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## Value Chain Analysis of Potato in the Southern Highlands of Tanzania: Constraints and Solutions

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### Abstract

*This study aimed at assessing the value chain of Potato (*Solanum tuberosum*) in the Southern Highlands of Tanzania so as to characterize its structure and institutional flow of the commodity; analyse institutional margins and challenge; and finally make policy recommendations based on the findings. It was a qualitative research that triangulated data collection methods by employing Focus Group discussions (FGD) with farmers, middlemen, local traders and scheduled interviews with various off-takers (traders and processors) and key informants (government officials and service providers). Results show that potato value chain is fragmented and dominated by numerous middlemen bulking the commodity at operating at different levels (village, local townships and major urban centres, the major market destinations of potato in the country is scattered in all urban centres especially the big cities (Dar es Salaam, Arusha, Mwanza, Tanga and Dodoma. During peak season potatoes find destinations in the regional market particularly Kenya, DRC, Rwanda and Zambia. During off-seasons potatoes take a reverse movement particularly is imported from Kenya. Prices are mainly determined by seasonality (demand/supply) and variety (improved variety are much more expensive). Gross margin analysis indicated that off-takers get more or less same returns which are larger than that of producers (confirming the general perception in Tanzania that off-takers usually exploit producers. The major constraints facing potato value chains limited availability of seed potato; dominance of middlemen, counterfeit inputs; prevalence of fungal disease; limited processing options. The author made a number of policy recommendations including establishing legal framework that supports contract farming (out-grower scheme) business model in potato value chain; review of seed certification and imports policy; and supporting seed potato production, research and post-harvest management.*

**Keywords:** Value Chain, Potato, *Solanum Tuberosum*, Southern Highlands, Mwalimu Nyerere

### 1. Introduction

Smallholder agricultural production has been a policy priority for the United Republic of Tanzania for decades which has neither improved the livelihoods of the rural population nor guaranteed food security. The government has traditionally focused on major staples namely, maize and rice, for which it has made strategic support such as providing subsidy in terms of inputs such as fertilizers and seed but given restrictions on sales and export basically to defend food security, stabilizing local prices and local processing enterprises. Such restrictions have primarily lowered the potential of maize and rice as commercial commodities and denied smallholder farmers opportunities to make cash. However, opportunities for commercialization exist in other staples such as round potato (*Solanum tuberosum*). It is estimated that around 88% of the crop is sold and the remaining 12% is consumed at household level. In areas of favourable weather conditions round potato has greater potential for food as well and generating income for smallholder farmer. The crop grows fast, it is adaptable, high yielding and responsive to low inputs (FAO, 2006; Mpogole, 2011). About 90% of the crop is grown in the Southern Highlands Zone (Iringa, Njombe, and Mbeya Regions). The remaining 10% is mainly grown in the northern highlands zone (Kilimanjaro and Tanga), with minor production in Ruvuma, Rukwa, Mara, Tanga, and Kigoma Regions. The zone accounts for 70-80% of potatoes produced in the country. Due to increasing population and changing eating habits (such as preference of fast foods and snacks) potato production is fast growing (Mpogole, 2013). The increasing demand, particularly in urban centres, expands potato production within the Southern Highlands zone, and is recently spreading into Eastern Zone (Morogoro) and the Lake Victoria zone. The market of potato is all urban centres, but the major destinations are the major urban centres including Dar es Salaam, Dodoma, Arusha, Mwanza, Mbeya, Iringa, Tanga and Unguja. Regional markets emerge during peak season in Kenya, DRC, Rwanda, Zambia and Burundi. In term of consumption, substantial quantity of potato ends up into chips and soups due to limited processing in the country. Only an insignificant quantity is processed into French Fries at Iringa (Snack Food Ltd and Tosti).

Despite its promising economic potential, the potato sector in Tanzania is facing a number of institutional, functional and policy-related constraints that need to be addressed holistically. Most of the past agricultural studies have invested much effort in exploring constraints facing the production segment of the value chains (e.g. Koizumi, 2007; Anderson, 2008; URT, 2009; Asrat *et al.*, 2009; Namwata *et al.*, 2010; FAO & CFC, 2010; Kilima, *et al.*, 2010). Due to this narrow focus, these studies have not managed to explore vertical causal linkages of the constraints amongst institutional actors engaged in the entire subsector from production to consumption node. Studies such as these offer limited solutions to the constraints facing the sector often making recommendations that are bound to auspices of only one segment. In

market-oriented agricultural studies, the assessment of constraints facing one node of the value chain needs analytical framework and/or approach that provides holistic and systemic solutions rather than segment-based interventions which most agriculture research has traditionally been coming up with but without or with minimal success.

Basically, systemic/holistic approaches are market-oriented approaches that among others assume that market players in a particular subsector are vertically linked to each other so that they cannot work in isolation; hence the challenge facing an actor at one functional level will soon or later face the others at lower or higher levels. This study identifies Value Chain Analysis as one of the holistic frameworks to use in assessing potato value chain in the southern highlands of Tanzania. Value chain is strategic tool that identifies activities that create value and generate competitive advantages. The purpose of this study was to apply value chain analysis on potato value chain with view of assessing strategic challenges that actors along the chain face and make recommendations related to creating value and competitive advantages. Specifically, the study characterized potato value chain; assessed strategic challenges facing the value chain and made policy recommendations aimed at improving efficiency of the value chain.

## 2. Literature Review

In recent years, the government in Africa including that of Tanzania and development partners, recognizing that economic growth and development can best be achieved within the broad context of private sector development, have shown a lot of interest in value chain analysis (VCA), focusing on design and implementation of development programmes especially in agriculture (Addy *et al.*, 2010). The "value chain" is an analytical and operational model which is based on the fact that most products, in agriculture as in other industries, after initial production go through various value-adding stages and transformations such as transport, packaging, marketing, sales and distribution. Kaplinsky (2001), on the other hand, describes: the value chain as the full range of activities required to bring a product or service from conception, different phases of production, delivery to retailers, and to purchase by final consumers.

The framework assists organisations in identifying business activities that can create value and competitive advantage. The value can be calculated in quantitative or qualitative terms. Gross margin analysis established quantitative value of functions performed by actors in the value chain which is also concerned about welfare economics for the actors along the value chain (Choumbou, *et al.*, 2015). FAO (2006) proposes the importance of assessing revenue (gross margins) distribution throughout the value chain for comparative reasons. Webber and Labaste (2010) categorize the uses of VCA in agricultural development programmes, which Governments and donors can use VCA as tools to protect threatened linkages between various VA actors; facilitate upgrading of products so as to generate greater returns; promote foreign direct investment (FDI) programmes; examine constraints in the enabling environment in which value chains operate; promote small and medium sized enterprises (SME) development; and link SME suppliers and service providers with lead processors or marketers.

Both analytically and operationally, value chain analysis (VCA) can potentially facilitate public and/or private sector interventions aiming to: increase the efficiency of the entire value chain and, in the process, increase revenues generated; enhance the competitiveness and capacities of the various value chain (VC) actors so as to increase their shares of the generated revenues. Webber and Labaste (2010, *op. cit*) note the various limitations of VCA as a tool for designing agricultural development programmes as Value Chains are not fixed or static; they tend to be dynamic in terms of composition, relationships and market positioning. VCA too often focuses on improvements in the system rather than on how VCs can be shifted to target different and more attractive markets. It is important to note that it is actually the private sector that decides where to compete and brings about changes in VCs as needed. Too much focus on delivering a product /commodity may mask the opportunities to deliver a range of products and services that markets or customers will find attractive.

## 3. Methodology and Approach

This study employed the Value Chain Analysis (VCA) approach to identification of bottlenecks and required interventions. In this respect, the inbound, operational, outbound and marketing logistics data downstream the value chain was gathered from various actors for the purpose of conducting functional, institutional, and cost analysis. Kaplinsky (2001) describes the value chain as the full range of activities required to bring a product or service from conception, different phases of production, delivery to retailers, and to purchase by final consumers. FAO (2006) proposes the importance of assessing revenue (gross margins) distribution throughout the value chain for comparative reasons. Both Kaplinsky (2001) and FAO (2006) concepts were incorporated in this study, which comprised of both literature review and field work. The author conducted field work, covering the three regions (Njombe, Mbeya and Iringa) aimed at validating the literature review findings, and involved consultations with key stakeholders along the value chain. The main stakeholders covered in the field work include producers, traders/exporters, processors and service providers; with the latter including NGOs, research institutes, micro-finance providers, farmers groups, and sector-specific and business umbrella associations.

During the field work, the Rapid Rural Appraisal (RRA) method of data collection was employed, which entailed the use of different techniques, a derivative Participatory Rural Appraisal (PRA) methodology. The techniques used included semi-structured interviews, focus group discussions (FGD), observations and documentary reviews. This methodology provided flexibility in collecting data depending on local circumstances, thus saving on unavailable time and resource constraints. Standard checklists/questionnaires were prepared for use in capturing data from the value chain actors. The questionnaires comprised of a mixture of open and close-ended questions. Semi-structured interviews entailed data collection from pre-identified key informants, including service providers, large traders and processors; as it was practically not feasible to organize them in discussion groups, given time constraints. The FGD method was only used to

collect data from some of the smallholder producers, since it was easier to organize them into groups than other VC actors given the fact that they are often concentrated in clusters (villages). This method was not feasible for traders, since these are mobile and dispersed and many times too busy to interview through group methods. Observation of available data was used in complementing some of the missing information.

#### 4. Findings of the Study

##### 4.1. Characteristics of Potato Value Chain in the Southern Highlands of Tanzania

In order to characterize potato value chain in the southern highlands of Tanzania, the author looked at potato value chain map, flow of commodity (potato), functions and constraints faced by actors including those related to policy enabling environment.

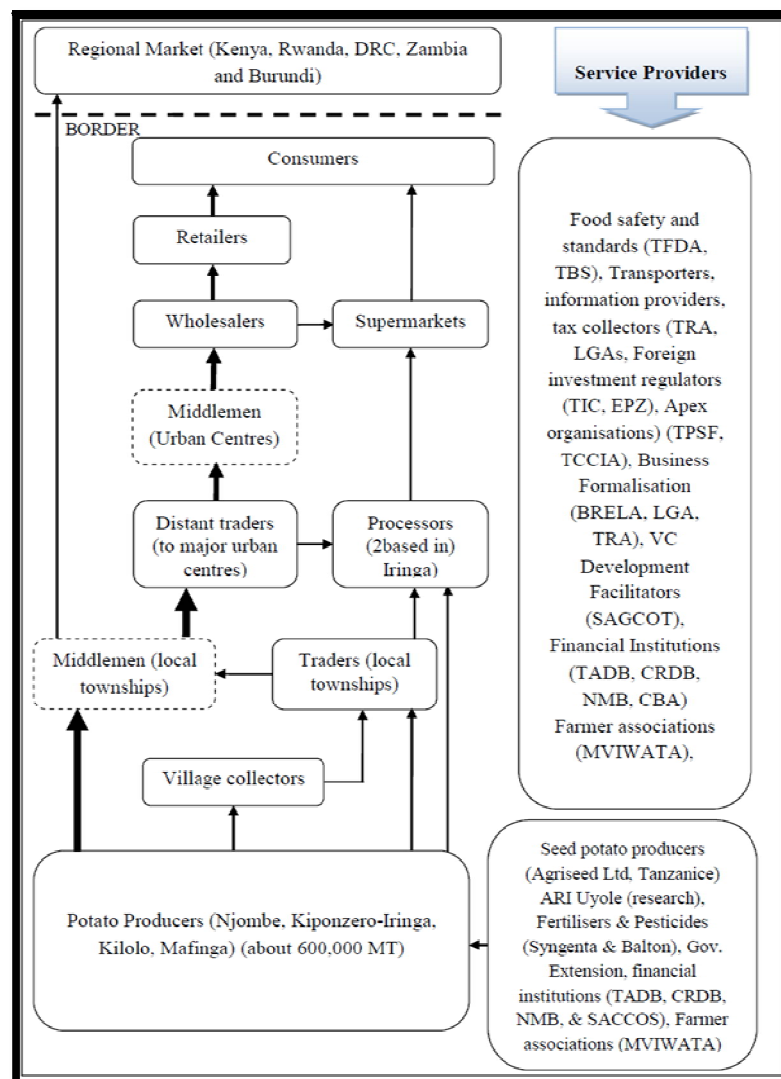


Figure 1: Potato Value Chain Map in Tanzania

Source: Fieldwork, 2018

In Figure 1, the Thickness of Arrows Represents Corresponding Flow Volumes of Potatoes

##### 4.2. Flow of Potato in Tanzania

From production areas the major destinations of potatoes are major urban centres particularly Dar es Salaam (the leading destination), Arusha, Mwanza, Dodoma and Tanga. During peak season potatoes find further destinations into regional markets in the neighbouring countries – Kenya, Rwanda, Sudan, Zambia and DRC). The key value chain actors in the potatoes value chain include input suppliers (seed potato, fertilizers and pesticides), producers, village collectors, middlemen (numerous), off-takers (traders and processors), wholesalers (based in urban centres), retailers and consumers. In terms of numbers these comprise of input suppliers (2 seed potato suppliers, 2 major fertilizer suppliers, and numerous pesticide suppliers), farmers, (numerous over 110,000 countrywide); traders (Makambako more than 100), middlemen (Njombe- 50-60), large processors (2 in Iringa), transporters (numerous), wholesalers (numerous), retailers (numerous), supermarkets selling potatoes (6 in Dar es Salaam). Generally, the potato value chain comprises of direct and indirect actors. The indirect actors basically provide services to direct actors at various nodes of the value chain. Figure 1 gives general picture of institutional flow of potatoes from production point to consumers and Table 1 & 2 summarize direct and indirect actors in potato value chain.

#### 4.3. Key Direct Actors in the Potato Value Chain in the Southern Highlands and Their Functions

Table 1 shows key direct actors in potato value chain and the functions they perform. The numbers of them were difficult to establish given great size of the study area and limited data sources in the study area.

Actors	Functions/Roles
Famers (producers)	<ul style="list-style-type: none"> <li>• Smallholders growing about less than 1 ha of potato in pure stands or intercropped with maize, large farmers cultivate up to 8 hectares or more – large farmers are in most cases traders or middlemen who also buy potatoes from smallholder farmers on behalf of urban traders;</li> <li>• Farm husbandry activities (buy farm inputs, do weeding, fertilizers and pesticide application, harvesting, and sorting)</li> <li>• They harvest up to 5-7 MT per ha under normal farmers conditions;</li> <li>• Sell potato to village collectors, local market outlets or neighbours;</li> <li>• Consume about 10% of potato at household level.</li> </ul>
Village collectors	<ul style="list-style-type: none"> <li>• Buy potato mostly on behalf of local urban-based traders;</li> <li>• Aggregate potato from farmers;</li> <li>• Transport potatoes to local urban-based off-takers and market outlets;</li> <li>• There 3 to 7 village collectors depending on size of the villages, production season (availability of potatoes)</li> <li>• They collect 5 to 10 metric tons of potatoes per day during peak season and less during offseason.</li> </ul>
Traders (based in local townships)	<ul style="list-style-type: none"> <li>• Provide funds to village-based potato collectors;</li> <li>• Act as intermediaries for distant/urban-based potato traders;</li> <li>• Transport potatoes from village collectors/farmers to near-urban and sub-urban centres (such as Njombe, Makambako Uyole and Mbeya);</li> <li>• Do temporary potato storage in warehouses and/or homes;</li> <li>• Selling potatoes to urban open market outlets and distant wholesalers.</li> </ul>
Distant urban off-takers	<ul style="list-style-type: none"> <li>• Provide funds to village collectors/local urban off-takers/middlemen;</li> <li>• Transport of potatoes to distant urban markets (wholesalers) such as Dar es salaam, Arusha, Mwanza; Dodoma and across national borders;</li> <li>• Do temporary storage (temporary) in warehouses based in local urban centres such as Uyole and Makambako;</li> <li>• Selling potato to urban open market outlets, supermarkets, wholesalers and exporters.</li> </ul>
Wholesalers (urban centres)	<ul style="list-style-type: none"> <li>• Buy potatoes from distant urban traders through middlemen at designated markets in urban centres;</li> <li>• Temporarily store potato in warehouses;</li> <li>• Sell potatoes in small quantities to retailers or consumers. The major outlets in Dar es Salaam are Mabibo (Ubungo), Mbagala and Kariakoo.</li> </ul>
Retailers and street food vendors	<ul style="list-style-type: none"> <li>• Buy potatoes from wholesales in the open market's outlets or distant urban traders –</li> <li>• Produce chips and locally made crisps;</li> <li>• Sell chips in small quantities to consumers;</li> <li>• Restaurants cook and sell vegetable soups to consumers.</li> </ul>
Supermarkets	<ul style="list-style-type: none"> <li>• Buy packaged and unpackaged potatoes from contracted off-takers;</li> <li>• Sell potatoes mainly to high and middle-income consumers in urban centres; supermarkets are basically retailers targeting these groups of consumers</li> </ul>
Exporters to regional markets	<ul style="list-style-type: none"> <li>• Buy potato from producers through agents (local village-based collectors or sub-urban based collectors);</li> <li>• Do sorting/grading, and packing;</li> <li>• Temporary warehousing</li> <li>• Transportation across national to the neighbouring countries (mainly Kenya, DRC)</li> <li>• Sell potato in the regional markets (Nairobi, Lusaka, Kigali, Comoros, etc.)</li> </ul>
Consumers	<ul style="list-style-type: none"> <li>• Buy potatoes mainly from urban-based wholesalers, retailers and supermarkets;</li> <li>• Consume potatoes</li> </ul>

Table 1: Description of Key Actors in Potato Value Chain

#### 4.4. Indirect Actors (Service Providers)

A number of indirect actors were identified providing some services in the value chain. These include the government, researchers, input suppliers, Tanzania Official Seed Certification Institute (TOSCI), various NGOs, market facilitators and donors. Table 2 shows the service providers participating in the potato value chain in the Southern Highlands of Tanzania.

Government	<ul style="list-style-type: none"> <li>• Setting by-laws, regulations and seculars regarding rule of the game in potato business e.g. setting up of weights and measures;</li> <li>• Local government authorities are setting up crop cess and levy</li> </ul>
Researchers	<ul style="list-style-type: none"> <li>• Uyole Research Institute - development of new seed potato varieties and tools;</li> <li>• Released varieties through ASA and seed potato producers in close supervision of TOSCI</li> </ul>
Input suppliers	<ul style="list-style-type: none"> <li>• Very few seed producing companies involved in production/multiplication of seed potato released by Uye ARI researcher institute and others foreign companies – teh major ones are Beula and;</li> <li>• Numerous fertilizer distributors and agro-dealers –the major players YARA and TFC – procure and distribute fertilizers;</li> <li>• Numerous pesticide distributors – major international companies include Syngenta, Balton, BASF, MONSANTO – importation and distribution of agro-pesticides. There are numerous local distributors of these inputs at different scales in local urban centres and even in villages.</li> </ul>
Transporters	<ul style="list-style-type: none"> <li>• In the Southern Highlands there are numerous transporters. The major ones include Simba Logistics Ltd, Tanzania Road Haulage (1980) Ltd, Bravo Logistics Ltd, Usangu Logistics Ltd, METL, ETG.</li> <li>• They transport potatoes from farmers to local urban centres; to distant urban centres and regional markets;</li> <li>• A normal practice is that distant traders of potatoes usually hire any truck available – most of these trucks are those coming back to Dar es salaam from transporting transit good to the southern highland or neighbouring countries (Zambia, DRC, Malawi)</li> </ul>
Extension agents	<ul style="list-style-type: none"> <li>• Village and ward extension staff – provide agricultural education &amp; extension services;</li> <li>• Do researcher-farmers liaison functions – technology transfer from researchers to farmers</li> </ul>
TOSCI	<ul style="list-style-type: none"> <li>• Inspection of seed multiplication farmers owned by seed-companies;</li> <li>• Testing of quality of seeds produced by seed companies – for purity and germination percent;</li> <li>• Issuing certificates to qualified seed production agents.</li> </ul>
Financial institutions and cooperatives	<ul style="list-style-type: none"> <li>• Provide loans to traders, processors and few selected potato farmers – the major ones in southern highlands include CRDB and NMB Bank and a number of micro-credit institutions and cooperatives such as SACCOS;</li> <li>• Provides training to loan applications;</li> </ul>
NGOs	<ul style="list-style-type: none"> <li>• Provide capacity building services to farmers on agronomic, postharvest, and marketing;</li> <li>• MVIWATA and MIICO lobby the government, donors on behalf of farmers;</li> <li>• FINCA, PRIDE and BRAC provide financial services and training.</li> </ul>
Donors	<ul style="list-style-type: none"> <li>• Major ones are DIFD, USAID, SIDA, GIZ, IFAD, AfDB, WB, JICA</li> <li>• Providing diversified support to farmers and off-takers through implementing partners.</li> <li>• Main support provided on farmers' capacity building of farming and postharvest handling, produce quality and marketing.</li> </ul>

Table 2: Indirect Actors in Bean Value Chain

#### 4.5. Gross Margin Analysis

Gross margin analysis was done along the chain by tracing the movement of potato from farmers in Njombe to traders selling the same to processors based in Iringa town. This was so done to keep consistency and follow-up to find out which institutional actor gets more or less returns to the functions performed. The calculation was done during harvest season (June - July).

#### 4.5.1. Gross Margin for Potato Farmers

Gross margin analysis for potato farmers was established during focus group discussion (FGD) with farmers in Njombe (Igagala village) and Mkambako township. The figures are average of data obtained during focus group discussions. Igagala is one of the leading villages in terms of potato production in Njombe region.

Functions	Cost (TZS)	Cost (USD*)	GM/MT
Land clearing	50,000	22.42	
Cultivation (ox plough)	70,000	31.39	
Ridging	40,000	17.94	
Planting	70,000	31.39	
Fertilizer	240,000	107.62	
Fertilizer (Top dressing)	240,000	107.62	
Weeding	100,000	44.84	
Fungicide application	360,000	161.43	
Pesticide application	288,000	129.15	
Harvesting	15,000	6.73	
Total	1,473,000	660.54	
Sales	2,400,000	1076.23	175,357.14
GM	927,000	415.70	285,714.29
GM%	39	39	112,142.86
			39

Table 3: Gross Margin Analysis for Farmers (Per MT)

\*The USD –TZS exchange rate during time of the study was 1USD = TZS 2230

Note that the gross margin for farmers were analysed per acre of land grown with potatoes which was then converted to gross margin per MT to be consistent with traders and processors. The GM% does not change with this conversion.

#### 4.5.2. Gross Margin for Potato Traders

The focus group discussions with traders in Makambako indicated that they buy potatoes from different villages (about 6 to 70 km from the township). They indicated that sometimes farmers from nearby villages bring potatoes to the Makambako market. The price of potato varied significantly from TZS 20,000 per bag (100 kg) during peak harvest period but went up to TZS 80,000 during offseason. The buying price during the study was around TZS 40,000 per bag (TZS 400 per kg). these traders sold at about TZS 1000 per kg to processors. The gross margin for traders was calculated at Makambako for traders who indicated that they sell potato to the two processors that are based in Iringa town (Crispo Snack Food Ltd and Tosti).

Functions	Cost (TZS)	Cost (USD)
Buying	408,163	183.03
Transport	51,020	22.88
Loading/Offloading	20,409	9.15
Pay (Market levy)	39,796	17.85
Pay (village cess)	20,000	8.97
Total Cost	519,387	232.91
Sales (Processors in Iringa)	1,000,000	448.43
GM	480,613	215.52
GM%	48	48

Table 4: Gross Margin (Per MT) for Local Potato Traders (Selling Potato to Processors)

#### 4.5.3. Gross Margin Analysis for Potato Processors

Two processors were interviewed in Iringa town, namely, Crispe Snack Ltd and Toste. The former produces potato crisps while the latter grinds potatoes into flour for mixtures in the confectionary products (biscuits and bread). Crispo Snack Food Ltd processes potatoes into differentiated crisps (flavoured and non-flavoured). The production manager provided more detailed data and information pertaining to potato processing into crisps which provided opportunity for the author to calculate gross margin. The gross margin was calculated for processors. The conversion ratio between ware potato and crisps was shown to be approximately 3:1 (i.e. 3 kg of ware potato give 1 kg of crisps). The processors generally process about 0.7 to 1 metric ton of ware potato per day, producing about 240 kg of crisps. This output of crisps is packed in 40 boxes containing packages weighing 30g each. The price of each package is TZS 650 at the factory. The same is sold at TZS 1000 in Dar es Salaam supermarkets.

Functions	Cost (TZS)	Cost (USD)
Buying (raw potatoes) TZS 1,000/kg	1,000,000	448.4305
Transportation (Raw potatoes)	71,429	32.03094
Loading/offloading	14,286	6.406278
Cooking oil	1,842,857	826.3933
Food flavour	1,714,286	768.7381
Storage (free)	0	0
Sorting/cleaning (free)	0	0
Cooking gas	185,714	83.27982
Power (20 units/700 kg)	16,327	7.321525
Transport to markets (Dar)	392,857	176.1691
Total Cost	5,237,756	2348.77
Sales (at factory price)	10,214,286	4580.397
Gross Margin	4,976,531	2231.628
GM%	49	49

Table 5: Gross Margin Analysis for Processor (Per Metric Ton)

#### 4.5.4. Comparing Gross Margins of Farmers, Traders and Processors

From the calculations above, it seems the traders get more or less the same gross margin as processors (48% and 49% respectively). This may be interpreted that traders and processors operate in a win-win situation such that each of them gets fair return to the functions performed. From the calculations above farmers get gross margins of about 39%. This is less than that of processor and traders by about 10%. This calls for interventions that will enable producers to increase their gross margin. This figure concurs with many studies which generally conclude that farmers are exploited by off-takers.

#### 4.6. Constraints Facing Actors in Potato Value Chain

##### 4.6.1. Farmers

Farmer's interviews revealed a number of challenges that need particular attention from different actors. The challenges mentioned by them were:

##### 4.6.1.1. Limited Availability of Seed Potato

During the time of study potato farmers indicated that they sourced most of seed potato from neighbours because there was limited availability of recommended seed. Potatoes farmers indicated that they use impure seeds due to limited availability and high price when available - about 35 to 65% of seeds used by farmers are impure. There were only two producers of seed potato Uyole Research Institute (ARI Uyole) and Mtanga Farm. These however were constrained by a number of issues. ARI Uyole was constrained by regulatory constraint that it was not legally allowed to sell seed potato directly to farmers prior to Certification by the Tanzania Official Seed Certification Institute (TOSCI) which basically takes a lengthy of bureaucratic stages. Lengthy process and time taken from release of pre-basic seeds to the time seed potato is released for use by potato farmers – the process takes 6 to 10 years because of a chain of agencies that must be involved – that is researcher, Agricultural Seed Agency (ASA), the Seed production company; while TOSCI has to intervene along the process by doing repeated inspections. Uyole Agricultural Research Institute (ARI Uyole) has a number of investment items such as infrastructure, machinery, laboratory facilities and other equipment/tools, most of which have become obsolete because of wear and tear as they have been into use for so long without repair or replacement. Modern and fast equipments and techniques for laboratory investigations are lacking. Mtanga Farm on the other hand was a donor-funded project which was about to phase-out despite its good work done during project implementation phase. There was an emerging company Beula seed Ltd which was just emerging but faced with limited availability of finance required to invest in modern seed production facilities. Other emerging private companies involved in seed potato production are Tanzanice (Iringa), Crop Bioscience (Arusha). Due to limited availability and cost of production, the price of seed potato is too high for farmers to afford. The price per kg during study period was TZS 1,000 (TZS 1,000,000 per MT).

Potato varieties commonly grown in the study areas include Kikondo (CIP 720050), Arka, Kagiri, Kidinya, Tigoni, Baraka and Sasamua CIP, Tengeru, Asante, Kadinye, Obama, and Kala, to mention a few. Different varieties of round potatoes have different characteristics such as size, shape, colour, taste, dry-matter content, processing qualities, yield, storability, and resistance to diseases such as late blight and bacterial wilt. Some varieties are good for boiling, others for chips (French fries), and others for processing into snacks or crisps. Potato farming in the country is typically smallholder cultivating 0.9 to 3 hectares (Wolter, 2008). Under prevailing smallholder conditions potato yield is 5-7 MT per hectare against potential of up to 40 MT per hectare if improved seeds such as CIP (Kikondo) are used under good agronomic practices.

##### 4.6.1.2. Dominance of intermediaries in potato Business

Farmer complained that the potato business is invaded by too many middlemen coming from urban centres during harvest season. these middlemen range from village collectors, urban traders from local suburban areas such as Njombe and Makambako and distant traders from major urban centres such as Dar es Salaam, Arusha and sometimes from

neighbouring countries especially Kenya. These middlemen go around villages from house to house looking for potatoes. They usually determine price of potatoes due to their higher bargaining power relative to farmers'. Due to limited financial capabilities and limited business experience, farmers cannot afford to transport the commodity to urban markets, as these are also dominated by middlemen. It is almost impossible for a farmer to penetrate and sell the produce in Urban centres such as Dar es Salaam where one needs to meet a chain of middlemen before meeting buyers. A result has been cutting down the farm-gate price of potato.

#### 4.6.1.3. Use of Inconsistent Measures and Weights

Potato farmers reported a persistent challenge related to weights and measures used in selling potato to off-takers. Generally, farmers sell potato using containers (volume) as opposed to distant traders who sell the commodity to consumers in kilogramme. Inconsistence occurs when containers have different weights. Farmers have been selling potatoes and other farmer produce in bags which are traditionally assumed to weigh 100 kilogrammes but in practice, the bags may weigh more (150 kg or more have been recorded). This is one of the ways off-takers have been blamed to cheat farmers. The commonest local name for overweighed bags in the area is *Lumbesa* (a bag filled above the required weight and level). The government has been discouraging such an unfair business practice with limited success. Farmers would like to use kilogramme as a standard measure in selling potato but they have limited bargaining power against traders who usually force them to use containers such as *debes*, *ndoo* and *gunia*. These are both volumetric measures which vary when measured in kilogramme (a weight measurement). Tanzania Weights and Measurement Agency (WEMA) is government body responsible for managing weights and measures in the country. The prevalence of inconsistent measures and weights may be a result of weakness on the part of this institution.

#### 4.6.1.4. Diseases and Pests and Counterfeit Agrochemicals

Potato plant is physiologically highly prone to a number of diseases and pests. The most serious diseases are fungal diseases (early and late blights) which affect the family of plants in the *Solanaceae* family (which includes tomatoes). Adverse weather conditions (frost, excessive rains during rainy season promote prevalence of diseases especially caused by fungus. The most common potato diseases in the area are early and late blight, *fusarium*, bacterial wilt, soft rot, stem cancer and viral diseases. Fungal diseases are very damaging if measures are not taken. Over 70% of cost of controlling diseases in potato goes to fungal diseases. This problem is aggravated by agro-dealers who distribute counterfeit pesticides which fail to control the diseases. Furthermore, farmers indicated high prevalence of agro-dealers that distributed low-quality agrochemicals which often fail to control pests and diseases. Farmers have been incurring substantial cost buying agrochemicals such as pesticides and fungicides only to find that they are not effective in controlling the diseases and pests in potato farms. Prevalence of counterfeit agrochemical might arise as result of weakness of the Tanzania Pesticide Research Institute (TPRI) which is responsible for managing local production, imports, blending and use of agrochemical in the country (URT, 1979).

#### 4.6.1.5. Short-Shelf Life

Potato in Tanzania has limited processing options apart from raw cooking, French Fries and chips. Failure to get difficult to get buyers at the right time can have disastrous implications for farmers. Once mature potato plant needs to be harvested and sold immediately. Middlemen have been using this natural short-coming of the plant to set low price especially during peak season which has traditionally discouraged farmers to expand production scale. This constraint has been one of the major reasons why financial institutions avoid giving loans to potato farmers. This constraint basically goes along the entire chain of actors in the raw potato value chain. Once potato is in your hands you need to dispose it off as soon as possible to avoid potential loss if it rots while in your hand (said one farmer at Igagala Village).

#### 4.6.1.6. Limited Access to Finance

Like other crop producers in Tanzania, the interviewed potato farmers indicated that they don't have easy access to finance because financial institutions avoid extending loans to risky of losing money. Farmers reported that they got micro-loans from locally established financial institutions such as Njombe Cooperative Bank (NJOCBA) and SACCOS. However, these institutions face critical financial shortage mainly due to low capital base. Interviews with NJOCBA revealed that the institutions get from corporate financial institutions especially CRDB and NMB Banks which give them bank looking at who their customers are and sometimes they give conditions that they should not extend loans to farmers to reduce changes of default.

#### 4.6.2. Constraints Faced by Processors

Interviews with potato processors revealed a number of constraints that need policy and institutional attention. The major constraints were inconsistent supply of quality potato, limited availability during offseason, frequent power blackouts and limited availability of cooking oil. Limited availability of consistent supply of quality potatoes from farmers because of use of recycled planting materials – farmers bring mixed varieties of seed potatoes – there is a need for existing seed production companies to increase their outputs so as to enable farmers get good planting materials at affordable prices. Processors also mentioned limited availability of potatoes – especially during dry season – during this time middlemen (who usually control potato business at farm-level) take all potatoes to large cities like Dar es Salaam or export outside the country. Buying potatoes from these middlemen adds up the cost of production significantly – the prices of potatoes usually go up to TZS 80,000 per bag (TZS 800,000 per MT). Frequent power blackouts were another major constraint mentioned by processors - this has obliged the companies to procure emergence power generator which



actually consume a lot of fuel (diesel), thereby adding processing cost substantially, affecting their gross margin as they have limited power to control market price of their products due to over flow of imported products such as crisps and chips in the urban markets. The processors also mentioned constraint related to limited supply and high prices of double refined cooking oil which gives good quality crisps. Most times the companies use unrefined oils to process crisps compromising the quality.

#### 4.6.3. Potato Traders

The constraints of traders were more or less the same as those of farmers. The constraints reported by traders were related to accessing the commodity from farmers and marketing. Specifically, they mentioned poor feeder roads which gave them difficulty getting to farmers in remote villages, the conditions of feeder roads were worse during rainy seasons as most of them are mud and sandy roads. Another constraint was high incidence of diseases which necessitated sometimes lending their money to farmers to assist them buy pesticides for controlling potato diseases and pests. Difficulty in getting buyers at the right time was another major constraint mentioned by traders. This is again related to the perishable nature of the commodity (potato) – cannot stay longer in bags. Delays put them in the risk of losing their working capital. This is connected to lack of storage facilities (cold rooms/technology) for seed and ware potatoes at the market place. Too much taxation (village cess, road and market levy) and high variation and unpredictable potato prices between peak and offseason which makes it difficult to predict and plan in advance on capital requirement and marketing.

#### 4.6.4. Regulatory Challenges

Regulatory challenges are cross-cutting constraints that affect all groups of actors in the value chain. The regulatory framework in Tanzania is such cumbersome that it inflates cost of doing business in the country (ACT, 2015). A typical example: doing business in agro-input supply chain is regulated by more than eight ministries those responsible for Agriculture, Industry and Trade, Science and Technology, Labour and Employment, Home Affairs, Regional Administration and Local Government, Finance, Communication and Transport, etc. These regulatory bodies are not coordinated, there is limited transparency and charges are quite high compared to services offered. A number of regulations, policies and laws concern potato value chain in Tanzania. The author briefly discusses a few; including seed potato, fertilizers and pesticides. However, there is myriad of policies, regulations and strategies that relate to potatoes value chain. A single page cannot suffice to describe them all. For convenience, the study briefly discusses those related to seed potato certification and protection; fertilizer and pesticide regulation; food processing and business or investment facilitation.

##### 4.6.4.1. Seed Potato Certification

Certification of seed potato; whether locally developed by research institutions or imported is a responsibility of Tanzania Official Seed Certification Institute (TOSCI). The Seed Act of 2003 and the Seed Regulations of 2007 make overall provisions for the control and regulation of the standards of all agricultural seeds. Seed Act empowers TOSCI with all aspects of seed quality control and certification. TOSCI is responsible for inspection of all National Seed Performance Trials of new varieties. It is responsible for the inspection of seeds produced by seed-producing companies while in farms. It certifies seeds that meet its set quality criteria. Prior to release to farmers for use seeds developed by researchers have to pass through a lengthy series of inspections and approvals involving researcher, Agricultural Seed Agency (ASA), Seed Production Company (SPC). TOSCI is engaged in all steps involving this movement. Importation of seed potatoes needs to meet the plant protection regulation established in the Plant Protection Act.

##### 4.6.4.2. Laboratory Services

Most of agricultural laboratory services are owned by the government. No private labs needed to improve laboratory testing of soil samples, seed properties, fertilizer content and efficacy, and food safety parameters (moisture, filth, contaminants, myco-toxins, pesticide residues, etc.). There is no regulatory framework for private firms to establish seed, fertilizer, pesticide and plant testing laboratories, as well as inspection services. Public-private partnership on these services is nonexistent. Implication for agribusiness investment in smallholder potato value chains: The absence of accredited laboratories hinders development of effective seed and fertilizer industries, as well as the emergence of scientific agriculture. It also increases laboratory testing costs as samples must be sent to foreign countries' labs. Inadequate testing facilities also have negative implications for food safety (and health) within Tanzania, and the competitiveness of agricultural exports that must meet exacting international standards

##### 4.6.4.3. Fertilizers

Tanzania Fertilizer Regulatory Authority (TFRA) was established as a body mandated to enforce laws / policies / regulations governing the manufacturing, importation, use of and trade in fertilizers. The mandate of TFRA includes: Fertilizer quality control in the country; issuing and cancellation permits for imports and exports of fertilizers and supplements; sets guidelines and culture for the dealers in fertilizer manufacture and distribution within the country. The regulation requires that three seasons of tests be carried out under Tanzania Fertilizer Regulatory Authority supervision at a cost of \$10,000 per season for each new fertilizer product, paid by the importer or blender. The implication for agribusiness investment in smallholder value chains is that this is a serious barrier to entry into blending business, capable of formulating fertilizer to meet specific crop needs and soil deficiencies. Hence, investment in blending and importing of fertilizer ingredients for local blending will be deterred.

#### 4.6.4.4. Pesticides

The main body responsible for the regulation of pesticides in Tanzania is the Tropical Pesticides Research Institute (TPRI) under the ministry of agriculture. TPRI is responsible for the Management of Pests, Pesticides and Biodiversity for food security, human health safety and facilitation of internal and external trade of these materials. TPRI was established with a mandate to undertake, promote, and evaluate the management of pests, pesticides and biological diversity. The main functions of TPRI include approval and registration of pesticides imported or manufactured within the country; control and regulate the manufacture, importation and sale, distribution and use pesticides in Tanzania; publish in the Gazette a list all pesticides approved and registered in the country. Sometimes, conflicts occur when some of its functions are also performed by the Tanzania Food and Drug Authority (TFDA) or Tanzania Bureau of Standards (TBS).

#### 4.6.4.5. Food Processing

The regulatory authority is Tanzania Food and Drug Authority (TFDA). Any firm aspiring to establish food processing business, whether processing plant or restaurant must obtain certificate and permit from TFDA. TFDA is responsible for controlling the quality, safety and effectiveness of food, drugs, and herbal drugs in the country.

#### 4.6.4.6. Taxation

Tanzania Revenue Authority (TRA) is government corporate body responsible for tax collection in the country. TRA is imposing 18% VAT charged on bags produced locally, services rendered at the port e.g. bagging of bulk fertilizer, and on transport services. Implication for agribusiness investment in smallholder value chains: These taxes increase operating costs for fertilizer importers and distributors and reduce fertilizer sales. The government charges import duties on seed, VAT applied to packaging materials, and cess charged on locally produced seed by local government authorities. Such measures need to be balanced against chronic budget deficits at all levels of government, however. The taxes on packaging materials and cesses reduce the competitiveness of domestic seed companies in the domestic seed market vis-à-vis regional suppliers. Furthermore, traders in potatoes have to pay other taxes such as levies and cess and local government levels.

#### 4.6.4.7. Business Environment for Investors

The Export Processing Zones Authority (EPZA) Tanzania offers generous fiscal incentives under the Export Processing Zone/Special Economic Zone (EPZ/SEZ) schemes to attract Foreign Direct Investments (FDIs) and Domestic Direct Investments (DDIs). Incentives can be both fiscal and non-fiscal. Fiscal incentives include: Import duty and VAT exemption on project capital/deemed capital goods and Import Duty Draw Back Scheme. Non-fiscal incentives include immigration quota of up to 5 people, guaranteed transfer of net profits or dividends of the investment, payment in respect of foreign loans, remittance of proceeds net of all taxes and other obligations, royalty fees and other charges, payment of emolument and other benefits to foreign personnel. Special incentives are provided to strategic investors with projects of over US\$ 20 million that offer specific/great impact to the society or economy. The EPZ works in collaboration with the Tanzania Investment Centre (TIC). To qualify for and obtain TIC Certificate of Incentives minimum fixed investment cost for New, Rehabilitation and Expansion Projects should be at least US\$ 100,000 for projects which are wholly owned by Tanzanian Citizen(s) and US\$ 500,000 for projects which are wholly owned by foreign investors or if a joint venture. The incentives guarantee availability to holders of TIC certificates of incentives. These investment figures are too high for local SMEs.

## 5. Conclusion and Further Research

Potato subsector has great potential to contribute to Tanzania's economic growth as it shows both prospects: income generations and national food security. Addressing the major institutional and operational challenges that constrain value chain efficiency will likely unleash the promising potential that is in important agricultural subsector. Further research is required in finding out ways that increase the share of income generated in the value chain that goes to farmers (producers). Ideal studies are those that will come up with appropriate business models that minimize the dominance of middlemen in potato value chain and promote adherence to standard measures and weights among value chain actors.

### 5.1. Recommendations

The challenges presented by this study would require appropriate interventions: the major recommendations this study propose include:

#### 5.1.1. Promotion and Legal Framework for Contract Farming Business Model

The development partners and government should Support and encourage potato off-takers (processors and/or wholesalers) to adopt out-grower (contract farming) consortium business model which basically cuts down the number of middlemen engaged in potato value chain, thereby boosting up smallholders' and off-taker's profit margins. This business model improves farmers' access to farm inputs and extension education and enhances off-takers access to consistent supply of raw material (potato). The model should comprise of a consortium of SMEs that work toward a common goal of supporting farmers while delivering mutual benefit from this support. The consortium should comprise of potato off-takers (processors or traders), input suppliers (fertilizers, pesticides and seed potatoes), financier (provide loan to the off-takers) to buy inputs to be provided to potato farmers on credit. Alongside, the government should establish legal

framework that enables effective working of the model to address challenges related to breach of contract among the participating parties, default and side selling among farmers.

#### 5.1.2. Support Seed Potato Production

There is need to support seed production companies in the construction storage facilities with requisite amenities for preservation of seed potatoes such as temperature control system that reduces potato losses due to heat stress and therefore prolong potato shelf-life. This will enable private companies to produce adequate quantity of quality seed available to potato farmers at affordable prices. Among other means of mobilizing the required investment capital, the government should negotiate with donors and development partners to provide more "hard" support instead of putting much attention to soft support such as training of farmers and staff, which has basically not yielded good substantial results. The support now should be directed towards development/improvement of infrastructure/facilities and equipment required in the production of potato tissues such as laboratories, green houses and irrigation infrastructure.

#### 5.1.3. Review of Certification Fiscal Policy

Furthermore, the government should review its Policy on imports of seeds. The review should relook at how quality seed potatoes could be imported into the country. Specifically, the government should review the Plant Protection Act and regulations that restrict entry of seed potato into the country e.g. from international seed potato producers. The companies may be allowed to temporarily import seed potato from high producing countries in Africa or Europe under special monitoring for quality. Amendment of fiscal policies that require that the qualification for obtaining TIC Certificate of Incentives should meet fixed investment cost of at least US\$ 100,000 for Tanzanian Citizen(s) and US\$ 500,000 for foreign investors. The incentive needs to be reviewed to guarantee availability to holders of TIC certificates of incentives.

#### 5.1.4. Reinforcement of Laws Regulations

The government of Tanzania have regulatory bodies in charge of imports of agrochemicals. This is Tanzania Pesticides Research Institute (TPRI). The government also have regulatory authority for managing Weight and measures in the country Tanzania Weights and Measures Agency (WEMA). The study calls upon these authorities to re-look and their present operational strategies and scrutinize the best ways that will effectively enhance their operations. Where the government is required to help such as by enacting the appropriate legal instruments, it might be responsibility of these regulatory authorities to inform the government.

#### 5.1.5. Support on Potato Research

The government should support research institutes such as ARI Uyole to be able produce adequate and quality tissue culture and mini-tubers e.g. by supporting them with the construction of green houses, laboratories and irrigation infrastructure. The government should support policy initiatives that strengthen flow of pre-basic potato seeds from researchers to producers, through Seed Agencies and seed production companies by shortening the time taken from research to producers which currently takes up to 10 years. More private organization should be encouraged invest potato research facilities and technology. Today, most of agriculture research pertaining to development of potato cultivars is done by the government institutions which rely on support from the government or donor agencies. Training of research staff on modern skills/techniques employed in seed potato development is also required.

#### 5.1.6. Establish Storage Facilities

Support establishment of public/community storage facilities (warehouses) equipped with temperature regulators to control heat stress that causes potatoes to rot – where farmers will pay a little amount of money to contribute to storage costs. There are technologies that use solar energy to regulate temperature e.g. lowering it to 3<sup>o</sup> C (storage temperature for potatoes). These facilities should be developed closer to farming communities. Support construction of potato storage facilities at major potato markets such as Mabibo - Dar es Salaam will also be a viable option to support potato wholesalers.

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