United Republic of Tanzania

Ministry of Agriculture

Value Chain Analysis of Barley, Wheat, and Grapes in Tanzania

Identifying forward and backward linkages, challenges and opportunities for economic growth

AGRA
Growing Africa's Agriculture

HUB FOR AGRICULTURAL POLICY ACTION (HAPA)

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ABOUT AGRA

AGRA is an African-led non-profit organization formed in 2006 in response to the call by former UN Secretary-General Kofi Annan for a uniquely African green revolution. AGRA's vision is to transform agriculture from a solitary struggle to survive into farming as a business that thrives, putting farmers at the center of the continent's growing economy. AGRA recognizes that developing smallholder agriculture into a productive, efficient, and sustainable system is essential to ensure food security, lifting millions out of poverty and driving equitable growth across the continent. AGRA's mission, therefore, is to catalyse and sustain an agricultural transformation in Africa through innovation-driven productivity increases and access to markets and finance that improve the livelihoods of smallholder farmers. We achieve this mission with and through partners. The alliance has built the systems and tools for Africa's agriculture; high-quality seeds, better soil health, access to markets and credit, and coupled with stronger farmer organizations and agriculture policies.

About HAPA

Across African countries today, there is a need for better, more timely use of evidence, and more targeted approaches, to improve the quality of policymaking by governments. The Hub for Agriculture Policy Action (HAPA), is a Unit within AGRA that provides policy advisory services to governments seeking to reform, refine, and/ or develop a more clearly defined policy direction. The approach recognizes the urgent need for timely policy support to the agriculture sector, which plays an important role in ensuring inclusive growth. It also recognizes the demands for political expediency and the need to ensure that a particular policy direction is anchored in evidence.

The purpose of the Hub for Agriculture Policy Action (HAPA) is to support AGRA to catalyze and sustain an inclusive agricultural transformation in Africa to increase incomes and improve food security of millions of Africans. The creation of HAPA was in response to a noticeable gap in the utilization of evidence within the policy-making cycle to drive policy change. Through Consolidation and Translation (C&T) of evidence, HAPA's work entails collating existing evidence, expertise and best practice that are relevant to a government request for policy support and processing these into a set of rationalized and costed policy options. Through HAPA, AGRA aims to increase the use of evidence to inform decisions for policymaking and implementation. HAPA works with local partners such as research actors to collate existing data and evidence, expertise, and best practices that respond to a government request for policy support and package these into a set of actionable policy recommendations.

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Comments

Comments, suggestions as well as requests for clarification of information contained in this report are welcome and should be addressed to: AGRAHAPA@agra.org

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Acronyms/Abbreviations

ASA	Agricultural Seed Agency
CRI	Crown Root Initiation
GAP	Good Agricultural Practices
GDP	Gross Domestic Product
GVCs	Global Value Chains
LGAs	Local Government Authorities
MITI	Ministry of Industry, Trade, and Investment
N	Nitrogen
REA	Rural Electrification Agency
RVC	Regional Value Chains
SWOT	Strengths Weakness Opportunities and Threats
TARI	Tanzania Agricultural Research Institute
TBL	Tanzania Breweries Limited
TBS	Tanzania Bureau of Standards
TFDA	Tanzania Food and Drugs Authority
TFRA	Tanzania Fertilizer Regulatory Authority
TOSCA	Tanzania Official Seed Certification Institute
TZS	Tanzania Shillings
VAT	Value Added Tax

Foreword from Minister of Agriculture

The Government of Tanzania has recognized the importance of Agriculture and agro processing in the country's industrialization and economic development. Tanzania has a huge potential for industrialization, given the country's agricultural favourable climatic conditions, and rapid urbanization which is changing the demand patterns towards more processed foods. The government identified various crops that can drive the growth of agro processing, increase income for farmers and create employment opportunities across the value chain. However, impediments in the value chains of commodities in the domestic markets have resulted in increased importation. Wheat, barley, and grapes are some of the crops with the largest potential for growth in farm-level production and processing. However, challenges and bottlenecks across the value chains constrain their potential and deny farmers revenue.

The government of Tanzania is working towards unlocking the agriculture growth by resolving the challenges faced by stakeholders in the sector. Consequently, the Ministry of Agriculture requested AGRA through the HAPA initiative to support various studies to inform reforms aimed at creating a better business environment in various sectors.

Phase 1 of the project assessed the fiscal implications of removing VAT on beer processed from locally produced raw materials and recommended suitable incentives and alternative measures. Based on the findings, the government granted various fiscal incentives that were geared towards making beer made from locally sourced barley more competitive.

In Phase 2, the focus was on two aspects. Firstly, the Ministry of Agriculture was interested in understanding the effect of proposed fiscal reforms to enhance the affordability of imported edible oils while increasing sunflower production for domestic and international markets. The second aspect focused on a value chain analysis to identify key challenges facing different actors and activities along the value chain and provide a basis for various reform recommendations that would foster improved sector performance across the value chains.

The findings of this study identifies the complex and numerous agricultural taxes and levies ((cess), value-added tax (VAT), and import duty)) as key constraints to the development of the three value chains (wheat, barley, and grapes) and recommend a regime that reduces the transaction costs to both primary and secondary producers. Further, the study notes that most of the small-scale farmers in Tanzania do not participate in the formal value chain, instead operating within a framework that is characterized by poor coordination with weak or no legal enforcement of contracts, policies, laws, standards, and regulations. The study recommends supporting farmers through affordable financing to expand the capital, mechanize and modernize their production systems.

The Ministry of Agriculture is grateful for the support of AGRA through HAPA that made this work possible. It is testimony to the successful partnership between the government of Tanzania and development partners, particularly AGRA.

Hon. Hussein M. Bashe
Minister for Agriculture

Note from AGRA President

The combined impact of climate change, runaway inflation started since the outbreak of the covid-19 pandemic, and the trade disruptions resulting from the Russia-Ukraine crisis, have disrupted food systems and affected the food security of millions of people across the globe. The most affected crops are edible seed oils and cereals such as barley, maize, and wheat. Low-income developing nations in Africa are the most affected due to the fragility of their food systems.

Many countries are faced with high debt levels and pressing financing needs. Several of them are carrying debt equal to 70 per cent of their GDP or more, which narrows the fiscal space and makes temporary subsidies on fuel, fertilizers, and food products unmanageable. Social safety programs that were targeted at vulnerable families, especially during the peak of covid-19 control measures are becoming unsustainable. Debt restructuring is needed to save developing countries from imminent economic disruption. Further, many countries are in dire need of humanitarian interventions to stop families from falling into famine.

Given the challenges, Africa's food systems must evolve and adapt to adequately respond to the unprecedented challenges being experienced globally and on the continent. Africa is heavily affected by global shocks because it is a net food importer. Intra-Africa trade is quite low currently. African countries trade with other continents than they trade with other African countries. The African Continental Free Trade Area (AfCFTA) and other regional trading blocs provide an opportunity to change this state of affairs by reducing barriers to intra-African trade. African countries must take this opportunity to trade more amongst themselves and become food sufficient.

AGRA is working with African governments and institutions to catalyse an agricultural transformation in Africa improving yields using Innovative technologies and improving access to markets and finance that improve the livelihoods of smallholder farmers. AGRA is also working with governments to reform agricultural policies and create a business-friendly environment for farmers and investors alike. The Hub for Agricultural Policy Action is an initiative of AGRA and its partner, the Bill and Melinda Gates Foundation, to support governments in generating and consolidating evidence to inform policy.

The Hub for Agriculture Policy Action (HAPA) was created to support AGRAs's efforts in catalyzing and sustaining an inclusive agricultural transformation in Africa as a means to increase incomes and improve food security for millions of Africans. To this end, the Ministry of Agriculture in Tanzania is one of the first institutions to partner with AGRA through the HAPA initiative. The partnership has seen HAPA support the Ministry through analysis of data to inform various fiscal reforms in the breweries and edible oil sectors in the country. This model of evidence-based policy and decision-making is a welcome departure from previous systems where the policy was informed more by political expedience than data and evidence.

Dr. Agnes Kalibata
President, AGRA

Note from Vice-President Policy and State Capability Division

HAPA is a distinct service offering by AGRA to provide policy consolidation and translation advisory services to governments seeking to reform, refine or develop a more clearly defined policy direction. The project has two outcomes (1) Improved policy environments for enabling Inclusive Agricultural Transformation (IAT) in participating countries, and (2) Timely and more responsive processes for improving Inclusive Agricultural Transformation (IAT) regarding relevant policies in participating countries. The intermediate outcomes are: (1) Adoption of policy recommendations for enabling Inclusive Agricultural Transformation (IAT) in participating countries, and (2) timely and reliable evidence on policy alternatives produced, (3) local capacity on evidence-based policy making process enhanced, and (4) The Consolidation and Translation (C&T) approach applied by a critical mass of actors – including local and international policy partners.

To fast-track agriculture transformation in Africa, AGRA had envisioned HAPA as a vehicle to respond to government requests for support. Through Consolidation and Translation (C&T) of evidence, HAPA's work entails collating existing evidence, expertise and best practice that are relevant to a government request for policy support and processing these into a set of rationalized and costed policy options. The HAPA Initiative was designed as a service desk with the ability to respond quickly to requests for support dealing with policy constraints lasting from 2 to 6 months (short term support). HAPA may also provide policy support of up to 1-year (considered medium term support) to address complex policy challenges, guiding government and providing continuous advice on request through to the adoption of the policy.

Therefore, HAPA's operating model recognizes the urgent need for timely policy support to the agriculture sector, which plays an important role in ensuring inclusive growth. It recognizes the demands for political expediency and the need to ensure that a particular policy direction is anchored in evidence. The approach also addresses the challenge posed by the high turnover of senior government decision makers by engaging local capacity and building on existing knowledge and partnerships. The model also prioritizes coordination and partnerships for delivery. Within AGRA's Policy and State Capability (PSC) division, HAPA works with its sister units, viz: Policy and Advocacy, State Capability and Regional Food Trade. Hence. as part of the PSC, HAPA's activities are aligned and work collaboratively with the other units to supporting overall efforts by PSC.

Dr. Apollos Nwafor
Vice-President, PSC, AGRA

Executive Summary

Agriculture and agro processing continue to be a core pillar of the country's industrialization strategy in many African countries including Tanzania. Rapid urbanization is changing the demand patterns towards more processed foods and changing consumer purchasing towards supermarkets. However, impediments in the value chains of commodities in the domestic markets have resulted in increased importation.

The agro-processing industry offers an entry point for small entrepreneurs to establish linkages in the country's agricultural sector. Currently, farmers use poor farming practices, and their production is largely labour-intensive. Consequently, farmers end up with low-profit margins that do not provide an incentive for many to engage in production. Value addition through the processing of crops is an opportunity that would not only create more employment opportunities and income but also reduce rural-urban migration, especially if processing industries are established in rural areas. If production and agro-processing constraints are not addressed in the value chains, the country will record growing trade deficits with less value addition in the value chains.

This study was designed to undertake a value chain analysis of three priority crops namely barley, grapes, and wheat. The objective is to thoroughly assess and identify the major value chain actors for each of the crops, their roles, functions, and their value which helps to determine who benefits from participating in the chain and who would need support to improve performance and gain along the value chain of the selected crops. Specifically, the analysis aimed to uncover key challenges facing different actors and activities along the value chain and provide a basis for various reform recommendations that would foster improved sector performance all along the chains.

Summary of the main findings

First, value addition at farm-gate provides huge profit margins for the traders/farmers who engage in value addition. The findings indicate that there is room for a farmer to more than triple their income by undertaking value addition and back-yard processing.

Second, the complexity of agricultural taxes (cess, value-added tax (VAT), and import duty) imposes constraints on agriculture and the three crops (wheat, barley, and grapes) in particular. Also, non-fiscal factors such as permit issuance, and the costly and time-consuming conditions are important constraints to production.

Third, despite the economic importance of associations and contracts, most small-scale farmers in Tanzania do not participate in the formal value chain. Rather, they operate within a framework/system that is characterized by weak or poor coordination with little or no legal enforcement of contracts between the postharvest actors.

Fourth, the status of physical infrastructures such as irrigation systems, roads, electricity, storage structures, telecommunication systems, market infrastructure, etc. is far from ideal to support the needed performance of the agriculture sector.

Fifth, despite clear articulation and documentation of the policies, laws, standards, and regulations, implementation is normally weak.

Policy Recommendations

Given the findings, the study recommends several measures:

1. Farmers need to produce globally accepted outputs if they want to tap into the available market to tackle the low-price challenge in both contract farming and retail business.
2. Create a tax regime that reduces the transaction costs to both primary and secondary producers.
3. Devise a proper mechanism that will improve contract farming enforcement, together with ensuring that none of the parties involved is exploited because of asymmetric information.
4. The government should improve supporting physical infrastructure including irrigation systems, roads, electricity, storage structures, and market infrastructure.
5. Efforts should be made to enable farmers to obtain funds to expand their capital and mechanize and modernize their production. For instance, enhance the financing mechanism for primary producers to access loans that will enable them to purchase equipment that facilitates value addition.

1. Introduction

1.1. Background

Global Value Chains (GVCs) describe the full range of cross-national value addition processes and activities that processors and workers engage in to transform raw commodities into final products or services (Gereffi and Fernandez-Stark, 2011). The global value chain framework provides a useful methodology for tracing patterns of value creation and understanding power and governance within an industry by exploring the linkages amongst geographically dispersed economic activities and actors (Gereffi and Fernandez-Stark, 2011; Kaplinsky and Morris, 2000). It looks at global, regional, and local economies by using a top-down approach that focuses on global lead firms that control trade, as well as a bottom-up approach that focuses on countries and regions.

For many low-income developing countries, the ability to insert themselves into a global value chain is important for economic development and integration into world trade (Gereffi & Fernandez-Stark, 2011). But for GVCs to be beneficial for growth, it presumes that firms or countries can access value chains, can compete within them, and can capture the benefits for local economic development. Historically, many African countries have been incorporated into GVCs at the low-skill and low-value parts of the chain where there are limited opportunities for upgrading into more complex technology-based and skill-intensive industries (SADC, 2015). Partly due to this trend, Regional Value Chains (RVC) have emerged as a complementary development tool to both GVCs and national industrial policy.

In many African countries, agriculture and agro processing continue to be a core pillar of the country's industrialization strategy. At the same time, rapid urbanization is changing the demand patterns toward more processed foods and changing consumer purchasing towards supermarkets (UNECA, 2017; Lall et al., 2017). Imports of food have supported urbanization in the absence of a domestic agricultural surplus. However, food in African cities is around 35 per cent more expensive than in comparable countries (Nakamura et al., 2016).

This means that if production and agro-processing constraints amongst others are not addressed along the value chains, African countries will record growing trade deficits with fewer value addition options. Thus, agro-processing and value addition are important for rapid industrialization and regional trade balance. Developing the agriculture sector requires building linked industrial capabilities along with logistics, packaging, testing, and certification with an enabling policy environment.

1.2. An overview of the Agriculture Sector in Tanzania

Agriculture is the mainstay of Tanzania's economy where on average the sector contributes 27 per cent of the country's Gross Domestic Product (GDP), 25 per cent of export earnings and employs about 58 per cent of the entire workforce (NBS, 2021). The sector has the potential to accelerate industrialization as it provides about 65 per cent of industrial raw materials. The agricultural sector has often driven the performance of the overall economy, due to its significance in industrial growth, food security and livelihood, especially for the rural population. Therefore, the sector possesses the potential to lift many poor people out of poverty and contribute to the development goal of graduating into the upper income of the middle-income country by 2025.

The average agricultural growth rate has remained at 4.6 per cent for the past six years. Agricultural export crops have been growing at an average rate of 6 per cent while food crops have been growing at an average rate of 4 per cent. Food and cash crops account for more than 60 per cent of rural incomes. However, this average agricultural growth rate is insufficient to lead to significant wealth creation and poverty alleviation since poverty alleviation requires an annual agricultural growth rate of between 6 and 8 per cent (URT, 2016).

Like many other developing countries, the agricultural sector in Tanzania is characterized by several challenges

along its value chain. For instance, on the production side, the sector is largely dominated by small-scale subsistence farming, with many farmers cultivating an average of 2.3 ha while using limited improved/modern agricultural inputs. According to the most recent agricultural census survey (URT, 2021), only 22 per cent of the cultivated area applied improved seeds and just 21 per cent used fertilizer (with only 8 per cent of this making use of industrial fertilizer and 13 per cent using organic fertilizer). In addition, only 7 per cent of Tanzanian farmers received extension services. Access and use of the irrigation infrastructures remain limited in the country with only 2 per cent of the cultivated area being under irrigation, the remaining relying on rains. Further, less than 4 per cent of agricultural households reported having had access to financial credit for agricultural purposes, the majority of those who received such credits got them from private individuals, family, and friends and not formal financial institutions. Low usage of credit facilities was a result of a lack of knowledge and awareness about the availability and sources of credit and how to access those available.

Tanzania's agricultural sector is characterized by a low level of agro-processing and commercialization. Most of the farming practices are for subsistence uses. This to a large extent constrains sustained availability of industrial inputs to agro-processing factories. For example, the commercialization index for pulses, oil nuts, and cereals crops in the country is only 22 per cent, 21 per cent, and 19 per cent, respectively (URT, 2021). The low commercialization index is not only a measure of low productivity in the country but also a threat to those intending to invest along a higher stage of the agricultural value chain due to the limited supply of inputs. Understanding the drivers for such low levels of commercialization and how to best foster growth is therefore paramount.

1.3. Relevant policies for selected value chains: Barley, Wheat, and Grapes

1.3.1. Enabling environment

An enabling environment is fundamental to the efficiency and success of the value chains as it influences access to the following: inputs; level of operation; extension and supporting services; markets, finance, and information; and their interaction. From the interviews conducted, it was observed that most of the challenges to the barley, grapes, and wheat value chains are legislative, regulatory, and policy related.

1.3.2. Policies, Laws, Standards, and Regulations

To promote the development of the sub-sector, several policies have been formulated and implemented, and regulations enacted. The Ministry of Agriculture plays a critical role in developing market conditions, while the

22% of cultivated area applied improved seeds

21% used fertilizer

7% of farmers received extension services

2% of cultivated area under irrigation

<4% of agricultural households had access to financial credit

Ministry of Industry, Trade, and Investment (MITI) play an equally critical role in the development of industries.

There are several policies, strategies, and programs that have articulated long and medium-term policy frameworks for the agriculture sector.

The National Development Vision 2025 guides the development agenda of the country and aims to transform the country's economy from a low agricultural productivity economy to a semi-industrialized one. The movement toward Vision 2025 and the Millennium Development Goals and later the Sustainable Development Goals was driven by the National Strategy for Growth and Reduction of Poverty I & II (known as MKUKUTA I and II) and the Five-Year Development Plans (I, II, and III). The MKUKUTA strategic intervention cluster, Growth, and Reduction of Income Poverty focus on equitable and employment-generating growth, sustainable development principle, food security, affordable and reliable modern energy services, and adequate infrastructures for production purposes.

The Agriculture and Livestock Policy of 1997 aims to assure basic food security for the country, as well as increased output and quality of food commodities, and better living standards in rural areas through increased income generation from agricultural production, processing, and marketing.

The Agriculture Sector Development Strategy I & II is the main tool the Government uses to coordinate and monitor agricultural development and to incorporate national reforms through its implementation programs. It aims to achieve a sustained annual agricultural growth rate of 5%, mainly through a transformation from subsistence to commercial agriculture. The transformation is to be led by the private sector, which is to be facilitated by an improved enabling policy environment and more public expenditure.

The Kilimo Kwanza initiative was launched by the Government in 2009 to modernize the Tanzanian agricultural sector. The initiative is driven by the private sector and aims to modernize agriculture through better access to fertilizer, tractors, power tillers, seeds, and other agricultural inputs; better access to markets, extension services, and payments systems; improved supply chain management; and access to training for farmers, among others.

Several laws and acts are also in place to govern the agriculture sector. The Seeds Act of 2003, amended in 2007, governs seed production and certification in Tanzania. It controls and regulates all standards related to agricultural seeds, and established the National Seeds Committee, which has the responsibility to advise the Government on all matters relating to the development of the Tanzanian seed industry. The regulator in these areas is the Agricultural Seed Agency (ASA) and Tanzania Official Seed Certification Institute (TOSCI).

The Fertilizers Act of 2009 was introduced to regulate the manufacturing, importation, exportation, sale, and use of agricultural fertilizers. The Act established the Tanzania Fertilizer Regulatory Authority (TFRA) and introduced registration and licenses for all those involved in the fertilizer or fertilizer supplements sector.

The Produce Export Act provides for the grading, inspection, regulation, and preparation of products to be exported from Tanzania. The law defines produce as any article produced or derived from farming, agricultural operation, or stock-keeping. It restricts the importation of products regulated under the Act, except through designated points of entry, and is subject to inspection or grading in the manner provided for under the inspection rules.

The Tanzania Food, Drugs and Cosmetics Act was enacted to regulate food and other manufactured or imported products. The Act establishes the Tanzania Food and Drugs Authority (TFDA) as the executive agency for controlling the quality and safety of food, drugs, poisons, and cosmetics; and regulating the importation, manufacturing, labelling, storage, promotion, and general distribution of these items. In 2019, the regulation of foods and cosmetics was shifted to the Tanzania Bureau of Standards (TBS).

The Tanzania Bureau of Standards (TBS) has issued several standards and specifications that are important for the barley, wheat, and grapes sub-sectors. TBS standards apply to a product that has an impact on the national economy, or the health and safety of the environment. For barley, grapes, and wheat sub-sectors, the most important standards are shown in Table 1.

All these policies, laws, standards, and regulations are aimed at improving access to improved seeds, fertilizers, and pesticides for increased yields and crop output;

Table 1: Standards for Wheat, Barley, and Grapes

Crops	Important Standard	Specifics
Grapes	TZS 527: 2018/EAS 139:2018(E)	Fortified wines – Specification
	TZS 246: 2013(E)	Fruit squashes – Specification
	TZS 664: 2017(E)	Fruit wine – Specification
Barley	TZS 764: 2003(E)	Brewing barley – Specification
	TZS 467: 2015 (E)	Still Table wines – Specification
Wheat	TZS 437: 2017/EAS 51:2017(E)	Wheat flour – Specification
	TZS 439-1: 2020/EAS 1:2019 (E)	Wheat grain – Specification
	TZS 439-2: 2020/EAS 767:2019 (E)	Fortified Wheat Flour - Specification

access to finance; increased use of farm technologies; the reduction of pre-and post-harvest losses; the promotion of agro-processing; and the establishment of sectoral associations.

1.4. The concept of the value chain and its relevance to the overall assignment

An agricultural value chain consists of the people and activities that bring a basic agricultural commodity like maize or vegetables from production in the field to the consumer, through stages such as processing, packaging, and distribution. Thus, at one end of the agricultural value chain are the producers – the farmers who grow crops. At the other end are the consumers who use the final products while in the middle are many thousands of men and women, and small and large businesses. Each person and each business perform one step in the chain, and each adds value along the way – by growing, buying, selling, processing, transporting, storing, checking, and packaging. Other institutions support the value chain. For example, banks provide loans; governments establish laws and policies, and agricultural research organizations develop technologies.

In agriculture, the concept of the value chain is very important as increasingly agricultural products are hardly consumed in the place where they are produced but are transformed, combined with other products, and transported from one actor (owner) to the other. The products are value-added, packaged, and displayed until reaching the final consumer. The value chain analysis is gaining momentum, especially in the context of enhancing the income of value chain actors. The value chain consists of stakeholders and their collective actions including input and support services for the production, marketing, and distribution of the product in enabling environment. Value chain analysis captures the actors, and factors influencing industry performance, including access to and the requirement of the end market; the legal, regulatory, tax, and policy environment; coordination between firms in the industry; and the level and quality of support services.

In the context of this study, undertaking a value chain analysis of the selected crops in Tanzania, allows us to thoroughly assess and identify the major value chain actors for each of the crops, their roles, functions, and their value which helps to deterWmine who benefits from participating in the chain and who would need support to improve performance and gains along the value chain of the selected crops. Specifically, the analysis aims to uncover key challenges facing different actors and activities along the value chain and provide a basis for various reform recommendations that would foster improved sector performance all along the chains.

Notably, this value chain analysis report is a subset of a series of reports within the framework of a much broader analytical study to undertake a Comprehensive Analysis of Agriculture Crop Sector Taxation Structure and Business Environment in Tanzania for selected Crops. As an input to the main analytical assignment, this value chain assessment allows us to have comprehensive scrutiny of various challenges facing the sector. The set of challenges articulated in this report will provide a starting point for the analytical report on the cost and benefit of various reform options that will be proposed by the ministry.

1.5. Scope of the Value Chain Analysis

The scope of this study hinges on two key elements namely, the number and type of crops covered, as well as contextual/geographical coverage of the study.

While we acknowledge the fact that the farming sub-sector in Tanzania constitutes many crops, this report only focuses on selected crops that require immediate intervention by the Ministry of Agriculture. The assessment considers three crops namely barley, wheat, and grapes. Barley is selected to represent the emerging opportunity within the breweries industry following the ongoing establishment of the malting plant in Dodoma and the fiscal incentives that the government put in place. Likewise, grapes are selected to represent challenges faced by farmers in their vineyards and post-harvest encounters that led to low productivity and profitability. Wheat is selected because it is among the staple foods consumed in Tanzania and demand has been rising compared to domestic production.

1.6. Methodology of the Study

The value chain analysis of the selected crops involved several methods, for data and information acquisition. The analysis relied mostly on secondary data. This necessitated a thorough review of the literature.

Value chain analysis draws from two major types of analytical tools namely, the value chain maps, and various statistical ratios required to draw inferences (e.g., total value shares of various actors, marketing margins, producer shares, etc.). In this report, we mainly rely on the value chain maps whose construction are largely informed by the collected information from the literature and (later) from the field. Statistical information will be drawn from existing value chain studies for the same crops from comparable geographical contexts.

1.7. Organization of the rest of the report

The remainder of this report is organized as follows: chapters 2, 3, and 4 present the value chain analyses for barley, wheat, and grapes, respectively; and chapter 5 provides the conclusions.

2. Value chain analysis: Barley

2.1. Overview of the crop production and marketing (trends)

2.1.1. Global Context

Globally, the value of barley exports rose in 2020 by an average of 20.1 per cent for all exporting countries. Since 2016 barley shipments have been valued at $6.2 billion and international sales from raw barley exports from all supplier countries totalled US$7.4 billion in 2020. The 5 biggest exporters (France, Australia, Russia, Ukraine, and Canada) generated 62.7 per cent of all exported barley by value during 2020. Suppliers in Europe sold the highest barley shipments worth $5.1 billion during 2020 or over three-quarters (79.4 per cent) of total barley exports, followed by Oceania (mostly Australia) (12.3 per cent) and North America (8.7 per cent) while Africa accounted for only 0.04 per cent.

Some countries have indicated opportunities for export markets since they are net importers of barley (Table 2) China posted the highest deficit of barley in the international trade signalling opportunities for barley-supplying countries.

2.1.2. Tanzania's Context

Barley was introduced in Tanzania towards the end of the 19th century and ranks 6th in value among the cereal crops grown. Despite having many uses such as being a traditional food ingredient used in soups, stews, bread, and beverages and used as animal fodder, in Tanzania it is mainly used for malt production by the brewing industry. On average, Tanzania produces 15,000 to 20,000 MT of barley. Despite having brewing companies like Tanzania Breweries Limited and Serengeti Breweries Limited that assure a market for the commodity, production is still very low. This low local production makes imports necessary to fill this production gap.

Barley is mainly grown in Manyara, Arusha, Kilimanjaro, Mbeya, Iringa and Rukwa. However, the northern region has attracted more attention on account of having two rain seasons favourable for the growth of barley. In northern Tanzania, the long rains start in March up to May/June and short rains start in October

Table 2: Global Barley Trade Status, 2020

World Rank	Name of Country	Export (USD)	Name of Country	Net Export (USD) (Negative/deficit)
1	France	1.3bn	China	1.9bn
2	Australia	913.2mn	Saudi Arabia	616.1mn
3	Russia	891.3mn	Netherland	483.3mn
4	Ukraine	874.9mn	Belgium	372.8mn
5	Canada	576.4mn	Japan	303.2mn
6	Argentina	444.7mn	Morocco	242.9mn
7	United Kingdom	282.9mn	Thailand	172.4mn
8	Germany	185.7mn	Tunisia	172mn
9	Kazakhstan	164.8mn	Algeria	166.3mn
10	Denmark	139.7mn	Brazil	164.7mn
41	Kenya	1.334mn		
43	South Africa	0.968mn		
49	Uganda	0.408mn		
68	Tanzania	0.019mn		

Source: https://www.worldstopexports.com/barley-exports-by-country/

to January hence enhancing the possibility of increased production.

Barley as an annual cereal matures in a relatively short period allowing it to grow in a wide variety of environments. Barley prefers adequate but not excessive moisture and doesn't do well in waterlogged soils. It requires well-drained, fertile soils (with a pH of 6 to 7.5.) The annual temperatures required range from 5 to 27 °C (low temperatures and high temperatures during ripening). The seasonal water requirement for barley depends on the variety, targeted yield, and crop management. Barley is a drought-resistant crop and requires 390 to 430 mm of rainfall for optimum yield. Maximum water use will occur for 21 to 28 days.

Based on Table 3, both the area under barley cultivation and production have shown an increasing trend although without much nominal difference in yields. The area under cultivation has increased from 6.61 thousand hectares in 2011/2012 to 10.4 thousand hectares in 2018/19. With proper farming practices, there is room for improved productivity. Since Tanzania depends on agriculture for most of its revenues, an increase in the production of barley will increase its performance not only on a domestic scale but also in the global markets. This will ultimately lead to the creation of job opportunities in the field or industry. For instance, early planting will generally produce higher yields, larger grain size, and lower protein levels making it more likely to achieve malt quality.

The increased area under cultivation has been partly attributed to the ongoing efforts by the brewery companies to reduce their cost of production by promoting local production of raw materials. In Tanzania, barley farming started in 1976 when Tanzania Breweries substituted imported barley for locally grown one. The brewery companies have a contract with farmers to assist in productivity-enhancing activities. However, on account of grading and quality requirements, challenges remain on the low product prices set by the companies which de-motivate people to engage in growing barley. Records indicate that in the past there have been limitations to growing barley such as a lack of modern farming techniques, basic equipment, and uneven rainfall patterns. Efforts need to focus on four productivity-enhancing elements namely breeding, agronomy, crop protection, and quality evaluation. Tanzania Breweries Limited and Serengeti Breweries Limited (SBL) have also introduced new seeds intended to increase productivity.

2.2. Crop value chain map

A value chain map charts the stakeholders existing within the production process of the respective crop from conception, through different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final customers, and final disposal after use. Along the chain, several stakeholders are involved in the transaction process, and these include input suppliers and plant breeders, farmers, traders, processors, transporters, wholesalers, retailers, industries, government, and final consumers (Figure 1 and Figure 2). The presented value chain will focus on these stakeholders.

i) Inputs suppliers

The main inputs in barley production are seeds, fertilizers, pesticides, land, labour, irrigation, credit facilities, and research and development. There are several varieties of seeds that are used by farmers (Table 4). Farmers can either purchase seeds from input suppliers or they can produce their own. Tanzania Official Seed Certification (TOSCI) is the sole agency to certify the quality of seeds before approval for release to farmers. Annually, 5 % of world production is generally retained for seed. The government and some value chain players such as industries have played a key role in ensuring the availability of quality seeds for the farmers that guarantee increased productivity. The main seed sources are Uyole Agricultural Centre, Selian Agricultural Research

Table 3: Barley: area planted, production, and yield

Items	Financial Years								
	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017	2017/ 2018	2018/ 2019
Area ('000' ha)	7.51	6.61	6.79	6.87	6.64	5.01	8.58	11.86	10.40
Production ('000' MT)	6.90	10.67	11.30	11.40	14.44	9.03	17.26	19.50	20.02
Yield MT/ha)	0.9	1.6	1.7	1.7	2.2	1.8	2.0	1.6	1.9

Source: Ministry of Agriculture

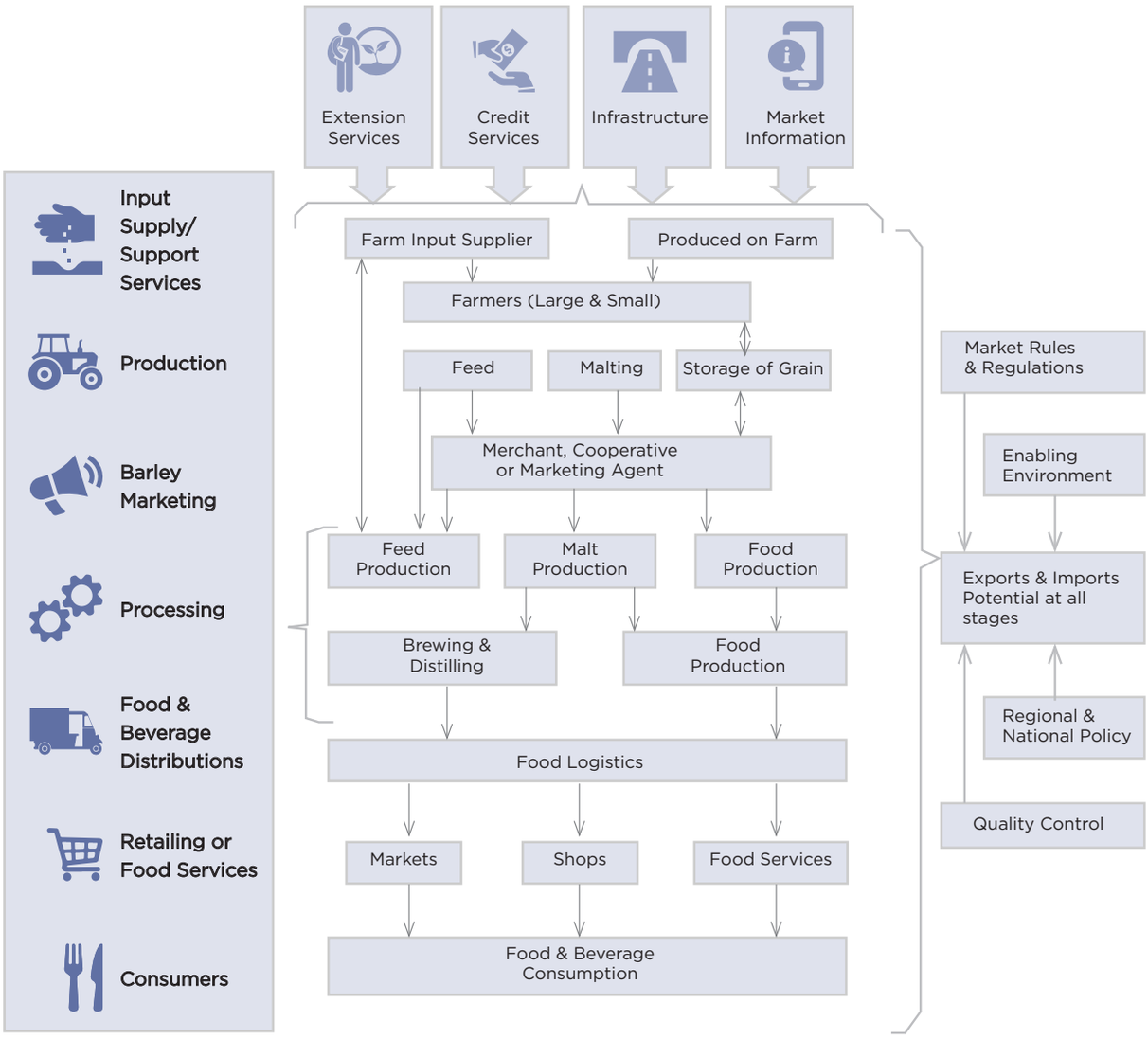

Figure 1: Barley Value Chain Map

Institute, and Tanzania Breweries Limited (TBL) sponsored seeds. Serengeti Breweries has also distributed quality seeds to their contract farmers. Before TBL and SBL interventions and the establishment of contract farming, farmers were using low-quality seeds due to ignorance, lack of capital, non-availability, or high cost of quality seeds. The common varieties of seeds in Tanzania include Makete 1 naked barley, Kibo, Subira, Bima, and Kusini. Table 4 provides a list of seed varieties, the source, optimal production altitude, recommended farming places, yield, and special attributes.

In some places, to increase productivity, the use of fertilizers is encouraged. The common fertilizers applied are Nitrogen and Phosphorous (applied at a ratio of 2:1). Copper Sulphate is also used to enhance products.

Table 4: List of Selected Seed Varieties and special features

S/N	Variety	Year of Release	Owner of Seed	Optimal altitude range (M)	Places Recommended	Grain Yield (Tons/Ha)	Special Attributes/Disease Reaction
1.	Makete-1 Naked Barley	1987	ARI Uyole	1850-2500	Mbeya, Iringa	2.0-3.5	Resistant to leaf rust and spot
2.	Kibo	1991	ARI Selian	1300-1900	Arusha, Manyara	3.5-4.0	• Moderate malting quality, Resistant to powdery mildew, loose and covered smut. • Resistant to leaf and stem rust
3.	Subira	1995	TBL	1300-2000	Arusha, Manyara	2.6	• Moderate malting quality. • Resistant to powdery mildew, loose and covered smut. • Resistant to leaf and stem rust • Tolerant to net and spot blotches
4.	8519	1996	TBL	100-1200	Arusha, Manyara	2.0-3.5	Moderate malting quality. • Tends to have high N content • Resistant to powdery mildew, loose and covered smut. • Resistant to leaf and stem rust • Tolerant to net and spot blotches
5.	Bima	1998	TBL	1500-2200	Arusha, Manyara	1.0-2.1	• Very good malting quality • Resistant to powdery mildew, loose and covered smut. • Resistant to leaf and stem rust • Susceptible to net and spot blotches
6.	Kusinii	2001	TBL	1000-1200	Arusha, Manyara	2.0-3.0	• Good malting quality • Resistant to powdery mildew, loose and covered smut. • Resistant to leaf and stem rust • Tolerant to net and spot blotches • Susceptible to lodging
7.	Kame	2004	TBL	1000-2000	Arusha, Manyara	2.0-2.5	
8.	9831	2004	TBL	1000-1200	Arusha, Manyara	2.0-3.0	• Disease reaction: Moderate
9.	SSG564	2011	TBL	100-2500		2.0-3.5	• High yielding • Good brewing characteristic • Maturity 150 days
10.	SHIRA	2012	BLK	100-2500		5.0-6.0	• High yielding • Good brewing characteristic • Maturity 150 days
11.	T-279	2012	TBL	100-2500		5.0-6.0	• High yielding • Good brewing characteristic • Maturity 150 days

ii) Producers

Contract producers/farmers dominate barley production in Tanzania. The development of contract farming in the barley sector is considered essential to better match farmers and company needs. TBL and SBL are the main promoters of contract farming, and they mainly advocate for soil fertility enhancement, timely planting, and control of diseases. Table 5 indicates the costs and margins for barley production in Tanzania, the typical farmer who does not process the seeds will make only **TZS 402,400/=** per acre as profit.

Table 5: Gross margins for Barley Production in Tanzania

1. Gross income		Improved practices		
Item	**Units**	**Quantity**	**Unit price (TZS)**	**Amount (TZS)**
Crop Yield	Kgs/acre	1,080	800	864,000
Straw yield	Bales/acre	16	3,000	48,000
Total gross income	**TZS/acre**			**912,000**
2. Variable costs				
(a) Non-labour input costs				
Seeds	Kgs/acre	44	2,000	88,000
Fertilizers – Urea	bags/acre	1	50,000	50,000
-DAP etc	Kgs/acre	0.5	60,000	30,000
Insecticides	Litres/acre	0.5	25,000	12,500
Post-emergence herbicide	Litres/acre			-
BUCTRIL MC FOR BROAD LEAVES	Litres/acre	0.5	45,000	22,500
RALON SUPER FOR GRASSES 1 LITER @	Litres/acre	0.4	80,000	32,000
Packaging materials	Bags	12	800	9,600
Sisal twine	Kgs/acre	1	5,000	5,000
Miscellaneous costs	TZS			100,000
Subtotal (a) non-labour input cash costs	**TZS**			**349,600**
(b) Labour inputs				
Ploughing (Tractor)	TZS/acre	1	40,000	40,000
Harrow (Tractor)	TZS/acre	1	20,000	20,000
Planting	TZS/acre	1	20,000	20,000
1st Weeding (Herbicide Spraying)	TZS/acre	1	10,000	10,000
Fertilizer application - spraying	TZS/acre	1	10,000	10,000
Insecticide spraying	TZS/acre	1	10,000	10,000
Herbicides application	TZS/acre	1	10,000	10,000
Harvesting (Combine harvester)	TZS/acre	1	40,000	40,000
Subtotal of (b) cash costs	TZS/acre			**160,000**
TOTAL VARIABLE COSTS	**TZS/acre**			**509,600**
GROSS PROFIT INCOME	**TZS/acre**			**402,400**

Source: Authors Calculation from field data

Post-harvest handling is key to the quality of the barley. Generally, after being dried barley is stored under shelter or in depots to avoid being affected by rainfall or other adverse climatic events. Barley is stored either in bags, or grains stored in depots made with brick, cement, and wood or earth wells specially drilled. Poor storage facilities such as sacks reduce the quality of barley before sale.

Barley is more susceptible to insect damage than many grains. Some specific issues need to be considered when storing barley for it to maintain its malting qualities and these include checking for temperature and moisture levels.

Barley grain needs to be stored at a temperature of 10°C-20°C with a moisture content of less than 10.5 per cent, beyond which will affect the quality of the malt. In most cases, barley grain is processed into beer (Diagram 1).

iii) Processors

Processing is dominated by the private sector and is mainly for feed or food production or brewing and distilling. Currently, large processors such as TBL and SBL dominate the trading process through contract farming. The processors require grains that meet the required quality and standards. For feed, barley grain is required

Diagram 1: Processed Barley (source: Author)

to meet screening and hectolitre weight specifications. For malting barley, apart from screenings and hectolitre weights, there are other requirements for retention (above the 2.5 mm screen) and protein. Malting barley requires moderate protein levels of between 9-12 per cent. Beverages especially beer generate a large volume of revenue in the barley value chain and this has a multiplier effect.

Barley is milled to make blocked barley, pearl barley, barley grits, barley flakes, and barley flour for human consumption. Removal of the hull or husk, which is largely indigestible, is an important part of the milling process. Barley milling is done to avoid sprouting, discolouration and removal of undesirable aroma or flavour. In the milling process, the harder type of barley is preferred to the softer[1] type because the hull and bran can easily be removed from the endosperm and retain the shape of the whole grain. The whole milling operation requires preliminary cleaning, conditioning (i.e., adjustment of moisture content), bleaching, blocking, peeling, polishing, steam cooking, and drying just to mention afew.

As indicated in Table 5, the typical farmer who does not process the seeds will make only TZS 402,400/= per acre as profit. However, more profit is accumulated by the brewers who add value. Creating a brewing industry is very expensive and needs more capital. For instance, putting up a malting industry in Tanzania needs more than 30 million USD investment. Non-labour inputs carry a large portion of costs per acre.

Literature shows that to generate 100 litres of beer, 17.3 kg of barley is needed. From this, one can extract about 16.1 kg of malt, which will translate when processed into 11.5 kg of extract that makes the beer. The extract is a soluble material, most of which is fermentable, extracted from the malt or added as adjuncts. According to the available data, the market price for Tanzania malt extract by 2022 is USD 0.725 per kg (around TZS 1672 per kg). Most beers come in 500ml bottles although cans are also sold. So, 100 litres are equivalent to 200 bottles. At the ex-factory price, a bottle of beer sells around TZS 1240. Table 6 provides the profitability values for a processor of barley for malt making.

1 The softer grains are not better because they would tend to fragment, leading to a reduction in the yield of first quality products.

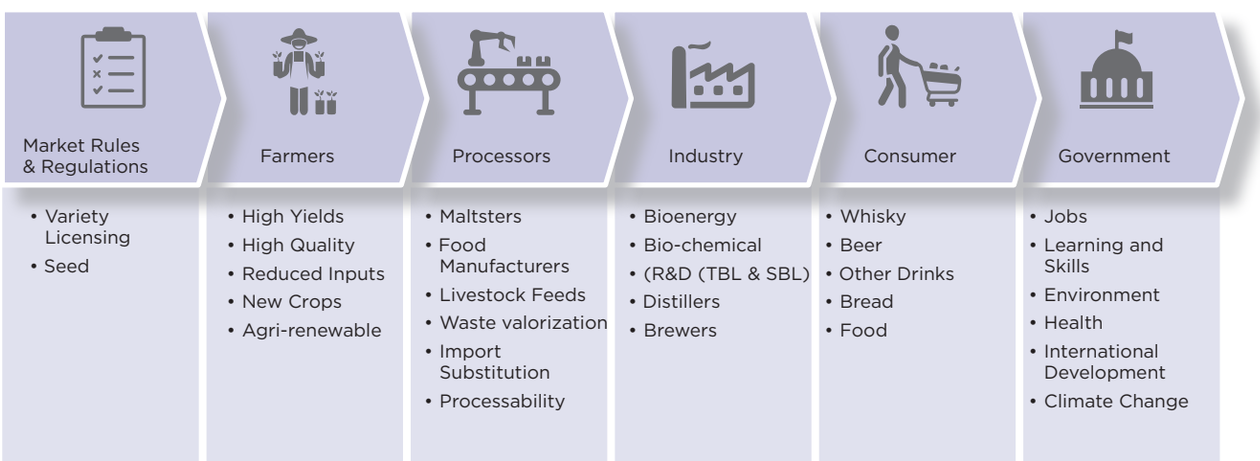

Figure 2: Actors and Impact Map in the Barley Value Chain

Table 6: Cost and Profitability of a Malting and Brewing Processor

Cost Component	Units	Price	Total Value (TZS)
Purchase of Raw Barley for Malt Making (kg)	1080	800	864,000
Malt extract produced (kg)	718	1672	1,200,496
Gross Margin (Extract)			336,496
Litres of beer produced	6243	2480	15,482,640
Gross Margin (Beer Producer excluding staff and other operation costs)			**14,282,144**

Looking at Table 6, more margins accrue to an actor in the brewing industry. Although putting up the brewing company is expensive, its pay-back period is quite short given the margins produced.

iv) Wholesalers/Retailers and Distributors

The main sales component are feed, food, seeds, and beverage consumption. Players include markets, shops, and food services. The selling and distribution process includes involving the agents who buy from the industries and sell to retailers and wholesalers. In Tanzania, it is uncommon to use barley for flour making. Table 7 shows the margins for wholesalers.

Beer industries sell to agents, who later sell to retailers. Based on existing prices in Tanzania, this category of value chain actors makes profits, though cannot be compared to the processor.

The brewer accumulates more benefits than the final sellers (Figure 3). This indicates that the top-end value chain actors benefit more than the farmers.

v) Consumers

Barley is a food ingredient used in soups, stews, bread, and beverages. Barley is also used to ferment malt beer. Barley has an additional food use serving as animal fodder. Consumers include households and small beer and food vendors who use the flour for making chapati and feeding animals. The quality aspects are mainly controlled at the manufacturing level.

Table 7: Profit Margin for Wholesalers and Retailers

Cost Component	Units	Price	Total Value (TZS)
Litres of beer produced	6,243	2,480	15,482,640
Bottle of Beer Packed (500 ml)	12,486	1,500	18,729,000
Gross Margin (Retailer)			**3,246,360**

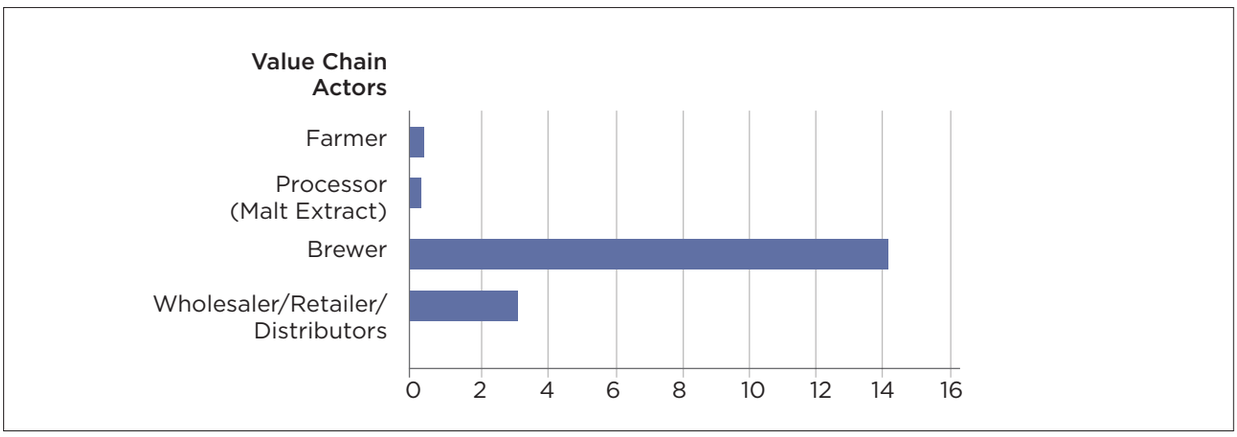

Figure 3: Profit margin at different levels of Barley Value Chain

2.3. Structure, conduct, and performance of the value chain

The barley business is characterized by high demand both locally and internationally. France is the main exporter of barley worldwide while China is the main importer. Of the first 100 producers of Barley, the production process is dominated by European countries. In Africa, Kenya dominates the export market and is ranked 41 in 2020 in the global ranking. Tanzania ranks 4th behind Kenya, South Africa, and Uganda. There have been deliberate efforts in these countries to promote barley production, which include enhancing contract farming and putting fiscal incentives to promote barley production within the country.

In Tanzania, the brewing industry is the main consumer/processor of barley (malted barley) which is an input in beer production –this makes the industry one of the main actors in the barley value chain. Tanzania Breweries Limited (TBL) which dominates the beer industry in Tanzania, with a market share of around 70 per cent –a subsidiary of ABInBev, is the largest and oldest brewing company in the country, while the East African Breweries Limited (EABL) retains 28 per cent of the beer market share in Tanzania. However, most of the malted barley is imported on account of the poor quality of the locally produced barley. There is still a lack of strong linkages between farmers and post-harvest actors in the value chains which marginalizes farmers' welfare gain because prices received from intermediaries are much lower and rarely cover the cost of production. Buyers set prices and contracts that do not favour farmers.

Capital and knowledge requirements are relatively high for barley farmers. Access to finance is still a big problem not only for small-scale farmers but also for small processors. Tax incentives are offered to input suppliers and processors, intended to promote mechanization and adoption of better processing technology.

2.4. Governance in the value chain

The players in the barley value chain are both private and public institutions with roles varying from input provision, R&D, production, processing and warehouses, marketing, and exporting. The Ministry of Agriculture and several institutions under the Ministry and the Ministry of Investment, Trade, and Industry are responsible for developing regulations and guidelines for the barley value chain.

Tanzania Agricultural Research Institute (TARI) was established as Canadian Wheat and Barley Research Farm in 1979 under Canadian Government Funding until 1982 when the Government of Tanzania took over the responsibilities, and the Centre became the northern zone research headquarters.

2.5. SWOT analysis

The SWOT analysis is summarized in Table 8 and explains the strengths, weaknesses, opportunities, and threats of the barley value chain in Tanzania.

Tanzania has the potential to benefit from barley. Some farmers are already engaged in barley production and many others are ready to participate if the constraints facing them are lifted. The private sector is already actively engaged, and it supports farmers to increase their yield and produce high-quality barley. The private sector has farming contracts with a few farmers and is ready to enter into more contracts to supply barley for processing. The government institutions shall support in terms of research, seed production, extension services, and trade support. All these strengths can be applied to explore the opportunities available such as vast suitable land for barley production which has a potential for irrigation, and high domestic and external demand for barley for brewing beer, and animal feed.

However, some weaknesses need to be addressed to improve the productivity and quality of barley produced. Currently, farmers use poor farming practices, and their production is largely labour-intensive. Consequently, farmers end up with low-profit margins that do not provide an incentive for many to engage in production. There is a need therefore to enable farmers to get funds to expand their capital, mechanize and modernize their production. The government has been strengthening the Tanzania Agricultural Development Bank to enable it to reach and provide finance to many farmers at fair and affordable interest rates. Other banks such as NMB and CRDB have special loans for agriculture and offer lower rates. Farmers should be made aware of the availability of financing opportunities and should also be educated on how to properly utilize funds and conduct commercial agriculture.

Extension services should be expanded to guide and support farmers on modern farming practices. These should aim to not only increase yields but also produce a high-quality product that meets domestic and international standards. In addition, postharvest handling should be improved to reduce losses and maintain the quality of the grain.

There have also been challenges in honouring the contracts by both parties involved; this calls for the local government and the ministry of agriculture to devise proper mechanisms that will enforce the contracts. This should also go hand in hand with ensuring that none of the parties involved is exploited because of asymmetric information. The business environment can also be improved by bringing together all the stakeholders and harmonizing their actions towards improving the barley value chain to avoid uncoordinated and disjointed efforts.

Table 8: SWOT analysis of Barley value chain in Tanzania

INTERNAL		EXTERNAL	
S Strengths	**W** Weakness	**O** Opportunities	**T** Threats
• Several smallholders, ready to farm if given appropriate inputs. • The willingness of industries (TBL & SBL) to engage in the provision of funding for R&D (soil, seed) • Availability of pre-existing government institutions that are engaged in breeding • Strong political will	• Poor farming practices & lack of capital • Labour-intensive production with low-profit margins. • Inadequate enforcement mechanism for contract farming. • Poor quality of barley • Lack of collaboration among promoters of barley farming	• Large suitable land and willingness of government to enhance irrigation farming. • Increasing domestic demand for malted barley • Availability of global demand for barley • Increased demand for animal feeds.	• Lack of law to safeguard contract farming. • Lack of law to safeguard farm gate prices. • History of poor coordination of smallholder producers. • Weak public infrastructure (railways and roads). • High competition among the promoters of barley farming. • Threat from imported malted barley

3. Value chain analysis: Wheat

3.1. Overview of the crop production and marketing (trends)

3.1.1. Global Context

Wheat is a major source of carbohydrates in human food, with a carbohydrate content of about 71 per cent. It also contains protein (13 per cent), fibre, and magnesium. Wheat is a cereal grain that belongs to the grass family of the genus 'Triticum'. Suitable climates for cultivating wheat are the temperate and sub-temperate regions. A dry, one-seeded fruit (kernel) is obtained from this spiky grass-like grain, which is ground to make flour.

The major wheat-producing countries in the world are China (in 2020 produced 134,250 thousand tons accounting for 20.66 per cent of global production) followed by India, Russia, the USA, and Canada which accounts for 63.66 per cent as shown in Table 9. The value of wheat exports rose by an average of 22.8 per cent by 2020 for all exporting countries and shipments were valued at $36.5 billion. International sales from all wheat exports were US$44.8 billion in 2020. Of the 5 biggest exporters (Russia, United States of America, Canada, France, and Ukraine), the first three generated 45.8 per cent of all exported wheat by value during 2020. Among continents, suppliers in Europe sold the most exported wheat during 2020 with shipments valued at $25.5 billion or about 56.9 per cent of total wheat exports, followed by North America 28.3 per cent. Africa accounted for only 0.2 per cent.

Some countries are net importers of wheat (Table 9). Egypt posted the highest deficit in the international trade of wheat signalling opportunities for wheat-supplying countries to satisfy consumer demand.

Tanzania commercially imports wheat from Russia, Australia, Canada, Germany, and Brazil. Tanzania imports 90 per cent of the wheat it consumes at 1 million MT per year, and this is the amount the government intends to produce domestically.

Table 9: Global Wheat Trade Status, 2020

World Rank	Name of Country	Export (USD)	Name of Country	Net Export (USD)(Negative)
1	Russia	7.9 bn	Egypt	2.7 bn
2	USA	6.32 bn	Indonesia	2.6 bn
3	Canada	6.3 bn	Turkey	2.3 bn
4	France	4.5 bn	China	2.26 bn
5	Ukraine	3.6 n	Nigeria	2.1 bn
6	Australia	2.7 bn	Italy	2 bn
7	Argentina	2.1 bn	Algeria	1.64 bn
8	Germany	2.1 bn	Philippines	1.57 bn
9	Kazakhstan	1.1 bn	Japan	1.53 bn
10	Poland	1 bn	Morocco	1.4 bn
34	South Africa	53 mn		
58	Kenya	244,000		
71	Uganda	21,000		
95	Tanzania	1,000		

Source: https://www.worldstopexports.com/barley-exports-by-country/

3.1.2. Tanzania's Context

Wheat is Tanzania's fourth most consumed crop after corn, cassava, and rice. More than 90 per cent of wheat produced in Tanzania comes from either large-scale commercial farms in the Northern highlands (Arusha, Kilimanjaro, and Manyara regions) or small and medium-sized family farms in Southern highlands (Iringa and Mbeya regions). Wheat is mainly consumed in urban areas. Tanzania's domestic consumption is estimated to be more than one million metric tons per year, thus requiring Tanzania to import about 90 per cent of its wheat.

The government of Tanzania has continued to promote the production of wheat within the country. In his meeting on 16th December 2020 with the Wheat stakeholders, the Deputy Minister of Agriculture then, Honourable Hussein Bashe said:

> *"It is the goal of our government to see that by 2025 Tanzania produces 1 million tons of Wheat. You all heard our president H.E. Dr John Pombe Magufuli indicate that wheat is a priority crop in this fifth government."*

In January 2021, the government continued stressing its commitment. The (then) Minister of Agriculture Honourable Prof. Adolf Mkenda in his meeting with wheat millers, traders, and processors insisted that Tanzania is planning to increase domestic wheat production using market mechanisms. He requested stakeholders to source 60 per cent of their wheat from local producers at a premium price starting in 2021/22. Under the proposal, local buyers were promised to be allowed to import only 40 per cent of total wheat in demand, a strategy that seeks to encourage local farmers to increase wheat production and reduce Tanzania's dependence on imports.

Wheat, as an annual cereal, matures in a relatively short period which allows it to grow in a wide variety of environments. Wheat needs 310 to 380 mm of water to produce a good crop and grows best when temperatures are warm, from 21° to 24° C, but not too hot.

Based on Table 10, both the area under wheat cultivation and production have shown decreasing trend although with a varying difference in yields. The area under cultivation has reduced from 108.28 thousand hectares in 2010/2011 to 42.63 thousand hectares in 2016/17. More efforts are needed to raise the production process, focusing mainly on proper farming practices. There is a huge gap between the government target and the 50 thousand tons produced currently.

3.2. Crop value chain map

A value chain map charts the stakeholders existing within the production process of the respective crop from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final customers, and final disposal after use. Along the chain, players include input suppliers and plant breeders, farmers, traders, processors, transporters, wholesalers, retailers, industries, government, and final consumers (Figure 4). The presented value chain will focus on these stakeholders.

i) Inputs suppliers

The main inputs for wheat production are seeds, fertilizers, pesticides, land, labour, irrigation, credit facilities, and research and development. There are several varieties of seeds that are used by the farmers with over 29 types of seeds being available, but few have continued to be suitable for Tanzania soil and climatic conditions. The main wheat seed sources are Uyole Agricultural Centre and Selian Agricultural Research Institute. These centres have come up with several strategies to promote research on improved varieties. TARI Selian over recent years has discovered five types of seeds that are resistant to diseases, tolerant to drought, take a short time to mature and produce big fruits, among others. The varieties of seeds are known as Chiriku, Sifa, Mbayuwayu, Riziki C1 and Lumbesa which have been distributed in Kilimanjaro, Arusha, and Manyara regions and Southern Highlands, including Iringa, Mbeya, Rukwa, and Njombe. Other varieties of seeds have been devel-

Table 10: Wheat: area planted, production, and yield

ITEM	YEARS						
	2010/ 2011	2011/ 2012	2012/ 2013	2013/ 2014	2014/ 2015	2015/ 2016	2016/ 2017
Area ('000' ha)	108.28	109.82	107.19	100.76	85.60	65.17	42.63
Production ('000' tons)	112.66	108.89	103.97	167.04	72.48	76.21	50.47
Yield (tons/ha)	1.04	0.99	0.97	1.66	0.85	1.17	1.18

Source: Ministry of Agriculture

oped by TARI Selian in collaboration with TARI Uyole in Mbeya Region. The three varieties namely Merina, Shangwe, and Ngoli are of high quality and address many challenges facing the farmers (See Annex 1 for a list of all the varieties). The challenging issue is how to encourage farmers to use modern technology and new varieties for enhanced productivity in the production areas. The new seeds produce a high yield of about three to five tonnes per hectare. In some places, to increase productivity, some soils need fertility enhancement and the common fertilizers applied are Nitrogen, Phosphorous, and Potassium and these may be applied as per Table 11.

Figure 4: Wheat Value Chain Map

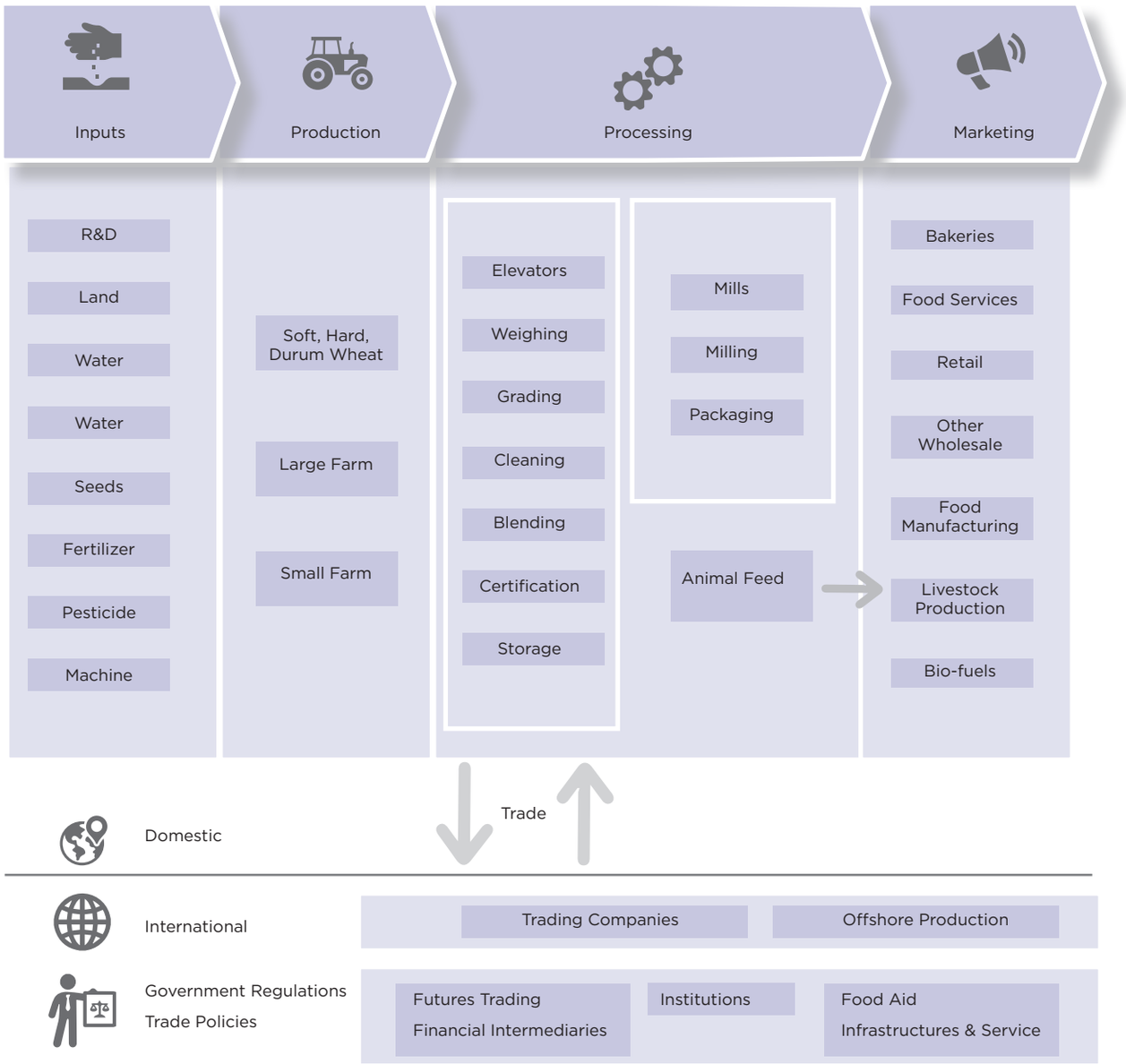

Table 11: Manures and Fertilizers in Wheat Cultivation

With assured fertilizer supply	Under fertilizer constraints/and late sown irrigated wheat crop
Nitrogen (N) @ 80 – 120 kg/ha	Nitrogen (N) @ 60-80 kg/ha
Phosphorus @ 40- 60 kg/ha	Phosphorus @ 30-40 kg/ha
Potash @ 40 kg/ha.	Potash @ 20-25 kg/ha

Total Phosphorus and potash and half of the Nitrogen (N) should be applied at the time of sowing. The remaining quantity of Nitrogen (N) should be applied at the time of C.R.I (crown root initiation).

Wheat is affected by prolonged drought at the time of maturity while drizzles and cloudiness at the time of ripening help in increasing the yield. Frost at flowering time and hailstorm at the time of ripening can cause heavy damage to the wheat crop.

ii) Producers

Contract producers/farmers dominate wheat production in Tanzania with over 90 per cent of domestically produced wheat coming from large-scale farmers. As with barley, farmers in wheat production do not have the bargaining power and thus price is set by other actors along the value chain. Despite the linkage between farmers and post-harvest actors in the value chains being sufficiently available, the prices set are very low to encourage increased domestic production. Buyers set prices and contracts that do not favour farmers. Despite its challenges, the development of contract farming in the wheat sector is considered essential to better match farmers' and company needs. Mid-February to mid-March is an appropriate time for planting wheat in the southern part of Tanzania. Table 12 indicates the partial budget for wheat production in Tanzania.

A contract farmer most often gets only TZS 378,400 per acre after deducting all the costs, at the farm gate. However, this level of profit per acre may change if the farmer decides to add value to some of the seeds through back-yard processing.

To achieve a high price both in contract farming and in the retail business, farmers need to produce outputs of an acceptable standard as per high-end market requirements (Diagram 2 shows a wheat field in Dodoma, Tanzania).
Thus, farmers are supposed to apply Good Agricultural Practices (GAP) within the framework of commercial agricultural production for long-term improvement and sustainability.

The recommended GAP are:

- Select the recommended varieties for the area specific to each climatic condition.
- Use certified seed with good physical purity and germination.
- Early planting.
- Application of the recommended quantity of fertilizers and correct application methods.
- Control weeds at right time with chemicals/manual weed control measures.
- Irrigate at the proper time/stage of the crop.

Diagram 2: Wheat fields in Dodoma, Tanzania
Source: Author

Table 12: Partial budget for Wheat Production in Tanzania per Acre

1. Gross income		Improved practices		
Item	Units	Quantity	Unit price (TZS)	Amount (TZS)
Crop Yield	Kgs/acre	1200	700	840,000
Straw yield	Bales/acre	16	3,000	48,000
Total gross income	**TZS/acre**			**888,000**
2. Variable costs				
(a) Non-labour input costs				
Seeds	Kgs/acre	44	2,000	88,000
Fertilizers – Urea	bags/acre	1	50,000	50,000
-DAP etc	Kgs/acre	0.5	60,000	30,000
Insecticides	Litres/acre	**0.5**	25,000	12,500
Herbicide	Mt/acre			
Preplant				
Post-emergence herbicide	Litres/acre			
BUCTRIL MC FOR BROAD LEAVES	Litres/acre	0.5	45,000	22,500
RALON SUPER FOR GRASSES 1 LITER @	Litres/acre	0.4	80,000	32,000
Packaging materials	Bags	12	800	9,600
Sisal twine	Kgs/acre	1	5,000	5,000
Miscellaneous costs	TZS/acre			100,000
Subtotal (a) non-labour input cash costs	**TZS/acre**			**349,600**
(b) Labour inputs				
Ploughing (Tractor)	TZS/acre	**1**	40,000	40,000
Harrow (Tractor)	TZS/acre	**1**	20,000	20,000
Planting	TZS/acre	1	20,000	20,000
1st Weeding (Herbicide Spraying)	TZS/acre	**1**	10,000	10,000
Fertilizer application - spraying	TZS/acre	1	10,000	10,000
Insecticide spraying	TZS/acre	1	10,000	10,000
Herbicides application	TZS/acre	1	10,000	10,000
Bird Scaling	Days			-
Harvesting	TZS/acre	1	40,000	40,000
Subtotal of (b) cash costs	**TZS/acre**			**160,000**
TOTAL VARIABLE COSTS	**TZS/acre**			**509,600**
GROSS PROFIT INCOME	**TZS/acre**			**378,400**

Source: Authors Calculation from field data

- Adopt proper crop protection measures.
- Harvest the crop at the proper stage and keep it at a safe moisture level.
- Follow post-harvest handling guidelines for quality produce

iii) Processors

Processing is dominated by the private sector and is mainly for feed production or food production. The main processors require grains that meet the required quality and standards. The processing stage of wheat is dominated by milling and packaging. In Tanzania, the manufacturing capacity for wheat flour millers is largely concentrated at the top, with the leading 20 players contributing approximately 70-80 per cent of Tanzania's total milling capacity. On average, large-scale millers have a processing capacity of 1,000 Metric tonnes a day and an average storage capacity of 80,000 Metric tonnes, though these figures are skewed by the largest miller, with more than double this capacity.

Wheat processing has a milling capacity of 1.35 million tonnes per annum and the wheat milling industry is dominated by two companies that are based in Dar es Salaam namely Salim Bakhresa & Co Ltd and Azania and supply wheat products to consumers in all regions of Tanzania. Wheat consumption is higher in urban areas. The main growth categories for the wheat industry are pasta, biscuits, and breakfast cereals. The milling output falls below the installed capacity on account of the inadequate supply of grains from farmers. The costs of maintaining supply chains also pose a challenge for smaller millers as larger players are better able to shoulder expenses such as credit facilities for farmers and payments to other suppliers, thus maintaining their lead in the market.

For a typical small-scale processor, Table 13 indicates the Wheat Extraction Rate when a farmer decides to undertake back-yard processing of the wheat seeds into flours.

Table 13: Wheat Flour Extraction Rate: Normal Quality

Type of Flour	Extraction Rate (%)
Dumpling Flour	60
Special Powder	70
Special Two Powder	75
Standard Powder	80
Pancake, fritter Powder	85
Whole Wheat Flour	92

More than two-thirds (68%) of global wheat is used for food, 20% is used for livestock feed, and another 3% to 5% each for seed, industrial use, and other uses, (Grote U *et al*, 2021). A farmer who may decide to undertake back-yard processing for food use (for instance Whole Wheat Flour and using the extraction rate) may increase profit to the tune of TZS. 1,588,000/= assuming a retail price of TZS. 2,000 per kilogram. This is an increase of over 4 times the profit earned by selling seeds by contract farming (Figure 5).

iv) Whole selling, Trading/Retailing, and distribution

The main sales component are bakeries, food service, livestock feeds, and biofuel and the players include markets, shops, and food service. The selling and distribution process includes the agents who buy from the industries and sell to retailers and wholesalers. Figure 6 indicates the wheat trade flow in Tanzania.

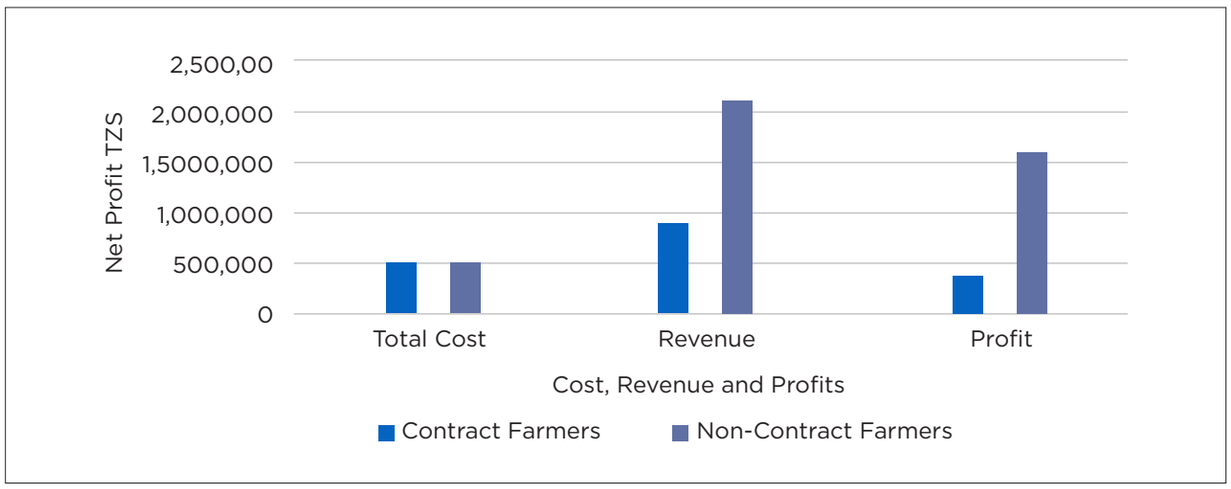

Figure 5: Net profit accrued by wheat farmers depending on contract status (values in TZS)

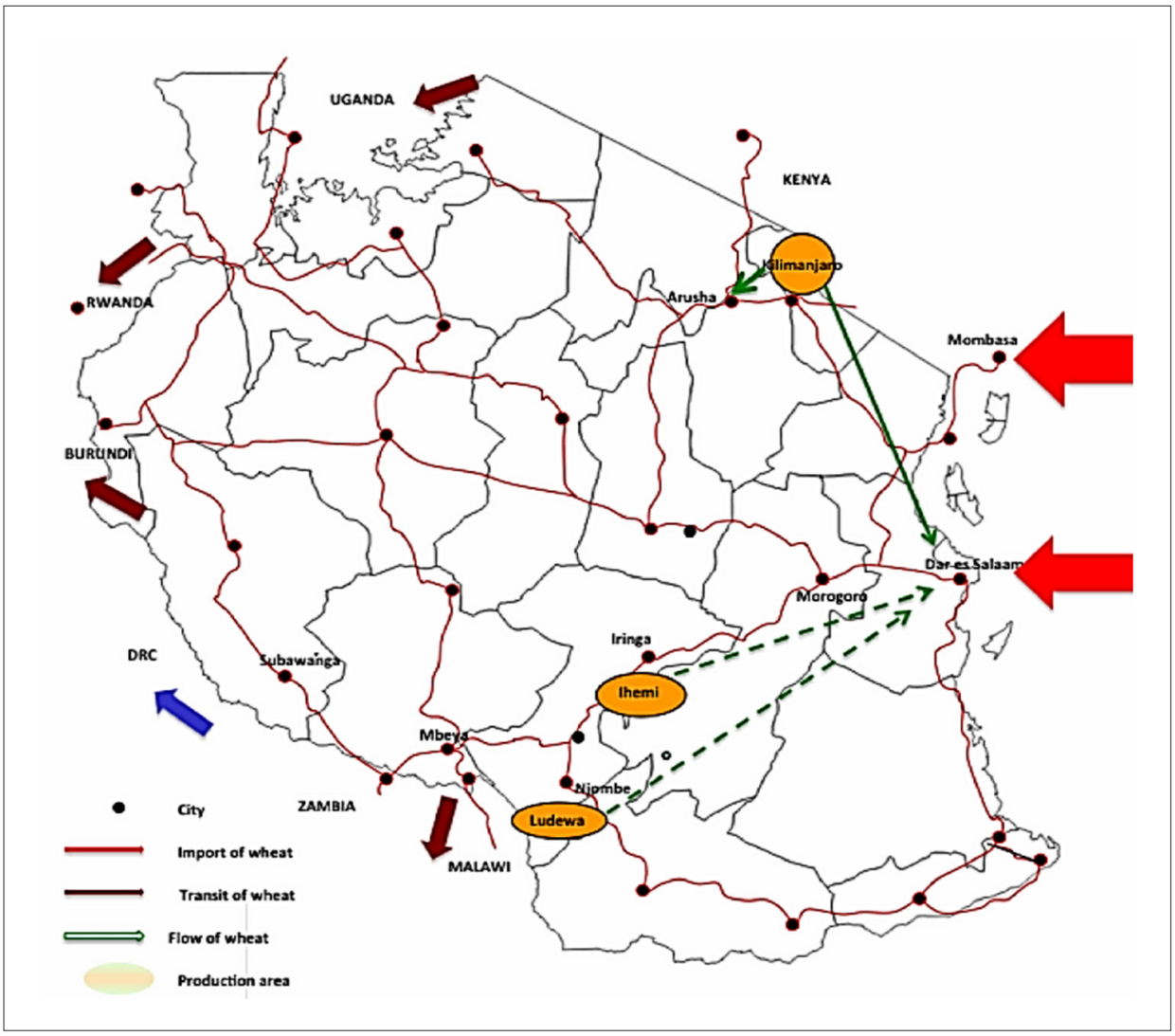

Figure 6: Wheat Trade Flow in Tanzania
Source: Southern Agricultural Corridor of Tanzania

v) Consumers

In Tanzania, wheat's primary uses are household including making bread and bakery products in milled form. Wheat is a food ingredient used in making Pasta, biscuits, breakfast cereals, mandazi, chapatis, cookies, stiff porridge (ugali), cakes, and doughnuts, to mention a few. Wheat consumption in Tanzania is ranked fourth after maize, cassava, and rice. Urbanization and the growth of major cities like Dar es Salaam, Mwanza, and Arusha are expected to increase demand for wheat products as 80 per cent of wheat is consumed in urban areas.

3.3. Structure, conduct, and performance of the value chain

Wheat business is characterized by high demand both locally and internationally. Worldwide, Russia is the main exporter of wheat while Egypt is the main importer. The production process is dominated by European countries while in Africa, South Africa dominates the export market and is ranked 34 in 2020 in the global ranking. There have been deliberate efforts to promote wheat production, which include enhancing contract farming and fiscal incentives to promote domestic wheat production and hence close the demand gap.

Tanzania, despite being a net importer, after processing turns out to be a key regional exporter, selling 40 per cent of wheat flour abroad while 60 per cent is consumed locally. The dominant export market is the Democratic Republic of Congo and Kenya, which receive 50 per cent and 45 per cent of exports, respectively.

3.4. Governance in the value chain

The players in the wheat value chain are both private and public institutions with roles varying from input provision, R&D, production, processing and warehouses, marketing, and exporting. The Ministry of Agriculture and several institutions under the Ministry and the Ministry of Investment, Trade, and Industry are responsible for issuing rules and guidelines to the wheat value chain.

Tanzania Agricultural Research Institute (TARI) was established as Canadian Wheat and Barley Research Farm in 1979 under Canadian Government Funding until 1982 when the Government of Tanzania took over the responsibilities, and the Centre became the northern zone research headquarters.

3.5. SWOT analysis

The SWOT analysis is summarized in Table 14 and explains the strengths, weaknesses, opportunities, and threats of the Wheat chain in Tanzania.

The wheat value chain in Tanzania has several weaknesses. First is the use of poor farming practices and the labour-intensive nature of production. This is heightened by a lack of capital and access to credit that could have enabled investment in improved technologies, adoption of better practices, and agro

Table 14: SWOT analysis of Wheat value chain in Tanzania

INTERNAL		EXTERNAL	
S Strengths	**W** Weakness	**O** Opportunities	**T** Threats
• Several smallholders, ready to farm • The willingness of industries to engage in the provision of funding for R&D (soil, seed) • Availability of pre-existing government institutions that are engaged in breeding • Strong political will	• Poor farming practices & lack of capital • Labour-intensive production with low-profit margins. • Inadequate enforcement mechanism for contract farming. • Poor quality of wheat	• Availability of large suitable land • Increasing domestic and foreign demand for wheat flour is needed. • Increased demand for animal feeds and associated food varieties and flour.	• Lack legislation to safeguard contract farming. • Lack of legislation safeguard farm gate prices. • Lack of finance • Weak public infrastructure • Ease of importing wheat from abroad

mechanization. The scale of production is low which limits farmers from enjoying the economies of scale and boosting their incomes.

Some challenges threaten investment in the wheat value chain including the lack of clear legislation to safeguard contract farming. This has led to fewer contract farming agreements than desired and disagreements while existing contracts from investing in wheat production. Farmers also have low price negotiating power and end up getting very low prices for their wheat, leaving the lion's share of profit to the middlemen or processors. Competition from imported wheat which sells at a cheaper price also constrains the performance of the domestic wheat value chain.

Nevertheless, there are strengths and opportunities to improve the Tanzanian wheat value chain. There is a pool of farmers who are willing to engage in wheat production. Some initiatives in contract farming and support to farmers by the private companies in terms of provision of high-quality seeds and other inputs set a platform for a continued forward and backward linkage. The government will support farmers' and processors' accessibility and availability of inputs at affordable cost, technical capacity, and use of fiscal incentives where necessary is also beneficial to the wheat value chain. The Tanzania Agricultural Development Bank and other banks are increasingly providing loans to farmers and processors at an affordable rate to enable the expansion of capital and scale of production.

4. Value chain analysis: Grapes

4.1. Overview of the crop production and marketing (trends)

4.1.1. Global Context

Viticulture is globally recognized as high-value agriculture with demand for grapes (*Vitis vinifera)* portraying increasing trends worldwide (Phadke *et al.,* 2022). The major grape-producing countries included China which leads with 19.1 per cent, Italy (10.6 per cent), the USA (9.2 per cent), France (8.06 per cent), and Spain (7.7 per cent). Other countries produced 45.34 per cent of the total global production (LIC, 2018). Grape is an excellent source of fibre, calcium, potassium, iron, vitamin C and phytochemicals, which are important for human health (Mpore, 2013). Grapes are consumed fresh (table grapes), dried (raisins), or in the form of pressed products (wine, juice, jellies, etc.). Global grape production indicates that about 54 per cent of the grapes are pressed for production of wine (48 per cent) and juice (6 per cent), while non-pressed grapes account for 46 per cent with table grapes occupying about 37 per cent and dried 9 per cent of the non-pressed grapes (Phadke *et al.*, 2022). Grape peel is a source of essential oil and pectin. It can also serve as a raw material to produce cattle feed and in the preparation of candies (Kumar, 2010). Raisins are a rich source of sugar (fructose) and antioxidants.

4.1.2. Tanzania's Context

In Tanzania, the Dodoma region leads in the production of grapes, especially in Chamwino and Bahi Districts, and the grape is the regional priority cash crop (Lwelamira et al., 2015(ii). The weather conditions and the soil texture favour the crop in this region. Other potential areas for grape production include Kondoa, Bunda, Peramiho – Songea, Lushoto, Tabora City council, Singida, Ruvuma, Iringa, and Manyara. In Tanzania, 80 per cent of grapes are used for making wine, 19 per cent as fresh fruits, and 1 per cent for raisins (Hussein, 2010). Grapevine cultivation has created employment for youths, men and women, employing about 2,704 households in Dodoma (Kalimangàsi et al., 2014marketing and income of small holder grape producers in Dodoma. The study used both primary and secondary data. A sample of 35 smallholders grape producers was randomly selected. Data were collected by using semi-structured questionnaires and analyzed by SPSS and Ms-Excel. Descriptive statistics was used to determine the frequencies and percentages whereby mean of Kgs/acre and mean income/acre were calculated to determine performance of the farmers. Results indicate that female small holder farmers were more efficient as they produced 2000Kg/1.60 acre than males who produced 1480Kg/1.72Acre. Further analysis indicates that unmarried smallholders were more efficient (2000kg/1.00acre). One of the unique features of the Tanzania grapevine is harvesting twice (March and September) while other growing countries in the world harvest only once per year.

Producers, traders, and processors earn income from selling grapes and grape products, and the Government earns about TZS 4.7 billion each year as income tax from wineries. However, grape cultivation has not yet been able to improve the living standard of smallholder farmers, particularly in Dodoma. Dodoma is among the regions with widespread poverty (Kisusu *et al.*, 2000; Mkenda *et al.*, 2004) and a high prevalence of food and nutrition insecurity (Arndt et al., 2012).

Grape production in Dodoma is growing steadily, from 7,527 tons in 2013/14 to 16,138.8 in 2019 (Table 15). Despite the good climate in Dodoma to support vineyard agriculture and the potential of the crop to transform subsistence agriculture into industrialization, grape yield in Dodoma averages only 4 MT/ha, which is significantly lower than 15 MT/ha for those who adopt good husbandry or the potential yield of 20-25 MT/ha (MAFS, 2006). However, the region targets production of 22,000 tons by 2024/25.

To date, only two improved grapevine varieties; Makutupora red and Chenin Blanc have been officially released (Richard, 2013; VRTC, 2011)"mendeley":{"formattedCitation":"(Richard, 2013; VRTC, 2011, limit-

ing consumers' preferences (Gutiérrez-Gamboa *et al.*, 2020). The most popular grape varieties in Dodoma are Makutopora Red which is used for producing red wine, Chenin Blanc used for producing dry white wine, and Table grapes used as fruits. Red grape is popular, highly demanded by wine processors, and accounting for 60 per cent of all grapes produced. Makutopora red is more tolerant to Dodoma salty soil and drought, and has a high sugar content compared to Chenin Blanc. Chenin Blanc grapes have high juice content compared to red but are scarce in the market. Table grape is a new variety and with a high market price compared to red and blank.

It is worth noting that the wine industry is fragmented with several small-scale processors attempting to compete with imports (Mzalendo & Devi, 2014). The current players include the formerly state-owned Dodoma wine Limited (CETAWICO), ALKO VINTAGE, and numerous small-scale wineries, some of which are owned by missionaries. Apart from low production, locally produced wine is of low quality and consumers prefer imported ones over local brands, but are willing to pay for local brands so long as the quality is guaranteed (Sutton & Olomi, 2012; Mzalendo & Devi, 2014).

The cost of bridging production and quality gaps is very high in Tanzania and the country has lost a substantial amount of foreign currency from the importation of grape and grape products. For instance, between 2013 and 2017 Tanzania imported 3,744.5 MT of grape and grape products valued at TZS 12.29 billion (TRA, 2018). The high importation is attributed to the failure of the sector to compete with imports due to the lack of market information and low quality of produce exacerbated by a limited number of grapevine varieties. Therefore, enhancing grape productivity, value addition, processing, and commercialization is necessary to boost the incomes of smallholder farmers and thus reverse the current poverty trend in the region. This should go hand in hand with established grape industries, industrial standards, and wine branding that meets local and international standards.

4.2. Crop value chain map

The grape value chain comprises primary key actors who are inputs suppliers, producers, aggregators, transporters, processors, wholesalers, retailers of grapes and grapes products, and consumers of fresh grapes, wine, and spirits. Others are supporting actors engaged in providing services, particularly training, extension, research services, information, and professional advice to the primary actors. In addition are media, telecommunications operators, financial institutions, importers, policymakers, development partners, and NGOs (Figure 7)

i) Input suppliers

Input requirements for grapes range from seedlings, manure, pesticide, insecticide, and implements –these are mainly private retail inputs supplies. Farmers obtain seedlings from farmers with nurseries and the Makutupora Research and Training Institute. About 70 per cent obtain seedlings from their fellow farmers with low quality and survival rates. Grape farming needs manure and boosting fertilizer once a year. It also needs four rounds of pesticides and insecticides annually. The main input suppliers in Dodoma include Agro dealers supplying fertilizers and pesticides and TARI, a supplier of quality grapevine seedlings and other improved technologies for grape production. Cooperatives associations also supply farmers with inputs at subsidized prices, but usually in insufficient quantities. However, poor grape seeds system and product outlets have constrained farmers from accessing quality grapevine seedlings; as a result, they rely on the use of their prepared seedlings which leads to lower yield (Lweramila et al., 2015)

ii) Production

Farmers perform most of the value chain functions from the purchase of the inputs to post-harvest handling and marketing. The farmer's roles include clearing the land, levelling, trenching, planting, trellis system, fertilization, irrigating, weeding, pest/disease controlling, pruning, spraying, harvesting, and post-harvest handling. They are also responsible for producing grape fruits and selling them to processors, traders, and final consumers.

Table 15: Grapes Production in Dodoma 2013/2014 – 2018/2019

	Financial Years					
	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Production (MT)	7,527	9,267	10,136	11,468	15,017	16,138.8

Source: Office of the Regional Commissioner, Dodoma

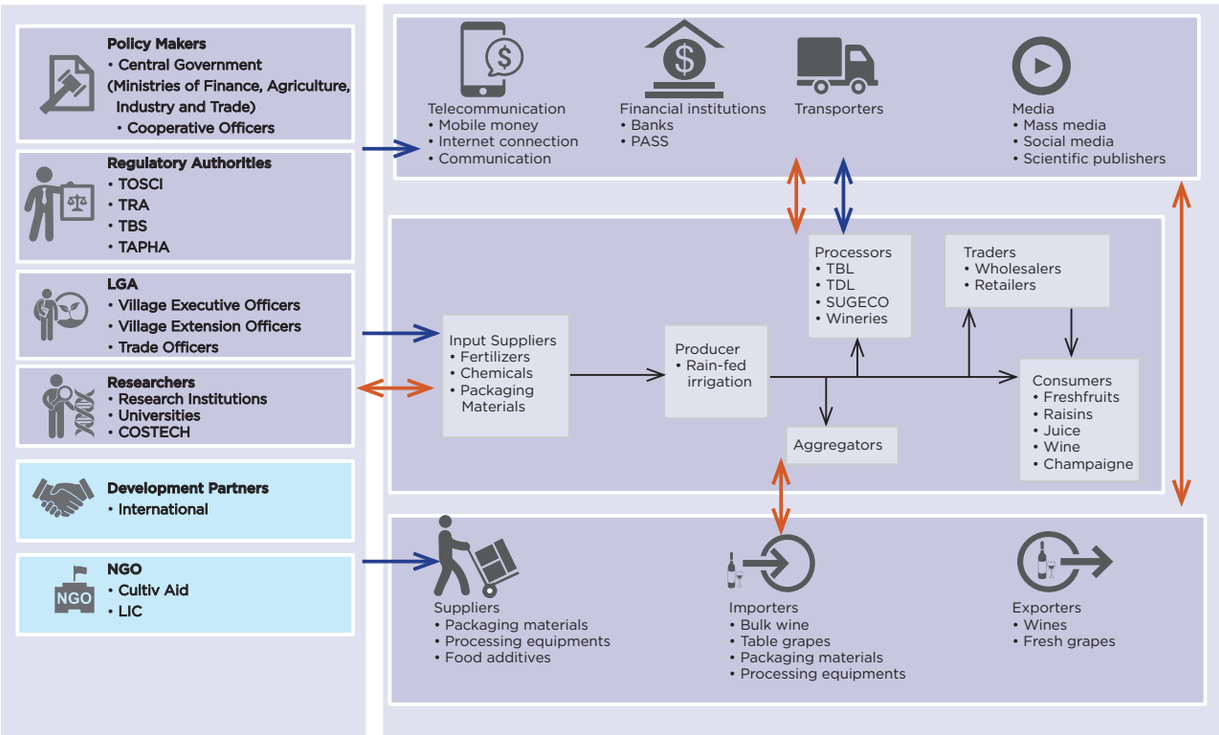

Figure 7: Grapes Value Chain

Some of the farmers play multiple roles by supplying their produce directly to markets or processing part of their grapes into wine and raisins. Most of the farmers practice rain-fed farming although there are opportunities for small-scale irrigation by digging wells and utilizing drip irrigation. Grape farming, particularly at the initial stages of establishment, is a capital-intensive venture compared to the limited financial capacities of small-scale farmers.

Diagram 3 shows a grape field in Dodoma.

Source: Photo by Author

Challenges include many new growers to the grape industry who are struggling with basic viticulture knowledge and low use of innovative technologies (Hussein, 2010; VRTC, 2011; Lweramila et al., 2015); new and existing diseases such as powdery and downy mildew, which can lead up to 20-50 per cent and 90-100 per cent loss if they are not controlled during the dry and rainy season, respectively (Kennelly et al., 2005); existing grape pests such as aphids, thrips, mealybug, termites, birds, and animals. On the other hand, most soils in Dodoma inherently have low fertility and imbalanced nutrition. The use of farmyard manure is commonly practised by the majority of smallholder farmers, but in most cases, it is nutrient imbalanced and required in bulk quantities up to 227MT/ha (Budotela, 1995). The extension services especially to small-scale holders are inadequate due to the shortage of financial and human resources in the field, whereas larger farms often rely on private advisory services. Table 16 shows total Costs and Sales Revenue from a Grape farm for the year 2022 (values per acre).

Table 16: Total Costs and Sales Revenue from a Grape farm for the year 2022 (values per acre)

Stage	Activity	Unit cost (TZS)	Units	Subtotal (First Season)	2nd Season	3rd Season
Farm preparation	Farm clearance and stump removal	40,000	1	40,000	-	-
	Setting the plot for furrowing	15,000	1	15,000	-	-
	Excavation/furrowing costs per furrow (one acre contains 20 furrows each 80 meters long)	20,000	20	400,000	-	-
	Limestone (needed for setting up the right soil pH)	10,000	20	200,000	-	-
	Organic Fertilizer/manure (each furrow requires one lorry of fertilizer of 4.5 cubic meters in size)	200,000	20	4,000,000	-	-
	Mixing (soil, limestone & fertilizer) and re-filling of the furrows: cost per acre	50,000	1	50,000	-	-
Planting	Number of seedlings per acre (80 cuttings per furrow)	500	1,600	800,000	-	-
	Polls to hold the seedlings (80 polls per furrow)	1,000	500	500,000	-	-
	Wires to be tied across the polls for seedlings to grow through (1 roller per furrow)	10,000	20	200,000	-	-
	U-nails for holding the wires onto the polls (in KGS)	7,000	5	35,000	-	-
	Labour cost for fixing Polls (per acre)	35,000	1	35,000	-	-
	Labour cost for Planting (per acre)	15,000	1	15,000	-	-
Watering/ Irrigation	Cost of irrigating "infant" grape farm for at least three months (per acre per month)	100,000	3	300,000	300,000	300,000
Pesticides (First round)	Anti-fungus (first round): 2 litres per acre	25,000	2	50,000	50,000	50,000
	Anti-Termites (first round): 2 litres per acre	15,000	2	30,000	30,000	30,000
	Labour cost-spraying the pesticides (per pesticide type per acre)	20,000	2	40,000	40,000	40,000
Weeding costs	Labour cost for 3-different rounds (cost per round per acre)	30,000	3	90,000	90,000	90,000
Pruning/ topping (removing the tops of seedlings to allow branches growth)	Labour cost per acre per round (two rounds of pruning are required per acre)	15,000	2	30,000	30,000	30,000

Stage	Activity	Unit cost (TZS)	Units	Subtotal (First Season)	2nd Season	3rd Season
Pesticides (Second Round)	Anti-fungus	25,000	2	50,000	50,000	50,000
	Other insects	15,000	2	30,000	30,000	30,000
	Anti-rust	15,000	2	30,000	30,000	30,000
	The labour cost of spraying per acre	20,000	2	40,000	40,000	40,000
Industrial fertilizer (i.e. Booster): Superglo	Booster needed to prevent flowers from falling off the plant: 5Liters of Super Glo Brand	120,000	1	120,000	120,000	120,000
Harvesting	The first harvest starts at 9 months from the planting date, then only 4 months harvest intervals afterwards (cost per basin)					
	Labour cost per basin (1-acre yields 50 basins per harvest)	500	50	25,000	25,000	25,000
Transportation	This varies depending on the distance and is often born by the off-takers/buyers					
Total Farming Costs				7,125,000	835,000	835,000
Revenue		Unit price per KG	Yield in KGS	Total revenue (1st season)	2nd season	3rd season
Yield: Well-managed farm (red grapes)	Yields up to 6 tons: One ton contains 20 basins each with 50kgs capacity	1,300	6,000	7,800,000	7,800,000	7,800,000
Yield: Well-managed farm (White grapes)		1,750	6,000	10,500,000	10,500,000	10,500,000
Yield: poorly managed farm	Yields between 1 and 2.5 tons per acre (we consider 2 tons)	1,300	2,000	2,600,000	2,600,000	2,600,000
Yield: Well-managed farm (White grapes)		1,750	2,000	3,500,000	3,500,000	3,500,000
Net Profit (Year 1): Well-managed farm	Red grapes			675,000	6,965,000	6,965,000
	White grapes			3,375,000	9,665,000	9,665,000

The production practices of grapes for a new farm involve several processes in year one, especially in farm preparation and seed planting. These costs are not incurred in year two onwards and thus, in year one, the profit is smaller. The revenue accrued depends also on the type of grape grown. Figure 8 indicates the profit share of the first harvest and beyond.

iii) Processors

Grapes are processed into different types of products such as wine, raisins, and juices with the most popular grape product in Dodoma being wine. The processors buy directly from the producers in larger quantities to process the grapes into wine or juice. Processed grape products, especially wine, are sold to wholesalers, retailers, and consumers in domestic and external markets. The dominant processors are CETAWICO, ALKO VINTAGE, Bihawana, and Hombolo (Roman Catholic Factories). Others are Dani Holdings, Mgwabi investments, and UWAZAMAM, all in Dodoma except Tanzania Distilleries Ltd, which is based in Dar-es-Salaam. The grape processing capacity increased from 1,995 Tons in 2014 to 7,551 Tons in 2018 (LIC, 2018). UWAZAMAM is a cooperative entity that specializes in the production of bulk wine only, the others produce bulk wine and add more value by making wines. CETAWICO and ALKO VINTAGE also buy large volumes of bulk wine from bulk processors such as UWAZAMAM.

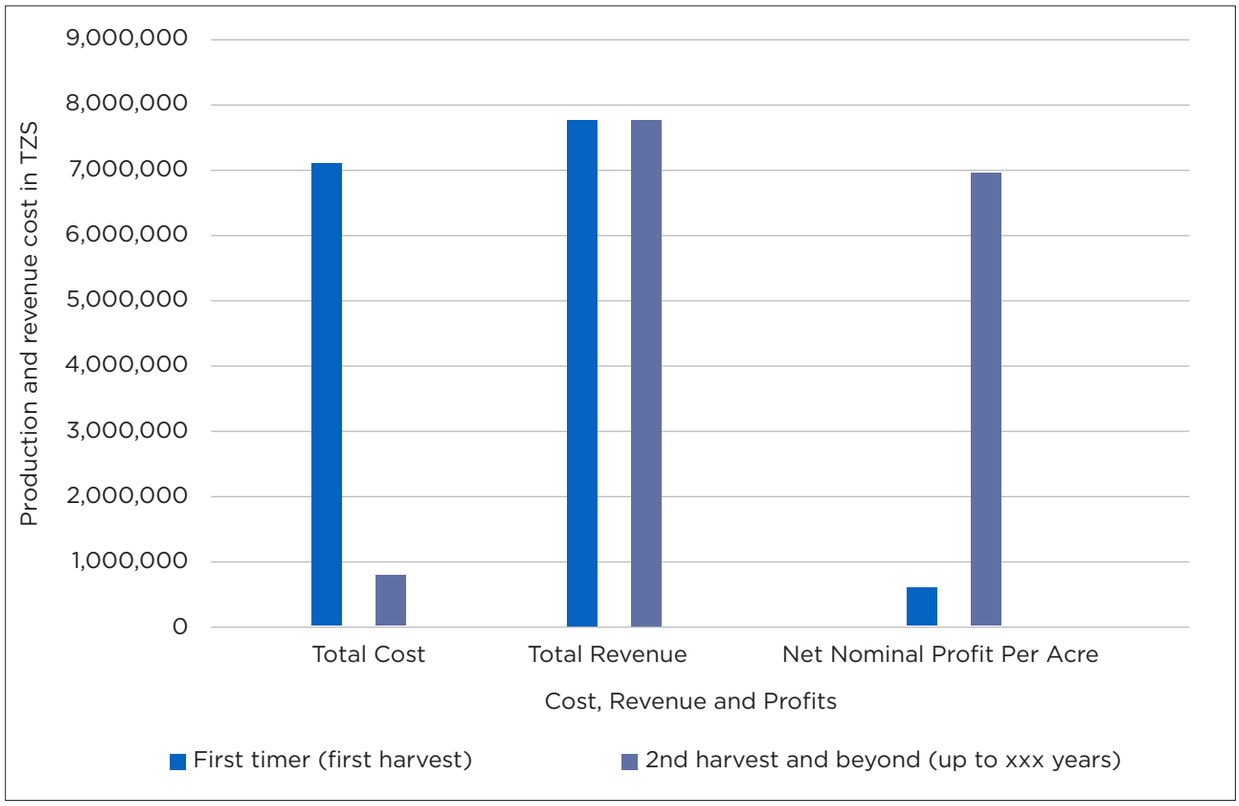

Figure 8: Production cost and revenue per acre of red grapes - 1st harvest and beyond (values in TZS)

However, there is a supply gap of bulk wine of 5.20 million litres, creating a capacity underutilization of 50% for local processors. Bridging this gap, therefore, is needed to produce at least 8,320 MT of grapes. Some processors import bulk wine from South Africa, estimated to be about 100,000 litres annually (LWR, 2016).

Three processing and marketing channels are currently in place. The 1st channel is the processors-led channel, the 2nd is the mixed grapes channel and the 3rd is the table grapes channel. It is estimated that the Processors Led Channel which deals with the production of bulk wine, refined as well as distilled wine and spirits, utilizes about 70% of the grapes, while the Mixed and Table Grapes Channels export 17.5%. These two channels are also responsible for the local supply of fresh grapes, which is 12.5% of the grapes produced in Dodoma (LIC, 2018).

iv) Whole selling and Retailing

Wholesalers of non-pressed grapes buy from producers in larger quantities, harvest, package, and transport them to their selling place in Dodoma town and supply them to retailers in the city or other traders in Dar es Salaam, Mwanza, Arusha, Mbeya, and Morogoro. Traders from Kenya also buy grapes directly from farms and export them to Kenya. Some wholesalers also export grapes to Kenya, Uganda, and Rwanda. Retailers buy grapes directly from farmers, package them, and transport them to regional markets. Retailers include vendors at informal markets, supermarkets, and hypermarkets. They also buy grapes from wholesalers and sell them to the final consumers.

v) Marketing

Buying is mostly informal and dominated by a group of buyers and thus making producers price takers. Although there are cooperatives such as UWAZAMAM, CHABUMA, LUBALA, NUFAIKA, and CAMILU which are AMCOS and Hozem, Jirani Wazalendo, Manchali, Chawima, and Wilunze which are SACCOS, the contribution of cooperatives in marketing is insignificant (LIC, 2018). Bulk wine production is the simplest undertaking in the value chain yet is not done by the cooperatives as an effort for value addition and thus assurance of better prices for their farmers. As a result, WAZAMAM which has an installed capacity of 90,000 litres can only process about 123.6 MT annually, which further impairs its influence on the competitive buying price. The aggregators who collect grapes from producers include UWAZAMAM, Dane holding, HOMCO, Kenyan traders, and Dodoma traders.

Transportation is a crucial component of the value chain, to transport grape produce to the marketers. Dodoma is the only region where grapes are produced and hence the only source of grapes supply in East Africa. About 17.5 per cent of the produce is exported to Kenya and Rwanda. Fresh grapes for local consumers include individuals, hotels, and raisins consumers are individuals and bakers, while wine and spirit are consumed by individuals and hotels.

4.3. Structure, conduct, and performance of the value chain

The structure of the grapes value chain has high demand domestically and in the neighbouring counties. However, the grapes subsector in Tanzania is still at its infant stage of growth and its national economic contribution is still very low, thus the subsector is not prioritized in national agricultural and other related policies like other traditional cash crops. Grape business is capital intensive and is limited by credit access and low-quality seeds, leading to low yield.

The conduct of the grape value chain is characterized by inadequate market information (prices and market opportunities), particularly for the farmers. Farmers remain price takers, since traders/processors have the power to set prices depending on supply and demand.

Private sector associations such as Cooperatives are not active in marketing with some being indebted, poorly managed, and operating under capacity with little involvement in bulk wine processing which is very important in value addition and thus profitability. There is also weak coordination among stakeholders, which leads to inefficient sector development and implementation of policies. There are also often burdensome and costly administrative and export procedures and low performance in the logistic sector.

The grape production trend during the past six years has been growing. The numbers of farmers growing grapes and production have grown by more than 73 per cent. This is believed to be due to both the rising grapes price (which has grown by an average of about 88 per cent for the past six years) and the increase in grapes processing capacity, which has increased by 73 per cent in the past six years. More imports of grape products than export implies that there is a large unmet local demand for both grapes and grape products and locally manufactured grape products have steadily been filling local market demand.

4.4. Governance in the value chain

National Agriculture Policy and Agriculture Marketing Policy have a direct influence on the recent growth of the grapes sub-sector from production to marketing of processed products. The inability of the existing farmer organizations (AMCOS and SACCOS) to function as marketing and production business services providers poses a great challenge in the chain. The weakness is currently being exploited by the Grape Market middlemen/agents to dominate all supply channels including prices and market information, which are the key important factors for enabling producers to make informed decisions.

The absence of collection/park-houses facilities/services compels the producers to sell small quantities at farm gate prices, thus becoming victims of high transaction costs related to the collection and logistics incurred by buyers. Both supply channels and buying of grapes in Dodoma are mostly done informally and dominated by buyers; a situation that makes the producers price takers. Around 70 per cent of the market of the grapes produced by farmers in Dodoma is controlled by middlemen while processors control only 30 per cent of the grapes business, this means middlemen benefit more from the grapes business than farmers themselves.

4.5. SWOT analysis

The SWOT analysis is summarized in Table 17 and explains the strengths, weaknesses, opportunities, and threats of the Grape value chain in Tanzania.

The grape value chain offers a potentially high investment return opportunity in Tanzania due to several strengths the country possesses in the grape value chain, including a wide diversity of grape germplasm coupled with favourable weather conditions for grape production, availability of suitable land for grape production, proven good agronomic practices for grapevine production and a readily available demand due to a significant increase of the number of wineries. These strengths are also boosted by the opportunities available ranging from the presence of research institutions and staff; the availability of underground water that allows for irrigation throughout; the presence of financial institutions that are ready to extend credits to players in the value chains; and harmonization of inter-regional and international trade that open doors to a larger international market.

However, several challenges still exist. These include limited access to improved varieties, underdeveloped irrigation technology; unfavourable loans conditions; insufficient extension support in the grape subsector; low capacity of processing industries; low and unreliable prices of grapes and grapes products; absence of collection/park-houses facilities/services; and lack of formal and professional third-party services providers that can link producers to local and external markets. Addressing these challenges will open more investment and higher returns from the grapes value chain.

Table 17: SWOT analysis of Grape chain in Tanzania

Table 14: SWOT analysis of Wheat value chain in Tanzania

INTERNAL		EXTERNAL	
S Strengths	**W** Weakness	**O** Opportunities	**T** Threats
• Availability of wide diversity of grape germplasm. • Favourable weather conditions. • Enough land for grape production. • Proven good agronomic practices packages for grapevine production. • Significant increase in the number of wineries. • High return on investment.	• Limited access to improved varieties. • Underdeveloped irrigation technology. • Unfavourable loan conditions. • The insufficient extension supports the grape subsector. • Low capacity of processing industries. • Unreliable prices of grapes and grapes products	• Investment in business, marketing, & farm management skills for farmers. • Presence of research institution and staff. • Availability of underground water. • Access to Finance. • Wide coverage of media to employ on the dissemination of GAPs to farmers. • Harmonization of inter-regional and international trade. • Expansion in bulk wine production • • Increasing domestic and foreign demand for wheat flour is needed. • Increased demand for animal feeds and associated food varieties and flour.	• Limited resources for grape research and development. • Unreliable rainfall • Low productivity of grapes among producers. • High cost of inputs and processing equipment. • High investment cost. • The inability of farmer organizations to function as marketing and production business services providers. • No existence of collection/park-houses facilities/ services • No existence of formal and professional third-party services providers that can link producers to local and external markets • Lack of legislation safeguard farm gate prices. • Lack of finance • Weak public infrastructure • Ease of importing wheat from abroad

5. Conclusion, Challenges, and recommendations

5.1. Conclusions: Barley, Wheat, and Grapes

Despite the existing potential and important socio-economic role of agriculture, the sector continues to face several challenges along its value chain. This study was designed to undertake a value chain analysis of the selected crops in Tanzania, allowing thorough assessment and identification of the major value chain actors for each of the crops, their roles, functions, and their value shared which helps to determine who benefits from participating in the chain and who would need support to improve performance and gains along the value chain of the selected crops. Specifically, the analysis aimed to uncover key challenges facing different actors and activities along the value chain and provide a basis for various reform recommendations that would foster improved sector performance all along the chains.

This value chain analysis report is a subset of a series of reports within the framework of a much broader analytical to undertake a Comprehensive Analysis of Agriculture Crop Sector Taxation Structure and Business Environment in Tanzania for selected Crops. As an input to the main analytical assignment, this value chain assessment allows us to have comprehensive scrutiny of various challenges and opportunities facing the sector along its value chain to ensure that "no player is left behind". The set of challenges articulated in this report provides a starting point for the analytical report on the cost and benefit of various reform options that will be proposed by the ministry.

This study limited its scope to three priority crops as guided by the Ministry of Agriculture namely, barley, grapes, and wheat value chains. The three commodities were selected based on their: -

i) Potential market growth and unmet demand,

ii) Level of support available from public, private, and non-governmental actors,

iii) Environmental impact,

iv) Saving foreign currency on cooking oil importation,

v) Contribution to food security and nutrition; and

vi) Contribution to income generation and poverty reduction especially to small-scale farmers.

The study organized each prioritized crop as standalone chapters and provides a detailed overview of the crop production and marketing (trends), presents a comprehensive value chain map from which a detailed analytical discussion is provided on the structure, conduct, and performance of each stage and actor along the value chain. In addition, a Strengths-Weakness-Opportunities and Threats (SWOT) analysis is provided.

5.2. Challenges: Barley, Wheat, and Grapes

Looking at the SWOT analysis, several challenges have been observed:

5.2.1. Policy and Regulatory Challenges

Despite clear articulation and documentation of the policies, laws, standards, and regulations, implementation is normally weak and sometimes not smooth due to many implementing organs which have diverse interests and sometimes due to lack of resources. For example, agriculture depends much on land and water which are controlled by other government ministries.

Priorities may not be the same for all the ministries involved. For example, there have been challenges in obtaining large percel packs of land for private investment since the land is under the jurisdiction of villages and it is very difficult to bring together all the villages that surround a certain piece of land viable for investment.

In other cases, utilization of water conflicts with hydropower generation. The multiplicity of regulatory agencies increases compliance costs for processing industries, for example, OSHA, TBS, and FIRE have the same objectives of ensuring the health and safety of

the consumers and the workers but there are, however, some conflicts in this regard. For instance, while the TTB grants export permits, MITI issues export licenses and TBS comes in on quality issues.

5.2.2. Fiscal challenges

The agricultural sector mainly faces three types of taxes: cess, value-added tax (VAT), and import duty. The complexity of these taxes imposes constraints on agriculture and the three crops (wheat, barley, and grapes) in particular. Cess is charged on all agricultural produce by local government authorities (LGAs) at a range of 3-5% of the farm-gate price as instituted by the Local Government Finances Act in 2011. One of the complexities comes from the variation in rates across LGAs, while some go for the minimum of 3%, others peg it at the maximum of 5%, which may create an imbalance in domestic competition. In addition, determination of the farm-gate price is also challenging as farmers feel that their product is sometimes overvalued for tax calculation. Crossing the produce from one LGA to another may involve a lengthy process to prove that cess has been charged in another LGA to avoid double charging, and this may hinder the trading of agricultural produce across LGA. In addition, cess gives an advantage to imported agricultural products to become more competitive as it adds to the costs in the value chain. Furthermore, government policy may not be geared towards emerging sub-sectors like barley, wheat, and grapes. The 18% VAT on the sub-sectors may also create a disincentive for small operators to grow.

Import tariffs have been set high for all three products, but the response in domestic production has been low. Imports are regulated in Tanzania; a permit is required for all imports, as is prior registration of the importer. Permits and registration are procured from the National Food Control Commission and are allegedly issued to closely monitor food crop movements in and out of the country. Each import permit is only applicable to a specific gateway into the country and via a specific customs office. Consequently, imported foods are at times transported via a route that is not the most direct and cost-effective. Due to the administrative formality that surrounds permit issuance, and the costly and time-consuming conditions they impose, it is a frequent trend to witness informal trading chosen over formal trading. This implies other non-fiscal factors are important constraints to production.

4.2.3. Physical infrastructures

Physical infrastructure includes irrigation systems, roads, electricity, storage structures, telecommunication systems, market infrastructure, etc. All these are important along different stages of the value chains of barley, wheat, and grapes. While the government is trying to improve this infrastructure, the status is far from ideal to support the needed performance of the agriculture sector. Most of the infrastructural issues cut across different sectors and involve players beyond the agriculture sector.

Of the 2.3 million hectares classified as having high potential for irrigation, less than 2% have improved irrigation infrastructure. This makes production highly dependent on rainfall which increases production risk. The road network is poor and limited to urban and a few peri-urban areas leaving rural areas where most production takes place with poor transportation systems and thus making it difficult to transport inputs to reach the farms and agricultural outputs to reach the markets. Market infrastructures are also lacking in most places and even where they exist, they are mostly managed poorly.

Through the Rural Electrification Agency (REA), most of the rural areas have been provided with access to grid electricity, but the uptake (connectivity) is still low and electricity supply is still erratic with frequent outages and low voltage that does not support the industries that need steady and high voltage. Recent developments in the telecommunication industry have brought a revolution in agriculture, by improving access to information and extension services, and simplifying transactions.

Storage facilities are also important infrastructure given that poor storage leads to high post-harvest losses and does not allow farmers to store and sell when prices are favourable. Most farmers use traditional storage methods which are not effective. Lack of storage facilities or warehouse systems forces small-scale farmers to sell their produce soon after harvest, and it is left to the processor to balance the purchase of the agricultural produce, process them, and meet the regular demand from consumers. Generally, the poor infrastructure conditions lead to a decrease in value chain efficiency and quality of wheat, barley, and grapes.

5.2.4. Organization and association

There are two types of linkages within the value chain literature: horizontal and vertical. For farmers, horizontal linkage refers to their membership and participation in farmers' associations. Acting collectively enables farmers to reduce their transaction costs for accessing inputs and transporting outputs, ease their access to market information and extension services, and improve their bargaining power with postharvest actors. Vertical linkage refers to various associations between

farmers and postharvest actors that entail formal and informal contracts that secure market outlets for farmers' output and reduce market uncertainty, enhance knowledge acquisition, and increase farmers' income.

Despite such apparent advantages to farmers, horizontal linkages in the value chains of wheat, barley, and grapes are very weak. Despite the economic importance of associations and contracts, most small-scale farmers in Tanzania do not participate in the formal value chain but rather operate within a framework that is characterized by weak or poor coordination with little or no legal enforcement of contracts between the postharvest actors.

5.3. Recommendations: Barley, Wheat, and Grapes

Looking at the challenges and SWOT analysis, there are several recommendations:-

- On low price challenges, both in contract farming and in the retail business, farmers need to produce globally accepted outputs if they want to tap into the available market. Thus, farmers are supposed to apply Good Agricultural Practices (GAP) within the framework of commercial agricultural production for long-term improvement and sustainability. These practices include the use of recommended varieties and certified seed and the proper quantity of fertilizers. This entails expanding extension services to guide and support farmers on modern farming practices. Farmers may also form producer groups to enhance their price negotiating power, and a warehouse receipt system so they sell during the off-season, or the off-takers negotiate with them to get a good price.
- On the capital and knowledge-intensive nature of the reviewed crops, efforts to enable farmers to obtain funds to expand their capital, mechanize and modernize their production should be enhanced. Farmers should be made aware of the availability of these financing opportunities and educated on how to properly utilize funds and conduct commercial agriculture.
- Storage practices should be improved to reduce post-harvest losses and maintain the quality of the grain. This also applies to providing incentives that encourage the establishment of storage facilities to store perishable products such as grapes. For grapes, there is also a need to develop collection/park-houses facilities/services.
- In honouring contract farming, the local government and the Ministry of Agriculture are urged to devise proper mechanisms that will improve contract enforcement. This should go hand in hand with ensuring that none of the parties involved is exploited because of asymmetric information.
- In sorting out conflicting policy actions, the government should improve the interaction between the government ministries and departments in implementing policies, programs, and projects. This should start by harmonizing the goals and targets, together with minimizing the multiplicity of agencies by reviewing the legal and operational status of regulatory agencies and creating robust entities capable of handling the regulatory roles comprehensively. Further, the food safety and new food fortification standards for wheat and other food and indirect feeds need to be enforced to be able to access export markets and maintain a competitive position in the high end of the domestic market.
- On fiscal challenges, the government should act on regulating and monitoring the charging of cess to ensure that it does not create a disincentive for producers and collectors. LGAs should be required to make public and list all relevant by-laws related to doing business in their jurisdiction. LGAs should cut the cess rate to 3% and consider reducing it gradually to zero. The fiscal policy provided using import duties should be supplemented with measures to ensure that there is no under-declaration of value or informal trading across the borders. In addition, VAT should be removed for a certain period to create domestic incentives to produce and process wheat, barley, and grapes. Further, tax incentives should cover more stakeholders in the value chain of these crops, especially those intended to promote mechanization and adoption of better processing technology.
- On physical infrastructure, the government should improve supporting physical infrastructure including irrigation systems, roads, electricity, storage structures, and market infrastructure.

6. Annexes

Annex 1: List of Selected Wheat Seed Varieties and special features

S/N	Variety	Year of Release	Owner(s) / Seed Source	Optimal altitude range (M)	Location	Grain Yield (MT/Ha)	Special Attributes
1.	Mamba	1973	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	2.0-3.0	• Resistant to stripe rust
2.	Nyati	1973	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	2.0-3.0	• Moderately resistant to yellow, leaf and stem rusts
3.	Mbuni	1975	ARI Selian	1200-2400	Arusha, Manyara, Iringa, Mbeya	1.5-4.1	• Susceptible to leaf, stem and yellow rust
4.	Kweche	1975	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	2.0-3.0	• Medium susceptible to yellow rust
5.	Tropy	1975	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	2.0-3.0	• Medium red seed colour. • Susceptible to yellow rust
6.	Tai	1977	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	2.0-3.0	• Has dark red kernel colour • Moderately susceptible to yellow and stem rust
7.	Kozi	1977	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	2.0-3.0	• Has dark red kernel colour • Moderately susceptible to yellow rust
8.	Joli	1977	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	2.0-3.0	• Moderately resistant to yellow rust
9.	Viri	1983	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	1.5-4.7	• resistant to yellow and leaf rust • Moderately susceptible to stem rust
10.	Duma (Durum)	1983	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	1.1-4.5	• esistant to stem rust
11.	Mbayuwayu	1987	ARI Selian	1200-2400	Arusha, Manyara, Iringa, Mbeya	1.4-2.8	• Moderately resistant to yellow, stem and leaf rusts • Has brown seed colour
12.	Azimio 87	1987	ARI Selian	1200-1800	Arusha, Manyara, Iringa, Mbeya	1.8-3.0	• Resistant to yellow, stem and leaf rusts
13.	Tausi	1987	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya	2.0-4.0	• Susceptible to yellow, stem and leaf rusts
14.	Tembo	1987	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya		
15.	Selian 87	1987	ARI Selian	1283-2400	Arusha, Manyara, Iringa, Mbeya		• Highly resistant to yellow, stem and leaf rusts

S/N	Variety	Year of Release	Owner(s) / Seed Source	Optimal altitude range (M)	Location	Grain Yield (MT/Ha)	Special Attributes
16.	Juhudi No 1	1987	TANWAT	1700-2200	Iringa, Mbeya	3.0-4.0	• Resistant to all yellow, stem and leaf rusts • Resistance to *Septoria* • 110-120 maturity days
17.	Njombe 6	1987	TANWAT	1500-2400	Iringa, Mbeya	2.1-4.1	• Highly resistant to yellow, stem and leaf rusts • 110-120 maturity days
18	Njombe 7	1987	TANWAT	1500-2400	Iringa, Mbeya	3.0-4.2	• Highly resistant to all rusts, *Fusarium* spp and root fungi • Resistant to *Septoria* spp • 110-120 maturity days
19.	Kware	1989	ARI Selian	1300-1400	Arusha, Manyara, Iringa, Mbeya	2.0-3.0	• Moderately resistant to yellow, stem and leaf rusts -• Moderately resistant to *Septoria*, leaf and spot blotch
20.	Chiriku	2002	ARI Selian	1300-2400	Arusha, Manyara, Iringa, Mbeya	2.2	• Slow rusting
21.	Sifa	2004	ARI Uyole	1700-2300	Mbeya, Iringa	4.5-5.0	• Moderately resistant to *Septoria* leaf blotch and stripe rust
22.	Riziki-C_2	2006	ARI Selian	1000-1500	Arusha, Manyara, Iringa, Mbeya	2.7	• Moderate resistant to Stripe rust, Stem and Leaf rust
23.	Riziki-C_1	2006	ARI Selian	1000-2000	Arusha, Manyara, Iringa, Mbeya	3.5	• Moderate resistant to Stripe rust, Stem and Leaf rust
24.	Lumbesa	2006	ARI Selian	1000-2000	Arusha, Manyara, Iringa, Mbeya	3.5	• Moderate resistant to Stripe rust, Stem and Leaf rust
25.	Merina	2014	ARI Uyole; ARI Selian	1500-2500	Arusha, Manyara, Iringa, Mbeya	3	• High level of gluten and protein (12.6 per cent) • Resistant to leaf rust
26.	Shangwe	2014	ARI Uyole; ARI Selian	1500-2500	Arusha, Manyara, Iringa, Mbeya	3.5	• High level of gluten and protein (12.6 per cent) • Resistant to leaf rust
27.	Ngoli	2014	ARI Uyole; ARI Selian	1500-2500	Arusha, Manyara, Iringa, Mbeya	2.8	• High level of gluten and protein (12.6 per cent) • Resistant to leaf rust
28.	SC Nduna	2019	Seed Co Zambia	1500-2500			• OPV • Days to maturity 117
29.	SC Shime	2019	Seed Co Zambia	1500-2500			• White OPV

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