have a better understanding of where the small cassava farmers stand in the value chain, it is important to analyze who the actors are and what their interactions are like. According to Land and Uliwa (2007) and Collinson *et al.* (2000), the main actors of the cassava value chain in Lake Zone – Tanzania and Uganda respectively, included input suppliers, producers, rural vendors, small and large traders, processors, retailers and consumers.

METHODOLOGY

The study was carried at Morogoro rural district in Morogoro Region, Tanzania. The area was chosen because cassava is widely cultivated by virtually all the farmers in the district. Moreover the largest area planted with cassava in the region (5 564 hectare, 31%) is located in the area of study while the largest area planted with cassava per household is Mvomero district (0.91 hectare). With exception of Morogoro rural and Kilosa, the variations in the area planted with cassava household for the rest of the districts are small ranging from 0.24 hectare, 0.28 hectare and 0.31 hectare in Ulanga, Kilombero and Morogoro urban, respectively (URT, 2007).

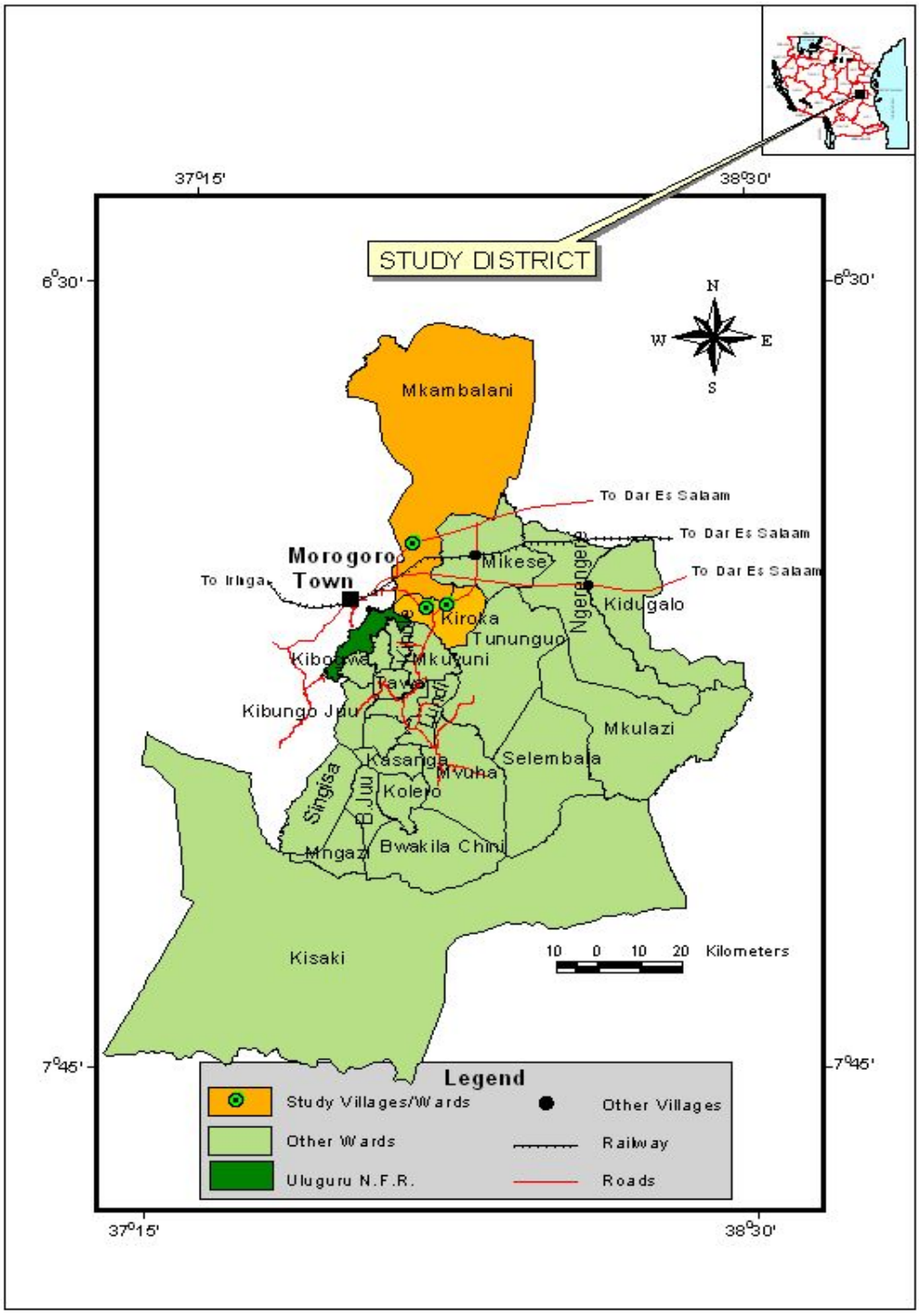


Figure 1: A map of Morogoro Rural District, Tanzania

Methods for Data Analysis

A combination of qualitative and quantitative methods of analysis was used to analyze the data as described in subsequent sections. There is a growing recognition in literature on field methods in development studies that a judicious combination of qualitative and quantitative methods can help to solve problems that are associated with each type of method taken separately (White, 2002; Kanbur, 2001).

i) Analysis of structure, coordination and profitability of cassava value chain

a) Analysis of the structure of value chain

Descriptive analysis and conventional mapping were used to describe the structure of the cassava value chain. Specifically, descriptive statistics were generated for product flows, volumes, prices, key actors and products marketed.

b) Analysis of coordination of the chain

Descriptive analysis (numbers, maximum, minimum, percentages and means) was carried out to assess coordination of the chain which involved the relationship between the actors of the chain, selling/procurement style, terms of payment and services provided by firms or institutions to the farmers. The Statistical Package for Social Sciences (SPSS) was employed for the descriptive statistics of both the structure and coordination of the chain.

c) Profitability of cassava production and marketing.

Data collected were entered in SPSS and descriptive statistics were carried out for analyzing the socio-economic characteristics of the respondents. Furthermore, Microsoft Excel was used for quantitative techniques analyses (partial budget) computing the profitability of the cassava smallholder enterprises. Net (profit) margin was determined by multiplying the physical output (kg/acre) and price (Tshs/kg) minus variable costs. The variable costs included the costs of land preparation, buying cuttings, planting, weeding and renting in land. The basic equation for profit margins computation is as follows:

$$PM_{ij} = \frac{1}{n}\sum_{i=1}^{n}(P_{ij}\,V_{ij} - VC_{ij}) \qquad (1)$$

Where,

PM_{ij}	=	average profit (net) margin earned by farmers i=1...n earned by i*th* farmer for j*th* cassava output in Tshs/acre
P_{ij}	=	unit producer price of i*th* farmer for j*th* cassava output, (in Tshs/kg)
V_{ij}	=	volume marketed by i*th* farmer for j*th* cassava output given k*th* (in kg)
VC_{ij}	=	total variable costs incurred by i*th* farmer for j*th* cassava output (in Tshs/kg)
n	=	Number of farmers dealing with j*th* cassava output.

Profitability of the above equation was estimated from the income generated by 98 sampled cassava farmers from the three villages (Mkambarani, Kiroka and Kungwe) for the 2007/08 growing season. The rest of the sampled farmers (52) were not included in the computation because they did not respond on cassava outputs for the same growing season. Furthermore, the villages' net margins were compared using Analysis of Variance (ANoVA). The partial budget was based on the production

costs and yield per acre for the 2007/08 growing season. Non-marketed outputs and inputs such as fresh and processed cassava consumed at family level and family labour respectively were evaluated at the local market prices. The estimation of average costs for variable inputs such as planting materials (cuttings), land preparation, planting, weeding, harvesting and post harvesting charges, hired labour and land rent was based on prices and wages as reported by farmers in the field. The analysis also included cassava traders (small traders, large traders, food vendors and retailers).

In order to get returns to labour, the net profit margin which was computed in equation 1 was divided by total person-days of family workforce employed in different value chain operations. Person-day refers to the adult Equivalents (AE) multiplied by effective days multiplied by effective hours. Adult Equivalent is a multiplier used in converting man-hours into the number of full-time workers needed to complete a job within a given time-frame. In this study the Adult Equivalent for households was calculated as follows: adult male and female of 15 and above years of age were assigned 1, while a child of 10-14 years of age was equated to 0.5 of an adult equivalent and children bellow 10 years were considered as contributing insignificantly to family labour. The farm operations included land preparation, planting, weeding, harvesting, and marketing of cassava. The basic equation for returns to labour computation is as follows:

$$RL_{ij} = PM_{ij} / PD_{ij} \quad (2)$$

Where,

RL_{ij} = average returns to labour earned by farmers i=1...n earned by i*th* farmer for j*th* cassava output in Tshs/acre,

PM_{ij} = average profit margins earned by farmers i=1...n earned by i*th* farmer for j*th* cassava output (Tshs/acre),

PD_{ij} = total person-days of family labour allocated by i*th* farmer in j*th* cassava output in person-day/acre.

ii) Determinants of cassava smallholder farmers' profitability

a) Description of explanatory variables

The description of explanatory variables ($X_1 \ldots X_{15}$) of the linear model is streamlined to five livelihood capitals namely human, financial, physical, natural and social capitals from the Sustainable Livelihood Framework (SLF). Details on the framework are found in a number of literature including Butler and Mazur (2007); Murray and Ferguson (2001) and DFID (1999).

b) Determinants of cassava profitability

A linear regression model was used to identify the determinants of farmers' profitability where farmers' profit margin was taken as a function of other 15 variables entailing age of the household head, gender of the household head, education level of the household head, household size, experience in business, farm size under cassava cultivation, physical accessibility to urban market, amount of labour force available for work, status of food insecurity, group participation, perception on contribution of cassava to household income, income from non crop livelihood sources, working status of farm implements and total person-days of family labour.

The model for profitability was specified as follows:

$$Y = \beta_0 + \beta_1 AGEHH + \beta_2 GEHH + \beta_3 EDUHH + \beta_4 EXPHH + \beta_5 AHSIZE + \beta_6 PERD + \beta_7 FULTLAB + \beta_8 INCLISO + \beta_9 CACONT + \beta_{10} WOSTHO + \beta_{11} ACEUMA + \beta_{12} MAINFO + \beta_{13} FARMSIZE + \beta_{14} GROPART + \beta_{15} FOODINSE + \mu \quad (3)$$

Where;

Y	=	Profit margin (Tshs/acre)
β_0	=	the intercept of the regression equation
$\beta_1 \ldots \beta_{15}$	=	the parameters to be estimated,
AGEHH	=	Age of the household head in years,
GEHH	=	Gender of the household head expressed as dummy, 1=female headed household, 0=otherwise),
EDUHH	=	Education level of the household head measured in years spent schooling,
EXPHH	=	Experience of household in cassava business expressed in years,
AHSIZE	=	Aggregate household size expressed in total number of family members,
PERD	=	Person-days spent in cassava cultivation in 2007/08.
FULTLAB	=	Labour force available was expressed in terms of total number of household adult working full time in cassava farm
INCLISO	=	Income from non crop livelihood sources measured in gross income of other acitivities excluding crop production,
CAICONT	=	Cassava contribution to household income was expressed as dummy variable where insignificant contribution to household income was coded '1' and '0' otherwise,
WOSTHO	=	Working status of farm implements was expressed as dummy variable whereby hand-hoes that were working properly were coded as '1' and '0'otherwise,
ACEUMA	=	Physical access to urban markets was expressed as dummy variable whereby all household heads/respondent who reside in remote area form urban market was coded '1' and '0' otherwise,
MAINFO	=	Access to market information was expressed as dummy variable whereby all respondents who have no access to market information were coded as '1' and '0' otherwise,
FARMSIZE	=	Farm size was expressed as the total amount of land in acres under cassava cultivation for 2007/08 growing season,
GROPART	=	Group participation was expressed as as dummy variable whereby all household who were members into different social groups were coded '1 and '0' otherwise,
FOODINSE	=	Food insecurity was expressed as dummy variable whereby all

households who face food insecurity were coded as '1' and '0' otherwise,

μ = Error term.

RESULTS AND DISCUSSION

Socio-Economic Characteristics of the Respondents

The socio-economic characteristics of the sampled households were age, gender, education level and occupation of the household head. The results showed that most of the household heads (60%) were below 50 years of age. It is also shown that more than 55% of the sampled households were males.

The results indicated that more than 80% of the sampled households attained formal education. The results generally concurred with the findings of agricultural marketing information needs study (URT, 2004), which found that there is a large number of farmers with primary education and below this level of education. Apart from education, the results also indicated that most of the respondents interviewed were involved in crop production (91%), where the rest of the respondents (9%) were involved in government services, casual labour and business activities.

The total number of members in the household was also investigated. This has an important implication in household ability to participate in productive activities. A large family size implies large labour power for agricultural activities, in this case cassava production. In the study area the maximum household size of the sampled households were 13 with an average of 6 members per household. There is small difference between the average household size of the sampled villages and the regional (Morogoro) average household size of 4.6 persons according to the 2002 population and housing census (URT, 2003). The deviation of the household size from the mean is 2.71.

Farm Resource Availability and Use

Land as an important resource was available and accessible to households. Analysis of total land in acres per household regardless of type of land tenure revealed that households possess on average about 4.3 acres each. Large land holdings per household signify the availability of one of the main factors of agricultural production. It offers a chance for farmers having more land to be in a good position to grow cassava among other crops compared to those with less land. The available land under the predominant customary tenure was utilized for growing annual crops (an average of 3.5 acres); annual and perennial crops (2.3 acres) and an average of 3 acres per household were fallows. This suggests that there is a possibility of increasing cassava production because land is not a limiting factor in the study area.

Cassava Production, Processing and Marketing

In the 2007/08 cassava growing season only 65% of the sampled households grew cassava. These were small scale farmers, whose farm size range from 0.25 to 4.5 acres. However, there was an increase in acreage in 2008/09 growing season. Basically cassava is grown for subsistence crop though some surplus is produced for commercial purposes.

About 57% of the households in the study area grew cassava as a sole crop while 43% grew it as an intercrop. In both cases cassava production requires routine activities from land preparation to harvesting and occasionally, post-harvest processing at household level. There are a number of cassava varieties grown in the area of study. The local variety which is known as *Msenene* was the main cassava variety grown by 59 farmers out of 98 sampled farmers in the area of study during the 2007/08 growing season.

The quality attributes of the variety are sweetness, early maturing taking 6 months to attain early and high yield up to 4 tons per acre and preferred in the market but prone to diseases. Other varieties grown in the area of study are *Kigoma, Magereza, Kibangameno, Mrefu, Kiroba and Mwarusha* (sweet varieties), *Dihanga and Kiliusungu* (Bitter varieties).

Most of farmers till the land before planting using mainly hand hoes (76%), whereby both men and women participate in the activity. Planting of cuttings is mainly carried out during short rainy season (October – November) and are mainly planted at an angle. It was reported that the most important sources of cassava planting materials were the neighbours and own farms. Weeding is also one of the vital activities for cassava production. Weeding is usually carried out using hand hoes and is done twice between planting and harvesting time whereby both men and women participate in weeding.

Cassava processing and utilization

Traditional methods of cassava processing are manual and carried out at the household level. They lead to one end product which is dried chips that could be farther milled into flour. Chips production involves peeling, washing, chipping and sun drying, thereafter milled to get flour for domestic human consumption. The processing practices among the farmers was minute (23%) and is of traditional type just for domestic consumption. Moreover the processing was mainly done by women. This implies that in the study area farmers do not process cassava for commercial purpose but for domestic consumption.

Cassava marketing

The total harvest of cassava in the 2007/08 growing season was 94 612 kg. Farmers sell their cassava in fresh form whereby 78% of the sampled farmers who grew cassava in 2007/08 growing season, marketed the product. These farmers marketed only 69% of the cassava harvested in this season. However, most (53%) of cassava was sold on-farm. This result supports the findings by Mpanduji *et al.* (2006) that 54% of cassava is sold on-farm in Kibaha district. The marketing of cassava seem to be localized probably due to lack of technology to upgrade and (add value) cassava products.

Structure of the Cassava Value Chain and Key Actors in the Chain

i) The cassava value chain in Morogoro rural

The cassava value chain in the study area is diagrammatically presented in Figure 1. The main value chain strands identified by the study were as follows:

a) Strand I: Farmers →Consumers

The strand was found to be the shortest of all cassava strands identified during the survey in the area of study. In this strand, farmers sell cassava roots to rural or household consumers. The volume of cassava sold through this strand is 10 680 kg at an average price of Tshs 125 per kg (Fig. 1).

b) Strand II: Farmers →Small traders →Retailers →Consumers

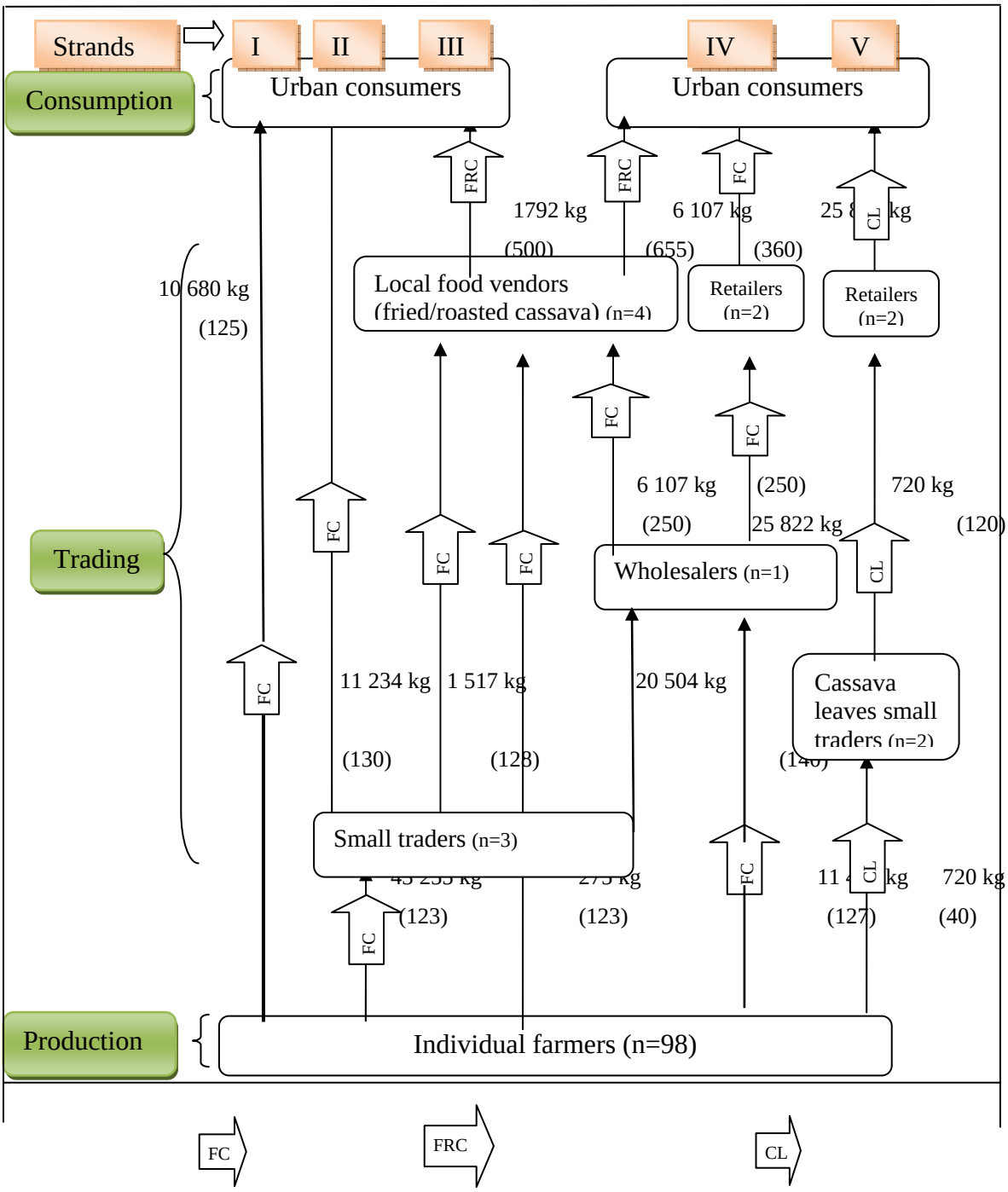
The strand is the most important alternative cassava sale outlet in the study area. It is through this strand that farmers sell their cassava roots to small traders, and the small traders sell to the wholesalers and food vendors (fried and roasted cassava) who sell to the final consumers. The small traders also sell the roots to rural consumers in village markets. Figure 1 shows that the sampled cassava farmers sold 43 580 kg to small traders at an average price of Tshs 123 per kg. Diagrammatically the main four strands in the study area are mapped as follows.

c) Strand III: Farmers →Local food vendors→Consumers.

Farmers sell their cassava roots to local food vendors who fry and roast cassava and sell to the final consumers. This strand is not very common as compared to others. About 275 kg were sold by the sampled farmers through the strand at an average price of Tshs 128 per kg (Fig. 1).

d) Strand IV: Farmers→ Wholesalers → Retailers → Consumers

In this strand, farmers sell the cassava roots to wholesalers who transport the roots to urban markets and sell to various retailers (Mawenzi, Mji Mpya and Msamvu markets) who finally sell to consumers. Individual farmers sold 11 425 kg of cassava roots to wholesalers at an average price of Tshs 127 per kg.



NOTE: Values in brackets are prices (Tshs)

Products traded: Fresh Cassava, Fried/Roasted Cassava, Cassava Leaves

Figure 2: Cassava value chain in the study area.

e) Strand V: Farmers (CL) → Small traders (CL) → Retailers (CL)→ Consumers

This is a strand for cassava leaves product. The strand is common in Mkambarani village. It was observed that farmers sell the leaves to small traders (most of them being women) who transport the leaves to urban markets (Msamvu market). The small traders sell on credit to retailers who pay the credit after selling the product. The sampled households sold 720 kg at an average of Tshs 40 per kg.

ii) The key actors in the cassava value chain

The value chain for cassava in the study area had only forward linkage; with the main nodes being the production, trading and consumption. The forward linkage after farm production involves middlemen involved in buying and retailing of raw cassava to ultimate consumers. This structure is contrary to the findings by Mpagalile *et al.* (2008) who found that cassava value chain is divided into backward and forward linkages; the backward link starting with farmers towards the input suppliers. Therefore, in the study area, there is no supporting market along the value chain, which means no financial services and sector specific services such as processing equipments which are important in upgrading the firms in the chain. To understand how cassava products move along the chain from production point to consumption, it was necessary to identify the role played by each actor in the chain. The value chain comprised the following key actors: smallholder farmers, small traders, wholesalers, food vendors and retailers.

a) Farmers (producers)

The producers of cassava sell part of their cassava to traders or neighbouring farmers who face food shortages. The amount sold varies by the size of cassava fields, amount harvested and food requirement of households. Most of the cassava roots were sold at farm gate and at the village markets (Mkuyuni and Kiroka) and along the Dar es Salaam – Morogoro road at Mikese. Table 1 shows that large quantity of cassava roots (43 255 kg) was marketed to small traders which was about 66% of the marketed output.

Table 1: Main cassava products' market outlets

Market outlet	Frequency	cassava marketed (kg)	%
Small Traders/brokers	15	43 255	65.9
Local/household consumer	54	10 680	16.3
Large traders (wholesalers)	5	11 425	17.4
food vendors	2	275	0.4
Total	**76**	**65 635**	**100.0**

b) Small traders

Rural small traders play an important role in collecting cassava and delivering it to either wholesale, retail outlets or ultimate consumers at Mkuyuni, Kiroka and Mikese village/rural markets. They buy cassava in small quantities ranging from 250 kg to 500 kg per week from farmers and sell the roots to retailers and wholesalers. The traders use bicycles to transport cassava roots to the road (Matombo - Morogoro) and then hire vehicles to ferry the roots to the respective village markets. Sources of

capital are mainly from their own saving or friends. Moreover, they have limited information on production and marketing of cassava.

c) Wholesalers

The wholesalers supply the majority of cassava tubers to urban markets such as Mawenzi and Mji Mpya in Morogoro urban. They revolve their capital rapidly by minimizing the length of time between purchase and sale. They limit the risk that prices will move against them and avoid significant overhead costs and damage of the tubers. Such traders usually buy from several small traders and sometimes from the farmers and hire vehicles to transport the roots to the urban centres. Wholesalers tend to specialize in dealing with cassava roots.

d) Rural and urban food vendors

These operate on individual basis like farmers. Rural food vendors are also cassava growers. They buy fresh cassava direct from farmers or take from their own farms while urban vendors usually buy from wholesalers. They usually procure small quantities of cassava roots ranging from 50 kg to 100 kg for 2 to 5 days. They generally sell fried and roasted cassava *(chips dume)* to consumers. They are also involved in others activities during cassava off-season including roasting green maize, potatoes and meat commonly known as *mishikaki*.

e) Retailers

In the study area, there are both urban and rural retailers who buy fresh roots and other cassava products such as cassava leaves (*Kisamvu*) and sell them to ultimate consumers in small quantities of a convenient form. The major retail outlets of cassava and cassava products are village market centres, town markets and along road sides.

f) Consumers

These are the final users of cassava products. These include household consumers who mainly buy fresh roots and leaves (*Kisamvu*) from farmers, small traders and retailers for their domestic consumption. Household consumers always buy intermediate products which are further processed and consumed at home such as fresh roots and leaves which are transformed through cooking into boiled cassava or vegetables respectively. Another group of consumers are those who consume cassava and cassava products away from their homes. These normally consume various cassava products including fried/roasted cassava chips and raw fresh cassava.

iii) The cassava products marketed

Figure 1 shows that there are two products passing through the main strands. These are cassava roots and boiled/fried/roasted cassava (*chips dume*). However, the potential strands in the area can be cassava chips for High Quality Cassava Flour (HQCF) for human consumption and chips for animal feeds. These products are potential due to the high potential domestic demand of cassava flour in case it substitutes wheat and maize flour by 10% or 20% while about 40 000 tons of dried cassava chips are needed for animal feed sector (Gwera, 2009; Mutabazi *et al.,* 2008).

iv) Coordination of the value chain

a) Vertical coordination

Results showed that 94% of the sampled farmers had no contractual agreements (both formal and informal) with their customers. The figure also indicates that more than 90% of the farmers neither sell to specific customers nor knowing the

customer of the produce before harvest. This indicates that there is poor vertical coordination between the farmers and their customers (buyers). This may enhance exchange failures and reduce motivation of engaging in trade.

b) Horizontal coordination

On the other hand results indicated that 66% of the sampled households belonged to farmers' associations. However, most of the associations were those of cassava production encouraged by the cassava project based at Sokoine University of Agriculture (SUA). Participation in farmers' association seems to be higher due to large number of project farmers being in the sample. The project farmers have recently benefited in terms of accessing new improved cassava varieties and extension services.

v) Sources of cassava market information

Farmers' sources of information is limited to farmers' efforts only visiting marketplaces whereby about 68% of the sampled farmers obtained market information (market, market requirements and prices) by physical visit to markets where they pretended as if they need the produce. The rest of the farmers obtained information from traders who buy the roots and from other farmers.

Analysis of Profitability of Cassava Products

Table 2 compares the profit margins obtained by the sampled cassava farmers in the three villages. The profit margin per 1 acre was estimated to be Tshs 109 253, Tshs 58 744 and Tshs 118 652 for Mkambarani, Kiroka and Kungwe respectively. The overall gross margin is 94 573 Tshs. Furthermore, results from the table reveal that the returns per every shilling invested in the enterprise (Cost-Benefit Ratio) are 3.9, 0.8 and 4.5 for the respective villages. This suggests that cassava production in Kiroka is not viable.

Table 2: Profitability of raw cassava at farm level

Village/Item	Mkambarani (n=29)	Kiroka (n=37)	Kungwe (n=32)	Overall (n=98)
1.0 Receipts				
1.1 Yield per acre (kg)	980	1 109	1 297	1 102
1.2 Average farm gate price (Tshs)	140	116	112	122
Revenue (Tshs)	**137 200**	**128 535**	**145 264**	**134 995**
2.0 Variable total costs				
Total Variable Cost (Tshs)	**27 947**	**69 791**	**26 612**	**40 422**
Profit Margin (Tshs)	**109 253**	**58 744**	**118 652**	**94 573**
3.0 Labour allocation (person-days)				
Total Person/Day	**29**	**29**	**50**	**35**
Return To Labour	**3 767**	**2 026**	**2 373**	**2 702**
Cost-Benefit Ratio	**3.9**	**0.8**	**4.5**	**2.3**

Note: Values are in Tanzanian shillings (Tshs)

This is due to high variable costs incurred in land preparation, weeding, planting materials (cuttings), planting and harvesting activities. The costs of production in Kiroka were probably accelerated by hired labour used while the other villages recorded more family labour (104 and 69 person-days for Kungwe and Mkambarani respectively) but Kiroka has the lowest person-days (51).

Determinants of cassava profitability at farm level

The results of linear regression analysis with respect to cassava profitability at farm level indicate that 68% of the variation in cassava profitability generated at farm level is due to the independent variables included in the regression model. That is to say the specified predictors explained the dependent variable (profit margin) by 68%. The remaining (32%) explains the error term. Table 3 indicates that farm size had a significant ($p<0.01$) positive correlation with cassava profit margin.

This is implies that farmers with large farms are liable to get larger gross margin than those with small farms. An increase in one unit of farm size leads to increase in profit margin of Tshs 138 847. This is similar to findings by Mafimisebi (2008) in his study on determinants and uses of farm income from the cassava enterprise in Ondo State, Nigeria whose findings show that farm size was significant at ($p<0.01$) with positive relation to profit margin. Moreover, experience of the household head in cassava production was also significant ($p<0.01$) and positively related with cassava profitability. The parameter estimates of each of these variables also carried a sign that conformed to *a priori* expectations.

Table 3: Linear regression model results of determinants of cassava profitability

Predictor	Coefficient	Expected sign	Significance
(Constant)	-134446.528		0.047
AGEHH	467.434		0.601
GENHH	13150.832		0.698
EDUHH	5376.150		0.134
AHSIZE	-4082.979		0.451
FARMSIZE	138847.115	+ve	0.000*
EXPHH	7244.068	+ve	0.003*
FULTLAB	10149.112		0.245
PERD	197.783	+ve	0.037**
ACEUMA	34725.096		0.231
WOSTHO	-26372.720		0.421
GROPART	-48984.340	+ve	0.048**
MAINFO	78739.005		0.113
CAICONT	12943.689		0.570
FOODINSE	-60056.295	-ve	0.015**
INCLISO	.031	+ve	0.093***

R^2=68%, Adjusted R =62%, F=12*, *=significance at ($p<0.01$), **=significance at ($p<0.05$, ***=significance at ($p<0.1$)

Food insecurity of the household was significant at ($p<0.05$) and negatively related to profit margin as it was hypothesized. This implies that as those households that face food insecurity were looking for means of survival (doing casual labour as a coping strategy) hence assign little time for cassava production, causing to decrease in profit margin.

Total person-days set for cassava production was significant ($p<0.05$) and positively correlated with profitability of the crop as it was hypothesized. Group participation was statistically significant ($p<0.05$) and negatively related to cassava profit margin. This relation is similar to what was expected. This proposes that for 2007/08 growing season, farmers' associations among cassava smallholder farmers were not common, despite the fact that few farmers were participating in farm field schools (*Shamba Darasa*) on rice, maize and sunflower. This signifies that farmers paid less attention on cassava.

Table 4 also shows that income from non-crop livelihood sources (INCLISO) predictor was significant ($p<0.1$) and positively associated with profitability of cassava. This suggests that an increase of one unit among the livelihood sources (as livestock keeping, business, salaries/wage and remittances) leads to increase in profit margin by Tshs 0.03.

CONCLUSIONS AND RECOMMENDATIONS

The analysis of structure of cassava value chain has shown that among the three cassava products (fresh cassava, cassava leaves and fried/roasted cassava) fresh cassava has been traded in large quantity. The mapping is confined into four strands that trade in fresh/raw/leaves of cassava and one strand on fried/roasted cassava. This indicates that cassava processing is much limited in the study area.

The analysis of coordination of the key actors in the value chain indicated that farmers are generally poorly coordinated both vertically and horizontally which contributed to low profit margins as compared to other actors in the value chain. This suggests that the product was not added value partly due to lack of knowledge (awareness) of the potential alternative products among the smallholder farmers, poor access to cassava markets, poor coordination and lack of appropriate technologies for value addition especially processing technologies.

Analysis of profitability of the alternative cassava value chain strands shows that food vendors who trade in fried and roasted cassava products obtained high profit compared to other actors who traded in fresh cassava roots in the value chain. This suggests that the profitability of cassava can be enhanced through value addition. Based on the results of the linear regression model, it can be concluded that profitability of cassava in the study area is enhanced by area under cassava cultivation in 2007/08 growing season, experience of the household head in cassava production, total labour days spent in cassava production for the crop and income of non-crop livelihood sources. On the other hand, lack of cassava farmers groups and food insecurity among smallholder farmers are significant factors that reduced cassava profitability.

In view of the major findings of the study and the above conclusions, the following were recommendations drawn:

i) **Strengthening coordination of the chain actors**

The findings of the study show weak vertical and horizontal coordination along the cassava value chain. Furthermore linear model regression results indicate that profitability of cassava at farm level is negatively and significantly affected by lack of farmers group. This suggests that efforts to improve both horizontal and vertical coordination are required. In order to improve horizontal coordination, deliberate efforts should be made to establish more farmers' groups and strengthen existing

ones by mobilizing, sensitizing and training farmers on the importance of farmers groups, group dynamics and management. Farmers' groups will not only increase their bargaining power but also reduce transaction costs in marketing cassava as well as economies of scale. In order to improve vertical coordination farmers have to be linked to profitable markets of cassava by facilitating and networking partnerships among farmers and other market players so as to enhance bargaining power, improve exchange relations and meet the contractual agreements in the profitable markets of cassava.

ii) Provision of improved (High yielding) cassava varieties

The findings of the study show that *Msenene* variety was a largely grown cassava variety in the study area. However, yields for this variety in the study area were found to be low averaging about 1.1 tons of cassava roots per acre. Though susceptible to diseases, the variety can yield up to 4 tons per acre. Therefore the low yield reported by farmers in the study area suggests improvement of husbandry practices to exploit the yield potential of this variety. Improvement of husbandry practices should go hand in hand with introduction of high yielding disease resistant varieties. Since the International Institute of Tropical Agriculture (IITA) is willing to join the Government and its partners in the design and implementation of a new strategy and programs for cassava to play its role as an engine for economic growth, job creation, and food security, there is a need of working with the institute for the provision of new cassava varieties that have yield potentials as high as 35 tons of fresh roots per hectare such as *Kiroba*. Working together with development partners (NGOs, farmers' organizations and the private sector) would facilitate the spread of new varieties that are disease resistant. In addition to provision of improved cassava varieties there is a need of improving agronomic practices among cassava growers.

iii) Introduction of cassava processing technologies

The findings of the study indicate that cassava was sold in fresh form without adding value. At the same time there are markets of value added products like cassava flour and cassava chips for animal feed. Moreover, the results indicate that farmers have positive attitude towards the alternative cassava strands such as HQCF and chips for animal feeds. In order to exploit these markets there is a need to promote appropriate cassava processing technologies such as grating, chipping and crashing by educating farmers on these technologies and facilitate acquisition of processing equipment. As farmers become knowledgeable and realize the importance of these technologies in reducing income poverty, they can be motivated to organise themselves through their farmers associations to purchase simple cassava processing equipments.

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