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Skills for Trade and Economic Diversification (STED) in the Yam, Roots and Tubers Sector of Ghana



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**Skills for Trade and Economic Diversification (STED)
in the Yam, Roots and Tubers Sector of Ghana**

By

INTERNATIONAL LABOUR ORGANIZATION

September 2019

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Dr. Irene S. Egyir (Lead Consultant)

Dr. Theophilus Adomako (Skills Expert)

Table Of Contents

ACKNOWLEDGEMENTS

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

ACRONYMS

1. INTRODUCTION

- 1.1 Background to the Study
- 1.2 Objective of the Study
- 1.3 Approaches and Methodology
- 1.4 Organisation of the Report

2. VALUE CHAIN PROFILE

- 2.1 Firm-Level Characteristics and Business Capabilities of Yam Value Chains)
- 2.2 Value Chain Employment (occupations and qualifications of employees)
- 2.3 Institutional Mechanisms

3. VALUE CHAIN OUTLOOK

- 3.1 Overall World and Yam Market Trends
- 3.2 Scanning the Business Environment
- 3.3. Gaps in Business Capabilities

4. IMPLICATIONS FOR SKILLS DEVELOPMENT

- 4.1. Projected Skills Demand versus Current Supply
 - 4.1.1 Labour market evidence
 - 4.1.2 Sources of labour
 - 4.1.3 Supply of skills in the agricultural sector
 - 4.1.4 Proposed response to future skills needs

5. CONCLUSIONS AND WIDER POLICY IMPLICATIONS (LEAD CONSULTANT AND SKILLS EXPERT)

REFERENCES

List Of Tables

Table 1: Trends in output, area and yield of selected root and tuber crops in Ghana

Table 2: Age of establishment, licenses and share of company ownership

Table 3: Turnover by employee and by establishment (GHS'000)

Table 4: Current market channels and potential usage in the future (proportions)

Table 5: Concentration of business processes and costs (GHS'000)

Table 6: Rating of skills of yam employees

Table 7: Import performance of main suppliers and regional suppliers in USA

Table 8: Export destination of yam from Ghana, 2016

Table 9: General employee characteristics

Table 10: Business capabilities gaps and vision set up for the root and tuber crops value

Table 11: Crops Gaps Yield Analysis in Ghana, 2016

List Of Figures

Figure 1: Average and potential yields of roots and tubers in Ghana

Figure 2: Type of establishment and concentration of Sweet Potatoes, Cassava and Yam

Figure 3: Trends in wholesale prices of yam and cassava in the domestic market

Figure 4: Trends in yam prices in the international market (2000-2016)

Figure 5: National institutional setting

Executive Summary

Introduction:

The value chain development of cassava, yam, cocoyam, potato and sweet potato have been prioritised by the Government of Ghana and other international organisations owing to huge potential that these crops command in the areas of wealth creation, business and trade opportunities, food security and nutrition, foreign exchange earnings, technology development and adoption, partnership and networking, scholarship and entrepreneurship. The International Labour Organisation (ILO) under its “Strengthening the Employment Impact of Sectoral and Trade Policies (STRENGTHEN)” project, funded by the European Union has focused on the capabilities of country partners to analyse and design sectoral and trade policies and programmes that would enhance employment creation in terms of quantity and quality. One component of this project is “Assessing and Addressing the Effects of Trade on Employment – Phase 2 (ETE II)”. This component was designed to support developing countries in harnessing international trade and trade-related foreign investment towards providing more opportunities for decent work within developing countries and raising the number of developing-country workers who are productively employed. In this component, the project commissioned several studies to develop and strengthen global- and country-level knowledge on the effects of trade and trade policy on employment. It is under the ETE II component of the project, that the study on “Skills for Trade and Economic Diversification (STED)” is being conducted in a selected export value chain of the partner countries with the aim of aligning skills policies with value-chain strategies for export growth, economic diversification and employment creation.

An eleven-point task was assigned to two Consultants, comprising a Lead Consultant (Agricultural Economist) and a Skills Expert. The data analyzed was obtained through desk search, the TRAVERA SURVEY (2018), other data bases and key informants representing actors in the root and tuber crops value chain in Ghana. The interviewees included 20 persons who engaged in domestic trading, exporting, research, academia and project management in the root and tuber value chain. Three levels of analysis were carried out: policy, institutional and enterprise-level. In general, the analysis focused on the appropriateness of state and firm level strategies and activities in enhancing exports, promoting economic diversification, enabling more and better jobs, ensuring that firms (including farms) find workers with the right skills, and helping workers acquire the skills needed to find productive employment. A workshop was organized that sought suggestions and comments from the stakeholders of the study which were incorporated to improve the quality of the draft report to in order to get the final STED report.

Summary of findings:

Description of the value chain profile of root and tuber crops in Ghana: The roots and tuber crops contribute about 50% to the agricultural gross domestic product of Ghana. The last decade trends in area, output and yield show promise though yield estimates are far below the potential. The most important value chain of root and tuber crops is the fresh form, taken up directly by individual consumers and households. Other value chains that are developing is export for yam and processing for cassava. However, value chains for the other crops (cocoyam, sweet potatoes, potatoes) are underdeveloped. Further observation indicates that yam and cassava are well concentrated in the wholesaler, exporter and cooperatives establishments and factories are almost non-existent.

In general, one or more root and tuber crops are cultivated in all the regions of Ghana. In terms of business capabilities, turnover adequacy was measured; it was adequate for firms, employees and the various establishment; the highest turnover was made by exporters in 2018. Domestic trade, wholesaling is the most important marketing channel for both the current and future periods. The use of traditional and intermediate technologies is common; research is promoting improved planting materials and high-technology machinery in processing. Business processes are concentrated on raw material procurement, transportation, labour, utility and communication; most cost is on procurement and labour.

Skills of workers are deployed at five levels: General management, field operations, post-harvest handling, processing, distribution and marketing support. The current situation suggests a fairly good position; lack of skills of workers was not listed as an important constraint militating against starting yam business. Operations with regards to efficiency and cost management, quality management and delivery time are the most important considerations of employees. However, access to good quality inputs and equipment machinery is considered quite a limiting factor in competitiveness. Few firms benefit from any agency or institute that conducts research and development for their product and the market. Less than 20% of firms use services of universal banks, savings and loans companies and informal money lending institutions. Due to the very large range of services required to complete activities in the value chains, the employment generation can be high. It is easier recruiting low skill workers that is abundant and relatively engaged at affordable cost.

Institutional mechanism: The structure of the institutional mechanism is well designed: there are well-known employer and worker organisations, educational and training institutions, professional associations and export councils, development agencies with interest in root and tuber crops and government regulatory organisations and ministries. The lead worker representative organisation for agriculture is the Ghana Employers Association and GAWU of TUC. Employers may also join platforms such as the Federation of Association of Ghanaian Exporters (FAGE) and Private Enterprise Federation (PEF). The Ghana Yam Development Council is the advocacy professional body and the Ghana Root Crops and Tubers Exporters Union (GROCTEU) ensures education and quality service provision.

The Ministry of Education (GES) oversees public and private institutions that offer courses in agriculture and agribusiness at the basic, secondary and tertiary levels. There are specialized agricultural technical and vocational education training (ATVET) institutions managed by the Human Resource Directorate of MoFA and the Ministry of Employment and Labour Relations (MELR).

The interest of Development agencies such as IFAD, World Bank and Danish Development Agency has been shown in the support provided to design and implement projects and programmes that focus on roots and tubers. Notable among the projects are RTIP/RTIPM, WAAPP, RTC and GASIP. The Ministry of Food and Agriculture is the key government body mandated to lead in the enforcement of rules in the sector. It collaborates with other departments and agencies of ministries (Trade and Industry; Environment, Science, Technology and Innovation; Education; Health, Finance and the Ghana Investment Promotion Centre) to regulate laws and legislation related to roots and tuber crops production, processing and trade. Application of agrochemicals by firm/firms, food safety and standards, port activities, teaching syllabuses, research and extension and advertisement are controlled by organisations under the various ministries. The public sector partner with the private sector to regulate sustainability practices such as Fairtrade, Global GAPs, No Child Labour and other certification for UTZ and Rain Forest Alliance.

Value chain outlook: The outlook on the value chain is promising; the World Trade Organisation is promoting trade liberalization and minimum tariff. Hence, trade flows between developing and developed countries have been sustained and Ghana's food export is growing, although the value is low. Ghana is the leading export of yam in the world market, especially to the European Union and the United States of America. New markets are being explored in Canada and African countries such as Mali. This is in response to the generally low and declining volume and values of export. The Political dynamics of the country somewhat encourage root and tuber crop production and commodity trade; there is trade liberalization, and root and tuber crops are considered among the food security tools targeted for improvement. The dwindling budgetary allocation questions the full political commitment and support. The Economic fundamentals do not favour promotion of private sector investments: double digit inflation and interest rate and depreciating Cedi. The effect of exchange rate on commodity trade is mixed; imports of fertilisers and other inputs (machinery and agro-chemicals) are affected negatively while exports of yam and other commodities are favoured. Social wellbeing issues of relevance include gender, child labour and employee welfare. There is gender division of labour in the root and tuber value chains; the dominance of males in production and females in processing and trade is well-known. The export trade is dominated by males although women are engaged in many of the stages prior to export; the proportion of female in the export business is significant. Child labour is related to apprenticeship, where children in producing and trade households assist in various non-hazardous activities. No cases of employee abuse have been recorded in any official statistics.

The technological dynamics are not well developed; there are a wide range of dealers who offer simple and sophisticated machinery for both pre-harvest and post-harvest activities. Post-harvest machinery for cargo handling is mainly at the ports prior to export, otherwise manual handling and simple packaging and sealing is carried out. The ecological environment or agro-ecology that support the cultivation of the yam and other root crops include both Savanna and Forest zones; the soils and climatic factors are adequate and incidence of pests and diseases are managed organically and with inorganic agro-chemicals. The physical environment factors, which include park houses and roads are underdeveloped. Access to financial institutions for savings and loans is restricted due to location and company policy issues; telecommunication is fast growing and the use of mobile telephony for market information is very popular. There are a number of research institutes that support agronomic, pest and disease and food safety enquiry: Noguchi Memorial Institute for Medical Research, Centre for Scientific Research into Plant Medicine, Food Research Institute, Kwame Nkrumah University of Science and Technology, Food Science Department and University of Ghana, Food Science Department. The legal environment is developing in that there are laws promulgated to support policies on quality seed and planting materials, pesticide handling and application, food inspection for sanitary and phytosanitary enforcement and standardization. Monitoring for enforcement may be weak although the court system is working quite well and the following agencies with mandate exist: Ghana Police Service, Narcotics Control Board, Bureau of National Investigations, Customs Excise and Preventive Service of the Ghana Revenue Authority, Ghana Standards Authority, Food and Drugs Authority, and Environmental Protection Agency.

Implications of the market environment for skills development:

Analyses of extant literature on the SWOT and survey findings on the business capabilities of yam, cassava and sweet potato value chains (TRAVERA SURVEY, 2018)

suggests a three year period (2019 - 2022) envisioning future outlook of yam, cassava and sweet potato value chains is summarized as follows: (i) to improve existing products and/or develop new yam, cassava and sweet potato-based products; (ii) to double yam export volume of 18,643.60 MT in 2017 to reach 37,287 MT by 2022; (iii) to reduce yam export tuber arrival loss rate by 30% annually; and (iv) to increase foreign exchange earnings from yam export business. To achieve the objects underlying envisioning the future outlook, the strategy advocated in this report is that the actors (exporters, processors and factories) along the yam and cassava value chains deepen and scale up their strategy on yam export by volume and value to the traditional export markets (USA and EU) as well as identify new export markets including Africa (Mali) so as to stimulate effective demand for yam production, technology and product development.

However, gaps of business capabilities of yam, cassava and sweet potato value chains identified are many and include input supply capabilities, production capabilities, product development capabilities, logistics and transport infrastructure capabilities, marketing capabilities, financial services, agribusiness business management and entrepreneurship development, and enabling environment. Five of these gaps business capabilities of yam, cassava and sweet potato value chains were selected to guide the achievement of the envisioning of the future outlook.

To address the skills improvement agenda of the five prioritised strategies of yam, cassava and sweet potato value chains will require these occupational levels of managers, professional, technicians & associate professionals, skilled agricultural workers, plant machine operators & assemblers and elementary occupations to work in the firms. Inference from current supply of skills at both pre-tertiary and tertiary levels of ATVET Institutions reveal that these various occupations and skills set are produced to feed the root and tuber crops value chains in Ghana. However, the challenge is that the sampled actors along the yam, cassava and sweet potato value chains are constrained to absorb the small number of graduates because majority of the enterprises operate in the informal sector and are small-sized entities, use traditional technologies and cannot expand for jobs creation in the short-run, whilst a few formal enterprises in the breweries industry have the organizational and managerial capabilities to hire graduates of varying occupations from the ATVET Institutions and use to produce to meet both local and export markets.

Proposals in response to future skills needs:

Five prioritised skills improvement options to address current and future skills demand are outlined below:

- (i) Yam, cassava and sweet potato factories, processors and exporters should be trained in good manufacturing practices on product development & innovation management, technologies and standard operating procedures (GMP); food processing and technology; post-harvest technology, quality management systems as well as agribusiness management, entrepreneurship and financial literacy so that trainees can improve on existing products of yam, cassava and sweet potato or develop new products to gain local and international market patronage and earn adequate returns to their investments in the culinary, manufacturing, pharmaceutical and medicinal-based enterprises;
- (ii) Yam, cassava and sweet potato factories, distributors and exporters are provided with skills in logistics and transport infrastructure capabilities in the areas of post-harvest technology, fleet planning, scheduling and routing system; storage management in haulage trucks;

vehicle maintenance management system; warehouse management; road safety regulations and practices; accident prevention and defensive driving; and driver behaviour & client service management. After skills training in logistics and transport infrastructure capabilities, the trainees are expected to improve yam, cassava and sweet potato shelf life and reduce tubers quality and arrival loss rates during haulage as well as comply with road safety regulations and adopt best driving management practice, prevent road accidents and the drivers and mates of haulage trucks conduct themselves professionally and ethically to mitigate against long delays from security officers;

- (iii) Under marketing of yam exports venture capabilities, two training interventions are suggested. First, yam exporters, processors and distributors shall be trained in (a) internal quality management system (product standards, technologies and skills) of yam and cassava factories, processing and exporting enterprises; (b) national regulations on quality management systems (product standards, testing, certification, and technologies) of FDA, GSA, PPRS of MoFA and GEPA, etc that relate to yam and cassava production, processing, distribution and exports; (c) international quality management systems (product standards, testing, certification, and technologies) such as HACCP, ISO Series, etc that relate to yam and cassava production, processing, distribution and exports; (d) yam and cassava export country selection and entry system, export documentation and procedures; product quality assurance system; product testing system; market information; international marketing mix, strategies and export organizational architecture and system. Second, regulators of export quality management systems (FDA, GSA, PPRS of MoFA, and GEPA) would also be trained in standard operating procedures, service charters, client service management and supervisory management skills so that management and supervisors of the regulatory institutions improve their communication, interpersonal and customer relationship skills so as to motivate yam and cassava processors, distributors and exporters to understand and comply with both local and international food regulations, standards, testing and certifications of yam and cassava exports ventures. Coordination among the regulators (FDA, GSA, PPRS of MoFA, and GEPA) as per their food regulations, standards, testing and certifications of yam and cassava exports ventures should also be harmonized and strengthened to boost export of yam- and cassava-based products;
- (iv) Institutional strengthening of yam, cassava and sweet potato factories, processors, distributors and exporters along the value chains through training, seminar, workshop, conference and technical assistance in agribusiness management, small business management and entrepreneurship skills including feasibility study, business planning, financial literacy & credit management as well as advocacy and lobbying strategies in favour of promotion and development of root and tuber crops value chains;
- (v) Quality training and business development services provision, here competent training and business development services provider (s) shall be procured competitively by the ILO Ghana Office to administer the aforementioned training and institutional strengthening programme to suit the needs of yam, cassava and sweet potato producers, factories, cooperatives, processors, distributors and exporters along the value chains.

Wider Policy Implications:

Analyses inferred from the business capabilities gaps and skills improvement options required to enhance the competitive edge of yam, cassava and sweet potato factories, processors, distributors and exporters along the value chains summarised at four policy levels, namely:

- (i) Policy level where collaboration between Government of Ghana and her donor community (ILO, AfDB, IFAD, WB, etc) should be strengthened through expertise transfer, technology, institutional reforms, projects and programmes, training interventions, technical assistance, etc to build institutional capacity of yam, cassava and sweet potato factories, processors, distributors and exporters along the value chains as well as the regulators (FDA, GSA, PPRS of MoFA and GEPA), financial institutions and support services providers (research and development, CSIR and training and business development services providers, MDPI & GIMPA) so as to play their respective roles and responsibilities in the promotion and development of yam, cassava and sweet potato value chains;
- (ii) Institutional level that covers better cooperation among policy makers at the MMDAs level (MoE, MELR, MESTI, MoTI, and MoFA), regulatory bodies (FDA, GSA, GEPA, and PPRS of MoFA), end-users (yam, cassava and sweet potato processors, factories, distributors and exporters), technology development agencies (CSIR) and training service providers (MDPI and GIMPA) for permanent mechanism, coordination and dialogue for skills improvement opportunities and adoption of best practice of regulations and laws, standards, testing, certification, support services, etc for development of yam, cassava and sweet potato value chains;
- (iii) Occupational level which shall entail that training and business development services providers (MDPI, GIMPA and ATVET Institutions), MoFA, regulators (GSA, FDA, GEPA, PPRS of MoFA) and financial services providers reposition their curricula, facilities and faculties to address the skills gaps of yam, cassava and sweet potato labour markets; collaborate extensively with end-users (factories, processors, distributors, and exporters) to facilitate in continuous improvement of their processes, technologies and skills set; and
- (iv) Enterprise level where gaps and skills profile of yam, cassava and sweet potato producers, factories, processors, distributors and exporters sampled along the value chains are improved through training, workshop, conference, seminar and institutional strengthening.

Conclusions:

This report has observed a number of gaps of business capabilities of yam, cassava and sweet potato value chains in Ghana and skills improvement opportunities aimed at responding to the Ghanaian's strategic imperative of reversing the sluggish informal sector (yam, cassava and sweet potato sub-sector) and export trade imbalance through root and tuber crops value chains upgrading and skills improvement agenda. Hence, the report concludes on actions required to address the existing gaps of business capabilities and skills problems, expand export growth potential, increase job openings and contribute towards national economic growth as far as yam, cassava and sweet potato value chains are concerned.

Further, envisioning the future outlook repositions yam, cassava and sweet potato value chains in the areas of good manufacturing practice via product development and innovation management; logistics and transport infrastructure; marketing of yam exports products; institutional strengthening of actors along the root and tuber crops value chains - agribusiness management and entrepreneurship development as well as other business functions in effective training and business development services provision that will facilitate to accomplish the strategies described in the report.

Acronyms

AGI	Association of Ghanaian Industries
AMSEC	Agricultural Mechanisation Centres
ASTI	Agricultural Science Technology and Innovation
ATVET	Agricultural Technical Vocational Education Training
BNARI	Biological and Nuclear Agricultural Research Institute
COTVET	Council for Technical and Vocational Education Training
CRI	Crop Research Institute
CSIR	Council for Scientific and Industrial Research
ETE II	Effects of Trade on Employment – Phase 2
FAGE	Federation of Association of Ghanaian Exporters
FASDEP	Food and Agricultural Sector Development Policy
FRI	Food Research Institute
GAEC	Ghana Atomic Energy Commission
GDP	Gross Domestic Product
GEPA	Ghana Export Promotion Authority
GHS	Ghana Cedis
GRA	Ghana Revenue Authority
GROTEU	Ghana Roots and Tubers Exporters Union
GYPEA	Ghana Yam Producers and Exporters Association
ILO	International Labour Organisation
Kg/Ha	Kilogram per Hectare
MEDA	Mennonite Economic Development Associates
MoLGRD	Ministry of Local Government and Rural Development
NBSSI	National Board for Small Scale Industries
NCTE	National Council for Tertiary Education
NTE	Non-Traditional Export
PESTEL	Political, Economic, Social, Environment and Legal
PPRSD	Plant Protection and Regulatory Services Directorate
RTIMP	Root and Tuber Improvement and Marketing Programme
SARI	Savanna Agricultural Research Institute
SMEs	Small Micro Enterprises
SRID	Statistics Research and Information Directorate
STED	Skills for Trade and Economic Diversification
TRAVERA	Trade and Value chains in Employment-Rich Activities
TV	Television
TVET	Technical and Vocational Education and Training
WAAPP	West Africa Agricultural Productivity Project

1. Introduction (lead Consultant And Skills Expert)

1.1 Background to the Study

Globally, wide range of root and tuber crops are cultivated by producers, but only five species account for 99% of the total global production and include potato (*Solanum tuberosum*, 46%), cassava (*Manihot esculenta*, 28%), sweet potato (*Ipomea batatas*, 18%), yam (*Dioscorea* spp, 6%) and taro/cocoyam (*Colocassia*, *Cytosperma*, *Xanthosoma* spp, 1%) as opined by (Jayakody, *et al.*, 2007). The five crops are cultivated in Africa, Europe, America, Asia and Oceanian for the purpose of meeting their household food security and nutrition needs as well as business opportunity gaps for 2 billion people (Ferraro, *et al.*, 2017). Thus, the socio-economic benefits and business opportunities of the five crops to the world cannot be over-emphasized.

As a result, the crops continue to attract huge investment in the promotion and development of their respective value chains from sponsors, partnership and networks of research and development interventions due to multiple reasons (Sanginga and Mbabu, 2015). First, they are cheap to grow on marginal soils, are energy efficient and have more usability in product and caloric energy source. Second, they are source of income for 700 million of people where women constitute significant proportion as actors of the value chains. Third, they are source of employment for 300 million of producers, processors, distributors and exporters and service providers. Fourth, they serve as raw materials for the preparation of traditional foods (*ampesi*, *fufu*, *gari*, etc.) and agro-based companies for the production and marketing of food processed items, starch, ethanol, glue, textiles, biscuit, alcohol, plywood, paperboard, health, pharmaceutical and nutritional products, etc. (MIDA, 2010; Ravibhushana, 2011; Addy, 2012; Adebayo, *et al.*, 2013; Owusu-Darko, *et al.*, 2014; Sugri, *et al.*, 2017). The crops and their derivatives have high consumer demand in both local and international markets for foreign exchange earnings as well as serve as import-substitution effects to stabilize local currencies from continuous depreciation against major currencies of the industrialized nations.

In Ghana, the root and tuber crops are the most important food crops for direct human consumption, after the cereals (maize, rice, sorghum & millet) and are grown in varied agro-ecological zones of the country. Thus, the aggregate value of cassava, yam and cocoyam of 30,208,643 MT in 2018 exceeds all other Ghanaian staples, including cereal and plantain crops of 28,612,129 metric tonnes in the same year (MoFA, 2019). However, the country has recorded a slight drop in the production volume of root and tuber crops from 53,125 million metric tonnes in 2013 to 52,809 million metric tonnes in 2017, representing a downtrend of 0.59% over the five-year period (FAOSTATS, 2017).

On the global front, Ghana has performed creditably in terms of production and export of cassava, yam and cocoyam tubers and corms to the international market where large numbers of African diasporas reside for their livelihoods (Kenyon and Fowler, 2000). Ghana is the world's seventh largest and Africa's fourth largest producer of cassava tubers (Koyama, *et al.*, 2015) and the largest yam tubers exporter in the world (IITA, 2009; MIDA, 2010). Ghana is currently the third largest producer of cocoyam corms in Africa and fourth largest producer in the world (FAOSTAT, 2014).

Sweet potato is the fourth most important root crop after yam, cassava, and taro in the country (Sugri, *et al.*, 2017). Sweet potato is widely cultivated in the Northern, Upper East, Upper West, Central and Volta regions. The crop continues to attract rising consumer demand

owing to its importance in addressing food security, nutritional, health and pharmaceutical as well as hotel and restaurant industries concerns (Sugri, et al., 2017). Similarly, potato is also grown to respond to its increasing market demand in urban centres for processed potatoes in diet diversification which is opening up new markets for fast foods, hotel or takeaway restaurants (Cromme, et al., 2010; Ravibhushana, 2011).

In spite of the huge socio-economic benefits and business opportunities associated with these crops in Ghana, they are saddled with several constraints. The major ones are low yields and productivity level, low research funding, poor quality techniques of plant propagation, unsustainable agronomic practices, high losses due to insect pests and plant diseases attack, high postharvest loss due to poor processing and storage technology, absence of well-designed distribution trucks to transport quality produce over long distance between sources of production and destinations of usage, weak linkages among key actors (input suppliers, producers, traders, exporters and consumers, financial institutions, etc.) on the chains, gender-imbalance in the adoption of technology for production, processing and storage, negative attitude of farmers towards new technology and weak organizational capacity of service providers (Sanginga and Mbabu (2015). It is noted that even though West Africa countries produce average production level of 110,088Kg/Ha of yam tubers above that of the world average of 106,525 Kg/Ha of yam tubers, it is far lesser than that of yam tuber production levels recorded in Asia of 225,093kg/Ha, Europe of 163,636kg/Ha and Oceanian of 142,150kg/Ha (FAOSTATS, 2014). The relatively low production level of yam in West African translates into very low returns to the farmer given the situation that the total cost of crop production accounts for nearly 80% of the farm-gate price of the crop in these countries (Aidoo, 2009).

There are tremendous opportunities for the continued development and sustenance of the root and tuber value chain systems in the areas of research and development intervention, partnership and networking, capacity building and institutional strengthening to enhance genetic enhancement of planting material systems; development of sustainable technologies for production, processing, storage, logistics and distribution, new product development, marketing, consumer preferences and nutrition impacts, crop farming models, agri-business models and diagnostic tools for upgrading the value chains (Sanginga and Mbabu, 2015). The opportunities can be harnessed for key actors of the value-chain systems to build their skills so as to export more value-added products. With that a diversified economy and a more business-oriented, profitable, employable, productive and competitive sector will be achieved (Sanginga and Mbabu (2015). It is for these reasons that the Government of Ghana and the ILO's Strengthening the Employment Impact of Sectoral and Trade Policies (STRENGTHEN) have prioritized the value chain development of cassava, yam, cocoyam, potato and sweet potato owing to huge potential that these crops command in the areas of wealth creation, business and trade opportunities, food security and nutrition, foreign exchange earnings, technology development and adoption, partnership and networking, scholarship and entrepreneurship (Sanginga and Mbabu, 2015). The overall objective of the project is to strengthen the capabilities of country partners to analyse and design sectoral and trade policies and programmes that would enhance employment creation in terms of quantity and quality. One component of this project is "Assessing and Addressing the Effects of Trade on Employment – Phase 2 (ETE II)". This component will support developing countries in harnessing international trade and trade-related foreign investment towards providing more opportunities for decent work within developing countries and raising the number of developing-country workers who are productively employed. In this component, the project will commission several studies to develop and strengthen global- and country-

level knowledge on the effects of trade and trade policy on employment. It is under the ETE II component of the project, that the study on Skills for Trade and Economic Diversification (STED) is being conducted in a selected export value chain of the partner countries with the aim of aligning skills policies with value-chain strategies for export growth, economic diversification and employment creation.

Problem areas or gaps of the Study

In recent times, agricultural value chain system has received tremendous support because of its potential to fully describe the full range of activities required to bring farm product from conception, through the different phases of input-dealership, production, processing, distribution and delivery to final consumer – whether local, national, regional or global, and finally, disposal after use. Its popularity has soared up among key stakeholders of the agricultural sector due to the impact to influence the actors along the chain in alleviating poverty, enhancing incomes, employability, productivity and competitiveness. Another aspect of agricultural value chain system is the need to identify the main drivers of the chain such as enabling environment, supply chain management, business operations, technology, market structure, chain coordination, product demand and consumer behaviour, skill set and capability of actors as well as the constraints and then assess the extent to which these drivers contribute, positively or negatively to the chain performance via economic diversification, export drive, income, jobs, productivity and competitiveness (Cromme, et al., 2010). Further, it is imperative to identify the actors' capability gaps, skills demand, skills supply and skills mismatch or skills gaps so that appropriate skills set can be professed to address the skills mismatch or gaps. It is recognized that skills mismatch or skills gaps among actors of agricultural value chains have high economic and social costs including unemployment and poor working conditions of enterprises. As a result, the skills gaps must be addressed through skills development policy and agenda so that innovation, agility and competitiveness can be internalized among the actors (Aggarwal and Gasskov, 2013). However, very little study of skills analysis has occurred in the cassava, yam, cocoyam, potato and sweet potato value chain systems in Ghana. Therefore, this study aims to fill the void.

Purpose of the Study

The purpose of the STED study is to align skills policies with capabilities, constraints and strategies of root and tuber (particularly yam) value-chains for a number of reasons. First, for enhanced export growth; second, economic diversification; third, income generation, and employment creation; next, strengthen the linkages among the actors on the chain for their economic benefit. Thus, the skills set, policy framework and strategies to be proposed in this study aim to address the gaps to facilitate effective linkages among the actors of the root and tuber crops value-chain system so as to become creative, innovative and agile in both local and international markets. The STED study should be useful for the project's stakeholders to see how skills development could help the yam export value chain become more competitive in the context of open markets as well as build or maintain a sound and diversified product offering.

1.2 Objective of the Study

The main objective of the STED study is to identify current and potential skill needs, to estimate skills gaps, and to provide recommendations for the design of effective and coherent

skills development policies to support growth and expand opportunities for the creation of productive employment. The following were the tasks assigned:

- 1 Identify main areas of business capability that must be created or improved in the cassava, yam, cocoyam, potato and sweet potato value-chain systems to be developed;
- 1 Explain main business capability gaps of the cassava, yam, cocoyam, potato and sweet potato value-chain system;
- 1 Deduce kinds of skills required to bridge the business capability gaps identified for the cassava, yam, cocoyam, potato and sweet potato value-chain;
- 1 Project for demand for different occupation and their respective skills;
- 1 Compare the projected skill demand with the current skills supply;
- 1 Identify gaps between the current skills availability and the skills required of the future, both in qualitative and quantitative terms;
- 1 Identify labour market evidence in the cassava, yam, cocoyam, potato and sweet potato system;
- 1 Identify and explain sources of labour for the cassava, yam, cocoyam, potato and sweet potato value-chain system;
- 1 Explain skills supply and assess skills supply side of the cassava, yam, cocoyam, potato and sweet potato value chain and present trends in students, graduates and new entrants in graduate pipeline;
- 1 Identify skills supply, and discuss main sources of skills supply for the cassava, yam, cocoyam, potato and sweet potato value-chain, barriers for training and make use of other sources of skills, as inward migration, and;
- 1 Propose response to future skills needs in the form of: (i) proposals and recommendations to respond to the skills gaps in consultation with the stakeholders; (ii) proposal on skills strategy for national agenda for cassava, yam, cocoyam, potato and sweet potato value-chain system stakeholders, identify where support from development partners have the greatest leverage; and (iii) conclusions and wider policy implications;
- 1 Summary of Findings and Conclusions and Recommendations

Deliverables:

Two consultants were selected to execute the study, the Lead consultant and the Skills expert. There were four deliverables, viz., outline of the study, draft version of the report, final version of the report incorporating comments from the ILO and final presentation of the report. The inception report was submitted on May 19 and included the Table of Contents as the outline of the study. This is the draft report.

1.3 Approaches and Methodology

The study is a rapid appraisal of the root and tuber value chain. The yam export value chain is used as a case study to highlight the key issues and direct recommendations. A mixed method approach was employed to obtain data. The analysis was mainly qualitative and presentation of simple descriptive statistics.

Sources of Data

There were three sources of data: (i) Desk review, (ii) survey data, and (iii) key informant interviews.

i. Desk review:

This step involved internet search for documents on the root and tuber value-chain sector of Ghana; policies, strategies and the investment plan from the Ministry of Food and Agriculture was reviewed for indications of support for capacity development, agricultural production and trade. Position papers and published research works on root and tuber value chains and on yam in particular were reviewed. Websites of institutes, trade associations, export firms and service providers were reviewed for relevant information on research and capacity building activities organized for members and actors in general. The institutes include Food Research Institute (FRI), Crop Research Institute (CRI) and Savanna Agricultural Research Institute (SARI), all of the Council for Scientific and Industrial Research (CSIR) and the Biological and Nuclear Agricultural Research Institute (BNARI) of the Ghana Atomic Energy Commission (GAEC). The trade associations include Federation of Association of Ghanaian Exporters (FAGE), Ghana Root Crops and Tubers Exporters Union (GROCTEU), Ghana Yam Producers and Exporters Association (GYPEA) and Association of Ghanaian Industries (AGI). The Ghana Export Promotion Authority (GEPA) of the Ministry of Trade and Industry (MoTI) documents sector profile, capabilities, trade performance, exporter and useful links.

ii. Survey data

The major source of survey data was the ILO survey data of firms, “The trade and value chains in employment-rich activities (TRAVERA): Survey of selected roots and tubers (yam, cassava and sweet potato) value chain in Ghana,” (TRAVERA SURVEY, 2018). Other sources of survey data that provided useful information missing in the TRAVERA report were: (ii) ProEcoAfrica data (FiBL, 2017) (www.fibl.net), (iii) MEDA (2011) rapid appraisal survey report iv) University of Ghana Student rapid appraisal surveys (2005-2019) in yam farming systems and export. (v) Ghana Statistical Service data on skills demand by Occupation. The ProEcoAfrica data (2014-2016) was collected from a total of 213 (77 females and 136 males) cocoa and food crop farmers who cultivated yam in Ghana in 2017. The respondents provided information on inputs purchased, field and post-harvest operations and as well as marketing activities. The Mennonite Economic Development Associates (MEDA) data was obtained from mainly qualitative key informant interviewing of yam farmers, traders and experts.

iii. Key informant interviews

A total of 20 experts including Deans and Directors of Agricultural Training Institutions and Education Councils, researchers, private consultants, extension officers, exporters, retailers and project managers were interacted with within three weeks of the

study (Appendix 1). There was informal interaction with the Minister of Education on new directions in Ghana's education and the role of TVET. The two Site Managers of the ProEcoAfrica project were interviewed to validate activities of yam producers and input dealers in cocoa farming systems in the Ashanti region and food crop farming systems in the Northern region. Four yam exporters and retailers in Accra (Agbobloshie market, Ashie and Amrahia) were interacted with to understand procurement and marketing activities.

The Dean of the School of Agriculture in University of Ghana, the Director of the Council for Technical and Vocational Education Training (COTVET) and National Council for Tertiary Education (NCTE) were interviewed to understand courses and pedagogies as well as type of research and mode of knowledge transfer and skills development in schools of agriculture. Four district directors of Agriculture in the Bono-Ahafo, Northern, Upper West and Volta regions were interviewed to obtain information on the extension and advisory system applied to address challenges of yam farmers. One scientist each from the Savanna Agricultural Research Institute (SARI), Food Research Institute and Crop Research Institute (all of Council for Scientific and Industrial research (CSIR)) and the Biological and Nuclear Agricultural Research Institute (Ghana Atomic Energy Commission) provided information on root and tuber research and motivation for specific activities being carried on for yam. Officers of the just-ended Root and Tuber Improvement and Marketing Programme (RTIMP) and the on-going West Africa Agricultural Productivity project (WAAPP) of the Ministry of Food and Agriculture were interviewed to obtain information on support provided to target actors and activities in the yam value chain. The mode of interviewing included face-to-face (10%), telephone (80%) and electronic mail (10%).

Apart from the personal profiles of the respondents, issues discussed included, courses offered at the farm institutes, colleges, polytechnics and universities towards adequate extension and advisory services and capacity-building for careers in the agricultural value chain; response of training institutions to issues in the 4th industrial revolution for the future of agriculture- Mechanisation, mass production, new employee with digital skills, forecasting skills and communication and other soft skills. For the farmer's personal skills, job history, industry relation, technology employed and personnel training were discussed. Directors' perceptions on structure of economy to standardize, modernize, provide legislation and formalize agriculture were sought.

Workshop and Feedback from its Analysis:

A workshop was organized by the ILO Ghana Office, Accra-Ghana on the Tuesday, 6th August, 2019 to enable the two consultants hired to present their gaps, objectives, methodology, key findings, recommendations and conclusion of the study to relevant stakeholders of the ILO Office, Accra-Ghana. Some gaps, weaknesses and improvement areas were identified by the stakeholders after the presentations on the STED Study by the two consultants. Hence, suggestions and comments made by the stakeholders sought to address the gaps and enrich the final report to the Client. Therefore, the two consultants have fully incorporated all the suggestions and comments made during the workshop which have contributed towards this STED report.

Method of data analysis

Three research questions were addressed: What is the current and potential skill needs of yam and root crops export value chain actors to ensure productive employment? What are the skill gaps of yam export value chain actors to ensure productive employment? and what

actions are needed to ensure the design of effective and coherent skills development policies to support growth and expand opportunities for the creation of productive employment. The issues raised require a systems approach to analyses of data. The System framework of the CTA (2005) termed Agricultural Science Technology and Innovation (ASTI) and the Institutional Analysis framework of Dorward and Omama (2009) were followed. The frameworks consider that effective outcomes are achieved when the Environment and Action domains of a system are adequately linked. The ASTI framework emphasises a five-step gap analysis of a sub-sector: Review of policies, mapping of actors, analysis of actors' habits, practices, competencies and innovation, determination of actors' primary and secondary functions and strength of actors' linkages. The IAF emphasis not only policy in the Environment domain but also physical infrastructure and socio-economic factors. Its Action domain analysis covers actors and their attributes, activities and their attributes and institutions and their attributes, enforcement and coordination.

Hence in the study three levels of analysis were carried out: Policy, institutional and enterprise-level. In general, the analysis focused on the appropriateness of state and firm level strategies and activities in enhancing exports, promoting economic diversification, enabling more and better jobs, ensuring that firms (including farms) find workers with the right skills, and helping workers acquire the skills needed to find productive employment.

- i. The policy level analysis considered five indicators to measure appropriateness: constraint identification and analysis, goal setting, multi-stakeholder dialogue and formulation, implementation plan and systematic evaluation. Policy outcome analysis was based on 17-year series of trends in output, area cultivated, yield, national price and fewer years analysis of export volume and values.
- ii. The institutional level analysis considered five indicators: levels of governance, strength of linkage, capacity (human, technical and financial), service delivery speed, monitoring, evaluation and accountability.
- iii. The enterprises level analysis considered five indicators: Organisation and management of risks related to in-bound logistics, operations, out-bound logistics, marketing and sale and services, following the thinking of Porter (1985). Competitive advantage is created at enterprise level when procurement of inputs (in-bound logistics) is well planned to achieve efficiency (see also Austin 1995). On-farm operation in terms of technology applied to manage soil fertility, weeds, pests and diseases and water and harvesting are essential for productivity assurance and quality product development. Post-harvest management, including drying, cleaning, storage, packaging and transporting are important outbound activities, which require standard materials and vessels to maintain quality of product and meeting market specifications. During marketing and sale, issues of actual form of product, pricing, marketing agents and promotion activities become essential (Kotler, 1999). After sale services may be necessary in sustaining the relationship between end users and suppliers.
- iv. Gaps in business capabilities were identified through assessment of selected indicators relating to operations, marketing and research and development. Based on the gaps identified the projected skills demand will be determined. The Ghana Statistical Service data on skills demand for agriculture related occupations will be analysed to complement the ILO data analysis. Current skills supply will be analysed based on the agricultural technical vocational education training (ATVET) student enrolment, graduation and employability.

1.4 Organisation of the Report

The report is organized into five sections. Apart from the introduction, which includes background, objectives and the approaches and methodology, Section two is a description of the value chain profile of root and tuber crops in Ghana. The section also presents the institutional mechanism and discusses the roles played by key public, private and intermediate local and international institutions. Section three discusses the yam value chain outlook by describing the overall world trade trend and yam market trends, scanning the business environment with respect to political, economic, social, environment and legal (PESTEL) dynamics and identifying the gaps in business capabilities. Section four discusses the implications of the market environment for skills development, in terms of needs, gaps and projected skills demand as well as current skills supply, identified skills gaps and proposed response to future skills needs. Section five is the conclusions and wider policy implications.

2. Value Chain Profile (lead Consultant)

The situation (Role) of roots and tubers in the economy of Ghana

Root and tuber crops in Ghana include yam, cassava, potatoes, sweet potatoes, cocoyam and taro. In Africa yam, cassava, potatoes and sweet potatoes dominate production and consumption making up 95% of all output. Potato cultivation is not a well-known farming system in Ghana; sweet potato is an emerging farming system, having been promoted as a source of vitamin A under the research project West African Agricultural Productivity Project (WAAPP). Taro and cocoyam production are limited to forest areas. The root and tuber crops are starchy and a key source of carbohydrate, contributing to the nutritional needs of majority of households. The crops contribute about 50% of the nation's agricultural GDP and cultivated by 55% of Ghanaian farmers (Boakye-Achampong, 2016). The per capita consumption of a Ghanaian consumer is estimated to be 151.4kg of cassava, 43.3kg of yam and 56kg of cocoyam and the crops account for 58% of per capita food consumption thus, making them major sources of dietary calories in the country.

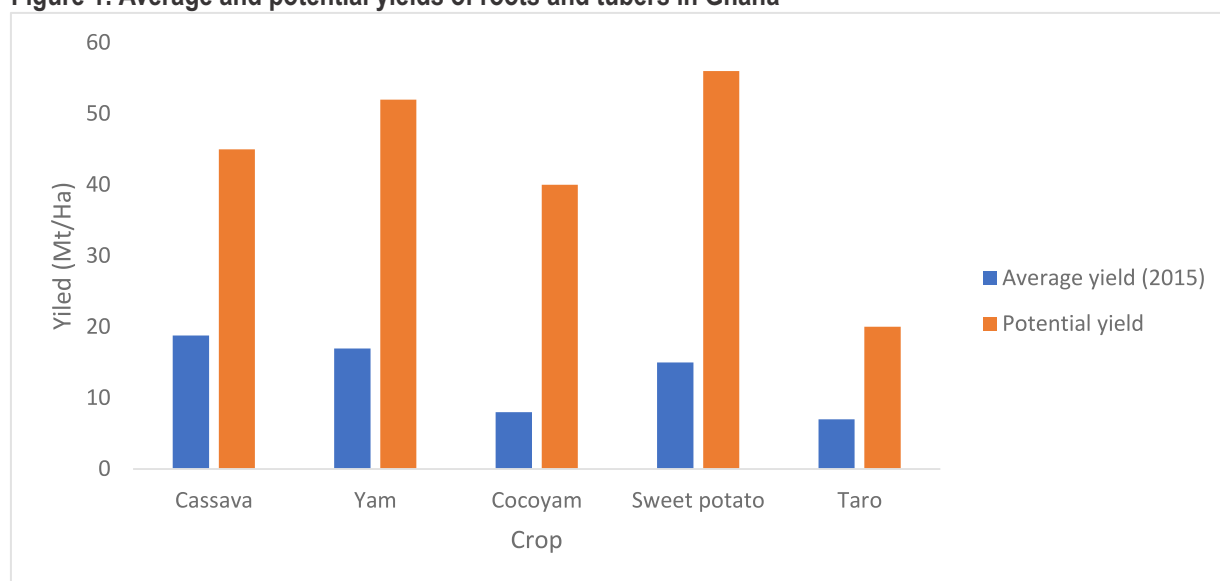
In terms of area cultivated, cassava and yam are the most important, covering between 300 000 hectares and 800 000 hectares per annum (Table 1). While fresh cassava, cocoyam, taro and sweet potatoes are largely non-traded, at least 1% of yam is traded on the world market. Ghana is the largest producer of yam after Nigeria in West Africa, recording an average yield of 17.42 Mt/Ha. The yield of yam and all the other crops are about 60% less than the potential (Figure 1). The concern for improvement has been overemphasized.

Table 1: Trends in output, area and yield of selected root and tuber crops in Ghana

	Yam			Cassava		
	Area (000Ha)	Production (000Mt)	Yield (Mt/Ha)	Area (000Ha)	Production (000Mt)	Yield (Mt/Ha)
2000	261	3,363	13	660	8,107	12
2001	287	3,547	12	726	8,966	12
2002	300	3,900	13	794	9,731	12
2003	321	3,813	12	807	10,239	13
2004	311	3,892	13	784	9,739	12
2005	300	3,923	13	750	9,567	13
2006	325	4,288	13	790	9,638	12
2007	324	4,376	14	801	10,218	13
2008	348	4,895	14	840	11,351	14
2009	379	5,778	15	886	12,231	14
2010	385	5,960	15	875	13,504	15
2011	204	5,855	29	889	14,240	16
2012	426	6,639	16	869	14,547	17
2013	422	7,075	17	875	15,990	18
2014	428	7,119	17	889	16,524	19
2015	430	7,296	17	917	17,213	19
2016	427	7,440	17	879	17,798	20

Source: SRID, 2016

Figure 1: Average and potential yields of roots and tubers in Ghana



Source: Data obtained from MoFA (2016 pg 19).

Research and development efforts to improve yield and value addition have been carried out for several decades; notable among the projects are the Root and Tuber Improvement and Marketing project (RTIP/RTIMP) of the late 1990s-2018 and the WAAPP of the last decade. Currently, crops (including roots and tubers) contribute over 60% of agricultural gross domestic product (GDP), which accounts for about 19% of the national GDP (MoFA, 2018). The demand and supply balance sheet for the crops has always shown surplus; in 2017, it was 2,280,000 metric tonnes for yam and 8540,000 metric tonnes for cassava.

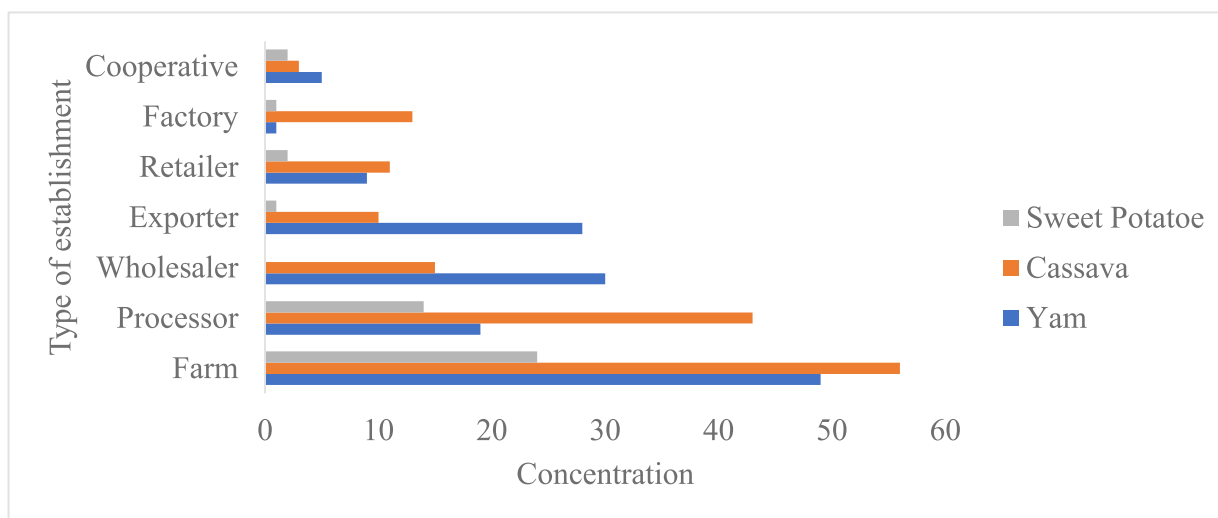
Women play a critical role in the production and trade of the crops(www.afdb.org). Retailing of the crops is almost entirely dominated by women who sell at market places, road sides and hawk. TRAVERA SURVEY (2018) comments that women “are the major

transporters of yam seeds by carrying on their head to the planting sites and by the same means transport harvested yams to yam sheds for storage. They are highly visible in the distribution of the 3 crops [yam, cocoyam and cassava] in the domestic market.... men, mostly yam farmers are also trading however, they prefer to be engaged as itinerant or sedentary and not retailing”.

Characteristics of root and tuber value chains in Ghana

The most important value chain of root and tuber crops is the fresh form, taken up directly by individual consumers and households. Cassava has more value chains than any of the other four root and tuber crops. Apart from the fresh, the other value chains (in descending order importance) are the processed forms (gari, dough, flour, starch and tapioca). All the crops are well concentrated in the farmer and retailer establishments (Figure 2). Yam and cassava are further well concentrated in the wholesaler, exporter and cooperatives establishments. Cassava is also more concentrated in processors and factories establishment. The well-known factories produce high quality cassava flour for the Brewery industry in Ghana. Neat Foods Limited is a factory that produces flour meal (fufu) with yam, cassava and cocoyam. Actors' organisation and management of risks related to in-bound logistics, operations, out-bound logistics, marketing and sale and services are as follows (see also Box 1 for narration of key informant).

Figure 2: Type of establishment and concentration of Sweet Potatoes, Cassava and Yam



Source: Data obtained from TRAVERA (2018)

Farmers: Farmers and other service providers support root and tuber on-farm operations involving land preparation and setting (including ridging and mounding) depend on simple machines for cutting undesirable trees, slashing and burning. A few (10%) farmers hire services of tractors for ploughing and harrowing fields that are not undulating, steep and with tree stumps (FiBL, 2017). Planting is only manual. Soil fertility management is largely organic, using mulches; there are a few cases of manure and fertiliser application by farmers. Weed management is both manual and chemical application; weedicides are applied before planting and manual weeding before harvest. Pest and disease control are managed through regular weeding and chemical application of pesticides when the injury level is above economic threshold; there is minimum use of chemicals. Farmers depend on rainfall for water management and drains are created to manage soil holding capacity. Harvesting is

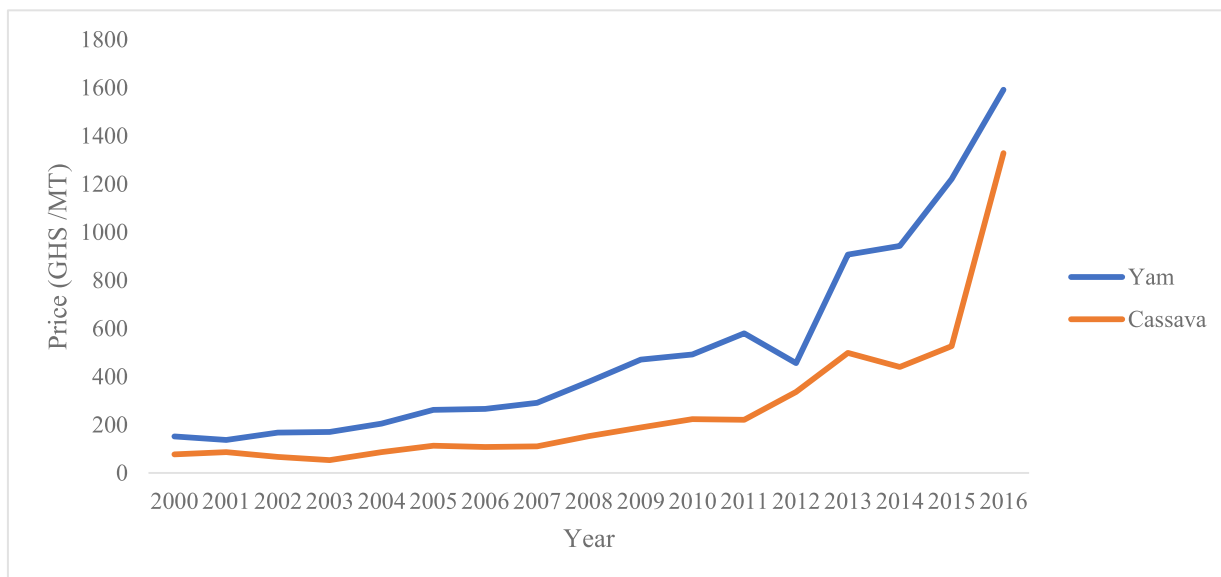
done manually; simple machines for cassava harvesting have been developed (www.waapp.org.gh) but there is no documentation on use in any of the major areas studied. The machine named Tek mechanical harvester functions excellently during the dry season when soils are much firmer than during the wet season when soils are loose.

Post-harvest management of root and tuber crops include mainly cleaning, storage, packaging and transporting (Egyir, *et al.*, 2008). Cassava farming households may process fresh roots or sell mature fields directly to processors. Sale to traders may be the harvested produce on the mature but unharvested fields. Unsold produce is stored in pack houses or under sheds on- farm, home or village market. Transportation of fresh produce by farmers involves hiring of tractors and trucks or head portage by male and female young adults.

Processors: Activities engaged in by processors include manual harvesting, transportation, peeling, milling, packaging and distribution of commodities. The out-bound activities require standard materials and vessels to maintain quality of product and meeting market specifications. Cassava processing into starch, *gari* (grits), dough, *kokonte* (flour) and tapioca at cottage level is based on indigenous and intermediate technology. There is machine milling into dough or flour, machine removal of water for starch and tapioca preparation processed yam into flour or grits is more a household level activity for home consumption than for the market.

Traders: Domestic trading of fresh and processed products is carried out by farmers, processors and specialized intermediaries or service providers (wholesalers/aggregators and retailers) (Al-Hassan and Egyir 2002). During marketing and sale, domestic bound fresh produce is packed on trucks for distribution to specific destinations. Packaging materials used by processors range from plastics to polypropylene sacks. A few traders transport unmilled *kokonte* in jute sacks to urban centres for sale to flour processors (Al-Hassan and Egyir 2002). Product pricing is based on competitive market situation; there is no government guaranteed minimum prices set for any of the root and tuber crops at any level (see Figure 3). The price received by a seller is dependent on bargaining power; cooperatives may have a slightly higher price if they dominate the chain. None of the crops has strong cooperatives or associations that influences market prices to a large extent. The key yam retailer informants in Accra suggested that final price is mostly dependent on transportation cost, an assertion largely confirmed by the TRAVERA study (Box 2). Formal promotion activities on roots and tubers is not a well-developed phenomenon (Egyir and Yeboah, 2009); one company's advert is running on TV and Radio After sale services, including customer feed-back assessments and training (demonstrations on how-to-use, how to store among others) is unknown; it may be necessary in creating awareness on new recipes and sustaining the relationship between end users and suppliers.

Figure 3: Trends in wholesale prices of yam and cassava in the domestic market



Box 2: Transportation concerns of actors in the root and tuber value chain in Ghana

.... Apart from high fuel prices, poor road network, high prices of spare parts, poor condition of vehicles, frequent accidents and breakdowns are among the numerous constraints that can affect the supply chain in businesses. These have been responsible for many businesses to rethink and adopt other supply chain strategies. For example, Mr Batu stated that the transportation costs and prices of the commodity influences his decision as to where to sell his yams:

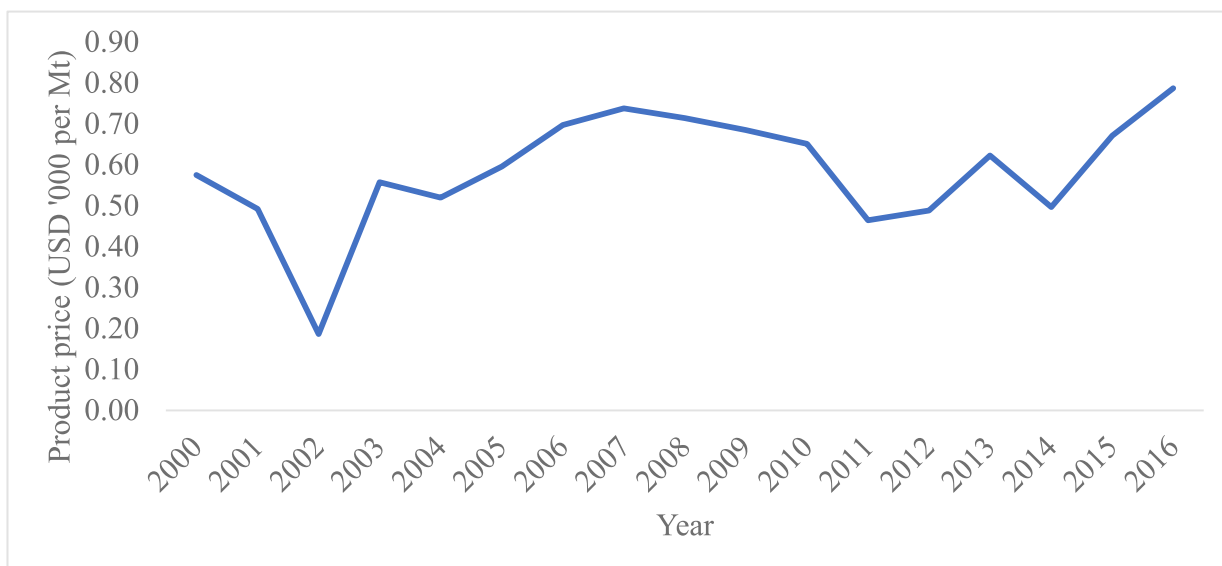
“I have a shed in the market, I study the prices in the Kokomba yam market and then compare it with what is in the north so whichever will favour me, then I sell. I can either refuse to sell in the north and come and sell in the market at Kokomba”.

Source: TRAVERA, 2018

Exporters: Export trading of fresh and processed products is carried out by specialized intermediaries or service providers and factories. Yam is the only root and tuber produce exported fresh. Gari and flour (fufu powder) are also exported but there is limited information for assessment in the study. During marketing and sale, fresh yam produce is packaged in 25Kg paper boxes and packed in trucks for distribution to specific destinations in Europe and America. Packaged flours and grits (from cassava only) is also exported. Packaging materials used by processors range from plastics to paper boxes. Product pricing is based on competitive market situation abroad, and has ranged between USD 400.00 and 1000.00 in the last decade and a half (Figure 4). The key yam exporter informants in Accra suggested that final price is mostly dependent on the variety, quality upon arrival and cost-insurance and freight, an assertion largely confirmed by the TRAVERA SURVEY (2018) study. Pre-shipment activities include off-loading of yam by males, sorting and cleaning by females, inspection is carried out by multiple agencies, including the Ghana Root Crops and Tuber Exporters Union (GROCTEU), freight forwarders, the PPRSD, GRA and other security agencies including Narcotics Control Board (NCB) and Bureau of National Investigation (BNI). At the park house in the Tema Port, “forwarders take over the rest of the

process to ensure that the goods reach the designated destination. Here, the packaged yams are offloaded, inspected, rearranged on pallets secured and latched. They are then loaded into containers to the scanner where they are certified and approved for release to the port. From here the consignment is sent to MPS [Meridian Port Services] where the container is plugged till it is shipped” (TRAVERA SURVEY, 2018).

Figure 4: Trends in yam prices in the international market (2000-2016)



2.1 Firm-Level Characteristics and Business Capabilities of Yam Value Chains) (Lead Consultant)

In general, one or more root and tuber crops are cultivated in all the regions of Ghana. Majority of yam and cassava firms are located in the Eastern, Central, Greater Accra, Volta, Upper West and Northern and Bono-Ahafo regions (MoFA, 2017 & TRAVERA, 2018). Many of the firms in Ghana have existed for more than years 20 years (Table 2). However, just over 50% operate with license from the Government (TRAVERA, 2018). About 98 % of all root and tuber firms across the value chain are owned by domestic private with a very small proportion (less than 10%) owned by government or foreign private/government entity.

In terms of business capabilities, the TRAVERA SURVEY (2018) indicated that in 2016, firms in the yam value chain estimated an annual turn-over amount of GHS4.64 million (USD 1.1 million) (Table 3). Each employee is estimated to have generated GHS 248,507.10 (USD 59,168.40). By establishment (for all root and tuber crops), the highest annual turnover for 2016 was made by exporters with an average amount of GHS9.65 million, due probably to higher returns in foreign exchange for exporting the crop products. The least amount of GH 543,840.00 was recorded by cooperatives. The most important marketing channel both for the current and future period is wholesalers (Table 4). The situation is inconclusive although employee and data on cost is missing hence connotes adequate capability support the working capital cycle that remunerates them monthly.

Table 2: Age of establishment, licenses and share of company ownership

Variable	Freq.	Percent
Age of establishment of firm:		
0-5	13	18.6
6-10	12	17.1
11-15	9	12.9
16-20	11	15.7
21 and above	25	35.7
Licensed firms by government agencies	40	53.0
Share of company ownership:		
Domestic private	75	98.7
Domestic government	26	0
Foreign private or government	27	7.4

Source: Data obtained from TRAVERA SURVEY (2018 pg)

Table 3: Turnover by employee and by establishment (GHS'000)

Element	Mean	Min.	Median	Max.
Average turnover per employee for Yam	248.50			
Average turnover per employee for Cassava	10.90			
Average turnover per employee for Sweet Potato	101.40			
Annual turnover in 2016 for Yam	4,642.74	1.40	15.00	121.00
Annual turnover in 2016 for Cassava	428.11	0	9.00	12,200.00
Annual turnover in 2016 for Sweet potato	8.16	0	2.50	80.00
Annual turnover by establishment				
Farm	1,081.94	0.03	3.50	121,000.00
Cooperative	543.84	2.00	9.50	5,000.00
Factory	598.44	0	312.00	2,800.00
Wholesaler	1,719.52	0.30	50.00	37,500.00
Retailer	826.62	0.30	5.50	13,100.00
Processor	731.62	0	49.18	13,100.00
Exporter	9,655.82	12.00	952.45	121,000.00

Source: TRAVERA SURVEY, 2018

Table 4: Current market channels and potential usage in the future (proportions)

	Currently using this market Channels		Potential to use this channel in the future	
	%	N	Mean	N
Wholesaler in the targeted market	51	176	2.3	41
Major retail chains in the target market	26	172	2	59
Informal agent or trader	16	174	1.8	58
Salespersons employed by your business in the target market	13	169	1.8	64
Foreign export/import company	9	179	1.7	61
Ghanaian export company	2	189	1.5	55

Source: TRAVERA SURVEY, 2018 (pg)

Technologies used by firms in yam Value Chain

Results of rapid appraisal survey of key informants in May 2019 indicate that yam farmers continue to use traditional and intermediate technologies (see also Agyei-Holes *et al.*, 2011). They commonly use simple tools and equipment which include wooden stakes, hoes, machetes, spraying machines and animal-drawn ploughs; tractors and accessories for ploughing, harrowing and ridging are considered high-tech. The tools are easy to use and can easily be handled by apprentices and on-the-job trainees. Farmers do not spend on high-tech equipment as they do on wooden stakes and seeds.

Factory producers of mixed flour use simple tools such as knives to engage in manual peeling of root crops and tubers. Machine dryers and mills are used to process flours. Milling machines are also used to produce doughs. Conversion of dough and starch to gari and tapioca are done manually.

Wholesalers and retailers of yam hire pack houses and sheds to store unsold yam. Exporters hire ware houses and stack yam on pallets. Paper wraps and card board boxes are used for packaging fresh tubers for shipment. Cargo handling at the ports, prior to shipping is both manual and machine operated (PC by Exporter in Agbobloshie, Accra). Equipment such as scanners, fork lifts and cranes are used.

Manufacturing and business processes in yam value chains

Value addition to transform root crops and tubers into processed forms is a well-known phenomenon for cassava and yam. However, many of the products are mainly for food and not for industrial use. Yam manufacturing is an underdeveloped phenomenon. In Ghana, NEAT Foods Processing Company is the only well-known firm that exports yam flour to the international market. The Food Research Institute (FRI) of the Council for Scientific and Industrial Research (CSIR) has a commercialisation unit that processes yam flours and other products for domestic marketing.

“The areas if well-developed could be a potential source of employment to the nation. Through research alcohol was produced from water yam to produce wine; water yam which

is not so much preferred for consumption (TRAVERA SURVEY, 2018).

Business processes are concentrated on raw material procurement, transportation, labour, utility and communication (Table 5). Manufacturers spend highly on these areas, indicating their importance. Labour cost for yam and cassava at all establishment centres is higher than utility and communication costs. The results suggest that firms will pay for skills that achieve company goals. In future, more dependence on the internet for information and transactions may push up communication cost. Skills in ICT will be needed to support the yam business. The ProEcoAfrica data provides expenses made by yam farmers in 2017; the mean was a mere GHS30.00 suggesting that activities in seed procurement, mounding, weeding and harvesting were based on gratis. The dependence on free family and reciprocal labour among food crop farmers in Ghana is very high (ProEcoAfrica, 2017).

Yam trading business is mainly dependent on transportation (GHS50.00/100 tubers for sedentary retailers). TRAVERA SURVEY (2018) indicated that yam traders spent an average of GHS 125.00 on transportation (vehicle hire, loading and unloading), the highest among all the root and tuber crops. Researchers consulted in the rapid appraisal survey believed that when farm business depend on quality seed yam and precision agriculture, skilled labour will be required and expenses would go up further but the return on the investment will be worth it. This is because higher yields of good quality tubers and roots will be harvested.

Table 5: Concentration of business processes and costs (GHS'000)

Element	Yam	Cass	S.pot	Farm	Coop	Factory	Whole	Retail	Proc	Export
Basic facilities (electricity, fuel, water)	23.00	8.00	4.70	2.16	19.00	19.28	29.60	9.68.	2218	21.18
Communication services used in production	12.80	1.06	0.48	0.48	1.33	1.01	14.97	1.43	10.16	7.95
Labour-including wages, bonus	38.68	39.60	25.5	13.55	86.12	50.06	32.06	27.15	42.07	106.41
Raw materials and intermediate goods	388.60	60.70	28.57	95.39	65.74	182.67	305.06	473.86	110.42	728.68
Transportation cost	127.50	13.00	1.61	3.46	50.46	7.80	117.53	82.79	36.92	252.15

Skills of Workers, Forms of Work Organization, and Access to Infrastructure

Skills of workers:

The workers in the yam value chain are at five levels: Managers, field operators, post-harvest handling, processing, distribution and marketing support. Managers engage in planning, supervision and financial control. Apart from specific technical skills for finance, production and processing managers, skills in human resource management is required by all. The skills of field workers concern quality seed selection, planting, manual weeding, weedicide preparation and machine application, other agrochemical preparation and application (of fertilizers and growth regulators), staking and harvesting.

The TRAVERA SURVEY (2018) study indicated a low score (mean = 1.4/5) for skills of existing workers, meaning that they are quite good and not an important constraint militating against starting yam business. The story of Yusuf (PC, Wholesale/retailer in Accra), collaborates the finding. *“Farm hands and farmers learn from their fathers and peers and understand the mound heights, width and depth that support growth and good yield. The care needed for harvesting that results in limited bruises and breakages is well understood. Post-harvest handling requires arrangement of tubers on open vehicles-bicycles, tricycles, tractors and tonner trucks to rural farm gate and markets or urban markets.*

Sorting for export or domestic markets is done by workers with no or some level of experience, knowing the specifications in terms of size, variety and skin roughness. *“Consignments for export and supermarkets are cleaned of all sand and clay; the activity requires careful handling and workers learn to perfect the skill on the job”* (PC, Exporter, Agbobloshie market).

Transporters of fresh yam and other root and tuber crops have an understanding of the perishable nature of the goods. Yet, the workers who handle the loading, off-loading and monitoring of produce during movement, may not be trained for purpose. The rapid appraisal survey results suggest that most of the workers are illiterates or school drop outs who may be well-informed of the consequences of mishandling only.

Workers engaged in pre-shipment inspection (marketing support) at air and sea ports are professionals who have obtained a minimum of high school certificate. They record and check indicators according to machine reading and visual signs. They receive regular training to prevent high cases of sanitary and phytosanitary issues and smuggling of contra bound goods with yam.

Forms of work organization:

Work organisation underpins economic and business development and has important consequences for productivity, innovation and working conditions. Work organization in yam value chain is about the control of work from planning to marketing and the division of labour. Results of the ProEcoAfrica project study indicate that both male and females spend a total of Indications from rapid appraisal indicate that, the major tasks are performed by personnel who depend mainly on manual techniques and depend a lot on discretionary learning and based on tradition structure. Yam production is generally a seasonal activity, hence working time, intensity of work and satisfaction with working conditions are key factors. A significant proportion of yam farmers cultivate with household food security rather than commercialisation aim. Such yam fields are intercropped with cocoa, other tree crops and other food crops especially cassava. Hence, surpluses offered on the market may not meet export standards; limited time is devoted to pest and disease management. Appropriateness of soil water and organic content is not studied. Supervision of workers is more for the main crop than for the yam. Results of the TRAVERA study on capabilities for business performance show that operations with regards to efficiency and cost management, quality management and delivery time are the most important considerations of employees (Table 6). Other critical areas include expanding domestic markets and developing critical supplier base. Sourcing inputs from international suppliers and applying information technology appears to be the least important consideration of employees. The implication is that there is good communication flow among management and employee and inputs, especially seed, agrochemicals, and simple tools applied are available in the local economy to support work tasks.

Access to infrastructure:

Infrastructure include markets for input and export, research information, finance and insurance. Access to good quality inputs and equipment machinery is considered quite a limiting factor in competitiveness (Table 3.7). Hi-tech farming demands equipment/machinery for ploughing and ridging, chemical spraying during weed, pest and disease management and harvesting. Although several machines and equipment for operating yam farming are available on the global market, yam farmers in Ghana do not invest in many of the machines (PC, wholesaler in Accra). A few farmers purchase or hire spraying machine; majority hire tractors for land preparation (in the Northern Regions) and vehicles for transportation. Tractor services are available in all districts operated by the private sector and by district assemblies under the AMSEC programme of MoFA.

Research information, extension and input dealers: Although the CSIR institutes have carried out several R&D activities on roots and tubers for decades, very few firms admitted benefiting from any agency or institute that conducts research and development for their product and the market. The District directors of Agriculture pointed the offices as centres of extension and advisory services. However, few farmers visit the centres for information on roots and tubers, “farmers experiment on their own; those who participate in project capacity building seminars and farmer field schools are few” (PC, Wa East district Director of Agriculture). There are input dealer shops at the district capitals and major towns in all the regions of Ghana. The dealers stock agrochemicals, seed and simple machines. However, farmers usually use seed varieties that are termed indigenous; very few farmers purchase yam seed. Only 7 out of the 213 farmers in the ProEco data purchased seed. Farmers save seed and obtain extra free of charge or at cost from friends and relatives in and outside of the communities they farm (PC, Site Manager, and ProEco Africa).

Financial and insurance institutions: Most yam farmers employ internally generated funds. The TRAVERA (2018) study indicated that under 20% of firms use services of Universal banks, Savings and Loans companies and informal money lending (known as susu) (pg 65). The multiple sources of funds are necessary to ensure yam export success (Box 3). All firm establishments noted the lack of financial institution in the area of the business as the most severe obstacle against access to credit. The rapid appraisal survey results indicated that finding money from microfinance institutions in the communities is not difficult for traders and exporters, it is the interest rate, collateral requirements and length of pay back period that is limiting.

Table 6: Rating of skills of yam employees

Skills	N	Mean	Rank
Teamwork	74	3.4	1
Attitude/personality: work ethic, punctuality, appearance, manners	76	3.3	2
Ability to learn new ideas, methods, and concepts	75	3.1	3
Communication	76	3	4
Food safety and handling	58	2.9	5
Measuring, grading and feeding batches of raw materials	71	2.9	5
Problem solving	74	2.9	5
Customer services	74	2.8	6
Production and inventory management	72	2.8	6
Operating non-computerized/non-automatic machinery	71	2.8	6
Equipment operation and safety	72	2.7	7
Taking initiative	75	2.7	7
Working with numbers	71	2.7	7
Management responsibility/taking a lead	75	2.5	8
Literacy/numeracy skills	76	2.3	9
Warehousing and shipping	61	2.3	9
Logistics	72	2.2	10
Quality control and assurance	70	2.2	10
Green skills (e.g. recycling, avoidance of waste, safe treatment, of waste, recovery of valuable materials)	73	1.7	11
Operating computerized/automatic machinery	61	1.7	11
Advanced IT application/computer skills	73	1.6	12
Foreign language	74	1.4	13

Source: TRAVERA SURVEY, 2018

Box 3: Responses on access to infrastructure by yam exporters

...”We have also initiated a seed yam improvement activity where we are giving support to the Ghana Yam Development Council which is the policy or advocacy group for the yam sector in Ghana so that they can cultivate improved yam seedlings for dissemination to the farmers so that they can improve the stock (Interview with GEP).

“...On the 4th of this month I delivered a container to Netherlands and I applied for a loan to do that in December, they could provide it for me. I was very stranded and angry because it was a new customer I had gotten in Netherland whom I was delivering to and he asked when to deliver the yam and I gave him a specific date. So if I should fail, he will terminate the contract and give it to another person. Luckily for me, I had shipped yams to a customer in the US and he paid part of the money so that was what I used to finance the shipment to Netherlands. Had it not been for that, I would have lost that contract” (interview with Geobat farms).

“If the government can step in then give loans to the exporters to expand their business and are able to export more, there will be foreign currency in the country and that will help the government do get revenue to develop the government. If the exporters can expand and export more, the government will earn more foreign exchange as a result and in the same way, the exporters themselves would be able to employ more people since they are expanding their business. So it is like a chain...if the government at the top supports the exporters, it will run through and help a lot of people (Interview with Calzion Exports).

Source: TRAVERA SURVEY, 2018

2.2 Value Chain Employment (occupations and qualifications of employees) (Lead Consultant)

There are so many activities in the root and tuber value chain that require hired labour and are points of income generation. There is no national data on occupations and qualifications of root and tuber crop employees. What exists in most farm-based data bases is the education, training courses and other occupation. In the ProEcoAfrica (2017) data is the proportion of farmers who were literate was less than 50%. The Site Manager confirmed that “most of the older hired and family worker were also illiterate. A few of the younger hired workers could have completed basic school, primary and JHS. It is rare to have farm hands that have completed Secondary School. The food crop farms are not operated as businesses so there are no managers, hence, no highly qualified people are demanded”. The TRAVERA SURVEY (2018) data showed that lack of qualification and required skills were not a critical issue of companies interviewed (see Table 4.4.34, pg 59). It was further observed that it is easier recruiting low skilled workers than high skill workers. This may be due to the high supply of the low skill labour force within the value chain and the relative affordable cost of employment (in terms of remuneration) to the employers than the high skilled workers. It was agreed among all respondents that recruitment of employees is not a problem due to high unemployment rates in the country. Mr. Tetteh of Calzion Export Company admits that:

“...they are the ones who will even be chasing me for the job. So, when they finish, then I just pay them and they go.” “The processor admits that due to the high unemployment rates some casual workers even come to her house to ask if there is any job for them” (TRAVERA SURVEY, 2018).

2.3 Institutional Mechanisms (Lead Consultant)

Institutional level analysis considered five indicators: levels of governance, strength of linkage, capacity (human, technical and financial), service delivery speed, monitoring, evaluation and accountability.

Employer and worker representative organizations

Firm level governance is facilitated by learning obtained through both employers' and employees' associations. The major exporting companies of yam listed by the Ghana Investment Promotion Centre (GIPC, 2016) included Dhillon Farms Int., K. Laast co. Ltd., Figban Farms Gh. Ltd., Tahiti Trading Enterprises, Abdula Enterprise, Prudents Export and Import Co. Ltd. And Touch Skies. Yam companies can join the Ghana Employers Association, Federation of Association of Ghanaian Exporters (FAGE) and Private Enterprise Federation (PEF). The workers of these companies are free to join the Trade Union Congress as members of the Ghana Agricultural Workers Union or Industrial and Construction Workers' Union (ICU).

Education and training institutions

Human capacity is enhanced by formal education and training. Is the school system in Ghana designed to include syllabi that exposes students to agricultural production in general? Agricultural science is introduced at all levels of the school system. Yam production and marketing is a subject matter included in the syllabi of agricultural sciences. The subject is discussed at the basic and secondary schools, selected technical and vocational education training institutes, post-secondary agricultural colleges and Schools/ Faculties of Agriculture in the University. In the basic school agriculture is introduced under science and geography; plant and animal physiology (science), soils, transportation and markets (geography).

In the secondary school, the integrated science core subject discusses general agriculture; and Agricultural Science is an elective. At the certificate and diploma awarding colleges various subjects in agronomy post-harvest management and business management or entrepreneurship is discussed. At the University level root and tuber crops may be a special subject area in crop science Departments. Farm institutes designed to use competency-based approaches run short courses in specific enterprises. There are councils under the Ministry of Education mandated to guide operations of all training institutions. The Council for Technical and Vocational Education Training and National Council for Tertiary Education. The monitor institutions through review of syllabi and making suggestions to improve standards. The Councils collaborate with the National Accreditation Board.

Professional associations and export councils

Professional associations are expected to contribute to human, technical and financial capacity building of individual firms so that the speed of service delivery will be high. The Ghana Yam Development Council which is the policy or advocacy group for the yam sector in Ghana. Ghana Root Crops and Tubers Exporters Union (GROCTEU) is the umbrella body for all yam exporters in Ghana. The leadership of the association link out-grower farmers and provide training to improve practices, hence technical support. The associations are part of an umbrella body, FAGE formed in 1992 with a mandate to support the growth of the private sector in non-traditional export (NTE's) through the provision of a portfolio of business

solutions (www.fageghan.org). Through its advocacy role it has ensured market development issues and other weaknesses such as grievances of actors are addressed. In ensuring market development, they aid in access to finance and other services in exportable goods (TRAVERA, 2018).

Development agencies

Development agencies contribute to capacity (human, technical and financial) building to enhance service delivery speed as well as monitoring, evaluation and accountability. There are a many development partners that support agriculture. Together with the MoFA, the Agricultural Sector Working Group (ASWG) has been formed. Partners that support root crops and tubers include the following:

- i. International Fund for agricultural Development (IFAD): Since 2000, the fund has provided technical and financial support to enhance yam subsector research and development, seed quality and agronomy, post-harvest management and marketing. They funded the Root and Tuber Improvement and Marketing projects (RTIPI & RTIMP II).
- ii. World Bank: Has supported projects such as Ghana Agricultural Sector Improvement Programme (GASIP), West African Agricultural Productivity Programme (WAAPP) and out grower and Value Chain Fund (OVCF).

The GASIP focuses on scaling up investments in private sector-led pro-poor agricultural value chain development.

The WAAPP (2008-2019) focused on roots and tubers, livestock, rice and cereals to enhance technology generation, dissemination and adoption. Research institutions and staff were supported to strengthen technology generation and dissemination with farmers.

The OVCF defines out-growers as smallholder farmer groups producing specific agricultural commodity for an off-taker under a contract. Those targeted are smallholder commercial farmers and on case by case technical operators directly linked to these smallholder farmers. The project therefore targets the productive poor to generate jobs and incomes. None of the respondents confirmed knowledge of any root crops and tuber groups that benefited from the fund.

Other Governments: The Netherlands is among the countries known to have supported the growth of the yam export sector (Box).

Box 4: Support provided by Development Partners in the yam subsector

GEOBAT Farms which has been trained on Hazard Analysis and Critical Control Point (HACCP) explains that there should be hazard analysis on the product. The product should not be contaminated with any chemical hazard or even physical hazard. These standards are given by the foreigners. He said:

“I am a GLOBALGAP certified company and I was trained by CBI from Netherlands and they gave me the certified”

According to him, the Centre for Promotion of Exports (CBI) from developing countries in the Netherlands which is under the Ministry of Foreign Affairs of the Netherlands support by paying exporters from developing countries to attend trade fairs. They pay about 10,000 Euros for each company to come and exhibit their products”. In all these they wished government was also committed to ensuring that they are trained.

Source: TRAVERA, 2018

Government regulatory organizations and ministries (major initiatives and plans)

Food and agriculture is a priority of the state, hence it is part of the wider national institutional setting (Figure 5). At the office of the President, there is a minister in charge of Agriculture that links up with the main Minister with a mandate to implement the vision. Apart from the Ministry of Food and Agriculture, the Ministry of Trade and Industry, Ministry of Environment, Science, Technology and Innovation (MESTI), Ministry of health and Ministry of Finance (MoF). The Ministries host agencies and authorities that regulate and enforce standards in the agricultural value chain.

Ministry of Food and Agriculture (MoFA):

The MoFA links with the regional and district level departments of agriculture to provide capacity support for staff and the institution as a whole. At the district level extension agents link with yam farmers in technology transfer and knowledge building activities. The districts are under the Ministry of Local Government and Rural Development (MoLGRD). The MoFA is guided by its Food and Agricultural Sector Development Policy to budget for food security and trade initiatives. Every four years the MoFA prepares a medium-term investment plan to direct funding of root and tuber crop activities. In recent times the Planting for Food and Jobs prioritised cassava as part of the targeted crops. Under research support, projects such as WAAPP, RTIP and GASIP, MoFA have promoted roots and tuber crops for home consumption, processing and trade.

The Human Resource Directorate has oversight responsibility for all the Agricultural colleges established by MoFA. In each of the ten regions of Ghana is a college that offer courses in agriculture using competency-based methods for delivery and engagements. Entrants have completed secondary school and obtained the West African Examination Council Certificate. There are also farm institutes in selected regions that receive people with minimum literacy and interest in agribusiness. Entrants may hold no certificate all but must pass an entrance examination.

The Plant Protection and Regulatory Services Directorate (PPRSD) is a technical unit of MoFA mandated to monitor and enforce rules on raw food commodity exports. It

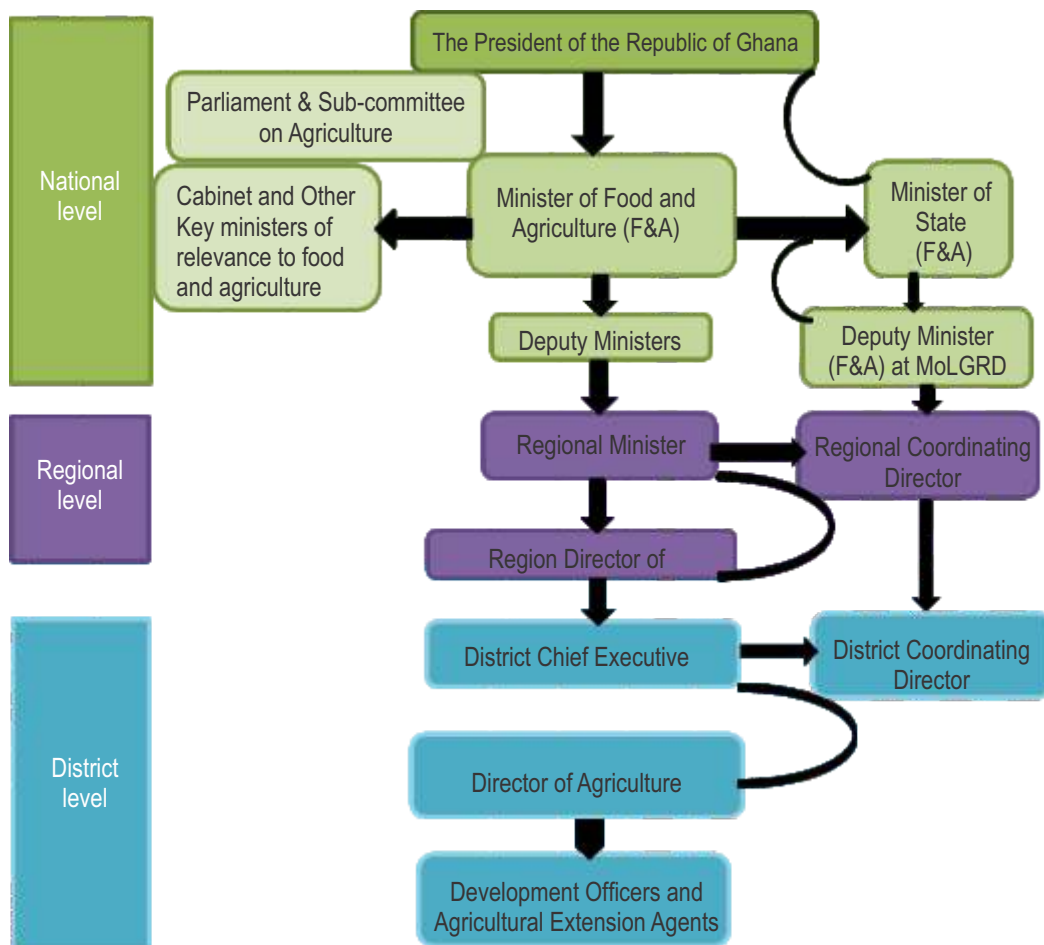
collaborates with the Environmental Protection Agency (EPA) to regulate importation and application of agrochemicals such as pesticides and fertilizer. Other technical directorates of MoFA that plans activities in the development of roots and tubers include crop services (fertiliser and soil and water), extension, engineer (tools and equipment for harvest and post-harvest management).

Other Key ministries:

i. The Ministry of Trade and Industry (MoTI)

Departments and Agencies of MoTI mandated to support yam production and export include Ghana Export Promotion Agency, Ghana Standards Authority and the National Board for Small Scale Industries (NBSSI). The Ghana Export Promotion Authority (GEPA) was established in 1969 (Act 396) and gained its authority status in 2011. It is the national export trade support institution of MoTI responsible for facilitation, development and promotion of Ghanaian exports (www.gepa.org). The TRAVERA study (2019) has documented the organisation's "plan towards ensuring that yam production is increased but also the quality of the yam is improved considerably so that the shelf life of the yam on the export market will be much better than it is now and the buyers will have more confidence to buy from us in Ghana". GEPA is working closely with Ghana Root Crops and Tubers Exporters Union to train yam farmers. The seed yam improvement activity has been initiated and in partnership with the Ghana Yam Development Council improved yam seedlings are being developed for dissemination to farmers. GEPA gives support to research institutions such as the FRI-CSIR to go into research in processed yam. GEPA facilitates the connection of businesses to trade attaches abroad. The private firms would rather officials from the organisation accompanied them to the fairs as well (Box 5). The National Board for Small Scale Industry (NBSSI) is another agency of MoTI that links with farmers and processors through its Rural Enterprise Program to provide advisory services at its centres at the district level.

Figure 5: National institutional setting



Source: Arete (2019)

Box 5: Concerns of private sector

“...If it was Burkina Faso which had this yam business, they would have made good use of it than we are doing. I am saying this because we have been going to trade fairs and they also come for those trade fairs as well. When they are coming to these trade fairs, they have ministers and government officials coming with them but no Ghanaian minister or government official has ever gone with us. It is only usually the Ghanaian Ambassador for the country in which the fair will be held who might come there. Even if the minister of trade cannot go, at least officials or executives within the ministry could go to these fairs with us and support us but they don't. (interview with GEOBAT FARMS)

Port paperless policy

“You know with this new policy, when the systems are down you cannot work or operate so due to that, sometimes they can leave your container without working on it. The system is such that everything is online and so sometimes we cannot even make inputs and because of that they will leave your container without working on it until the next time they will be working. For me, that is the only problem I have with that policy” (Calzion Exports).

Source: TRAVERA SURVEY, 2018

i. Ministry of Environment, Science, Technology and Innovation

The Ministry has oversight responsibility for the Council for Scientific and Industrial Research (CSIR), which uses its agricultural research institutes to improve soil, water, seed, and agronomy, post-harvest and industrial machinery. The research centres are spread in all the agroecological zones. The institute in Accra include Soil Research Institute, Food Research Institute and Industrial Research Institute; Crop Research and Soil Research are in the Ashanti region; Savannah Agricultural Research is in the Northern, Upper East and Upper West regions and Water research Institute is in the Eastern Region.

ii. Ministry of Health

Laws of food safety and nutrition are regulated by the Ministry of Health. There is a Food and Drugs Authority (FDA) that is mandated to inspect all food imports. It collaborates with the GSA to undertake factory inspection to assure hygiene and control advertisement.

iii. Other Agencies

Ghana Investment Promotion Centre (GIPC): The GIPC is under the office of the President. It supports the registration of companies that a fully owned by Ghanaians and foreign-Ghanaian partnerships. Its Doing-business-in-Ghana series on Agriculture (Crops production) documents the state of yam production as a principal crop in Ghana (www.gipc.org).

The Ghana Police Service and Narcotics Control Board are agencies under the Ministry of Interior that monitor smuggling and contraband goods. How all the agencies work together to enforce trade regulations is what is of interest to the development of the root and tuber value chain

3. Value Chain Outlook (lead Consultant)

3.1 Overall World and Yam Market Trends

Trade is a driver of global growth, convergence, and poverty alleviation (Reis and Farole, 2010). Export-led growth has been promoted by all economies; developing economics adopted the concept in the 1980's when trade liberalization was the talk. During 1983–2008, global trade grew 85 percent faster than gross domestic product (GDP). Developing countries in particular benefitted - annual exports from low- and middle-income countries grew 14 percent annually between 1990 and 2010 compared to only 8 percent for high-income countries. “The global economic crisis came crashing into the middle of this long-running export-led growth party during 2008 and 2009. As the financial crisis drained liquidity from the market and risk was dramatically recalibrated, the financial shock quickly affected demand and then reverberated rapidly through these now closely integrated global supply chains”. Between the last quarter of 2007 and the second quarter of 2009, global trade contracted by 36 percent (see Haddad and Hoekman, 2010). Governments around the world moved relatively rapidly to head off the crisis, flooding the markets with liquidity, supporting trade finance, and investing in massive stimulus packages to boost demand. And although for a period there was a fear that creeping protectionism might undermine the recovery, governments for the most part managed to forego the temptation to engage in populist trade wars on a large-scale basis; however, since employment recovery is likely to lag significantly behind trade and output recovery, at least

in high- income economies, the risk of protectionism may remain on the agenda for some time (Gregory and others 2010). The open, integrated economies of East Asia, which benefited most from export-led growth and global production networks, were among the first to emerge from the crisis and moved quickly back to robust growth.

Africa's trade has been mainly in fresh food produce and agricultural raw materials such as cocoa, tea, coffee, cashew, pineapples, bananas and a few vegetables. Assorted agro-products like yam, plantain, cassava and sweet potatoes for a minute part of world trade. A key observation in world market trends is the impacts of time and costs on developing country exports and, particularly, perishable agricultural products. Finding new markets is a way to go but more importantly governments are being called upon to support new and existing exporters to increase survival rates in export markets, particularly during the first few years after beginning to export. Competing in high-value (usually perishable) agricultural exports may require support to ensure standards and certification requirements are met on an industrywide level to facilitate market access for new exporters.

Yam market trends:

Ghana was the World's largest exporter of yam in 2017, ahead of Jamaica, Japan, the United States of America and China with a total market share of 20.4%, valued at USD33.07 Million (Table 7). In 2016, the value of yam export was USD27.5 Million, 75% of which was generated by the three most important destinations. The largest destinations are the USA and United Kingdom (member of the European Union) (Table 8). Belgium is fast becoming an important yam export destination; during 2012-2016 it realized about 56% average annual growth in importing yam (www.gipcghana.org). Exports to the European Union (EU) market require a GLOBALGAP certification. Recent declines in both value and volume of export does not only question the quality of product handled but also price competitiveness. In 2014, the volume of yam exported was 35, 802 metric tonnes, declining to 18,644 in 2017 (ISSER, 2018). There is no intra-African Trade, indicating both limited marketing strategies and the potential for exploration. Mali's potential is being explored as well as other countries in North America such as Canada (www.gipcghana.org).

Table 7: Import performance of main suppliers and regional suppliers in USA

Supplier	Import value in 2017 (USD thousand)	Market share (%)	Average annual growth 13-17 (%)	Annual growth 2017 (%)	Average Tariff applied by USA (%)
World	69,166	100	3	3	0
Jamaica	25,291	36.6	8	13	0
Ghana	12,929	18.7	1	26	0
Costa Rica	9,990	14.4	-14	-29	5
Japan	7,075	10.2	5	-20	0
Colombia	6,506	9.4	30	30	5
China	2,883	4.2	20	22	0
Brazil	2,777	4	8	-15	0
India	636	0.9	33	213	0
Philippines	563	0.8	15	32	0
Nigeria	142	0.2	54	517	0
World	69,166	100	3	3	0

Source: ITC Trade map

Table 8: Export destination of yam from Ghana, 2016

No.	Country	Market share (%)
1.	United Kingdom	80
2.	United States of America	15
3.	Belgium	12
4.	Canada	Exploring
5.	Mali	Exploring

Source: Authors' compilation

3.2 Scanning the Business Environment (Lead Consultant)

The yam business environment was scanned with the PESTEL lens and the conclusions are as follows:

Political (P): There is political concern for yam as a food security crop. In the Food and Agricultural Sector Development Policy (FASDEP II), yam was selected as one of the crops to target: “the broad strategy for the attainment of food security is to focus at the national and agro-ecological levels on the development of at most five staple crops (maize, rice, yam, cassava and cowpea)” (MoFA, 2007). The limited income growth in the crop as an indigenous crop compared to other exports was identified as a concern. Hence, projects such as the RTIMP and WAAPP provided technical support, research, extension and market linkages to the yam subsector value chain.

Economic (E): The macro economy issues of direct concern to yam value chain actors include inflation, interest rates, exchange rate, and tariffs. The economic fundamentals in terms of inflation does not look good though improving from the high 15% per annum in the 2010's to the now 11% seems good for investment in the value chain. Ghana's financial market situation has for decades supported double digit interest rates, leading to restrictive access of businesses to credit. Given that many of the yam and root and tuber value chain actors are small and medium enterprises collateral demands of banks with lower interest rates are largely unmet. The value chain actors tend to borrow from savings and loans companies and other semi-formal financial institutions such as microfinance and money lending companies at high costs. Yam inputs for production are mainly home grown, hence actors are somewhat insulated from the exchange rate concerns of importers. The exchange rate does affect imports of fertilisers and other inputs (machinery and agro-chemicals) to a large extent. Exporters of yam may be benefitting from the falling cedi (USD1.00-GHS5.20 as at end May 2019). Yam is considered a non-traditional export; there are no export duties. Exporters may incur only shipping costs, insurance and freight.

Social (S): Social wellbeing issues of relevance include gender, child labour and employee welfare. Both male and female adults of economic active age (15 years and above) can obtain access to land through renting, sharecropping and leases. In patrilineal societies, mostly in Northern Ghana (Northern, Upper east and Upper West regions) and Volta region, men can inherit land and obtain freehold. In matrilineal societies in Southern Ghana (Ashanti, Bono, Ahafo, Central, Eastern and Western regions), women can inherit land and obtain free-hold. There is a labour market to support all activities in the yam value chain. Occasionally, children under 15 years may be found carting and supporting yam retailing (Personal communication with yam retailer in Amrahia). Otherwise, there are no visible

cases of employee abuse. The national minimum wage is GHS10.00; none of the activities in the value chain (land preparation, mounding, planting, manual weeding, weedicide application, staking, harvesting, carting on head, sorting and packaging), offers less than the minimum wage (Personal communication, Yusif, yam aggregator in Accra). Results of the TRAVERA SURVEY (2019) indicate that most employers offer competitive wages to employees. About 38% of employers offered better than their peers (Table 9).

Table 9: General employee characteristics

Variables	Manager		Production		Sale Service		Supporting	
	N	Mean	N	Mean	N	Mean	N	Mean
Average monthly wage (range 1-4)	78	1.6	81	3.6	26	3.6	70	3.3
Employee skills match/mismatch	93	2.6	83	3	30	2.9	88	2.9
No of wks. < than 24 years old	33	0.1	34	0.8	3	2.3	27	2.8
Number of female workers	37	0.4	48	4.4	12	1.6	23	2.2
Number of workers	49	1.2	57	10.2	7	1.6	9	1.9

Source: TRAVERA SURVEY, 2018

Technological (T): The technological demands of the yam value chain consist of field level machines and planting materials, vehicles and packaging materials. There are a wide range of dealers who offer simple and sophisticated machinery for both pre-harvest and post-harvest activities. There are several varieties of yam that meet the specifications of both the domestic and export markets. The know-how related to agronomy, harvesting and post-harvest management is not difficult to grasp. There are technology development and transfer platforms at the local level to support capacity building needs of all the actors in the value chain.

Environmental (E): The ecological environment or agro-ecology that support the cultivation of the yam crop include both Savanna and Forest zones. Most yam produced for the market is grown in the forest-savanna transition and guinea Savannah transition. Forest-cultivated varieties are usually limited to household consumption and local markets. Other physical infrastructure creating the incentive for yam value chain development include the emerging effective telecommunication and connectivity environment and the financial sector confidence building of the last few years. Trade facilitation infrastructure such as pack houses and roads are developing; most rural roads remain in poor condition and the networks are inadequate. Pack houses close to major market centres in both the producing and destination centres are few.

Legal (L): Legal issues relating to food laws and legislation are well documented. There are laws promulgated to support policies on quality seed and planting materials, pesticide handling and application, food inspection for sanitary and phytosanitary enforcement and standardization. A few of the well-known laws listed by the National Seed Traders Association of Ghana include: Seed Law Act (2013), Plant and Fertiliser Act 803.

The key agencies mandated to monitor, evaluate and enforce the laws are Plant Protection and Regulatory Services Directorate (PPRS) of the Ministry of Food and Agriculture, Ghana Standards Authority, Environmental Protection Agency and Ghana Export Promotion Agency.

SWOT Analysis and Envisioning the Future Outlook of Yam, Cassava and Sweet Potato Value Chains.

Inference from the analyses based on the National Export Strategy as per yam, cassava and sweet potato crops value chains (MoTI, 2012; MoFA, 2017) are as follows:

- | The growth rate of the non-traditional exports currently stands at 15-25% per annum and has the potential to address poverty, unemployment and economic diversification and thus, need investment to exploit various business opportunities identified;
- | Yam export volume has declined from 36,826 MT in 2014 to reach 18,643.60 MT in 2017, registering a reduction of 22.66% over the period under study;
- | Need modern and competitive enterprises nurtured and managed by a calibre of professional that are capable of improving and/or developing and marketing yam, cassava and sweet potato-based products;
- | Need educated skilled and trained workforce to achieve relatively higher rates of productivity and competitiveness of agribusinesses along the yam, cassava and sweet potato value chains;
- | Need competent business development service providers, including training institutions to support the development and competitiveness of yam and cassava export enterprises;
- | Need to broaden yam and cassava export base through new product and market development to make Ghanaian economy less vulnerable to exogenous shocks;
- | Need to develop root and tuber crops export-based products that are knowledge-, skilled- and technology-intensive; and
- | Skills requirement for agri-product groups include diplomacy and communication skills, project management, techniques of export promotion, export project monitoring and evaluation.

Based on the gaps of business capabilities identified in the yam, cassava and sweet potato value chains (TRAVERA SURVEY, 2018), aforementioned analysis (MoTI, 2012) and feedback from ILO workshop held on Tuesday, 6th August, 2019, it is suggested that going forward within t three year period (2019 - 2022), the envisioning future outlook of yam, cassava and sweet potato value chains is summarized as follows: (i) to improve existing products and/or develop new yam, cassava and sweet potato-based products; (ii) to double yam export volume of 18,643.60 MT in 2017 to reach 37,287 MT by 2022; (iii) to reduce yam export tuber arrival loss rate by 30% annually; and (iv) to increase foreign exchange earnings from yam export business (Table 10). To achieve the objects underlying envisioning the future outlook, the strategy advocated in this report is that the actors (exporters, processors and factories) along the yam and cassava value chains deepen and scale up their strategy on yam export by volume and value to the traditional export markets (USA and EU) as well as identify new export markets including Africa (Mali) so as to stimulate effective demand for yam production, technology and product development (Table 10).

Table 10: Business capabilities gaps and vision set up for the root and tuber crops value Chains

Gaps	Export volume of yam has declined by 22.68% from 36,826 MT in 2014 to reach 18,643.6 MT in 2017.
	Estimated yam export tuber arrival loss rate of 30% per annum.
	Estimated yam foreign exchange earning loss of 30% per annum.
	Lack of development of yam, cassava and sweet potato-based products.
Vision statement	Double yam export volume of 18,643.60 MT in 2017 to reach 37,287 MT.
	Reduce yam export tuber arrival loss rate by 30% per annum.
	Increase yam export value of 30% per annum.
	Improve and/or develop yam, cassava and sweet potato-based products.

3. Gaps in Business Capabilities

This part of the study introduces the concept of business capabilities, the required areas of business capabilities of producers, farms, cooperative societies, factories, processors, distributors and exporters of yam, cassava and sweet potato value chains, gaps of the business capabilities of the actors, and lastly, empirical evidence underlying gaps of business capabilities of actors of root and tuber crops value chains of the study.

3.3.0. Introduction

Business capabilities comprise skills and knowledge embedded in organizational processes that contribute most for producers, farms, cooperative societies, factories, processors, distributors and exporters of yam, cassava and sweet potato value chains to deliver value to their customers and gain superior competitive advantage in both local and international markets while managing costs, uncertainties and risks (Carmeli and Tishler, 2004; Teece, 2019). The business capabilities provide favourable conditions for producers, farms, cooperative societies, factories, processors, distributors and exporters along yam, cassava and sweet potato value chains to sense, seize and transform their agribusiness enterprise architecture to increase their profits, market share, productivity and competitiveness in more turbulent business environment (Parida, 2008; Teece, 2019).

Several studies acknowledge that producers, farms, cooperative societies, factories, processors, distributors and exporters along yam, cassava and sweet potato value chains must be endowed with the required business capabilities to spur up their competitiveness (Sachitra, 2016; AGRA, 2018) because these actors of the root and tuber crops value chains contribute immensely in the supply of food, income generation, job creation, earnings of foreign exchange and import substitution (Sachitra, 2016). Therefore, the required state of business capabilities of producers, farms, cooperative societies, factories, processors, distributors and exporters of yam, cassava and sweet potato value chains influence their income levels, employability, profitability, productivity and competitive edge through managerial capabilities and technical capabilities (Mugera, 2012; Sachitra, 2016).

3.3.1. Areas of Business Capabilities of the Yam, Cassava and Sweet Potato Value Chain in Ghana:

This study and others have highlighted dimensions of producers, farms, cooperative societies, factories, processors, distributors and exporters of yam, cassava and sweet potato value chains in Ghana in which stronger business capabilities are required to spur their future competitiveness (Feng, et al., 2016; TRAVERA SURVEY, 2018) and are summarized below.

Operations Capabilities

Operations capabilities of sampled producers, farms, cooperative societies, factories, processors, distributors and exporters of yam, cassava and sweet potato value chains in Ghana describe the ability of the actors along the value chains to deliver fresh tubers or processed products of required mix, volumes, quality standards and price as well as improve existing products and introduce new products in the culinary, manufacturing, medical and pharmaceutical industries at competitive prices, comply with standards and certification which are requisite to enter both local and export markets and eventually make profits (Feng, et al., 2016; TRAVERA SURVEY, 2018).

Marketing Capabilities:

Sales and marketing capabilities of producers, farms, cooperative societies, factories, processors, distributors and exporters of yam, cassava and sweet potato value chains concern the ability of the studied firms to achieve marketing tasks in the local market as well as motivation to enter the export market which aim to boost their competitive advantage and eventually, generate foreign exchange and expand job opportunities (Feng, et al., 2016; TRAVERA SURVEY, 2018).

Compliance with Regulatory Requirements

Compliance with regulatory requirements capabilities of producers, farms, cooperative societies, factories, processors, distributors and exporters of yam, cassava and sweet potato value chains focus on their ability to comply with four areas of regulatory requirements; namely, internal organizational quality systems (standard operating systems and technology), national regulations and quality management systems (FDA, GSA, PPRS, GEPA, etc) and international quality management systems (HACCP, export destinations specifications, etc) as well as meet exporting countries product standards, certification and consumer market requirements so as to enhance their edge to satisfy local customers and foreign customers, make more profits and grow their agribusinesses (TRAVERA SURVEY, 2018).

Value Chain Capabilities

Value chain capabilities entail how the sampled producers, farms, cooperative societies, factories, processors, distributors and exporters of yam, cassava and sweet potato value chains are able to fulfil their supply chain management and functions in the areas of requirements and orders of the procurement and logistics system so that actors' production system can function effectively to deliver quality products to local and export markets (TRAVERA SURVEY, 2018).

Other Business Functions Capabilities

Other business functions capabilities cover how the investigated producers, farms, cooperative societies, factories, processors, distributors and exporters of yam, cassava and

sweet potato value chains exploit financial performance, human resource management, sustainable environment, information technology and R & D system, all aimed to build the actors' competitive advantage in the local and export markets (Feng, et al., 2016; TRAVERA SURVEY, 2018).

3.3.2. Business Capabilities Gaps of Yam, Cassava and Sweet Potato (Yield Gaps Analysis):

This section outlines yield gaps of yam, cassava and sweet potato value chain and is followed by causes outlining the business capabilities gaps of producer, distributors, processors, factories, exporters, etc along yam, cassava and sweet potato value chains.

There is the need to measure the difference of crop yield between on-farm actual level and the potential national mean yield in Ghana or between the crop yield in Ghana and the rest of the world so that causes accounting for the yield variations can be resolved (McElwee and Smith, 2012; FAO and DWFI, 2015). Apart from resolving the crop yield gaps, producers and other actors along the yam, cassava and sweet potato value chains are motivated to optimize their crops yield at both potential national and global crop mean yields in order to earn good returns on their investments; and eventually, increase their incomes, create jobs, improve productivity and competitiveness (FAO and DWFI, 2015). Thus, yam, cassava and sweet potato producers along the crop value chain must aim to achieve minimum of 80% of the national potential crop mean yield to sustain their profits; attract investment, technology and skills from entrepreneurs and financial institutions, and; eventually, become more productive and competitive in the root and tuber value chains (FAO and DWFI, 2015).

It is noted that roots and tuber crops mean yields in Sub-Saharan Africa represent between 37% and 64% below the global crops mean yield values; thus, accounting for the unprofitable nature and low return on investment of yam, cassava and sweet potato production systems (Adebayo, et al., 2013; Kleih, et al., 2013; Makini, et al., 2018). Similarly, yam, cassava and sweet potato producers in Ghana harvested 33.50%, 45.96% and 26.41% respectively of the national potential mean crops yields in 2016 (Table 11). However, with improved planting materials coupled with the adoption of the best agronomic practices and technologies, yam, cassava and sweet potato harvestable yields can go up to 52.0MT/Ha, 45.0MT/Ha and 26.5MT/Ha respectively (MOFA, 2016; Wie and Aidoo, 2017).

Table 11: Crops Gaps Yield Analysis in Ghana, 2016

No.	Crop	Actual on farm yield (MT/Ha)	Potential Yield (MT/Ha)	Percentage Achieved (%)	Percentage of Yield Gap (%)
1	Yam	17.42	52.0	33.50	66.50
2	Cassava	20.68	45.0	45.96	54.04
3	Sweet Potato	6.0 – 8.0	18.0-35.0	26.41	73.59

Sources: SRID, 2016 and Wie and Aidoo, 2017.

3.3.3. Empirical Evidence Underlying Business Capabilities Gaps of Yam, Cassava and Sweet Potato:

The yield variations or business capabilities gaps of yam, cassava and sweet potatoes value chains are attributed to a number of constraints (gaps) which are described below.

Input Supply Constraints:

Scarcity, High Cost and Poor Quality of Planting materials:

Managing the supply chain base and capabilities of producers, farms, cooperative societies, factories, processors, distributors and exporters along yam, cassava and sweet potato value chains facilitate effective production of required fresh tubers or processed products. The survey report cites no significant input supply gaps as the sampled actors along the yam, cassava and sweet potato value chains have developed local supplier base; managed supplier relationships; followed procurement procedures; managed logistics and warehouse system; and sourced mostly from suitable international suppliers (TRAVERA SURVEY, 2018). The situation of building the skills of local suppliers in supply chain management is a good start for sustainable development of yam, cassava and sweet potato value chains in Ghana.

However, other input supply gaps are observed in the literature. Some producers do experience frequent scarcity and high cost of planting materials of yam, cassava and sweet potato due to attacks from insect pests and diseases during storage contributing to the low crop yields (AfDB, 2015; Sanginga and Mbabu, 2015; Verter and Becvarova, 2015). For instance, seed yams are expensive to the resource-poor yam producers as it accounts for 30% - 45% of the total variable production cost (Kenyon and Fowler, 2000; Mignouna, et al., 2014). This condition can militate against the optimal yields of yam, cassava and sweet potato.

Insufficient Farm Inputs and Improved Technology to Boost Yam, Cassava and Sweet Potato Production and Productivity:

In West Africa farming systems, it is noted that yam, cassava and sweet potato value chain systems are characterized by traditional and insufficient farming inputs of cutlasses and hoes; very few producers use improved planting materials, apply agro-chemicals, fertilizers, storage facilities; etc thus, contributing towards the low yield and poor shelf-life of yam, cassava and sweet potato tubers (Verter and Becvarova, 2015). For instance, it is revealed that whereas in Ghana, none of the sampled yam producers used inorganic fertilizers; in Nigeria, 25% of the respondents used inorganic fertilizers and the reasons behind the low use of fertilizers is the perception that fertilizers have adverse effects on yam food quality and storability (Mignouna, et al., 2014). This limited use of improved technology and innovation in yam, cassava and sweet potato value chains has been confirmed (TRAVERA SURVEY, 2018).

Production Constraints

Poor Soil Fertility & Health Conditions

The soils of Ghana that are cropped intensively and continuously for long period of time without corresponding improvement in the soil fertility and health conditions have contributed towards declining or stagnating yield of yam, cassava and sweet potato

(Sanginga and Mbabu, 2015; Verter and Becvarova, 2015). For instance, whilst, annual yam production level and total cropped land area have increased by 70.01% and 31.80% respectively between 2007 and 2016, the current national average yield of yam constitutes 33.50% of the national potential yield (MOFA, 2016). Thus, this situation partly contributes towards the yield gaps of yam, cassava and sweet potato (TRAVERA SURVEY, 2018).

High Production Cost of Yam, Cassava and Sweet Potato Value Chains:

It is noted that some actors of yam, cassava and sweet potato value chains complain of high cost of farming inputs, intermediate goods, transportation and labour, coupled with produce glut and seasonal market price fluctuations render such farming systems unprofitable and high risk venture for smallholder producers (Kenyon and Fowler, 2000; TRAVERA SURVEY, 2018). For instance, it is recorded that hired labour for land preparation, mound making, staking, planting on ridges, harvesting and assembling constitutes 30% - 40% of total cost of yam production (Kenyon and Fowler, 2000). Under this condition, yam producers are discouraged to hire labour to increase their production, thus, contributing towards the yield gaps of the crop (TRAVERA SURVEY, 2018).

Increasing Pressure of Diseases and Insect Pests Attacks on Yam, Cassava and Sweet Potato:

Yam, cassava and sweet potato are attacked by a host of biotic agents such as yam mosaic virus disease, anthracnose disease, nematodes, tuber rotting fungi, bacterial infection attack, insect pests, etc which together, combine to reduce total crops yields by 50%, thus contributing to yam, cassava and sweet potato yield gaps (Sanginga and Mbabu, 2015; Verter and Becvarova, 2015).

Poor On-Farm Harvest and Post-Harvest Technology

Yam, cassava and sweet potato tubers rot significantly after few days of their harvest due to poor harvesting, assembling and distribution approach as well as poor storage facility and technology, which cumulatively contribute towards high rate of tubers loss up to 24% (FAO, 2003; Kenyon and Fowler, 2000; Sanginga and Mbabu, 2015). Again, it is posited that 10-12% of yam get rotten during the first 3 months of storage, whilst 30-60% after 6 months of storage (FAO, 2003; Kenyon and Fowler, 2000); thus, contributing to yam, cassava and sweet potato yields gaps.

Value Addition or Processing (Products Development) Constraints

Poor Value Addition Technology of Yam Products for Culinary, Manufacturing and Pharmaceutical Purposes:

Adding value to starch of 70-82% by volume of fresh produce of yam, cassava and sweet potato into high-grade products in the culinary, manufacturing, medicinal and pharmaceutical industries enhance processing capabilities of factories, processors, distributors and exporters for economic gains and consumer acceptability (Amanze, et al., 2011; Addy, 2012; Sanginga and Mbabu, 2015). However, product development capabilities gaps among some actors of the value chains have been observed as the producers, farms, cooperative societies, factories, processors, distributors and exporters recorded deficit in their operations capabilities via product mix (raw yam tuber), poor quality (short shelf-life) and weak standards (non-compliance with export requirements), low export market price (low FOB price) and unresponsiveness in serving yam export markets relative to Brazilian

exporters in the USA market (TRAVERA SURVEY, 2018). Again, yam yield decreased by 3.9% between 2013 and 2017, but that of cassava rose up by 2.1% over the same period (SRID, 2017). Similarly, exporters, factories and distributors surveyed said that they hardly introduce new yam products often to serve yam export markets better than their rivals (Feng, et al., 2016; TRAVERA SURVEY, 2018).

This situation of product development capability gap explains why 25%, 6% and 1% of cassava starch are processed into gari, dry chips and industrial products respectively (Kleih, et al., 2013) because processors and exporters along cassava value chain lack the requisite skills and technology to do that (MIDA, 2010; Addy, 2012). Again, the entrepreneurs claim that insufficient throughput discourages them from investing in agro-processing enterprises (MIDA, 2010); thus, constraining effective market demand for yam, cassava and sweet potato, which, in turn, deter producers from increasing on-farm crop productivity reflecting in yam, cassava and sweet potato yield gaps.

Logistics and Transport Infrastructure Capabilities Constraints:

Poor Transportation Facilities of Yam, Cassava and Sweet Potato along the Value Chain

Managing logistics and transport infrastructure capabilities by producers, factories, processors, distributors and exporters along yam, cassava and sweet potato value chains enhance the chance to reduce produce loss, maintain shelf life and gain market acceptability. However, logistics and transport infrastructure capabilities gaps were cited where yam, cassava and sweet potato produce transported in trucks suffer from high post-harvest losses due to poor road facility, followed by high cost and inadequate truck rentals, risks of road accidents and exhortation by traffic police as well as absence of warehouse facility for rental (TRAVERA SURVEY, 2018). This distribution capability gap accounts for 50% of the total production cost of yam and cassava production (Kenyon and Fowler, 2000; TRAVERA, Survey, 2018); thus, contributing to yam, cassava and sweet potato yield gaps.

Poor Export Market Infrastructure and Technology:

Ghana, the largest yam exporting country in the world exports yams to the UK, USA and EU but, it is constrained by poor post-harvest handling, storage infrastructure and fumigation practices which contribute towards poor export tuber quality and arrival loss rate between 10% and 50% (Anon, 1993) and 25%-50% yam losses globally (Anon, 1993). This capability gap is confirmed by this survey in three areas. First, 27% of crop producers, 97% of exporters, 36% of retailers, 33% of wholesalers, 24% of processors and 12% of farms export their products directly or indirectly to the export markets (TRAVERA SURVEY, 2018). Further, puna cultivar of yam, is the most preferred export commodity to generate foreign exchange earnings and creates jobs but, its export volume has decreased by 22.68% between 2011 and 2017 (GEPA, 2017; SRID, 2017). Second, 50.7% of 142 respondents of the survey expressed their interest to export yam products (TRAVERA SURVEY, 2018). Third, non-compliance of yam export quality standards and certifications and also lower FOB price of yam tubers offered to Ghanaian exporters (Anaadumba, 2013; TRAVERA SURVEY, 2018) relative to the Brazilian yam exports (Anaadumba, 2013) partly account for the reduced yam export volumes in Ghana (SRID, 2017).

With lower FOB price received, yam producers, distributors and exporters suffer financially rendering yam value chain unattractive enterprise (Anaadumba, 2013). With estimated annual mean yam export tuber loss of 30% coupled with relatively lower FOB

price, Ghana suffers substantial loss of foreign exchange earnings from yam export business (IITA, 2009; MIDA, 2010). These export marketing capability gaps partly account for the reduction of yam export by 22.66% between 2011 and 2017 (SRID, 2017), which in turn, account for the yam yield gap (TRAVERA SURVEY, 2018).

Marketing Capabilities Constraints

Yam End-Users' Buying Behaviour and Attitude towards the Products:

It is recognized that the low demand (end-use) for yam, cassava and sweet potato-based products is due to negative attitude that consumers show towards them. This attitude constraints industrialization of the crops value chains (Koyama, et al., 2015) that undermines the potential of starch as raw material for business and economic purposes. Again, investors are not conversant with technical, economic and financial viability of the yam, cassava and sweet potato value chains based on feasibility study and/or business plan (Koyama, et al., 2015). This entrepreneurial capability gap depresses investment into yam, cassava and sweet potato value chains functions including production, marketing and consumption of high-valued products, that in turn, can contribute towards crops yield gaps.

Obstacles Militating Against Starting or Increasing Export Business:

Initiating an exporting venture or increasing scale of the export business along yam, cassava and sweet potato enable exporters optimize their profitability, employability and competitiveness. However, export marketing capabilities gaps were cited. The study notes weaker institutional capacity, poor government support to exporters, lack of access to export market information, failure of the yam exporters to certify their products from the FDA and also comply with product quality standards from GSA account for the rejection of yam exports in overseas markets, reduction of yam export volumes and reducing foreign exchange earnings from yam exports (MoFA, 2018). This export marketing capability gap deters yam exporters either from either starting or increasing their exports volume and value (TRAVERA SURVEY, 2018), which invariably, contribute partly towards crops yield gaps in Ghana.

Financial Services Constraints

Lack of Financial Resources for the Development of Yam, Cassava and Sweet Potato Value Chains:

Accessing financial services from financial institutions is vital for yam, cassava and sweet potato producers, processors and exporters to optimize profitability and competitiveness of the value chains in Ghana. However, financial capabilities gaps were cited which indicate that 93% of respondents along the crops value chains cannot access financial services from banks to procure required planting materials, fertilizers and hire skilled labour to maintain their farms coupled with the fact they produce at high cost which tend to erode their margins, rendering the farming business unattractive to investor (Verter and Becvarova, 2015; TRAVERA SURVEY, 2018). In addition, high cost of interest rate and short repayment period of loans; lack of collateral security; lack of presence of a financial institution in actors' communities; and lack of knowledge on the application procedures for loans discourage some actors of the value chains from applying for credit facilities from institutions (Verter and Becvarova, 2015; TRAVERA SURVEY, 2018). This financial capabilities gap and lack of advisory services from agribusiness experts to the actors militate against higher crops productivity and thus, contribute towards the crops yield gaps.

Potential Allocation of Additional Financial Capital:

The total credit allocated from Ghanaian financial institutions to the agricultural sector has decreased from 4.46% in 2007 to 3.79% in 2016 (MOFA, 2016) translating into less funds for investment in the sector. Nevertheless, 26%, 24.6%, 22.3% and 5.4% of the root and tuber crop producers surveyed need more credit facilities from financial institutions to purchase extra plant and machinery, raw materials, rent bigger production space and place advertisement in the media respectively (TRAVERA SURVEY, 2018). Thus, this financial capability gap prevents majority of the studied actors along the root and tuber crops value chains to procure extra farming resources; which can also contribute towards crops yield gaps in Ghana.

Agribusiness, Entrepreneurial and Management Constraints:

The agribusiness management and entrepreneurial acumen and skills of yam, cassava and sweet potato producers, processors, distributors and exporters are prerequisite for optimization of profitability, employability and competitiveness of the value chains in Ghana. However, gaps related to agribusiness management and entrepreneurial capabilities are outlined below.

Subsistence Nature of Yam, Cassava and Sweet Potato Production and Marketing Activities:

Majority of yam, cassava and sweet potato production, processing and marketing in Ghana takes place in smallholding manner as 93% of cassava produce is used by households, whilst 6% and 1% are used for dry chips and industrial purpose respectively (Kleih, et al., 2013; Mignouna, et al., 2014). Equally, yam cultivated on smallholdings has recorded productivity rate loss by 0.23% between 2013 and 2017 partly due to unattractiveness of production, high risk and low return of investment (Verter and Becvarova, 2015; TRAVERA SURVEY, 2018). Thus, this high level of subsistence crops production systems partly accounts for the crops yield gaps.

The Socio-Economic Characteristics, Superstition and Ritualism Culture of Yam Households and Adoption of Technology:

It has been noted that 70% of the yam survey respondents are illiterates where some in the Bono, Bono East, Ahafo and Ashanti regions of Ghana practice superstition and ritualism by way dressing their planting materials with foreign materials before planted; where, crop failures are blamed on enemies; and solutions to insect pests and diseases of yam problems are sought in ritualism. Thus, they spend a lot of funds and time to consult the gods for protection against yam failure (Mignouna, et al., 2014). The high illiteracy rate and cultural belief can adversely affect adoption rate of new technologies as 68% of the studied firms said they are unable to access technical advice from MoFA or new technology from CSIR (TRAVERA SURVEY, 2018). Thus, this negative attitude towards improved technologies can also contribute towards the crops yield gaps (Mignouna, et al., 2014; TRAVERA SURVEY, 2018).

Limited Opportunities for Smallholder Women Farmers in Yam Production and Marketing

Women dominate in activities of yam, cassava and sweet potato value chains, but very low technological and financial support are available to provide solutions to their challenges (Anaadumba, 2013; Sanginga and Mbabu, 2015). Thus, it revealed that 61% and 60% of yam, cassava and sweet potato producers and firms respectively are members of associations who are benefiting from bargaining power and negotiation skills, welfare package, market information and effective pricing strategies (TRAVERA SURVEY, 2018). However, 40% of each of the crops producers and firms are not members of any association, hence deny themselves of such benefits and may contribute towards the crops yield gaps.

Enabling Environment Constraints:

Lack of Political Will by the Government of Ghana:

It is viewed that effective development, functioning and outcomes of agricultural value chains need favourable and enabling environment of government policies, regulations, institutions, support services and friendly business climate (AGRA, 2018). Nevertheless, it is noted that Government of Ghana is yet show ample political will and commitment towards yam exports venture because sampled yam exporters claim that they are yet to benefit from skills development relative to training solution received from Government of the Netherlands (TRAVERA SURVEY, 2018). This training gap creates skills problems for yam exporters who are unable to manage risk in the yam competitive and dynamic export environment, which in turn, can contribute to yam yield gap.

Land-Use Policies and Regulations for Agri-business Set Ups:

It is observed that Ghana's current land tenure systems do not motivate entrepreneurs to invest in large-scale and commercial yam, cassava and sweet potato production and processing opportunities (Adebayo, et al., 2013). With majority of the farming lands under communally-owned land tenure system, prospective investors have to satisfy the vested interests of all the extended family members which make the acquisition process of lands for the agribusiness venture very cumbersome, tedious and expensive, and in turn, deter entrepreneurs from investing (Adebayo, et al., 2013). This situation partly accounts for 60% of farm plots are under 1.2Ha, whilst, 85% of farm sizes are also less than 2.0 Ha (SRID, 2017). Thus, this development may deter potential entrepreneurs from investing substantially in the root and tuber crops value chains which, in turn, can contribute towards yam, cassava and sweet potato yields gaps.

Yam or Cassava as both Food Security and/or Commercial Venture:

Yam, cassava and sweet potato serve as food security strategy for millions of smallholder farming households in Ghana, but the starch can be developed into high-valued products through industrialization and commercialization. Policy makers are undecided about commercializing the use of starch for the industrial sector for fear of food insecurity issues in developing countries (Adebayo, et al., 2013). Consequently, industrialization and commercialization gaps can discourage potential entrepreneurs to invest in the root and tuber crops value chains, which in turn, can contribute towards yam, cassava and sweet potato yields gaps in Ghana.

Lack of Training in Agribusiness Management, Entrepreneurship and Business Development Services in Yam, Cassava and Sweet Potato Value Chains:

It is cited that producers, distributors, processors, exporters, managers, operatives or shop floor staff, financial institutions, research scientists, government agencies, and policy-makers along root and tuber crops value chains are hardly trained in agribusiness management, entrepreneurship and business development services so that they can exploit business opportunities identified in the market (Adebayo, et al., 2013; TRAVERA, Survey, 2018). Thus, such training solutions can facilitate development of technologies and markets as well as operationalization of business models to solve business capabilities gaps, skills gaps and skills mismatch identified along yam, cassava and sweet potato crops value chains (Adebayo, et al., 2013).

Management Training Capabilities Constraints:

It is recognized that lack of funding, difficulty in funding training programmes, no or poor information on training courses and trainers, difficulty in selecting the right trainees into training programmes, and low quality of training courses are some factors that account for low skills of workers and weak institutional capacity of studied producers, processors, distributors, exporters, etc along the yam, cassava and sweet potato value chains (TRAVERA SURVEY, 2018). This situation nurtures skills deficits in human resource development and capabilities among actors along yam, cassava and sweet potato value chain, which in turn, can contribute towards the crops yield gaps.

Recruitment Challenges:

The result of a study cites that difficulty of employers in hiring to meet seasonal employment request, lack of work experience and skills required for specific jobs demands and very often, very high number of job applicants prospecting for very few job postings are worrying development in the root and tuber crops value chains (TRAVERA SURVEY, 2018). This situation of either over-supply or under-supply in skills availability can militate against human resource development and capabilities among actors along yam, cassava and sweet potato value chain, which in turn, can contribute towards the crops yield gaps.

Weak Agricultural Extension Education and Services in a Demand-Driven System to facilitate the Development of the Yam, Cassava and Sweet Potato Value Chains:

It is acknowledged that weak ATVET institutions are supplying the agricultural labour market with research scientists, technologists and extensionists who are technically sound but deficit in agribusiness management, entrepreneurship and life skills which can contribute towards skills shortage, skills mismatch and skills gaps (Darvas and Palmer, 2014; Cappeli, 2015). It is noted that weak linkages among the functions of input supply, production, assembling, processing, marketing, consumption and support services along the yam, cassava and sweet potato value chains exist (TRAVERA SURVEY, 2018). Besides, 67.68% of sampled firms claim they have never received extension services or advisory services from MoFA, CSIR, GSA, FDA, GEPA, etc (TRAVERA SURVEY, 2018). This development facilitates skills deficits on production, processing or exporting among yam, cassava and sweet potato actors along the value chains, which in turn, contributes towards the crops yield gaps.

4. Implications For Skills Development (Skills Expert)

This section outlines the types of skills required to address the gaps of business capabilities of factories, processors, distributors and exporters along yam, cassava and sweet potato value chains, implications of the types of skills, projected skills versus current supply, sources of labour, skills of existing workers, main barriers to skills improvement interventions and lastly, inward migration that relate to the skills improvement opportunities of yam, cassava and sweet potato value chains.

4.1. Types of Skills Required to address Business Capabilities Gaps

Inference drawn from literature review and findings of the survey reveal five prioritized gaps of business capabilities of yam, cassava and sweet potato value chains to be addressed through envisioning the future outlook (Tables 10 & 11). Therefore, to address gaps of business capabilities of factories, processors, distributors and exporters along yam, cassava and sweet potato value chains and achieve envisioning the future outlook, require occupational levels (ISCO-08) namely, managers, professional, technicians & associate professionals, skilled agricultural workers, plant machine operators & assemblers and elementary occupations (GLSS6, 2014). Below outline types of skills required at each level of occupation.

First, at the managers level who are mostly chief executive officers of sampled enterprises of formal entities (factories, processors, distributors and exporters), they need skills in agribusiness management to address gaps of business capabilities through envisioning the future outlook.

Second, for the professionals level (specialists), factories, processors and exporters along yam, cassava and sweet potato value chains will use the skills of extension services, logistics, warehousing and transport management, food technology, post-harvest technology, quality management and export management to solve gaps of business capabilities through envisioning the future outlook.

Third, at the technicians & associate professional level (supervising operatives), factories, processors, distributors and exporters along yam, cassava and sweet potato value chains need skills from food technology technicians, quality assurance technicians, agricultural engineering technicians, laboratory technology technicians, post-harvest engineering technicians, etc to resolve gaps of business capabilities through envisioning the future outlook.

Fourth, at the skilled agricultural workers level (shop floor staff and operatives) factories, processors and exporters along yam, cassava and root tubers value chain will use expertise in basic yam, cassava and sweet potato agronomy, basic post-harvest technology and basic agricultural mechanization. These workers will be directly involved in yam, cassava and sweet potato production, assembling, processing (product development), distribution, logistics and transport, marketing and sales officers, etc along the value chains and play supportive roles to resolve gaps of business capabilities through envisioning the future outlook.

Fifth, at the plant machine operators & assemblers level, these workers will constitute the technical support team of factories, processors and exporters to realize functionality, reliability and maintainability of farm or factories assets, facilities and technologies so that yam, cassava and sweet potato products (fresh or processed) can be delivered to customers in Ghana and abroad cost-effectively. This situation needs the skills of farm machines operators

and repairers, maintenance crew, drivers and their mates, farm attendants, etc to solve gaps of business capabilities through envisioning the future outlook.

Sixth, at the elementary occupation level, factories, processors, distributors and exporters along the yam, cassava and sweet potato value chains will also need expertise of janitors, cooks, gardeners, etc to support the roles and duties of management, operational and administrative staff of the agribusinesses to achieve the vision statements. Lastly, expertise from the occupations of clerical support workers, services & sales workers as well as crafts & related trade workers are also useful in the yam, cassava and sweet potato factories, processors and exporters along the value chains to address gaps of business capabilities through envisioning the future outlook.

Consultation from various stakeholders of the study, the ILO workshop and prioritisation of the gaps of business capabilities of factories, processors and exporters along the value chains have led to the selection of only five business capabilities to be addressed in the report; namely, product development, marketing of yam export produce, logistics and transport management, agribusiness management and entrepreneurial development and lastly, other business functions. Therefore, each of the five prioritised business capabilities related to specified actors along the yam, cassava and sweet potato value chains has skills implications which are discussed below.

4.2. Implications of Types of Skills to Address Business Capability Gaps

Implications for Types of Skills Needed for Value Addition (Products Development) Capabilities

Based on the business capabilities gap of products development, there is the need to facilitate improvement of existing products and/or development of new products of yam, cassava and sweet potato from industrial and commercial interventions to gain better local and export market acceptability. To realize this envisioning the future outlook, starch of yam, cassava and sweet potato must be processed immediately after harvest into high-valued products to prolong their shelf-life, gain better consumer patronage both in the local and export markets. This processing activity will involve improvement of existing products and/or development of new products in food, animal feed, starch, ethanol, alcoholic beverage, flour, bakeries, high quality cassava flour, baby weaning food, pharmaceutical- and medicinal-based active ingredients niches to serve clients in the culinary, pharmaceutical, manufacturing and medicinal industries.

The improvement of existing products and/or development of new high-valued products will require sophisticated and advanced skills, well-trained and professional workforce as well as technology and standard operating procedures of processing of yam, cassava and sweet potato to meet clients' markets acceptability (Adebayo, et al., 2013; Kleih, et al., 2013; Makini, et al., 2015). Therefore, to achieve envisioning the future outlook in product development capabilities, sampled factories, processors, distributors and exporters along yam, cassava and sweet potato value chains will need expertise in product and innovation management, food processing and technology, post-harvest technology, quality management and agribusiness management and entrepreneurship.

Implications for Types of Skills Needed for Marketing of Yam or Gari Export Produce Capabilities:

Based on the business capabilities gaps of reducing both the volume and value of yam export produce, there is the need to double export volume and value (foreign exchange earnings) of yam by 30% and reduce yam export tuber arrival mean loss rate by 30% annually. To accomplish these two envisioning the future outlook objects; first, yam exporters will have to double their export volumes (fresh yam tubers); and second, achieve reduced arrival mean loss of 30% annually to serve the Africans in the Diaspora; thirdly, yam export products (fresh tubers or gari) must comply with four areas: (i) internal quality management system of export produce (size, weight, freshness, shelf life, etc) of yam distributors and exporters; (ii); national regulations on quality standards and certification requirements of yam export produce or gari; (iii) international quality management system, including HACCP, ISO Series required for yam tuber exports or gari; and (iv) USA, EU or other Africans' yam tuber or gari export requirements on quality standards, testing, certification, distribution and consumer behaviour patterns, etc.

Meeting these marketing capabilities and requirements of yam tuber or gari export market require skills in analysis and laboratory testing for chemical, biological, heavy-metal and physical standards, yam or gari food hazards; yam or gari quality certification; yam or gari quality assurance and control; and yam or gari export standards documentation; and yam or gari export procedures and rules of USA, EU and African markets. The yam exporters will need to comply with the requirements by possessing the aforementioned skills. Again, yam exporters will need the services of these regulatory institutions - FDA, GSA, GEPA, PPRS of MoFA, Ghana Airport Company Limited and Ghana Ports and Harbours Authority to expose them to product and export standards, testing, and certifications so as to reduce yam tuber mean arrival loss by 30% annually, yam tubers comply with exporting destinations' regulations and can earn competitive FOB price for yam export produce relative to Brazilian export fees.

In addition, the managers and professionals of yam tuber or cassava gari exporting enterprises or distributors should have skills in export management, international marketing mix and strategies (product mix, pricing, promotion, branding, packaging and labelling, etc) and distribution network as well as access market information on consumers buying patterns in USA, EU and African markets to be able to make sound and informed business decisions on investment options, pricing, return on investment and risks in the export venture.

Furthermore, managers, professional and technicians & associate professional of the regulatory authorities (FDA, GSA, PPRS, GEPA, etc) should also be skilled enough in managerial acumen and through their service charters and marketing skills motivate their subordinates and their clients (factories, processors, distributors and exporters) to religiously comply with the culture of exports regulations, product quality, standards and certification.

Implications for Types of Skills Needed for Logistics and Transport Infrastructure Capabilities

Based on the business capabilities gaps of logistics and transport infrastructure, there is the need to reduce yam export tuber arrival mean loss of yam by 30% each year through improved logistics, warehousing and transport management between yam producing areas and yam warehouses or export pack house in Accra or Tema. To realize this envisioning the future outlook will require skills in logistics, warehousing and transport management.

Therefore, inbound and outbound logistics are vital in linking yam, cassava and sweet potato producers to distributors, processors and exporters so as to minimize bottlenecks of high distribution cost, high storage losses and delays; and eventually, achieve high customer value in the local market and export market. Higher productivity in logistics and transport management requires skills in logistics and transport management as well as procurement rules of Ghana where haulage vehicles with appropriate storage technology and facilities will be used to cart, store and maintain acceptable quality (maintenance of shelf life) of yam, cassava and sweet potato products from producing areas to consuming areas, where end-users (consumers or exporters) can access quality products in a convenient way and value-added forms through warehousing, retailing or shopping.

To achieve this envisioning the future outlook object will require skills in post-harvest handling and storage technology; packaging, warehousing management, stock management; fleet planning, routing, scheduling and maintenance management; road regulations, accident prevention and defensive driving; driver behaviour management; compliance with national food regulations; export procedures and processes, quality standards, and certifications. The target trainees of the suggested skills development interventions to address logistics, warehousing and transport infrastructure capabilities are yam exporters, processors, transport officers, drivers and mates of factories (if any) and distributors as well as drivers and mates of haulage trucks.

Implications for Types of Skills Needed for Agribusiness Management and Entrepreneurship Capabilities:

Analyses from the survey report and literature show that majority of the actors along the yam, cassava and sweet potato value chains lack skills in agribusiness management and entrepreneurial development and this skills deficit can hamper the achievement of the envisioning the future outlook. Therefore, achieving the envisioning the future outlook in a professional manner would also need application of sound business management and entrepreneurship skills in product development, marketing and financing of yam, cassava and sweet potato value chains. The application of the required expertise in yam, cassava and sweet potato value chains are meant to sustain actors' economic and financial viability as well as longevity and sustainability of their agribusinesses. Therefore, yam, cassava and sweet potato processors, distributors, exporters and factory managers, professionals and other staff will need skills in small business management & entrepreneurship, financial literacy, feasibility studies, business planning and agribusiness management.

Implications for Types of Skills Needed for on Other Business Functions Capabilities:

It is reported that distributors, exporters, processors and factories along yam, cassava and sweet potato value chains lack skills on effective human resource development system for staff of studied enterprises; they incur infractions and fail to comply with some provisions of the labour law (Labour Act, 2003, Act 651) and national pensions law (National Pensions Act, 2008, Act 766); they are not conversant with requirements and activities of some regulators (FDA, GSA, GEPA, MoFA and GEPA); and they do not often receive technical advice and support from technology development institutions such as MoFA and CSIR.

To resolve these gaps of business capabilities will require that exporters, processors and factories along yam, cassava and sweet potato value chains possess skills in human

resource development, legal aspect of human resources management, client service charters, quality management and standard operating procedures of these institutions (FDA, GSA, GEPA, MoFA, MoTI and CSIR). So based on the analysis, the target trainees of the suggested skills development interventions to address other business functions capabilities are owner-managers, paid workers, family members, human resources managers or officers of yam, cassava and sweet potato exporters, processors and factories.

4.3. Projected Skills Demand versus Current Supply (Skills Expert)

This section outlines the labour market evidence, sources of labour, supply of skills, skills of existing workers, main barriers to training solutions and inward migration of yam, cassava and sweet potato value chains.

4.3.1 Labour Market Evidence

The agricultural sector of Ghana has been a good employer as it employs around 44.7% of the total employment active people aged between 15 and 60 years of age (GLSS6, 2014), making it the largest employer in Ghana (SRID, 2015). The sector employs a wide range of skilled workers of diverse occupations such as managers, professionals, technicians & associate professionals, skilled agricultural workers, plant machine operators & assemblers and elementary occupations, etc. Nevertheless, in general the agricultural sector and for that matter, root and tuber crops value chains offer relatively less competitive compensation package to its workers compared to other workers employed in industry and services sectors of the Ghanaian economy. For instance, whilst, skilled agriculturist is paid hourly earnings of GHS 0.66; relative to managers, professionals, elementary operators and other occupations, they are paid GHS 3.54, GHS 3.50, GHS 1.26 and GHS 5.06 respectively making the agricultural sector less competitive employer to attract and retain skilled workers in their vocations (GLSS6, 2014). Despite challenges of less competitive compensation system of the agricultural sector, graduates of the ATVET institutions are employed or can be hired by formal enterprises along yam and cassava product development, logistics, warehousing and transport management as well as marketing who can make good use of their knowledge and skills in order to progress through the career structure and in turn, achieve their career goal, development and job satisfaction.

Specifically, the employment openings in yam, cassava and sweet potato value chains in Ghana are categorized into three namely, formal sector, urban informal sector and rural informal sector (Osei-Boateng, and Ampratwum, 2011). First, the formal sector comprises both domestic firms and factory units with varying ownership and legal status in the country. The domestic firms are mainly micro and small-scale enterprises which are involved in the production and processing of yam and cassava products into chips or flour and packed for retailing at Supermarket, Shoprite (local consumption) and export to EU and USA. The factories, on the other hand, are foreign-owned (Ghana Guinness Limited and Accra Brewery Company), state-owned or partnership between state and the private sector or private sector (Ayensu Starch Company Limited, Bawjuase in the Central region). The sampled factories process large quantities of fresh or processed cassava tubers into high-grade products (starch, flour, flakes, alcoholic beverage, ethanol, gari and high quality cassava flour) and contribute significantly to the nation's economy through reduction of post-harvest loss, outputs towards GDP growth, create jobs, earn foreign exchange and serve as import substitution (Owoo and Lambon-Quayefio, 2017). Thus, the legal status of the factories comprises that 91.7% of 194 sampled yam, cassava and sweet potato firms are

owned by domestic private entities relative to 2.0% by domestic government and 6.3% by foreign private/government entity (TRAVERA SURVEY, 2018). From this, it is inferred that the private sector dominates in the production, processing and export of yam and cassava produce in Ghana.

The small-scale agro-based enterprise in the formal sector, especially the domestic wing (factories) are not well-advanced and produce at low production capacity; there is relatively low degree of value addition to yam, cassava (1% industrial use) and sweet potato produce; there are few linkages with production, marketing and financial services in the value chains probably because of their small sizes, low productivity level, inefficient technology deployment; and low skills of staff (Owoo and Lambon-Quayefio, 2017). It is observed that 85% of all agro-processing firms in Ghana are micro-enterprises, 7% are very small firms, 5% are small firms and only 3% are medium-sized enterprises (Owoo and Lambon-Quayefio, 2017) confirming the smallness and serious capacity constraints of agro-based enterprises in Ghana, including yam, cassava and sweet potato processing firms, factories or exporters. Under the formal sector of yam, cassava and sweet potato value chains, very limited skills development initiatives occur through on-the-job training, apprenticeship and enterprise-sponsored training programmes (TRAVERA SURVEY, 2018).

The urban informal sector of yam, cassava and sweet potato value chains in Ghana covers urban traders and processors such as food sellers in the market, itinerant wholesalers and retailers, bakers, caterers and cooked-food sellers and they acquire their skills largely from their families and traditional apprenticeship (Osei-Boateng, and Ampratwum, 2011). Lastly, the rural informal sector of yam, cassava and sweet potato value chains cover primary production, traditional processing and rural agro-based processing of fresh cassava tubers into gari, cassava dough and neat fufu; yam into yam flour, chips and neat fufu; and sweet potato traditionally processed into ready-convenient fried food. These informal agro-based enterprises (processing) take place in the homesteads which are promoted by mostly women and supported by the family labour (Osei-Boateng, and Ampratwum, 2011).

So far, inference deduced reveal that the supply of skills is not so strong demanded in the urban informal and rural informal yam, cassava and sweet potato value chains, but stronger and needed in the formal sector of the crops value chains because cassava or yam factories, processors or exporters are in a better position to attract and retain skilled workers required in food processing technology, quality assurance, packaging, distribution, transportation and supply chain management, and human resource management. For instance, with increasing demand for cassava tubers to serve as throughput in the breweries industry (Guinness Ghana Limited and Accra Brewery Company) for the production and marketing of alcoholic beverage (beer or malt drink) will require skills in supply chain management, production, product development, distribution as well as logistics and transport and agribusiness and entrepreneurship along the cassava value chain. Equally, if ownership and legal tussle of Ayensu Starch Company between the government of Ghana and owners of the factory is resolved, restructured, resourced and competitively managed, the cassava processing factory will also need skills (industrial starch processing technology, quality assurance, packaging, distribution, transportation and supply chain management, etc) similar to the brewery industry for the production of cassava industrial starch in the country.

Besides, expertise in export management, product quality, standards, standard operating procedures and service charters of the regulatory institutions (FDA, GSA, GEPA

and PPRS) will increasingly be in demand as yam and cassava distributors, processors and exporters are motivated to scaled up their volumes and value of export products abroad, especially fresh yam tubers or processed yam (flour or chips) or gari and other cassava and sweet potato food-based products (MoFA, 2018). Further, demand for training in entrepreneurship and agribusiness development skills targeting yam and cassava factories, processors, distributors and exporters are expected to rise over the next few years. This means that these skills development interventions are required to address skills gaps of yam and cassava distributors, processors and exporters in order to enhance Ghanaian yam export competitiveness in the USA and EU markets relative to other key rivals from Central or Latin America.

4.3.2 Sources of Labour (Skills Expert)

The study analyses the demand for skills of required occupations in yam, cassava and sweet potato value chains via the number and frequency of vacant advertisement by occupations published officially (Cappelli, 2015). Though job vacancy notices data specifically on yam, cassava and sweet potato value chains are not available, data on the number of job vacancy notices in the agriculture sector is used as proxy which shows that the demand for skills in the labour market of the agriculture sector has declined from 1,010 in 2015 to reach 201 in 2017, translating into reduction of 80.09% during the period under review (MELR, 2017) because the employment in the agricultural sector expanded by 1.0% on average, as against 8.3% and 4.25% in the service and industry sectors, respectively between 2006 and 2013 (Baah-Boateng and Baffour-Awuah, 2015). In addition, the agricultural sector recorded the least of 3.6% of the total job advertisements relative to 83.9% and 12.5% in the services sector and industry sector respectively in 2017 (BoG, 2017).

This means that majority of the skilled agriculturists (including yam, cassava and sweet potato graduates) from the ATVET institutions may find it difficult to be employed in the agricultural labour market, especially the urban informal and rural informal sectors, translating into skills mismatch (Cappelli, 2015) because, generally, the total number of job advertisements in Ghana decreased from 7,591 to reach 5,845 between 2016 and 2017, representing a drop of 20.3% under the period reviewed (BoG, 2017; MELR, 2017). Per occupations and skills category advertised, professionals and technicians accounted for 60.0% of the total job advertisements, followed by sales and service workers (13%), artisans and machine operators (10%), others (11%), secretarial and clericals (3%) and the least expertise, top executives (managers) is 3% in 2017 (BoG, 2017). This situation of skills mismatch as per job openings in Ghana in general was confirmed by sampled yam, cassava and sweet potato firms who opine that it is relatively easier for them to recruit low skill workers than high skill workers (TRAVERA SURVEY, 2018). This therefore probably explains reasons underlying 55% of total labour force hired in the agriculture sector has dropped to 44.7% between 2006 and 2013 and the sector further anticipates reduction in the demand for skilled labour in the coming years (GLSS6, 2014). Nevertheless, with industrialization and formalization of yam, cassava and sweet potato value chains in the areas of supply chain management, product development, distribution and local and international marketing, the demand for skills in product and innovation management, food processing and technology, post-harvest technology, quality management, standards and certifications, export marketing as well as agribusiness management and entrepreneurship in the various occupations (managers, professionals, technician & associate professional, skilled agriculturists, etc) will rise tremendously in the coming years.

4.4. Supply of Skills in Yam, Cassava and Sweet Potato Value Chains: (Skills Expert)

Various actors including Agricultural TVET (ATVET) institutions offer courses in agricultural science, technology and related disciplines to trainees who learn agricultural trades for the purposes of either self-employed or employed in another enterprise as manager, professional, research scientist, technician & associate professional, skilled agriculturist, etc (Kirui and Kozicka, 2018). In Ghana, ATVET institutions, either as public or private-type cover pre-tertiary education level, tertiary education level and training intervention level made up of apprenticeship, training service providers, private extension services, NGOs, faith-based entities and farmer organizations (Kirui and Kozicka, 2018). The public ATVET institutions are coordinated by three ministries: Ministries of Employment & Labour Relations (MELR), Education (MoE) and Food and Agriculture (MoFA) which supply skills to feed the agricultural labour market, including the yam, cassava and sweet potato value chains.

At the pre-tertiary sector, the National Vocation Training Institute (NVTI) and Integrated Community Centres for Employable Skills (ICCES) offer training, test and certify the trainees in general agriculture and apprenticeship programmes (Baffour-Awuah and Thompson, 2012). The biggest challenges these institutions face are low graduation rates of agricultural science courses relative to other trades' graduation rates (MELR, 2017). Also, at the pre-tertiary level, MoFA manages three (3) farm institutes and five (5) agricultural colleges which offer courses at the certificate and diploma levels in agricultural science covering all the specializations; namely, soil science, crop science, horticulture, animal science, extension education and in recent times have added agribusiness and entrepreneurship skills to the curricula (MoFA, 2018). Whilst the three farm institutes (Adidome, Asuansi and Wenchi) train the youth to acquire employable skills in the agricultural labour market, four agricultural colleges, namely, Ejura, Damongo, Ohawu and Pong-Tamale run a 2-year certificate in general agriculture. Also, Kwadaso, Ohawu and Pong-Tamale agricultural colleges have been upgraded from certificate-awarding to diploma-awarding colleges in general agriculture and animal health & production to respond to dynamics of the agricultural labour market (Gondwe and Walenkamp, 2011; MoFA, 2017). The biggest challenges that MoFA-managed ATVET institutions face are low graduation rates of trainees in the country (MELR, 2017).

At the tertiary level, technical universities and traditional universities offer undergraduate and graduate courses in agriculture and allied courses (MoFA, 2018). Seven out of the ten technical universities educate their students at the non-tertiary engineering technician certificates (part I and part II), Higher National Diploma (HND), degree (Bachelor of Technology, B-Tech) and postgraduate degrees (Masters of Technology, M-Tech). These courses offered to trainees cover agriculture, ecological agriculture, agro-enterprise development, agribusiness and entrepreneurship, food technology, post-harvest technology, agricultural engineering and mechanization with options in farm machinery and power engineering, soil and water engineering, post-harvest and food security technology as well as applied social sciences with specializations in procurement management and entrepreneurship with emphasis on skills development (MoE, 2014; MoE, 2014; Tabie and Yunus, 2014).

It is noted that fewer students are enrolled in science related courses in HND, consisting of 26% relative to 74% in the humanities in 2013. During the 2017/2018 academic

year, out of the total of 926 student enrolment in the seven Technical Universities who study ATVET programmes, 77.53%, 17.60% and 4.85% of them offer Higher National Diploma, Bachelor of Technology and Technician Certificates (NCTE, 2019). It is observed that the technical universities offer courses and skills that can address gaps identified in the business capabilities of yam, cassava and sweet potato value chains (TRAVERA SURVEY, 2018).

For the traditional universities, public (KNUST, UoG, UCC, UDS, UoE, UENR, etc) and private universities (CUC and MUCG) educate students in disciplines at both undergraduate and graduate levels (MOFA, 2018). It is noted that both undergraduate (Diploma, B.Sc. or B.A.) and graduate (M.A., M.Sc., M.Phil., and PhD) courses cover general agriculture, with options in agronomy, extension education, economics, agribusiness management, biotechnology, post-harvest technology, engineering and mechanization that contain skills needed to also mitigate against gaps of business capabilities of yam, cassava and sweet potato value chains. As at the end of 2013, total student population in both public and private universities stood at 226,750, comprising 32%, 9%, 23%, 8%, 6% and 22% of them read arts, social science, business, maths, natural science and applied sciences respectively (NAB, 2015).

Together, student population enrolled in the ATVET Institutions at both pre-tertiary and tertiary educational levels is small relative to the total student population across the country. For instance, total students enrolled in agricultural science and technology courses at the seven (7) technical universities was 926 (1.76% of the total) compared to total student population of 52,533. Also, total students enrolled into five agriculture colleges stood at 0.14% compared to total tertiary student population of 443,693 during 2017/2018 academic year (personal communication, HRD, MOFA and NTCE, June, 2019). Similarly, between 2014 and 2017, trainees in agricultural science trades at NVTI and ICCES never exceeded 0.15% of the total student trainee populations in the two ATVET Institutions (MELR, 2017).

The implication of these low rates of enrolment and graduation of agricultural and technology-based professions from the pre-tertiary ATVET Institutions especially, is that root and tuber crops value chains can suffer from deficit or shortage in expertise or personnel in plant machine operators and assemblers, crafts and related trade workers and elementary occupations who are needed to provide supportive roles in maintainability, functionality and reliability of on-farm and off-farm plant, machinery, equipment and tools at the shop floor of the factories or other enterprises.

Training Services Providers

Apart from the ATVET Institutions, training and business development services providers of government origin and private sector ownership are available to provide training programmes of either regular or customized mode to students or trainees including actors along yam, cassava and sweet potato value chains to overcome training barriers aimed to increase their productivity, quality and competitiveness. Specific services provided by the training and business development service providers to actors along yam, cassava and sweet potato value chains include management training, consultancy and advisory services, marketing, assistance, information technology, technology support, etc. Notably, the government-sponsored training and business development services providers are the Management Development and Productivity Institute (MDPI), Ghana Institute of Management and Public Administration (GIMPA), Civil Service Training School (CSTS), University of Ghana Business School (UGBS) and University of Professional Studies (UPSA).

A cursory look at their training services reveals that GIMPA has training modules on agribusiness management or agricultural administration that can address some of the business capabilities gaps and skills gaps that are associated with yam, cassava and sweet potato value chains investigated. Also, in recent times, the MDPI is also building her capacity in the ILO SCORE programme that aims to target MSMEs in skills development covering areas such as enterprise development, productivity improvement techniques, quality management, human resources management, safety and health management, agribusiness management, entrepreneurship and hospitality management including actors (factories, processors, exporters, etc) along yam, cassava and sweet potato value chains.

Inference on Skills Supply and Projections:

Few observations are made on the skills supply and availability including their projections in the agricultural labour market, including yam, cassava and sweet potato value chains. Data available suggests that 44.7% of the total labour force in Ghana work in the agriculture labour market comprising only 1.4% of them engaged as managers; 4.9% of them serve as professionals; 1.8% of them are technicians & associate professionals; 1.3% of them are engaged as clerical support workers; 24.5% of the staff work as service/sales officers; 44.3% of them work as skilled agriculturists; 12.7% of them operate as craft & related trades workers; 4.4% of workers constitute as plant machine operators & assemblers and lastly, 4.5% of the rest work as elementary occupations (GLSS 6, 2014). Similarly, MOFA has a total staff strength of 1,675 at post representing 47.6% out of the required staff size of 3,517, leaving a deficit of 1,842 unfilled positions (MOFA, 2017). Out of the 1,675 at post, 21.3% are professional agriculturists, followed by 6.5% sub-professional agriculturists, 37.8% are support staff and 34.3% are technical staff (MOFA, 2017). This analysis on skills supply and availability at the national and policy-implementation levels yam, cassava and sweet potato value chains have access to an array of skills and occupations to mitigate the gaps of business capabilities of the root and tuber crops value chains in Ghana.

Earlier section shows that yam, cassava and sweet potato value chains depict business capability gaps and skills gaps that require varying occupations, especially, managers, professionals, technicians & associate professionals, plant machine operators & assemblers to address them. Specifically, the experts will provide skills in prioritized areas to factories, processors, distributors, and exporters of yam, cassava and sweet potato value chains: (i) improve existing products and/or develop new products targeting culinary, manufacturing, and pharmaceutical industries for economic and business gain; (ii) marketing of yam export produce to gain better market acceptability over key rivals in EU and USA; (iii) logistics and transport infrastructure to maintain products shelf life and reduce tubers arrival quality loss rate; (iv) agribusiness management, entrepreneurship and financial literacy to build business acumen of the actors; and (v) other business functions in the areas of human resources development, legal aspect of human resources management, sales and client service management and service charter, advocacy and lobbying in favour of root and tuber crops value chains. Further, projecting into the future shows that the afore-mentioned skills or expertise will be in high demand to bridge the skills gaps so as to diversify the economy through increase in exports, jobs, productivity and competitiveness of yam, cassava and sweet potato processors, factories, distributors and exporters who are mainly MSMEs that operate in both formal and informal economies of Ghana.

4.5. Skills of Existing Workers in the Yam, Cassava and Sweet Potato Value Chains

Extracts from the survey and literature review reveal mixed reactions on the extent to which skills of workforce of sampled agribusiness enterprises meet labour market needs of yam, cassava and sweet potato value chains (TRAVERA SURVEY, 2018). On the positive side, some of the sampled yam, cassava and sweet potato processors, exporters and factories are very much satisfied with the skills of the existing labour market and describe them as appropriate to their current employers' needs. Specifically, yam, cassava and sweet potato processors, factories and exporters emphasized that majority of their workforce are skilful in operations capabilities, followed by sales and marketing capabilities, other business functions capabilities (financial management, sustainable development and information technology) and value chain capabilities and also the current labour turnover rate among yam, cassava and sweet potato firms do not have adverse impact on their growth and sustainability (TRAVERA SURVEY, 2018).

However, on the negative side, two skills areas that processors, exporters and factories along yam, cassava and sweet potato value chains need improvement are compliance with regulatory requirements and product development, where issues of product quality standards, certification and testing as well as standard operating procedures and technologies for yam, cassava and sweet potato product development into high-valued products to meet local and export markets dynamics (flour, flakes, chips, etc) are of major concern to them (TRAVERA, SURVEY, 2018). Also, expertise to deal with the reducing yam export volumes (MT) and values in terms of foreign exchange earnings through unfavourable FOB price offered due to reduced yam tuber export arrival loss rate came out strongly to be resolved in earnest.

Other priority skills areas mentioned by processors, exporters and factories along yam, cassava and sweet potato value chains are adoption of improved logistics, warehousing and transport management practices to address gaps of poor yam quality and export tuber arrival loss rate; and financial literacy to mitigate gaps of financial services capabilities in credit administration and investment decisions in agribusiness venture to boost their profitability (TRAVERA, SURVEY, 2018). Further, areas of enforcement of and compliance with regulations related to labour, registration of workers with the social security and pensions authority, updating personnel manual and job descriptions were mentioned largely by processors, exporters and factories along yam, cassava and sweet potato value chains as their skills priority areas as well (TRAVERA, SURVEY, 2018). It appears that the current skills training supply is optimal to address the skills gaps of yam, cassava and sweet potato value chains but the capacity constraint coupled with high number of the actors along the value chains that operate in the informal sector of the economy hinder the application of the expertise (skills) and in turn, restrict the actors' productivity, growth and competitiveness.

4.6. Main Barriers to Skills Improvement Interventions in Yam, Cassava and Sweet Potato Value Chains:

Main barriers that undermine skills training intervention effectiveness were deduced from the TRAVERA SURVEY (2018)'s findings and are summarized below:

Sixty-eight percent of sampled firms in the root and tuber crops value chain do not regularly

access technical advice, technology and business advisory services from CSIR and other support services providers in Ghana;

Seventeen percent of sampled firms in the root and tuber crops value chain do not offer orientation at all to new hires;

Almost 30% of the sampled firms in the root and tuber crops value chain do not offer training programme at all to their staff;

Majority of the 198 sampled firms (72%) in the root and tuber crops value chain have not trained their staff either internally or externally over the last 12 months prior to the study;

Seventy-three percent of 198 sampled firms' workers, 54% of exporters, 45% of retailers and 60% of factory have never been trained by the Government of Ghana on national regulations on food and drugs, export policy, procedures and standards as well as product and quality certification compared to similar training offered by the Netherlands Government targeting some Ghanaian yam exporters;

The respondents of the survey rated obstacles to training effectiveness as “difficulty in funding training” was seen as the most important prohibiting factor, followed by “no/poor information on courses/trainers”, then, “no or lack courses/trainers available” then come “low quality of courses on offer/low quality of trainers”, and the least rated went to “difficult to select the right people into training”. Analysis on the obstacles to effectiveness of skills development shows that training and business development service providers in yam, cassava and sweet potato value chains are generally not known by the actors along the root and tuber crops value chains. Therefore, training services providers (GIMPA and MDPI) need to innovate and design tailored-made courses to address the aforementioned skills gaps; promote their innovated courses in the media (print, electronic and social media); run demand-driven courses targeting the factories, distributors, processors, exporters, regulators, etc; use training needs analysis and training plan report to select appropriate trainees for all training courses to achieve training effectiveness and impact; and make their services more cost-effective (fees) so that trainees become more satisfied and ask for repeat business; all aimed to mitigate the obstacles to training effectiveness mentioned.

4.7. Inward Migration in Yam, Cassava and Sweet Potato Value Chains:

The role of migration on the socio-economic development of people and countries have been recognized since time immemorial (NMPG, 2016). Due to its importance, Ghana has a policy on migration which is implemented for the benefit of the stakeholders taking cognizance of international protocols and treaties signed or ratified (NMPG, 2016). The policy recognizes both inward migration and international migration and outlines that people migrate either to escape from unfavourable conditions or to take advantage of attractive policies to access jobs, seek better remuneration and improved standard of living (NMPG, 2016). There is strong North-South movement of internal migrants from Burkina Faso, Mali, Niger and Upper East region of Ghana to Upper West, Savannah, Northern, Ashanti, Ahafo, Bono, Bono East, Eastern and Central regions because these regions are the hubs for yam, cassava and sweet potato production, assembling and trading (MoFA, 2018). Eventually, these emigrants work during land preparation, mound making, weeding, staking, harvesting and assembling of yam, cassava and sweet potato when the rains cease in

their residences (Asare, 2012; MoFA, 2018). Similarly, emphasis is placed on inward migration where skilled agriculturists, engineers, food scientists and technologists, entrepreneurs and financial institutions are encouraged to invest and develop yam, cassava and sweet potato value chains as attractive and lucrative agribusiness ventures (MoFA, 2017).

Apart from cash remittances inflows estimated around USD 2.2 billion into Ghana in 2017 (UNCTAD, 2017), Diasporas and return migration can also facilitate development of yam, cassava and sweet potato value chains projects, transfer skills and technology, as well as mobilize investment to finance activities along the value chains (NMPG, 2016). As the TRAVERA SURVEY (2018) recognizes numerous business capabilities gaps, skills gaps and skills improvement opportunities along yam, cassava and sweet potato value chains, Diasporas of population ranging between 1.5 million and 3 million in over 33 countries across the world (NMPG, 2016) can be motivated to exploit business opportunities in the areas of yam and cassava export market development, products distribution, promotion and warehousing system. This call is premised that overall skill level of Ghanaian emigrants living abroad is relatively high as 33.8% of them possess medium skills, 27.6% have high skills, while 3% have no skills; coupled with fact that return migration is high as 85.91% of 1,090,972 Ghanaians who left Ghana returned between 2000 and 2007 (Asare, 2012). Therefore, inward migration can facilitate the development of yam and cassava value chains effectively to diversify the export base and improve profitability and competitiveness of Ghana.

4.8. Proposed Response to Future Skills Needs in Yam, Cassava and Sweet Potato Value Chains:

Evidence of gaps of business capabilities and skills problems have led to envisioning the future outlook in four targets outlined below: (i) double yam export volume of 2014 to reach 37,286 MT by 2022; increase the value of yam export by 30% annually; (iii) facilitate the improvement of existing products and/or development of new products in the culinary, manufacturing, medical and pharmaceutical sector; and (iv) reduce yam export tuber arrival loss rate by 30% and annually.

This study has adequately revealed business capabilities gaps and skills problems of yam, cassava and sweet potato value chains in Ghana that need to be resolved to facilitate the productivity and competitiveness of processors, factories, distributors and exporters along yam, cassava and sweet potato value chains in Ghana. Each of the actors along yam, cassava and sweet potato demonstrated some degree of business capabilities gaps or skills deficit. Therefore, a number of the gaps of business capabilities and skills gaps of the root and tuber crops value chain identified have been prioritised into five areas to be addressed.

First, yam, cassava and sweet potato factories, processors and exporters show limited skills in improving existing products and/or develop new products despite enormous opportunities in the food, manufacturing, and medical and pharmaceutical industries for business and economic gains. With skills in product development and technology, yam, cassava and sweet potato tubers can serve as outlets: (i) traditional foods, fermented food, beverages, jam, sauce, flakes or flour, snack food, bakeries targeting specified categories of buying behaviours - upper-, middle- and low income-consumers; (ii) animal feed (feed companies or livestock farmers); (iii) industrial, where starch serves as raw material for the production of industrial starch, alcohol, glucose, mannitol, sorbitol, dextrin, flour, paper, textiles, glue, plywood, cardboard and oil; and (iv) medical and pharmaceutical sector where

bioactive constituents such as phenolic compounds, saponins, bioactive proteins, etc have health, nutritional and well-being effects on man. These four outlets offer tremendous business opportunities for the local and export markets.

Second, yam, cassava and sweet potato processors, factories and distributors experience high produce loss rate (poor shelf life) between producing areas and consuming areas due to poor logistics, warehousing and transport infrastructure system. Third, yam exporters experience mean yam tuber export arrival loss rate estimated at 30% yearly (Anon, 1993; Asante, 2002), high yam export market price fluctuation, poor access to yam export market information, failure of actors along yam value chain to comply with both local and international quality management systems (GSA, FDA, MoFA and GEPA's regulations, standards, testing and certification) and low yam consumer patronage and acceptability; which in turn, all contribute towards relatively lower FOB price offered to Ghanaian yam exporters compared to yam exporters from Brazil in the USA yam export market. This situation probably accounts for the reduction of yam export volumes and values in recent years (MoFA, 2017).

Fourth, majority of yam, cassava and sweet potato processors, cooperatives, distributors and exporters along the value chains are micro, small, and medium agribusinesses who operate in the informal sector and lack skills in agribusiness management, entrepreneurship and financial literacy, credit administration and communications skills to lobby and advocate for their good and support from various stakeholders.

Finally, poor human resource management system, non-enforcement of legal aspects of human resources management system and lack of training opportunities impede majority of yam, cassava and sweet potato processors, distributors and exporters along the value chains from attracting, retaining and motivating skilled labour and also upgrading the low skills labour regularly to mitigate against the business capabilities gaps and skills problems.

Specifically, five responses are available to address now and future skills demand and are outlined below (see Table 12):

- 1 Yam, cassava and sweet potato factories, processors and exporters should be trained in good manufacturing practices on product development & innovation management, technologies and standard operating procedures (GMP); food processing and technology; post-harvest technology, quality management systems as well as agribusiness management, entrepreneurship and financial literacy so that trainees can improve on existing products of yam, cassava and sweet potato or develop new products to gain local and international market patronage and earn adequate returns to their investments in the culinary, manufacturing, pharmaceutical and medicinal-based enterprises. It is expected that after the training programme, trainees can use good manufacturing practices, standard operating procedures and technologies as well as skills acquired to improve on existing yam, cassava and sweet potato products or develop new products to feed the food, animal feed, industrial and pharmaceutical sectors for economic gain. Therefore, yam, cassava and sweet potato factories, processors, distributors, and exporters will be the target trainees of the skills training programme.
- 1 Yam, cassava and sweet potato factories, distributors and exporters are provided with skills in logistics and transport infrastructure capabilities in the areas of post-harvest technology, fleet planning, scheduling and routing system; storage management in haulage trucks;

vehicle maintenance management system; warehouse management; road safety regulations and practices; accident prevention and defensive driving; and driver behaviour & client service management. After skills training in logistics and transport infrastructure capabilities, the trainees are expected to improve yam, cassava and sweet potato shelf life and reduce tubers quality and arrival loss rates during haulage as well as comply with road safety regulations and adopt best driving management practice, prevent road accidents and the drivers and mates of haulage trucks conduct themselves professionally and ethically to mitigate against long delays from security officers. Therefore, yam, cassava and sweet potato factories, processors, distributors, and exporters will be the target trainees of the skills training programme. Besides, drivers and mates of haulage trucks, transport officers of yam, cassava and sweet potato factories, processing and exporters, Ghana Security Services will also be trained in the aforementioned skills.

Under marketing of yam exports venture capabilities, two training interventions are suggested. First, yam exporters, processors and distributors shall be provided with training in four topics: (i) internal quality management system (product standards, technologies and skills) of yam and cassava factories, processing and exporting enterprises; (ii) national regulations on quality management systems (product standards, testing, certification, and technologies) of FDA, GSA, PPRS of MoFA and GEPA, etc that relate to yam and cassava production, processing, distribution and exports; (iii) international quality management systems (product standards, testing, certification, and technologies) such as HACCP, ISO Series, etc that relate to yam and cassava production, processing, distribution and exports; (iv) yam and cassava export country selection and entry system, export documentation and procedures; product quality assurance system; product testing system; market information; international marketing mix, strategies and export organizational architecture and system. The essence of this skills training is to motivate yam and cassava processors, distributors and exporters to operationalize their internal quality management systems and also comply with both national and international food regulations, standards, testing and certifications of yam and cassava exports ventures. This skills training shall aim to boost yam and cassava export quality, volumes and values as well as enhance incomes of actors along the root and tuber crops value chains. Hence, yam and cassava factories, processors, distributors and exporters will be the target trainees of the skills training programme.

Second, regulators of export quality management systems (FDA, GSA, PPRS of MoFA, and GEPA) would also be trained in standard operating procedures, service charters, client service management and supervisory management skills so that management and supervisors of the regulatory institutions improve their communication, interpersonal and customer relationship skills so as to motivate yam and cassava processors, distributors and exporters to understand and comply with both local and international food regulations, standards, testing and certifications of yam and cassava exports ventures. Coordination among the regulators (FDA, GSA, PPRS of MoFA, and GEPA) as per their food regulations, standards, testing and certifications of yam and cassava exports ventures should also be harmonized and strengthened to boost export of yam- and cassava-based products. Thus, management, supervisors, public relations staff, client services officials and frontline staff of the regulators (FDA, GSA, PPRS of MoFA, and GEPA) will be the target trainees of the skills training programme.

1 Institutional strengthening of yam, cassava and sweet potato factories, processors, distributors and exporters along the value chains through training, seminar, workshop, conference and technical assistance in agribusiness management, small business management and entrepreneurship skills including feasibility study, business planning, financial literacy & credit management in financial institutions, good manufacturing practices, marketing management, human resources management, legal aspect of human resources management, records keeping & financial management, and attitudinal change for increased adoption of technologies and enhanced productivity as well as advocacy and lobbying strategies in favour of promotion and development of root and tuber crops value chains. Besides, financial service providers, policy-makers, practitioners and celebrities will participate in this institutional capacity building programme to deepen their awareness on the business opportunities available and support services required in the promotion and development of root and tuber crops value chains. The essence of this training programme is to enable trainees (yam, cassava and sweet potato producers, processors, distributors, factories, cooperatives and exporters) better manage their agri-businesses professionally and productively to meet international best practice. In addition, the financial services providers, support services institutions (CSIR), celebrities, policy makers, etc will participate in yam, cassava and sweet potato value chains development conferences, seminars or workshops to sensitize them to play their respective roles better. Therefore, yam, cassava and sweet potato processors, distributors, factories, and exporters as well as financial service providers, policy-makers, CSIR staff and celebrities will be the target trainees of the institutional strengthening programme.

1 Quality training and business development services provision, here competent training and business development services provider (s) shall be procured competitively by the ILO Ghana Office to administer the aforementioned training and institutional strengthening programme (Table 12). The training and business development service provider (s) must be competent, have similar or prior experience and conversant with training needs assessment and training plan, adult-facilitation and learning approaches, have staff with proven mix of skills to design, plan, deliver and evaluate training and institutional strengthening programmes as well as undertake follow-up on post-training solutions to suit the needs of yam, cassava and sweet potato producers, factories, cooperatives, processors, distributors and exporters along the value chains.

Table 12: Summary of Training Programmes for Targeted Trainees of Yam, Cassava and Sweet Potato Value Chains.

No.	Skill	Topics	Trainees
1	Product development of yam, cassava and sweet potato capabilities.	<ul style="list-style-type: none"> • Post-harvest technology. • Good manufacturing practices. • Product development & innovation management. • Food processing and technology. • Quality management systems. • Agribusiness management and entrepreneurship. • Financial literacy. • Attitudinal change for increased adoption of technologies and enhanced productivity. 	<ul style="list-style-type: none"> • Processors • Factories managers • Exporters. • Entrepreneurs.
2	Marketing of yam export venture capabilities	<ul style="list-style-type: none"> • Enterprise quality management system. • National quality management systems of FDA, GSA, GEPA, and PPRS of MoFA. • International quality management systems - HACCP, ISO Series, etc. • Export management procedures and practices – country selection and target market, quality regulations – product standards, testing, certification, distribution, promotion, pricing, etc. • Export business architecture and management. 	<ul style="list-style-type: none"> • Yam exporters • Yam processors • Yam distributors
		<ul style="list-style-type: none"> • Standard operating procedures in export business. • Service charters of regulators. • Communication and client service management. • Supervisory management in quality management environment. 	<ul style="list-style-type: none"> • Staff of the regulators – FDA, GSA, GEPA, PPRS of MoFA.
3	Logistics, warehousing and transport infrastructure capabilities	<ul style="list-style-type: none"> • Logistics and transport management. • Post-harvest handling and storage technology. • Fleet planning, scheduling, routing, and maintenance management. • Storage management system in haulage trucks. • Warehouse management. • Road regulation, accident prevention and defensive driving. • Driver behaviour, ethics and client services management. • Export procedures and practices • Quality management system 	<ul style="list-style-type: none"> • Distributors • Exporters • Factories managers. • Drivers and mates of haulage trucks • Security agencies – police and customs.

4	Institutional strengthening of enterprises - Agribusiness management and entrepreneurship capabilities	<ul style="list-style-type: none"> • Good manufacturing practices. • Entrepreneurship, small business & agribusiness management. • Value chain management of root & tuber crops. • Business planning & feasibility studies. • Financial literacy & credit management in financial institutions. • Records keeping & financial management. • Public speaking, lobbying and advocacy skills 	<ul style="list-style-type: none"> • Distributors, processors, exporters, staff of the regulators, credit officers of banks, etc. • Policy makers, celebrities, CSIR staff, etc.
5	Institutional strengthening of enterprises - Other business functions capabilities	<ul style="list-style-type: none"> • Human resources management. • Legal aspect of human resources management. • Client service charter of regulators. • Quality management system of enterprises, national regulators, international quality management systems and exporting requirements of USA, EU, Asian and African states. • Attitudinal change for increased adoption of technologies and enhanced productivity. • Advocacy and lobbying skills for agribusiness enterprises. 	<ul style="list-style-type: none"> • Human resources managers of factories, exporters and processors. • Owner-managers of factories, exporters and processors. • Promoters of factories, exporters and processors.

5.0 Conclusions and Wider Policy Implications (Lead Consultant and Skills Expert)

Wider Policy Implications:

Based on these analyses, the business capabilities gaps and skills improvement options required to enhance the competitive edge of yam, cassava and sweet potato factories, processors, distributors and exporters along the value chains are broad and also extensive. Therefore, the policies required are also extensive and entail four-level approaches outlined below.

Policy Level:

- | The business capabilities gaps and skills gaps of yam, cassava and sweet potato value chains have been influenced to a large extent by “policy failure” via poor political commitment and support; non-prioritized of yam, cassava and sweet potato value chains to exploit business opportunities of enhanced incomes, employability, productivity and economic diversification; weak collaboration between Government of Ghana on one side and the donor community (ILO, AfDB, IFAD, WB, etc) on the other side to create congenial environment to promote and develop the three root and tuber crops value chains to reach their full business, economic and financial potentials.
- | Here, all the stakeholders (Government of Ghana, international community (ILO), policy-makers, academia and practitioners) should commit themselves adequately through financial resources, expertise, technology, institutional reforms, projects and programmes, training interventions, technical assistance, etc to build institutional capacity of yam, cassava and sweet potato factories, processors, distributors and exporters along the value chains as well as the regulators (FDA, GSA, PPRS of MoFA and GEPA), financial institutions and support services providers (research and development, CSIR and training and business development services providers, MDPI & GIMPA) so as to play their respective roles and responsibilities in the promotion and development of yam, cassava and sweet potato value chains. Seminars, workshops, conference, project proposals, research and development, trade agreements, tariffs, free trade and custom regulations, etc would feature prominently at the policy level of yam, cassava and sweet potato value chains development in Ghana.

Institutional Level

- | Improvement in the cooperation among policy makers at the MMDAs level (MoE, MELR, MESTI, MoTI, and MoFA), regulatory bodies (FDA, GSA, GEPA, and PPRS of MoFA), end-users (yam, cassava and sweet potato processors, factories, distributors and exporters), technology development agencies (CSIR) and training service providers (MDPI and GIMPA) for permanent mechanism, coordination and dialogue for skills improvement opportunities and adoption of best practice of regulations and laws, standards, testing, certification, support services, etc for development of yam, cassava and sweet potato value chains.

Mechanism in the form of skills council, industry advisory boards and working groups, technical committees, workplace-based training programmes, collaboration, partnership and networking would feature prominently at the institutional level. The suggested mechanism will “bring together key industry players and actors along yam, cassava and sweet potato value chains to discuss skill development issues affecting their employability, productivity, performance and competitiveness”. It is expected that this mechanism will identify and anticipate skills needs, develop policies, planning for improving skills development capabilities and other aspects of building, maintaining and continuous improvement for strong skills system for the development and promotion of yam, cassava and sweet potato value chains.

Occupational Types Level:

Here, the for the purpose of skills dialogue and improvement, training and business development services providers (MDPI, GIMPA and ATVET Institutions) should redesign their curricula & content to be demand-driven in order to address the skills gaps of yam, cassava and sweet potato labour markets; collaborate extensively with end-users (factories, processors, distributors, and exporters) to facilitate in continuous improvement of their processes, technologies and skills set; improve their training delivery and evaluation and follow-up systems; and form long-life and sustainable relationship with yam, cassava and sweet potato factories, processors, distributors and exporters along the value chains as well as the regulators, financial institutions and technology development agencies.

MoFA should also regularly organize workshops, conferences, seminars and training courses for the PPRS staff and extension services staff to beef up skills in emerging technical areas and also address skills gaps in the managerial, entrepreneurial and soft disciplines so as to meet expectations in product development and quality management system of yam and cassava exporting venture.

The regulators (GSA, FDA, GEPA, PPRS of MoFA) shall also be trained to improve their standard operating procedures and service charters (simplify and customer friendly), communication skills systems, human relations and customer relationship management so that staff of various occupations can serve their clients better in the areas of regulatory compliance and product standards, testing and certifications as far as yam, cassava and sweet potato value chains development are concerned.

The CSIR shall develop service charter and use it to motivate factories, processors, distributors and exporters along yam, cassava and sweet potato value chains to improve their existing products and technologies, develop new products or adopt new technologies based on cost-effective practices as well as enhanced yield, quality characteristics, consumer patronage and use by manufacturers, etc.

The staff of the financial institutions (banks, savings and loans companies and microfinance companies) shall also improve their service charters and standard operating procedures (simplify and customer friendly) and use them to motivate factories, processors, distributors and exporters along yam, cassava and sweet potato value chains to access credit facilities, use them judiciously and repay them timely aimed at expanding their enterprises' operations,

incomes, jobs and productivity. Besides, staff of the financial institutions shall also be trained to better provide financial literacy and advisory services to exploit skills improvement and business opportunities and also mitigate gaps of business capabilities and risks associated with yam, cassava and sweet potato value chains in Ghana.

Enterprise Level:

- | The micro, small and medium-scale enterprises form the backbone of the Ghanaian economy and thus, majority of yam, cassava and sweet potato producers, factories, processors, distributors and exporters sampled along the value chains are integral part of the informal economy. Though sampled actors of yam, cassava and sweet potato record strengths in some aspects of business capabilities and skills improvement, however, majority of them are constrained and saddled with business capability deficits and skills gaps. Therefore, the prioritised five skills gaps must be addressed in earnest to promote agility and competitiveness of yam, cassava and sweet potato value actors (factories, processors, distributors, exporters, etc) along the value chains.
- | The biggest challenge that emerged from the study is capacity and employability constraint of the factories, processors, distributors and exporters who dominate the informal economy of Ghana. Central to this capacity constraint is to upgrade the skills profile of yam, cassava and sweet potato factories, processors, distributors and exporters along the value chains through continuous improvement culture and human resource development policy framework in the areas of workshop, conference, seminar and institutional strengthening.
- | The skills upgrading and improvement intervention shall also involve other methods such as on-the-job training, off-the-job training, apprenticeship, attachment, mentoring, coaching, etc targeting yam, cassava and sweet potato factories (owner-managers, human resources managers, training managers or other workers), processors, distributors and exporters along the value chains as well as drivers and mates of haulage trucks.
- | The weak institutional capabilities of sampled agribusiness enterprises via infractions on local, national and international regulations, quality standards and testing, certification, labour law, pensions law, human resource management policies and procedures (company human resource manual, scheme of services and job description), etc should be strengthened through training, workshops, conferences, seminars and institutional strengthening.
- | Seasoned training and business development services provider (s) shall strengthen the institutional capacity of the actors along the value chains, including training, workshops, conferences and seminars to address the business capabilities gaps and skills problems so that yam, cassava and sweet potato processors, distributors, factories and exporters find workers with the right skills and also build the capacity of their workers to acquire the skills needed to sustain productive employment and economic diversification of yam, cassava and sweet potato value chains.
- | All these suggestions at the four-level areas will require substantial financial resources (budget) to operationalize them, hence establishment and an active functioning of a National Training Fund Authority in the long run, will help to address financial capabilities gaps of yam, cassava and sweet potato processors, distributors, factories and exporters in respect of

human resource development policy framework. The development partners (ILO, AfDB, IFAD, WB, etc) are encouraged to assist Ghana to set up a National Training Fund Authority to operationalize skills improvement framework and agenda in Ghana.

Conclusion

This report has provided evidence that corroborates the growth potential in income, jobs and export development of yam, cassava and sweet potato value chains in Ghana. It presents significant opportunities for responding to the Ghanaian's strategic imperative of reversing the sluggish informal sector (yam, cassava and sweet potato sub-sector) and export trade imbalance through root and tuber crops value chains upgrading and skills improvement agenda. It outlines the actions required to address the existing gaps of business capabilities and skills problems, expand export growth potential, increase job openings and contribute towards national economic growth as far as yam, cassava and sweet potato value chains are concerned.

Further, envisioning the future outlook repositions yam, cassava and sweet potato value chains to systematically identify types of skills (occupations) to mitigate the business capabilities gaps in the areas of good manufacturing practice via product development and innovation management; logistics and transport infrastructure; marketing of yam exports products; institutional strengthening of actors along the root and tuber crops value chains - agribusiness management and entrepreneurship development as well as other business functions in effective training and business development services provision. Existing ATVET institutions and support service providers (MDPI and GIMPA) have the capacity to supply technical skills to feed yam, cassava and sweet potato labour markets, but the business skills of the graduates remain a challenge, coupled with feeding them into the highly informal labour market of root and tuber crops (weak skills demand due to capabilities constraints). The MDPI and GIMPA should be capacitated to address the business skills gaps of the root and tuber crops value chains to unleash their full economic and entrepreneurial potential.

A framework at four-tier levels – policy, institutional, occupational and enterprise is proposed to create congenial environment where government (policy-makers – MoTI, MoFA, MELR, MESTI and MoE), development partners (ILO, AfDB, IFAD, WB, etc), regulators (FDA, GSA, GEPA and PPRS of MoFA), training and business development services providers (MDPI and GIMPA) as well as yam, cassava and sweet potato enterprises along the value chains deepen their respective roles to mitigate the gaps of business capabilities through skills development and continuous improvement agenda, including technology, market and business models in the coming years. It is expected that the policy, institutional, occupational and enterprise interventions suggested have the potential to double yam export volume and value by 30% annually; facilitate improvement of existing products of yam, cassava and sweet potato and/or development of new products to meet both local and export markets; and reduce yam export tuber arrival loss rate by 30% annually so as to diversify the economy and boost root and tuber crops trade between Ghana on one side and the USA, EU, and Africa (emerging yam markets) on the other side.

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