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# Scoping study on fruits and vegetables; results from Tanzania

An assessment of investment opportunities for the Bill and Melinda Gates Foundation

Edwin van der Maden, Edmond Ringo, Likoko Eunice



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# Scoping study on fruits and vegetables

Results from Tanzania

Edwin van der Maden,<sup>1</sup> Edmond Ringo,<sup>2</sup> Likoko Eunice<sup>1</sup>

1 Wageningen Centre for Development Innovation

2 Match Maker Associates

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Wereldwijd lijdt een op de drie mensen aan een of meer vormen van ondervoeding. De teams van de Bill & Melinda Gates Foundation die zich bezig houden met landbouw en voeding, in samenwerking met het Britse Department for International Development (FCDO), willen het potentieel van groente- en fruitketens onderzoeken om het aanbod van voedzame voedingsmiddelen te vergroten en te versterken, en om de lokale marktkansen voor meer inkomsten te vergroten, speciaal voor vrouwen. Dit rapport belicht de conclusies van een onderzoek in Tanzania en identificeert verschillende oorzaken en mogelijke interventies om de fruit en groente sectoren te verbeteren en daarmee de consumptie te verhogen.

Currently, one in three of the world's population suffer from one or more forms of malnutrition. The Agricultural Development and Nutrition teams at the Bill & Melinda Gates Foundation, in collaboration with the UK's Department for International Development (FCDO), seek to investigate the potential of vegetable and fruit supply chains to increase the supply of and strengthen demand for nutritious foods, as well as increase local market opportunities for increased income, especially for women. This report highlights the conclusions from a study in Tanzania, and identifies several root causes, as well as opportunities for interventions to further develop the fruit and vegetable sectors, and with that enhance consumption.

Key words: Tanzania, fruit, vegetables, food system, nutrition, supply chains

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P.O. Box 29703, 2502 LS The Hague, The Netherlands, T +31 (0)70 335 83 30,  
E [communications.ssg@wur.nl](mailto:communications.ssg@wur.nl), <http://www.wur.eu/economic-research>. Wageningen Economic Research is part of Wageningen University & Research.



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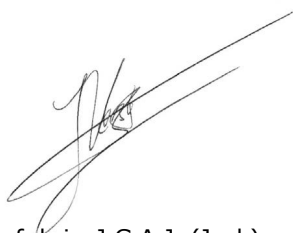
# Preface

The world's population is expected to increase by 2 billion persons in the next 30 years, from 7.7 billion currently to 9.7 billion in 2050. In spite of progress made in the past decades, the number of people being undernourished is on the increase again. Globally, 462 million are underweight, while 1.9 billion adults are overweight or obese. This contrast highlights well one of the most prominent global challenges imposed on our food systems, which is: how to make available, accessible and affordable healthy food to all.

To meet the growing demand for food and improved nutrition, food production and its nutritional value need to be enhanced. Compounding this issue is the pressure that existing agricultural systems place on the environment. Although there is scope to bring new land under cultivation, for example in Africa and Latin America, this has the knock-on effect of damaging the climate, biodiversity, natural habitats and more generally the integrity of the Earth's environmental system. The challenge of achieving global food and nutrition security is underscored by Sustainable Development Goal (SDG) 2: "End hunger, achieve food security and improved nutrition, and promote sustainable agriculture."

Fruits and vegetables play a key role in achieving above mentioned goals. This was acknowledged by the Bill and Melinda Gates Foundation (BMGF) and the Foreign, Commonwealth & Development Office (FCDO) which realised that more knowledge on the current state of fruit and vegetable consumption, trade, processing and production worldwide, and notably in low- and middle-income countries, is needed. For that purpose, Wageningen University & Research was contracted to conduct a global scoping study including deep dives into selected countries. After more than a year and a half of research, we are happy to present a number of research outputs that address comprehensively the state of art and main challenges associated with fruits and vegetables. The reports take us through all aspects of food systems in which fruits and vegetables play a role, from consumption to production, but also around the world, from Nigeria to Nepal. The study provides BMGF and FCDO with a clear set of recommendations as to priorities for philanthropical investments that have the goal of enhancing consumption of and economic benefits from fruits and vegetables.

Fruits and vegetables play a key role in meeting current and future food system challenges. With this research we know better where we are and what is needed to address these challenges. I hope our work contributes to setting in motion food system changes urgently needed.



Prof.dr.ir. J.G.A.J. (Jack) van der Vorst  
General Director Social Sciences Group (SSG)  
Wageningen University & Research

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# Summary

## Background

The Agricultural Development and Nutrition teams at the Bill and Melinda Gates Foundation (BMGF), in collaboration with the UK Foreign, Commonwealth & Development Office (FCDO), seek to investigate the potential of vegetable and fruit supply chains to increase the supply of and strengthen demand for nutritious foods, as well as improve market opportunities for increased income, especially for women.

A global scoping study of the horticultural sector in West Africa, East Africa and South Asia was conducted. The Phase I study was based on available literature and secondary data and resulted in the identification of so-called leverage points for interventions in the food system to promote the production, trade and consumption of fruits and vegetables. To test the validity and feasibility of the identified leverage points in specific contexts, seven deep-dive country studies have been performed in seven countries in Bangladesh, Burkina Faso, Ethiopia, India, Nepal, Nigeria and Tanzania.

This country study has the objective to further investigate and validate the leverage points identified in Phase I of the study for Tanzania. The ultimate goal of the country study is to understand what kind of investments can be made to accelerate systemic changes in the food system for healthier diets for all and more economic opportunities in particular for women. As a result of this study, BMGF and FCDO intend to identify potential investment options for enhancing the sustainable and inclusive development of the horticulture sector in Tanzania.

## Method

We investigated key questions on fruits and vegetables identified during Phase I. To add scope and focus to the study, we selected four vegetable (amaranth, cabbage, eggplant, spinach) and two fruit (mango, orange) crops. The crop selection is justified based on socio-economic, consumption and nutrition criteria, as well as gender considerations, and represent the diversity of fruits and vegetables produced and consumed across Tanzania.

We used a mixture of literature research, focus group discussions (FGDs) and key informant interviews (KIIs) to provide answers to the key questions identified, allowing for in-depth information gathering as well as cross referencing and triangulation.

## Key findings

The fruit and vegetable sector is the fastest growing subsector in Tanzania, with a growth that is more than double compared to the overall growth rate of the agriculture sector. As such, the sector has the potential to make a significant contribution to the Tanzanian economy, as well as to food and nutrition security.

However, the increased volume of fruit and vegetable production can largely be attributed to the expansion of the production area, as yields have remained relatively stable. Intensification of production by farmers is mainly hampered by a lack of quality inputs, limited access to finance, limited access to adequate extension services and unreliable and inaccessible markets while, at the same time, access to land and irrigation resources are increasingly becoming limited for farmers to increase fruit and vegetable production. Women face additional gender-specific barriers including, for example, limited access to and control over resources, and high time demand for household tasks. All of these barriers negatively impact fruit and vegetable consumption in terms of reduced food availability and



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nutritional diversity. However food insecurity can also predominantly be attributed to low and fluctuating household income, and not just to inadequate overall supply.

Vegetable production in Tanzania is still dominated by small-scale farming. To a lesser extent, smallholders are involved in the production of fruits due to the higher requirements in terms of investments, inputs and land, the more seasonal nature of fruit production, and relatively low local demand.

In Tanzania, men are still largely responsible for cash crop farming and income-generating activities, while women mostly take charge of food crops, help with the cultivation of cash crops and take up the larger part of responsibility for household chores. Women are the actors most involved in generating agricultural produce, from production to processing, storage and marketing. Yet, their involvement in decision-making is minimal, as is their access to profits. For women, the vegetable value chain and, more particularly, the production of green leafy vegetables and African indigenous vegetables, provides the most agribusiness opportunities, due to good local demand for these crops, ease of cultivation, short crop cycles, yearly production, low land size requirements, and limited need for external inputs.

As horticultural production is mainly concentrated among smallholder farmers with a low capacity to purchase high-quality inputs, and given the relatively small number of export-oriented production companies, the horticultural input supply sector, including technology supply, can be characterized as marginal and underdeveloped. Due to the low productivity, intensification (i.e. increasing the amount and quality of inputs relative to the land area) could be a key strategy to reduce the cost price, which would imply more efficient production practices while, at the same time, proper knowledge and skills of farmers are a prerequisite. A lower cost price, and increase in the current relatively small gross margins, could provide an additional positive contribution to farm household income and food security. However, it should be noted that *labor currently accounts for the largest percentage of production costs*.

Fruits and vegetable trade in Tanzania is predominantly local, either at the farm gate, in rural markets, or through local traders to urban areas. Tanzania has a rather insignificant position in the export of vegetables while, in the case of fruits, (e.g. mangos, oranges), the export to international markets is slightly more significant. Connections between producers, traders (collectors, wholesalers and retailers) and consumers in the fruit and vegetable sector in Tanzania are mostly informal. Collectors (or brokers) play an important role as they match supply from a multitude of smallholder farmers, which are geographically dispersed, with a more or less steady demand in a few centralized national and regional markets. Farmers and traders act on the basis of trust when it comes to, for example, price agreements, product quality and timely deliveries of produce. These prevailing informal markets and loosely arranged marketing agreements result in high vulnerability and risks for farmers, as well as the traders. More secure and reliable markets could lead to improved market information for smallholder farmers, based on which they can make more informed production decisions. Contract farming is another option to provide a secure market for farmers. In addition, a well-organized and efficient fruit and vegetable supply chain could contribute to a better allocation of resources, with the (economic) benefits passed onto all stakeholders along the value chain, including a reduction in post-harvest losses and lower transaction risks and associated costs.

Fruit and vegetable consumption in Tanzania is, on average, below the recommended amounts, with urban consumers consuming more fruits and vegetables than their rural counterparts. Diversification to enhance consumption of fruits and vegetables is expected to be most successful through the promotion of African indigenous vegetables. Prices of fruits and vegetables are high due to inefficient supply chains, seasonality and high production costs. Price fluctuation for fruits and vegetables are also quite significant. Less expensive staple crops are therefore preferred above relatively expensive fruits and vegetables. In addition, no evidence was found that reductions in farm gate price would lead to reduced retail market prices and thus lower prices for consumers, as these are most commonly influenced by other factors, including efficiency of the supply system, number of intermediaries, as well as traders being the dominant actors in setting prices. In this case, reducing farm gate prices will only have the negative effect of reducing farmers' income. Furthermore, as fruit and vegetable

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consumption does not differ substantially across income groups, making fruits and vegetables more affordable as a strategy for increased consumption is unlikely to impact food and nutrition security in Tanzania without increased awareness of their nutritional value. A greater understanding of consumer preferences, choices and decision-making regarding food purchases, coupled with awareness raising to promote consumption especially in rural areas, might be required to increase consumption.

Investments in the fruit and vegetable supply chains in Tanzania have the potential to positively contribute to several food system outcomes, especially related to food and nutrition security. The gender gap in Tanzania's agricultural productivity is still large, and the potential economic gains from reducing the gender gap could translate into significant poverty reduction and improved nutritional outcomes. As barriers to promote the production, trade and consumption of fruits and vegetable are interlinked, a mix of interventions at different stages of the food system need to be developed to overcome these barriers, and to realize the desired food system outcomes. Due attention should be given to possible trade-offs but also potential synergies of interventions.

# 1 Introduction

## 1.1 Background

The Agricultural Development and Nutrition teams at the Bill and Melinda Gates Foundation (BMGF), in collaboration with the Foreign, Commonwealth and Development Office (FCDO) in the UK, seek to investigate the potential of vegetable and fruit value chains to increase supply of and strengthen demand for nutritious foods, and increase local and export market opportunities for increased income, especially for women.

Wageningen University and Research (WUR) was assigned to conduct such a study. First, a global scoping study of the horticultural sector in West Africa, East Africa and South Asia was conducted. This Phase I study was based on available literature and secondary data, and resulted in the identification of so-called leverage points for interventions in the food system to promote the production, trade and consumption of fruits and vegetables. These potential leverage points were formulated in general terms only. To test the validity and feasibility of the identified leverage points in specific contexts, deep-dive country studies were conducted in seven countries: Bangladesh, Burkina Faso, Ethiopia, India, Nepal, Nigeria and Tanzania. This report describes the findings of the Tanzania country study.

## 1.2 Objective

The objective of this country study is to further investigate and validate the leverage points identified in Phase I of the study for the case of Tanzania. The ultimate goal of the country study is to understand whether and what kind of investments can be made to accelerate systemic changes in the food system for healthier diets for all and more economic opportunities in particular for women.

## 1.3 Research questions

For each leverage point identified during Phase I, associated assumptions and a number of research questions were formulated. The initially identified leverage points, assumptions and guiding research questions for the Phase II country studies are listed in Table 1.1 below.

**Table 1.1** *Leverage points, assumptions and guiding research questions for Phase II*

Leverage point	Assumptions	Guiding research question Phase II
Production	Increase in production leads to lower fruit and vegetable consumer prices	How does seasonal variation in weather influence fruit and vegetable production, yields and market prices (disaggregated by fruit and vegetable category)? What are the main causes and volumes of production losses, and where do they occur? What are the main barriers for farmers to increase the production of fruits and vegetables? What keeps farmers from intensification? Do female producers face greater barriers than male producers, and are there examples that have lowered these barriers? Are quality inputs and services accessible and is the enabling environment supportive to intensification? Does the intensification of fruit and vegetable production offer additional opportunities for women? Does it overburden women? How do women balance working on fruit and vegetable production with household tasks? Are the latter 're-negotiated' or mitigated by other strategies?

Leverage point	Assumptions	Guiding research question Phase II
Cost price	Reduction in cost price will make production of fruits and vegetables more profitable to smallholders	How much are the production costs and can we compare them across the seven countries? What happens to the farm gate price when costs are reduced? What happens to the income of farmers when farm gate prices are lower?
Fruit and vegetable supply chain efficiency	More efficient supply chains can lead to lower fruit and vegetable consumer prices	Does value chain efficiency result in lower farm-gate prices and/or consumer prices? Data on prices: farm-gate and consumer prices. What are the risks, costs and types of coordination for the key fruit and vegetable categories? How can more efficiency be achieved and are there examples of such enhanced efficiencies?
	More secured fruit and vegetable markets increase value chain efficiency, farmer income and reduce wastage	Are there examples that more secure markets (formal markets) are beneficial to smallholder farmers? How should farmers benefit from such arrangements?
Communication	Intermediary actors communicate consumer needs to producers and (jointly) develop innovative food products	How do traders and processors (male and female) connect to consumers? Are they organized to support each other? Do they impose standards on producers? What examples are there of women succeeding? Are these exceptions or at scale in the different levels of the food value chain? Are there examples of traders and processors (male and female) who are capable of responding to consumer needs by developing innovative food products? What are the conducive conditions for information sharing and what is the role of trust?
Diversity	More and higher diversity in fruit and vegetable crops produced and traded leads to more and more diverse fruits and vegetables in the food environment	Has the introduction of new fruit and vegetable varieties contributed to more fruits and vegetables being consumed? What are the trends in fruit and vegetable consumption, are these dependent on season, geographical location (production/ non-production areas), and can these trends be disaggregated by different types of fruits and vegetables?
Consumer prices	Prices of fruits and vegetables are always higher compared to other food categories	Why are consumer prices of fruits and vegetables higher compared to other domestically produced food crops? Are there differences between categories of fruits and vegetables and what explains these differences?
Women participation	Women's participation in fruit and vegetable production and value chain operations leads to higher income and empowerment of women	Are there examples of the successful integration of women in profitable production and fruit and vegetable value chain operations? What explains these successes and is there evidence of them being scaled up? What business models work best for women's inclusion and leadership?
	Higher income by women leads to higher consumption of fruits and vegetables	If fruits and vegetables become more commercial (or scaled up) will the income be controlled by women?
Consumer participation	Public enforcement of standards will enhance food safety for consumers of fruits and vegetables	An inventory of relevant standards (public/private). How are these standards enforced? Do consumers trust these standards? How are they perceived and acknowledged by other stakeholders in the food system?
	Nudging and public extension will improve consumer awareness of the health benefits of fruits and vegetables and consumption preferences	Are there specific policies and strategies formulated and implemented for improving diet quality among different consumer categories and do they include strategies on fruit and vegetable consumption? Is there evidence of their impact? How have policies enabled women to address systemic constraints that they face, and to successfully access sufficient nutrition? An inventory of innovative policy and strategy examples implemented – who is implementing them? Are consumers' motives taken into account?
	Increased food safety, consumer awareness and responses to consumer preferences lead to higher acceptability of fruits and vegetables	What are consumer motives and barriers to (not) consume (specific) fruits and vegetables, such as indigenous vegetables, for different household members?

Leverage point	Assumptions	Guiding research question Phase II
	Improved availability, affordability and acceptability leads to intake of fruits and vegetables that meet the recommendations	If everything is as planned (available, affordable, acceptable) will consumers increase fruit and vegetable intake in their diet, according to the recommendations?

## 1.4 Approach

During Phase II, we investigated key questions on fruits and vegetables, that were identified during Phase I (Section 1.3). To add scope and focus to the study, based on screening of available literature and secondary data on fruit and vegetable production and consumption in Tanzania, four vegetables and two fruits were selected to investigate the potential for action and investments in more depth (i.e., amaranth, cabbage, eggplant, spinach, mango and orange). These crops were selected based on socio-economic, consumption and nutrition criteria as well as gender considerations, and represent the diversity of vegetables and fruits produced and consumed across Tanzania (Chapter 3).

We used a mixture of literature research, focus group discussions (FGD) and key informant interviews (KII) to provide answers to the key questions identified, allowing for in-depth information gathering as well as cross referencing and triangulation:

- Desk research: Review of academic publications, literature, reports and information published on fruits and vegetables in Tanzania during roughly the last decade (2010-2020) and describing the situation in the Tanzanian horticultural sector, with special attention to the selected crops and the role of women. We complemented this with additional secondary data sources (e.g. FAOSTAT).
- FGDs: to address the identified research questions, and to collect views on recent developments and harvest expert and actors' opinions and perspectives on the horticultural sector. The topics/themes for the interviews and group discussions were based on clustering identified research questions and associated stakeholder groups. A total of six FGDs took place, with a total of 43 participants (21 male and 22 female). Representatives came from producers (three separate groups), traders, private sector service providers and public agencies. One FGD specifically dealt with gender and nutrition interests.
- In addition, KIIs were conducted with various key players in the horticulture sector in Tanzania:
  1. Ministry of Agriculture (MoA) informed us on the relevant public sector policies in Tanzania.
  2. MoA, Directorate of Policy and Planning informed us on gender-related issues with regard to horticulture.
  3. The WVC elaborated on the development of the horticulture sector in Tanzania.
  4. RIKOLTO is an international network organization with Belgian roots, who shared their experiences regarding their horticulture-related activities in Tanzania.
  5. TAHA provided further insights as a representative stakeholder organization in the sector.
- The FDGs and KIIs were organized and reported upon by a Tanzanian local consultant (Edmond Ringo, Match Maker Associates, and co-author of this report). An overview of the actors who participated in the FGDs or were interviewed for the KIIs is provided in Appendix 1.
- In addition, we made indicative crop budget calculations for some of the selected vegetable crops, based on information provided during the FGDs. This is based on typical farm costs like seeds, fertilizers, crop protection, labor and the revenues coming from the foreseen harvest. All calculations are made for 1 acre of production, excluding fixed costs like land rent. As input for these calculations, we used various sources including relevant literature and expert information coming from the KIIs and input provided during the FGDs.

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## 1.5 Reading Guide

Chapter 2 gives a general overview of the fruit and vegetable sector in Tanzania, including current domestic area and production figures, consumption, prevailing seed system and the role of gender and women in the fruit and vegetable sector. Chapter 3 describes the criteria followed for the selection of the six priority fruits and vegetables, with a description of the significance of those selected crops in the country. Chapter 4 and its sub-sections analyze the leverage points and associated research questions as described in Table 1.1. The final chapter compiles the major findings of the study by reflecting on the leverage points.

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## 2 State of play

### 2.1 Country profile Tanzania

The United Republic of Tanzania is located in the Great Lakes region of Africa. The 2021 population is estimated to be over 61 million people, of which 37% are urban, with an annual population growth rate of close to 3% and a median age of 18 years.<sup>1</sup> The population is projected to increase to 89 million in 2035 (URT, 2018).

In 2019, the Tanzanian economy grew by 5.8% reaching a gross domestic product (GDP) of US\$63.2 billion, making it the second largest economy in East Africa after Kenya and the seventh largest in sub-Saharan Africa.<sup>2</sup> Tanzania is becoming a lower middle-income country. As a result of the COVID-19 pandemic, the country's GDP declined by 2% in 2020, but the International Monetary Fund estimates the growth of Tanzania's economy to recover in 2021 with a GDP growth of 3.6%.<sup>3</sup> The Tanzania Development Vision 2025 guides the country's development goals.<sup>4</sup>

The agricultural sector remains a mainstay of Tanzania's economy in both mainland Tanzania and Zanzibar, employing approximately 65% of the country's total labor force and contributing 29% of the country's GDP according to World Bank data.<sup>2</sup> Tanzanian agriculture in general, and fruit and vegetables in particular, has the potential to be a main driver of the economy. However, exact estimations on the contribution of fruit and vegetables to the national GDP are not available.

The fruit and vegetable sector is the fastest growing subsector in Tanzania, with an annual average growth of approximately 9-12% per annum. This growth is more than double as compared to the overall growth rate of the agriculture sector. The fruit and vegetable sector (jointly with the flower and spice sector) employs about 4.4 million people.

Tanzania has about 40 million hectares of agricultural land, of which about 34% is arable (see Figure 2.1).<sup>2</sup> The majority of actors in the agricultural sector are small-scale subsistence farmers, owning less than four hectares of land and mostly relying on rain-fed agriculture and low-level technology (Davids and Maliti, 2015).

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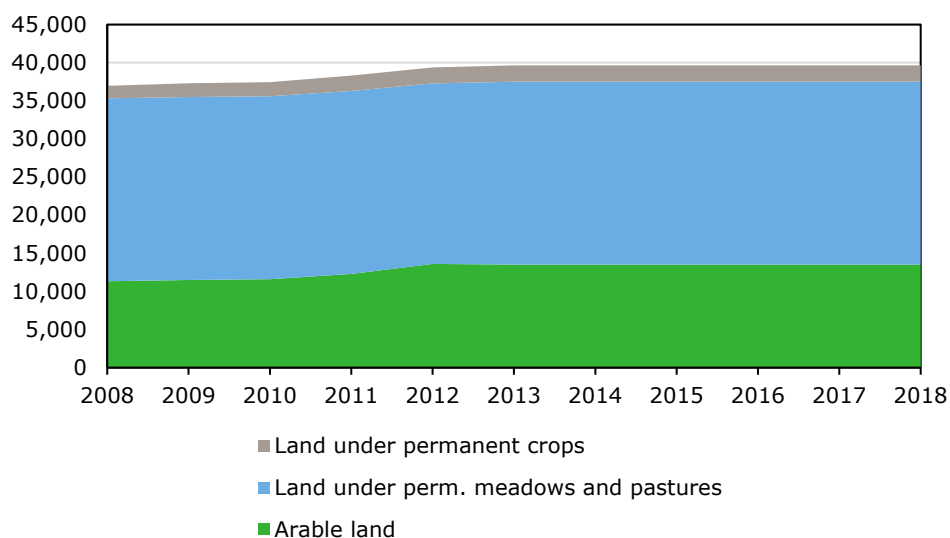
<sup>1</sup> <https://www.worldometers.info/world-population/tanzania-population>

<sup>2</sup> <https://data.worldbank.org/country/tanzania>

<sup>3</sup> <https://www.imf.org/en/Countries/TZA>

<sup>4</sup> <http://www.mof.go.tz/mofdocs/overarch/vision2025.htm>





**Figure 2.1** Agricultural land use in Tanzania (1,000 ha)

Source: FAOSTAT.

## 2.2 Overview and trends analysis of horticultural produce in Tanzania

### 2.2.1 Area and volume of fruit and vegetable production

The volume of fruit and vegetable production is increasing in Tanzania. Aggregate production of fruit and vegetables has displayed an increasing trend over the past 10 years, with a cumulative annual production growth rate of 75% and 31% for vegetables and fruits (excluding bananas and plantains) respectively from 2010 to 2019, as shown in Table 2.1 and 2.2. This increase in production has mainly been demonstrated through expansion of the production area, and underscores the growing dominance of the fruit and vegetable subsector in the national economy (TAHA, 2019).

Increase in fruit production can be observed in the cultivation of almost all fruits, including watermelon, oranges, pears and plums. The key contributor to this increase in production volume was a sharp expansion of the production area, while the reported yields remained at the same level.

**Table 2.1** Area, production and yield of fruits 2010-2019

		2010	2017	2018	2019	10-year trend
Fruit, tropical fresh nes	Area (ha)	18,500	19,748	19,808	19,869	7%
	Production (t)	50,000	50,719	50,755	50,791	2%
	Yield (t per ha)	2.70	2.57	2.56	2.56	-5%
Grapes	Area (ha)	2,500	775	774	772	-69%
	Production (t)	7,000	3,303	3,253	3,202	-54%
	Yield (t per ha)	2.80	4.26	4.02	4.15	48%
Lemons and limes	Area (ha)	1,300	1,761	1,776	1,700	31%
	Production (t)	7,000	10,242	10,359	10,000	43%
	Yield (t per ha)	5.38	5.82	5.83	5.88	9%
Mangoes, mangosteens, guavas	Area (ha)	30,000	33,570	33,631	33,748	12%
	Production (t)	350,000	436,697	444,027	451,357	29%
	Yield (t per ha)	11.67	13.01	13.2	13.37	15%
Oranges	Area (ha)	26,000	37,500	38,192	42,049	62%
	Production (t)	240,000	450,000	468,276	535,275	123%
	Yield (t per ha)	9.23	12	12.26	12.73	38%
Pears	Area (ha)	400	792	844	894	124%
	Production (t)	3,000	6,302	6,778	7,254	142%
	Yield (t per ha)	7.50	7.96	8.03	8.11	8%
Pineapples	Area (ha)	14,000	16,632	17,001	17,360	24%
	Production (t)	320,000	421,938	437,973	454,008	42%
	Yield (t per ha)	22.86	25.37	25.76	26.15	14%
Plantains and others	Area (ha)	280,001	299,076	301,616	304,201	9%
	Production (t)	579,072	579,819	579,618	579,416	0%
	Yield (t per ha)	2.07	1.94	1.92	1.90	-8%
Plums and sloes	Area (ha)	350	749	800	850	143%
	Production (t)	2,200	4,883	5,257	5,631	156%
	Yield (t per ha)	6.29	6.52	6.57	6.62	5%
Watermelons	Area (ha)	1,700	3,709	3,927	4,144	144%
	Production (t)	16,000	37,114	39,430	41,747	161%
	Yield (t per ha)	9.41	10.01	10.04	10.07	7%
Fruit, citrus nes	Area (ha)	12,000	16,450	17,373	18,387	53%
	Production (t)	43,000	45,903	46,314	46,725	9%
	Yield (t per ha)	3.58	2.79	2.67	2.54	-29%
Fruit, fresh nes	Area (ha)	31,000	31,781	31,788	31,795	3%
	Production (t)	200,000	201,613	201,626	201,638	1%
	Yield (t per ha)	6.45	6.34	6.34	6.34	-2%
Fruit primary	Area (ha)	417,751	462,543	467,530	475,769	14%
	Production (t)	1,817,272	2,248,533	2,293,666	2,387,044	31%
	Yield (t per ha)	4.35	4.86	4.91	5.02	15%

Source: FAOSTAT.

Increase in vegetable production is observed in the cultivation of all products (see Table 2.2). Beans, cabbages, onions and tomatoes show the most relevant increases in volume produced. A key contributor to this observed increase is the sharp expansion of the production area, while the reported yields remain at the same level for all vegetables with the exception of tomatoes and onions, which also report a high increase in yield. For tomatoes, yields increased by 44% and for onions by 97%.

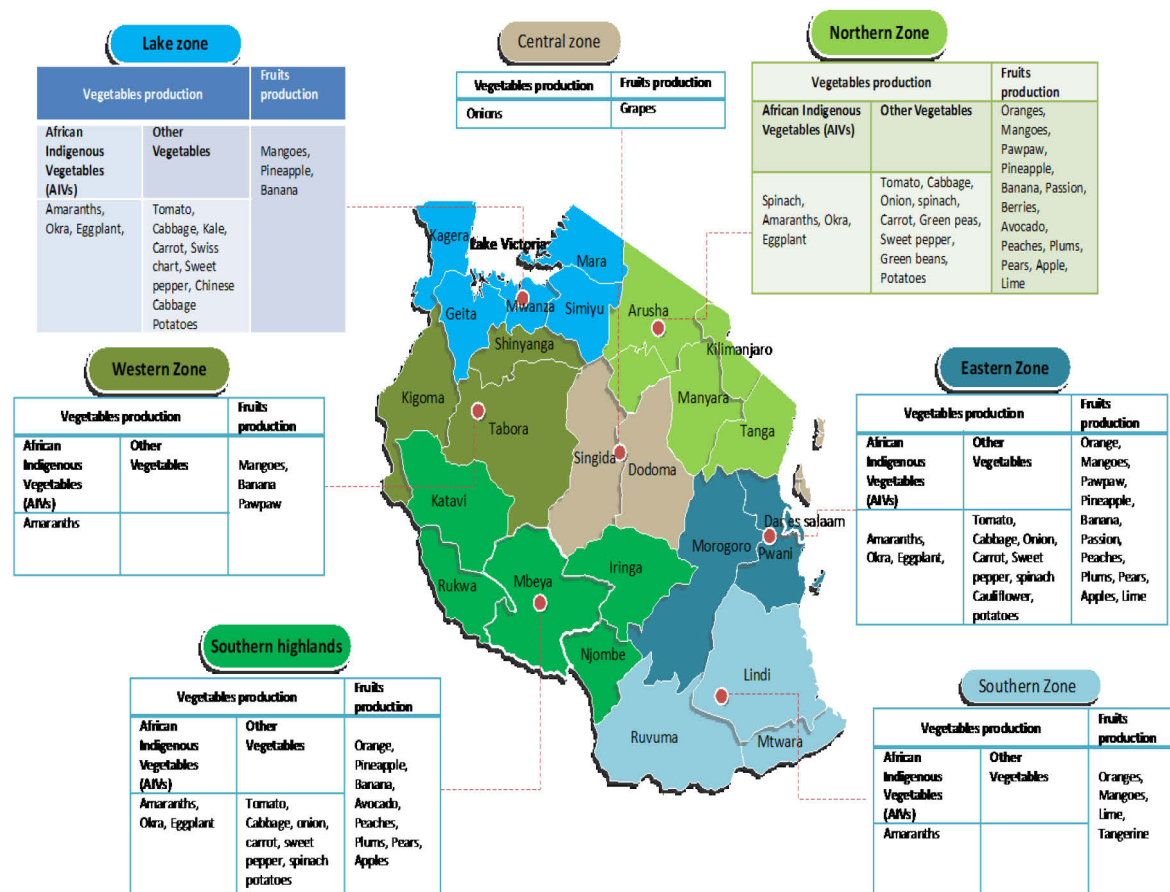
**Table 2.2** Area, production and yield of vegetables 2010-2019

		2010	2017	2018	2019	10-year trend
Beans, green	Area (ha)	750	1,208	1,250	1,292	72%
	Production (t)	3,200	6,120	6,440	6,760	111%
	Yield (t per ha)	4.27	5.07	5.15	5.23	22%
Cabbages and other brassicas	Area (ha)	4,200	7,755	7,985	8,170	95%
	Production (t)	45,000	87,540	89,808	91,573	103%
	Yield (t per ha)	10.71	11.29	11.25	11.21	5%
Chilies and peppers, green	Area (ha)	500	677	708	739	48%
	Production (t)	11,500	17,800	18,675	19,549	70%
	Yield (t per ha)	23	26.29	26.38	26.45	15%
Garlic	Area (ha)	900	1,882	2,049	2,234	148%
	Production (t)	3,850	5,935	6,164	6,392	66%
	Yield (t per ha)	4.28	3.15	3.01	2.86	-33%
Maize, green	Area (ha)	14,000	16,267	16,869	17,475	25%
	Production (t)	48,000	58,257	60,181	62,104	29%
	Yield (t per ha)	3.43	3.58	3.57	3.55	3%
Onions, dry	Area (ha)	12,500	16,947	17,072	17,181	37%
	Production (t)	100,000	236,077	253,436	270,796	171%
	Yield (t per ha)	8.00	13.93	14.85	15.76	97%
Peas, green	Area (ha)	2,800	6,855	7,836	9,045	223%
	Production (t)	7,200	10,292	10,659	11,027	53%
	Yield (t per ha)	2.57	1.50	1.36	1.22	-53%
Tomatoes	Area (ha)	28,000	38,870	39,880	40,820	46%
	Production (t)	300,000	555,979	591,883	627,788	109%
	Yield (t per ha)	10.71	14.3	14.84	15.38	44%
Vegetables, leguminous nes	Area (ha)	1,100	2,216	2,398	2,584	135%
	Production (t)	4,500	8,505	9,081	9,656	115%
	Yield (t per ha)	4.09	3.84	3.79	3.74	-9%
Vegetables, fresh nes	Area (ha)	300,000	391,985	413,081	434,487	45%
	Production (t)	1,500,000	2,231,335	2,334,398	2,437,462	62%
	Yield (t per ha)	5.00	5.69	5.65	5.61	12%
Total vegetables	Area (ha)	364,750	484,662	509,128	534,027	46%
	Production (t)	2,023,250	3,217,840	3,380,725	3,543,107	75%
	Yield (t per ha)	5.55	6.64	6.64	6.63	19%

Source: FAOSTAT.

## 2.2.2 Production areas

Different horticultural studies have classified Tanzania into five different clusters of horticultural development/production zones (see Figure 2.2, and Tables 2.3 and 2.4 for an overview of the vegetables and fruits for the different zones respectively). Across the country, women have significant opportunities to engage in the production and marketing of African Indigenous Vegetables (AIVs) and other popular vegetables for local market and home consumption, including cabbage, carrots, peppers, Chinese cabbage and to a lesser extent spinach. Further elaboration on the opportunities for horticulture production and investments in the various production zones are provided in the sections below.



**Figure 2.2** Fruit and vegetable production zones in Tanzania

Source: compiled by authors, February 2021.

**Northern Zone:** Despite increasing scarcity of land, the Northern Highlands still represent the highest potential for horticulture investments. The zone's conducive climate, adequate infrastructure, proximity to export and tourism markets, supporting technical institutions in Tanzania and neighboring Kenya, and a cluster of already established activities make it the most likely magnet for investment by exporters. In addition, smallholder farmers in this region could produce vegetables for local markets and engage in potential out-grower schemes for export-oriented vegetables.

**Eastern and South Zones:** The Eastern and Southern Zones are well suited for off-season production of tropical fruits. These zones can take advantage of readily available local markets and proximity to air and seaports to develop their potential in mangoes, pineapples, oranges and papaya production. Further, their proximity to Dar-es-Salaam allows for the targeting of produce to rapidly expanding markets, such as the Middle East and India. However, improved and appropriate facilities for bulking, storage and cargo handling at the airport and seaport in Dar-es-Salaam must be guaranteed so as to enhance growth of horticulture in this cluster. Through the Tanzania Horticulture Association (TAHA), a number of pack houses have been initiated, but their capacity is not yet sufficient.

**Southern Highlands:** The climatic conditions in the Southern Highlands afford the region the highest long-term potential for horticulture growth in Tanzania. Further development of existing infrastructure, (Mbeya airport, trunk roads, the railway line and container transport) and investment in logistics such as cold chains (storage facilities, trucks, pack house, etc.) are required to make this zone a viable source for horticulture exports.

**Central and Lake Zones:** The Central and Lake Zone clusters are emerging as production areas for horticultural crops for the local and regional markets. With the expansion of Mwanza and Dodoma airports, and the road network that connects with all East African Community (EAC) countries, these zones can become a major horticulture export cluster as well.

**Table 2.3** *Distribution of production of vegetables in Tanzania, according to production zones*

Zones	Major African Indigenous Vegetables	Major high value vegetables
Northern Zone	Spinach, amaranth, okra, eggplant	Tomato, cabbage, onion, chives, mint, carrot, green peas, sweet pepper, green beans, Potatoes
Eastern Zone	Amaranth, okra, eggplant, spinach	Tomato, cabbage, onion, carrot, sweet pepper, cauliflower, potatoes
Southern Highlands	Amaranth, spinach, okra, eggplant	Tomato, cabbage, onion, carrot, sweet pepper, potatoes
Southern Zone	Amaranth, okra, eggplant	Sweet pepper
Lake Zone	Amaranth, okra, eggplant, Chinese cabbage	Tomato, cabbage, kale, carrot, Swiss chart, sweet pepper, potatoes
Central Zone	Amaranth, okra	Onion
Western Zone	Amaranth, okra	Tomato, cabbage, chilies

Source: MMA (2017).

**Table 2.4** *Distribution of fruits production in Tanzania according to production zones*

Zones	Major fruits
Western Zone	Mangoes, banana
Northern Zone	Oranges, mangoes, papaya, pineapple, banana, passion, berries, avocado, peaches, plums, pears, apple, lime
Eastern Zone	Orange, mangoes, papaya, pineapple, banana, passion, peaches, plums, pears, apples, lime
Southern Zone	Oranges, mangoes, lime, tangerine
Southern Highlands	Orange, pineapple, banana, avocado, peaches, plums, pears, apples
Lake Zone	Mangoes, pineapple, banana
Central Zone	Grapes

Source: MMA (2017), TAHA (2019).

## 2.2.3 Consumption of fruit and vegetables

Tanzania scores 47.1 on the Economist's Global Food Security Index,<sup>5</sup> ranking number 89 out of a total of 113 countries, and number 9 out of 28 sub-Saharan countries. Prevalence of undernourishment, an estimate of the proportion of the population whose habitual food consumption is insufficient to provide the dietary energy levels that are required to maintain a normal, active and healthy life, is estimated at 25% (2019, 3-year average), which fell from 32.6% in 2010. Prevalence of obesity in the adult population (18+) has gradually increased and more than doubled, from 3.8% in the year 2000 to 8.4% in 2016.<sup>6</sup>

Consumption of fruits and vegetables is on average below the recommended amounts, with urban consumers consuming more fruit and vegetables than their rural counterparts (Keller et al., 2012). On average, adults consume 107g of fruits and 91g of vegetables.<sup>7</sup> In a semi-urban sample of about

<sup>5</sup> <https://foodsecurityindex.eiu.com/>

<sup>6</sup> <http://www.fao.org/faostat/en/#country/215>

<sup>7</sup> [http:// foodsystemsdashboard.org](http://foodsystemsdashboard.org)

8,000 participants, 82% of the population did not meet the dietary recommendation of 5 portions of fruits and vegetables a day. Rather, the average number of vegetable portions consumed per person per day was 2. Older participants tended to have higher numbers of standard vegetable portions than younger people, and the frequency of daily vegetable intake appeared to be lowest among the least educated, unskilled and skilled laborers. Participants with more frequent use of healthcare also tended to have higher proportions of daily vegetable consumption when compared to those with less frequent health care use. Younger participants appeared to consume more fruits daily (16.1%) compared to older participants (8.1%). Fruits were consumed less frequently, although the portion sizes of fruits were larger than the vegetable portions. No difference in consumption patterns between men and women was observed, although inadequate fruit and vegetable consumption was observed less amongst people having obtained a higher education level (Msambichaka et al., 2018a).

Some of the major barriers to consumption of fruit and vegetables were found to be 'lack of knowledge, including a basic misunderstanding of nutritional needs versus hunger, generational misinformation on cooking vegetables too long to cleanse them of pesticides, and taboos concerning the effects of certain vegetables' (Beaudreault, 2019). More details are presented in Section 4.9.

## 2.2.4 Trade in fruits and vegetables

Fruits and vegetables trade in Tanzania is predominantly local, either at the farm gate, in rural markets, or through local traders to urban areas. Most horticulture produce is absorbed by the local market as fresh produce, and only a very small proportion is processed. It should be noted that a significant proportion is wasted due to a lack of post-harvest facilities, given the perishable nature of horticulture produce (see Section 4.4.3).

Tanzania has a rather insignificant position in the export of vegetables, mainly due to the current business arrangements whereby Tanzanian exporting companies are subsidiaries of large aggregation companies often based in Kenya, and thus these kinds of exports are not fully captured in Tanzanian data (MMA, 2017). In the case of fruits, mangoes and oranges in particular, the export to international markets is slightly more significant. In Table 2.5 the export values of fruits and vegetables from 2014 to 2017 are presented. Reliable data for 2018 and is not yet available. Less than 10% of the horticultural products produced in Tanzania are exported to the European Union, regional markets (i.e. EAC and the Southern African Development Community), and the Middle East (Mashindano et al., 2013).

**Table 2.5** Tanzania fruit and vegetable export values 2014 – 2017 (US\$1,000)

	2014	2015	2016	2017
Edible vegetables and certain roots and tubers	249,765	398,570	186,897	171,274
Edible fruit and nuts; peel of citrus fruit or melons	399,534	279,311	359,161	554,779
All commodities	5,704,654	5,854,231	4,741,925	4,178,109

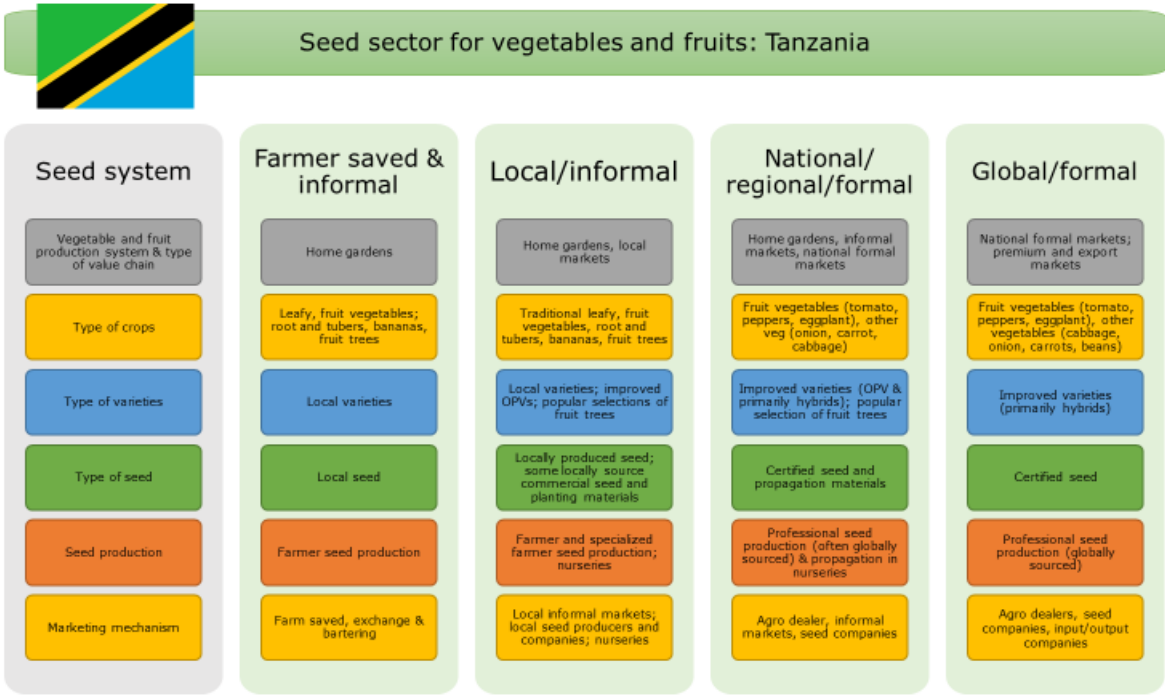
Source: UNComtrade.

## 2.2.5 Seed system

In Tanzania, there are two types of seed systems: the formal system, which is market-oriented and is developed by the public and/or private sectors, and the informal system, which is based primarily on seed self-provisioning exchanges, gifts among neighbors and the informal market (Figure 2.3).

The formal seed system mainly consists of public agricultural variety development and early generation seed production, certified seed multiplication by public and private seed companies, and marketing by registered agro-dealers and agricultural offices. Certified seeds are typically available for maize, sorghum, beans and rice, as well as for some vegetables and some oil crops (ASARECA/KIT, 2014). Most vegetable production depends on a formal seed system, with the exception of AIVs for which seeds are generally supplied through informal seed systems. There are a number of initiatives (i.e., by the World Vegetable Centre (WVC)) aimed at improving effective seed supply systems to ensure a market for AIV seeds, as this is considered critical in harnessing their potential to improve

food security and livelihoods of vulnerable communities, and increase income and nutrition opportunities of vulnerable populations (Karanja et al., 2011).



**Figure 2.3** Overview of the seed sector for fruits and vegetables in Tanzania  
Source: based on Louwaars et al. (2013).

Seed sector reform in Tanzania has led to the development of vegetable seed companies, but at a much slower pace than in Asia. There are now about 25 vegetable seed companies operating in Tanzania, and the total value of the sector is expected to grow from US\$25 million in 2018 to US\$65 million by 2023 (Guijt and Reuver, 2019). Currently, there are more than 100 private seed companies operating in Tanzania in variety development, seed production, processing, marketing, exporting and importing seeds. The private and public sectors both conduct seed production, processing and marketing. Global and regional companies are present in Tanzania and invest in local seed sector development, but need to step up efforts to reach more smallholders.

Most of the seed companies have built a business around trading and distributing seed but, unlike Asia, few have invested in research and development to develop their own locally-adapted varieties. There is very little breeding of vegetables or other crops for the domestic market in sub-Saharan Africa, despite the entry of several multinational seed companies. Much of the vegetable seed is still imported from outside the country and continent, while local companies continue to produce seed of open-pollinated varieties (OPV). Some OPV have seen spectacular adoption; for instance, two improved tomato varieties developed by the WVC accounted for 82% of the tomato area in Tanzania in 2014, and one improved African eggplant variety accounted for nearly all of the area planted with that crop (Schreinemachers et al., 2017). Although impressive, the longevity of these varieties in the market reflects the limited choice available to farmers and the lack of competition. Most global and regional companies offer vegetable seed to smallholders in the region, with maize considered the most important in most of their business models. Companies demonstrate tailored approaches to smallholder customers by offering a mix of hybrid and OPV, which for vegetables moves to a larger portion of hybrid varieties. Smallholders often prefer OPV as they lend themselves to on-farm seed saving.

For commercially less attractive vegetable crops and nearly all fruit trees, public agricultural research institutes are critical for varietal development and the seed supply chain. However, public investment in the development of vegetable and fruit varieties is mostly absent or extremely fragile. For those vegetables and fruits, farmers continue to use local varieties, and local and informal seed sources.



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Therefore, one finds a large diversity of varieties in cases adapted to specific locations. In this manner, the formal commercial seed sector provides vegetable producers with quality seed of improved varieties for a small portion of the total commercial vegetable market (tomato, onion, eggplant, cabbage, etc.), and the informal sector remains important for other vegetables (especially African leafy vegetables) and fruits.

Farmers with home gardens or those engaged in some informal marketing of vegetables and fruits use multiple seed sources. They may use farmer-saved seed or planting material (fruit trees), from neighbors or informal markets or nurseries. For some vegetables, they may purchase small packs, some of which are as small as 1g or 100 seeds, from regional or national companies. The farmers would then opt for quality seed that may be open-pollinated or, in some cases, hybrid varieties, generally depending on the investment they are willing to make in purchasing vegetable seed. With an array of seed systems, from farmer-saved to global commercial seed systems, the seed sector of Tanzania is in development, particularly for commercially more attractive vegetables. The seed sector predominantly depends on imported quality seed of improved varieties for the major vegetables, as the public sector is fragile and weak and the role of informal seed systems remains important.

## 2.2.6 Gender and women's roles

Women in Tanzania play an essential role in agricultural production and constitute the vast majority of the farming population, making a significant contribution to national development. Tanzania's agricultural sector is characterized as women-intensive, with women constituting 54% of the overall agricultural workforce (Leavens and Anderson, 2011; Mnimbo T., 2018). Men in Tanzania are largely responsible for cash crop farming and income-generating activities, while women take charge of food crops, help with the cultivation of cash crops and take up the larger part the responsibility in household chores. Due to women's burden of unpaid, continuous, time-intensive and energy-consuming domestic tasks and responsibilities, time constraints are widely identified as a major constraint on women's enterprise and income improvement (Galiè et al., 2019; Leavens and Anderson, 2011). Women farmers and women in agribusiness are often ignored or denied services and opportunities for advancement, and agricultural intervention programs target men by default. Clear differences between male and female farmers can especially be observed with regard to access to credit, access to land and access to extension services and training activities (Fischer et al., 2017). Due to cultural inheritance and ownership systems, women rarely own the land they cultivate, and even when they do own land, they own less than men. However, land rights are vital in Tanzania because of the predominance of agriculture in the economy, the centrality of agriculture to rural poverty reduction and the importance of land ownership in providing collateral for credit access (Fischer et al., 2017; Leavens and Anderson, 2011). In addition, due to the lack of land ownership and insecure land rights, women may be less inclined to invest in their land to increase productivity and economic value.

Our study also observes a clear gender imbalance within the fruit and vegetable sector. The production process is mostly carried out by women, who contribute about 70% of the actual work on farms but have very limited access to land, credit, education and labor-saving technologies (Amani, 2006; Davids and Maliti, 2015). Women are the primary agricultural producers in Tanzania and are the ones most directly involved in their families' feeding, nutritional needs and other essential family requirements. They are the actors most involved in generating agricultural produce, through from production to processing, storage and marketing. Yet, their involvement in the process of development and decision-making is minimal, as is their access to profits. Cultural barriers, as well as low levels of education among women, have also undermined their active participation (Amani, 2006).

The vegetable value chain, and more particularly the production of green leafy vegetables and AIVs, provides the most agribusiness opportunities for women, due to good local demand for these crops, ease of cultivation, short crop cycles, yearly production, low land size requirements, and limited need for external inputs. Women are active at different trading nodes of vegetables, but are most active in retailing.

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Conversely, fruit production is less interesting for women to engage in due to high initial investments, high external input requirements, seasonal and regional production, the need for larger land sizes, low local demand, and transportation to main markets. Women are actively engaged in the retailing of fruits, while men dominate the wholesale business (Amani, 2006; Davids and Maliti, 2015).

In Tanzania, the right to gender equality is guaranteed by the Constitutions of the Mainland and Zanzibar and a host of complementary legislation. However, due to a variety of factors including social-cultural customs and traditions, significant gender gaps remain in almost all areas of life. In addition to its inherent value as a human right, gender equality and investments contribute to economic growth and transformation through a number of pathways. Investments in gender equality also contribute to poverty reduction and more equitable development outcomes, and the business case for moving decisively towards gender equality has never been stronger. This is, however, no easy task. Development practitioners will need to broaden their horizons and move beyond laws, policies and regulations to influence and change deeply held customary practices. Changing mentalities, attitudes and behaviors has never been easy but there are some facilitating factors that could be expected to boost the effort. These include the gradual but steady modernization of the economy, the increasingly youthful nature of the population and the laws and policies already in place (Davids and Maliti, 2015). In addition, there is a need for interventions that draw a link between increased agribusiness production and profits, and gender and women's empowerment (Galiè et al., 2019).

Homestead food production can be associated with increased dietary diversity. Growing vegetables leads to higher dietary diversity, as certain crops are more likely to be consumed at home rather than being sold at the market. Therefore, promotion of homestead production of non-starchy foods such as fruits and vegetables may increase dietary diversity in women and their household members (Bellows et al., 2020). Promotion of crop diversification with fruits and vegetables may be effective in increasing women's dietary diversity, specifically in relation to nutrient-rich foods. Integrated homestead food production programs that have shown increases in maternal dietary diversity have reduced the prevalence of wasting in women in Tanzania. Similarly, improved access to markets in rural areas that promote nutrient-rich diversification of produce can contribute to improving dietary quality among the rural poor (Bellows et al., 2020).

The gender gap in Tanzania's agricultural productivity is large, and the potential economic gains from reducing the gender gap translate into significant poverty reduction and improved nutritional outcomes. Agricultural and nutritional interventions should identify and focus on the most costly constraints to women's productivity. For example, women are disadvantaged in accessing agricultural machinery and production technologies, and farms managed by women farmers are less productive due to observable factors including inequalities in manager attributes such as experience, education, land characteristics, agricultural technology and input use, and crop choice. In addition, women and men farm different crops and women farmers are less likely to grow cash or export crops that men sell to the market for higher incomes. Gender gaps persist as a cumulative result of all these factors. Therefore for women, equitable access to production factors such as land, physical inputs, machines and livestock may have benefits beyond increasing agricultural productivity and profits, to include improved nutritional and household wellbeing (UN Women, UNDP, UNEP, 2015).

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## 3 Selection of fruits and vegetables

### 3.1 Introduction

During Phase I of the study, potential leverage points in the food systems were identified that could positively impact the production, supply and consumption of fruits and vegetables, and generate positive income effects for women. During Phase II, these identified leverage points were further investigated, for which a number of associated research questions were formulated. These research questions were presented in Section 1.3.

In order to add focus to the study, six horticulture crops (four vegetables and two fruits) were selected to investigate the potential for action and investments in more depth. The criteria for selection and the eventually selected crops are presented in Section 3.2.

### 3.2 Selected fruits and vegetables

Six horticulture crops were selected in order to further narrow down the scope of the FGDs and KIIs. These crops were selected based on socio-economic, production, consumption and nutrition criteria, as well as gender considerations, and represent the diversity of vegetables and fruits produced and consumed across Tanzania, i.e.:

1. Current production and consumption (e.g., production regions, rural and urban markets)
2. Gender inclusiveness (e.g., income opportunities for women in production, processing, trading)
3. Affordability and availability
4. Nutritious value
5. Sentinel foods typically consumed by a large share of the population in Tanzania (see Table 3.2).

Based on a long list of horticulture crops compiled by means of quick screening of available literature and secondary data on fruit and vegetable production and consumption in Tanzania, the above mentioned criteria and supplemented with expert opinions, four vegetables (amaranth, cabbage, eggplant and spinach) and two fruits (mango and orange) were selected for this country study. The six selected crops are further characterized below.

#### 3.2.1 Vegetables

##### 3.2.1.1 Spinach

Spinach is grown at almost all altitudes, but preferably at 800-2,200m above sea level. Spinach can be harvested at least twice a week for 2-3 months, and hence gives the farmer continued income and vegetables for household consumption. Technologies for drying (solar drying) are available, although there is still a limited market for dried vegetables as most consumers prefer to consume them fresh. Women can actively engage in retailing because the vegetable has a short supply chain (mostly sold locally) and post-harvest losses are minimal because the farmer can harvest in small portions. Spinach is affordable and is a source of nutrients including vitamin K, vitamin A, vitamin C, magnesium, folate, iron, calcium and antioxidants (FAO and GOK, 2018).

##### 3.2.1.2 Eggplant

African eggplant is the most popular type of eggplant grown in Tanzania, and is one of the indigenous vegetables playing a significant role in both subsistence production and income generation among rural and urban poor groups in Tanzania. The crop is notable for high yield and high market potential. Color, shape, size and flavor are the most perceivable quality attributes of African eggplant fruits and are important determinants of purchase decision-making. In Tanzania, African eggplant is grown in almost every region and is one of the most traded indigenous vegetables in local markets (Majubwa,

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2015). Eggplant is a source of nutrients such as fiber, potassium, niacin, vitamin B-6 and antioxidants (FAO and GOK, 2018).

Eggplant is among the vegetables with annual production increases, which is primarily a result of increased health awareness in urban areas (Msambichaka et al., 2018a). Certified seeds offer good yields, however, the majority of smallholder farmers cannot afford these seeds and resort to farmer-saved seeds which give very low yields (De Putter et al., 2012). Women are engaged in trading at different nodes, but are generally retailers (Mayala and Bamanyisa, 2018). Due to various factors including inadequate storage facilities, there are post-harvest losses at the level of intermediaries in urban areas (Juma, 2020). The vegetable is affordable for low income populations and is available almost throughout the year.

#### **3.2.1.3 Amaranth**

Amaranth, known in Tanzania by various local names such as '*Mchicha*', is a popular traditional African leafy vegetable with a long cultural tradition in East Africa and other regions on the continent. The leaves are a source of fiber, vitamin A, vitamin K, vitamin B, vitamin C, potassium, calcium, zinc and iron, some of which are deficient in local diets (Dinssa et al., 2019).

Smallholder farm households in Kenya and Tanzania have widely adopted improved amaranth varieties, as they give higher yields and are more resistant to diseases and pests. This is, in large part, due to international vegetable breeding supported by international donors and led by the WVC in Arusha, Tanzania, with the involvement of a large number of public and private sector partners (Ochieng et al., 2019). The ready availability of improved amaranth varieties together with increasing consumer demand for the crop have given private seed companies the incentive to include amaranth in their seed catalogues. Seed companies in Kenya and Tanzania produced 2.9t of amaranth seeds in 2016, with eight out of nine varieties based on WVC breeding research (Ochieng et al., 2019).

The production of amaranth is possible countrywide, provided there is sufficient water. It is a short-term crop (21 days to harvest), requires limited other inputs and there is no need for a large size of land so women can actively engage in production. Furthermore, it has been mentioned that indigenous vegetables are more profitable for farmers than exotic leafy vegetables, because they are resistant to most common diseases and thus require less inputs, especially pesticides (Bizzotto Molina et al., 2020). Technologies for drying (solar drying) are available, but there is a limited market for dried vegetables as most consumers prefer to consume them fresh. Women can actively engage in wholesaling and retailing. The challenge of post-harvest loss is moderate, because traders can buy in small volumes and no transport is required over long distances because it grows in so many places. Amaranth is the most commonly traded indigenous vegetable (Lotter et al., 2014), and is affordable for low income populations and available all year round. Every family in Tanzania, regardless of their level of income, consumes Amaranth.

#### **3.2.1.4 Cabbage**

Cabbage is among the most produced and consumed products in Tanzania. It is produced in most regions in the country, primarily by smallholder farmers. Cabbage is mainly produced in open fields and requires sizable capital and land, so women experience a high barrier to entry this business. It is among the horticultural crops with the highest fertilizer application (Bizzotto Molina et al., 2020). Women are involved in the retail phase of cabbage, during which they add value by slicing the cabbage and packing it in a plastic bag for low income consumers to buy. Cabbage is one type of vegetable with high post-harvest losses, especially in retail (Dome and Prusty, 2017). The vegetable is affordable for low income populations, is available all year round and is nutritious, offering a good source of vitamin C and folate (FAO and GOK, 2018). However, the crop is strongly affected by pests and diseases, which results in a relatively high application of pesticides, and as a result, is often associated by consumers with risk of contamination by pesticide residues.

### 3.2.2 Fruits

#### 3.2.2.1 Orange

Orange production is largely concentrated on the North East coast, with Tanga and Pwani regions having the largest planted areas. Tanga region stands out with the highest hectareage under orange production followed by Morogoro, Mwanza and Ruvuma (MMA, 2009). There is limited involvement of women in orange production due to limited possibilities for female land ownership (Stahl, 2015). Further, there are limited processing technologies that are affordable and accessible to women; they all require high initial investments. As a result, women are actively engaged in retailing while males dominate the wholesale business. There is emphasis on exports to regional markets (Dube et al., 2018), which is generally male-dominated. Oranges are affordable to poor consumers, highly seasonal (May-August), and are a healthy source of fiber, vitamin C, thiamine, folate, potassium and antioxidants (FAO and GOK, 2018).

#### 3.2.2.2 Mango

Mango, as well as orange, is a long-term tree crop. Over 90% of the mango traded in Tanzania are traditional varieties, as they were planted many years ago. The improved varieties have been introduced in recent years, but with limited success due to limited access to land and irrigation. Similarly to orange, there is limited involvement of women in mango production due to a lack of possibilities for female land ownership (Stahl, 2015). Drying of mangoes is a potential processing possibility, however there is limited local market demand for dried mangoes, as consumers prefer the consumption of fresh mangoes. Juice production is another way of processing and value addition, however requires high investments making it difficult for women to enter this market. Women are actively involved in the retailing of mangoes while men dominate the wholesaling business. There is limited affordability for poor households' mango consumption, and it is a seasonal fruit (November-March). Mango is primarily known for its vitamin A content, but also contains a high fiber, niacin, folate and vitamin C content (FAO and GOK, 2018).

**Table 3.1** Production areas in Tanzania of selected fruits and vegetables

Crop	Production areas
<b>Vegetables</b>	
Spinach	Pwani, Kilimanjaro, Iringa, Tanga, Arusha, Mwanza, Geita
Eggplant	Arusha, Kilimanjaro, Tanga, Iringa, Mwanza, Geita, Morogoro
Amaranth	Kilimanjaro, Tanga, Irina, Arusha, Morogoro, Mbeya, Mara, Mwanza
<b>Fruits</b>	
Orange	Tanga, Pwani, Morogoro, Dar es Salaam, Lindi, Mbeya
Mango	Tabora, Shinyanga, Pwani, Tanga, Morogoro, Lindi, Dar es Salaam, Mwanza, Kilimanjaro, Mtwara

Table 3.2 gives an overview of the different sub-groups of fruit and vegetables, including the sentinel foods that are typically consumed by a large share of the population in Tanzania. The fruits and vegetables selected for this study are highlighted in bold. The last column provides the typical health associations.

**Table 3.2** Overview of the different sub groups for fruit and vegetables in Tanzania

Sub-group	Sentinel foods	Health associations
(Dark) green leafy vegetables (DGLV or GLV)	Sukuma wiki, <b>spinach</b> , Chinese, <b>amaranth leaves</b> , cowpea leaves, cassava leaves, Nightshade leaves, spider flower leaves, jute mallow, sweet potato leaves, pumpkin leaves or delega	Contribute to iron, vitamin C, vitamin A and folate intake Positive association with coronary heart disease, stroke, all-cause mortality, but negative with cardiovascular disease
Red, orange and yellow vegetables	Carrots, <b>orange</b> pumpkin or <i>viasi lishe</i> (Sweet potato that is orange inside)	Contribute to vitamin A, folate Positive association with coronary heart disease, total cancer
Cruciferous vegetables	<b>Cabbage</b>	Positive association with total cancer and all-cause mortality but negative association with cardiovascular disease
Other vegetables	Tomatoes, <b>African eggplant, eggplant</b> , sweet pepper, cucumber or okra	
Red, orange or yellow fruits	<b>Mango</b> , papaya or passion fruit	Contribute to vitamin C, vitamin A and Folate Positive associated with coronary heart disease
Citrus fruits	<b>Orange</b> , tangerine	Contribute to vitamin C (and helps to improve iron/zinc bioavailability), folate Positive association with coronary heart disease, stroke, cardiovascular disease, and all-cause mortality
Apples, pears	Apple	Positive association with coronary heart disease, stroke, cardiovascular disease and all-cause mortality
Other fruits	Banana, pineapple, avocado, grapes, pear, watermelon, baobab, guava or jackfruit	-

Source: Sentinel fruit and vegetables (from DQQ – dietary diversity questionnaire).

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## 4 Research results

### 4.1 The food supply system

#### 4.1.1 Description of the food supply systems and its actors

The actors of the fruit and vegetable sector in Tanzania can broadly be categorized into four groups: 1) producers, 2) input suppliers, 3) traders, wholesalers and retailers and 4) processors. Below, the actors and their linkages and roles within the selected fruit (mango and orange) and vegetable (spinach, eggplant, amaranth, cabbage) supply systems are characterized and described in detail.

##### 4.1.1.1 Producers

Vegetable production in Tanzania is dominated by small-scale, semi-subsistence farmers with less than two hectares of land, whereby they account for about 70% of the vegetable producers (MMA, 2017). Currently, Tanzania's horticulture sector counts less than 40 large-scale growers and exporters, the majority of them located in northern Tanzania, particularly in Arusha, Moshi and Manyara regions (Davids and Maliti, 2015). The majority of the small-scale farmers are not directly connected to the regional and international markets, though large-scale growers and exporters do make offtake agreements with smaller-scale farmers.

Smallholder farmers are generally active in the production of green leafy vegetables (e.g., amaranth, spinach), AIVs (e.g., okra, African eggplant, pumpkin leaves, cassava leaves, jute mallow), eggplant, cabbage and tomatoes. The vegetable farming system can, to a certain extent, be characterized as intensive where it concerns the application of improved seed, fertilizers, agro-chemicals and irrigation (Lotter et al., 2014).

Smallholders are less involved in the more commercial production of tree fruits (e.g., oranges, mangoes, avocados) due to limited access to both credit and land, as these crops require high initial investments, high use of external inputs and large land sizes. Furthermore, fruits are more seasonal, produced in specific regions only, local demand is relatively low and transportation is required to reach end markets. In comparison, vegetables are easier to grow, have shorter crop cycles, can be marketed locally and can be produced year round on small plots, with relatively low external input requirements.

Mangoes are produced by 1) semi-subsistence smallholder farmers, growing traditional and improved varieties, and 2) large-scale mango growers (>50 acres), who are predominantly growing improved mango varieties. The latter group accounts for less than 30% of all mango farmers. Oranges are predominantly produced by small-scale farmers, who intercrop oranges with other cash and food crops. A low number of medium-scale farmers produce oranges in areas with suitable agro-ecological zones, like Tanga and Morogoro, with land areas of more than 10 acres allocated to orange production, besides additional fields planted with other cash crops. Large farmers historically identified orange production as one of their most profitable enterprises and thus actively expanded their orange orchards.

There are examples of orange farmers in the medium-scale categories who have diversified their business (majority men), and who are more exposed as far as the business dynamics of the marketing and trade of oranges are concerned. A few of them are reported to own trucks, and play a three-fold function of production, transportation and trade in oranges. Some of them are reported to take their own harvests of oranges to the domestic markets outside Tanga region, and to Kenyan markets.



#### Box 4.1 Stories from the field - Amaranth production in Lemara, Arusha

Lemara is an administrative ward in the Arusha District of the Arusha Region of Tanzania, and counts a population of 11,766. The majority of the population is involved in small-scale farming, cultivating vegetables like African eggplant, amaranth, spinach and tomatoes. The smallholders are enjoying the irrigation advantages of the Lemara River that flows its water throughout the year via the Themu valley.

The Lemara area is famous for the production of amaranth, supplying, amongst others, central markets in Kilombero and Arusha. Production mainly occurs on individual basis, on rented land (0.5-1 acre). The majority of the amaranth farmers are male. Production also takes place in home gardens or small pieces of land around houses, of which the produce is directly marketed to local/neighboring consumers. The production of amaranth takes place for 8 months, consecutively, from March to early June, due to the rainy season.

While men are usually involved in the production of amaranth, women generally take care of delivery to/supplying the markets. This is mainly due to the burden that comes with the irrigation needed to participate in the production of amaranth, i.e., if the farm cannot be fed by traditional water streams channeled across the farms, then water should be fetched manually from the river to the farm for irrigation, which is found to be difficult for women.

#### 4.1.1.2 Input suppliers

As horticultural production is mainly concentrated among smallholder farmers with a low capacity to purchase high-quality inputs, and given the relatively small number of export-oriented production companies, the horticultural input supply sector, including technology supply, can be characterized as marginal and underdeveloped (RVO, 2015). Seeds, fertilizers and crop protection products are mostly provided to farmers by small/local agro-dealers, who operate on a regional basis, with the larger suppliers having offices in Dar es Salaam. Some of the large Tanzanian input and technology suppliers are By-Trade and Balton. International companies like Yara, Syngenta, Monsanto and Rijk Zwaan are also active in the market for the supply of seeds and crop protection products.

Seeds for most AIVs are supplied through informal seed systems (see Section 2.2.5), while seeds for most of the remaining vegetable production depends on a more formal seed system. However, as the potential of the AIV market is also being noticed by commercial seed companies, investments are being made in the development of hybrid varieties of AIVs, like Rijk Zwaan, which have developed hybrid varieties for crops such as African eggplant and African kale.

Planting material for both oranges and mangoes is, in most of cases, produced by farmers themselves, or is either purchased from other farmers with small nurseries, seedling producer businesses (nurseries) or public institutes. These seedlings can either be grafted or not grafted. In Muheza district in Tanga region, the agriculture research institute (TARI Mlingano) raises and grafts planting material on order, but generally on a small-scale basis. Public organizations like Sokoine University of Agriculture, Government orchards in Mpiji - Bagamoyo and the Agricultural Seed Agency are important suppliers of seedlings.

#### 4.1.1.3 Markets, traders, wholesalers and retailers

The traditional domestic marketing system continues to dominate in all fruit and vegetable value chains in Tanzania, and the majority of farmers sell their surplus produce to rural traders called collectors (or brokers). Various different output markets can be distinguished (Eaton et al., 2008; Eskola, 2005):

- **Rural village markets:** the farmers themselves bring the produce to nearby informal markets, which are often located near (main) roads. The produce is often sold by women or children, who sell to an established circle of customers or travelers on the road. These small roadside markets usually have little or no link to larger markets in the region.
- **Regional markets:** these are the most important consumer markets. Although some farmers may bring their produce to these markets, they are generally dominated by traders, which can be divided into collectors, wholesalers and retailers. In Tanzania, wholesalers buy from the collectors (who are organized into a collectors' association). An often cited study by Eskola (2005) reported that even large traders are unlikely to move from the regional markets into national markets, even for marginally higher profit, because they are committed to serving the existing customer base. This

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commitment is usually social rather than economic, and the loyalty to customers, friends and relatives is more important than the 'short-term opportunistic profits available in other market'.

- **National markets:** In Tanzania, the national market is Kariakoo Market located in Dar es Salaam, which is the largest wholesale facility in the country. It handles a daily average of 250t of produce and provides services in four submarkets. Traders are organized in registered organizations.

Collectors play an important role as they match supply from a multitude of small farmers, which are geographically dispersed, with a more or less steady demand in a few centralized markets (regional, national or abroad such as in Kenya). This function is combined with transport, some sort of grading, and often financing. Auxiliary actors occasionally appear for specialized functions such as transport, packing or picking (oranges). As collectors pay farmers in cash on the spot, they travel with large amounts of cash, which constitutes a big risk. One interviewed wholesaler in the Kariakoo market explained in the report by Eaton et al. (2008) that it was preferred to work with many collectors who handle smaller amounts of produce and cash than to work with one big collector. The report also indicates that most traders have liquidity problems, which is a symptom of imperfections in credit markets (and thus of coordination). As a result, especially the small traders are financially constrained. This also limits the amount of cash one trader can carry, and will thus limit the extent of trade that can be done by a trader. Most collectors have formed their own association to which all collectors sell their collected produce, which then sells to wholesalers and retailers. This makes it virtually impossible for farmers to directly sell in Kariakoo market. Collectors need to travel long distances over roads that are in bad shape. Collectors are usually 'specialized' in a certain area and crop (especially cabbage and eggplant), and have detailed knowledge of the area and the farmers. As there are many farmers that produce fruits and vegetables, collectors are certain that they will be able to source sufficient amounts. However, much time and effort is spent in collecting (e.g., waiting time) and transporting the goods. It is not unusual for some mango traders to rent a tree for a season from smallholder farmers, according to the expected production of that tree and harvest according to the ripening and market needs.

The larger part of orange production is destined for the regional Kenyan export market, for which a broker system is most common. Through a system of village and district brokers, linkages are established with Kenyan (export) traders. Usually, the brokers initiate the trade, arrange for and take charge of the harvesting upon agreement with the farmer, and contract the labor needed for harvesting. Farmers and harvest contractors are paid on a per-orange basis. Traders either deliver their stock in bulk to the wholesale market, or deliver directly to retailers at retail markets who had placed orders in advance. Wholesalers sell to retailers, consumers, hotels and restaurants and to processors, if no other fresh market outlet is available. In the case of oranges for regional export to Kenya, the Wakulima market in Nairobi is the primary wholesale market. Retail traders from other smaller markets in Nairobi also buy their oranges from this market, and traders typically pay an off-loading fee at the wholesale market for offloading a truck.

Retailers comprise mainly small stationary vendors (over 80%) and mobile vendors (over 10%), and account for over 95% of total fruit and vegetable market share (Kirk et al., 2019). The majority of vegetables selected for this study (amaranth, cabbage, eggplant and spinach) are retailed by small vendors. Retailers operate in local markets or at street corners, in kiosks or vegetable shops. The retailers usually buy small lots of fruits and vegetables according to their demand and renew it when they have sold most of their inventory (after a week). There are no special cooling facilities/pack houses in those markets, and thus retailers experience substantial post-harvest losses. Few urban retailers try to get supply directly from rural areas. Supermarkets are an emerging phenomenon in Tanzania and retail accounts for less than 5% of all national fresh fruits and vegetables produced (Kirk et al., 2019).

#### Box 4.2 Stories from the field - vegetable traders in Arumeru district, Arusha

The economy of the Arumeru district in the Arusha region depends mostly on agriculture, consisting mainly of subsistence farming, livestock production and the production of high quality seed and flowers for exports.

Most of the fruit and vegetable traders in the Arumeru district are experienced farmers themselves, as they produce or have previously produced fruit and vegetables in small quantities. Most of the traders collecting vegetables from farmers in the Arumeru district are able to source at once, on average, five bags of different vegetables. Traders have an average trading capital ranging from TSH 300,000 (US\$129) up to TSH 1,000,000 (US\$431).<sup>8</sup> The business of vegetables is mostly dominated by women, and few men are engaged in trading vegetables. Vegetable traders are not organized in trading associations, however they do work on a cooperative basis towards each other and collectively manage the consignments of farmers. For example, if a farmer is harvesting 10 bags of eggplant and one trader is not able to purchase them all, the trader will invite fellow traders to purchase the remaining bags.

##### *Experienced fruit and vegetable traders Rose and Magreth*

Rose and Magreth are fruit and vegetable traders at Tengeru Market (near Arusha), and have business relationships with farmers at Arumeru District. Rose and Magreth have more than 20 years of experience in this business. Most traders at Tengeru Market have good experience with being a member of self-saving and lending groups from their villages, commonly known as village community banks (VICOBA) or village saving and lending groups (VSLG). Beyond using VICOBA/VSLG as sources of financing, traders also use the group as their social capital for support during festivals (weddings, funerals) and source of financing for emergencies (school fees, hospital bills, etc.). Furthermore, through the VICOBA/VSLG market information is being exchanged. Through their VICOBA/VSLG they are able to supply traders from other markets including Kilombero Market and Soko Kuu in Arusha town, and other buyers come from outside Tengeru like Namanga. Currently they are trading cabbage, eggplant and spinach. They collect the produce a day before the market day, at which point they harvest, grade and pack it for transporting to the market the next morning.

#### 4.1.1.4 Processors

Processing of vegetables rarely takes place, as consumers prefer them fresh. There are low-tech solutions available for drying fruits and vegetables (e.g., amaranth leaves, mangoes, spinach), however there is limited (local) market demand for dried fruits and vegetables. The largest processor of mangoes and oranges in Tanzania is Bakhresa - AZAM Fruit Processing Co., which processes mostly traditional mango varieties and oranges to make mango concentrate (for juice) and orange juice. The juices are sold in Tanzania, while the mango concentrates and some orange juice are exported to Eastern and Southern African countries. Mangoes and oranges have the potential to be processed in many other forms (e.g., marmalades, jams), but Tanzania has only established a few of these processing facilities so far.

#### 4.1.2 Visualization of the selected fruit and vegetable supply systems

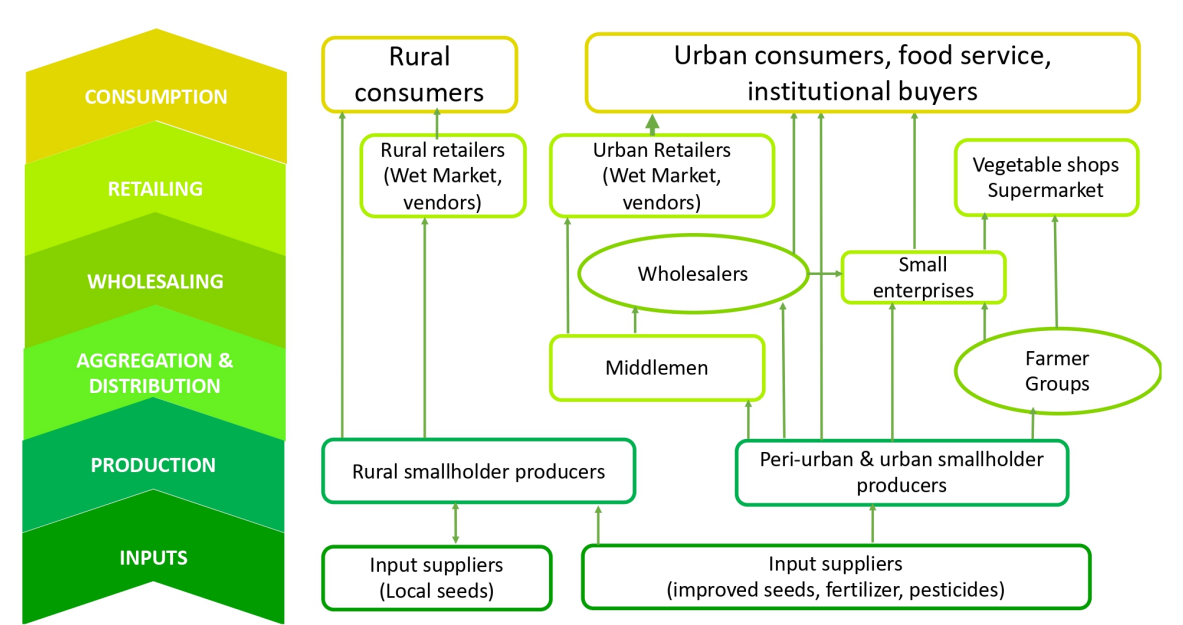
The following figures visualize the fruit and vegetable supply systems for the selected crops. Most of the linkages between different actors within the fruit and vegetable supply systems have already been discussed under Section 4.1.1.

Figure 4.1 shows a typical example of a supply system for AIVs. Figure 4.2 shows the supply system for cabbage, which is somewhat differently organized as compared to the AIVs supply system due to its more commercially oriented character. As already explained in Section 1.4.1, although they are both fruit tree crops, the systems for mango and orange are organized differently due to different end markets and trading systems, and are therefore visualized separately in Figures 4.3 and 4.4, respectively.

Spinach, eggplant and amaranth in Tanzania are grouped under AIVs, and have relatively short and informal supply systems. Farmers who are engaged in AIVs can be grouped as either rural smallholders or peri-urban/urban smallholders. Rural smallholders make up the largest part of these smallholder vegetable producers, who still do the marketing and retailing of their produce themselves to consumers in their neighborhood or directly to urban retailers who mostly prefer to buy at farm

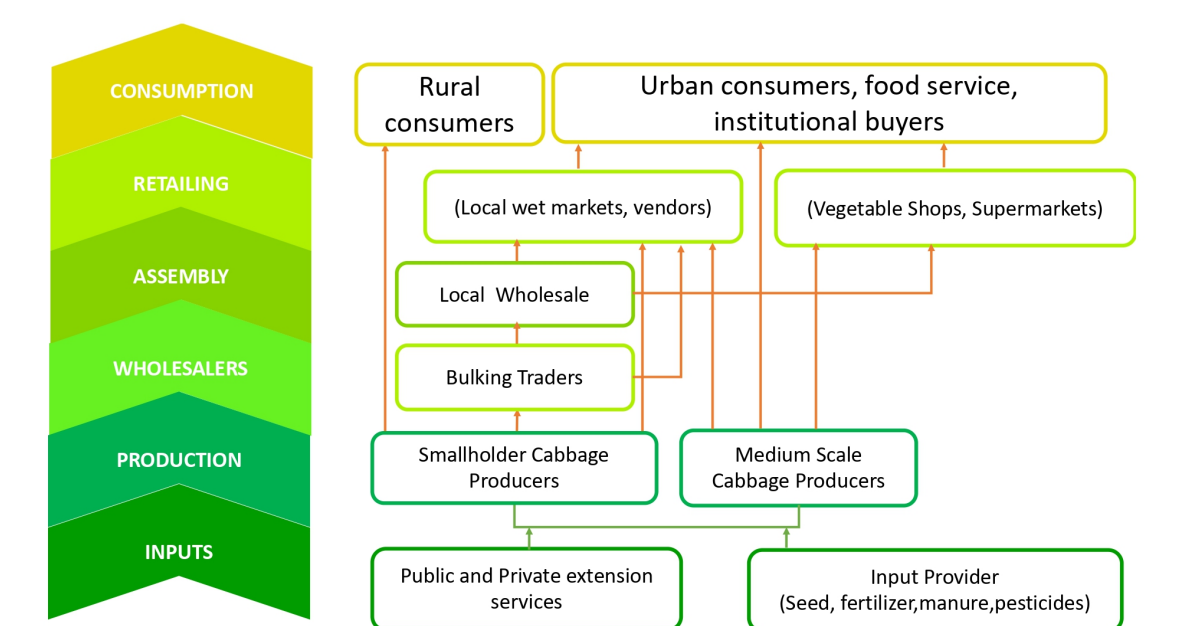
<sup>8</sup> TSH 1 equals US\$0.00043 as per 2 June 2021, [www.xe.com](http://www.xe.com)

gate. Peri-urban and urban smallholders produce primarily for urban consumers, for which somewhat longer supply systems are in place and where trade takes place through middlemen and wholesalers, supplying to both urban retailers, vegetable shops and supermarkets. These farmers are also more commonly organized in farmer groups or cooperatives.



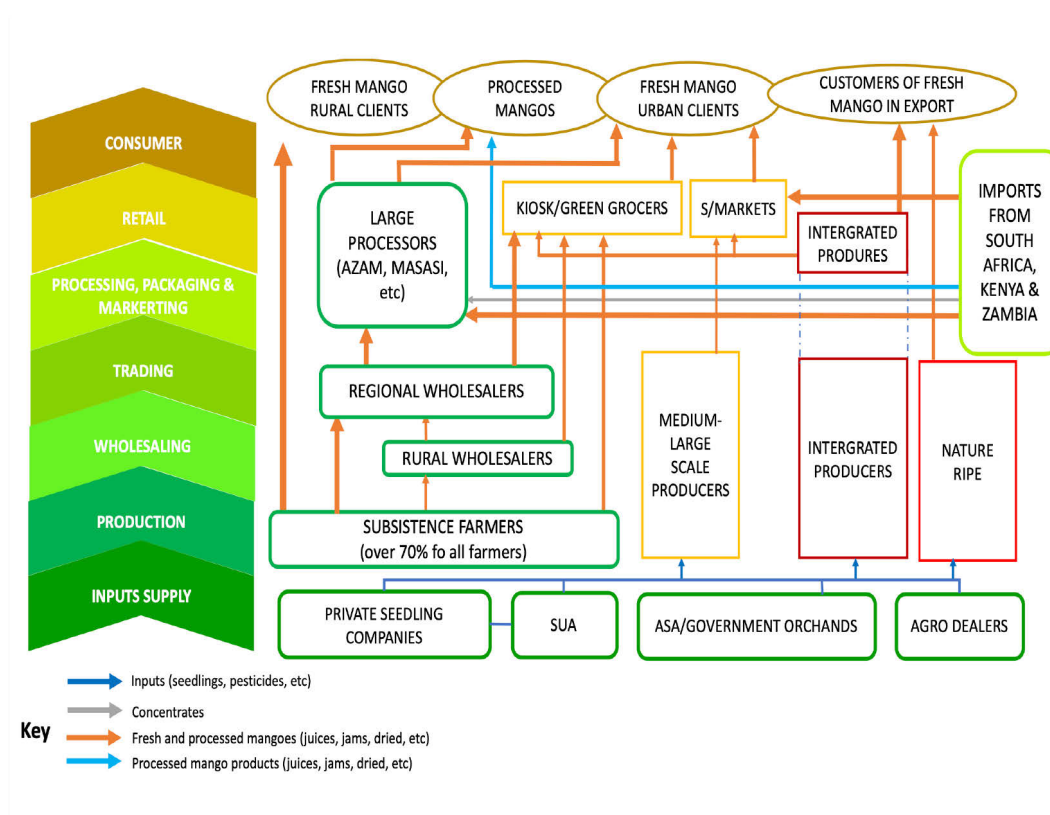
**Figure 4.1** AIV supply system (amaranth leaves, eggplant and spinach) in Tanzania  
Source: Adapted by authors from Abel et al. (2019).

Farmers who are engaged in cabbage production are small-scale or medium-scale producers. The supply system is more commercial in nature than AIVs.



**Figure 4.2** Cabbage supply system in Tanzania  
Source: Adapted by authors from Cugala et al. (2012).

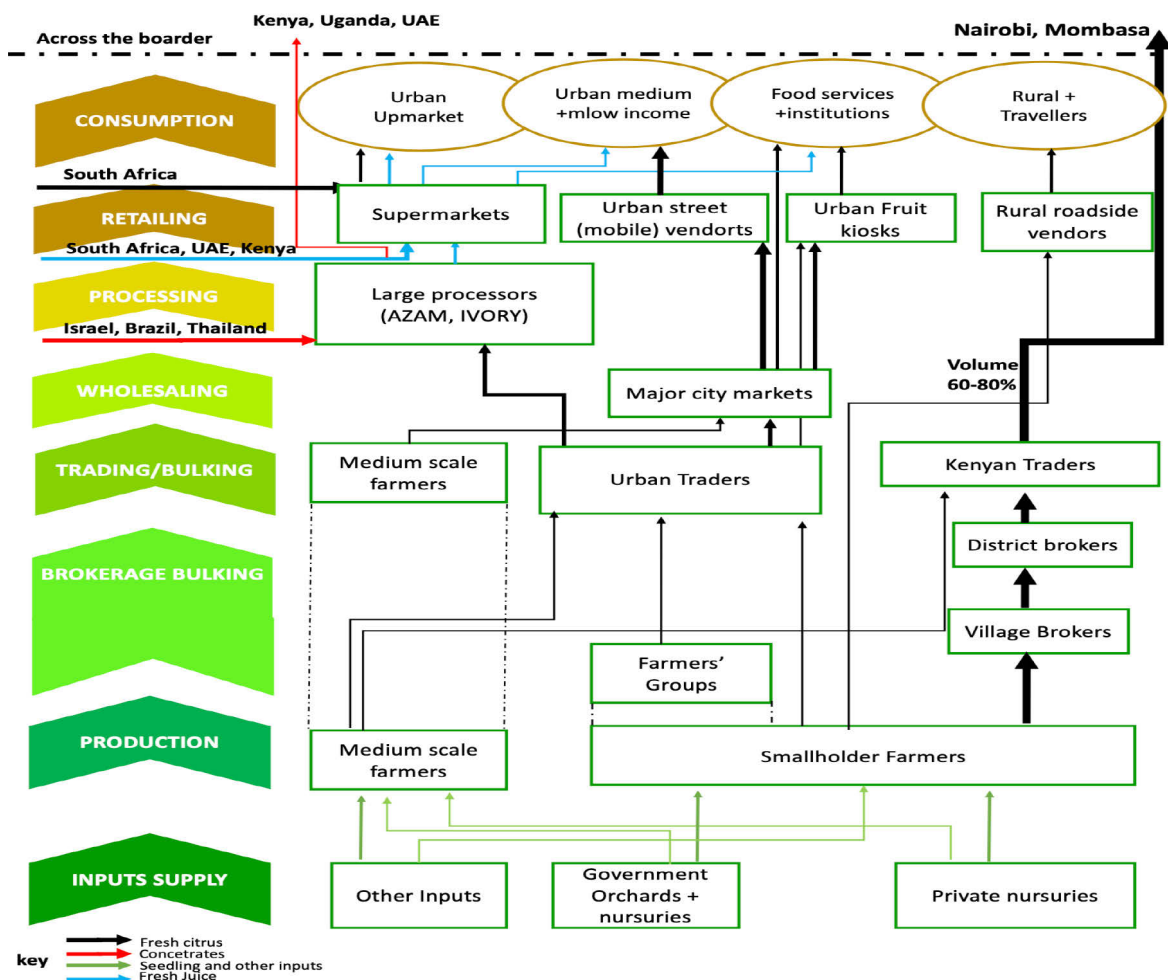
Mango is very much a seasonal crop, destined for both the domestic market and, to a limited extent, the export market. The processing industry for mangoes, although it offers opportunities, is in its infant stage. Processed products are mainly dried and pulp, but farmers do prefer to sell fresh mango on the wholesale markets, as prices are about four times higher than the amount processors pay (International Trade Centre, 2014).



**Figure 4.3** Mango supply system in Tanzania

Source: Adapted by authors from MMA (2011).

Orange is also a seasonal crop produced by both small-, medium- and large-scale producers. The orange processing industry is in its infancy (mostly producing juice), and export of processed orange products is mainly regional.



**Figure 4.4** Orange supply chain system in Tanzania

Source: Adapted by authors from MMA (2009).

### 4.1.3 Enabling environment

#### 4.1.3.1 Policies

Tanzania has in place a rich variety of policies, plans and strategies (as shown in Table 4.1), often prepared with significant donor support. However, their effective implementation remains a challenge beyond the capacity of the civil service. Implementation has been rendered difficult by a variety of factors including decentralization of implementation to Local Government Authorities (LGAs) not sufficiently equipped to meet the challenge; low wages and poor incentive structures keeping human resources from areas where they are most needed; insufficient human and financial resources relative to needs; and diversions of financial resources from their intended purposes (Davids and Maliti, 2015).

Implementation of the range of agricultural policies, strategies and commitments that fall under the Tanzania Agricultural and Food Security Investment Plan is done through a number of programs, including the Agricultural Sector Development Programme (ASDP) for the mainland and the Agricultural Sector Strategic Plan (ASSP) for Zanzibar. Several synergistic initiatives that add value to the efforts under the ASDP and the ASSP include the Southern Agriculture Growth Corridor of Tanzania (SAGCOT),<sup>9</sup> the agriculture component of the Big Results Now initiative (TZDPG, 2014), and a number of donor-funded programs (see Appendix 2). Several agricultural projects implemented by non-governmental organizations, individual farmers, civil society organizations and private firms also contribute to food and nutrition security and poverty reduction in Tanzania (Davids and Maliti, 2015).

<sup>9</sup> <https://sagcot.co.tz>

**Table 4.1** Highlights from policy documents aimed at promotion of horticulture, healthy diets and economic empowerment of women in Tanzania

Relevant policy / strategy	Policy highlights
<b>Tanzania Horticultural Development Strategy 2012-2021</b>	<ul style="list-style-type: none"> <li>The strategy envisages facilitating the development of the horticultural industry, so as to improve nutritional status, increase incomes and reduce poverty while increasing productivity and quality of produce</li> </ul>
<b>The Seed Act 2003</b>	<ul style="list-style-type: none"> <li>Condition for importation, exportation and sale of seeds</li> <li>Registration of seeds dealers (importer, exporter, producer, distributor or seller)</li> <li>Ensure the quality and grade of seed in the market through inspection and testing</li> </ul>
<b>Trade Policy 2003</b>	<ul style="list-style-type: none"> <li>Stimulate a process of trade through triggering features of development including infrastructures; encourage value-addition activities before exporting the products in the areas of agriculture, mining and tourism</li> <li>Stimulate investment for export purpose through improved technology</li> <li>Establish and maintain business relationships to regional and international trading to increase accesses to market</li> <li>Consolidate the financial sector and encourage private sector to invest in specialized banking institutions targeting agriculture and industry</li> </ul>
<b>National Agriculture Policy 2013</b>	<ul style="list-style-type: none"> <li>An effective cost sharing and cost recovery mechanism for the development of irrigation in the country shall be established</li> <li>Irrigation schemes with special focus on high value crops including vegetables, fruits and flowers shall be promoted; irrigator's organization shall be strengthened to ensure effective management of irrigation schemes and full participation in Integrated Water Resources Management</li> <li>Providing enabling environment to attract more investors to the sector</li> <li>Production and utilization of crops with high nutrient content in areas experiencing nutritional problems shall be promoted; knowledge on good nutrition shall be promoted</li> </ul>
<b>Small- and Medium-Sized Enterprise (SME) Development Policy 2003</b>	<ul style="list-style-type: none"> <li>Developing and institutionalizing public-private partnerships for SMEs sector development</li> <li>Developing strategies that will facilitate provision of different services to SMEs</li> <li>Enhance the growth of the SME sector</li> </ul>
<b>National Strategy for Gender Development 2008</b>	<ul style="list-style-type: none"> <li>Guide and involve all stakeholders to bring about gender equality and equity to help development; build capacity of ministries, departments and other institutions including LGAs on gender</li> <li>Support women in becoming economically empowered and their opportunities enhanced</li> <li>Enhance entrepreneurship and managerial skills for women and men</li> <li>Promote wide-ranged participation among women and youth farmers into farmers organizations</li> <li>Increase availability, accessibility and utilization of adequate food through promotion of provision nutritional education to communities.</li> <li>Awareness campaign on modern methods of agriculture and storage facilities</li> </ul>
<b>Agricultural Marketing Policy 2008</b>	<ul style="list-style-type: none"> <li>Stimulate value addition to products based on market demand</li> <li>Promote adherence to quality standards to ensure easy penetration of products to different markets</li> <li>Promote investments in agricultural marketing infrastructure and agro-business; develop and improve market infrastructures</li> <li>Promote access to finance to improve agricultural marketing</li> <li>Gender and youth are involved in all market-related activities, women's agricultural marketing co-operatives, associations and other groups are promoted and facilitated together with participation of youth</li> <li>Stimulate and facilitate development of agricultural marketing information</li> </ul>
<b>Agricultural Sector Development Strategy-II (ASSP II) 2015/2016-2024/2025</b>	<ul style="list-style-type: none"> <li>Improve productivity and profitability through access of various services</li> <li>Strengthen institutions to provide quality services and build business relationship among the stakeholders</li> <li>Improve rural infrastructure to be able to access markets; the government is in the process of establishing international markets at Segera in Tanga region for horticulture products</li> <li>Create conducive environment through policy to enhance inclusiveness in the sector</li> <li>To promote the efficient and inclusive use of water for irrigation, livestock and fisheries: <ul style="list-style-type: none"> <li>Promote increased export of fish and horticulture</li> <li>Cropping intensity for irrigated crops (horticulture)</li> </ul> </li> </ul>



Relevant policy / strategy	Policy highlights
<b>Agricultural Sector Development Programme Phase II (ASDP II) 2016</b>	<ul style="list-style-type: none"> <li>• Transform the agricultural sector in productivity commercialization and increase smallholder farmers' income for livelihood improvement, food security and nutrition</li> <li>• The expansion of irrigated agriculture aimed at expanding an opportunity for crop intensification, one of which could be diversification into high value crops, such as horticulture</li> <li>• Horticulture is priority sector for Northern and Southern Highlands Zones</li> <li>• Strategies under Component 3 of ASDP II aim to reduce post-harvest loss and expand value addition of horticulture products through enhancing: <ul style="list-style-type: none"> <li>◦ Cold chain infrastructures and marketing</li> <li>◦ Partnerships with private sector involved in transformation &amp; marketing</li> <li>◦ Awareness of standards and compliance control</li> <li>◦ Access to markets of horticulture products, including increased export</li> </ul> </li> </ul>
<b>National Microfinance Policy 2017</b>	<ul style="list-style-type: none"> <li>• Promote financial inclusion in the financial sector; encourage usage of technology and availability of innovative financial products and services to meet the needs of low-income populations</li> <li>• Encourage mainstreaming of community financial groups into the financial system</li> <li>• Create legal regulation toward delivering quality and services to women and youth</li> <li>• Expand the range of microfinance products and services that will meet the distinct needs of disadvantaged groups, women and youth</li> <li>• Promote access of bundled services and products to women and youth with fair and affordable usage</li> </ul>
<b>National Multi-Sectoral Nutrition Action Plan (NMNAP) Strategic Plan 2016-2021</b>	<ul style="list-style-type: none"> <li>• Promote increased small-scale production and processing of quality honey, fruits and animal products to enhance nutritional outcomes at household level.</li> <li>• Improve food security, food safety and quality for enhancement of nutrition status at individual, household and community levels through diversification, post-harvest management and quality control.</li> <li>• Coordination and partnership with other different sectors, as there are multiple causes of malnutrition and collective action is needed to address this problem</li> </ul>
<b>National Post-Harvest Management Strategy (NPHMS) 2019-2029</b>	<ul style="list-style-type: none"> <li>• NPHMS 2019-2029 is a 10-year cross-sectoral document aimed at providing significant interventions that will reduce post-harvest losses and potentially offset the food deficit and achieve national food needs</li> </ul>

Source: Compiled by authors, February 2021.

## 4.2 Production

### 4.2.1 Seasonal variation influences fruit and vegetable availability, production, yields and prices

In Tanzania, in terms of the availability of the selected fruits and vegetables on the market, amaranth, cabbage, eggplant and spinach can be produced year-round. Seasonal production only applies to mango and orange (Table 4.2).

In Tanzania, there is only one harvesting season for mango, which is from November through March of the following year. The harvesting season for orange is region dependent. The main production season is between April to October, with peak production between June and August. The period from November to February is regarded as a minor production season for orange in the Tanga/Muheza region, while March to May is considered a period of fruit scarcity with a small number of farmers producing very low volumes of oranges. The Morogoro region has a shorter production season, but has the advantage of an earlier harvest, which enables farmers in this region to produce higher volumes of oranges in the very low supply period between April to May when prices are highest (Ebony Consulting International, 2003).

**Table 4.2** Seasonality chart for selected fruits and vegetables

	Region	Jan	Feb	Mar	Apr	May	June	Jul	Aug	Sep	Oct	Nov	Dec
Amaranth	Country wide	X	X	X	X	X	X	X	X	X	X	X	X
Eggplant	Country wide	X	X	X	X	X	X	X	X	X	X	X	X
Spinach	Country wide	X	X	X	X	X	X	X	X	X	X	X	X
Cabbage	Country wide	X	X	X	X	X	X	X	X	X	X	X	X
Mango	Country wide	X	X	X	-	-	-	-	-	-	-	X	X
Orange	Pwani/Kilwa/Rufiji	-	-	-	-	X	X	X	X	-	-	-	-
	Tanga/Muheza	-	-	-	X	X	X	X	X	X	X	-	-
	Morogoro/Matombo	-	-	-	X	X	-	-	-	-	-	-	-
	Pwani/Kisarawe	-	-	-	-	X	X	X	X	-	-	-	-

Source: Compiled by authors.

Based on the KIIs conducted, it has been argued that seasonality is 'a big issue' for mango and orange, resulting in peak supply and relatively low prices for producers. Due to various factors, this situation will persist for the foreseeable future. The factors that emerged from the FGDs and KIIs include the following:

- Local markets are volatile altogether and thus there is little incentive to invest.
- Availability of (cold) storage facilities to store produce during peak supply periods and subsequent selling of produce during more off-season periods could prevent producers from receiving low prices, however requires high and long-term investments.
- Most smallholder farmers have limited means and tend to think in terms of short-term gain rather than long-term investment.
- Contract farming could be one of the potential solution for farmers to receive better prices, but is not yet common practice in Tanzania.

Vegetables such as amaranth, cabbage, eggplant and spinach are grown year-round but are preferably produced during the dry season when pest and disease pressure is low. As a result, prices for these vegetables are higher during the rainy season when supply is less. To illustrate this, it was raised during the FGD with eggplant growers that, during the most recent rainy season, a bag of eggplant (kiroba, 50kg) was sold at TSH 45,000 or US\$19.40 (farm gate price), whereas during the dry season only a price of TSH 3,000 (US\$1.29) could be obtained. Interviewed eggplant traders mentioned that, currently, a bag of high quality eggplant is sold at farm gate for TSH 20,000 (US\$8.62). Transport cost per bag to the market is about TSH 2,000 (US\$0.86). A bag of eggplant is then sold by traders in the market at a price of TSH 25,000 (US\$10.78), ultimately resulting in a profit margin of 12% for the trader. Average quality and low quality eggplant are purchased at the farm gate for TSH 15,000 (US\$6.47) and TSH 10,000 (US\$4.32) per bag, respectively.

In addition to the above challenges, for both fruits and vegetables, market access remains one of the key challenges within the horticulture sector in Tanzania. Due to the perishable nature of the produce, and the distance of most farmers from the market, traders typically dictate the price at farm gate and farmers have low bargaining power. Furthermore, currently limited investments are made in research and development of new varieties, including pest- and disease-resistant vegetable varieties, which could overcome some of the seasonality challenges farmers are facing.

#### 4.2.2 Barriers for farmers to increase production and intensification

The most important factors hampering the increase and intensification of fruit and vegetable production in Tanzania have been identified both during FGDs and from the literature, i.e., 1) lack of quality inputs (and farm implements), 2) limited access to finance, 3) limited access to adequate extension services, 4) unreliable markets and 5) inadequate storage facilities.

##### 4.2.2.1 Lack of quality inputs (and farm implements) and limited access to finance

Lack of quality inputs is the main barrier faced by smallholder farmers to increase production, and concerns both availability and affordability of those inputs. This challenge is closely related to limited access to finance. Quality inputs for increasing production are not easily affordable and accessible,

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especially in rural areas where access to inputs for fruit and vegetable farmers is limited, as they need to travel far to agro-dealer outlets to get inputs such as fertilizers and agrochemicals.

Farmers generally do not have the necessary knowledge to identify qualitative inputs and to properly use and apply inputs such as agrochemicals and fertilizers, next to a lack of capital to access these types of quality products. Registration of agrochemicals in Tanzania is done by government authorities such as the Tropical Pesticides Research Institute (TPRI), however judicious usage at farm level is a challenge as most agro-dealers do not have the required knowledge to properly advise farmers on application, or they tamper with the recommended protocols for financial gains (e.g., mixing different agrochemicals, re-packaging and poor storage). Counterfeit products are also a serious problem in Tanzania. These forms of mismanagement regarding agricultural inputs result in inefficient and ineffective use of inputs, leading to suboptimal productivity. Improper usage of agrochemicals also leads to high pesticides residues in both fruit and vegetables (see Box 4.4).

While hybrid seeds (e.g., amaranth) are available, the price is five times that of OPV and thus seed companies refrain from large-scale production of improved amaranth seed. Although improved seeds offer much higher yields and are mostly pest-, disease- and drought-resistant, most amaranth farmers still use farm-saved seed due to the high costs of hybrids, as well as low awareness amongst farmers of the benefits of hybrid seed. One amaranth farmer in Lemara explained that the major challenge for most of the amaranth farmers is working capital. The amaranth production requires high-quality seeds, fertilizer and reliable irrigation facilities to get quality yields, for which there is high demand in the market. Currently, and especially for fruit and vegetable production, farmers rely solely on rain-fed agriculture (Amani, 2006; ESRF, 2010; Davids and Maliti, 2015).

Agriculture technologies such as drip irrigation, raised beds, plant-based fertilizers, crop rotation, and integrated pest management (IPM) all increase the resilience of a farmer, especially in the face of climate change, and thus contribute to improved production. However, these strategies all require financial capital. Obtaining the capital without the necessary financial literacy is a major obstacle for smallholder farmers, as banks will not invest in farmers who provide little assurance to yield returns.<sup>10</sup>

#### **4.2.2.2 Limited access to adequate and timely extension services**

Regardless of concerted interventions and initiatives made to foster agricultural information and knowledge delivery to smallholder farmers, access to these resources remains largely poor in rural Tanzania (Ndimbwa et al., 2019). Overall, agricultural knowledge and extension systems are not adequate nor up-to-date, and the quality of the services provided to farmers is generally poor. There are also not sufficient agricultural extension officers to reach all farmers, and fruit and vegetable farmers in particular, and even those available are not fruit and vegetable agronomy specialists. Farming as a business is also not fully facilitated and mainstreamed. The government, through its Ministry of Agriculture (MoA), intends to have at least one extension officer in each village; however, the current outreach of extension officers is only 33% (Ndimbwa et al., 2019), meaning that two-thirds of farmers do not have access to agricultural extension services.

Government extension officers are facing challenges to deliver their agronomic services to farmers given the variety of crops, geographic coverage and limited funding available. Consequently, donor programs are often implemented to overcome these challenges. However, this arrangement creates additional challenges, since donor-funded projects have a limited lifespan and, without proper exit strategies in place, make extension programs vulnerable to shocks and compromise the sustainability of knowledge transfer over time. As a result, guaranteeing sustainable and demand-driven provision of extension services has long been a topic of discussion in the development community (Abed et al., 2020).

Despite this general trend, there are also exceptions and examples of extension approaches which have been successful. During one of the FGDs, farmers from the Lemara area, in the Arusha region, mentioned that they have benefited from TAHA's extension services in the application of modern farming techniques for amaranth, spinach, and tomatoes, as well as dealing with marketing issues.

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<sup>10</sup> <https://www.csis.org/analysis/bank-plate-risky-business-fruits-and-vegetables-tanzania>

#### 4.2.2.3 Unreliable markets and inadequate storage facilities

Fruit and vegetable markets in Tanzania are mainly informal, volatile and thus unreliable. The local and regional market demand for fruits and vegetables fluctuates, and the more formal export markets are not easily accessible for the majority of farmers due to the stringent requirements.

In order to sustainably increase production and intensification, farmers need to have access to market information and are in need of reliable and well-organized markets, according to FDG participants. However, these types of markets hardly exist in Tanzania. Limited contract farming is being practiced, and too much competition amongst too many small-scale farmers with supply-driven production is the norm rather than the exception. Furthermore, as farmers have limited access to market information, farmers tend to produce the same products as their neighbors, resulting in market saturation.

Intensification also means taking advantage of off-season production, but that means investments in irrigation, storage, mechanization and other agricultural technologies, for which capacity and investment opportunities are lacking amongst most farmers. For example, to overcome the problem of market saturation, (cold) storage of produce during peak supply periods and subsequent selling of produce during more off-season periods could be one of the solutions. However, these are resources to which smallholder farms do not have access, or require high and/or long-term investments.

As a consequence of the aforementioned barriers, the low productivity in agriculture, and particularly in fruit and vegetable production in Tanzania, contributes to food insecurity and poverty. However, Tanzania's food insecurity is predominantly a problem of low and fluctuating (farm) household income, not merely inadequate overall supply. Higher rural labor productivity and incomes hold the answer to improved nutritional standards (Amani, 2006).

##### Box 4.3 RIKOLTO

In addition to the above, the Belgian-based non-governmental organization RIKOLTO reports<sup>11</sup> a myriad of challenges that exist in the fruit and vegetable sector in Tanzania, of which the following challenges are commonly faced by smallholder farmers:

- Farmers do not have a strong market position because the farmers' associations are weak or non-existent. Due to a lack of organizational, business and leadership skills, the organizations are unable to provide their members with the necessary services.
- Farmers experience a lack of access to finance and other business development services. Few financial institutions finance the fruit and vegetable sector and they charge very high interest rates.
- No finance means that farmers are unable to make the necessary investments in technology. For irrigating, most farmers use an open canal system that scores very low in terms of efficient use of water (15%-25%), because they cannot invest in highly efficient systems such as sprinklers (80%) or drip kits (90%).
- Trade is dominated by brokers and local traders, with mostly opportunistic and unfair trading relationships. This leaves the smallholder farmers with a lack of market information regarding quality and quantity.
- Due to the high costs of certification and the low levels of technology, farmers are unable to adopt sustainable farming practices. This has led to a low productivity of most crops. In addition, environmental issues, such as soil erosion and water loss, remain important problems that are only exacerbated by climate change.

#### 4.2.2.4 Enabling environment

Government policies in general are supportive to the development and productivity increase of the fruit and vegetable sector, but implementation is overall found challenging or lag behind. Some of these supportive policies include the following:

- The National Agriculture Policy 2013 is very clear on provision of extension services: 'the government, in collaboration with the private and education sectors, shall strengthen human

<sup>11</sup> <https://www.rikolto.org/en/project/inclusive-horticulture-businesses-tz-southern-highlands>

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capacity development in agriculture-related activities; and the government, in collaboration with other stakeholders, shall strengthen research-training-extension-farmer linkages’.

- There are deliberate efforts to increase the number and outreach of extension services to farmers by increased budget allocation, to improve the quality of extension services and undertake bulk procurement of fertilizers under coordination of the Tanzania Fertiliser Regulatory Authorities.
- In July 2020, Tanzania’s MoA and the WVC released a memorandum of understanding to improve research and development of vegetable crops, enhance nutrition, and increase food security in the country. The partnership will work with the MoA’s 14 agricultural training colleges, 17 agricultural research institutes, and 18 specialized centers to produce quality horticultural seeds to reach farmers across the country.
- Since 2004, the government has removed taxes on inputs (zero import duty) and exemption of capital goods for investment in agriculture, including horticulture.

Currently, due to the shortage of extension officers, the government (MoA) is promoting a number of initiatives to ensure farmers’ access to extension services:

- M-Kilimo (Mobile Agriculture) is a mobile technology that aims to help farmers, breeders and fishermen to access markets through their mobile phones. It enables them to reach the buyers of their products directly, without the hassle of transporting the products to the market. Through this mobile technology, farmers, breeders and fishermen will be able to provide product information, product prices and their location to buyers so they can reach them more easily and purchase their products, while transaction costs are being reduced. In addition M-Kilimo also allows for sharing of additional information to farmers, like knowledge and information on good agricultural practices.
- In the new budget, the MoA will procure 7,000 motorbikes and tablets to ensure that all extension officers are mobile enough to reach farmers, and to complement M-Kilimo service’s delivery mechanism.
- The new horticulture strategy and action plan will have strategies to enhance good agricultural practices, productivity, farmers’ business schools and Horticulture Hubs - working with TARI in Simiyu Centre of Excellence for fruit and vegetable production - as well as developing fruit and vegetable production manuals and promoting demand-driven extension delivery approaches while linking farmers, extension and research.

#### 4.2.3 Increasing fruit and vegetable production

Farmers have four basic options to increase fruit and vegetable production:

1. Expand the cropping area
2. Increase the production frequency
3. Increase productivity and
4. Reduce on-farm losses.

##### 4.2.3.1 Expansion of the cropping area

Access to land is an important factor in agricultural production. Suitable land for agriculture has become a scarce commodity and recent agricultural production expansion has been mainly driven by land extension, as discussed in Chapter 2. However, land is becoming more and more scarce, mainly due to population pressure, land degradation and climate change. While subsistence farming dominates, the market-led economy has ushered in a flurry of large-scale commercial farming initiatives. Recently, unprecedented high demand of agricultural land from smallholders has been witnessed, as well as from potential commercial farmers (Kimaro and Hieronimo, 2014). Land allocation and management is not always formally arranged, and in rural areas land is often communal. Villagers use communal lands for various purposes such as grazing, firewood and fruit collection. Everyone who is a recognized member of a certain village does, in principle, have such rights, and exercises them to varying degrees. However, rights to village public lands are a frequent object of struggle. There are many cases of village boundary disputes, as well as disputes about whether outsiders have the same rights as indigenous inhabitants in such areas, while some people claim that they have customary rights to various pieces of land (Eaton et al., 2008). Access to land is a greater obstacle to female farmers, as compared to male farmers (Section 4.2.4). Short-cycle vegetables that are produced intensively, such as amaranth, are less constrained by access to land.

#### 4.2.3.2 Increasing production frequency

Increasing the production of vegetables through increasing the cropping frequency is only possible if farmers have access to irrigation water. Some of the production regions do have access to irrigation, and others have limited access. However, studies show that the present water governance structures and institutions are weak (J. Kabote and John, 2017). They are not able to influence water users' behavior nor to control and monitor water quality because of lacking human resources and funding. The formal and informal institutions are interlinked in their operations. However, village governments and village water committees were unable to resolve water conflicts because of being colluded by those who breached the rules. Water governance in Tanzania's small-scale irrigation schemes has become ever more challenging because of increasing market penetration and declining predictability of water availability (Namara et al., 2014). So, important efforts can be made to increase access to irrigation including increased funding, staffing and, potentially, the expansion of drip irrigation which is widely studied and shows potential for improving production while reducing water usage (Everaarts et al., 2011)

#### 4.2.3.3 Increasing crop productivity

Increasing productivity (yields) implies producing more fruits and vegetables on the same plot within the same period. To assess the potential for increasing vegetable and fruit yields in Tanzania, we looked at the yield gap; the difference between the yield potential ( $Y_p$ ) without limitations due to water or other abiotic and biotic stresses (the most relevant benchmark for irrigated systems), and actual crop yields ( $Y_a$ ). Because such models are lacking for fruits and vegetables, or are not parametrized for the prevailing conditions in Tanzania, we use global average yields based on FAOSTAT. We also use yields obtained under experimental research conditions as a benchmark for  $Y_p$ . We **Error! Reference source not found.** show the actual yields and yields obtainable according to expert information and literature for conditions in Tanzania. The relative yield gap for the fruit crops is expressed as a percentage (i.e.,  $(Y_p - Y_a) / Y_p * 100\%$ ). For the selected vegetables combined, this value is as much as 81% and for the fruits, 77%. However, increasing the crop yields depends on the availability and quality of inputs and the skills of farmers to apply these inputs efficiently and effectively. Intensification needs go hand-in-hand with making improved agricultural practices and crop finance available to fruit and vegetable smallholder farmers.

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**Table 4.3** Yield gap for selected crops (2019)

		Current yield $Y_a$	Obtainable yield $Y_p$	Yield gap
Fruit (units per ha)	Mangoes	7,000 a)	46,000 a)	85%
	Oranges	79,040 a)	250,000 b)	68%
Vegetables (t per ha)	Spinach	3.7 c)	45.00 d)	92%
	Eggplant	5.4 c)	25.00 d)	78%
	Amaranth	No data	No data	
	Cabbage	8.1 c)	30.00 d)	73%

Source: a) FGD; b) IZAMUHAYE (2008); c) Everaarts et al (2017); d) expert information.

#### 4.2.3.4 Reduce on-farm losses

The participants in the FGDs indicated that farm losses are limited compared to the losses further upstream. The harvest season of fruits and vegetables results in a peak period of supply, associated with low prices. This means that farmers are often unwilling to harvest and transport their produce to the markets, due to unfavorable prices. According to the response from the FGDs and interviews conducted, and in agreement with literatures, losses in fruits, especially oranges, mostly occur due to poor harvesting methods, storage and other poor handling facilities along the supply chain to be discussed in Section 4.4.2.

#### 4.2.4 Barriers for female farmers vs. male farmers

The existence of specific barriers for female farmers in fruit and vegetable production and intensification was discussed and acknowledged during the FGDs. Women have multiple domestic tasks and responsibilities to take care of, and as such time limitations are widely identified as a major

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constraint for women's increased engagement in fruit and vegetable production, agribusiness and income growth (Leavens and Anderson, 2011). They often run small retail agribusinesses and the little income they get from fruit and vegetable production is typically used for the purpose of purchasing food items for home consumption and other household needs. Little income or profit is left for re-investment in farming. Gender-specific barriers include:

- Post-harvest management technologies and infrastructure are expensive and most female fruit and vegetable farmers do not have the financial means to invest in these technologies. Limited land ownership among women curtails their ability to rent and, or purchase equipment from available credit facilities that require land as collateral.
- Intensified fruit and vegetable production often requires significant irrigation infrastructure, which is costly compared to the rain-fed production that women farmers generally practice. Female fruit and vegetable farmers have limited access to capital to invest in the necessary infrastructure suitable for irrigation. In addition, irrigation is often undertaken around the clock and the farmer has to allocate time to irrigate at night; men can easily do this, but women farmers cannot due to safety concerns. Hence, they need to hire additional labor to supervise irrigation at night, or forfeit the intensification opportunity altogether.
- Women's access to land is socio-culturally limited, as men both inherit and own land in their households. This lack of ownership and access to land is a major hindrance to women's efforts to intensify the production of fruits and vegetables. Access to other factors of production, such as finance from financial service providers, is also limited for women because they do not have enough (fixed) assets that could be used as collateral for loans and other capital options.
- Women have additional household work responsibilities compared to men because they are responsible for taking care of children and undertake most of household chores before engaging in economic activities, such as production, processing or trading of fruit and vegetables. In addition, harvesting and selling at farm gate is mostly very early in the morning (to avoid post-harvest losses); but this timing interferes with critical time for young women whose cultural household roles include to take care of their children before they go to school. So, their household roles hinder them from participating in crucial value chain activities that are necessary for increased production, and thus women tend not to intensify production to the same extent as their male counterparts who have more time flexibility. Therefore, when women engage in fruit and vegetable production, processing or trading they tend to be small-scale, and in a way that aligns with their household tasks, as this realistically aligns with their time constraints. With these constraints in mind, women farmers do not often intensify production. It is, however, possible to increase women's labor productivity by enabling them to adopt labor-saving technologies on farm or by freeing up their time through the adoption of labor-saving technologies at home.
- Women have limited training in emerging agricultural know-how, as they do not attend trainings as much as men. These knowledge limitations affect their risk-taking ability with regard to embracing new technological innovations. This is further compounded by their preference toward ensuring household food security, which is a significant factor in women's preference for food crops in agribusiness as they can use them to supplement family nutrition (UN Women, UNDP, UNEP, 2015).
- Sociocultural norms and household traditions limit women's access to markets and methods of cultivation. Accessing markets may also be problematic for women, due to cultural norms and women's limited access to transport, both of which restrict their mobility. This limited market access acts as a deterrent for intensification to avoid losses, hence they produce only what they can sell locally.
- The participation of women in fruit and vegetable value chains does not necessarily translate into equitable gains from involvement (Fischer et al., 2017). Despite the hard work that women do in fruit and vegetable production, they often do not have access to nor control over the income and profits made from the produce. Women are often found at the bottom of the agriculture value chain, with limited decision-making power over agricultural receipts, while at the same time constrained with nurturing roles including caring for children, the sick and elderly, and other daily routine house chores (Davids and Maliti, 2015). This leads to limited motivation for engaging intensifying production.
- Since women tend to cultivate smaller plots, they may not have enough produce left to sell to the market after fulfilling their families' consumption needs.

Participants in FDGs added that when women are actively involved in fruit and vegetable production, processing and trading, there are also opportunities that exist in intensification. These include:

- Diversifying the diet at household level, because they are in charge of household food preparation and can decide what to put on the table from the farm.
- Improving nutritional value of the household diet (fortification, processing), although most of them expressed an interest in additional training on fortification and processing.
- Improving food security, as women are responsible for food security at their respective households, and processing fruits and vegetables during bumper harvests could make them food secure during dry/off-season.
- Vegetables have a short crop cycle. Women can get a quick return on their investment in a relatively short period of time; besides, vegetables don't require a large land size and can often be grown close to the home.
- When women intensify and get more income, it is likely their income will be used by the whole family. Conversely, if men obtain more income it is not guaranteed that the increased income will be used by the whole family.

## 4.3 Cost prices

### 4.3.1 Production costs

#### 4.3.1.1 Amaranth, cabbage and eggplant

Reliable data on the costs and benefits of production for the targeted fruits and vegetables were not easily obtained. During FDGs with vegetable farmers in Arusha, the cost of production and revenues for the targeted vegetables were discussed, the results from which are shown in Table 4.5. Although farmers also provided cost and benefit figures for spinach, these have been discarded as the calculations resulted in unrealistic profits. This also indicates that the data in Table 4.5 should be considered as indicative. Farmers mentioned that spinach is being produced on very small plots (less than 0.1 acre) as there is little demand and is not widely consumed. The high seed costs for cabbage are due to the use of hybrid varieties.

The figures do clearly show that labor accounts for the largest percentage of production costs. Amaranth is the least labor-intensive because it grows faster (about 21 days to harvest) whereas eggplant and cabbage require much more labor. An earlier study (Everaarts et al., 2017) also showed that for vegetable crops, the profit was primarily influenced by labor input (hired labor) and to a lesser extent by, for example, yield level and product price.

**Table 4.4** Estimated production costs and revenues per acre for amaranth, cabbage and eggplant

	AMARANTH LEAVES			EGGPLANT			CABBAGE		
	TSH	US\$	%	TSH	US\$	%	TSH	US\$	%
Seed	21,000	9.06	3%	20,000	8.62	1%	200,000	86.24	20%
Fertilizers	201,800	87.02	28%	198,000	85.38	13%	120,000	51.75	12%
Crop protection	60,000	25.87	8%	15,000	6.47	1%	95,000	40.97	10%
Irrigation (energy)	176,000	75.89	24%	288,000	124.19	19%	-	-	0%
Labour	271,000	116.86	37%	980,000	422.60	65%	575,000	247.95	58%
Total costs	729,800	314.70	100%	1,501,000	647.26	100%	990,000	426.91	100%
Yield (kg/acre)	900	900		7,000	7,000		12,000	12,000	
Farm gate price (per kg)	1,000	0.43		300	0.13		100	0.04	
Total income	900,000	388.10		2,100,000	905.56		1,200,000	517.46	
Net income/profit	170,200	73.39		599,000	258.30		210,000	90.56	
Cost per kg produce (per kg)	811	0.35		215	0.09		83	0.04	
Gross margin (sales – costs)/sales)	19%			29%			18%		

Source: Authors' estimations based on KIIs and FGD discussions.



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#### **4.3.1.2 Mango**

During this study, it has proved difficult to get in touch with mango farmers and bring them together for an FGDs. As such, we were not able to directly retrieve cost benefit data on mango production. However, according to a study conducted in 2011 (MMA, 2011), mango farmers who do not invest in the crop in an adequate manner fail to take advantage of the crop's potential. The study highlights that the aforementioned farmers only managed to get an average of 50 mangoes per tree (7,020 mangoes per ha after deduction of losses), and only after substantial investment during several years (up to seven), with their gross revenue per ha ascertained at TSH 1.17 million (US\$733), corresponding to a gross margin of 17%, after deduction of their direct costs of TSH 970,000 per ha (US\$418). With this scenario, the farmers will receive a return on their invest after 12 years.

The same study also provides the case for farmers who have invested substantially in mango production, i.e. about TSH 3 million per hectare (US\$1,293), which included irrigation. These farmers have managed to sell up to 46,800 mangoes per ha for over TSH 8.4 million (US\$3,600) (seventh year), resulting in a gross profit of TSH 5.4 million (US\$2,328) (equivalent to a gross margin of 64.3%) and a return on their invest after 8 years. However, for those who have made such investments but have not be able to significantly increase yields above the level of the average farmers, the investments have resulted in high negative margins, i.e., gross profit of minus TSH 1.6 million (US\$689) equivalent to a gross margin loss of 115.8%. This may be the result of a variety of factors including poor management and external climatic conditions.

#### **4.3.1.3 Orange**

Also for orange production it was difficult to retrieve reliable cost benefit data. Various studies that conducted feasibility assessments on orange production in Tanzania (Izamuhae, 2008; Tu, 2008) established the gross margin at farmer level by considering a farmer with a production of about 200,000 pieces of oranges per ha. It appears that this is a lucrative business, with gross margins of about 85% (Izamuhae, 2008). These calculations include cost for inputs, but many orange farmers in Tanzania do not apply any inputs at all, resulting in lower costs but also in less fruits per tree. In the end, the profitability of oranges depends to a large extent on the number of oranges produced per ha and per tree, and the sales price farmers receive for their oranges. It should also be noted that orange trees usually achieve their mature production only after several years, with peak yield per tree within a period range of 12-15 years. In Tanzania, most of the varieties have the first (small) harvest after three years of planting, although some other varieties start five years after planting. It therefore takes considerable time, and thus relatively long return on investments, before reaching the optimal production and to benefit from the high gross margins, which for most (smallholder) farmers is not a feasible and desirable.

Transportation costs are most significant to the traders, and the fee accounts for a large part of their cost. Although traders' margins per trip are lower than farmers margins per ha, traders are able to aggregate several trips per season and make more profit than individual farmers (Tu, 2008).

### **4.3.2 Effects of cost reduction strategies**

Farmers generally have limited to no control over the product price and cost-reduction strategies, i.e., approaches to reduce the cost price per unit produce and improve the profitability of their enterprises. Reducing the unit cost may mean that some farmers need to limit the current amount of (and use more efficiently) inputs per unit of land, such as fertilizers or pesticides. For other farmers, it may mean production intensification, i.e., increasing the amount or quality of inputs to increase crop productivity, for example, by using better quality and more productive or effective (and thus more expensive) seeds, pesticides or fertilizers. In Tanzania, where fruit and vegetable productivity is generally low, intensification should be a key strategy to reduce the cost price, i.e., increasing the amount and quality of inputs relative to the land area. In the various FGDs carried out in this study, stakeholders complained about inefficient and ineffective use of inputs. As described in Section 4.3.1, most fruit farmers in our FGDs do not use external inputs at all. Often own labor or household labor is not considered either.

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Reducing the cost per unit of land through lowering the use of inputs to a minimum is not sustainable and will not be effective, as crop yields will be extremely low. It is important to realize that cost-reduction strategies are not only about decreasing or increasing the amount or quality of inputs, but about optimization of input use for a targeted yield level. In this respect, and equally important, is *how, which* and *when* inputs are applied during the growing season, i.e., the overall crop management from field preparation, sowing and planting, nursing and harvesting of the crop. For all these operations, proper knowledge and skills of farmers are a prerequisite. For example, many agronomic decisions and knowledge are needed to decide *which* pesticide to apply for controlling a specific insect pest, the proper dose and method (the *how*), and to apply the pesticide timely under conducive weather conditions (the *when*), all in order to successfully and effectively control the prevailing pest. Only with sufficient operational information, profound knowledge and skills, which are built up over the years, can farmers achieve true cost price reductions. Proper knowledge and skills of farmers are the means to realize cost price reductions and to increase farmer profits. Based on the limited data available, it is difficult to quantify the potential effects of cost price reductions, but considering the current limited use of inputs of mediocre to low quality (i.e., farm-saved seed, outdated pesticides, etc.), relative higher yield gains are more likely than the production costs increase with more and better quality inputs (i.e. improved varieties, more selective pesticides).

## 4.4 Fruit and vegetable supply chain efficiency

### 4.4.1 Increased efficiency

Interviewed stakeholders mentioned various inefficiencies that lead to higher costs and increase the lead time of the fresh produce to reach the consumer. First and foremost, fruit and vegetables in Tanzania are grown in specific areas that are often remote from consumers. A well-organized and efficient fruit and vegetable supply chain could contribute to a better allocation of resources, with the (economic) benefits passed onto all stakeholders along the value chain. This efficiency can relate to 1) smooth operating chains resulting in low post-harvest losses with actors being well-aligned and 2) low transaction risk and associated costs. For this second point we rely heavily on the work done by Eaton et al., (2008), that studied the institutional arrangements in the Tanzanian fruit and vegetable market.

### 4.4.2 Post-harvest losses vary between crops

The National Agriculture Policy (2013) already acknowledged that, among the key challenges in the sector in Tanzania, is the high prevalence of pre- and post-harvest loss. In the literature, estimates of post-harvest loss vary widely, ranging between 10–70%, often from untraceable sources. Furthermore, many estimates link to datasets collected 30 years ago, and are fragmentary and unconsolidated (Affognon et al., 2015; Mtingele and O'Connor, 2019).

The largest magnitudes of losses occur in fruits and vegetables, due to the perishability of these commodities and the poor post-production infrastructure for handling perishable produce across Tanzania. An indication of the share of losses for this study's selected fruits and vegetables is shown in Table 4.6. The main reasons for losses are poor post-harvest handling, lack of infrastructure and over-supply during peak seasons (Affognon et al., 2015; Dome and Prusty, 2017; Kitinoja and Kader, 2015; Mtingele and O'Connor, 2019).

Fruit and vegetable trade is considered high risk and volatile, as post-harvest losses are high, especially during transport and off-loading, and wholesalers share a disproportionate amount of the risk. In an attempt to mitigate these losses, wholesalers must establish prices that account for them. The production of African eggplant in Tanzania is characterized by poor post-harvest handling practices and a short shelf-life of about three to four days. A study that quantified the economic post-harvest losses of African eggplant, amaranth and tomatoes in northern Tanzania (Mtui, 2017) showed that retailers recorded higher proportions of vegetable post-harvest losses compared to farmers and wholesalers. The post-harvest losses were significantly intensified by delays in harvesting, and pests and diseases at farm level, while delays in selling were the significant cause of vegetable post-harvest

losses at retail and wholesale levels. A lack of appropriate post-harvest storage management practices are reported to cause up to 50% of the losses of vegetable crops between harvesting and consumption (Majubwa, 2015).

In addition to peak production periods (see Section 4.2.1) that result in high post-harvest losses for fruits, risks of post-harvest losses in fruit are also high as traders have to buy in bulk and transport is required over long distances. Retailers experience most of the post-harvest losses in this sector, more than twice compared to the amount at the wholesale stage (Dome and Prusty, 2017).

A study conducted in the Mkuranga district concluded that a total of 39.7% of orange fruits produced per year are wasted (Zakaria et al., 2014), of which the following percentages were lost at each step in the value chain: 15% of orange fruits wasted during harvesting process, 18% loss during handling process, 50% of orange fruits lost at storage and 17% lost during transportation from farm to the marketplace. The study revealed that existing methods and facilities for harvesting, handling and especially storage are poor and significantly contribute to the orange losses, as well as poor transportation infrastructures. Similar, a study on mango in Morogoro recorded losses of 48–60% (Msogoya and Kimaro, 2011).

**Table 4.5** *Post-harvest losses in selected based on existing literature*

		Estimated post-harvest losses	Source
Fruit	Mangoes	Up to 60%	Msogoya and Kimaro (2011)
	Oranges	Up to 40%	Zakaria et al. (2014)
Vegetables		Up to 50%	Majubwa (2015)

A major obstacle to efforts to mitigate post-harvest loss is the lack of appropriate knowledge and data on the real magnitudes of losses along value chains, which makes it impossible to measure progress against and costs of loss reduction targets. Uncertain estimates of post-harvest loss, coupled with imprecise understanding of the points in value chains where the losses occur and the socio-economic factors for the losses, could end in policy errors and sub-optimal choices of mitigation approaches.

#### 4.4.3 Transaction risks and costs in fruit and vegetable value chains are high

There are various factors influencing transaction risks and the size of transaction costs. Here, we follow a simple approach based on Eaton et al. (2008) in which transaction costs are affected by four kinds of attributes of the transaction in question:

- Asset specificity
- Uncertainty
- The difficulty of measuring performance in fulfilling the terms of an agreed transaction
- The level of coordination.

##### 4.4.3.1 Asset specificity

Perishability is an important factor in spot markets for fruit and vegetables. Vegetables are highly perishable and once picked, they must be traded and transported within a certain timespan as product quality deteriorates rapidly. A study by Eaton et al. (2008) found that farmers avoid delays with tomatoes by picking them only after an agreement has been secured with collectors who have arrived in the village. Collectors are forced to wait up to a day before they have filled up their quota (truck) and can leave. Farmers in Tanzania also avoid potential delays by selling their produce to the first collector who offers a reasonable price. There is a trade-off between risk of not selling produce in time and obtaining a good price, because farmers do not know what price the next collector will offer and thus take a risk when they decide not to sell and wait for another collector to pay a better price (Eaton et al., 2008).

Eaton et al. (2008) beg the question why farmers and collectors do not establish an agreement to decide when the collector will pick up the produce, or establish relationships by repeated contracting. Reasons for not doing this are a combination of risk aversion by the farmer, the availability of many

collectors, high price fluctuations and a perishable product. Apparently, the advantages of being able to sell to more collectors (at different prices and at different times) outweigh the advantages of relying on one collector. Establishing a relationship with one collector through repeated transactions may also involve high costs of coordinating the timing of transactions, and failure to do so would involve high costs of unsold and spoilt produce or unfulfilled orders. However, the reverse may also be true. A producer located in a remote location may only be able to sell produce at a relatively low price.

During the FGDs, participants indicated that it would be beneficial for farmers to shift away from 'broker-led marketing system' and to establish relationships between aggregated farmers and off-takers. For example, some vegetable farmers in Lushoto established long-term relationships with selected off-takers in Dar es Salaam, such as hotels, supermarkets and wet markets.

#### **4.4.3.2 Uncertainty is high**

Due to climatic variability, fruit and vegetable farmers in Tanzania face production uncertainty and risk of crop failure, which have a direct impact on their income. Production fluctuation, in turn, causes price fluctuation, as an increase in supply causes a decrease in price, and vice versa. In the spot markets, production risks are borne mostly by the farmer (Eaton et al., 2008). Fruit and vegetable farmers in Tanzania often reduce this risk by avoiding to rely on one (high income) cash crop, choosing instead to diversify their range of crops, including subsistence crops. This means that they will only be able to offer small amounts on the market and are not able to specialize, which increases their transaction costs in the market where different traders buy different crops.

#### **4.4.3.3 Performance measurement is poor**

Spot markets leave room for opportunistic behavior of market participants, especially in the form of incomplete or distorted disclosure of information. The study by Eaton et al. (2008) gives various examples:

- In transactions with fruits and vegetables in spot markets there does not seem to be a problem of performance measurement with respect to production. Collectors have no interest in the way the fruits and vegetables are produced, and are merely interested in the final product. When performance measurement does become an issue, for instance because consumers demand pesticide-free products, a spot market arrangement would no longer suffice as the pesticide content of fruit and vegetables cannot be determined by the end product alone (without expensive testing). This would give rise to asymmetric information problems and possible opportunistic behavior, requiring a different institutional arrangement, as without the appropriate institutional arrangement, it remains difficult to certify whether these products have really been grown organically (Eaton et al., 2008).
- The current packaging methods of fruits and vegetables give room to hide produce of inferior quality. In Arusha, for instance, vegetables are sold per bucket on the markets and some buyers complain that the bottom of the buckets were filled with paper, instead of fruit or vegetables (Eaton et al., 2008). Thus, the information asymmetry is not between the farmer and collector, but between the collector and subsequent buyer (wholesaler, retailer, etc.).
- Quality can be easily assessed by appearance, so there are no agreed and standardized quality grades, leaving much room for negotiation between farmers and traders, and between traders (e.g. collectors and wholesalers).

#### **4.4.3.4 Coordination is lacking**

Coordination in fruit and vegetable food supply systems is challenging due to the following reasons:

- **Complex food supply systems.** In Tanzania it is common practice to source various types and quantities of fruits and vegetables from different, remote locations to different markets. Traders operating in the main markets usually employ or contract other actors to contact farmers, gather information on supply, quality and prices, purchase, inspect, pack and transport goods. This can result in a long supply chain involving many middlemen and other actors such as transporters, farmer-collectors and packers. This type of food supply configuration requires complex coordination.
- **Lack of fair sorting, grading and weighing.** An important example is the lack of standardized weights and measures which effectively reduce the costs of coordinating otherwise unrelated transactions by a range of actors. Produce in spot markets is not weighed and paid by kilogram, but by crate or bag (of standard size but they are usually topped up to 150%, a system called *rumbesa* in Tanzania), and locally used measures such as tins, debe and kosovo can vary in weight. Collectors

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in Tanzania seem to have the advantage over farmers in this, and have demanded increasingly higher top-ups from farmers, while the price of a bag has not increased accordingly. However, collectors also favor bigger bags, since the tax is paid per bag to local governments. Also, the more produce that can be transported in fewer bags reduces the costs of transportation. Conversely, the bargaining over weight and measures increases transaction costs.

- **Weak institutional environment.** Tanzania has a weak institutional environment, particularly their legal frameworks, which leads to difficulties in enforcing contracts, and rent-seeking behavior in the sector. All these factors consume resources and inhibit economic and technological development, which hinders access to markets and market development. This will lead to high transaction costs and risks. Tanzania only ranks in the 141<sup>st</sup> position globally for business indicators (out of 190 countries). For enforcing contracts, it is ranked 71<sup>st</sup> (World Bank, 2020). Both indicators imply a poor business environment.
- **Low degree of association and organization within and among Tanzanian fruit and vegetable farmers.** Farmers have had negative experiences with cooperatives in the past, which has made them skeptical about joining them now. This lack of trust in the cooperative movement can be seen as an informal institutional constraint (Eaton et al., 2008). Furthermore, it is not yet easy to formalize producer organizations in Tanzania, which can be considered as a formal institutional constraint (Eaton et al., 2008). These two reasons may have contributed to the fact that there are only a few well-functioning producers' organizations in Tanzania, which are typically those that have been established by farmers themselves. Examples do exist of farmers working together in clusters (e.g., aggregate women farmers) who can organize and agree on a planting calendar in order to ensure consistent supply to the market (to avoid over supply and shortages) especially for vegetables that are not seasonal. So, this implies that there are emerging shared interests or collaborations among some actors, especially those targeting institutional markets such as hotels, whereby the consumer dictates the standards.
- **Absence of collective marketing models.** Collective marketing business models with various supply chain partners (especially off-takers and farmers) need to work closely together to deliver the required products and according to standards in a timely and consistent manner. Collective marketing efforts in Tanzania often fail due to issues of distrust among actors and shared vision on the long-term benefits.

#### 4.4.4 Secured markets are not common

##### 4.4.4.1 Farmers are depending on informal markets

As highlighted before, there is a fruit and vegetable supply chain serving the urban high-income consumers through supermarkets, and a separate food supply chain serving the urban poor through corners shops. As a result, horticultural markets serving the poor in Tanzania are largely scattered, informal and disaggregated. This is despite a huge (and largely unmet) food demand in many areas of Tanzania, particularly around urban centers. The largest demand is still for cheap, highly caloric food in local markets, but higher-end niche markets in grocery stores and supermarkets are growing in urban centers. Farmers supplying these high-end markets sell their produce at premium prices.

##### 4.4.4.2 Fruit and vegetable processing is challenging

Stakeholders in the FGDs indicated that the industry of processing fruits and vegetables is still in its infancy stage and remains uncoordinated in Tanzania. For processing, many challenges are present and were listed during the FGDs. Key is the lack of proper tomato varieties suitable for processing. Also, the ongoing import of raw material from abroad (despite introduced import bans) jeopardizes the competitiveness of the domestic processing sector. Another issue raised was the volatile supply and high cost of raw materials, as processors need a constant supply of raw material at an affordable price to run a profitable business.

##### 4.4.4.3 Contract farming

In Tanzania the majority of fruit and vegetable producers, and particularly producers of AIVs, are smallholder farmers, who market their produce through the traditional and informal domestic (spot) marketing channels. Coordination is low, and market actors (aggregators, wholesalers and retailers) prefer to operate individually. Business relations are largely informal and contract farming is not

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common practice. The majority of fruits and vegetables are sold through retail outlets, and supermarkets are still emerging in Tanzania, retailing less than 5% of fresh fruits and vegetables.

The high competition that exists among smallholder farmers, with supply-driven production and limited access to market information, leads to the farmers' tendency to produce the same products at the same time, resulting in quick saturation of the market.

More secure and reliable markets could lead to improved market information for smallholder farmers, based on which they can make well-informed decisions on what to grow and when. In addition, contract farming is another option that provides a secure market for the farmers. In Tanzania, two types of contract farming can be distinguished (Eaton et al., 2008):

- First, collectors and farmers enter into **marketing contracts**, in which the collector provides the farmers with credit or inputs that are repaid when the produce is sold by the collector. Marketing contracts were observed in only a few cases. One example is in orange growing, although it appears to be rather uncommon in this sector and limited to the poorer farmers who need cash on short notice. A study on the orange sub-sector in Tanzania describes that the collector estimates on the basis of blossoms or unripe oranges on a tree, the number of oranges that will be harvested and pays the farmer 25% of the purchase price up-front, as previously described. The difference in price is a function of the risk the collector takes that not all blossoms will turn into ripe oranges, the interest rate of the up-front payment, and the fact that the collector is in a 'take it or leave it' position with respect to the farmer, who is in need of cash. Another example was a village in which farmers called contract farming the 'ufasili system' in which the farmers receive credit and inputs (e.g., seeds) from the trader. The profit is equally shared between the trader and the farmer.
- Second, a more extensive form of vertical coordination can be seen in **production contracts** which include agreements on production practices, extension services, inputs supplied by the contractor, quality and quantity of the commodity and the price. Production contracts are a more common type of contract farming in which large-scale farmers or processors enter into (formal or informal) contracts with smallholders to supply a certain product with particular quality requirements. We have observed various forms of contract farming in Tanzania, from large-scale vegetable farmers (often Europeans) who, in order to fulfil a contract with a supermarket, contract small-scale farmers to flower and seed companies (usually foreign) that use contract farming, to a large processing company that uses spot markets and brokers. Processors usually demand fewer quality requirements, but need a constant flow of produce, which may be difficult to attain in the off-season.

## 4.5 Communication between actors

### 4.5.1 Linkages between producers, traders, processors and consumers are largely informal

From both FGDs and KIIs, it became clear that connections between producers, traders, processors and consumers in the fruit and vegetable sector are not formally organized by means of formal agreements (e.g., contracts) but depend on prevailing social institutions and mutual trust. The relationship between the trader and the producer(s) is especially based on trust when it comes to price-setting, quality of the product and timely deliveries. Obviously, sometimes relations sour when traders provide skewed price information in their favor, or do not uphold their side of the bargain. In these cases, producers source different traders.

Traders - usually operating as individuals - set the price depending on perceived market demand and quality of the product. For amaranth, women (sometimes in groups) take the lead in trading. They usually buy amaranth at the farm gate, on credit, at agreed-upon prices, then collect it and sell it at the market.

The definition of quality of the produce is largely determined by the consumer, who may have different preferences. That depends largely on where the produce is sold: at a street corner kiosk (known as Mama Genge), food vendors (commonly known as Mama Lishe) in urban areas, a local market, urban market, or supermarket. Regional differences in consumer preferences have also been observed. For

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example, in Arusha, the selling price of a 20kg bag of sweet eggplant varieties (WVC's DB3 and Rijk Zwaan Afrisem's Limpopo) is TSH 30,000 (US\$12.94), which is higher than the price of 20kg of bitter eggplant (Tengeru White) sold at TSH 20,000 (US\$8.63). However, in the coastal regions (Tanga, Pwani and Dar es Salaam), consumers prefer bitter eggplant and prices are reversed. Traders are well aware of these varying consumer preferences.

Traders play an important role here, as they respond to consumer preferences and impose consumer choices and quality standards on producers by sharing feedback from the market during trading. Traders and processors usually respond quickly to consumer needs based on what quality/variety is highly demanded in the market. They do that through their individual networks, which implies well-coordinated fruit and vegetable supply chains.

A few examples of quality requirements are:

- Cabbage: compact and easy-to-slice varieties are preferred
- Mangoes: for processing, low fiber varieties are preferred; availability of these varieties are limited locally, and therefore processors import mango pulp
- Oranges: for the high-end markets, seedless varieties are preferred; availability of these varieties are limited locally, and therefore retailers (supermarkets) import oranges.

The standards referred to here are based on consumer preferences, and do not reflect the formalized food safety and quality standards.

More formal ways of linking value chain actors are the activities of TAHA, which has a total of 719 members, categorized into three groups: (1) large producers, exporters and processors of horticulture-related products; (2) suppliers of agro-inputs and other service providers in the industry including, but not limited to, development projects, financial and credit providers, consultancy companies, and business development service providers; and (3) smallholder farmer groups, associations and individuals taking part in horticultural activities. While the consumer is not part of the association, the activities of TAHA are believed to be of value for strengthening the performance of the entire horticulture value chain.

RIKOLTO (Belgian development cooperation) also aims to improve and formalize horticulture stakeholder communication after their research in the sector revealed that 49% of the tested horticultural produce was highly contaminated with hazardous elements, and 69% of the green leaves were contaminated with bacteria due to application of animal manure during production and/or splashing of contaminated water in the market. This prompted the establishment of the Arusha Food Platform initiative in 2018, which aims to provide safe and healthy food. RIKOLTO created five platforms to facilitate access to quality and healthy vegetables and fruits in the region:

1. Sustainable production, which includes input suppliers' companies (Rijk Zwaan, East African Seeds, Monsanto). This platform is to look for GAP and application of inputs to produce quality products in the market.
2. Consumption platform; this includes the City council. The platform aims to create awareness amongst vendors to take charge of selling quality products to the consumers. Vendors are to wash the vegetables and fruits with clean and safe water.
3. Standards platform; this includes the Tanzania Bureau of Standards (TBS) to be able to enforce standards and quality of food in the market.
4. Infrastructure improvement platform; the platform aims to create a good working environment in the market for safety and good fruits and vegetables to be sold.
5. Generation Food; this platform is looking to stimulate entrepreneurship amongst youth with business mentalities. The program is to help youth start a business for value addition and help to provide quality food to the community.

#### 4.5.2 Information sharing

An important source of information asymmetry stems from market conditions (e.g., prices). Many farmers complain about lacking up-to-date information about prices, which puts them in a disadvantaged bargaining position. Mobile phones have the potential to reduce this information

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asymmetry greatly, but farmers in Tanzania seem not to have profited much. Even when they have a mobile phone, they have no contacts in the relevant markets to call. However, information-sharing in the sector seems to be predominantly driven by projects such as those implemented by TAHA, RIKOLTO, USAID Feed the Future project and the WVC (see Appendix 2 for more details).

(Local) government extension and information services in the sector are generally considered weak. Policy instruments are present but implementation is lacking. A recent study by Mubofu and Malekani (2020) revealed that radio, church leaders, seminars, newspapers, brochures and fliers should be intensively used to disseminate good agricultural practice information among farmers so as to raise productivity in their farms. The study suggested that there is a need to use other disseminators, such as influential people, religious leaders, political leaders, primary school teachers and pupils, to disseminate such information, in addition to repackaging agricultural research findings to be tailored to farmers' needs.

## 4.6 Diversity of supply

### 4.6.1 Introduction of new varieties has not led to increased consumption

Participants in FDGs and KIIs claim that, although limited, there are on-going efforts to breed new varieties of fruit and vegetables, including for AIVs, and some of which are intended to enhance palatability, taste and fortify nutritional value with nutrients such as iron and vitamin A. Most breeding agendas are targeting production characteristics, although also other requirements are being considered:

- Producers' demands:
  - Yield
  - Resistance to pests and diseases
  - Drought resistance
- Traders' demands:
  - Increased shelf life
  - Consistent supply (avoiding scarcity due to seasonality)
- Consumers' demands:
  - Taste (e.g. eggplant sweet versus bitter varieties)
  - Affordability

Diversification to enhance consumption of fruits and vegetables among-low income populations is initiated by different partners through promotion of AIVs like amaranth, nightshades, potato leaves, spider plant, Ethiopian Kale (*Loshuu/Figiri*), pumpkin leaves and jute mallow, (*mlenda*). These vegetables are grown nearly year-round, require limited amounts of inputs and could be produced in a small land sizes, including home gardens in urban and peri-urban areas. However, consumption of fruits and vegetables is still considered low and those who consume do so below recommended daily dietary requirements. Respondents suggested awareness raising to promote consumption, especially in rural areas.

It was noted that if yields increase, there is a likelihood that farm gate price will be reduced, i.e. as production costs are lowered, and farmers do not have storage and would wish to sell their produce as quickly as possible to avoid post-harvest losses at farm gate, even at lower prices. However, reduction in farm gate price does not guarantee reduction in retail price in the market, because this is influenced by other factors including efficiency of the supply system and number of intermediaries. In other words, fruits and vegetables are not becoming more affordable to consumers even if there is an increase in yields.

### 4.6.2 Consumption trends

A study by USAID (USAID TRADE HUB, 2013) established that consumption patterns of fruit and vegetables in East African households indicate strong consumer preferences towards other food groups, even as household level incomes rise. Consumption of fresh fruit and vegetables on a daily



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basis is still low for all income classes in Tanzania, Kenya and Uganda. Although food consumption patterns vary by country and income group, many traditional diets are based on cereals or starches, and fruits and vegetables are not priority food items. Further, relatively high prices mean that fruit and vegetables remain out of reach for food- and nutrition-insecure households - those that need them the most.

The study was confirmed by participants in the FDGs and KIIs. While the majority of consumers in Tanzania eat seasonal fruits and vegetables, generally, the consumption of fruit and vegetables has remained low, especially among the low-income populations as explained in Section 2.2.3. During off-seasons, the fruits and vegetables become expensive and most consumers refrain from buying them,. Especially fruits are consumed in lesser amounts because they are much more expensive than vegetables and considered as a snack or luxurious addition to the meal. AIVs are much cheaper and more widely available in rural areas. They have been consumed by communities for many years and are less seasonal. Nevertheless, there are areas with poor nutritional habits and a high prevalence of stunting among children such as Njombe region, despite the fact that the region is very rich in the production of fruit and vegetables, including AIVs. In addition, extensive use and misuse of agro-chemicals has made some people refrain from consuming particular fruits and vegetables, as a result of perceived high levels of pesticide residues in the produce.

## 4.7 Consumer prices of fruits and vegetables

### 4.7.1 Prices of fruits and vegetables are always higher compared to other food crops

Fruits and vegetables are highly perishable, which makes transporting, trading and retailing risky. For these value chain actors to make a profit, they must account for these risks in setting their prices, which contributes to higher prices for consumers. For other crops, like cereals, the risk of losses is reduced. Refrigerated transport and storage could mitigate these risks, but required investments are high and profit margins generally too low to recuperate such investment. In addition, price fluctuation for fruits and vegetables are quite significant, as confirmed by the MoA and Ministry of Industry and Trade (MIT).

The majority of low-income consumers in Tanzania prefer staples above more expensive fruit and vegetables. Staples constitute a large part of served meals as starch (maize, rice sorghum) followed by protein (beans, sardines). Vegetables are served in very small portions and not with every meal and fruits are considered to be a luxury and only served occasionally as a snack. In some communities, cultural practices form a barrier to consumption of fruit and vegetables.

The global review of food-based dietary guidelines (Herfort et al., 2020), provides an overview of the average costs (US\$) per person, per day, for a healthy diet based on food-based dietary guidelines. The healthy diet is defined according to the national food-based dietary guidelines and, if guidelines were not available, the guidelines of a neighboring country were used. The average cost for a healthy diet in Tanzania is US\$2.62 per day, with costs for the least costly fruits and vegetables calculated as US\$0.86, 33% of which is accounted for by fruits and vegetables. The average cost for a healthy diet globally is US\$3.77 per day, with costs for the least costly fruits and vegetables valued at US\$1.46, 39% of which is accounted for by fruits and vegetables.

**Table 4.6** Cost of fruits and vegetables and proportion of cost of a healthy diet in several countries, 2017

	Cost of healthy diet (mean across 10 guidelines)	Cost of least costly fruits and vegetables (mean across 10 guidelines)	Share of the cost of a healthy diet accounted for by fruits and vegetables
Bangladesh	3.41	1.17	34%
Burkina Faso	3.66	1.08	30%
Ethiopia	3.73	1.46	39%
India	3.27	1.26	39%
Nepal	4.13	1.72	42%
Nigeria	3.57	1.21	34%
Tanzania	2.62	0.86	33%
<b>GLOBAL</b>	<b>3.77</b>	<b>1.46</b>	<b>39%</b>

Note: These results are based on analysis of the 2017 ICP dataset to find the lowest cost foods in each country. National datasets may have additional foods that may be lower or higher cost at different times and places in the country. The proportion of the cost of a healthy diet is based on the mean cost of ten different national food-based dietary guidelines. The mean cost may differ from the median cost, which was reported in the SOFI 2020.

Source: Anna Herforth and Aishwarya Venkat, personal communication. Based on the analysis in Herfort et al. (2020).

#### 4.7.2 Price differences

Production of fruits and vegetables requires higher investments (e.g., irrigation, pest and disease control) and threaten a higher prevalence of post-harvest losses than other crops, such as cereals. As a result, prices of fruits and vegetables are relatively higher than cereals. For example wheat and barley have variable costs of per acre of only US\$150 and US\$130.<sup>12</sup> This much lower compared to the variable costs for vegetables, as presented in table 4.5.

## 4.8 Women participation in the fruit and vegetable supply chain

### 4.8.1 Examples of women in production and fruit and vegetable supply chains

KII respondents claimed that women are ready to engage in fruit and vegetable trading (primarily retailing due to limited capital and to avoid investments in storage facilities), at least if they are able to access financial support. Some women are able to have multiple stalls in different wet markets, if they have capital to purchase large consignments. There are instances in which women control the income from their fruit and vegetable trading, as they are perceived to trade for the benefit of the entire family. Husbands have acknowledged, during the FGDs, their wives' income contribution to family costs and 'have allowed them' to utilize and control income. The money obtained is partly invested through village community banks/village saving and lending groups, and is typically used for purchasing household necessities. The invested money at village community banks/village saving and lending groups is to be used for supporting the business and buying other household needs (school fees, clothes, furniture, building materials, etc.)

A few projects that are worth mentioning, which have achieved some successes for women participation in the fruit and vegetable value chain, are:

- Feed the Future - Mwami Green Veggies:<sup>13</sup> Hydroponic vegetable production enterprise in Dar es Salaam, with technical and financial support from Feed the Future (USAID)
- Feed the Future Tanzania - Mboga na Matunda:<sup>14</sup> The project increases the productivity of horticulture activities that add value to products, while integrating women and youth. Through

<sup>12</sup> Estimation based on an example in Kenya: <https://cropnuts.com/farm-cost-of-production-cereals-maize-wheat-barley/>

<sup>13</sup> <https://www.youtube.com/watch?v=ICocJ7CrbRM>

<sup>14</sup> <https://www.usaid.gov/tanzania/news/stimulating-womens-engagement-horticulture-sector>

collaboration with dozens of private sector partners, the activity stimulates women's engagement in horticulture by training them in crop production, technologies, market access, and nutrition. Currently over 50,000 individuals trained by the activity, 47% are women. Mboga na Matunda also stimulates women's involvement by training them in basic business planning and development, and how to access affordable credit and financial services.

- GBRI Business Solutions Limited:<sup>15</sup> A horticultural export business, supported by SAGCOT

TAHA has actively promoted women in the fruit and vegetable value chain and has seen them succeeding. However, their numbers are limited and women have still been less privileged in access to productive assets like land and financing despite policy emphasis on equality.

#### 4.8.2 Commercial pathways in the fruit and vegetable value chain towards women's empowerment

Fruit and vegetable agribusiness presents opportunities for women to earn income across the food value chain. While there are examples of successful women entrepreneurs in different value chains, women agri-entrepreneurs are largely running small-scale, informal agribusiness initiatives, engaging in low-value-addition activities that reap marginal returns. Similarly, they are engaged in minimal wage labor opportunities, largely in production, trade and processing. This makes women in fruit and vegetable value chains engage in income generation out of necessity and survival, rather than empowerment opportunities. They are driven into small income-generating opportunities in the value chains by a lack of alternatives. Production intensification, aggregation opportunities, scaling up and skill development provide avenues for women to earn more income. Yet, if the increased income and opportunities in agribusiness are not managed well, women can earn additional income and still not have control over it due to household gender roles. In addition, as new opportunities emerge, men position themselves to serve these new markets with those new income opportunities that were traditionally managed by women.

##### Box 4.4 Deliberate effort to engage women in the fruit and vegetable value chain and increase food safety of fruits and vegetables through a social business

Sustainable Agriculture Tanzania (SAT) is a Tanzanian NGO, promoting organic agriculture. Through their social business (SAT Holistic Group Limited) they collaborate with 3,500 organic small-scale farmers by upgrading and selling their products to the local and international market. The social business is jointly operated by small-scale farmers and the founders of SAT. While the latter own 51% of the company for security, the remaining shares are held by farmer joint ventures and investors. The members of the board include farmer representatives, and the business relies on flat hierarchies. Accordingly, decisions on what to do with profits are made on a participatory basis. The first dividends are expected in 2023 and will be partially invested in corporate responsibility projects, which are steered by farmer committees. The remaining profit flows back into the social business to drive further pioneering projects.

Since opening the first organic store in Morogoro in 2012, SAT has pioneered organic production for the local market. Due to its success, SAT now hopes to further improve the value chain for its farmers, which formed the idea of SAT Holistic Group Ltd. To scale up the approach, the social business further expanded the production of high quality organic products and brought prosperity to local farmers.

Many small-scale farmers of organic fruits and vegetables are dependent on unreliable markets, and the majority of these organic fruit and vegetable farmers are women. As a result of SAT's initiatives, female (and male) farmers of organic fruits and vegetables have access to more secure markets, resulting in women being economically empowered. At the same time, consumers have access to organic, nutritious and safe fruits and vegetables.

Source: <https://holisticfood.bio>

Beyond income generation, women's control over income is important because controlling one's income is a source of empowerment and agency, the income benefits the household, and it increases their stake in the value chain. Ultimately, it means that women have some say in how household income is used. A central component of empowerment through agribusiness income is agency, and the inclusion of women

<sup>15</sup> <https://sagcot.co.tz/index.php/gbri-driven-relentless-and-opening-up-tanzania-to-a-growing-international-export-market/>

in decision-making within the agriculture sector. Women's access and agency over resources is a precursor to agricultural intensification, and has the potential to increase food production by women and create opportunities for them to earn extra income and invest. Empowerment involves creating access to funds, technology and innovation which women farmers can use to make daily life efficient and productive, such as using electric blenders instead of hand mills. Access to funds enables women farmers to purchase farm equipment or pay for hired laborers during growing and harvesting seasons.

Contributions made by women within the household are increasingly affected by changes external to the household. For instance, rural poverty has acted as a push factor, encouraging women to seek sources of income, whereas new economic opportunities outside the household have emerged as pull factors, encouraging rural women to cross customary gender role boundaries and to participate in the economy outside the household, often in farm and off-farm production. Yet, despite recent trends in agricultural diversification, accompanied by commercialization and marketization, generating opportunities for off-farm paid work, rural women's poor educational attainment, inadequate training and social immobility have often prevented them from responding to these opportunities. Due to the labor-intensive work of women as caregivers and food consumption managers, empowering women to undertake intensification of fruits and vegetables has the potential to overburden women. Therefore, any efforts to engage women in intensified fruit and vegetable production need to be complemented with labor-reduction strategies for those engaged in the value chain. Labor-saving technologies are also instrumental in achieving gender equality and women's empowerment. The saved time through these technologies gives women more opportunities to participate in development and decision-making, with the possibility of undertaking more productive work (such as intensification of fruits and vegetables) with greater income potential.

## 4.9 Consumer participation

### 4.9.1 Relevant standards and consumer trust in such standards

In comparison to the stringent food safety and quality standards for the (high-end) export markets (e.g. GlobalGAP), consumers in Tanzania are not well-protected in the domestic market. Public quality and food safety standards do exist to an extent, but are minimally enforced, and the actors in the domestic value chain are rarely aware of such standards. Very informally, sometimes traders sets a standard (to the producer) in terms of size, shape and type of variety. Some high end supermarkets have introduced private standards, but fruits and vegetables that are retailed in wet vegetable markets, which is most common in Tanzania, are not subjected to any standards.

As a result, some Tanzanians refrain from consuming fruits and vegetables due to a lack of trust as to how they were produced, processed and stored. Consumers are also increasingly sensitive to the levels of pesticides and other residues and contaminations among retailed fruits and vegetables (Kiwango et al., 2018). Following a recent study, food safety is identified as an issue with regard to locally produced and consumed vegetables (see Box 4.5)

#### Box 4.5 Co-contamination of local vegetables with pesticide residues and pathogenic bacteria

A recent study by Kapeleka et al. (2020) revealed that locally produced and consumed vegetables contain high levels of pesticide residues, whereby continuous consumption of contaminated vegetables can lead to the accumulation of toxic substances in the body, causing long-term health effects. Organophosphorus, followed by organochlorines, pyrethroids and carbamates, was the most frequently detected pesticide in most of the samples analyzed. The concentration of pesticide residues were compared with the FAO/WHO Codex Alimentarius Commission's maximum residue limits (MRLs). A high proportion (74.2%) of vegetables contained concentrations of pesticide residues above the MRLs. Vegetables produced under smallholder horticultural production, therefore, pose high public health risks and increased risks of detrimental health effects among consumers as well as farmers, who are also primary consumers of these vegetables. The study also revealed that, apart from pesticide residues, fresh fruits and vegetables produced by smallholder farmers have been contaminated with bacterial pathogens. A considerably high proportion (63.2%) of samples tested were contaminated with at least one bacterial pathogen.

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#### 4.9.2 Policies and strategies for improving diet quality

Tanzania has policies and strategies on nutrition in place: a *Food and Nutrition Policy, 1992* to integrate a food and nutrition agenda into various sectors, essentially aimed at improving the nutritional situation of women and children; a *Tanzania Horticultural Development Strategy, 2012–2021* to facilitate the development of the horticultural industry so as to improve nutritional status; and a *National Multi-Sectoral Nutrition Action Plan (NMNAP), Strategic Plan 2016–2021* to improve food security, food safety and quality for the enhancement of nutrition status at individual, household and community levels through diversification, post-harvest management and quality control. For more details see Section 4.1.3.

Also at local government authority (LGA) level, the Department of Health is specifically dealing with nutrition promotion with a focus on expectant mothers and children under 5 years of age. Regional Commissioners and District Commissioners are supposed to set aside a budget to support nutrition initiatives for children under the age of 5. LGA Nutrition Committees have quarterly meetings to report on the NMNAP and evidence of impact on the basis of nutrition data.

Young extension officers have limited experience in crop agronomy and less so in nutrition (dietary requirements), and district-based nutrition officers have limited resources to conduct awareness campaigns regularly and cover their huge constituencies. There is also limited dissemination of what has been researched by research and development institutions, so a lot is known but the target groups are not informed.

#### 4.9.3 Policies and strategies on food security and nutrition addressing gender in place

Gender mainstreaming is a cross-cutting agenda for all ministries. For example, the MoH is responsible for developing and monitoring gender policy, regulations and action plans, while the MoA Gender Desk is tasked with implementing strategies initiated by MoH on aspects of gender in agriculture. The agriculture agenda is also handled by other ministries. Relevant policies are in place:

- The *National Agriculture Policy 2013* is very clear on supporting women in agriculture.
- Policy statement 3.4.3 (iii): Farmers shall be empowered through training on new techniques, as well as on new approaches focusing on individual women and men, to enable them to reach levels of adequate productivity and self-sustainability; women to be empowered to have women friendly technologies.
- The *Food and Nutrition Policy 1992* focuses on the elimination of malnutrition and ensuring food security. Food quality and number of meals is emphasized for vulnerable groups, i.e., children, expectant and lactating mothers, and elderly people.
- The government is currently in the process of developing the new *National Horticultural Development Strategy and Action Plan 2021–2030* as the previous strategy (2012–2021) is coming to an end. Among other things, the new strategy has put more emphasis on:
  - Scaling up nutrition because of the hidden hunger
  - Deliberate promotion of production and consumption of fruit and vegetables, spices and herbs
  - Initiatives that are inclusive and empower women, who account for 65–70% of fruit and vegetable value chain actors.

The Gender Desk in the MoA is positioned in the Directorate of Policy and Planning, and coordinates strategies for the elimination of gender-based violence in the agriculture sector, promotion of women-friendly agricultural technologies, empowerment of women to be included and have leadership positions in agricultural organizations, mainstreaming of gender in agricultural development plans, empowerment of women to own agricultural land, water rights for irrigation and access skill gaps, market information and access to finance.

Box 4.6 National Multi-Sectoral Nutrition Action Plan (NMNAP): deliberate effort to promote consumption of fruit and vegetable – reduction of malnutrition

Tanzania's NMNAP was initiated by Government of Tanzania (GoT) in 2016. The GoT found that scaling up an integrated multi-sectoral approach is an interesting strategy to promote fruit and vegetable consumption. Tanzania's NMNAP offers an opportunity for foreign aid donors to work with the GoT to build local capacity across its ministries. NMNAP is the country's main policy process, with strong political leadership at the Finance and Health Ministers level, besides the Prime Minister. It has also generated considerable funding. For the Plan's practical implementation, Multi-Sectoral Nutrition Committees at the village, ward, district and regional level were created as the main policy platforms concerning nutrition.

High levels of malnutrition in Tanzania inspired the development of NMNAP. The Action Plan aims to address the unacceptably high levels of malnutrition and translates into a single comprehensive national nutrition action plan relevant to national, regional and international commitments. The first NMNAP was implemented for the period of July 2016–June 2021; the second NMNAP is currently being developed.

Tanzania's nutrition targets for this action plan are to tackle the triple burden of malnutrition (undernutrition, overweight and micronutrient deficiencies) and to reduce stunting to 15% by 2025. Although Tanzania has made some good progress, the pace of improvement, especially for the alleviation of stunting, has been slow. New WHO-UNICEF prevalence thresholds classify a level of stunting as 'very high' when rates exceed 30%. According to this threshold, the national nutrition survey done in 2018 (URT, 2019) showed that the prevalence of stunting was 'very high' in 15 regions out of 26 (Dodoma, Tanga, Ruvuma, Iringa, Mbeya, Rukwa, Kigoma, Shinyanga, Kagera, Manyara, Njombe, Katavi, Simiyu, Geita and Songwe). The most affected regions, with a prevalence of stunting exceeding 40%, were: Ruvuma (41.0%), Iringa (47.1%), Rukwa (47.9%), Kigoma (42.3%), Njombe (53.6%) and Songwe (43.3%).

Scaling this action plan requires the following:

*1. Strengthening the capacity of the Nutrition Committees:* The Committees' activities are mostly at the level of exchanging information, and do not reach effective coordination of different stakeholders' interventions. In practice, the ambitious cascading system of Nutrition Committees lacks punch. Also, tracing nutrition-sensitive interventions in sectors other than health (e.g. agriculture, education) is difficult, which complicates public expenditure reviews. At the local level, a mechanism to track nutrition interventions is lacking.

*2. More emphasis on production and consumption of fruits and vegetables:* The NMNAP does not refer to the importance of indigenous vegetables in achieving diversified, nutritious diets, unlike in Kenya, where nutrition policies do refer explicitly to the role of indigenous crops as key nutrient providers.

Tanzania has developed an enabling environment for nutrition action through substantial policy and institutional development and innovation. This increases the chances to accelerate nutrition gains. However, stronger domestic investments, strengthened coordination at different government levels and greater political space to hold the government accountable on its nutrition commitments are needed.

Clear guidelines for gender mainstreaming in agriculture, including the fruit and vegetable sector, are missing. Absence of such guidelines reduces the chance for inclusive scaling up of women in agriculture in general, and in fruit and vegetable sectors in particular. Guidelines for gender mainstreaming in the MoA could be a good instrument to ensure that gender-responsive measures are considered in the implementation of agricultural programs, strategies and activities. For example:

- *Women empowerment and inclusiveness:* This guideline will ensure integration of gender concerns in agriculture development programs and strategies, which will not only lead to increases in productivity but also will create equal opportunity for all farmers (men and women) to participate in poverty reduction, food security, employment generation and wealth creation through agricultural value chains.
- *Enforcement of standards:* The guideline will ensure LGAs are given by-laws on how to protect fruit and vegetable farmers (majority of labor provided by women) from risks of exposure to hazardous agro-chemicals, through guided pesticide management and safe usage. The by-laws can also guide the monitoring of trading fruits and vegetables to ensure that pesticide residues in the fruits and vegetables in domestic markets are checked through rapid testing to protect consumers.
- *Access to extension services for women:* the gender mainstreaming guideline could instruct through the by-laws how to ensure women are reached in the course of disseminating extension messages and skills to farmers.

- *Access to market information*: ensuring that the by-laws explicitly show how women can access market information to enable them to make informed decisions on what to produce, and for which market.
- *Access to finance*: ensuring there are instruments that make inclusive financing options available for all women active in agricultural value chains.

Other policy options can target either 1) enabling women to raise their productivity for the crops they already grow, or 2) incentivizing them to shift into more profitable crops. Strengthening female farmer groups may allow women to not only scale up investments, but also access markets by reducing unit costs. Such interventions have a positive ripple effect on nutritional outcomes. Understanding what women want in terms of crop cultivation is also crucial, especially if they prefer growing crops that embody certain characteristics such as nutritional value for their households. Another policy intervention option is to promote non-traditional staple crops that are easier for women to engage in (UN Women, UNDP, UNEP, 2015). On paper, the policy environment seems conducive to address food security and nutrition constraints. However, respondents are generally skeptical about implementation and impact.

#### 4.9.4 Fruit and vegetable consumption motives and barriers

The major barriers to individual and household consumption of fruits and vegetables in Tanzania include affordability, lack of knowledge (including a basic misunderstanding of nutritional needs versus hunger), generational misinformation on cooking vegetables too long to cleanse them of pesticides, and taboos concerning the effects of certain vegetables on male reproductive health. (Flowers and Beaudreault, 2019; Kirk et al., 2019; USAID TRADE HUB, 2013).

Perceived high prices of fruits and vegetables (as mentioned in Section 4.7) are a barrier to regular consumption. Households that are food and nutrition insecure (or considered at-risk for being so) have an already limited capacity to purchase low-cost staple foods. Such households are often unable to source enough food for three meals per day. Even if fruit and vegetable prices were to decrease as a result of increased regional trade and increased value chain efficiency, fruits and vegetables will likely remain largely out of reach for these households.

Moreover, although diversification in the food basket (decline in staple consumption) is expected from an increase in per capita incomes, fruit and vegetable consumption will not necessarily increase with purchasing power. It is even less likely that the marginal decrease in prices of a very limited number of fruits and vegetables as a result of intra-regional trade will have any significant impact on food and nutrition security in the region. A greater understanding of consumer preferences, choices and decision-making regarding food purchases (or food production) is necessary (USAID TRADE HUB, 2013).

As fruit and vegetable consumption does not differ substantially across income groups, it can be inferred that affordability is not the only factor in under-consumption of fruits and vegetables, but also awareness of the nutritional importance of fruits and vegetables. Making fruit and vegetable more affordable is unlikely to impact food and nutrition security in Tanzania without increased awareness of their nutritional value.

In some ethnic groups, women and children consume more fruits and vegetables than men because of cultural myths (e.g., Mbaria in Maasai) that fruits and vegetables are for women and children while men should eat meat and cereals for energy. The importance of vitamins and minerals from fruits and vegetables is overlooked by the community, with a higher focus placed on satiety. There is a gradual change once women are informed about the importance of fruits and vegetables, as they can introduce fruit and vegetables into their daily meals and, because they take a lead role in deciding what to put on the dining table, they are instrumental in the effort to remove barriers. Also, fruit and vegetable retailers could play a role in motivating people to eat fruit and vegetables, and place a greater emphasis on health aspects within their marketing. People like *Mama Mboga* (Women Vegetable Retailers) do not use benefits accrued from consumption of fresh fruits and vegetables as their marketing tool and for re-investment into the business. Rather, their main marketing tool is competitive pricing of their produce. Awareness creation about their produce and its nutritional benefits for the consumers are not used to promote sales (Makorere et al., 2019).

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Gender roles may explain why men eat less fruits and vegetables than women, as men tend to consume more meals prepared out of the home, especially for lunch while at work, most of which contain few to no vegetables (Msambichaka et al., 2018). Street food vendors don't offer the recommended daily dietary allowance/portion of fruits and vegetables.

Improved availability, affordability and acceptability of fruits and vegetables will increase their consumption. Respondents of both the FGDs and KIIs raised four pointers that would leverage enhanced availability, affordability and acceptability for increased consumption:

1. If cultural barriers and ignorance could be removed, then more consumers will increase fruit and vegetable intake as part of their diet.
2. If post-harvest management could be improved along the value chains, more and better quality fruits and vegetables will reach consumers.
3. If pest management and disease control could be improved (and inspection and control stepped up), safer fruits and vegetables will reach consumers.
4. If efficiencies along the value chain (from farm to fork) could be improved, more affordable fruits and vegetables will enter the market.

Gradual improvement in these four domains are visible, and are an indication that when safe fruits and vegetables are more available for better prices, the consumption will increase:

- The health benefits of most fruits and vegetables have been promoted by health centers all over Tanzania, and more people (especially expectant and lactating mothers and children) are now consuming far greater amounts of fruits and vegetables, as evidenced in the reduction in severe acute malnutrition among children 0–59 months in four years from 0.9% to 0.4% (URT, 2018). Men and youth are still lagging behind; partly because of their lifestyle as they are busy at work all day and thus unable to find time to prepare healthy food at home.
- The outbreak of COVID-19 has increased consumption of vegetables (vitamins and minerals) to boost people's immune systems, so the pandemic has affected vegetable demand. The consumption is higher for some fruits and vegetables (citrus fruits, carrots, cucumbers, melons, etc.) with more farmers producing the same crops to flood the market. Thus, prices have decreased.
- There are cheap vegetables available in Tanzania with a high nutritional value, such as amaranth. This is due to the low cost and short cropping cycle of amaranth production. Also, as long as farmers have access to seeds and water, amaranth can be grown anywhere.



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## 5 Conclusion

### 5.1 General findings

The agriculture sector in Tanzania remains a main driver of the Tanzanian economy, contributing 29% of Tanzania's GDP and accounting for 65% of the country's total labor force. As the fastest growing subsector in Tanzania, with a growth rate that is more than double that of the overall agriculture sector, the vegetable sector has the potential to make a significant contribution to the economy, as well as to food and nutrition security.

In recent years, the volume of fruit and vegetable production in Tanzania has increased, which can largely be attributed to the expansion of the production area, as yields have remained relatively stable. Trade of fruits and vegetables in Tanzania is predominantly local, and the country maintains a fairly insignificant position in the export market. Consumption of fruits and vegetables in Tanzania is, on average, below the recommended amounts, with urban consumers consuming more fruits and vegetables than their rural counterparts.

Vegetable production in Tanzania is dominated by small-scale farming. Conversely, smallholders are less involved in production of fruits due to higher requirements in terms of investments, inputs and land, the more seasonal nature of fruit production, and relatively low local demand.

While some of the produce is taken by farmers themselves to rural village markets, collectors, wholesalers and retailers play an important role in the fruit and vegetable supply system for regional and national markets. Most collectors of vegetables buy at farm gate and sell to wholesalers in urban areas. Meanwhile, orange production is typically destined for the regional Kenyan export market. Processing of both fruits and vegetables is rare, as consumers generally prefer them fresh.

Although women in Tanzania play an essential role in the different parts of the value chain, carry out most of the production-related work and generally dominate the trading of vegetables, they have fewer business opportunities than their male counterparts. This is especially with regard to access to credit, access to land and access to knowledge. While women largely take charge of food crops, the production and business of cash and export crops in Tanzania are dominated by males, within which higher profit can be achieved.

### 5.2 Leverage points

In this section we highlight the results drawn from Chapter 4. We give an overview of the different leverage points, and will verify how the various assumptions explained in Chapter 2 relate to the Tanzanian fruit and vegetable context.

#### 5.2.1 Production

The low productivity in agriculture, and particularly in fruit and vegetable production, contributes to food insecurity and poverty in Tanzania. However, the country's food insecurity is predominantly a result of low and fluctuating household income, not just inadequate overall supply. Higher rural labor productivity and incomes hold the answer to improved nutritional standards.

The most prominent obstacles to intensifying fruit and vegetable production are a lack of quality inputs (and farm implements), limited access to finance, limited access to adequate extension services (and thus knowledge and skills), unreliable markets and inadequate storage facilities. Market access is

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still one of the main challenges for farmers, as traders in dictate the price at farm gate and farmers thus have low bargaining power.

Women face gender-specific barriers that limit their ability to intensify production. These include limited access to and control over resources, high demand on their time from household tasks that are their cultural responsibility and limited freedom to access markets. Despite this, there is an acknowledgement of the potential for increased income and nutritional benefits with increased intensification. The implications of these barriers on the consumption of fruits and vegetables include reduced food availability and nutritional diversity, in addition to reduced income that can be used to address household nutritional needs.

### 5.2.2 Cost prices

As gross margins for both vegetables and fruits are rather small, and fruit takes a substantive time to generate return on investment, a cost reduction will increase the gross margin. However, reducing the farm gate price alone will reduce farmers' income and is not a guarantee that the price for consumers will be lowered, as the traders are the dominant actor in setting prices. Therefore, cost reduction should go hand-in-hand with increasing yield by making better use of inputs, and providing access to higher quality inputs, while at the same time strengthening farmers' agronomic knowledge and skills and availability to and interpretation of crop specific information.

### 5.2.3 Supply chain efficiency

The fruit and vegetable supply chains' efficiency in Tanzania is characterized by high post-harvest losses, although clear data are not available. In order to mitigate post-harvest loss, proper knowledge, understanding and data on the real magnitudes of losses are need for informed mitigation approaches and policies.

At the same time, perishability of produce, production uncertainty, opportunistic behavior (of both farmers and traders), and an overall lack of coordination, all contribute to high transactions costs and risks in fruit and vegetable value chains. The prevailing informal markets and loosely arranged marketing agreements results high vulnerability and risks for both farmers as well as the traders. Women's vulnerability in the value chain is increased even more so because of their limited negotiation power and lesser access to information. More secure and reliable markets could lead to improved market information for smallholder farmers, based on which they can make more informed decisions on production. In addition, contract farming would be another option that would provide a secure market for farmers.

### 5.2.4 Communication

Connections between producers, traders, processors and consumers in the fruit and vegetable sector in Tanzania are mostly informal, are in general not organized by means of formal agreements (e.g., contracts), and depend mainly on prevailing social institutions and trust. Especially farmers and traders act on the basis of trust when it comes to price agreements, product quality and timely deliveries of produced. At the same time, traders fulfil an important function regarding communicating demand and requirements from the market down to the level of farms, by means of responding to and imposing consumer demands and requirements on producers. However, as all is based on trust and informal relations, information systems, e.g., for market prices, are lacking at times and results in an information asymmetry between actors, which is greater for women than for men.

### 5.2.5 Diversity of supply

There is little attention paid to research and the introduction of new varieties of vegetables, and even more so for fruit. This is connected to consumer trends as, even with increased disposable income, consumer preference does not lead to an increase in the consumption of fresh fruits and vegetables. Diversification to enhance consumption of fruits and vegetables is expected to be most successful through be promotion of AIVs. However, consumption of fruits and vegetables remains low and those

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who consume do so below recommended daily dietary requirements. Awareness raising to promote consumption, especially in rural areas, might be required to increase consumption. Furthermore, no evidence was found that reduction in farm gate price would also lead to reduced retail market prices, as these are most commonly influenced by other factors including efficiency of the supply system and number of intermediaries.

#### 5.2.6 Consumer prices

Prices of fruits and vegetables are high due to inefficient supply chains, seasonality and high production costs. Price fluctuation for fruits and vegetables is quite significant. Produced volumes of fruits and vegetables are significantly less compared to cereals and legumes, and thus fruits and vegetables have shortage supplies and are more expensive. Staple crops are therefore preferred above relatively expensive fruits and vegetables, as fruits and vegetables account for a 33% share of the cost of a healthy diet. The implication is that Tanzanians, on average, do not consume the recommended daily intake of fruit and vegetables.

#### 5.2.7 Women participation

Fruit and vegetable agribusiness presents opportunities for women to earn income across the food value chain. However, women generally engage in income generation out of necessity and survival rather than empowerment opportunities. Women have less privileges in the access to productive assets like land and finances, despite policy emphasis on equality.

#### 5.2.8 Consumer participation

For the domestic market, quality and food safety standards do exist to an extent, but are rarely enforced. Absence of clear guidelines reduces the chances for the inclusive scaling up of women in agriculture in general, and in the fruits and vegetable sectors in particular. The major barriers to individual and household consumption of fruits and vegetables in Tanzania include affordability, lack of knowledge (including a basic misunderstanding of nutritional needs versus hunger), generational misinformation on cooking vegetables too long to cleanse them of pesticides, and taboos concerning the effects of certain vegetables on male reproductive health.

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# Appendix 1 Actors interviewed during FGDs and KIIs

FGD / KII	Type of participants	Number of participants	Location
FGD 1 - Producers	Amaranth smallholder farmer (SHF)	2 male/1 female	Lemara area, Arusha Region
	Cabbage SHF	6 male/4 female	Arumeru District, Arusha region
	Eggplant SHF	6 male (youth)	Usariver Arumeru District, Arusha region
FGD 2 - Traders	Fruit and vegetable traders	2 female	Tengeru market, Arumeru District, Arusha region
FGD 3 – Services & markets	Mixed	4 male/6 female	TARI Tengeru, Arusha region
FGD 4 - Gender & nutrition	Mixed	3 male/9 female	New Dodoma Hotel, Dodoma
KII 1 – MoA (policies)	Policy Officer & Horticulturist	2 male	Ministry of Agriculture, Dodoma
KII 2 – MoA (gender)	Assistant Director of Policy	1 male	Ministry of Agriculture, Dodoma
KII 3 - WVC	Agribusiness Specialist	1 male	Arusha City
KII 4 - RIKOLTO	East Africa Regional Director	1 male	Arusha City
KII 5 - TAHA	Chief Manager (Development)	1 male	Arusha City

## The World Vegetable Centre

The World Vegetable Center (WVC; formerly known as Asian Vegetable Research and Development Centre), was founded in 1971 and is the only international institute dedicated to vegetable research and development.

Its mission is to enhance the nutritional well-being of people and raise the incomes of farmers so as to achieve healthier lives and more resilient livelihoods. In partnership with communities and national and international stakeholders, WVC works on improving key vegetables and their cultivation technologies. These improved plant materials and technologies are disseminated and adopted widely by farming households, research institutions, small and medium enterprises, and many others.

WVC is the world's leading international non-profit research and development institute committed to alleviating poverty and malnutrition in developing countries through increased production and consumption of nutritious and health-promoting vegetables. It maintains the world's largest public-sector vegetable gene bank, and has been active in Africa for more than 25 years. The center's improved cultivars, released by both the public and private sector, are planted on hundreds of thousands of hectares around the world. Its vegetable production, post-harvest and nutrition-related technologies have made major improvements in smallholder incomes and improved the consumption of vegetables, contributing to a reduction in malnutrition. Seed kits distributed to smallholder farmers and in humanitarian emergencies are one of the flagship tools of WVC.

The center's African regional program began in 1992 in Arusha, northern Tanzania. Today the WVC has professional research and development staff working across Africa on important vegetable crops such as cabbage, onion, pepper and tomato, as well as a range of African traditional vegetables, and partners with more than 40 national institutions and many international organizations. With the establishment of the Regional Center for the Dry and Humid Areas of West Africa in Mali, the center in Arusha became the Eastern and Southern Africa (ESA) Regional Center. As a sub-regional office, it implements WVC's work program in 23 countries in the region. The ESA Center holds the gene bank with the largest collection of traditional African vegetables in Africa, which also undertakes vegetable germplasm collection missions. It also undertakes breeding of improved vegetable varieties, with a focus on tomatoes in the past and traditional African vegetable presently.

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WVC ESA engages with seed companies to ensure the availability of quality AIV seeds. It provides training in seed production to small African seed companies, and the Africa Vegetable Breeding Consortium facilitated by WVC engages seed companies of all sizes to improve seed production and distribution. The WVC develops seed and crop production systems, and post-harvest technologies to profitably engage farmers in vegetable value chains. These products and activities contribute to a steady supply of nutritious and affordable vegetables. They include GAPs, IPM, trials of biological pest control methods, the adoption of protected cultivation and technologies like grafting, and the promotion of good post-harvest management. WVC ESA builds capacity among staff of national agricultural research and extension systems (NARES), non-governmental organizations, the private seed sector, farmers and communities. WVC partners with national governments and NARES, amongst others, to cooperate in the release of improved vegetable seed varieties, and in training thousands of farmers and extension workers on agribusiness development. Finally, it also has an important focus on promoting healthy diets and good nutrition through vegetables, and undertakes strengthening of the agribusiness capacities of smallholder farmers to produce safe and sufficient vegetables.

### **RIKOLTO Tanzania**

Currently RIKOLTO is working in eight countries in the world, working on rice, cocoa and horticulture. RIKOLTO is viewing horticulture in Tanzania as the key toward success to both increased nutrition and generation of decent income at household level. The organization is implementing three programs in Tanzania:

1. Arusha Food Platform, which started 2018 and is funded by Belgium Cooperation, works to create a multi-stakeholders' platform in Arusha. The platform aims to provide safe and healthy food. RIKOLTO created five platforms to facilitate access of quality and healthy vegetables and fruits in the region:
  - Sustainable production, which includes input suppliers' companies (Rijk Zwaan, East African Seeds and Monsanto). This platform is to look for GAP and application of inputs to produce quality products in the market.
  - Consumption platform, including the city council, aims to create awareness among the vendors to encourage them to take charge of selling quality products to the consumers. Vendors are to wash the vegetables and fruits with clean water.
  - Standards platform: this includes TBS to be able to enforce standards to ensure quality of food in the market.
  - Infrastructure improvement platform: established to create a good working environment in the market for safe and high quality fruits and vegetables to be sold.
  - Generation Food: this platform is looking to stimulate entrepreneurship among business-minded youth. The program is to help youth start value-addition businesses and help them provide access to quality food for their communities.
2. Food Smart Cities is linked to other cities' programs including the Arusha Food Platform.
3. Southern Highlands-Horticultural Program, is supporting production of horticultural production with the aim of improving accessibility to more nutritious food from horticulture produce. The program is working with three groups of key players:
  - Smallholder farmers who are producers of horticultural products in the regions. Farmers in these regions are the semi-commercial producers for horticultural products, but still experience high rates of malnutrition. They produce horticultural products for sale but not for consumption within the household.
  - Pregnant girls from 15-18 years old, who are school drop-outs and suffer badly from malnutrition. About 40% of these girls cannot go back to school.
  - Linkages to horticultural production and school feeding programs in the five regions. The program aims to help parents who are horticultural producers to be able to contribute horticultural products to school. Currently the contribution typically constitutes maize and beans.



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## **TAHA**

TAHA has a total of 719 members, categorized into three groups: 1) Comprehensive members (16) include large producers, exporters and processors of horticultural related products; 2) Allied members (26) include suppliers of agro-inputs and other service providers in the industry including, but not limited to, development projects, financial and credit providers, consultancy companies, and business development service providers; 3) Associate members (677) include smallholder farmer groups and associations, and individuals taking part in horticultural activities. TAHA's strength is anchored in its wide membership base, which has continually expanded across 25 regions of Tanzania mainland and Zanzibar.

TAHA operates two complementary divisions: 1) the Development Division and 2) the Commercial Division. The Development Division comprises of the Association (TAHA). It delivers demand-driven services to industry stakeholders. The division coordinates and implements all development projects and programs that address various gaps and challenges from smallholders' level to national industry issues. Through its developmental activities, TAHA provides critically needed strategic leadership to shape the industry and guide investments and contributions in the sector. TAHA works on the pillars of the Business Enabling Environment (over 50 policy issues successfully resolved with government): increasing access to markets by linking its members to markets and through market information services; and participation in trade platforms and capacity building of its members on GLOBAL GAP certification. TAHA also works on enhancing productivity and competitiveness, whereby TAHA works with about 50 extension officers/lead farmers to offer extension services, and has entered into partnerships with financial institutions to offer credit facilities to its members. TAHA's commercial division comprises of three independent subsidiary companies; TAHAFRESH Handling Ltd, GREENCERT and FreshToMarket (F2M). Commercial operations also provide financial sustainability to TAHA in addition to strengthening quality and reliability across the industry.

## Appendix 2 Description of on-going initiatives in the horticulture sector in Tanzania

Actors	Main activities
Ministry of Agriculture	<ul style="list-style-type: none"> <li>Formulating, coordinating, monitoring and evaluating the implementation of relevant policies in the agricultural sector and monitoring crop regulating institution</li> </ul>
Funding: Government of Tanzania	<ul style="list-style-type: none"> <li>Collaboration with the private sector, local government and other service providers to provide relevant technical service in research, extension, irrigation, plant protection, crop promotion, land use, mechanization, agricultural inputs, information services and cooperative development</li> </ul>
Implementing agencies: All Directorates, but more specifically, Directorate of Crop Development: Plant Health Services, Horticulture Section: Tanzania Official Seed Certification Institute, TPRI and TARI	<ul style="list-style-type: none"> <li>Undertaking crop monitoring and early warning, maintaining strategic food reserves and promoting appropriate post-harvest technologies; and</li> <li>Encouraging, undertaking and coordinating research and development and training.</li> </ul>
Project: Mboga na Matunda (2017-2022)	<ul style="list-style-type: none"> <li>Feed the Future's <i>Mboga na Matunda</i> project is a USAID-funded project implemented by Fintrac in partnership with TAHA. The project aims to make the horticulture subsector more competitive and inclusive, while improving the nutritional status of Tanzanians. The project will end June 30, 2022. Expanding improved technologies and practices that lead to increased productivity of smallholder farmers, including large numbers of women and youth, in targeted commodities</li> </ul>
Funding: USAID	<ul style="list-style-type: none"> <li>Expanding market system models able to reach large numbers of direct and indirect beneficiaries, including vulnerable populations, while increasing trade for targeted commodities</li> </ul>
Implementing agencies: Fintrac & TAHA	<ul style="list-style-type: none"> <li>Strengthening the overall capacity of the horticulture industry.</li> </ul>
Project: Building Inclusive and Competitive Horticulture Business in Tanzania's Southern Highlands (2020-2023).	<ul style="list-style-type: none"> <li>RIKOLTO is implementing a project known as Building Inclusive and Competitive Horticulture Business in Tanzania's Southern Highlands, funded by the European Union. The project works to improve the performance of Tanzania's fruit and vegetable sector, include smallholder farmers in it, and contribute to job creation and food and nutrition security in five regions in Tanzania</li> </ul>
Funding: European Union	<ul style="list-style-type: none"> <li>Building capacity of value chain actors through strengthening of their managerial skills</li> <li>Facilitating linkages to different services through improved business relationships between actors</li> </ul>
Implementing agency: RIKOLTO	<ul style="list-style-type: none"> <li>Supporting financial inclusion and literacy of women and youth</li> <li>Facilitating development of platforms to be able to air out the challenges to the government at district and regional level</li> <li>Supporting establishment of commercial high nutritious traditional vegetable seed production</li> <li>Establishing a network of community development officers that coach community leaders on the importance of high nutritious diets and set up a public campaign on food safety that will reach 1 million people</li> <li>Establishing women and youth peer groups in the farmers' organizations to address nutritious issues.</li> </ul>
TAHA	<ul style="list-style-type: none"> <li>Tanzania Horticulture Association (TAHA) addresses restrictive policy, legal and regulatory issues that affect the functioning and competitiveness of horticulture enterprises through lobbying for enabling environment with the government. TAHA spearhead the process through coordination of value chain actors</li> </ul>
Funding: TAHA members and multiple donors	<ul style="list-style-type: none"> <li>Building business relationship to increase up-taking of products in the regional markets and other markets and facilitate linkages with smallholder farmers whom mostly are members of TAHA</li> <li>TAHA addressed the quality issues which lead to standard adherence to different markets in the world and hence the products become competitive in the market, through quality services delivery including extension services</li> <li>Linkages and partnerships with financial institutions and credit providers to create</li> <li>TAHA promote climate-smart horticulture, gender and youth inclusion for environmental sustainability</li> <li>TAHA is taking a lead in the development of EAC Horticulture Strategy.</li> </ul>

Actors	Main activities
Project: Make it Grow (2020-2024)	<ul style="list-style-type: none"> <li>• TRIAS is implementing a Make it Grow program, funded by the European Union and implemented in Zanzibar from 2020-2024. TRIAS and other project partners aim at strengthening the horticultural value chain in Zanzibar</li> <li>• The program is to strengthen organization capacity, increase consumption, facilitate linkages to value chain actors and increase productivity</li> <li>• TRIAS is also implementing the project as a co-facilitator working with MVIWATA.</li> </ul>
Funding: European Union	
Implementing agency: TRIAS	
WVC	<ul style="list-style-type: none"> <li>• The WVC develops improved vegetable varieties, seed and crop production systems, and post-harvest technologies to profitably engage farmers in vegetable value chains. These products contribute to nutritious supply and affordability</li> <li>• Facilitating conservation of traditional vegetables and technology dissemination to maximize vegetable production and use</li> <li>• Supporting promotion of production of traditional vegetables in Tanzania through training and sharing of research findings</li> <li>• "Power on your plate" is a call for action: for increased investment, regional research and development programs, and policies to promote traditional vegetables at national and regional levels and fully integrate traditional vegetables into Africa's food systems (Jan 2021).</li> </ul>
Norwegian Church Aid (NCA)	<ul style="list-style-type: none"> <li>• NCA Tanzania and partners are implementing the Climate Smart Empowerment project, particularly the micro-investment in cucumber, green beans, green vegetables, strawberries and tomatoes and next level investment in poultry and fruits production</li> <li>• The project is providing agronomic services on market-oriented vegetables production demand through the Veggie Project.</li> </ul>
Project: Lishe Endelevu (2018-2022)	<ul style="list-style-type: none"> <li>• <i>Lishe Endelevu</i> program is the nutritious program. The program is to improve the nutritional status of women, children and adolescents across four regions (Dodoma, Morogoro, Iringa and Rukwa). The program is implemented with 5 organizations including Save the Children, who is serving as the project lead.</li> <li>• The program is to capacitate LGAs to implement the national multi-sectoral nutritional action plan.</li> <li>• Effecting communication between the civil society, private sector and local government basing on nutrition programs</li> <li>• Facilitating the community to access and deliver quality nutritional services at community level</li> <li>• Facilitating increase household production and consumption of nutrient-rich food</li> <li>• Facilitating equitable control over household resources and income generation for dietary diversity.</li> </ul>
Funding: USAID	
Implementing partner: Save the Children (lead)	
Southern Agricultural Growth Corridor of Tanzania (SAGCOT) (2010 – 2030)	<ul style="list-style-type: none"> <li>• Engaging smallholder farmers and ensuring environmental sustainability through their investments</li> <li>• Partnering with others to promote a harmonized approach and improve synergies within and across priority value chains</li> <li>• Maintaining engagement, communication and support for the SAGCOT Centre</li> <li>• Contributing to the resolution of policy and infrastructure constraints</li> <li>• Considering new and innovative financing mechanisms</li> <li>• Deliberate promotion of horticultural value chains especially tomatoes and avocado.</li> </ul>
Funding: multiple donors	

Source: Compiled by authors.

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Wageningen Economic Research  
P.O. Box 29703  
2502 LS The Hague  
The Netherlands  
T +31 (0)70 335 83 30  
E [communications.ssg@wur.nl](mailto:communications.ssg@wur.nl)  
[www.wur.eu/economic-research](http://www.wur.eu/economic-research)

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Wageningen Economic Research  
P.O. Box 29703  
2502 LS Den Haag  
The Netherlands  
T +31 (0)70 335 83 30  
E [communications.ssg@wur.nl](mailto:communications.ssg@wur.nl)  
[www.wur.eu/economic-research](http://www.wur.eu/economic-research)

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