



# **Sustainable food systems through diversification and indigenous vegetables**

**AN ANALYSIS OF THE ARUSHA AREA**

## **REPORT II**

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**Sustainable  
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## Acronyms

ACB	African Centre for Biodiversity
AEZ	Agroecological zone
AfroNet	African Organic Network
AGRA	Alliance for a Green Revolution in Africa
AMCO	Agricultural Marketing Cooperative Society
ASA	Agricultural Seed Agency
AU	African Union
CA	Conservation Agriculture
CAADP	Comprehensive Africa Agriculture Development Programme
CCAFS	CGIAR Research Program on Climate Change, Agriculture and Food Security
CCM	Chama Cha Mapinduzi
CGIAR	Consultative Group for International Agricultural Research
CIAT	International Center for Tropical Agriculture
COMESA	Common Market for Eastern and Southern Africa
CSA	Climate-Smart Agriculture
CSO	Civil Society Organisations
DC	District
EAC	East African Community
EAOM	East African Organic Mark
EAOPS	East African Organic Product Standards
ECDPM	European Centre for Development Policy Management
ESRF	Economic and Social Research Foundation Tanzania

FAO	Food and Agriculture Organization of the United Nations
FEWS NET	Famine Early Warning Systems Network
FGD	Focus Group Discussion
GAIN	Global Alliance for Improved Nutrition
GDP	Gross Domestic Product
HDI	Human Development Index
HLPE	High Level Panel of Experts on Food Security and Nutrition
IFAD	International Fund For Agricultural Development
IFOAM	International Federation of Organic Agriculture Movements
IFPRI	International Food Policy Research Institute
INGO	International Non-Governmental Organisation
IPCC	Intergovernmental Panel on Climate Change
IPES-Food	International Panel of Experts on Sustainable Food Systems
IPR	Intellectual Property Rights
LGA	Local Government Authority
LGRP	Local Government Reform Programs
MIUR	Ministry of Education, Universities and Research
MWEKA	College of African Wildlife Management
NAIP	National Agricultural Investment Plan
NAIVS	National Agricultural Input Voucher Scheme
NDC	Nationally Determined Contribution
NEAP	National Environmental Action Plan
NEMC	National Environment Management Council
NEPAD	New Partnership for Africa's Development
NGO	Non-Governmental Organisation
NMNAP	National Multisectoral Nutrition Action Plan
OECD	Organisation for Economic Co-operation and Development
PANITA	Partnership for Nutrition in Tanzania
PBR	Plant Breeder Rights
PEA	Political Economy Analysis
PELUM	Participatory Ecological Land Use Management Tanzania
PG-NFSCR	Parliamentary Group on Nutrition Food Security and Children's Rights
PGS	Participatory Guarantee Systems
PO-RALG	President's Office of Regional Administration and Local Authorities
QDS	Quality Declared Seed
SACCO	Savings and Credit Cooperative
SADC	Southern African Development Community
SASS	Sustainable Agrifood Systems Strategies
SAT	Sustainable Agriculture Tanzania

SDGs	Sustainable Development Goals
SFS	Sustainable Food System
SIDO	Small Industries Development Organization
SIIL	Sustainable Intensification Innovation Lab
SSA	Sub-Saharan Africa
SUA	Sokoine University of Agriculture
TADB	Tanzania Agricultural Development Bank
TAFSIP	Tanzania Agriculture and Food Security Investment Plan
TAHA	Tanzania Horticulture Association
TARI	Tanzania Agricultural Research Institute
TASTA	Tanzania Seed Traders Association
TBS	Tanzania Bureau of Standards
TCCIA	Tanzania Chamber of Commerce, Industry and Agriculture
TFNC	Tanzania Food and Nutrition Centre
TFRA	Task Force Rural Africa
TOAM	Tanzania Organic Agriculture Movement
TOSCI	Tanzania Official Seed Certification Institute
TPRI	Tropical Pesticides Research Institute
TRA	Tanzania Revenue Authority
TSh	Tanzanian Shilling
UK	United Kingdom
UNDP	United Nations Development Programme
UNICATT	Catholic University of the Sacred Heart
UNIMIB	University of Milano-Bicocca
UNIPV	University of Pavia
UNISG	University of Gastronomic Sciences
URT	United Republic of Tanzania
USAID	United States Agency for International Development
USD	United States Dollar
VLUP	Village Land Use Planning
WB	World Bank
WEF	World Economic Forum



## Executive Summary

**The unsustainability of food systems around the globe is one of the greatest current threats to human and planetary health.** Not only does it lead to malnourishment and hence poor health, but it is also the cause of soil degradation, biodiversity loss and, ultimately, contributes to climate change. Globally, the call from scientists, farmers, consumers, and governments for a 'great food transformation' towards sustainable food systems and healthy diets is getting louder. However, each food system has different characteristics and, therefore, **unique pathways towards sustainability.**

**One pathway to more sustainability** – which acts as a guiding principle for the various unique pathways – **is to support diversified agroecological systems.** The 'diversification pathway' can contribute to more competitive, environmentally sustainable, and food and nutrition secure food systems. One way to diversify is to better integrate indigenous vegetables, which are generally highly nutritious, potentially require fewer natural resources, and can lead to higher profit margins. Despite their potential, **indigenous vegetables are routinely neglected by policymakers.** There is **limited information on the factors and actors that are currently hindering the benefits of indigenous vegetables to materialise**, and how governance and policy can support indigenous vegetables in diverse contexts.

This report, a major outcome of the **Sustainable Agrifood Systems Strategies (SASS) programme** (Box 1) aims at filling this knowledge gap and presents the preliminary results of two years of **interdisciplinary research and dialogue activities in Arusha, Tanzania**, on the diversification pathway. This report describes the food system(s) of rural, peri-urban and urban areas in and around Arusha, diagnoses the drivers and constraints for better integration of indigenous vegetables, and helps to decide on pathways towards more sustainability.

**The food system is central to Arusha's social, environmental, and economic sustainability, contributing to both positive and negative outcomes.** Arusha is favoured by fertile mountain slopes and relatively constant water availability. Small and medium-sized farms produce crops and livestock for domestic, regional and international markets, while production for self-consumption, both in urban and rural contexts, is a key component of livelihoods. The larger horticulture companies provide jobs through direct employment and contract farming. Arusha also has a well-established food processing industry, with numerous medium-size companies, and an important tourist flow to several nearby natural parks and conservation areas. These favourable conditions contribute to a lower level of poverty than in the rest of Tanzania. Conversely, negative outcomes of the food system include high levels of malnourishment and declining soil fertility. Low dietary diversity, increased population pressure and gender biases threaten the sustainability of Arusha's food system. The inappropriate use of agrochemicals and low adaptation to climate change are particularly dangerous for medium to long-term sustainability. **Diversification can alleviate some of these factors and contribute to long-term sustainability in Arusha.**

**The governance of Arusha's food system is marked by fragmented and sometimes incoherent policies**, missing out on possible synergies. There have been advances towards more integrated, multi-sectoral and multi-actor nutrition approaches. But the government's rhetoric of prioritising agriculture for economic transformation is not matched by strong public investment in the sector. Also, national climate and environmental policies are in place but suffer from weak enforcement and are ill-adapted to the diversity of local contexts. **While indigenous vegetables are present in the plot, market, and on the plate, they are largely absent from policy.** Higher profitability for farmers and high consumer preference drive the supply and demand for indigenous vegetables in Arusha. Distribution relies on informal trading networks that bridge isolated farmers and urban markets contributing to economic efficiency.

However, **several factors constrain a stronger integration of indigenous vegetables in Arusha**. These factors pertain to the production, distribution, consumption and governance domains. High perishability and low processing increase the risk of losses along the chain. Extension services, policies and subsidies mainly target staples and export crops. Agrochemicals misuse is widespread while the promotion of more sustainable cropping practices is constrained by an unfavourable investment climate. Farmers' organisations are weak and the vertical linkages between farmers and traders are hampered by information asymmetries, market weaknesses, and infrastructure challenges. Prices are volatile and food safety standards compliance is low. Lack of food knowledge and low consumer awareness are major barriers to increased indigenous vegetables consumption. Some of these factors are recurring bottlenecks, such as limited shelf life and low processing, others are more systemic, such as the bias towards staple and export crops. Although the indigenous vegetables value chain is relatively short, many actors are involved or connected to it.

Our governance analysis, highlighting key actors and their interlinkages and unpacking drivers and constraints of indigenous vegetables integration, led to the **identification of several entry points for stronger integration of indigenous vegetables in Arusha**. In collaboration with local stakeholders, we charted four 'pathways for change' by describing their likely benefits, possible drawbacks or trade-offs, and key actors to be involved. These four pathways for solutions are:

1. Stronger value chain governance through a **multi-stakeholder platform**
2. **Better informed farmers' choices** by including indigenous vegetables in extension officers' curricula
3. **Improved food safety and reduced loss** along the chain
4. **Greater food knowledge** about indigenous vegetables through information campaigns.

These pathways span across the governance, production, distribution, and consumption of indigenous vegetables. For each pathway, we suggest a possible coalition of actors to champion the pathway and put forward the potential role of the SASS project.

The first pathway would bring together several actors to **facilitate stronger governance in the indigenous vegetable value chain** in a multi-stakeholder platform. They can, for example, jointly identify bottlenecks and develop shared solutions while being part of implementation and monitoring efforts. The platform can act as a conduit to design and facilitate action plans – for example, to improve food safety along the indigenous vegetable chain.

The second pathway would **strengthen extension services support for indigenous vegetables**, as part of a strategy towards more sustainable practices and increased attention to nutritious crops. Currently, indigenous vegetables are absent from the curricula of extension officers and invisible in local government statistics. Building extension officers' knowledge and sharing experiences around sustainable practices and the role of indigenous vegetables will give households greater choice in what to grow, sell and consume.

The third pathway centres on **improved food safety**, mostly threatened by the inappropriate use of agrochemicals. A food safety programme is already being debated in Arusha, but specific information on the particularities of indigenous vegetables is needed in the overall food safety plan. Taking into account the informal part of the indigenous vegetables value chain – such as informal traders' networks – when designing strategies to promote safer practices will increase effectiveness. This could be part of the multi-stakeholder platform elaborated as the first pathway.

The fourth pathway tackles **low food knowledge through information campaigns**, as nutrition advice can lead to more adequate diets, while tips about producing indigenous vegetables can increase the diversity of

self-consumption for those with access to land or garden plots. Each campaign needs to be adjusted for its specific audience and use different media platforms.

**Interdisciplinary research using a politically sensitive food system approach can help develop pathways that make trade-offs more explicit and take into account the interests and incentives of the different actors involved.** To maximise synergies, stronger food governance is necessary, preferably through a multi-stakeholder platform dedicated to indigenous vegetables. This and the other findings of the SASS project will hopefully contribute to a more sustainable food system in Arusha.

### **Box 1: Sustainable Agrifood Systems Strategies (SASS)**

The SASS programme is a multidisciplinary consortium initiative by the European Centre for Development Policy Management (ECDPM), the University of Milano-Bicocca (UNIMIB), the Catholic University of the Sacred Heart (UNICATT), the University of Pavia (UNIPV) and the University of Gastronomic Sciences (UNISG). Between 2017-20, SASS' multidisciplinary programme, funded by the Italian Ministry of Research, aims to build knowledge, policy dialogue and partnerships that contribute to more sustainable food systems at national, regional and international levels. SASS studies three locations: the Arusha Region in northern Tanzania, the areas around Iringa and Dodoma in southern and central Tanzania, and the southern Nakuru County in Kenya.

The objective of SASS is to improve the sustainability of these three food systems with a focus on the opportunities and challenges of better integrating indigenous vegetables. First, we analyse the social, economic, and environmental sustainability of the studied food systems with a particular focus on the role of indigenous vegetables. Second, SASS proposes various pathways and entry points to promote the production, distribution, processing, and consumption of indigenous vegetables. Third, strategic partnerships are sought to promote indigenous vegetables. The objective is attained in partnership with local stakeholders, such as universities, public and private sector representatives, and civil society. The outcome of SASS contributes to specific policy and investment recommendations that improve the sustainability of the studied food systems.

In Tanzania, the SASS project benefitted from close interactions with many local actors including Oikos East Africa, Sokoine University of Agriculture, Slow Food Tanzania, MWEKA and the World Vegetable Centre. In the course of the SASS programme, ECDPM visited Arusha, Dodoma and Dar es Salaam several times to carry out in-depth interviews with stakeholders and experts and discuss with local and national level policymakers. In December 2018, ECDPM, with support of Oikos East Africa and other members of the SASS consortium, organised a multi-stakeholder workshop, held at the World Vegetable Centre in Arusha. The results of the rich and insightful discussions are integrated in this report, as well as some of the preliminary findings of the research conducted by the other consortium members.

For the Kenyan case study, the findings of southern Nakuru's food system were published as Rampa, F., & Knaepen, H. (2019). *Sustainable food systems through diversification and indigenous vegetables: an analysis of southern Nakuru County*. Maastricht: European Centre for Development Policy Management. Within the framework of the SASS programme, the different consortium members published and will publish several academic papers in the fields of anthropology, biology, political science, sociology (UNIMIB), microbiology and agronomy (UNICATT), nutrition and economics (UNIPV) and ethnobiology and gastronomy (UNISG).

# 1. Introduction and objectives

## 1.1. Food system transformation through diversification

**Food systems can provide healthy diets from sustainable food production, but fail to do so at great human and ecological costs.** First, malnutrition is the leading cause of poor health globally (Swinburn et al., 2019). Undernourishment rises for the fourth year in a row (FAO et al., 2019), while no country has reversed its obesity epidemic (Zwicker et al., 2015). Second, the food systems contribute to the crossing of several 'planetary boundaries' that attempt to define a safe operating space for humanity (Springmann et al., 2018). Food systems, and particularly food production, are major drivers of climate change, land-use change and biodiversity loss, depletion of freshwater resources, and ecosystem pollution. For example, food systems emit up to 37% of anthropogenic greenhouse gas emissions (IPCC, 2019). Food in the Anthropocene represents one of the greatest health and environmental challenges of the twenty-first century. Because of these challenges, **a global transformation towards healthy diets from sustainable food systems is urgently needed** (Willett et al., 2019).

**The transformation of food systems is highly context-specific and particularly different between developed and developing countries.** Local factors that impact food systems sustainability, like consumption patterns, input use and poverty, can vary immensely, even within regions. Not only the resources and capacities to implement necessary policies or regulations differ greatly between countries, but also the political will and policy space to implement, reform, and enforce necessary policies. As such, the required transformation needs interdisciplinary research delivering context-specific programs and policies in partnership with – or owned by – local actors.

In Africa, food systems are often challenged by persistent malnourishment, demographic growth, poor livelihoods, urbanisation, dietary shifts, and climate change, to name a few. Transformation of African food systems is not only necessary to address these challenges but also crucial to achieving the Sustainable Development Goals (SDGs; FAO, 2018).

**Food systems in Tanzania face a complex web of interlinked challenges and opportunities that hinder or help to achieve economic, environmental and social sustainability.** Tanzanian diets are poor in nutrient-rich foods and dominated by staples. As a result, malnourishment, especially children malnutrition, is rampant. Agriculture is the most important sector for livelihoods, which makes Tanzanian households very vulnerable to environmental stressors. Already, climate change has an impact through flooding, droughts, and more severe environmental degradation. This environmental degradation and climate change reinforce each other to detrimental effect for vulnerable populations (Campbell et al., 2016). Given previous yield increases and projected population growth and dietary shifts, Tanzania is poised to import 75% of its cereal demand in 2050 (Makoi et al., 2017).

**The picture of Arusha's food systems shows how despite its status as a breadbasket area in Tanzania, malnourishment remains rampant in Arusha.** Furthermore, the fertile but fragile slopes of Mount Meru on which Arusha's food production depends are pressured by a growing population through intensive food production, urban encroachment, climate change, and competing land uses, such as by Arusha's national park (Istituto Oikos, 2011). These dynamics contribute to a less sustainable food system – economically, environmentally, and socially – and place Arusha's contributions to national development and food security in peril.

**A proposed transformation pathway is to support diversified agroecological systems** (IPES-Food, 2016). This ‘diversification pathway’ can contribute to more competitive, environmentally sustainable, and food and nutrition secure food systems (Dawson et al., 2018), and be instrumental to several sustainable development goals. One way to diversify is to better integrate ‘indigenous vegetables’,<sup>1</sup> which could help transform our food systems (Hunter et al., 2019). The advantages of indigenous vegetables are a generally higher nutritious profile, potential lower natural resource requirements, and a possible higher profit margin. Thus, **promoting the production, distribution, processing, and consumption of indigenous vegetables can result in healthier diets from more sustainable food systems.**

Against the background of malnutrition and environmental challenges, Arusha might especially benefit from the promotion of indigenous vegetables as they are frequently nutrient-dense, require fewer natural resources, and have higher profit margins. **The promotion and integration of indigenous vegetables likely require changes in the governance of Arusha’s food system.** At the moment, Arusha’s food governance landscape is challenged by issues such as high fragmentation, a multitude of actors, policy incoherence, inconsistent data availability due to high informality, weak government structures, and budget shortages. These governance challenges hamper interventions, and thus policy proposals need to strategically navigate this complexity to be locally relevant.

The promotion and integration of indigenous vegetables are seen as a pathway to aid in the necessary food system transformation. But **there is limited information on the roles of context for the benefits of indigenous vegetables to materialise**, and how governance and policy can support indigenous vegetables in diverse contexts. As such, this report is placed in these knowledge gaps and seeks to bridge the study of indigenous vegetables to locally relevant policy formulation through a case study in the Arusha area.

In summary, there is a rising need to transform food systems towards more sustainability. This transformation requires context-specific actions. One way to improve sustainability is to diversify the food system as it possibly provides concurrent economic, environmental, and social benefits compared to more homogeneous systems. Given the historical neglect of indigenous vegetables in research and policy, the space for improvement might be large. We study Arusha’s food system and the potential of indigenous vegetables to improve sustainability.

## 1.2. Objectives and research questions

**This report analyses the economic, social and environmental sustainability of the Arusha food system and studies the potential role of indigenous vegetables to advance sustainability.**<sup>2</sup> Additionally, we analyse Arusha’s food system governance and propose pathways to better integrate indigenous vegetables. We did this through a ‘mapping’ of Arusha’s food system, including both ‘hard’ and ‘soft’ elements, as it pertains to indigenous vegetables. We especially focused on the drivers and constraints of Arusha’s food system governance and policies in relation to indigenous vegetables.

We sought to answer the following questions:

1. How does Arusha’s food system contribute to:
  - a) Food quality, availability and access (the food system contributes to affordable, healthy, and nutritious food, regardless of its source)?
  - b) Environmental sustainability (the food system uses available natural resources efficiently and contributes to maintaining, restoring, and diversifying ecosystems)?

<sup>1</sup> See Box 3 for the definition and delimitation of indigenous vegetables.

<sup>2</sup> Meaning social, economic, and environmental sustainability.

- c) Economic sustainability (the food system encompasses efficiently organised, inclusive and diverse food supply chains that are economically viable and provide decent livelihoods)?
  - d) Social sustainability (the food system contributes to effective, equitable gender-inclusive local engagement, together with health protection, social cohesion, security, freedom of choice and identity values)?
2. Who are the main actors in Arusha's food system as it relates to indigenous vegetables?
  3. What constraints and drives the main actors to reduce, maintain, and improve the sustainability of Arusha's food system?
  4. What are potential policy entry points to stimulate the main actors to contribute more to Arusha's food system sustainability, particularly through stronger integration of indigenous vegetables?

Thus, this report depicts **Arusha's food system through the lens of indigenous vegetables, with special attention to the system's governance and actors**. Furthermore, we propose different pathways to improve the sustainability of Arusha's food system and analyse the **synergies and trade-offs of each pathway**.

The report is structured as follows: Section 2 discusses the SASS approach to sustainable food systems and indigenous vegetables by unpacking the food system concept and the methodologies employed for the mapping. Section 3 maps Arusha's food system by studying the drivers of the food system, the food system activities, and its outcomes. Section 4 analyses the food system governance dynamics by studying the policies and actors that underpin Arusha's food system. Section 5 charts several pathways to improve Arusha's sustainability through stronger integration of indigenous vegetables. Section 6 concludes this report and discusses a way forward to promote indigenous vegetables in Arusha.

## 2. Food systems, sustainability and indigenous vegetables

### 2.1. The food system approach

**The challenges of food and nutrition security, environmental sustainability and social equity are interlinked and can rarely be tackled in isolation** (IPCC, 2019; Springmann, 2018). To understand the inter-linkages of these issues with food and to act upon the resulting complexity, policy circles and research increasingly turn to the concept of food systems. In general, a food system approach refers to the embedding of food in multifaceted and multi-layered processes, linking food production, processing, distribution, and consumption, while recognising that these processes are underpinned by complex political, economic, social and ecological relationships (Dekeyser, 2019). **A food system is defined as 'All elements and activities that relate to production, processing, distribution, preparation, and consumption of food'** (Willett et al., 2019: 4). This includes the environment, people, inputs, processes, infrastructure, and institutions involved in getting food from farms to consumers' plates (IFPRI, 2016).

The food system approach describes the different elements in our food system and the relationships between them (van Berkum, Dengerink & Ruben, 2018), and requires the integration of different disciplines, including agronomy, anthropology, economics, sociology, political sciences and nutrition. A key feature in food systems is **feedback loops**, in which certain interactions reinforce or balance each other out. For example, increased agri-inputs can lead to more income, which can lead to more agri-inputs. The presence of these feedback loops means that food systems lack clear cause-effect relationships and that the outcome is uncertain. Thanks to the food systems approach, 'emergent orders' can be distinguished, which are

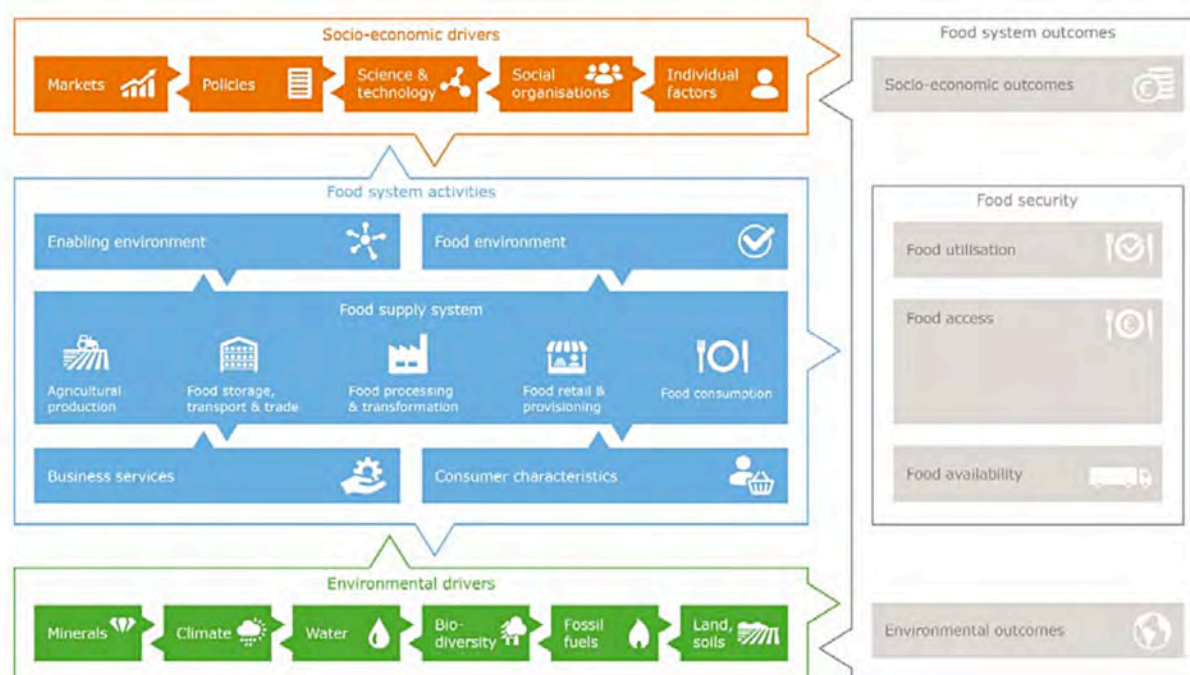
*'...systemwide phenomena that are not present in any individual part, developing without a plan or an overall decision maker dictating those results'* (Pinstrup-Andersen and Watson II, 2011: 12). *'In summary, **the food system approach provides an analytical framework that gives new insights in intervention pathways** which enrich the 'menu of opportunities' for linking key food policy instruments and for involving different stakeholders'* (Ruben, Verhagen and Plaisier, 2018: 9).

Because of the multitude of interlinkages, food systems have social, economic, and environmental dynamics. Every food system has a particular combination of these dynamics, for example, a food system can provide healthy, affordable food and decent livelihoods, but depletes local water resources and is thus environmentally unsustainable. Food systems can be ranked according to their level of sustainability over social, economic, and environmental dynamics. Then, a sustainable food system is a food system that *'...explicitly meets the needs of society, economy and environment over time, and guarantees sustainable outcomes in all these three dimensions, hence balancing their trade-offs'* (TFRA, 2019: 39). Thus, **a sustainable food system is a food system with a balance between different social, economic, and environmental outcomes and that can reproduce over time**. A food system needs to be treated as a complex system to be sustainable, lest trade-offs are overlooked (Pinstrup-Andersen and Watson II, 2011).

In this report, we build on the conceptualisation of food systems developed by van Berkum et al (2018), which is depicted in Figure 1. We include both 'hard' (e.g., biophysical) and 'soft' (e.g., social, economic, and political) elements to study linkages between, for example, the production of indigenous vegetables (hard) and social relations among middlemen (soft).

**The core of a food system is the food system activities, which link food production and food consumption through the supply chain.** The production side of the supply chain is influenced by an enabling environment, which includes transport, regulations, institutional arrangements, and agricultural research infrastructure. Furthermore, the production side is shaped by business services such as information and technical support, agricultural inputs, and financial services (van Berkum et al., 2018). As the 'enabling' and 'food environment' are lesser known concepts, we briefly introduce them here, together with the notion of 'consumer characteristics'.



**Figure 1: Connecting food system activities to drivers and outcomes**

Source: van Berkum et al., 2018

'The food supply system is embedded in an enabling environment that creates the conditions in which the system functions' (van Berkum et al., 2018: 11). **The enabling environment is defined as '...political and policy processes that build and sustain momentum for the effective implementation of actions...'** (Gillespie et al., 2013: 553). In enabling environments, governments have the political will, as well as the coordination, accountability and effective responses necessary to reach their goals (HLPE, 2017). There are broadly three factors shaping enabling environments: knowledge and evidence, politics and governance, and capacity and resources (Gillespie et al., 2013).

Contrary to the production side, food consumption is more influenced by the food environment and consumer characteristics. First, food environments '*...refers to the physical, economic, political and socio-cultural context in which consumers engage with the food system to make their decisions about acquiring, preparing and consuming food*' (HLPE, 2017: 11). **The food environments shape the constraints and influences of the larger political, social, and cultural norms on consumers' food choices.** The food environments include food availability, physical access (i.e., proximity), economic access (affordability), food labelling and promotion, and nutrient quality. Second, **consumer characteristics '...reflects the choices and decisions made by consumers, at the household or individual level, on what food to acquire, store, prepare, cook and eat, and on the allocation of food within the household'** (HLPE, 2017: 11). This encompasses purchasing power, preferences, time and knowledge.

## 2.2. Food systems governance

Food systems are governed, as its activities are not random but '*...organised, dynamic and contested, resulting from the interactions of different actors' agendas, strategies, and capacities within the food system*' (Delaney et al., 2018: 289). Policy interventions can, for example, eliminate, guide, add, enable or restrict choice; provide information; or do nothing (Willett et al., 2019). But **the complexity of food systems raises challenges for the design and implementation of integrated food policy.** The inadequate linkage between research, policymaking, and economic activity hampers sustainable and inclusive development.



Currently, policy incoherence is persistent (Carbone, 2008), and policy integration is one of the 'philosophers stones' in public policymaking (Candel & Pereira, 2017). This complexity raises the question if 'common' food policy is feasible.

However the challenges, increased complexity necessitates more coordination. **A participatory approach can bring multiple perspectives, remove protest, and help implementation** (Dekeyser and Rampa, 2019). For example, Devaux et al. (2016) show that research needs to include farmers and other key food system actors since they will be the ones driving the change. Food citizenship, food democracy and food sovereignty are some of the recent proposals to include more people in food policy (Dekeyser, 2019a; 2019b; 2018). Participation is particularly interesting given that much of our knowledge of food systems elements and dynamics - especially of the informal sections, which dominate in the developing world - is limited.

The food system approach aids in identifying feedback loops, of which positive feedback loops are particularly interesting intervention points thanks to their self-reinforcing behaviour. Furthermore, this approach helps to identify inefficiencies and constraints, compare patterns, and explore possible futures, rather than predict the future (Giller, 2013). But evidence or knowledge is only one factor to influence policymakers to reform certain policies or regulations.

**The ideas, interests and power structures matter in formulating and implementing food policy** as '*Policies that emerge from this system rarely resemble the idealised versions considered in most policy analysis*' (Pinstrup-Andersen and Watson II, 2011: 27). The ideas, interests and power structures of stakeholders and policymakers can be studied by a Political Economy Analysis (PEA). Taking a PEA can result in more realistic proposals by incorporating the perspectives of stakeholders, which improves the uptake of proposals.

ECDPM's (2016) PEA framework systematically explores how **foundational factors, institutions, sector characteristics and external factors influence and shape the roles and interests of key actors** and stakeholders. ECDPM's PEA uses five 'lenses', which are a) structural or foundational factors; b) formal and informal institutions or rules of the game; c) actors, agency or incentives; d) (sub)sector-specific technical and political characteristics; e) external or endogenous factors. This approach can analyse formal policies or proposals, such as regulations or incentives, and informal institutions or proposals, such as the enabling environment.

### Box 2: Trade-offs and synergies in food systems

In a food system, all the elements, including the socio-economic and environmental drivers, the food system activities, and the outcomes, can impact each other. For example, more food production impacts the environment but lowers food prices, which can drive more population growth, which in turn requires more food production. Identifying drivers of change within food systems and engaging with potential trade-offs and synergies is central to the food systems approach. On the one hand, interventions in the food systems inadvertently encounter trade-offs due to the linkages, complexity, and competing objectives involved. On the other hand, synergistic interventions that advance multiple goals simultaneously are possible as well.<sup>3</sup> **The food system approach ‘...offers not only a means to compare different intervention options but also a framework for systematically analysing synergies and trade-offs between various policy objectives’** (van Berkum et al., 2018: 24). Linkages of food systems with other domains mean that changes in one domain can impact other domains. These impacts, and thus the potential for synergies and trade-offs, are often context-specific. Often, researchers and policymakers describing food systems and applying food systems thinking did not place trade-offs central, and win-wins were overemphasised (Bené et al., 2019a). However, these win-wins are relatively rare and difficult to implement. **Ignoring synergies and trade-offs come at a cost**, as this can lead to policy incoherence, adverse impacts of policy in one sector to another sector, loss of opportunities for positive synergy effects, and delayed outcomes (Mainali et al., 2018). Contrary to this approach, the sustainable food system approach places trade-offs central. But acknowledging trade-offs does not overcome difficult choices. For example, in low-and middle-income countries, closing the yield gap (to combat undernourishment) and decrease the food-print simultaneously is especially challenging (Bené et al., 2019a). *‘In sum, while synergies are feasible if we capitalize on innovations, trade-offs and hard choices are more likely to characterize the near future of food systems and it is important to understand how diets (as proxy for health) and sustainability interactions play out at different scales and in different contexts’* (Bené et al., 2019a: 121).

## 2.3. Indigenous vegetables in the plot, market and on the plate

**The decreasing diversity in crop species that contribute to the world’s food supplies has been considered a potential threat to food security.** Diets worldwide became more similar in composition, which increased reliance on a small set of crops (Khoury et al., 2014). In contrast to this homogenisation is the ‘diversification pathway’, which can be described as *‘...strategy for improving diets is based on widening the range of food produced by farmers and available to consumers, under the assumption that such widening can positively influence nutrition. It has both a qualitative component—for example, the number of crops grown and consumed in a particular location—and a quantitative one—for example, the balance of consumption across crops, with reference to total dietary intake and the nutritional compositions of foods’* (Dawson et al., 2018: 2).

**A key element in the diversification pathway is the integration of more crop diversity** in farming systems through intercropping, crop rotation and the use of less uniform, locally-adapted varieties and breeds. By maximizing multiple outputs instead of maximising yields or production of a single product at farm level it reduces the risk of total crop failure or complete loss of livestock by pests, diseases, and/or extreme weather events (IPES-Food 2016). Diversification at field and household level can also positively impact nutrition by increasing home consumption of nutritious and diverse foods, as a source of income by selling produce and agricultural production, and as a source of women’s empowerment (Lang, 2010). However, higher yields do not automatically lead to higher incomes and food availability does not equate food consumption. **Achieving advantages from diversification depends on local conditions and power relations.** For example, to combat malnutrition, diversification needs to strengthen women’s decision power as more gender equality is crucial to achieving beneficial nutritional outcomes (Ruben et al., 2018).

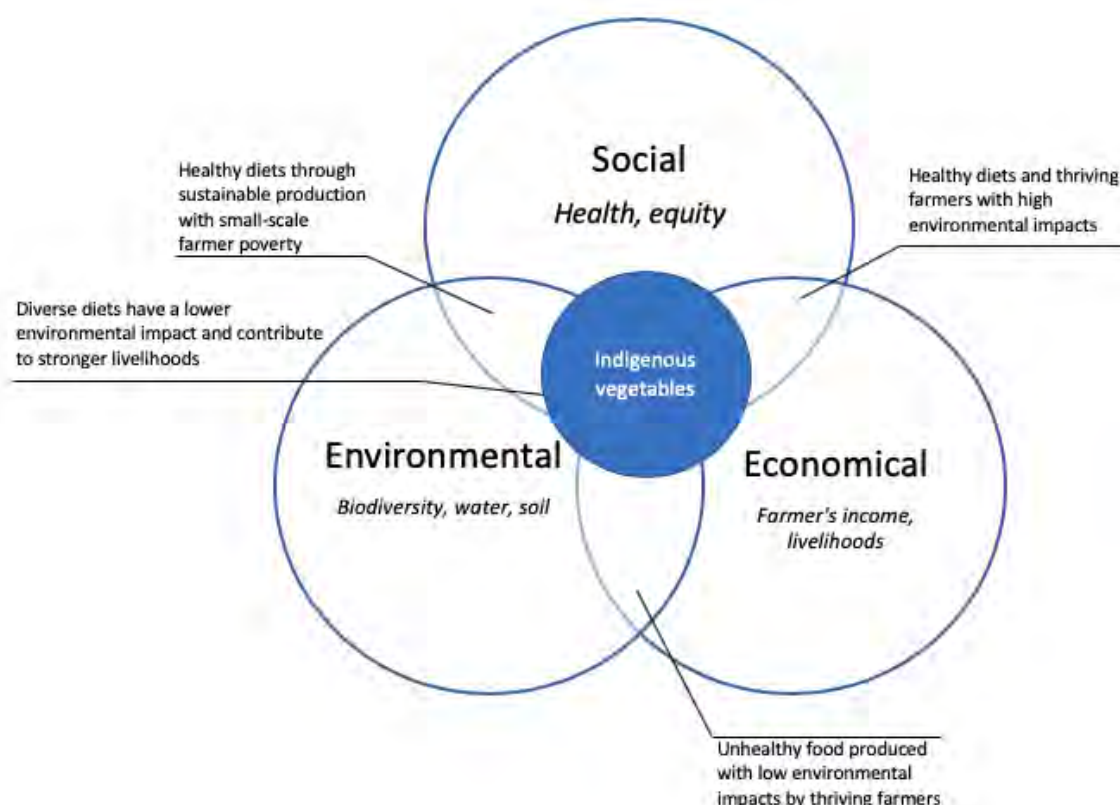
<sup>3</sup> ‘Synergy is interaction among two or more actions, which will lead to an impact greater or less than the sum of individual effects. Therefore, synergy can be positive or negative (trade-off)’ (Mainali et al., 2018: 1).

Progressively, **diversification of food systems and the role of indigenous vegetables receive more global attention** and are promoted as a key intervention to fight climate change and malnutrition (IPCC, 2019; Swinburn et al., 2019; Willett et al., 2019). To combat malnutrition, one of the key recommendations is ‘...including indigenous and traditional approaches to health and wellbeing’ (Swinburn et al., 2019: 2). Making the global food system more sustainable entails ‘...enhancing biodiversity within agricultural systems’ (Willett et al., 2019: 3). More importantly, the recent IPCC report summary, which was approved by the world’s governments, states with high confidence that ‘Agricultural practices that include indigenous and local knowledge can contribute to overcoming the combined challenges of climate change, food security, biodiversity conservation, and combating desertification and land degradation’ (IPCC, 2019: 34). In light of the major challenges to food security, achieving greater diversity within agricultural systems is increasingly recognized as an important pillar of sustainable development.

Greater diversity in species can stimulate productivity, stability, ecosystems services, and resilience (Khoury et al., 2014). More diversification can contribute to more competitive, environmentally sustainable, and food and nutrition secure food systems. It can also be instrumental to several sustainable development goals. **One way to diversify is to better integrate indigenous vegetables.**

The advantages of indigenous vegetables are a generally higher nutritious profile, potentially lower natural resource requirements, and a possible higher profit margin (Dawson et al., 2018). They are **economically, socially, and environmentally ‘sound’** (Mabhaudhi et al., 2018). Particularly interesting is their adaptability to agro-ecological niches, marginal lands, and resilience to climate change (Padulosi et al., 2019). Some leguminous indigenous vegetables enhance soil fertility through nitrogen fixture, which is especially beneficial to low input, rain-fed or dryland agriculture.

Leafy indigenous vegetables are highly perishable when fresh, thus farmers around the burgeoning African urban food economies are in a unique position to supply to those **urban markets** as the international market cannot provide these fresh products. As indigenous vegetables are mostly grown by small-scale farmers, promoting them can create important **poverty-reducing effects** (Rampa and Knaepen, 2019). While indigenous vegetables are mostly grown by women (Padulosi et al., 2013), increased market opportunities might result in more **purchasing power for women**, which is particularly beneficial for child nutrition (Kennedy and Peters, 1992).

**Figure 2: Sustainability's dimensions showing the trade-offs of food, centred on indigenous vegetables**

Source: adapted from Mabhaudhi et al., 2018

With indigenous vegetables, small-scale farmers and women can be key actors to drive sustainable food system transformation and poverty-reducing private sector development (Rampa and Knaepen, 2019). Indigenous vegetables can support better diet quality and help build resilient production and food systems (Padulosi et al., 2019). In sum, **the inclusion of indigenous vegetables can lead to ‘...increased diversity in crops, improved local value chain, and diversified food system, result in increased household food security, improved livelihoods, and reduced hidden hunger, a virtuous cycle’** (Mabhaudhi et al., 2018: 15-16).

**The reasons why indigenous vegetables are often ‘neglected’ and the uptake is below their social optimum** include i) poor economic competitiveness compared to staple crops; ii) inefficiency in producing, storing, and processing; iii) lack of nutritional information on the different varieties of indigenous vegetables; iv) disorganised or non-existing food supply chains; and v) negative associations with poor rural lifestyle and low social status. Furthermore, indigenous vegetables are often highly perishable, which is especially unfavourable in contexts where cold storages are frequently absent (Baldermann et al., 2016). Other disadvantages include a lack of uniformity demanded by markets, limited seed availability, poor agronomic practices, low yields, laborious processing, lack of markets and information on consumer demands (Rampa and Knaepen, 2019; Padulosi et al., 2019). While greater production diversity is generally linked to more diverse diets, it is not necessarily connected (Dawson et al., 2018), which highlights the importance of understanding intermediary processes and contexts.

But there is room for indigenous vegetables in the current food system, as many of the barriers to their uptake can be addressed by changes in policy and the policy environment (Mabhaudhi et al., 2018). Indigenous vegetables have been largely ignored by policy-makers due to a lack of knowledge, which might favour more

uniform and less healthy diets (Padulosi et al., 2019). These policy-makers might favour the large-scale commercial sector because its actors communicate it as more productive, improving national food security, reduces employment, and contributes to economic growth. However, this might come at the expense of ecosystems and contribute to unequal distribution (Mabhaudhi et al., 2018). **Developing a holistic approach to indigenous vegetables requires an unprecedented building of supportive structures, knowledge systems, cooperation and partnerships** (Padulosi et al., 2019).

Thus, changes in the policy environment can enable and promote the production, distribution, processing, and consumption of indigenous vegetables. In turn, more indigenous vegetables can result in healthier diets from more sustainable food systems.

This section introduced the food system approached and debated the need for increased diversification of food systems. Indigenous vegetables might be a particularly promising pathway to diversify the food systems. But advantages are context-specific, thus necessitating in-depth interdisciplinary research and policy proposals. The next section maps Arusha's food system based on research by the SASS consortium. This section is followed by the governance dimensions - entailing policies and actors - of the Arusha food system.

### Box 3: Defining indigenous vegetables

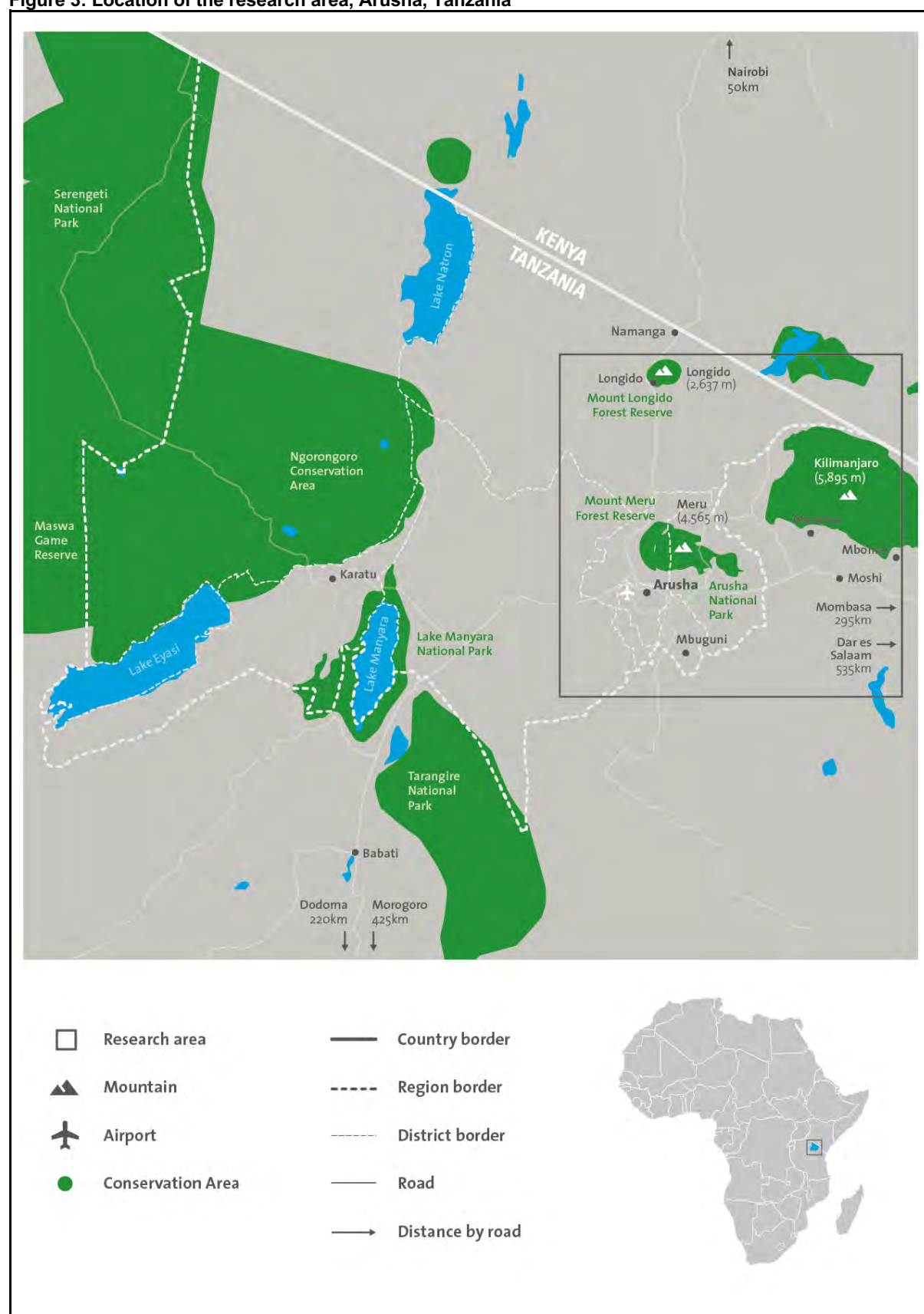
Indigenous vegetables – also ‘traditional vegetables’ – *‘though locally or regionally valued by consumers and farmers, have received relatively little attention by researchers, such that their potential for dietary improvement by contributing important minerals, vitamins, anti-oxidants and other micro- and macro-nutrients has not been fully explored’* (Dawson et al., 2018: 1). In this report, we limit the range of vegetables studied to **‘those plants which originate on the continent, or those which have such a long history of cultivation and domestication to African conditions...’** (Ambrose-Oji, 2009: 10). In other words, we consider indigenous both the vegetables native to Africa, as well as introduced vegetables that have been integrated into local food cultures and have thus become indigenised (Guijt and Reuver, 2019). The latter is the case for the popular *matembele* (sweet potato or Ipomea leaves) and *kisamvu* (cassava leaves), both originating in the Americas (Lotter et al., 2014). Following this definition, *sukuma wiki* is also considered an indigenous vegetable. We provide a list of most common indigenous leafy vegetables found in Arusha in Table 1 (section 3.2).

## 2.4. Research area description

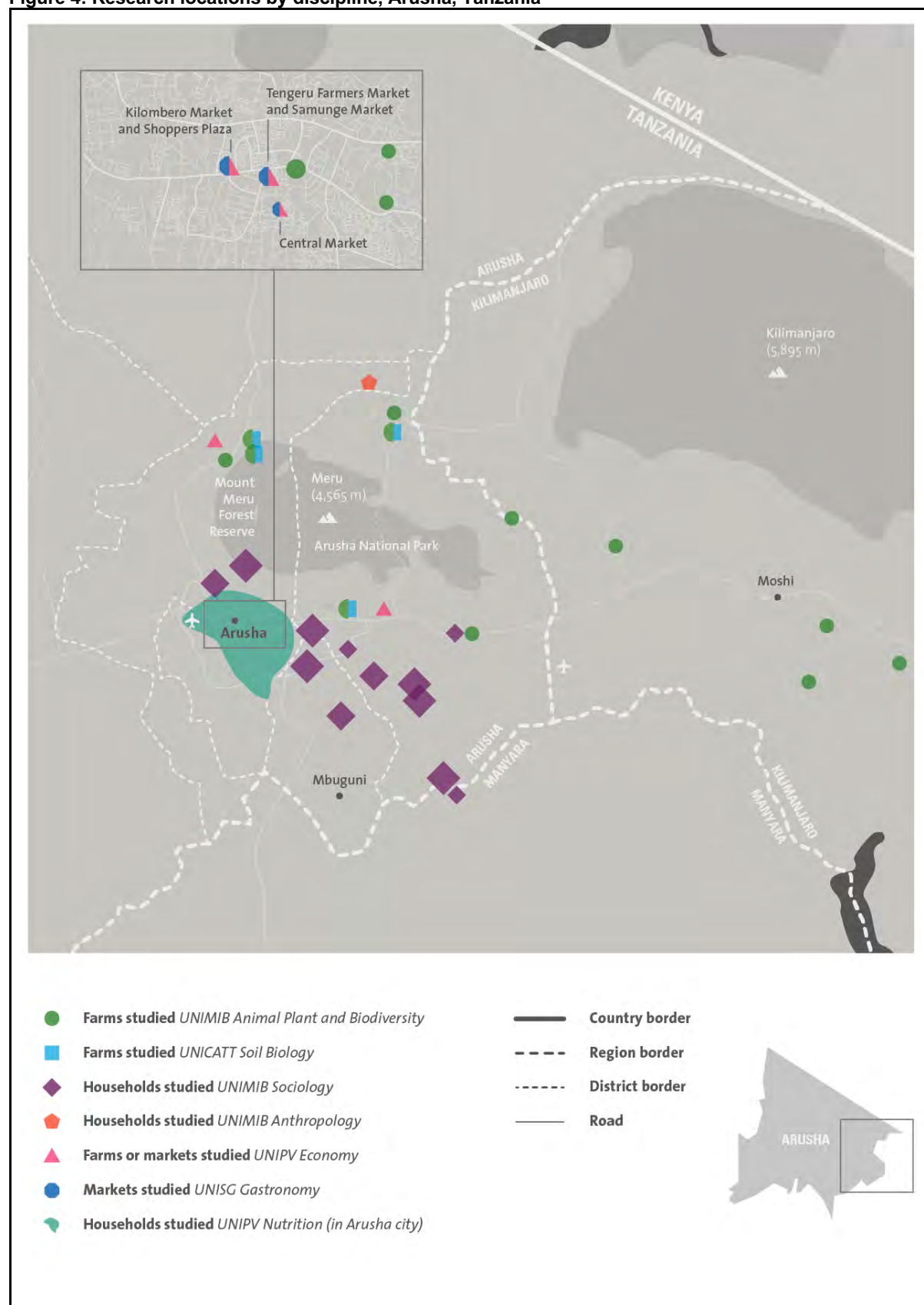
**The Arusha Region is located in the north-east of Tanzania, bordering Kenya and Kilimanjaro** (see Figure 3). The region comprises seven districts namely Monduli, Arusha Urban, Karatu, Arusha Rural, Ngorongoro, Longido and Meru. Arusha's highest point is Mt. Meru at 4,565 m, which is Tanzania's second-highest mountain. Arusha City is the region's capital and a major diplomatic hub as the de facto capital of the East African Community (EAC). Figure 3 shows the location of Arusha and the area researched by the SASS project.

For this report, **UNIMIB's Animal, Plant and Biodiversity** and **UNICATT's Soil Biology** teams sampled farms for soil fertility and functional biodiversity analysis, and estimated interactions of plant-animal biodiversity (e.g. pollinator insects) to assess the impact of agricultural practices in terms of environmental sustainability and ecosystem functioning. **UNIMIB's Sociology** team analysed market orientation, plot size, and livelihoods of farming households, and studied the role of social organisations in the local production and distribution systems. **UNIPV's Development Economists** investigated the indigenous vegetables value chain, visiting farms and markets, while the **UNIMIB's Anthropology** unit studied food production and consumption in a Masaai community, focusing on cultural practices around maize. **UNISG's Gastronomic Science** analysed the social structure and dynamics of food markets and the role played by indigenous vegetables within it, and the **UNIPV's Nutrition** team sampled childbearing-age women to study dietary adequacy. Figure 4 shows the research teams' sites.

Figure 3: Location of the research area, Arusha, Tanzania





**Figure 4: Research locations by discipline, Arusha, Tanzania**

### 3. Mapping Arusha's food system

**Food systems, particularly in Africa, are undergoing rapid changes under a host of drivers. Some of these drivers transition Tanzania's 'traditional' food system into a more 'modern' one.** In traditional food systems, the population engaged in agriculture is high, food production is mostly small scale and low on external inputs, food distribution is mostly through informal chains, and malnutrition is mostly undernourishment and undernutrition. This broadly characterises Tanzania's food systems today. But in modern food systems, most food production is energy and input-intensive, and labour-extensive, while supermarkets have more market share, and overweight and obesity are widespread (Drewnowski & Popkin, 2009; HLPE, 2017). Shifting from traditional to modern food systems comes not only with wide-ranging economic, social, and ecological impacts but also with changed power relations between food system actors (Dekeyser, 2019b). But food system transitions are not a linear process. Local actors, current food systems, and drivers shape the direction and result of the transition.

#### 3.1. Drivers of the food system

This section provides an overview of the main socio-economic and environmental drivers that affect Arusha's food system. Food systems drivers are defined '*...processes and events that are known (or simply theoretically expected) to have an impact on food systems*' (Béné et al., 2019b:150). Examples of major socio-economic drivers include urbanisation, economic and population growth, and agricultural homogenisation, while key environmental drivers include climate change and soil degradation (Béné et al., 2019b).

##### 3.1.1. Economic drivers

###### Economic growth and poverty

Tanzania is a low-income country that has shown **sustained and high economic growth**, averaging 6.5% between 2006 and 2016<sup>4</sup> thanks to investments in infrastructure and increasing specialization (World Bank, 2019; 2018). This is steadfastly higher than sub-Saharan Africa (SSA) average of 4.8%, but the recent surge in population has kept per capita incomes relatively modest, putting Tanzania behind regional peers such as Ethiopia and Rwanda (World Bank, 2018).

The recent growth benefited from economic reforms and strong capital accumulation in the 1990s and the 2000s, which in turn raised productivity and helped to create a buffer against external shocks such as the 2008–09 global financial crisis. As a result, the country has benefited from relative stability despite relying intensively on resources and volatile international commodity prices. Inflation rates have been rather low in recent years<sup>5</sup> and there have been some improvements in the trade balance (World Bank, 2017). **However, the high growth rate did not result in commensurate poverty reduction**,<sup>6</sup> as Tanzania displays one of the lowest Human Development Index (HDI) scores in the world, ranking 159 out of 189 (UNDP, 2019). About 49% of Tanzanians live on less than USD 1.90 per day (World Bank, 2019).

<sup>4</sup> GDP growth has been sustained over the last twenty years, reaching 8.5% annual growth in 2008. Then, growth rates slowed down a little and regained up to 7% in 2014–2016. GDP value was USD 47.4 billion in 2016, corresponding to per capita current USD 879.19 (in Tanzanian shilling 1,926,731).

<sup>5</sup> Around 6% in 2015, well below the inflation rate of the 1990s when it was around 23% per year.

<sup>6</sup> In the mainland, the poverty headcount ratio (USD 1.90/day at 2011 PPP) declined between 2007 and 2012 from 60 to 49 %. However, the absolute number of poor remained high at 11.9 million, based on the national poverty line (2012). This is mainly attributable to high fertility rates. Poverty reduction was uneven geographically with most of the decline occurring in the main city Dar es Salaam (World Bank, 2017).



## Economic structure and employment

Tanzania's sustained growth has been accompanied by signs of **economic diversification**, as industry and services have become more dynamic (World Bank, 2018). Agriculture continues to be a key economic sector, contributing to 28.7% of Tanzania's GDP<sup>7</sup>, but its importance has decreased throughout the 1990s and services represent today the main GDP component (42%). Communication and financial services, in particular, have expanded rapidly, recording double-digit annual growth, while the industrial sector saw a significant increase in its relative contribution (from 17 to 27%). Tourism is also becoming increasingly important and employs over half a million people (World Bank, 2017). Conversely, **agricultural sector performance has been lagging**. Despite having a rich base of fertile land, freshwater resources, and a favourable climate in many areas, agricultural growth has been modest (4.4%) over the past few years, and agricultural productivity, despite some improvements, has remained low. Agricultural productivity suffers from over-reliance on rainfall, utilisation of rudimentary and unsustainable production techniques, poor access to inputs, but also low budgetary allocation<sup>8</sup> and understaffed extension services, to name a few. As a result, **gains in agricultural productivity have been based more on the expansion of cultivated land rather than yield increases, contributing to deforestation and land degradation** (CIAT and World Bank, 2017).

The agriculture sector employs 66% of economically active Tanzanians, even though its importance is declining. Women account for nearly half of the workforce and approximately 7.2 million youth are employed in the sector (CIAT and World Bank, 2017). Industry employment levels are tiny and male-dominated, while services employment has expanded up to 27% in 2019, with slightly more women than men (World Bank, 2019). However, labour shifts to manufacturing and services have mainly taken place in the informal sector (World Bank, 2018).

## International and regional trade

Between 2006-16 imports exceed exports, with an average annual trade deficit of USD 1.3 billion (World Bank, 2019). The regional market trade has increased and trade relations have shifted away from Europe and towards Asia (ECDPM & ESRF 2015). India and China, the largest trading partners, represent both significant markets for Tanzania's exports as well as key import sources. Other top export destinations include a few neighbourhood countries such as Kenya.<sup>9</sup> While gold and precious stones are the largest category of exports, **food items, together with agricultural raw materials, constitute most of the country's exports revenues**, with horticultural products, tobacco, oilseeds, coffee and tea.<sup>10</sup> Other important export crops are sisal, cut flowers, and pyrethrum (World Bank, 2017; Benson et al., 2017).

**Being generally a surplus producer of staple cereals and pulses, Tanzania plays an important role in regional staple food trade** across East and Southern Africa, exporting significant quantities of cereals and pulses to neighbouring countries, including Kenya, Malawi, Zambia, Uganda, Rwanda, Burundi and the Democratic Republic of Congo (FEWS NET, 2018). For other food products, particularly processed foods such as sugar, milk, wheat flour, and canned products, Tanzania is still a net-importer (ECDPM and ESRF, 2015).

<sup>7</sup> The average for SSA is 17% (World Bank, 2019).

<sup>8</sup> Official figures of the Tanzanian public budget allocation to agriculture ranges between 5 and 7% of the national budget, which is well below the minimum 10% target set under the Comprehensive Africa Agriculture Development Programme (CAADP; IFPRI, 2017).

<sup>9</sup> However, according to the Regional Integration Index for 2016, Tanzania perform lowest on regional integration among members of the East African Community (EAC) and is below average within the Southern African Development Community (SADC; World Bank, 2018).

<sup>10</sup> The share of traditional tropical products (coffee, tea, tobacco, fish and cotton) in total agricultural exports has almost halved since 2000, while fisheries and horticulture sectors have emerged as sources of primary sector exports (URT, 2013b).

### Arusha's economic context

The region of Arusha reflects the national dynamic of increasing economic diversification, as the share of those engaged in purely agricultural economic activities has decreased 12.8% between 2008-09 and 2014-15 (from 60.1 % to 47.3%; Benson et al., 2017). **Farming and livestock keeping, however, remain key economic activities**, alongside beekeeping, food transformation, timber and charcoal production, tanzanite and coal extraction and small manufacturing (such as glass and tile, wood and furniture manufacturing).<sup>11</sup> **Export horticulture and flower industry developed in the 1990s**, benefitting from the favourable climate and the relatively good international airfreight connection. Arusha is also developing as a seed hub (Dubois et al., 2015) with several seed companies producing vegetable and flower seeds. With nearly 2,500 accessions, the Arusha World Vegetable Centre is the largest vegetable seed bank in SSA (McClafferty and Zuckerman, 2014). Retail services, personal services and tourism also play an increasing role.

**In Arusha City, employment is more diverse** (URT, 2016). Two large industrial areas are located in the southern outskirts, in Themis and Ngirō Ward, and trade is well developed, with important commercial areas (Central Business Area, Sekei, Sombetini and Ngarenaro ward) and food markets. The main tourist attraction is the Arusha National Park, reachable with a 40-minute drive from Arusha City and part of the Tanzania Safari Northern Circuit, which comprises high-value natural areas in Serengeti, Tarangire and Kilimanjaro National parks, as well as the Ngorongoro Conservation area. The city receives many visitors every year, also thanks to its comfortable location close to Kilimanjaro International Airport. **This tourist flow is an important resource for the entire area**,<sup>12</sup> but this economic potential is still largely unexploited by local communities living in the surroundings of the park due to the lack of education, skills, financial resources and investment capacities. Nevertheless, some community-based tourism initiatives have started in the area (Istituto Oikos, 2011).

Finally, Arusha City is a **major diplomatic hub** and hosts the headquarters of the EAC, housing five of its eight agencies.

### 3.1.2. Social and cultural drivers

#### Demography and urbanisation

Tanzania is the 6th most populous country in SSA, with an estimated population of 56 million<sup>13</sup> and an average density of 64 persons per km<sup>2</sup>. Distribution of the population is uneven, with most people living on the northern border or the eastern coast, while the remainder of the country is sparsely populated.<sup>14</sup> The country displays a young age structure, with 44.1% of the population under 15, 53.3% between 15 and 64, and only 3% aged 65 or older. **Demographic growth rates are very high** (2.98 % in 2018), also compared to average SSA (2.6%), causing a surge in Tanzania's population, which is expected to double in the next 26 years (World Bank, 2019).<sup>15</sup> This is attributed to a combination of high birth rates, a drop in mortality rates and improvements in life expectancy (currently 64.9 years old compared to only 50 years old in the 1990s). The surge in population risks to strain the government's capacity to deliver services, especially in urban areas, and increases pressure on natural resources and the job market (World Bank 2018).

<sup>11</sup> According to the Arusha Strategic Plan 2021 (2017), in Arusha DC there are 4 private-owned slaughterhouses and 2 district-owned slaughterhouses. There are 26 coal mining sites and 40 artificial fishing ponds (of these ponds, 2 are owned by producers' association). At least 20 beekeepers' groups are reported, counting 511 beekeepers. The honey-making process is still mostly traditional (wood beehives).

<sup>12</sup> The park receives an average of 60,000 visitors per year who, through park fees, contribute about 2.3 million USD per year to Tanzania's National Parks.

<sup>13</sup> The composition of the population between women and men is rather even, with 28.2 million women and 28.1 million men in 2018. (World Bank, 2019).

<sup>14</sup> In the arid regions, population density is as low as 1 person per km<sup>2</sup>, while it reaches about 53 people per km<sup>2</sup> in the mainland highlands and up to 134 people per km<sup>2</sup> in the capital city of Zanzibar (World Population Review, 2019).

<sup>15</sup> Demographic growth slowed down in the second half of the 1990s but returned to 1980s levels in the early 2000s.

**Most Tanzanians (66% in 2018) live in rural areas but urban areas are growing rapidly**, with an annual increase in the urban population of 5.1% in 2018 (vs. 1.9% in rural areas). This urban growth is driven both by demographic growth and rural-to-urban migration (World Bank, 2019; World Bank, 2018). Dar es Salaam is a coastal city, one of the fastest-growing in East Africa (Ijumba et al., 2015). It is the only city with more than one million residents, hosting 11% of the population. Just over a third of Tanzanians live in urban areas (World Population Review, 2019; OECD and Club du Sahel, 2018).

### **Inclusion and human development**

There have been significant gains in health and education in recent years. Life expectancy has improved thanks to considerable reductions in communicable diseases and infant and child mortality, mainly attributed to better immunization coverage, improved access to primary care, and a decline in AIDS prevalence.<sup>16</sup> At the same time, access, completion, and equity in primary education have improved, with enrolment rates shooting up from less than 55% in 1990 to nearly 90% in 2013 (World Bank 2017; World Bank, 2018). However, progress in decreasing maternal mortality has been slow,<sup>17</sup> reflecting inadequacies in the health care system,<sup>18</sup> and high fertility rates delay the demographic transition, thus putting structural pressure on job markets and social service delivery. Besides, quality of education remains low, with high dropout rates from primary to secondary, especially among young girls. Tanzania also still faces problems of both service access and quality, with **persisting regional disparities and gaps between urban and rural areas in terms of access to basic services such as electricity, water and sanitation** (World Bank 2017; World Bank, 2018).<sup>19</sup>

**Malnutrition also remains a serious problem**, especially among women and children: stunting is among the highest in SSA and levels in the poorest households and rural areas are almost double those in the wealthiest and urban households (World Bank 2017).

### **Gender bias**

Tanzania still displays pervasive gender disparities. Unemployment rates are generally higher for women, irrespective of education<sup>20</sup>, and women earn lower incomes. Inequalities in education are also large: nearly twice as many women as men aged 20-24 years have had no formal education (19 versus 10%). Women also participate in very few decisions related to their health or household purchases, and only 37% of national parliamentarians were women in 2016. In addition, sexual and domestic violence often goes unpunished: Tanzanian laws address sexual harassment in the workplace, but not in the educational system or public spaces, and there is no law on domestic violence (World Bank, 2017; World Bank, 2018).

**The gender gap is particularly large in the agricultural sector**, as women tend to have access to fewer productive assets, particularly finance and land. According to a recent study of maize markets in Tanzania, women farmers tend to own smaller plots, and display less access to modern technologies (i.e., improved seeds and tools), consequently achieving lower yields (World Bank, 2016b in World Bank 2017). Because of gendered work responsibilities - bound to the home - women have fewer transport opportunities and thus

<sup>16</sup> Between 2005 and 2015, HIV/AIDS-related deaths fell by 66 % (World Bank, 2017).

<sup>17</sup> Maternal mortality per 100,000 births was almost halved between 2005 and 2015 (from 687 to 398), but it is still far above its 2015 target of 193 and is almost twice as high as in lower-middle-income countries (World Bank, 2017).

<sup>18</sup> The health sector suffers from input shortages and imbalances in the distribution of human resources, with staffing being largely skewed in favour of urban areas and private facilities. Only 50% of health facilities have access to clean water, improved toilets, and electricity (World Bank, 2017).

<sup>19</sup> Clean drinking water and improved sanitation are accessible to only 55% and 15% of the population, respectively (World Population Review, 2019). The gap between rural and urban areas is still very large. As for electricity, an estimated 7 % of rural households have access as of 2015, in sharp contrast with the rapid expansion of electricity access in urban areas (World Bank, 2017).

<sup>20</sup> The female unemployment rate was 12.3 % compared to the male rate of 8.2 % in 2014, and the national average monthly income was 166,00 TSh compared to 278,000 TSh for men (World Bank, 2017).

more limited direct market options. Thus, they mostly sell their maize to small traders at farm-gate. Large gender gaps are reported in terms of profitability of household enterprises, with median monthly profits for female-owned enterprises being only 43% of males. This discrepancy is due mainly to barriers to formal credit and lower access to mobile phones or motorized transport. Customary land rights and the inheritance system often deprive women holding assets and property, thus further constraining their prospects for securing credit for activities.

### Arusha socio-cultural context

Arusha Region is predominantly rural and displays a young age structure (URT, 2012). However, with the decline in productivity and profitability of agriculture in the region, rural-urban migration trends have increased significantly and the urban extent of the city<sup>21</sup> expanded rapidly (6.5%) since the 2000s (Atlas of Urban Expansion, 2019). Today, **Arusha City is the 5th urban centre in Tanzania**,<sup>22</sup> with a population of approximately 483,000 and an annual growth rate of 2% (World Population Review, 2019). It is expected to grow up to 1.5 million by 2035 and 2 million by 2050 as a result of urban expansion and migration (Arusha City Council, 2016). **As a result of urban expansion**, coupled with high demographic pressure and a political push towards transforming Arusha into a 'European-like city', **land pressure has increased, which reduces farming opportunities and leads to environmental degradation**. Moreover, current urban intensification policies have augmented social inequalities (Owenya et al., 2012). In spite of these challenges, **the Arusha Region displays high human development outcomes**, recording one of the highest HDI scores together with two other regions (Kilimanjaro, and Dar es Salaam; UNDP, 2017). Arusha has one of the **lowest proportions of poverty** (UNDP, 2017), and registers the **highest life expectancy indicator** (67.7 years) in the country (AfDB & National Bureau of Statistics of Tanzania, 2016). Adult literacy rates (over 15 years) in the three study districts are higher than the national average (67.8%): 96.7% in Arusha City, 90.3% in Meru DC, and 82.7% in Arusha DC. However, the spatial differentiation is remarkable, as the literacy rate above 5 years is estimated at 94% in urban areas versus 67% in rural areas (URT, 2016). In terms of gender disparities, Arusha performs slightly better than the national average (UNDP, 2017).

**Three main ethnic groups<sup>23</sup> dominate in the study area: Wameru, Warusha and Maasai.** Wameru are the major group in the area. They settled in the rainy and fertile slopes of Mount Meru around 300 years ago. Wameru speak a Bantu language and their main economic activity is small-scale farming. Warusha settled on the higher slopes of the mountain after the Wameru, around 1830. Their language and origin are Nilotic, as the Masaai, from which they descend, and they practise both agriculture and livestock keeping (Istituto Oikos, 2011). Consistently, the Wameru response to continuous demographic pressure and the consequent scarcity of land has been the **expansion and intensification of agricultural activities** in increasingly higher areas around the volcano, up to 1,600 meters.<sup>24</sup> This triggered severe conflicts, particularly in the 1940-50s, which were exacerbated by tensions between African farmers and European settlers (Spear, 1997). Both the Wameru and Warusha livelihoods are based on complex intercropped farming systems with bananas, coffee, finger millet, sorghum, cassava, maize and beans, which substituted more drought-resistant indigenous crops such as lablab and cowpeas. Coffee, whose cultivation expanded greatly in the 1920s during the European colonization, partially replacing maize and bean fields, has represented the most important and successful cash crop for both groups for over a century. However, in the last decades, as coffee production

<sup>21</sup> Defined as the combined built-up area and open space associated with a city at a given date (Atlas of Urban Expansion, 2019).

<sup>22</sup> After Dar Es Salaam (6.3 m), Mwanza (1.06 m), Zanzibar (676,000) and Mbeya (540,000).

<sup>23</sup> About 125 indigenous ethnic groups live in Tanzania, each having its own language, social structure, and culture, with notable similarities among them. Most are of Bantu origin, representing around 95% of Tanzania's inhabitants. The rest are Nilotic speakers and indigenous hunter-gatherer descendants. Less than 1% of Tanzania's inhabitants are comprised of Asians, Arabs, and Europeans.

<sup>24</sup> This economic strategy was supported and encouraged by European colonizers and post-colonial governments, who viewed the pastoral strategies of the Maasai and the Warusha as destructive and unproductive manner of land and resource management (Spear, 1997).

became less profitable due to an international price collapse, **Wameru communities started irrigated horticultural production**, mainly tomatoes and onion, next to maize and beans intercropping. This change in land use has impacted the lifestyle considerably, leading to higher incomes, intensification of land use, increased use of agrochemicals, environmental problems and exacerbation of land and water use conflicts. The Maasai are the third major ethnic group in the area. They speak a Nilotic language known as *Maa*. They live in semi-nomadic pastoralist communities in the drylands of northern Mount Meru. Livestock keeping is the base of their traditional economy and occasionally they practice subsistence maize cultivation. While Wameru and Warusha live in permanent settlements concentrated in small villages<sup>25</sup>, most Maasai still live in scattered homesteads, known as '*boma*', that is, a group of huts built around the cattle enclosure which is fenced and protected from potential wild animals' attacks.<sup>26</sup> In recent years, however, many **Masaai communities started combining pastoral and agricultural activities**. Some shifted towards more profitable activities such as **irrigated vegetable production** and consequently achieved higher incomes, shifting from traditional *bomas* to cement block houses with iron sheet roofs. Other households, in more traditional areas, engaged in rain-fed agriculture using animal traction or tractors and planting maize in former grazing areas. This increased their vulnerability to drought (Istituto Oikos, 2011).

### 3.1.3. Political drivers

#### Unbroken rule of CCM and Magufuli's presidency

Tanzania is considered a relatively stable country in the region. Its political history is marked by the **unbroken rule of the Chama Cha Mapinduzi (CCM) party** since independence from the United Kingdom in 1961. The relative stability of Tanzania can be partly explained by the social policies implemented during the Nyerere's presidency (1964-1985), rooted in his philosophy of African nationalism and socialism. While human development was the objective of these policies, the state-regulated economy was not able to deliver the goods needed by the population and gave rise to a parallel economy (Lofchie, 2014).

**State ownership of companies, control over markets and the imposition of rural collectives have marked Tanzania's economy and Tanzanians' perception of politics and the economy.** Before the liberalisation, labour was organised around state cooperatives and collective production units, and, for the main cash crops (like sugarcane, cashew nuts or cotton), public boards were in charge of the marketing. Anti-capitalist and nationalist sentiments reminiscent from the Nyerere era still influence the ruling party, opposition and NGO campaigns alike (Booth et al., 2014) and seem to be revived in Magufuli's populist-nationalist rhetoric (Poulton, 2018).

In the early 1990s, as liberalisation of the economy intensified, a multi-party electoral system was introduced. This increased the costs of doing politics and fomented factionalism within CCM. Power became more contested between individuals and groups within the party and from outside (Poulton, 2017; Poulton, 2018). **Commercial interests in the economy increased, and so did the influence of the private sector in party politics.** This influence concerned mostly the trade-related private sector. Tax exemptions, but also non-competitive government tenders, have been a way to reward companies that support CCM election campaigns (Booth et al., 2014). Tensions between the interests of agricultural companies and trading enterprises benefitting from the import of agricultural commodities persist (Poulton, 2018).

<sup>25</sup> The Wameru are the most well-off: most of their houses are constructed in cement bricks and roofed with sheet iron. Warusha have permanent huts where the whole family lives together. Huts are generally built with mud and thatched with grass, even though few of them have sheet-iron roofs.

<sup>26</sup> Each boma comprises a number of family members and represents the basic unit of the Maasai cultural and economic life. Bomas are generally headed by one married man, who owns the livestock and has many wives. The number of wives is directly proportional to the wealth of the head. Traditionally, the male's role is to take care of cows, sheep and goats, while women are in charge of the household and all domestic issues, including water and firewood collection (Istituto Oikos, 2011).

John Magufuli was elected President in 2015 as a relative outsider to the internal CCM party politics. Magufuli has spurred a lot of enthusiasm with his **strong anti-corruption rhetoric**, referring, for example, to his low budget election campaign and relative independence from big business funders (Poulton, 2018). In the first years of his presidency, he acted on this rhetoric with public sector reforms by, for example, cutting down personal allowances and foreign travel of senior staff and a crackdown on ghost workers (Poulton, 2018; Eriksen, 2018). Interviewees signalled that, on the one hand, this has had a significant **impact on policies and regulations being enforced after years of weak enforcement**. As such, these actions were received with enthusiasm by the general public. On the other hand, the ad-hoc measures taken by the President, for example by firing public officials on the spot have caused bureaucratic paralysis (BBC News, 2017). Some interviewees see that government officials do not dare to be proactive out of fear of retaliation. This **could create negative incentives for government officials that would like to work across silos**. The President's anti-corruption actions are also rarely systematic, often overriding existing procedures, and seem to reward political loyalty to the President (Eriksen, 2018).

**There have been concerns about the growing authoritarian character of Magufuli's presidency.** The increased pressure on media, activists, domestic and international NGOs and opposition parties was renounced in two recent reports by Human Rights Watch and Amnesty International (Human Rights Watch, 2019a; Amnesty International, 2019). Civil and political rights, such as the organisation of political rallies, have been curtailed. Journalists and activists have been arrested or harassed, while since 2015 at least five newspapers were banned or suspended (Human Rights Watch, 2019b). The latest elections for local government authorities were boycotted by most opposition parties and the UK and the US found they lacked credibility and transparency (Africanews, 2019).<sup>27</sup> Many international organisations in Arusha have left or are considering leaving because their foreign staff is having more trouble renewing their residence permits. Several organisations saw the publication of their research results delayed or stopped using the 2015 Statistics Act that limits the publishing of statistics and research results that don't agree with the official figures.

### **Political drivers influencing agricultural policy and implementation**

Agricultural and rural policies in Tanzania are inconsistent, both in objectives as well as in implementation. During the Kikwete presidency (2005-2015), **different drivers influenced agricultural policy and its challenging implementation**. Policies aimed at pleasing rural voters, ideologically inspired towards small-scale producers support, often contradicted measures intended to serve the business interests of politicians or campaign supporters (Booth et al., 2014). Also with Magufuli, **the discourse celebrating agriculture and small-scale farmers as the backbone of Tanzania's economy has not led to effective rural policies** benefiting poor rural populations or the business environment of the agrifood sector (Poulton, 2018). Besides, **visions of large-scale investments in commercial agriculture still contrast with a certain hostility towards the private sector** – particularly if non-Africans – and lie at the heart of contested agricultural policies.

In a political economy analysis of Tanzania before Magufuli's presidency, Booth et al. (2014) argued that any new President after Kikwete would have a hard time tackling the structural problems behind the contradictory rural policies and slow improvements in the agribusiness environment. Vested interests would be too strong for any real reform to be achieved. **Magufuli, however, has not shied away from strong state interventions** in areas where, during Kikwete, the private sector had been able to gain terrain, backed up by development partners and international financial institutions support. His nationalist rhetoric emphasises domestic production to deliver on employment creation and, at the same time, reduce import dependence. The new regulations on bulk procurement of imported fertilisers and seeds introduced in 2017 resonate well

<sup>27</sup> More in-depth literature on the political economy of Tanzania also finds the electoral committees at national and local level are not independent but mostly dominated by CCM (Poulton, 2018; Booth et al., 2014).

within this more nationalist stance but have been accompanied by **concerns around the transparency and coherence of some of these measures** (Eriksen, 2018). In the same trend of reinforcing state control, it seems that the inefficiency and inefficacy of certain boards and cooperatives to manage export crop markets - that Booth predicted could lead to deeper liberalisation of arrangements - have instead given Magufuli arguments to take a stronger hold of the state on price regulating measures. Magufuli has also re-empowered cooperative unions in crop purchasing, undermining private exporters and contract-farming arrangements (Africa Confidential, 2019). The recent take-over of the cashew market by the army in November 2018<sup>28</sup> is an example of such a trend. Unpredictable trade policies such as export bans and the restoration of state control for some of the key export crops are also likely to undermine private sector interests.

**Relations with development partners have been declining in recent years**, while investment and public debt finance from countries such as China, Turkey and the Gulf States is increasing (Eriksen, 2018). Despite these trends, development partners still influence policymaking through a considerable contribution to the national budget. However, the impact development partners can have on policy agendas is limited by implementation gaps (Poulton, 2018) but also a lack of acknowledgement and adaptability to the significant power of informal rules of the game (Booth et al., 2014). Finally, interviewees signalled that, under Magufuli's nationalistic narrative, investments in 'soft' infrastructure (such as capacity building) are received less enthusiastically than those geared towards 'hard' infrastructure (such as roads and dams). Development partners' projects and programs geared towards strengthening knowledge infrastructure and facilitating peer-to-peer exchanges could thus receive little buy-in from national and local governments.

### **Decentralisation and urban policies in Arusha**

**The decentralisation process in Tanzania started in the 1990s** with two subsequent Local Government Reform Programs (LGRP) underpinned by the principle of Decentralisation by Devolution. Reform programs had the objective *'to create Local Government institutions that are largely autonomous, strong and effective, democratically governed, deriving legitimacy from services to the people, fostering participatory development, reflecting local demands and conditions, and being transparent and accountable'* (Mollel and Tollenaar, 2013). Through these reforms, **local government authorities (LGAs) have become the main provider of public services** such as healthcare and education, agricultural extension services and irrigation infrastructure (Mollel and Tollenaar, 2013; Masaki, 2018; Poulton, 2018).

**Reforms also delegated the mandate to raise taxes to the local level in many domains.** This has given local governments considerable autonomy in generating revenues (Masaki, 2018). Specifically, urban district councils can collect taxes on business and corporate activities (for example through a service levy), while for rural district councils the agricultural produce cess is a major source of revenues (Masaki, 2018). Despite increased fiscal powers, LGAs are still highly dependent on intergovernmental transfers, receiving on average 91% of their revenue from the central government (Cummings et al., 2016). To support LGAs to generate greater revenues themselves, the government has passed a Public-Private Partnership Act (2010) and a Public Procurement Act (2011), which allow LGAs to seek private sector involvement in the provision of services (Cummings et al., 2016).

**Despite these reforms, administrative and political power in Tanzania is still relatively centralised** (Eriksen, 2018; Cummings et al., 2016; Poulton, 2018). Implementation of the second phase of the reforms was never finalized, while, under Magufuli, the centralisation of political power seems to be increasing. Responsibility for policy implementation is in the hands of district administrations, but their plans and budgets are closely overseen by the President's Office of Regional Administration and Local Authorities (PO-RALG,

<sup>28</sup> Cashew nut exports are a major foreign-currency earner for Tanzania. In November 2018, Magufuli threatened to deploy the military over a cashew nut crisis, which originated over low prices offered by private traders to farmers. He also disbanded the Cashewnut Board of Tanzania (BBC News, 2018).

or *Tamisemi*); Poulton, 2018; Cummings et al., 2016). It is also this national-level department that appoints most senior positions such as District and Regional Commissioners and Executive Directors (Eriksen, 2018; De Ridder et al., 2015). These appointments are often regarded as being ‘gifts’ of the president (Eriksen, 2018).

As of 2016, Tanzania is divided into 31 regions (*mkoa*), 26 on the mainland and 5 in Zanzibar. **Regions are divided into districts (*wilaya*)**, also known as local government authorities (LGA). Districts can be **urban or rural**; rural districts are governed by District Councils while urban districts can have either a Town Council, Municipal Council or City Council. Councils at district and municipal level have some decision-making power around policies, while administrative positions (Directors, Heads of Department) are mandated with the execution of decisions *and* programs (De Ridder et al., 2015). Urban and rural districts governments have different mandates, especially concerning land planning. In the past 20 years, rural towns have become increasingly urbanised, but the governance transition has not kept up with this speed. **This has caused a lack of authority of government officials in urbanised areas still lacking formal ‘urban’ status** (Tacoli and Agergaard, 2017).

**In the Arusha region, the legal and fiscal mandate of local governments is well enshrined, but, in practice, the autonomy of urban and rural councils is limited by capacity and resource constraints.** In recent years, the area around Arusha City has gone through a rigorous administrative reshuffling, expanding the areas considered as urban. As a result, a large portion of the City lacks proper urban planning, suffers from poor infrastructure and transport, as well as encroachment and pollution of natural assets (Arusha City Council, 2016). In January 2015, the City Council thus started working on a new **Arusha City Master Plan**. The Plan provides a long-term vision for the City and includes a detailed land-use plan, urban design guidelines and an implementation framework. It aims at addressing the challenges of accommodating new jobs to cater for the needs of the growing population and reducing urban congestion, with a vision of transforming Arusha into a ‘Green Tourism Capital of East Africa’. Strengthening tourism development, education and industrial services are among the key priorities. Moreover, urban development plans include the creation of many green areas to preserve biodiversity and ecological corridors. However, **the Plan is still awaiting implementation**. Limited central funding, weak LGAs financial capacity and ineffective revenue collection, coupled with inadequate human resources, are outlined as key challenges. Conflicting interests of different government authorities complicate the process.

### 3.1.4. Environmental drivers

This subsection overviews the environmental drivers - in this case, land, water, and climate - of Arusha’s food system. Environmental drivers are *‘natural factors or factors affected by human intervention which directly or indirectly bring about a change in the ecosystem’* (Van Berkum et al., 2018: 10). Food systems severely impact ecosystems. Globally, food systems and land-use change contribute up to 37% of greenhouse gas emissions (IPCC, 2019), while food production accounts for 70% of freshwater withdrawal worldwide (OECD, 2013). Land-use change, primarily driven by agriculture, forestry, and urbanisation, is the largest driver of biodiversity loss (IPES, 2019). While food systems impact ecosystems, food production is highly dependent on local environmental conditions as well.

#### Land pressure

About 46% of Tanzania is suitable for agriculture, translating in 44 million hectares. Much of the arable land is only marginally suitable for agricultural production due to a combination of reduced soil fertility, erosion, soil degradation and sensitivity to drought. As a result, only 32% of Tanzania was cultivated in 2014 (CIAT and World Bank, 2017). This cultivated land degrades due to high population growth, poor implementation of existing protection policies, inappropriate use of technologies (eg, increased fertiliser use), and poor



livestock rearing practices (CIAT and World Bank, 2017). As a result, **soil erosion and fertility loss are major environmental constraints**.

Arusha's mountain slopes have highly fertile volcanic soils, which are very fragile and prone to soil erosion. At lower altitudes and moving away from Mt. Meru, soils become rockier and the layer of fertile soil becomes thinner. In swamps and depressions soils are often unsuitable for agriculture due to bad drainage and very high Ph values. **Human exploitation, particularly woodland clear-cutting, threatens the soil capacity to sustain local community development**. High population growth leads to land scarcity and overuse through badly managed intensive agriculture (Istituto Oikos, 2011). For example, pesticides - some banned - are widely available but knowledge of proper handling is lacking. This can result in overuse, biodiversity loss, and food safety issues (Elibariki and Maguta, 2017). In addition to pesticides, a study of Caudell et al. (2017) highlighted the frequent and unregulated use of livestock antibiotics by agro-pastoralist. Presence of antibiotics in manure may affect the soil fertility through their impact on the functional biodiversity of soil microbes (Semedo et al., 2018).

### **Water pollution and drought**

**Tanzania is officially water-stressed**, with agriculture accounting for 89% of Tanzania's water use (World Bank, 2018). In Arusha, water is brought by rain and rivers, with distribution shaped by Mt. Meru. The mountain acts as a catchment for rainwater and thanks to its condensing action divides Arusha into a dryer North and a wetter South. Thus, **climate and rainfall patterns are not uniform in Arusha**: while the higher south-western slopes, where Arusha City is located, receives up to 2,000 mm/year of rain, the northern slopes only record 500-600 mm/year of rain, due to the rain shadow effect of the mountain (Istituto Oikos, 2011). Besides rain, several rivers supply water to crops by a widespread network of canals and ditches and springs or groundwater supply homes.

**But the water is soiled by salt and fluorite**, which can affect human, animal, and plant health. Household waste disposal, particularly in the urban areas, and chemical leakage from agriculture pollutes too. Water availability becomes less secure due to extreme droughts and flash rains, whose intensity is exacerbated by climate change. Recent prolonged droughts (2005 and 2007-09), associated with strong winds, have caused severe livestock and rain-fed crop losses and repeated food crises (Istituto Oikos, 2011).

In sum, southern Arusha is particularly blessed with water from rivers and Mt. Meru. But its unpredictability is a major constraint to agricultural and pastureland productivity. Furthermore, water quality is compromised by salt and fluoride and polluted by households and agriculture. Moreover, availability becomes less secure due to droughts, whose intensity is exacerbated by climate change.

### **Climate change**

Tanzania's northern districts are **extremely vulnerable to climate change**, and adaptive capacity is undermined by inadequate national and local policies and planning systems (Greene, 2015). Heavy reliance on rain-fed crop production systems increases the risks faced from precipitation changes, highlighting the reality of climate change as a major threat to smallholders' livelihoods. There is a close relationship between variations in the amount of rainfall and differences in the country's annual economic growth. In some regions, this created problems for food production and food security. Climate projections for Tanzania indicate an **increase in temperatures** by 1.4°C by the 2030s - with the West and North-West regions expected to experience faster warming relative to the coastal regions. Even though projections for future rainfall regime changes are uncertain, **precipitation levels are predicted to increase** throughout the country, with uneven regional distribution. At the same time, **increased rainfall variability** and reduced reliability are likely to prolong dry seasons and to **increase the frequency and severity of extreme events**, such as droughts (CIAT and World Bank, 2017).

**Predicted climate changes will significantly impact food production:** warming and changes in rainfall will diminish water availability for crops, shorten the growing season, and increase crop losses due to weeds, pests and diseases, a consequence of increased temperatures. Regional predictions suggest that Tanzania may lose 10% of its grain production by 2080. Maize – a staple crop grown by half of Tanzanians and providing a third of their daily calorie intake – is going to be particularly hard hit. There is considerable uncertainty regarding the impact of climate change on the yields of cash crops such as coffee, cotton and tea (CIAT and World Bank, 2017).

Tanzania's **water resources will experience varied climate change impacts:** higher peak flows contribute to floods which adversely affect human settlements and health; lower minimum flows will, in turn, impact the use of water for power generation, irrigation and public water supply. More frequent floods will destroy infrastructure, buildings and belongings in the floodplains, which in urbanised areas are often populated by poor households. Moreover, warming, flooding and increased rainfall increase the spread and incidence of waterborne diseases (such as diarrhoea, typhoid, and cholera) and insect-borne diseases such as malaria (Paavola, 2004). **Small scale farmers are more likely to suffer the adverse effects,** given their reduced adaptive capacity (CIAT and World Bank, 2017).

## 3.2. Food system activities

In this section, we describe the main food systems activities in Arusha. In doing so, we analyse the food supply system – including production, processing and distribution activities – the food environment and food consumption in Arusha. We devote special attention to the indigenous vegetables chain.<sup>29</sup> We also discuss food and nutrition security in Tanzania and Arusha and highlight the importance of diet diversification with indigenous vegetables as a sustainable way to supply vital nutrients while combating micronutrient malnutrition and associated health problems.

### 3.2.1. Food supply system

This section **overviews the food supply system** in Tanzania and Arusha and **provides key insights into the indigenous vegetables value chain.** We build on desk research and a survey carried out in 2019 by the UNIMIB Department of Sociology and Social Research,<sup>30</sup> in collaboration with Nelson Mandela African Institute of Science and Technology, that sampled 100 farming households from the Arusha Rural and Meru districts.<sup>31</sup> Data specific to the indigenous vegetables chain is based on the literature review and fieldwork conducted by the UNIPV Development Economics team in April-May 2019. The fieldwork entailed two focus group discussions with farming households,<sup>32</sup> and some key informant interviews with indigenous vegetable traders (3), small scale processors (1), horticultural investors (1), contracted farmers groups (2), and representatives of public and private actors involved in the horticulture sector.<sup>33</sup>

<sup>29</sup> A discussion on the enabling environment and business services in which the food supply system is embedded will be presented in section 4, alongside the actor mapping.

<sup>30</sup> The survey analysed the production and distribution systems of the selected farmers (including crop selection, input use and farming techniques, access to markets); evaluated the role of social organizations and extension services; investigated gender dynamics and studied waste management practices.

<sup>31</sup> 49 interviews were carried out in Arusha Rural district ( Ilkiding'a, Sambasha, Nduruma, Olorieni, Mlangarini wards), and 51 in Meru district (Mbunguni, Kikwe, Ambureni, Mororoni wards).

<sup>32</sup> The two focus group discussions were carried in Usa River and Oldonyo Sambu, two villages on the Mount Meru slopes and main indigenous vegetables producing zones. Respectively, 13 and 14 farmers attended, including organic farmers targeted by Istituto Oikos in the past and their non organic neighbours. The FGDs entailed: a value chain mapping exercise for farmer-selected indigenous vegetables (*mchicha* and *mnavu* in Usa River, and *mnavu* and *saro* in Oldonyo Sambu); and a 4 months costs and revenues recording, including individual recall of acreage allocated to different crops, and cost and revenues associated with indigenous vegetables production.

<sup>33</sup> Interviewees include horticulture sector organization TAHA, farmers organization MVIWATA, Kilombero and Samunge market managers, the Chamber of Commerce, and various public institutions.

**Table 1: List of most common leafy indigenous vegetables in Arusha**

Species	Category	Swahili name	English name	Family
<i>Solanum nigrum, scabrum and others</i>	Leafy vegetables	Mnavu (or Mnafu)	African nightshade	Solanaceae
<i>Amaranthus</i> L.	Leafy vegetables	Mchicha	Amaranth leaves	Amaranthaceae
<i>Vigna subterranea</i> (L.) Verdc.	Leafy vegetables; Legumes	Njugu mawe	Bambara groundnut	Papilionaceae
<i>Cucumis anguria</i> L.	Leafy vegetables; Fruit	Matango pori or mlenda matango	Cackrey / Bur gherkin leaf	Cucurbitaceae
<i>Cnidoscolus aconitifolius</i> (Mill.) I.M.Johnst.	Leafy vegetables	-	Chaya	Euphorbiaceae
<i>Manihot esculenta</i> (Crantz), <i>M. glaziovii</i> (Mull.Arg.)	Leafy vegetables	Kisamvu-Muhogo	Cassava leaves	Euphorbiaceae
<i>Vigna unguiculata</i> (L.) Walp.	Leafy vegetables	Kunde	Cowpea	Papilionaceae
<i>Brassica carinata</i> A.Braun	Leafy vegetables	Saro or Sukuma wiki	Ethiopian mustard	Brassicaceae
<i>Sonchus luxurians</i> (R.E.Fr.) C.Jeffrey	Leafy vegetables	Mchungu	Hare lettuce / Bitter lettuce	Asteraceae
<i>Lablab purpureus</i> (L.) Sweet	Leafy vegetables; Legumes	Fiwi	Lablab / Hyacinth bean	Papilionaceae
<i>Moringa oleifera</i> Lam.	Leafy vegetables	Mblonge or Mlenda <sup>34</sup>	Moringa	Moringaceae
<i>Cajanus cajan</i> (L.) Millsp.	Leafy vegetables; Legumes	Mbaazi	Pigeon pea	Papilionaceae
<i>Cucurbita</i> L.	Leafy vegetables	Majani ya maboga	Pumpkin / Squash leaves	Cucurbitaceae
<i>Symphytum</i> L.	Leafy vegetables	-	Russian comfrey	Boraginaceae
<i>Crotalaria brevidens</i> Benth	Leafy vegetables	Sunn hemp	Slenderleaf	Papilionaceae
<i>Cleome gynandra</i> L.	Leafy vegetables	Mgagani or Mkabili	Spider plant / Spider flower	Cleomaceae
<i>Ipomoea batatas</i> (L.) Lam.	Leafy vegetables	Majani ya viazi or Matembele	Sweet potato leaves	Convolvulaceae
<i>Basella alba</i> L.	Leafy vegetables	Mdelenda	Vine spinach	Basellaceae
<i>Nasturtium officinale</i> R.Br.	Leafy vegetables	Saladi	Watercress	Brassicaceae

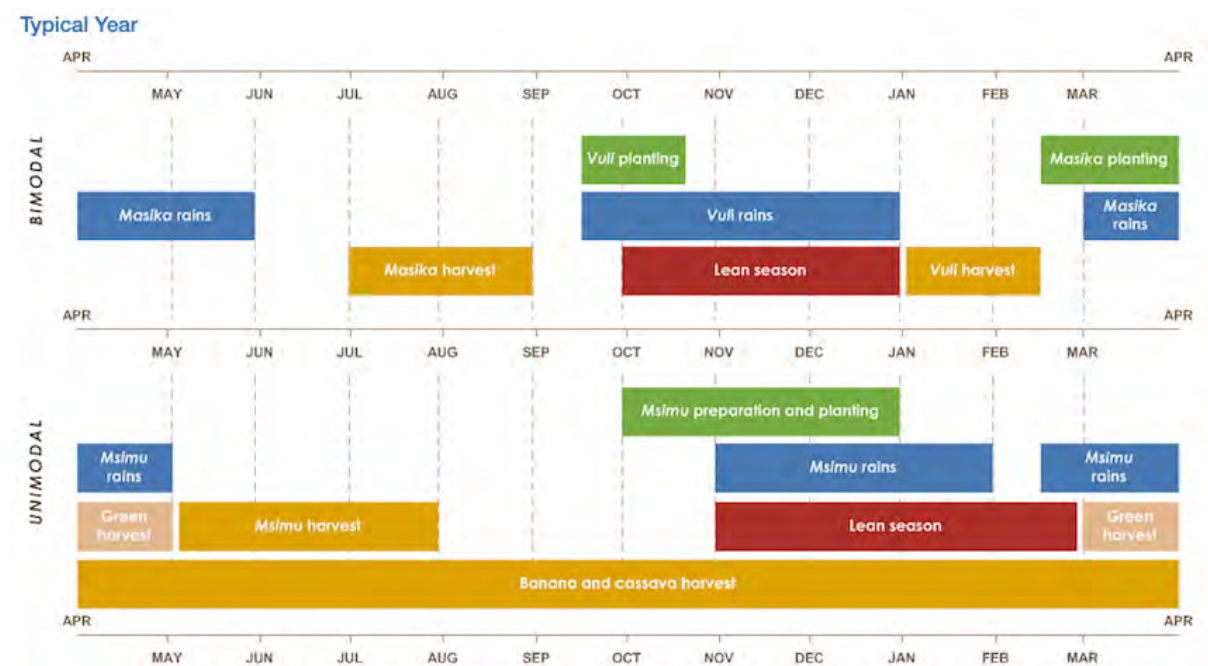
Source: Authors' elaboration based on literature and UNISG fieldwork 2019

<sup>34</sup> Mlenda is the name for several plants whose leaves make a mucilaginous or thickened dish when boiled (Lotter et al., 2014).

## Agricultural production in Tanzania and Arusha

Tanzania has several climatic zones,<sup>35</sup> ranging from a tropical zone - hot and humid - on the coast and the islands to a more temperate climate in the north-east and south-west, and lastly the semi-arid steppe. The **cropping calendar** follows two distinct seasonal patterns: the *msimu* season, that covers unimodal rainfall areas (in the south, west and central parts of the country) and the *masika* (long rains) and *vuli* (short rains) seasons, covering bi-modal rainfall areas (in the north and eastern parts of the country; see Figure 5). Arusha falls into the second category, with the short rains taking place between October and December and the long rains between March and May.<sup>36</sup>

**Figure 5: Tanzania's seasonal calendar**



Source: FEWS NET, 2018

Based on the rainfall regimes and physiographic characteristics (landscape, altitude, soil, vegetation cover), five agro-ecological zones (AEZ) can be identified in the research area. The variety of agro-ecological zones results in different levels of agricultural potential and, hence, in differentiated farming systems.<sup>37</sup> Table 2 provides an overview.

<sup>35</sup> This is due to the country's geographical location (close to the equator) and physical characteristics such as altitude, relief and vegetation cover: Tanzania's mainland is divided into a central plateau, highlands along the north and south, and coastal plains (Hamisi, 2013).

<sup>36</sup> The long rains show less interannual variability than the short rains, both in intensity and distribution (Istituto Oikos, 2011).

<sup>37</sup> Intended as 'a population of individual farm systems that have broadly similar resource bases, enterprise patterns, household livelihoods and constraints, and for which similar development strategies and interventions would be appropriate' (Kassam, 2003).

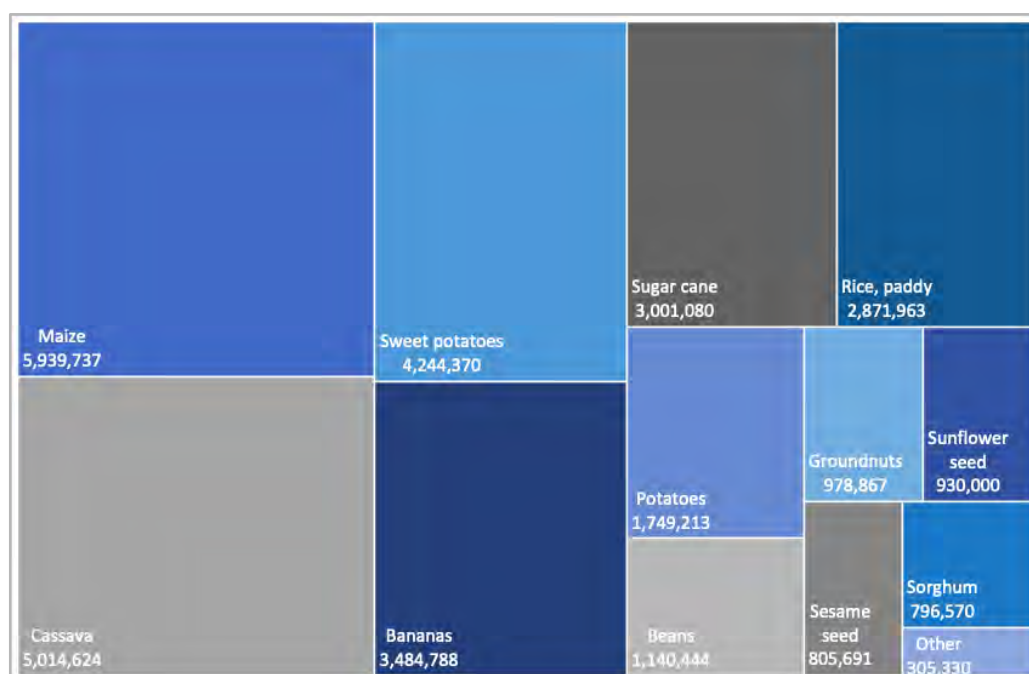
**Table 2: Different Agro-Ecological Zones (AEZ) around Arusha**

Landscape	Altitude (m abs)	Soil	Rainfall (mm/year)	Vegetation cover	Main land-use	Agricultural potential
Flat plains and lowlands (AEZ 1)	1200- 1400	Shallow soils, variable fertility with localized salinity problems	Unreliable Bimodal, 300-600	Grassland and/or low deciduous bushland	Rangeland and very marginal rain-fed agriculture	Very low
Undulated to hilly (AEZ 2)	1300- 1600	Soils of variable depth and fertility	Unreliable Bimodal, 300-700	Deciduous woodland and/or shrub-land	Scattered rangeland and rain-fed agriculture	Poor to medium, dependent on rainfall and topography
Gently undulated (AEZ 3)	1400- 1600	Soils of variable depth and fertility	Bimodal, >700	Semi-deciduous to semi-evergreen woodland and forest	Scattered perennial and annual rain-fed agriculture and pastureland	Medium to good
Mountain slopes and foot slopes (AEZ 4)	>1600	Deep soils, erosion-prone	Bimodal, >800	Evergreen forest	Perennial and annual rain-fed crops	High if good soil management is adopted (erosion control measures)
Flat alluvial plains (AEZ 5)	1200- 1500	Medium deep soils, localized salinity problems	Bimodal, 400-700	Highly anthropized landscape	Irrigated crops	High

*Source: Author's elaboration based on Istituto Oikos (2011)*

**Agricultural production is dominated by small-holder farmers**, accounting for 11.4 million ha (URT, 2017).<sup>38</sup> Medium-scale farms are on the rise, occupying five times farmland than large-scale farms (Poulton, 2017).<sup>39</sup> The country is **largely self-sufficient in staple cereals and pulses production**, and the main staple foods<sup>40</sup> include maize, rice, sorghum, millet, pulses (beans and peas), sweet potatoes, cassava and bananas (particularly plantains<sup>41</sup>). **Maize is the most important cereal**, with an average annual production of around 5 million tonnes, accounting for about 70% of annual cereal production (FEWS NET, 2018). The crop has benefitted from strong policy attention for decades and is grown throughout the country, despite unsuitable soils and climate in some areas (CIAT and World Bank, 2017). In recent years, its production has grown mostly due to increases in land under cultivation and use of improved varieties, but productivity levels have been negatively affected by poor agronomic practices, weak market information as well as pests and diseases. Yield increases are also very volatile as production is mostly rain-fed. Main cash crops include cotton, tobacco, coffee, pyrethrum, and cashew nuts. Other important crops are sesame, sunflower and groundnuts (World Bank, 2017). Figure 6 visualises crop production in Tanzania.

**Figure 6: Main crops produced in Tanzania in 2017 (tonnes)**



Source: Authors' elaboration based on FAOSTAT

In addition, Tanzania produces a wide assortment of fruits and vegetables, and **horticulture has been the fastest growing industry** within the agricultural sector - recording an annual average growth of 11% in the past five years - with exports increasing massively.<sup>42</sup> The horticultural sector is dominated by small scale producers, with women accounting for the majority of the labour force (Mrema et al., 2017). Crops include

<sup>38</sup> There are about 1000 large farms which account for 1.1 million ha (URT, 2017).

<sup>39</sup> According to Jayne et al. (2016, in Poulton, 2017) smallholders occupy 8.59 million ha of land, medium-scaled farms control 5.86 million ha and large-scale farms hold 1.29 million ha in Tanzania. In this classification, small-scale farms own 0-5 ha, medium-scale farms 5-100 ha and large-scale farms more than 100 ha.

<sup>40</sup> Each AEZ has a main staple: plantain is common in north western and northern Tanzania; maize and sorghum in the central and southern highlands zones; rice in the river basins of Kilombero, Rufiji and eastern zones; cassava in the western and south eastern zone (CIAT and World Bank, 2017).

<sup>41</sup> Plantains used to be the major staple in the volcanic highlands of Arusha, but they were slowly replaced by white maize during the colonial period (Haapanen, 2011).

<sup>42</sup> Horticultural exports reached USD 645 millions in 2016. Since 2007, investments in horticulture make up approximately 17% of total investments in agriculture (Netherlands Enterprise Agency, 2017).

vegetables (e.g. green beans, tomatoes, cabbages, onions, carrots and hot peppers), flowers (e.g. roses and cuttings), fruits (e.g. avocado, mangoes, pineapples and berries, oranges, jackfruit, apples, passion, bananas etc.) and spices (mainly from Zanzibar; Netherlands Enterprise Agency, 2017). **The majority of farming households produce both for self-consumption and for the market** (Carletto et al., 2017). While maize is still produced primarily for own consumption (roughly 60%; FEWS NET, 2018), an increasing share is commercialised. Other crops have higher shares of harvest being sold (e.g. for rice the figure is between 40 and 50%) and overall market orientation is increasing (Benson et al., 2017). As for fruits and vegetables consumption, home production and market both represent a 50% share (USAID; 2013)

The country has **one of the largest livestock populations in East Africa**, though the contribution of the sector to agricultural GDP is relatively low, estimated at 7.4% in 2015 (CIAT and World Bank, 2017). Traditional breeds of cattle, sheep, goats, poultry, and pigs are the most common livestock types, with cattle accounting for about 50% of total livestock production (FEWS NET, 2018). Livestock is mostly produced in extensive systems, practised by pastoralists and agro-pastoralists on natural pastures. Intensive and semi-intensive systems are common for improved livestock breeds. Pastoralism predominates in arid and semi-arid areas such as in Central Dodoma, Singida, Shinyanga, Simiyu, the north-eastern parts of the country such as Manyara, parts of Arusha and Northern Iringa, and is largely dependent on seasonal rainfall thus making the sector vulnerable to drought (World Bank and CIAT, 2017). Finally, fisheries and aquaculture are growing and represent a main livelihood source on the country's coastline (including Zanzibar and Pemba Islands). However, they still lack important infrastructure investments (World Bank, 2017).

**In the Arusha Region, agricultural production is dominated by smallholders, with maize being by far the most important crop** both in terms of area planted and quantity harvested. Most farmers intercrop maize with other staples such as beans, cowpeas, pigeon peas and sometimes with vegetables, including indigenous ones. Some farmers also cultivate wheat and rice (Ochieng et al., 2017; URT, 2017). There are also a few large-scale farms that grow coffee, vegetables and flowers (Owenya et al., 2012). Coffee is an important cash crop, particularly in Meru district, displaying a mixed production system based on a majority of smallholders (intercropping with bananas) and a few large estates. However, in the last decades, the region has recorded **a major shift in favour of irrigated horticultural production** due to the collapse in the international price of coffee (Istituto Oikos, 2011). Commercially-grown vegetables target both the domestic, particularly fresh urban markets, and the export market. The main crops grown for domestic markets are tomato, onion, and cabbage. Export markets target the high-end produce of these vegetables, as well as more exotic crops such as French beans (Netherlands Enterprise Agency, 2015; Guijt and Reuver, 2019). The **production of vegetable and flower seeds** has also developed (McClafferty and Zuckerman, 2014; Netherlands Enterprise Agency, 2015). Figure 7 provides an overview of crop production in Arusha.



**Figure 7: Main crops produced in Arusha in 2016-2017 (tonnes)**

Source: Authors' elaboration based on the 2016/17 Annual agriculture sample survey (URT, 2017)

In addition, **livestock activities play a key role**, and the region records the highest percentage of households involved exclusively in livestock farming in Tanzania (45.2%).<sup>43</sup> However, livestock-based farming systems are affected by recurrent droughts and unpredictable weather conditions, and the fast growth of the cattle and goat population leads to overgrazing, pushing herders to shift to alternative livelihood strategies or migrate to the southern and coastal regions (SAGCOT, 2012, in FEWS NET 2018; Istituto Oikos, 2011).

#### Box 4: Agro-pastoralists have different food systems

Maasai's traditional diet is based on milk, blood, and meat consumption, with scarce vegetables. Traditionally, food unrelated to pastoral activities was considered "non-food", which was something to eat in periods of extreme economic and environmental adversities (e.g. droughts, famines). More recently, milk and meat were complemented daily by other staple foods such as *ugali*. This dietary change reflects the more general shift of pastoralism to agro-pastoralism occurring in many Maasai communities in Northern Tanzania.

In Mkuru, the village in which our anthropological unit has carried out fieldwork for five months, most Maasai abandoned a purely pastoral life several decades ago. Although they consider themselves herders – Maasai is synonymous with 'people-of-cattle' – and all their cultural life still revolves around pastoral rites and symbols, they have adapted to economic and social circumstances by growing maize and beans. In this way, they limit as much as possible the sale of livestock to buy food. However, this risk-minimising strategy may not be enough to stay within the communities. Many young Maasai men look for jobs in Arusha town as drivers or guards. Young and older women work as seasonal labourers during the tomato season, waking very early and walking a long distance to get a day job at the fields on Mount Meru's slopes.

#### Indigenous vegetables production in Arusha

Popular indigenous vegetables in Tanzania include African eggplant, amaranth, mustard, okra, roselle, spider plant, jute mallow, celosia, cowpea leaf, and African nightshade (Guijt and Reuver, 2019). **The top**

<sup>43</sup> Conversely, at national level, the majority of operators grow crops only (55.8 %), 41.8 % engage in both crop production and livestock keeping and only 2.4 % keep livestock only (URT, 2017).



leafy indigenous vegetables in the researched area in Arusha, common among farmers and produced in large quantities, **are African nightshade, amaranth, and Ethiopian mustard**. These findings are in line with Weinberger and Msuya (2004) and Maro (2008).<sup>44</sup> A distinct advantage of many indigenous vegetable crops is that they can be harvested repeatedly. Shorter growing cycles (21 days for leafy crops) and prolonged harvest periods are considered to be quality traits of different indigenous varieties because they ensure higher productivity. Table 3 shows the average number of harvests of selected vegetables in Arumeru<sup>45</sup> during the same planting cycle. Because of irrigation, most farmers have multiple growing cycles of indigenous vegetables.

**Table 3: Average number of indigenous vegetable harvests per year in Arumeru and their yield per hectare**

Indigenous vegetable	Average number of harvests	Yield t/ha (SD)
Amaranth	9.7	12.87 (6.27)
Nightshade	5.3	3.85 (0.79)
Ethiopian mustard	4.5	11.64 (8.05)

Source: Weinberger and Msuya, 2004

Most farmers devote a quarter of an acre or less to indigenous vegetables, but a large share of farmers devotes half an acre or even a bit more. All the farmers participating in the focus groups **produce both for business and consumption**, but they report that some farmers only produce for self-consumption. We did not encounter large farms<sup>46</sup> producing indigenous vegetables.

Selling indigenous vegetables was found to be an **important coping mechanism** which contributes to the household finance during the dry season and between the onset of long rains and maize harvest, corresponding to the hungry season for households out of stocks. Indigenous vegetables can be harvested in this lean period, as their growing cycle is much shorter than that of maize and even of tomatoes. They can thus be sold to contribute to purchase maize or to cater for other basic cash needs, while preserving household assets. As most indigenous vegetables are watered in this area, they have this role year-round.

### Agri-inputs and farming practices in Arusha

**Fertilisers and pesticides use**<sup>47</sup> in Tanzania is **relatively low** compared to regional averages,<sup>48</sup> although increasing in recent years (AECF, 2016; Benson et al., 2017). Fertilisers and pesticides are largely restricted to the commercial farming sector and used mostly for maize and cash crops. The average fertiliser application

<sup>44</sup> Weinberger and Msuya (2004) reported the following share of households cultivating indigenous vegetables in Arumeru district: African nightshade (71.6%), amaranth (70.1%), and Ethiopian mustard (40.3%). Maro (2008) confirms amaranths to be cultivated by 80% of his sampled farmers, and nightshade by 84%, which is above all other vegetables considered.

<sup>45</sup> Arumeru is the former name of the district covering the areas now under Meru District and Arusha Rural District.

<sup>46</sup> We define large farms as production units which employ hired labour on a permanent basis. Other features of large units are more specialization and bigger acreage than household plots, particularly when the area devoted to one single produce is considered. Large farms of indigenous vegetables (and other leafy vegetables) are very common in Nakuru (see Rampa and Knaepen, 2019) but were not found in Arusha.

<sup>47</sup> The most commonly used fertilisers in Tanzania are Urea, CAN, DAP and NPK, which together account for more than 70% of all fertiliser use (AECF, 2016).

<sup>48</sup> In general, fertiliser application rates in Sub-Saharan Africa remain less than half that of other developing regions, and represent a fraction of the application rates in Europe and North America.

rate is under 20 kg/ha (compared to 100-120 kg/ha in Kenya and South Africa respectively), with many smallholder farmers using no fertiliser at all (AECF, 2016; CIAT & World Bank, 2017). There are also **large regional differences**, with fertiliser use being more common in the southern part of the country (Benson et al., 2017). As for agrochemicals, virtually all products are imported by private companies but, due to the small market size, the menu of available products is often restricted. Besides a thriving **black market** for pesticides, **product adulteration** is common, both contributing to the widespread presence of unregistered and potentially hazardous products. Less than 20% of farming households use any registered chemical products, and awareness of the purpose and proper use of agrochemicals remains limited, particularly among smallholders (AECF, 2016; Lema et al., 2014). Bio-pesticides are also used in some parts of the country (Rajabu et al., 2017).

**In the Arusha Region, intensification of horticulture has led to increased pesticide trading and utilisation**, while the use of traditional methods of pest management has declined (Mrema et al., 2017; Ngowi et al., 2007). However, pesticide use is still deemed relatively low (Everaarts et al., 2015). Insecticides and, to a lower extent, fungicides are routinely applied in vegetable production in this area, and farmers often apply pesticides in mixtures (Ngowi et al., 2007). As for fertiliser, the amounts applied to vegetable crops are considered low or very low, especially for phosphorus and potassium. Potatoes, cucumber, cabbage and tomatoes are the crops with the highest fertiliser application. High costs are one of the main reasons for low amounts applied (Everaarts et al., 2015). Meru DC is the district with the highest area planted with fertilisers (both organic and inorganic) and pesticides, particularly insecticides, due to the higher market orientation of agriculture. The district is well known for the intensive (irrigated and large-scale) tomato production in Ngare Nanyuki ward (URT, 2012; Match Maker Associates Limited, 2008).

**As for seeds, the Tanzanian market is dominated by the informal sector** and most smallholder farmers either keep and recycle seed from the previous season through in-field selection or informally trade in small quantities with neighbouring farmers. A recent survey by TOAM revealed that farmer-managed seed system (i.e. informal systems and Quality Declared Seeds systems<sup>49</sup>) was the major source of seed in all agro-ecological zones in most of the crops grown (TOAM, 2015). Farmer-managed seed systems were used for more than 90% of rice, groundnut, and beans production, and above 60% for sunflower and other crop production. However, the trend was different for maize and vegetables: 45% of vegetables and 46% of maize acres cultivated were planted with seeds from farmers-managed systems. This is explained by the consideration that being a profit-driven undertaking, the commercial seed companies were confined to seeds of hybrid maize and vegetables targeting high potential areas. Conversely, the formal sector accounts for only 10% of the market<sup>50</sup> and the estimated adoption rates for improved seed are extremely low: 27% for maize<sup>51</sup> and just 1% for rice. In general, only around 15% of the seed planted in Tanzania is registered and certified. Low adoption rates are mainly due to prohibitively high prices<sup>52</sup> (AECF, 2016). There are, however,

<sup>49</sup> Quality declared seeds are seeds produced by a registered seed producer, including farmers, which conforms to the minimum standards. The Quality Declared Seed System (QDS) guidelines/protocols, presented by FAO in 1993 and revised in 2006, are aimed at assisting small-scale farmers, specialists in seed production, field agronomists and agricultural extension services in the production of quality seed. The system is recognized by many countries among which Tanzania as an alternative to conventional commercial seeds system, to produce seeds in areas affected by unpredictable rainfall and providing food security to vulnerable households in context of limited access to appropriate improved seeds for a majority of smallholder farmers.

<sup>50</sup> The private sector provides roughly 80% of the formal seed supply, with the vast majority of seeds being imported by large South African and Zambian firms.

<sup>51</sup> Maize is among the most commercial crops in Sub-Saharan Africa, thus the adoption rate for its improved varieties is likely to be substantially higher than for other crops. However, Tanzania has the lowest adoption rates for improved maize seed varieties as compared to neighbouring Uganda (54%) and Kenya (74%). (MacRobert, 2013, in AECF, 2016).

<sup>52</sup> The seed-to-grain price ratio for hybrid maize in Tanzania stands at 10:1, notably higher than in many regional neighbours (World Bank, November 2012, in AECF, 2016). For instance, this ratio in Kenya has halved in recent years – from more than 10:1 in 2005 to 5:1 in 2012 (World Bank, January 2013, in AECF, 2016).

large spatial differences: a greater share of farmers in the northern and central regions of Tanzania use improved seeds than in southern and coastal areas (Benson et al., 2017). This includes **Arusha**, where, **thanks to the excellent climate conditions, the production of vegetable and flower seeds has developed**, with several companies supplying from seed-producing farmers in the region (McClafferty and Zuckerman, 2014).

The **level of mechanisation** of Tanzanian agriculture is **low** but it has seen a constant increase since the mid-1990s (World Bank, 2017). The use of hand-held tools dominates in the farming systems, including in the Arusha Region, while the use of animal traction or machinery is low (estimated respectively at 24% and 13% (Lyimo, 2011).

Moreover, **only 2.5% of the land in Tanzania is under irrigation. Arusha is the fourth region for irrigated planted area** (6.4%), following Kilimanjaro (22.6), Dar es Salaam (18.2) and Mbeya (10.2) regions (URT, 2017). Most of it is located in Meru DC (URT, 2012). In Arusha and Meru districts, most farmers practice irrigation and the main source is surface water. Private or village shallows are also used. The most common technology is stream channels while stocking rainwater or employing pumps is less widespread, and drip irrigation much less developed.<sup>53</sup>

### **Sustainable production practices and conservation agriculture in Arusha**

Different farming techniques and land management practices affect farm productivity and profitability and can lead to differentiated socioeconomic and environmental outcomes. One way to distinguish farming systems is based on the share of production derived from external inputs (synthetic or biological) or ecosystem services (Therond et al., 2017). **Chemical input-based production systems** can increase agricultural yields, often by highly specialising in key staple crops (Duru et al. 2015). However, increased productivity can come at the expense of natural resources availability and quality, leading to biodiversity loss, reduced crop diversity and soil fertility. For instance, fertiliser use in Tanzania, in the absence of preliminary soil tests and capacity building of farmers and extension workers, contributed to environmental degradation (CIAT and World Bank, 2017). **Biological-input based farming systems** aim at decreasing impacts on human and environmental health by replacing some or all chemical inputs with biological ones. Iconic examples include organic agriculture<sup>54</sup>, agroforestry and integrated crop-livestock systems. **Biodiversity-based farming systems** strive to optimize ecosystem services provided by biodiversity and drastically reduce the reliance on external inputs (Therond et al, 2017). Developing or stimulating plant and animal diversity is a central principle in these systems, together with a balanced exploitation of natural resources such as soil and water. Strategies include: planting hedgerows and flowers to attract pollinators and natural predators; rotational or intercropping with leguminous crops to fix nitrogen; the use of cover crops to reduce evaporation and other practices to increase soil life. These methods can reduce costs and increase self-sufficiency, build soil health, fight desertification and improve long-term resilience to climate change and other environmental and economic challenges (Snapp et al. 2010; Lin, 2011). Conservation agriculture and agro-ecological approaches<sup>55</sup> share many of these principles.

<sup>53</sup> UNIMIB Sociology survey (2019).

<sup>54</sup> Organic agriculture is defined as 'a production system that sustains the health of soils, ecosystems and people. It relies on ecological processes, biodiversity and cycles adapted to local conditions, rather than inputs with adverse effects' (IFOAM, 2009). 'Organically produced' does not automatically coincide with 'environmentally sustainable', as most organic standards and norms prohibit chemical inputs but do not provide for, say, water and energy usage requirements, or minimum crop diversity.

<sup>55</sup> Agroecology is defined here as an holistic approach which combines ecological principles with the use of affordable, locally available resources and locally adapted technologies and the inclusion of indigenous knowledge. It also considers the broader political-economic aspects of agriculture and food and is action-oriented, aiming to build a sustainable and equitable food system (Méndez et al. 2013).

### Box 5: Benefits of Conservation Agriculture

Conservation agriculture (CA) combines soil management practices, including reduced soil disturbance (i.e. no tillage) and permanent organic cover, with crop rotation and biodiversity preservation. *'It enhances natural biological processes above and below the ground surface, which contribute to increased water and nutrient use efficiency and to improved and sustained crop production'* (FAO, n.d.). It doesn't, however, exclude the use of agrochemicals, although by building soil fertility and using cover crops or soil cover by plant residues the use of synthetic inputs can be minimised. Fields managed under CA have higher carbon and nitrogen content (Montanaro et al. 2017) and can perform better in terms of soil microbial diversity (Vasileiadis et al., 2012; Baraniya et al., 2016; Delgado-Baquerizo et al., 2016; Jansson & Hofmockel, 2018). Another important advantage for farmers is the time and labour reduction (between 30 and 40%) derived by not tilling the soil and the increased resilience to erosion and water leaching (Dumanski et al. 2006). Moreover, CA adoption increases the absorption of greenhouse gases (mainly CO<sub>2</sub> and N<sub>2</sub>O; Gonzalez-Sanchez et al., 2019). These factors are highly relevant to Sub-Saharan farming systems where soil erosion and fertility loss are major environmental constraints and yields improvements are limited by lacking infrastructure and technology (Mkonda and He, 2017). In this context, CA practices hold great potential to enhance resilience, productivity, and profitability, while conserving biodiversity.

Currently, research on uptake and impact of these approaches in Sub-Saharan Africa is limited. In Tanzania, Mkonda and He (2017) found that CA adoption trends vary in time and space, with semi-arid and environmentally stressed areas being likely to adopt CA, particularly in the central and northern parts of the country. Practices differ depending on the topography, soil and available indigenous knowledge. In some regions, CA practices have been sponsored by development projects and have led to improved soil fertility and increased crop yields.

In Arusha, **SASS researchers** from UNIMIB Animal and Plant Biodiversity and Biotechnology and UNICATT Soil Biology **mapped the distribution of different agricultural practices in urban and rural contexts**,<sup>56</sup> including field management (e.g. intercropping, green manure, cover crops, fallow), cultivated crops (species, crop rotation) as well as use of chemicals and/or technological inputs. They also **assessed their impact** on animal and plant biodiversity (including pollinators), soil fertility and functional biodiversity.

Their results indicate that **most organic farms** do not use any agrochemical products and sometimes employ natural pesticides and manure. They also **adopt CA strategies** such as intercropping, crop rotation and no-tillage. However, many rely on such practices because of lacking mechanisation rather than as a conscious choice. The UNIMIB Sociology survey confirms these findings. Their data shows that machinery is not common, while intercropping, crop rotation and the use of manure and organic compost is quite widespread. Tree planting is also widely used.<sup>57</sup> Fewer farmers practice no-tillage or conservative tillage or employ natural pesticides. **These cultivation strategies support agroecosystem conservation**: the preservation of meadows and/or woodlands in rural areas favours spontaneous biodiversity, and the scarce use of herbicides guarantees a natural vegetation cover of the fields during the resting phases. In addition, organic/CA practices better support pollinators by providing more stable and diverse resources that ensure benefits to insect communities. No significant differences in terms of the total number of plant species were found among the investigated farms. However, occurring species were quite different depending on the farm visited and **a greater variety of plant species was observed in organic farms**. The occurrence of invasive plant species did not differ significantly based on management.

<sup>56</sup> The sample included 20 farms (see Figure 4). Most of these farms were organic (targeted by Istituto Oikos), with a few settled in the urban area. Additional data on non-organic farms were retrieved through a collaboration with the African College of Wildlife Management.

<sup>57</sup> Almost all respondents (94/100) manage trees in their land for a variety of reasons: mostly for fuel (79) and timber (65), but also for food and fruits (50), as well as for shelter and shadow to the soil and the land (38).

Some biological and agronomic challenges were identified: (i) the adoption of agrochemicals and antibiotics for breeding can cause **alterations in the agroecosystem due to the use of manure rich of antibiotics**, which depletes the microbial diversity of the soil, harming fertility; (ii) the **use of herbicides favours the spread of resistant weed species**; (iii) there is a growing demand for mechanisation while the principles of organic and/or conservation agriculture are disseminated and known mainly in associative realities. **Although the literature reports conservation agriculture models, findings suggest that this practice is not as widespread and well structured.**

At the urban level, the distribution of agricultural soils is patchy, but, in some areas, there is an **intensification of urban gardens, where horticultural products are grown, including indigenous vegetables**. These areas act as corridors, in terms of ecological connectivity, for many animal species thus supporting biodiversity and ecosystem conservation. Themí Garden is an example of such corridors.

### **Input use and agricultural practices in the indigenous vegetables chain**

Existing literature suggests that **fewer inputs are necessary** for the production of indigenous vegetables than for exotic vegetables (Weinberger and Msuya, 2004). Thus, indigenous vegetables seem particularly attractive for small-scale farmers as they require relatively little financial input and, consequently, the risk of financial losses is smaller than for most of the exotic vegetables. However, low input intensity is partially due to the general rule according to which crops for which market involvement is higher are produced with higher levels of variable input. Lower input intensity is not confirmed by other sources (Maro, 2008). According to Maro (2008), indigenous vegetables seem to have higher input intensity when commercial inputs are considered (pesticides and fertilisers) and also when labour intensity is considered. Indigenous vegetables seem to have lower input intensity only for seeds.

Table 4 shows the share of cost associated with different items in indigenous vegetables production and shows that more than half of the input cost comes from chemical fertilisers and pesticides used. Rajendran and Afari-Sefa (2015) also model indigenous vegetables output based on input use and find that average farm output is highly sensitive to changes in manure, inorganic fertiliser and labour and irrigation costs. **Output is more sensitive to labour, share of irrigated area, and manure rather than for pesticides**, which is consistent with the low input intensity assumption. Conversely, farm output seems to be **less sensitive to the cost of seeds, because this doesn't increase when farmers increase their use of own-saved seeds** (Rohrbach et al., 2003; Afari-Sefa et al., 2013).

**Table 4: Share of different cost items for indigenous vegetables production (%)**

Crop	Labor	Inputs					Marketing	Rent	Other	Total variable costs
Amaranth <sup>1</sup>	48.5	48.4					2.9	0.2		100%
Ethiopian mustard <sup>1</sup>	1.4	89.1					8.5	1.0		100%
Nightshade <sup>1</sup>	9.1	88.7					2.3	0.0		100%
Indigenous vegetables <sup>2</sup>		Seed	Manure	Chemical fertilizer	Pesticide	Irrigation				
	20	3	12	18	20	16			10	100%
		69								

Source: <sup>1</sup>Weinberger and Msuya (2004); <sup>2</sup>Rajendran and Afari-sefa (2015)

As for most crops, in fact, **farmer-managed seed systems are the major source of seeds** for indigenous vegetables varieties. Estimates suggest that 70-75% of indigenous vegetable seeds come from the informal sector, whereas the semi-formal and formal seed sector together constitute 25-30% (Ellis-Jones et al. 2008, in Rajendran et al., 2016). Approximately 15% of all indigenous vegetable seeds used were probably certified seed in 2004, while another 8–10% were quality declared seeds. Interestingly, while the share of seeds purchased in the market appears low, these figures were still higher than for staple crops at that time.

In our study area (Usa River and Oldonyo Sambu), **agricultural inputs are mostly produced by the farmers or exchanged among them**, particularly in the case of farmers who practise organic farming, who can produce organic fertilizers, pesticides and seeds. **Farmers who do not practice organic farming rely on agro-vet shops** to purchase inorganic fertilisers and synthetic pesticides, but **only a few purchase seeds**. Intercropping with indigenous vegetables is not very common (Weinberger and Msuya, 2004). However, on some occasions, spontaneous growth of these vegetables occurs resulting in intercropping as a result of farmer's decision to let it grow together with seeds sown.<sup>58</sup>

Moreover, most farmers in Arumeru (76%) have irrigated indigenous vegetables plots and some farmers (22%) don't even produce during the rainy season, as heavy rains damage the produce and make access to markets challenging (Weinberger and Msuya, 2004). Lotter (2014) found 100% of the production in Arusha markets coming from plots with irrigation. Our research confirms these findings, and in both our study areas

<sup>58</sup> Field visits by UNIMIB-UNICATT teams in 2018.

**farmers have access to irrigation, or at least to sources of water like streams and tap water, for the production of vegetables.** Sprinklers, furrows, water cans, and drip irrigation are the technologies adopted.

### **Food processing and value addition in Tanzania and Arusha**

Food processing encompasses a varied range of activities, *'from minimal washing, cleaning and packing (e.g. spring mix) to complex manufacturing (e.g. cured meats)'* (Gaspard, 2019). It is an important activity in the food supply chain: processing can extend products' shelf-life and prevent waste; increase the bioavailability of nutrients and improve food safety by destroying food-borne microbes and toxins. It can also improve food's palatability and convenience, reaching consumers with limited time and space to cook. However, processing can also decrease the nutritional value of food, for instance by removing key nutrients or adding unhealthy ingredients such as unnecessary high levels of salt and sugar and unhealthy fats. Value addition activities vary widely: in traditional food systems staple cereals may be milled into flour and fruits and vegetables may be dried, packaged and transported to local markets; while in modern systems foods are more heavily processed and sold canned, frozen, and ready for consumption (HLPE, 2017).

### **Tanzania is experiencing rapid food system changes, particularly at the retail and processing stages.**

This is happening mostly in urban centres, but with wide disparities across cities. Food processing is one of the largest industries in the country and is made up of micro, small, medium and large processors. The largest sectors include brewing, milling, baking, animal and vegetable oils, sugar, dairy products, fruits and vegetables, soft drinks, fish and meat processing, among others (Ruteri, 2009). A recent inventory of selected processed food products in Dar es Salaam, Arusha, and Mwanza retail outlets identified around 950 products across five categories (maize and other flour products; packaged rice; dairy; fruit juices; and poultry; Ijumba et al., 2015). The milled grains industry (maize, blended, and other flour products) in all three cities is dominated by Tanzanian firms, with highly localised products. This industry is still largely in the firm proliferation phase, recording in recent years a rapid surge of micro-firms – largely undifferentiated in terms of quality and product type. However, consolidation is starting in Dar es Salaam and Arusha, with the rise of small to medium size firms investing in quality differentiation and marketing (e.g. Power Foods in Dar es Salaam and Med Food Products in Arusha). For packaged rice, dairy, and juice, Tanzanian firms have a respectable presence in the market but imports are still largely dominant. Nonetheless, regional firms are competitive with international ones. As for poultry, virtually all products are nationally produced, usually in the city where they are sold (Ijumba et al., 2015).<sup>59</sup>

However, the Tanzanian food industry still faces several challenges, including limited access to modern technology, processing equipment, and technical know-how; costly, imported, packaging materials; limited access to finance; limited investments in research and development, and insufficient physical infrastructure (Ruteri, 2009).

Interestingly, **Arusha was identified as the city where most food processing transformation has occurred.** Despite being much smaller and having fewer companies than Dar es Salaam, Arusha displays greater quality differentiation (measured by the complexity of packaging) and has a well-established food processing industry with numerous semi-national or nationally representative medium-sized companies. It also has a higher share of international products, including imports from neighbouring countries, compared to Dar es Salaam (Ijumba et al., 2015).

<sup>59</sup> Generally, processed poultry products are found only in supermarkets or modern butcher shops, and target middle and upper income consumers, while in traditional markets live chickens are commonly slaughtered/processed for customers and restaurants by shopkeepers (Ijumba et al., 2015).



### Processing and value addition in the indigenous vegetables chain

The available literature suggests that proper handling and processing of indigenous leafy vegetables in Arusha is very limited, and most vegetables are **sold fresh, loose, and without packaging**. Maro (2008) found that farmgate buyers harvest indigenous vegetables themselves and bear the costs of harvesting and packing. Most retailers and some wholesalers divide the vegetables purchased into small bundles tied with plastic rope or banana plant fibre. Most vegetables received are packed in polyethene bags of around 50 kgs. **Value addition is absent and indigenous vegetables are mainly handled and sold fresh, loose and not sorted**<sup>60</sup> (62%), particularly amaranths and African nightshade. Fresh loose sorted sold crops were 38% (Maro, 2008).

Lotter (2014) found that **harvesting was carried out in the late afternoon to prepare the vegetables for early morning transport to the market**. Of the growers sampled<sup>61</sup>, 60% did not wash the produce, while 32% washed with tap or drinkable water, and 8% used non-drinkable flowing water from streams and irrigation canals. Culling with one sellable grade was done only by 31%, the remainder cull in the field by selective harvesting of desired plants. The majority of the sellers/producers (83%) bundled the indigenous vegetables with a fibre tie, while the remainder was sold loose. Packaging for transport generally consisted of nylon-reinforced plastic bags (approximately 1m x 0.5 m) with a small percentage using the same type of bag inside a basket. Pre-transport storage averaged 8.6 hours (overnight). **None of the sellers had access to refrigerated storage**, which generally does not exist in Tanzania's public markets. When asked how much they would pay for each half-day of refrigerated storage for 5 kg of produce, 70% of sellers could not answer or were not interested, and this percentage rose to 100% in Arusha. In terms of value addition, 40% of sellers did no processing. Some slicing, crushing and sun-drying processing was reported for cowpeas, pumpkin and sweet potato leaves (Lotter 2014).

Our research confirms such findings, as **virtually no processing was found in the Arusha area**. Drying indigenous vegetables is **technically feasible** for small-scale processors operating in the sector with simple solar drying techniques, **but other crops are higher in demand** and more profitable (lemongrass and hibiscus are the most common dried products). For example, the Tumaini group from Kingori village, nearby Arusha, was supported by USAID and operates small-scale drying facilities at the Lutheran church. They explain that drying indigenous vegetables is not a good business activity during the rainy season. Some indigenous vegetables processing is done between July and September when the purchase price is low but rains are over so that sun-drying is possible. They only sell in Kingori village, but the demand is low. According to the members of Tumaini group, **dried indigenous vegetables should be promoted as a complement to the staple for the dry season**, instead of the so-called *daga*, the popular small fishes, that need more complementary ingredients, while dried vegetables only need onion and oil.

### Food distribution in Tanzania and Arusha: storage, transport and trade

The crucial role of distribution in food systems is often overlooked - for example in SDG 2 (Veldhuizen et al., 2020) – which earned it the nickname 'hidden middle' (Reardon, 2015). Food distribution encompasses storage, transport and trade. Together, these activities ensure consumers get access to safe and nutritious food while minimising food losses and waste (HLPE, 2017).

<sup>60</sup> Sorting is the selection and rejection of bunches and leaves so that the produce sold does not include leaves which cannot be consumed.

<sup>61</sup> Lotter (2014) sampled a total of 160 sellers of indigenous vegetables in four regions of Tanzania, with attention to post-harvest management.

Storage allows farmers to extend the shelf-life of the harvest and to await favourable prices. However, storage and distribution of perishable foods are subject to the risk of contamination<sup>62</sup> and food losses, with negative consequences for diets and health. Perishable foods such as fruits, vegetables and animal-sourced foods require cold chain storage unless consumed within a short time. But these facilities are often not available in rural areas in many low-income countries. Furthermore, the storage of food crops directly affects the variability of market prices and has an impact on farmers' income. **In Tanzania, there are numerous constraints relating to inadequate storage, preservation of fresh fruits and vegetables and other food products and shelf-life enhancing infrastructure.** Poor storage facilities, lack of vehicles for transport, limited knowledge on value addition, and insufficient market information contribute to post-harvest losses and food safety threats while compromising the temporal and spatial distribution of food products across the country. Crop loss may happen at different stages of the chain, e.g. during and after harvesting, processing, transport and marketing. The maize value chain, for instance, records high proportions of post-harvest losses, ranging between 10-15% of annual production (FEWS NET, 2018). The primary causes are pest infestation and biological deterioration, together with poor handling, improper packing and low quality of warehouses (AGRA, 2014; CEPA, 2016; ECDPM and ESRF 2015). In addition to physical losses, product quality can be lost along the supply chain, leading to large price discounting in markets (Mutungi and Affognon, 2013). **In Arusha, food storage systems are inadequate, thus often forcing farmers to sell their crops immediately after harvest, when prices are lowest, and to buy at a high price the same products in periods of drought** (Istituto Oikos, 2011).

Transportation is a transversal sector in the whole food supply chain. Most goods in Tanzania move by road. The road network stretches for 86,472 km<sup>2</sup> and supports 70% of freight transport.<sup>63</sup> **Poor road infrastructure and high transportation costs** hamper the access to domestic input and output markets and limit the efficient flow of food from surplus producing areas to deficit areas within the country (FEWS NET, 2018). While major trunk roads are adequate, minor and rural roads may be poorly maintained and become impassable, especially during the rainy season. **As a result, many of the rural areas are substantially remote from markets, critically reducing farmers' ability to sell their products.** Given that most smallholders produce relatively little marketable output, returns from bringing the product to the market may not justify the time and expense incurred in travel. This affects their crop choices (for instance, diminishing the attractiveness of perishable crops such as fruits and vegetables), input use, and the overall profitability of harvested commodities. Nearly two-thirds of Tanzanian farmers sell their produce at farm-gate rather than carrying it to a nearby market (Derksen-Schrock et al., 2011). This also leads to substantially higher food prices in urban areas due to transport and transaction costs (Adam et al., 2012). **In Arusha, the absence of public transport makes farmers dependent on intermediaries** (e.g. entrepreneurs owning trucks, lorry drivers, porters<sup>64</sup>) **and traders that provide transport services from the production areas to the markets.** Farmers and intermediaries hire the means of transportation plus drivers and often accompany them. Farmers are usually only involved in transport from the field to the farm and, in some cases, they arrange transport from the farm to the markets, especially to the local markets in Arusha.<sup>65</sup> Gathering the production in bigger volumes makes it more attractive for traders to buy the produce, either at farmgate or at aggregation markets in rural areas, where buyers and sellers meet (König, 2008).

<sup>62</sup> If not dried and stored properly, many staple foods risk aflatoxin contamination, which in turn may lead to diseases such as liver cancer and may be linked to stunting in children (HLPE, 2017).

<sup>63</sup> There are also two separate railways and five international airports. The main marine ports are located in Dar es Salaam, Mtwara and Tanga. Over 90% of total ocean freight is handled by the port in Dar es Salaam (FEWS NET, 2018).

<sup>64</sup> Porters comprise handcart drivers, engaged in transporting commodities from wholesale to retail markets, and carriers who load, unload, and carry the goods in the production areas and at the markets. In some cases they also perform the grading and repacking (König, 2008).

<sup>65</sup> Sometimes, farmers who take over transportation are able to bring the produce to markets located further away, such as in the bordering regions of Manyara and Kilimanjaro.

Diets are increasingly globally sourced (HLPE, 2017), leading to a 'distancing' or decoupling of production and consumption sites (Clapp, 2015). However, most food in developing countries is still sourced regionally (Holt-Giménez, 2009) and the degree of long-distance trade depends on the region and crop characteristics. Marketing channels may differ depending on the crop considered and various types of markets exist which may be near or distant from farming communities (HLPE, 2017). Markets may also differ in terms of structure and product range and shape the food environment in which consumers make purchasing decisions (HLPE, 2017).<sup>66</sup> **In Tanzania, a large network of traders supports the collection, distribution and retailing of staple foods across the country** with no significant barriers to entry. Marketing channels range from direct selling to more complex structures, involving many intermediary buyers and processors. Marketing channels may also display varying degrees of efficiency and competitiveness, as well as different levels of formality. **Dar es Salaam is the key destination market of the most important marketing corridors for staples** originating in the surplus producing regions of Rukwa, Mbeya, Njombe and Ruvuma. **Domestic staples, particularly cereals and pulses, are also exported to neighbouring deficit markets** in Eastern and Southern Africa. In general, Tanzanian markets are characterized by inadequate adherence to product quality standards, grades and post-harvest management (FEWS NET, 2018). Price volatility is common for most crops and is linked to the harvest cycle, but also to bad road conditions and weak producers' bargaining power (Istituto Oikos, 2011). For what concerns livestock, primary markets are managed by local authorities while secondary and border markets are dealt with by the Tanzanian Ministry of Livestock and Fisheries. There is poor horizontal and vertical coordination between livestock producers and processors, and most markets lack the required infrastructure to enforce existing laws on weighing, grading and auctioning. Quantifying livestock trade with neighbouring countries is difficult due to the frequency of grazing across national boundaries (FEWS NET, 2018).

**For the fruit and vegetable sector**, we distinguish two sub-sectors: high-volume and high-value trade. **High-volume trade includes vegetables produced and traded in large quantities** (lorries of one product) and consumed locally such as tomatoes, onions, cabbage, carrots and sometimes sweet pepper. **High-value trade refers to vegetables traded in smaller volumes and typically in mixed loads.** It includes non-traditional crops such as leek and zucchini, processed products (e.g. packed, dried, pulps, juices), or labelled products – such as organic, Fairtrade or Global G.A.P. High-value trade may also apply to tomatoes, cabbage or carrots but then of high quality for specific buyers. Each value chain has not only different quality, food miles, and product range, but involves different dynamics and actors (Match Maker Associates Limited, 2008). **High-volume trade is diversified and informal, characterised by spot transactions with a central role for the broker that negotiates deals between buyers and sellers.** The seller can be either a farmer or a small intermediary. The buyer could sell large quantities to others (a wholesaler) or small quantities to end-consumers (a retailer). The broker pays the seller when the goods are sold. Many traders and brokers are specialized on a certain product and frequently work closely together while making it difficult for newcomers to enter the trade (Match Maker Associates Limited, 2008; König, 2008). The majority of the produce is distributed in local markets, while intra-regional trade in vegetable crops (e.g. tomatoes, onions, or cabbages) only accounts for a small proportion. The percentage varies by commodity mostly due to differences in shelf-life. Oversupply in local markets is common, especially during peak seasons, due to weak market knowledge, and lack of processing or alternative use opportunities (USAID, 2013; Mutungi and Affognon, 2013). **High-value trade is highly organised and formal as it works on a contractual basis.** The trade exploits modern technologies such as refrigerated air freight, cold storage, and packing houses, which are unavailable to the high-volume trade. The buyer is usually a big exporter, processing company, or supermarket chain, which demands quality, continuity and reliability. Sometimes contracts require quality or safety standards compliance (Match Maker Associates Limited, 2008; König, 2008).

<sup>66</sup> For a discussion on the food environment and a detailed description of the food businesses and markets existing in Arusha City we refer to section 3.2.2.

**The Arusha region is among the most productive areas for fruits and vegetables** thanks to its temperate climate. Besides, **Arusha's urban area is a commercial cluster because of its food businesses, markets, and the small distance to Kenyan markets and airfreight hub of the Nairobi airport.** Through Arusha's food businesses and markets, food from all the regions of Tanzania and neighbouring countries reaches hundreds of thousands of final consumers; and from the same markets, food produced around Arusha is traded across Tanzania and exported to Kenya, other East African countries, and to the world.

### Marketing indigenous vegetables

Among the farmers who produce indigenous vegetables, Weinberger and Msuya (2004) found that 88% also market them and the proportion of harvest sold is above 60% for African nightshade, amaranth and Ethiopian mustard. The share of marketed and non-marketed indigenous vegetables in overall household income in Arumeru was respectively 8.8 and 3.8, accounting overall for an estimated 12.6% of total income (Weinberger and Msuya, 2004). This percentage is high if we consider that the same authors find the share of total cultivated area devoted to indigenous vegetables to be only 2.8<sup>67</sup> and implies **profitability of indigenous vegetables to be higher than average compared to other crops.** Table 5 compares the net value of production per acre found by Maro (2008) in Arumeru with that estimated by Weinberger and Msuya (2004).<sup>68</sup>

**Table 5: Net value of production per acre (TSh 2017)**

	Source	Nightshade	Amaranth
Costs per acre	Weinberger and Msuya 2003	338,688	1,187,439
	Maro 2006	621,876	703,243
Revenues per acre	Weinberger and Msuya 2003	1,637,151	3,111,222
	Maro 2006	6,233,906	7,184,785
Revenues - cost per hectare	Weinberger and Msuya 2003	1,298,463	1,923,784
	Maro 2006	5,612,042	6,481,544

The net value per acre calculated by Maro (2008) is much higher than that calculated by Weinberger and Msuya (2004). The difference between the two sources seems to be driven by higher revenues, rather than by clear differences in the costs, possibly due to improvements in the relative price of indigenous vegetables over time. In fact, Weinberger and Msuya find **the willingness to pay of consumers in Arusha to be much higher than the actual price of indigenous vegetables on local markets** (almost double for amaranth and more than double for nightshade).

<sup>67</sup> This does not refer to Arumeru alone but to all study areas in Tanzania (for comparison the average share of income in all areas was 12.9%).

<sup>68</sup> Both figures are deflated to 2017 Tanzanian shillings.

Maro (2008) also provides some comparison between leafy exotic and indigenous vegetables. His findings indicate that **indigenous vegetables are more profitable for farmers than exotic leafy vegetables** (see Table 6). Despite Maro comments that this is due to multiple harvests and low production costs, higher margins seem to be driven by revenues (higher prices and/or higher yields resulting from multiple harvests) rather than driven by lower cost. Similarly, Mwaniki et al. (2008) find that the price per kg of amaranth in Dar es Salaam is similar to that of onions and **higher than that of other exotic vegetables** considered (carrots and tomato).

**Table 6: Comparison of indigenous and exotic leafy vegetables profitability (TSh 2017/kg)**

	Nightshade	Amaranthus	Chinese cabbage	Spinach
Variable costs	621,875.74	703,242.78	555,341.28	192,438.01
Revenues	6,233,917.99	7,184,787.00	2,121,987.00	1,012,849.28
Net value per hectare	5,612,042.25	6,481,544.22	1,566,645.72	820,411.28

Table 7 summarises the available data on indigenous vegetables final prices. We notice that, while the price of amaranth was found to be higher than that of nightshade in the older study (Weinberger and Musuya 2004), the opposite is found in more recent studies (Maro 2008; Mwaniki 2008; Lotter 2014). The deflated prices registered in 2012 are much higher than 2003 prices, revealing that the nominal increase is not explained by inflation. The increases implied by Mwaniki's data are even higher, although they are from 2008, but they refer to Dar es Salaam. Lotter (2014) reports that, on average, sellers in Arusha estimate an **increase in wholesale prices since 2008 of 50%**.

**Table 7: indigenous vegetables final prices from the literature review (TSh 2017/kg)**

Source	Amaranth	Nightshade
Lotter: Dodoma, Arusha, Morogoro, and Iringa 2012	895	1065
Mwaniki: Dar es Salaam 2008	3009	1741
Maro: 2008	876	1952
Weinberger and Musuya: Arusha 2003	552	517

**Most sales of indigenous vegetables take place at farmgate**, in line with Keller (2004), Maro (2008), and Lotter (2014).<sup>69</sup> **Prices at farmgate are lower than final market prices.** Lotter (2014) reports that producers

<sup>69</sup> Keller (2004) found that almost three out of four farmers in Arumeru sell their indigenous vegetables at farmgate, mostly to traders but also to village consumers. Only one-third of the product is sold directly at markets. The proportion

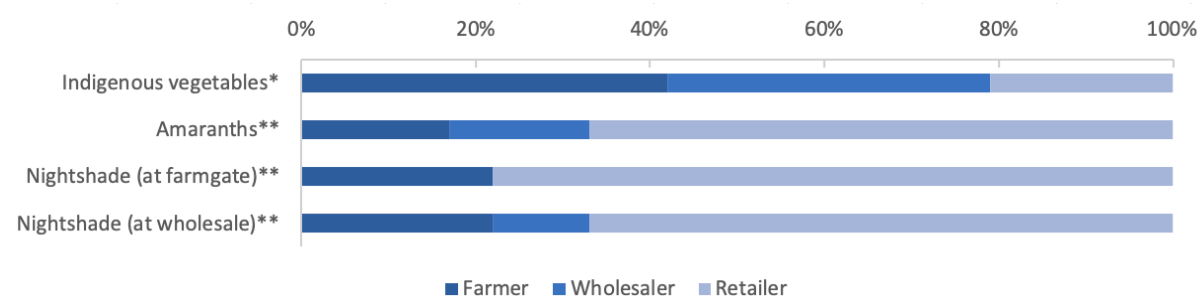
generally sell indigenous vegetables to wholesalers by 'bed' (which is approximately 40-50 kg) and that a bed can have a widely varying price: minimum prices, when supply was high, were found to be around 400 TSh per kg (536 in 2017 TSh) or even 200. Lotter (2014) also provides a nice thumb rule: a standard bed equals a big bag (nominal value 100 kg maize). Its price can go from 10,000-20,000 TSh in times of high supply, up to 100,000 in times of shortage. The former scenario of surplus supply, however, was the more common of the two, according to producers.

**Failure to sell timely is the main concern for indigenous vegetables traders, due to high perishability of the crop.** Thus, retailers purchase quantities that can be sold with minimum loss resulting from unsold produce. Nonetheless, Lotter (2014) in his survey on 160 traders from Dodoma, Arusha, Morogoro, and Iringa markets, found that 62% of sellers store unsold produce and sold it the next day with an average end of business day discount of 13%. Two-thirds of the sellers rented table space in a market (67%), 20% sold from a piece of plastic laid on the ground, and the rest were mobile (basket on head alternating with sitting) verbally promoting sales.

Maro (2008) considers three markets in Arusha (Central Market, Tengeru and Kilombero) and finds that **leafy indigenous vegetables are not transported far away**. Only African eggplant, less perishable, is transported to Dar Es Salaam. This is in line with Putter (2007), who reports that more than 90% of leafy vegetables supply in Dar es Salaam comes from production in the city itself. Also, Lotter (2014) finds that **average distance to market was 11.5 km**, taking one hour generally inside a passenger van (48%), a hired truck with covered bed (29%), or bicycle (13%).

Weinberger and Pichop (2009) and Maro (2008) find margins of different actors in the value chain to be as shown in Figure 8. It should be noted that the definition of wholesaler and retailer is sometimes fuzzy and there is a possibility that retailers buy straight from farmers at farmgate.<sup>70</sup> While differences between the two sources are there, both point to a **low farmer share when compared with the combined share of traders**. However, data doesn't account for the respective costs borne by the actors.

**Figure 8: Margins of farmers, wholesalers, and retailers for indigenous vegetables**



Source: \*Weinberger and Pichop, 2009; \*\*Maro, 2008

**SASS researchers in Arusha found** that the net value of production of indigenous vegetables per hectare as calculated from individual plots records of focus groups participants is 2,661,655 TSh 2019, which, even after deflating to TSh 2017, stands in between the estimates of Weinberger and Msuya (2004) and Maro (2008; see Table 5).

of farmers selling at farmgate is even higher according to Maro (2008) who finds that 62 out of 75 farmers surveyed sell at their farm or garden.

<sup>70</sup> Maro (2008) assumes that also retailers purchase indigenous vegetables from farmers and, possibly as a consequence of this assumption, finds high retailer margins when compared with margins of wholesalers.

**Most traders book the plot<sup>71</sup> in advance, with an unwritten contract** with the farmers who can't harvest anything from the field until the produce is ready for the trader to come and harvest. Contact between the farmer and the selected trader is frequent thanks to mobile phones. Sorting and packing is also done by the buyer. Producers with higher acreage sometimes sell in bulk to bigger traders who negotiate the price of the plot, without entering into detail about the number of bags, kgs or bunches which will be harvested from it. **This, however, doesn't mean that the buyer bears the risk of crop failure or low yield because the price is only negotiated at the time of harvesting** when the performance is already observable. Smaller buyers negotiate the price per bag and bunch (i.e. negotiate the number of bunches in one bag and the dimension of the 500 TSh bunches).<sup>72</sup> Big buyers, who don't buy regularly, use a small truck; other traders, who visit farms more regularly, use motorcycle taxis, donkeys and carrying the vegetables on their heads. From the tarmac road, *dala-dala* minibuses are also used. The majority of farmers prefer farmgate buyers because this option reduces the risk and there is a possibility of communicating before the harvest so that upon maturity the buyers are identified. It is also safe because the negotiation and payment is done on the day of purchasing goods. Few farmers who are involved in business (entrepreneurs and traders) suggest that selling wholesales at the market is better. Payment is done at delivery, which is not in line with Maro (2008) and could correspond to an increase in farmers power in the market, as demand risk is transferred on traders. The produce is not weighted at any stage.

**Some farmgate buyers are retailers, some are wholesalers, some adopt a flexible business** model changing from time to time. This means that retailers can buy directly from farmers without passing through wholesales and partially explains the challenges found in the literature about wholesalers and retailers' margins.

**Farmers themselves reach out to markets when farmgate buyers are not available**, which happens especially during the low season when there are a lot of vegetables and the price is too low. Farmers sell in the early morning to the traders in the respective markets. Selling to retailers is not a preferred option because retailers tend to pay the supplier only after they have sold the produce. Farmers face a risky situation in this case, as the retailer may pay low giving reason that he/she could not sell well. This is the only case of delayed payment reported during focus groups, which stands in contrast with findings from the literature (Maro 2008). Lastly, farmers sell in retail in their respective neighbourhoods but, despite positively rated in terms of profitability, this trade accounts for a small share of the total due to the low volume demanded.

<sup>71</sup> The typical plot dimension is 7x3 m.

<sup>72</sup> The standard bunch price is 500 TSh. Sometimes retail bunches for 200 TSh are found. However, these prices do not reflect a standard quantity. As a matter of fact, informers met in the markets seldom refer to prices per kg and, to describe price variability they do not refer to changes in prices for a constant quantity, i.e. a kg, or a standard bunch. They instead refer to changing quantities for a given price. The quantity is the variable that is adjusted across seasons and periods to reflect the relative scarcity of vegetables. The inversion between quantity and price, with price remaining fix and quantity adjusting, is of course only apparent and it can easily be addressed by people mastering basic mathematics and technologies like scales and calculators that can easily calculate the unit price corresponding to different bunches' dimensions. Nonetheless, this system leaves rural people and small traders without a reliable reference other than subjective estimations and memory. The prices are expected to convey market information and the price of a product is expected to change while the product and its quantity remain constant, so that it is possible to make meaningful comparisons. Given the lack of scales and the low use of the few available in the markets and at the farm gate, this system generates big uncertainty and information asymmetries.



**Table 8: Prices and shares\* of indigenous vegetables at farmgate, wholesale, and retail**

Type	Farmgate price	Wholesale price	Retail price
Amaranth	160-400 (22-55)	400-500 (14-33)	720 (31-44)
Nightshade	400-1,350 (17-56)	2,200 (35-75)	2,400 (8)
Ethiopian mustard	100-200 (10-20)	200-900 (10-70)	1,000 (10-80)

\*Shares of the final price (percentages) in parentheses.

Sources: author's elaboration based on focus group discussion and key informants (traders) interviews

Table 8 provides prices per kg at different stages of the value chain. **African nightshade maintains a relatively high price** in all markets and throughout the year and both farmers and traders report it to be the most preferred indigenous vegetable and highly demanded. **Low prices, driven by seasonal oversupply and by huge post-harvest losses seem nonetheless to be relevant for most indigenous vegetables.**<sup>73</sup>

This is in line with recent studies (Maro, 2008; Mwaniki, 2008; Lotter, 2014). We find **higher farmers margins than in previous literature** (Figure 8). This could confirm the idea of increased farmers power over time, thanks to better information on prevailing market prices, or to reduced costs for traders (i.e. same profit with lower margin) thanks to the now popular Chinese motorbike taxi, which recently made a big difference in rural Africa accessibility generally, and in the study area as well.

**Farmers report about 10 buyers are visiting each of the two areas** and each farmer has, as an average, the contact of three buyers, to whom he/she is loyal, and **they have mutual trust**. This shows that some competition exists among farmgate buyers and that they are not perceived as exploitative by farmers. In any case, to make sure that the price proposed by the trader is fair, farmers get price information from the markets from relatives and friends through mobile phones. **Traders are mainly women** in the wholesale stage of the value chain, and exclusively women in retail.

Interviews with traders confirm that they harvest and buy at farmgate in the afternoon and travel to the markets in and around Arusha in the early morning (Lotter 2014). **Markets for leafy vegetables work as wholesale markets before sunrise and as retail markets during the day.** Other produce enjoys a dedicated space for wholesale, so that wholesaling activity can continue throughout the day. This is the case for example of tomatoes and cabbages in Kilombero market in Arusha, where a dedicated shed is available. From our assessment in the production areas and the markets, **it was not possible to find any trader selling or sending indigenous leafy vegetables to Dar es Salaam or other faraway markets.** Conversely, we found traders coming from Moshi (around 40 km) to sell in Arusha, but, again, not from any place further.

**In sum, leafy indigenous vegetables, which are highly perishable and generally sold unprocessed, are characterised by short value chains,** with most trade taking place at farm-gate and in retail and wholesale open-air markets – where they generally lack a dedicated area. Cold transport is not available and thus long-distance trade is rare. Some leafy vegetables (amaranth, African nightshade and Ethiopian

<sup>73</sup> Quite surprisingly the lowest prices are not registered towards the end of the main rain season (May-June). The lowest price is instead from July to November, during the short-rains season and in between the two seasons. This is due to three reasons: most of indigenous vegetables production in the area is not rainfed, but watered; the strong rains of the main season in the area tend to damage indigenous vegetables, which are very prone to rotting; the poor accessibility of markets and worsening conditions of rural roads during the main rain seasons also contribute to keeping the price quite high.

mustard) are more profitable for farmers than exotic crops and the proportion of harvest sold for these crops is high. Also, the willingness to pay of consumers in Arusha is above current market prices (almost double for amaranth and more than double for nightshade).

### 3.2.2. Food environment

Food environments are **the broader environments that influence people's choices around food**. For example, household's diets are shaped by distance to markets, available food, and price. As such, food environments sit between supply chains, that produce and distribute food, and consumer's preferences. Food environments encompass social aspects – such as political, social and cultural norms – and physical factors – such as road infrastructure.

Food environments are key to understanding the changes from traditional self-grown, local diets to modern supermarkets with diets that require ever-increasing 'food miles' (Clapp, Desmarais, & Margulis, 2015; Weber & Matthews, 2008). While traditional food systems have markets that buy from local producers and are more locally embedded, more modern systems provide a large diversity of food from around the world and out of the seasons. More and more livelihoods shift from production to this type of more modern food environments as rising land pressures limit access to land for the poorest (Dekeyser, 2019a; 2019b).

#### Arusha's food entry points

A food environment includes **'food entry points'**, which are *'...the physical spaces where food is obtained'* (HLPE, 2017:11). For example, households close to a 'wet' market<sup>74</sup> increase their exposure to fresh fruit and vegetables, compared to a 'food desert' – meaning an area with little availability of fresh products.

**Arusha has a large and bustling diversity of food entry points**, which are summarised in Table 9 according to their different activities. The type of food entry points determines what gets sold, who sells, and the degree of centralisation (such as supermarkets) or decentralisation (like hawkers).

**Table 9: Characterisation of different food entry points around Arusha**

Activity	Inventory	Infrastructure	Owner's gender
Small-scale selling and markets	Small selection of food and non-food products	No infrastructure, small shed, or carts	Division women and men
Small shops	Small selection of food products, cooked foods, and non-food products	Small shed or small brick store	Women and men
Large shop	Food and non-food products	Small or medium brick store	Women and men
Supermarket	Large selection of food and non-food products	Large brick store or shopping mall	Men

Source: UNISG fieldwork, 2019

Table 9 presents a rich array of food entry points that perform different roles in Arusha's food environment. **Small-scale selling and markets**, which include wet markets and hawkers, provide a small selection of goods but at cheap prices. They are the main source for fresh fruit and vegetables in Arusha. **Small shops**

<sup>74</sup> Markets selling fresh fruit and vegetables, meat, and fish, in contrast to markets selling clothes or household appliances.

include small retail and restaurants. The small retail businesses sell a limited selection of packaged products and non-food products and are dotted around Arusha. **Large shops** provide a larger selection of packaged food and non-food products in a larger building. The **supermarkets** sell the largest variety of food and non-food products and have much more indoor space than the shops. Ownership's gender is tied to the inventory or food entry point's size: at the markets, fresh fruit and vegetables are female-dominated, while meat, fish and eggs are male-dominated; small and large shops can be owned by men and women, but supermarket managers were all men.

### Modern value chain expansion

Arusha's food environment has a **mixture of traditional and modern markets, with the former dominating the sale of fresh fruit and vegetables**. While Arusha has ample traditional 'wet' markets, several supermarkets and malls opened up in line with SSA's 'supermarket revolution' (Reardon, 2015). Against this background, we contrast the Arusha's central market - an example of continued wet market dominance in the fresh fruit and vegetable segment – with Shoppers Plaza – an example of the supermarket revolution. Each of these two food trade areas has large differences in consumers and sellers' profiles, role in the food environment, and supply chains and inventory (Table 10).

**Table 10: Features of Arusha's central market and Shoppers Plaza**

Name	Description	Social profiles	Products' range
Central market	The Central market consists of stalls under large sheds. The central building hosts shops and bars.	Women dominate the external stands while men trade inside the market. The market benefitted from a 2017 deregulation of retail trading, and an initiative to support female entrepreneurship.	Fresh fruit and vegetables, meat and fish, seeds, very few processed products, and kitchen tools.
Shoppers Plaza	The Shopper is a franchise of Indian origin with supermarkets in Tanzanian regions such as Arusha, Dar es Salaam, and Iringa.	Customers are mostly foreigners, but the number decreased dramatically while the formation of Tanzanian middle class stalled.	The Shopper offers a wide range of mostly foreign goods. Prices are similar to British supermarkets and frequently displayed in both shillings and pounds. The prices are three times the average of traditional markets, which excludes most citizens.

Source: UNISG fieldwork, 2019

### Arusha's central market

The central market is a **regional distribution hub**, in part due to Arusha's agricultural production and proximity to Kenya. The market exhibits **strong gender specialisation in the supply chains**. Women are more involved in labour-intensive horticulture products such as pulses and fresh fruit and vegetables. Men focus on grains and animal products, which have longer supply chains, are less labour-intensive, and more profitable than women's chains. Given this specialisation, **leafy vegetables and indigenous vegetables are only found in the women's section**.

Leafy vegetables follow a slightly different supply chain than other vegetables. While they are sold throughout Arusha, **leafy vegetables are brought straight to the markets, without going through aggregation markets, because of their high perishability.** The main wholesale market for leafy vegetables is, before sunrise, a dedicated area at the **Samunge market**<sup>75</sup>, without any shed or pavement. After sunrise, the area becomes a regular retail market section. Other important markets for leafy vegetables are Kilombero and the Central Market in town, and Tengeru Farmers' market, held in the suburb west of Arusha (see Figure 4 for their location).

**Figure 9: Arusha's central market, women's section**



*By Carmen Torres Ledezma, ECDPM*

Given its availability and affordability of fresh food, the central market is a key factor for the diet of Arusha's urban citizens as it provides a rich array of nutrients. The market crucially supports rural livelihoods as it connects urban consumers with rural producers. However, space is limited and newcomers crowd around the market. Across all social classes, the market is the one-stop for Arusha's citizens buying and selling food. In sum, this traditional market, with rich social connections and informal networks, is able to connect urban diets and rural livelihoods. But other players entered Arusha's food distribution.

### **A supermarket revolution in Arusha**

Global retailers, with their dominant position in the agro-supply chains, reshape the food markets through the '**supermarket revolution**' (Reardon & Gulati, 2008). Since the 1990s, this revolution drove a supermarket expansion in the developing world, which competed with traditional markets (Neven, Odera, Reardon, & Wang, 2009; Reardon & Gulati, 2008; Tschirley et al., 2015). This dynamic impacts production, as supermarkets prefer large mechanised farms, preferably under direct control, for their need of plentiful, stable, and cheap supply with strict quality and safety controls (Fuchs et al., 2011; Robbins, 2015). **The market share of supermarkets or modern retail chains in SSA is smaller than other continents,** besides South Africa, and traditional markets are still the primary source of fresh food such as fruits, vegetables and meats (Reardon & Gulati, 2008).

**However, due to SSA's economic growth, supermarkets are spreading rapidly in cities catering to a rising middle class.** Supermarkets make micronutrients and other required nutrients more available in these cities, but the nutritional benefits accrue primarily to the middle or high-income groups that supermarkets overwhelmingly depend on for their sales. These middle or high-income groups are attracted to supermarkets for food quality, diversity, and convenience, such as ready-to-eat meals. These appealing new foods lead to

<sup>75</sup> The market has nearly 3500 traders, and three-quarters of them deal with horticultural products (Ihucha, 2015).

the substitution of staples with processed food dense in sugar and fat, whose consumption contributes to overweight and obesity (Foo & Teng, 2017).

Since the 1980s, the market for packaged products, such as sodas or biscuits, has expanded much faster in the developing world than the developed world (Monteiro et al., 2013). These packaged products are not primarily driven by supermarkets in developing countries, but by small sellers. These small sellers can sell the products in lower quantities, give credit, and lower transportation costs. Rather than the supermarkets' high-volume and low-margin business models, the small seller compensates lower volumes with higher mark-ups. Currently, SSA's small sellers that offer processed products are expanding even faster than the supermarkets. For SSA's population, the supermarkets change the food environment as they make processed products more available and contribute to an obesogenic environment (Dekeyser, 2019; Gómez & Ricketts, 2013).

**Arusha has a higher share of international products compared to Dar es Salaam, and more food processing** (Ijumba et al., 2015). In Arusha, there are now **three medium-large supermarket chains**, which are mostly frequented by local elites or foreigners as most individuals and households cannot afford the fresh fruit and vegetable mark-up (Ijumba et al., 2015). **Indigenous vegetables are scarcely sold in Arusha's supermarkets**. This does not reflect a bias against indigenous vegetables but rather **results from the supermarket's limited role in fresh fruit and vegetables** across all social strata. Even if local elites buy some fresh fruit and vegetables at supermarkets, most of their fruit and vegetable needs are met at the wet markets.

In sum, Arusha's food environment mixes traditional and modern supply chains. While dominated by the traditional markets, of which Arusha's central market is an example, the food environment experienced an influx of supermarkets. At the moment, the supermarkets do not compete directly with the traditional markets on fresh fruit and vegetables. But **if supermarket dynamics in other continents are any indication, supermarkets will compete for market share with traditional markets over time**. This competition will have consequences for farmers as supermarkets generally have different demands in terms of stability, price, and quantity than traditional markets. As a result, small-scale farmers lose market access to medium-sized farmers, and households are more exposed to processed products, which could initiate food consumption changes.

### 3.2.3. Food consumption: Tanzanian diets

Tanzania's staple dish is **ugali**, a porridge produced mainly from grounded or pounded maize, and is typically consumed with cooked green leafy vegetables. As such, **consumers have a strong preference for maize** over drought-resistant grains like sorghum and millet. Annual per capita consumption of maize is estimated at 135 kg (USDA, 2018). Wheat is, after rice, the third most consumed cereal and is mainly imported (FEWS NET, 2018). Wheat is consumed more by wealthier urban households, usually as flour or through products like pasta, breakfast cereals or chapati. Rural and pastoralist communities rely more on sorghum and millet (USDA, 2018; FEWS NET, 2018).

Still, despite the wide variety of food produced in the country, **diets are often monotonous** with limited diversity. Diets are **based on starchy foods** with high fibre content, such as cereals (maize and sorghum), starchy roots (cassava) and pulses (mainly beans), which supply almost three-quarters of total energy.<sup>76</sup>

<sup>76</sup> Cereals supply more than half (51%) of total dietary energy, followed by starchy roots (19%).

**Consumption of micronutrient dense foods such as animal products and fruits and vegetables is low.**<sup>77</sup>

Tanzania has **wide geographical and economic variations in diets and food security**. Geographically, the staples of the central regions are mainly maize and sorghum, while the Arusha and Kilimanjaro regions consume mostly plantain. Economically, rural and low-income urban residents often react to seasonal food insecurity by lowering the quantity or frequency of meals. While two meals are common in the harvest months, the lean months are often characterised by just one meal a day. Generally, meat and milk consumption are extremely low: on average once a week or less, in certain communities once a month or less.

**Tanzanian diets change rapidly.** Most food is bought, even in rural areas, and 70% of purchased food is processed (Ijumba et al., 2015). **Especially high and middle-income groups increasingly replace traditional vegetables with imported highly-processed food.** While lowering the risk for undernourishment, this diet can be less nutritionally adequate than the traditional diet. Urban diets of high-income groups have changed the most from traditional diets high in carbohydrates and fibre to energy-dense processed food, meat, and alcohol. These dietary changes led to nutritional problems such as obesity, diabetes, and cardiovascular diseases. Gender plays a role as well: Tanzanian women have four times more obesity than men (16.4 - 4%; Ng et al., 2014).

In sum, while diets and the burden of disease change among urban high-income groups, Tanzania is dominated by extremely low and low-income households for which dietary inadequacy results in all forms of malnutrition.

### 3.2.4. Food and nutrition security in Arusha and indigenous vegetables benefits

This section overviews the food and nutrition security dynamics in Tanzania and Arusha. Given high levels of stunting, we emphasise the importance of women's and children's dietary adequacy and food security. We suggest that diversifying women's diets with indigenous vegetables can break the intergenerational cycle of malnutrition by delivering missing vitamins.

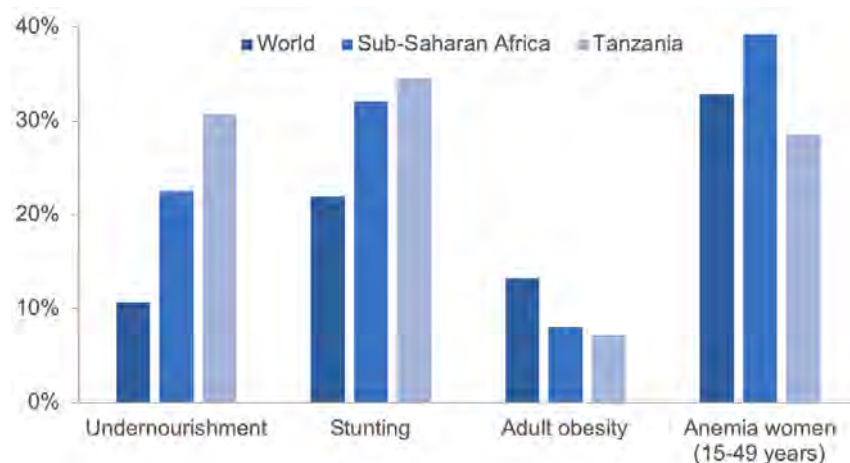
#### Tanzanian food and nutrition security

In contrast to SDG 2's goal of zero hunger, global undernourishment rose for the fourth year in a row to 820 million people, or 10.8% of the world's population. Fuelled by conflict and drought, this rise is most apparent in SSA, which struggles as well to decrease stunting and wasting. As a result, SSA faces both major food insecurity and malnutrition and is off-track to deliver on SDG 2 (FAO, 2019).

**Tanzania is more food insecure than the SSA region in many indicators** (see Figure 10). At 30.7%, Tanzania's **undernourishment** is substantially higher than SSA's 22.5%. Tanzania's under-five **stunting** rate is similar to SSA, but high compared to the world; Tanzania's **adult obesity** is low but increased 37% from 2012. Positively, while **anaemia** is widespread, women of reproductive age have less iron deficiency, a common malnutrition condition, in Tanzania than the rest of SSA (FAO, 2019).

<sup>77</sup> While the frequency of vegetable consumption is high, especially among rural communities, quantities are generally small. Adults deem fruits unimportant and do not commonly consume them.

**Figure 10: Comparing Tanzania's food insecurity through prevalence of undernourishment (2018), stunting under five (2018), adult obesity (2016), and anaemia among reproductive-age women (2016)**



Data: FAO, 2019

Tanzania's agriculture is mainly rain-fed, causing **hunger to be seasonal and climate-dependent**. Tanzania reduced undernourishment - primarily driven by economic growth - by almost 4% between 2016-18 (FAO, 2019). But the decline is too slow and, in combination with stalled progress on stunting and micronutrient deficiencies, places Tanzania off-track to reach SDG 2. **To reach SDG 2, major dietary macro and micronutrient improvements are needed.**

### Searching for nutrients

Tanzania's extremely low and low-income households suffer from widespread malnutrition, especially stunting (see Figure 10). In 2015, 34.5% of Tanzanian children were stunted, and minimally 58% of children had micronutrient deficiencies.

**Micronutrient malnutrition is a major obstacle to socio-economic development** and contributes to vicious circles of underdevelopment. Lack of nutrients has long-ranging effects on health, learning ability and productivity: it leads to high social and public costs; contribute to infant mortality; and reduced work capacity in populations due to high rates of illness and disability. Stunted and underweight children are most likely to suffer from impaired physical and cognitive development, with long-term consequences for educational attainment and adult productivity, and are more vulnerable to diseases. As a result, malnutrition contributes to half of Tanzania's under-five mortality (Ahmed et al., 2016).

**Female's micronutrient status can impact fertility** (e.g. vitamin A, C and E) and **pregnancy outcomes** (e.g. iron, calcium, folate, vitamin B12, magnesium, zinc), as vitamins and minerals have important roles in the physiological processes. For instance, folate deficiency is a well-known risk for birth defects (such as neural tube defects; Furness et al., 2012). Zinc contributes to higher rates of morbidity and mortality in mothers and newborns (Kumssa et al., 2015). Vitamin E deficiency in pregnant women leads to placental ageing, vascular injury, hypertensive disorders, placental abruption, and premature birth (Chen et al., 2018). Calcium inadequacy leads to insufficient calcium stores, which influences pregnancy outcome, particularly for young women (Conti et al., 2019). **Iron deficiency, the leading cause of anaemia in women of childbearing age, contributes to maternal and perinatal mortality and low birth weight** (Conti et al., 2019).



**Women of reproductive age have increased nutritional needs, but face higher rates of malnutrition than men** (Development Initiatives, 2018). This gender inequality is particularly worrisome given the intergenerational damage of malnutrition: a poor nutrition status of childbearing women can cause irreversible damage to the foetus as 20% of growth restriction occurs in the womb (de Onis & Branca, 2016). Specific micronutrients' daily requirements increase during pregnancy, and poor nutrition prior and/or during pregnancy affects foetal programming and offspring outcomes, causing irreversible damage to newborns' neurocognitive and physical functioning (Conti et al., 2019). For these reasons, **guaranteeing women an adequate diet is a crucial health priority**. Therefore, women-centred food security strategies are recommended to combat the intergenerational consequences of poor nutrition (Conti et al., 2019).

### **Indigenous vegetables help female food security**

Diversifying diets with indigenous vegetables is a sustainable way to supply many nutrients while combating micronutrient malnutrition and associated health problems, particularly for poor urban and rural households.

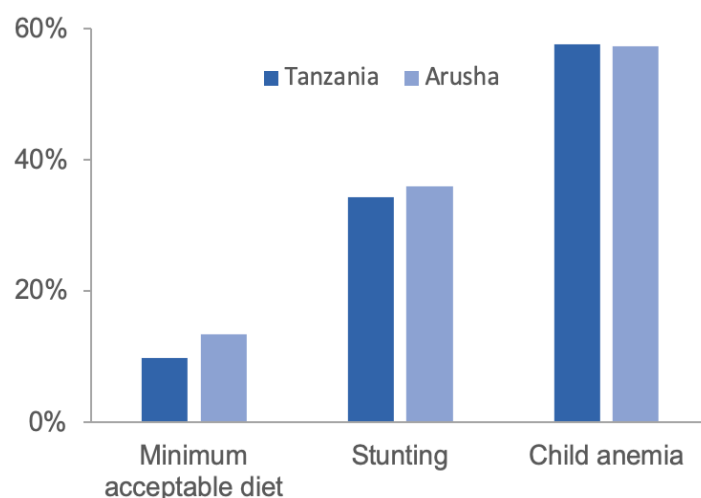
**Indigenous vegetables can help with undernutrition and overweight**, which are the most common forms of malnutrition. Cultivation of indigenous vegetables could reduce overreliance on only a few major crops and increase sustainability since crop diversification is one of the best means to advance sustainable agricultural production. **Traditional vegetables are a vitally important source of micronutrients, fibre, vitamins and minerals and are essential components of a balanced and healthy diet**. In addition, indigenous vegetables can be better adapted to the environment than standard vegetables, and thus can provide low-cost quality nutrition to a large population segment (Chweya and Eyzaguirre, 1999).

Tanzania faces high food insecurity and malnutrition due to poverty and diets that are commonly too monotonous, low-energy, have few animal products, and lack enough fruits and vegetables to provide adequate nutrient intake. Current food insecurity and malnutrition are particularly harmful to those under five years. Thus, **food security strategies that centre on women are necessary to break the intergenerational malnourishment cycle**. **Diversifying the diets with indigenous vegetables can be a sustainable way to combat malnutrition and enhance resilience**.

### **Arusha's food and nutrition security**

Previous research reported that about 39% of Arusha's households were food insecure (Leyna et al., 2010). The food insecure households were almost equally located - 13% each - along mild, moderate, and severe food insecurity categories. Coupled with this high food insecurity is a low dietary diversity: starchy staples, especially maize, provide up to 70% of total energy intake, with limited consumption of meat and vegetables. As a result, Arusha has slightly higher malnutrition than Tanzania's average (see Figure 11). At the same time, Arusha has a great availability of diverse crops and favourable soil and climate conditions (Ecker et al., 2010; Ochieng et al., 2017). **Even though Arusha has good farming conditions, food insecurity is high and diets inadequate**.

**Figure 11: Child nutrition in Tanzania and Arusha through stunting (6-23 months), minimum acceptable diet (6-23 months), and child anaemia (6-59 months)**



Source: 2015-16 Demographic and Health Survey and Malaria Indicator Survey

Several key stakeholders state that poverty, low food knowledge, and socio-cultural factors drive Arusha's food insecurity and malnutrition. Bibi Giyose<sup>78</sup> argued that **Arusha's food and nutrition challenges stem from:**

1. **Poor infant care and feeding practices:** Due to lacking basic nutrition education, families do not optimise the plentiful nutritious food in Arusha;
2. **Food waste,** due to inexistent post-harvest agro-processing; and
3. **Health issues,** which hamper the biological utilisation of food and nutrients.

A lack of basic nutrition education is seen as a more important driver of child stunting than insufficient food availability:

*'It's more about social behavior change. That is our strategy. We see it is a lack of knowledge really rather than not having enough foods in the localities'* (Interview A. Assery, Prime Minister's Office, Scaling Up Nutrition focal point, September 2017).

While the Tanzanian government previously approached malnutrition as a health issue, they now believe it is caused by a lack of knowledge. **Food knowledge and malnutrition intersects with gender roles.** While women are the main caretakers, they also provide most of the farm work (52% of total agricultural labour; Palacios-Lopez, Christiaensen, & Kilic, 2017). Given the importance of the first 1000 days for children's growth and Tanzania's high child stunting, mothers' food knowledge is crucial:

*'You will go to communities where food is available, but it is not given to the children. These foods are there, but you will find women are making maize porridge and giving it to children. Food is available in the communities. It is a question of knowledge'* (Interview G. Kirenga, Southern Agricultural Growth Corridor of Tanzania, September 2017).

<sup>78</sup> Interview with Bibi Giyose, Senior Nutrition Officer, FAO Nutrition and Food Systems Division, September 2017.

Previous research confirms that **lack of knowledge is a major barrier of fruits and vegetable consumption in Tanzania**, including a basic misunderstanding of nutritional needs versus hunger, generational misinformation on cooking techniques, and taboos (Beaudreault, 2019). In Arusha, for example:

*‘Men do not eat Chinese cabbage and okra because they believe these vegetables will affect their reproductive health and make them impotent’ (Beaudreault, 2019: 42).*

Lack of food knowledge is exemplified by **common food preparation techniques**, such as cooking vegetables for a long time and discarding the cooking water, and removal of bran and soaking of maize before milling. These techniques **can lead to significant destruction and loss of nutrients** such as vitamin C, carotenes and others. Inadequate information and knowledge of food and nutrition can contribute to a poor diet in terms of nutrient intake. Additionally, an overwhelming fear of pesticides spurs Tanzanians to not eat raw vegetables from the market (Beaudreault, 2019).

### **SASS’s food and nutrition research**

The Dietetics and Clinical Nutrition Laboratory team from the University of Pavia sampled 141 urban and peri-urban childbearing-age women (15-49 years) living in the Arusha district. The team studied energy, macro- and micro-nutrients intake<sup>79</sup> through a 24-hour recall,<sup>80</sup> and the Minimum Dietary Diversity Index for Women<sup>81</sup> (FAO, 2016) was calculated. The Minimum Dietary Diversity Index for Women is a proxy indicator that reflects the micronutrient adequacy of diets. Also, the team evaluated the potential of indigenous vegetables to combat undernutrition.

Out of the 141 sampled women, 81 were peri-urban (57.4%) and 60 urban (42.6%). Total mean energy intake was estimated at 1939.4 Kcal per day (IQR 1329.6-2512.4). Notably, urban women consumed 1888.6 Kcal daily (IQR 1276.1-2422.4) compared to peri-urban women’s 1939.4 Kcal (IQR 1329.6-2512.4). These differences were not significantly different. The estimated mean micronutrient intake ( $\pm$  standard deviation) and the percentage of women that did not meet the recommended nutrient intake are described in Table 11 per area.

<sup>79</sup> Intakes of energy and micronutrients (vitamins: vitamin A, vitamin C, vitamin E, folate, vitamin B12; minerals: calcium; magnesium; iron; meat, fish and poultry iron; zinc) were calculated using the Tanzanian Food Composition Table (Lukmanji et al., 2008). Micronutrients intakes were then compared with the standard levels of requirements according to the “Vitamin and mineral requirements in human nutrition” FAO/WHO (2004) and they were defined inadequate when they were below the Recommended Nutrient Intake (RNI; WHO and FAO, 2004).

<sup>80</sup> Food quantity was evaluated by the sample’s description of food consumption in the previous 24 hours, using household measures (such as cups, bowls and cooking pots) related to national portion size thanks to utensil pictures; open interview was used for recording. In case of consumption of complex recipes (e.g. meat plus vegetables recipes), specific questions were asked about the portion of each ingredient.

<sup>81</sup> The Minimum Dietary Diversity Index for Women (FAO, 2016) was calculated starting from information obtained by the 24h-recall. The authors evaluated the Index after data collection, starting from the 24h recall. According to the Index’ protocol (FAO, 2016), foods were classified into ten food groups: (1) grains, white roots and tubers, and plantains; (2) pulses (beans, peas and lentils); (3) nuts and seeds; (4) dairy; (5) meat, poultry, and fish; (6) eggs; (7) dark green leafy vegetables; (8) other vitamin A-rich fruits and vegetables; (9) other vegetables; and (10) other fruits. The Index was calculated by summing up the number of food groups consumed. Mothers’ diets were considered diverse if minimally 5 food groups were consumed.

**Table 11: Urban and peri-urban micronutrient intake**

Data are reported as median (interquartile range). Squared brackets depict the percentage of women with unmet recommended nutrient intake (RNI).

MICRONUTRIENTS	RNI (cut-off)	TOTAL (n=141)	URBAN (n=60)	PERI-URBAN (n=81)	<i>p</i> (urban vs peri-urban)
		Median (IQR)	Mean (SD)	Mean (SD)	
VITAMIN A (µg RE)	≥500	<b>341.0</b> (90.8-801.7)	<b>277.12</b> (81.1-900.5)	<b>430.1</b> (94.7-798.1)	ns
below cut-off	%	[58.3]	[61.0]	[56.3]	ns
VITAMIN E (mg α-TE)	≥7	<b>3.2</b> (1.2-8.3)	<b>2.5</b> (1.2-9.5)	<b>3.5</b> (1.2-8.3)	ns
below cut-off	%	[67.9]	[69.5]	[71.7]	ns
VITAMIN C (mg)	≥45	<b>65.1</b> (21.9-136.0)	<b>61.9</b> (20.6-134.5)	<b>70.8</b> (25.4-136.0)	ns
below cut-off	%	[36.2]	[43.4]	[30.9]	ns
FOLATE (µg DFE)	≥400	<b>290.6</b> (167.9-488.3)	<b>355.6</b> (181.2-529.7)	<b>279.2</b> (155.7-467.7)	ns
below cut-off	%	[63.3]	[55.0]	[70.4]	ns
VITAMIN B <sub>12</sub> (µg)	≥2.4	<b>1.2</b> (0.2-2.6)	<b>0.6</b> (0.1-2.0)	<b>1.4</b> (0.2-4.0)	<b>0.024</b>
below cut-off	%	[72.5]	[79.3]	[67.5]	ns
CALCIUM (mg)	≥1000	<b>192.9</b> (93.3-372.0)	<b>159.0</b> (92.9-347.1)	<b>205.7</b> (94.7-400.8)	ns
below cut-off	%	[97.2]	[96.7]	[97.5]	ns
MAGNESIUM (mg)	≥220	<b>394.0</b> (233.8-789.1)	<b>375.9</b> (235.4-652.9)	<b>408.6</b> (228.5-953.8)	ns
below cut-off	%	[21.3]	[18.4]	[23.5]	ns
IRON <sup>a</sup> (mg)	≥29.4	<b>9.0</b> (5.3-13.9)	<b>8.5</b> (5.5-13.4)	<b>9.1</b> (5.2-14.6)	ns
below cut-off	%	[92.9]	[96.7]	[90.1]	ns
ZINC (mg)	≥9.8	<b>5.8</b> (3.7-8.9)	<b>6.2</b> (3.6-9.0)	<b>5.7</b> (3.8-8.8)	ns
below cut-off	%	[76.6]	[76.7]	[76.5]	ns

Significance  $p < 0.05$  (T-student test; Chi-square test).

<sup>a</sup>Iron bioavailability assumed at 10%.

RNI: Recommended Nutrient Intake.

IQR: Interquartile Range

RE: Retinol Equivalents.

α-TE: α-Tocopherol Equivalents.

ns: not significantly different.

Source: UNIPV nutrition team, field research December 2018 - August 2019

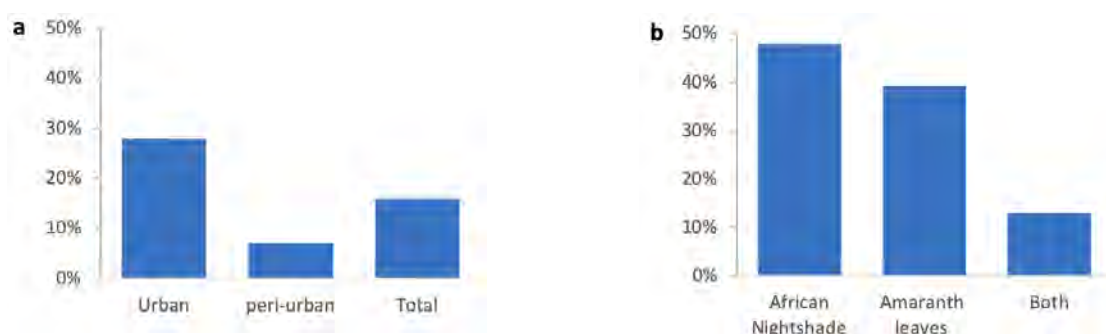
**Most diets were deficient for all micronutrients**, except for vitamin C and magnesium. Average micronutrient intake did not differ significantly among urban and peri-urban women, except for vitamin B12, which was significantly higher in peri-urban women.

The consumption of indigenous vegetables was evaluated through a retrospective analysis from the 24h recall. Species consumed were amaranth leaves and African nightshade. The results describe that **only 16% (n=23) of women consumed Amaranth leaves (rich in calcium and vitamin C) and/or African Nightshade (rich in iron and zinc)**. Only 13% of those that ate indigenous vegetables consumed both species.<sup>82</sup> Notably, **urban women consumed four times more indigenous vegetables than peri-urban women (28 vs 7%; Figure 12a)**. **The low daily consumption of indigenous vegetables demonstrates a lack of knowledge about their importance for nutrient provision** (Conti et al., 2019).

**Figure 12: Consumption of indigenous vegetables among urban and peri-urban women of childbearing age**

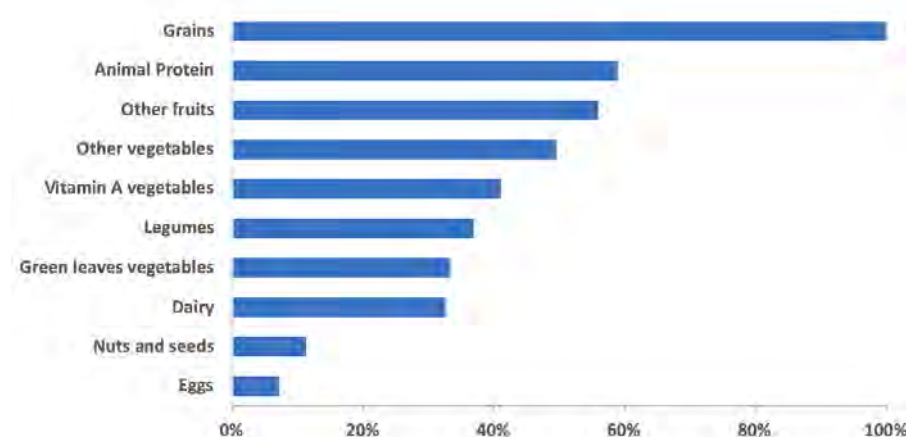
a. Percentage of sample that consumed indigenous vegetables, per area.

b. Percentage of indigenous vegetables consumed by sample, per type.



**Lack of diversity is a major issue, as less than half of all women (43.6%) ate a minimally diverse diet** (i.e., at least 5 food groups). All women ate grains (Figure 13), but consumption of eggs, nuts and seeds was low. Diversity and frequency of consumption were not significantly different between urban and peri-urban areas.

**Figure 13: Frequency of daily food group consumption**



The team studied the food consumption of childbearing age women, particularly the intake of indigenous vegetables that could supply possible unsatisfied nutrients requirements. Also, the Minimum Dietary Diversity Index for Women was assessed.

<sup>82</sup> While 47.8% (n=11) of those 23 women that consumed indigenous vegetables consumed African nightshade, and 39.2% (n=9) consumed amaranth leaves (Figure 12b).

In the Arusha study, most women did not reach the recommended intake for all vitamins and minerals (see Table 11), with the exception of vitamin C (36.2%) and magnesium (21.3%). These nutrient shortages could impair fertility, pregnancy outcomes, and affect children's health if not adequately solved. High dietary diversity could provide adequate micronutrients (FAO, 2016). However, more than half of women (56.43%) did not have minimal dietary diversity. Therefore, **low dietary diversity could explain the inadequate micronutrients intake.**

Finally, as described by Conti et al. (2019), **dietary diversity could be affordably and sustainably improved by raising women's awareness of indigenous vegetables.** Indigenous vegetables have been documented to be micronutrient-dense, with high antioxidants content, and are adapted to tropical environments (Conti et al., 2019).

#### **Box 6: Experimental research on health benefits of indigenous vegetables**

A section of the SASS consortium conducted experimental research on the carcinogenic and neurodegeneration characteristics of different indigenous beans. Extracts of the indigenous beans *Cajanus cajan*, *Vigna unguiculata* and *Phaseolus vulgaris* from the Arusha area were evaluated for their effects on the longevity of yeast cells. All treatments significantly increased cell longevity, but extracts from *Vigna* beans showed the best results. In laboratory experiments, *Vigna* beans slowed down the growth of colorectal cancer cells. While still in the experimental phase, these findings point to potential health benefits of indigenous beans, particularly for cancer and neurodegeneration. This experimental research shows that many health properties of indigenous beans are still hidden. Alike the current commercial success of quinoa and seaweed, further research on indigenous beans can contribute to their popularity at home and abroad.

**In sum, Sub-Saharan Africa, Tanzania, and Arusha face high food insecurity and malnourishment, especially children malnourishment.** Childbearing-age women have particular nutrient needs and their dietary adequacy is crucial to break the cycle of intergenerational malnourishment. However, most diets of a sample of childbearing-age women in Arusha were nutritionally inadequate, for most of the analysed vitamins, due to their low diversity. As indigenous vegetables contain many of the missing nutrients, higher consumption could combat certain forms of malnourishment. **Lacking food knowledge in Arusha can be alleviated with information campaigns that communicate the importance of adequate diets for women, indigenous vegetables' advantages, and cooking techniques.** This campaign would increase consumers' nutritional knowledge, which could lead to increased demand for indigenous vegetables. As a result, malnourishment could decline sustainably as diets become more diverse.

## **4. Governance of Arusha's food system: key policies and main actors**

Section 3 showcased the different elements of Arusha's food system with special attention to indigenous vegetables. A food system encompasses a dizzying array of dynamics in complicated and complex relations. With the recognition of this complexity comes an increased need for stronger governance, as complexities require more systematic, coordinated, and evidence-based approaches (von Braun, 2018).

In this section, we thus turn to the analysis of the governance dynamics, by studying the policies and actors that underpin Arusha's food system. First, we analyse the **formal and informal institutions** in terms of their impact on different dimensions of sustainability. We focus on the most relevant formal policies and regulations in place. We also explore informal 'rules of the game' (unwritten norms, customs, beliefs) which affect the way formal policies are implemented and, ultimately, their effectiveness in attaining set policy

objectives. Secondly, we describe the **key actors** in the local food system, their interests, incentives and interlinkages, with the objective of identifying key entry points to catalyse change in the food system outcomes. Finally, we explore the **key practices** by which different actors and networks **may drive or hinder a stronger integration of indigenous vegetables** in the system.

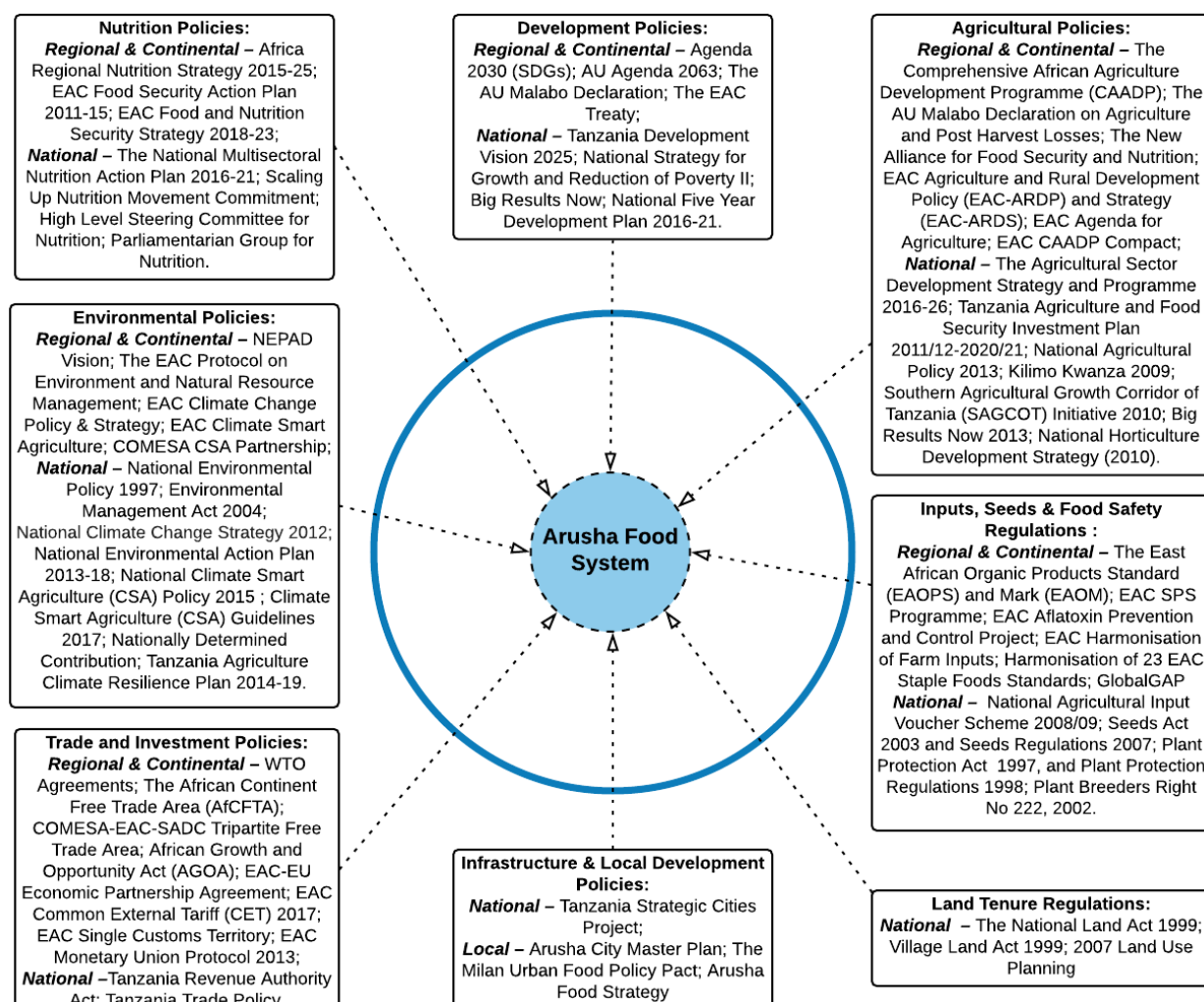
The next section 5 explores, building on the food system mapping and analysis of Arusha's food system governance, several pathways to improve Arusha's sustainability. Afterwards (section 6), we conclude this report and discuss a way forward to promote indigenous vegetables in Arusha.

#### 4.1. Policies and institutional frameworks, with a focus on indigenous vegetables

**The Arusha food system is influenced by a vast array of policies, regulations and institutional frameworks.** They span across different sectors and government levels. Apart from these formal policies and institutions, there are also unwritten, informal rules of the game which affect the way formal policies are implemented and, ultimately, their effectiveness in attaining set policy objectives. Figure 14 provides a non-exhaustive overview of the Arusha food system policy landscape.



**Figure 14: Overview of continental, regional, national and local policies in Tanzania with (in)direct impact on the food system in Arusha**



Source: Compiled by ECDPM

In this section we analyse the most important formal policies and institutions governing the Arusha food system, focusing on the **nutrition, agriculture, environmental and climate domains**. In doing so, we analyse the frameworks in place both at the **national and the local level**.<sup>83</sup> We discuss their relevance regarding different dimensions of sustainability and present some of the implementation challenges faced. Lastly, we provide insights on the current policy environment for indigenous vegetables promotion.

#### 4.1.1. Nutrition: high on the political agenda but faced with implementation challenges

The government of Tanzania has demonstrated a strong commitment to ending malnutrition for decades. Progress has been made in reducing undernourishment, but the decline is too slow and malnutrition remains high, placing Tanzania off-track to reach SDG 2 (see 3.2.4.).

<sup>83</sup> When relevant, references will be made to continental and regional level frameworks.

In 2011, Tanzania was one of the first countries to join the **Scaling Up Nutrition (SUN) Movement**, with a letter of commitment from President Kikwete. In the same year, Tanzania elaborated a **multi-sector and multi-actor approach to nutrition** with the publication of the **Tanzania Agriculture and Food Security Investment Plan** (TAFSIP 2011/12-2020/21) and the **National Nutrition Strategy** (2011/12-2015/16; Tanzania Ministry of Health and Social Welfare, 2011). Kikwete also formed the **High-Level Steering Committee for Nutrition**, convened in the Prime Minister's Office and involving multiple ministries and stakeholders. Each Ministry has a nutrition contact point, and the coordination for nutrition is housed at the Prime Minister's Office to ensure mandate across sectors (TFNC, 2012). Most of the practical implementation at the local level is overseen by the President's Office of Regional Administration and Local Authorities (PO-RALG). At ward level, budget decisions are taken by ward councillors but highly influenced by politicians. Political parties need to endorse policy priorities so that politicians buy into them. Repackaging nutrition actions to fit other priorities like education or employment can then help to build stronger support and potential coalitions and champions. In 2016, the country strengthened its integrated approach with the elaboration of the **National Multisectoral Nutrition Action Plan 2016-2021** (NMNAP; Prime Minister's Office, 2016). This 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.<sup>84</sup> For the Plan's practical implementation, **Multisectoral Nutrition Committees** at the village, ward, district and regional level were created. These Committees are the main policy platforms concerning nutrition. Other efforts to boost lagging results on malnutrition were the introduction of a **nutrition scorecard** and a relatively recent policy mandating an **obligatory allocation of 1000 Tanzanian Shilling per child under five** at the council level.

**Tanzania's nutrition strategy faces several implementation challenges.** The capacity of the Nutrition Committees needs strengthening. 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.<sup>85</sup> 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.<sup>86</sup> Tanzania's scores in the IFAD 2019 Rural Sector Performance Assessment illustrate this implementation gap: Tanzania scores highest of all East African countries in terms of the nutrition policy framework in place, but lags in the quality and transparency of allocation of resources for rural development, rating third last of 16 countries in the region. In accountability, transparency and corruption, Tanzania scores a lot better though (IFAD, 2019). The **Parliamentary Group on Nutrition Food Security and Children's Rights (PG-NFSCR)** and the **Partnership for Nutrition in Tanzania (PANITA)**<sup>87</sup> play an important role in holding the government accountable for commitments on nutrition targets.

Key objectives specified by the Nutrition Action Plan include: (i) ***promote consumption of bio-fortified and high-nutrient value food varieties at community level to increase nutrient intake***; (ii) ***conduct social and behaviour change communication to increase production and consumption of diverse range of nutritious food at community level***; and (iii) ***train agricultural officers as Trainer of Trainers of agricultural extension workers on production of nutritious food crops*** (URT, 2016: 87). In addition, the NMNAP details key actions in the agricultural realm<sup>88</sup> aiming to 'ensure communities have access to a diverse range of nutritious food throughout the year.' It focuses on 'increased production of diversified nutritious foods using modern technological methods, bio-diversification, post-harvest prevention of losses and quality (e.g. addressing the

<sup>84</sup> For 2015 and 2016, the government's overall nutrition expenditure for the mainland was about USD 375 million (3.8% of total government expenditure and 0.9% of GDP; Beaudreault, 2019).

<sup>85</sup> Based on interviews with NGOs such as TAHEA Mwanza and Doctors with Africa (CUAMM), Iringa, May 2019.

<sup>86</sup> Based on interviews with the Food Security Department at the Ministry of Agriculture, Dodoma, May 2019.

<sup>87</sup> PANITA is a coalition of CSOs and INGOs working across Tanzania.

<sup>88</sup> The NMNAP is in line with the National Five Year Development Plan 2016-2021.

issue of mycotoxin contamination especially of aflatoxins), promotion of agro-industries to add value and finding easy access to markets' (URT, 2016: 85). Complementary measures include food safety improvements.

**The NMNAP does not refer to the importance of indigenous vegetables in achieving diversified, nutritious diets.** This is different from the case of Kenya where nutrition policies do refer explicitly to the role of indigenous crops as key nutrient providers.<sup>89</sup> Also, the **National Nutrition Strategy (2011) only mentioned vegetables as a means to reduce fat intake** and address potential, emerging overnutrition problems, not to address undernutrition: *'The government will monitor trends in diet-related disorders and intervene where indicated. The focus will be on the promotion of healthy diets and healthy active lifestyles, and market interventions to encourage the production of healthier foods, particularly fruits and vegetables, and controls on food fat content'* (Tanzania Ministry of Health and Social Welfare, 2011: 25). A paragraph is devoted to the importance of micronutrients in nutrition, but it only mentions **vegetables as a second-best source of minerals and vitamins, mostly focusing on animal foods**: *'selection of food processing methods that increases absorption of vitamins and minerals should be promoted. Animal foods are the best sources of vitamins and minerals and should be promoted where economically and culturally appropriate. Where poverty or culture limits the intake of animal foods, small changes in the dietary intake of plant foods can considerably improve the intake and absorption of vitamins and minerals'* (ibidem).<sup>90</sup> **Indigenous vegetables**, although currently omitted in health, extension and food security strategies, **are present on plates, markets and plots**. As vital sources of micronutrients, they can make an important contribution to the fight against malnutrition (see 3.2.4). Thus, **there is a need to explicitly include support and promotion of indigenous vegetables in nutrition strategies.**

Tanzania has been supported by several development agencies in its efforts to alleviate malnutrition. The NMNAP offers an opportunity for foreign aid donors to work with the Tanzanian government to build local capacity across its ministries. Tanzania was one of the U.S. Government **Feed the Future Initiative's** initial target countries and it is currently an aligned country (Beaudreault, 2019). Also, the **New Alliance for Food Security and Nutrition** – launched at the G8 summit in 2012 – was implemented in Tanzania, in the same year, together with Ethiopia and Ghana. This is one of the many PPP initiatives connected to the Tanzania Agricultural Food Security Investment Plan (TAFSIP). Furthermore, the Swedish cooperation has supported the establishment of the Tanzania Food and Nutrition Centre (TFNC, 2012).

**In sum, 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 (te Lintelo et al., 2020). **Indigenous vegetables, currently omitted from nutrition policies, should be better promoted and supported as important contributors to a diverse and healthy diet.**

#### **4.1.2. Agricultural policies: state-led development versus private sector investments**

As we have seen (3.1.3), **agricultural and rural policy in Tanzania has revolved around a tension between different visions**: one oriented towards **attracting large-scale investment in commercial agriculture**; the other **prioritising government investment in small-scale producers** (Poulton, 2018;

<sup>89</sup> For instance, Kenya enacted in 2013 a regulation promoting blending of maize flour with sorghum and millet (Rampa and Knaepen, 2019).

<sup>90</sup> The strategy also points to the risk that 'the nature of most diets – undiversified, low in animal products and high in plant sources that are rich in anti-nutrients – makes it likely that zinc and B1 and B2 deficiency are a public health problems' (Tanzania Ministry of Health and Social Welfare: 4).

Eriksen, 2018). The Agricultural Sector Development Programme (ASDP) reflects the former vision, while Kilimo Kwanza (*Agriculture First*) assigned a prominent role to the domestic private sector in driving agricultural growth. Similarly, the Southern Agricultural Growth Corridor of Tanzania (SAGCOT) Initiative, launched at the World Economic Forum (WEF) in 2010, is strongly oriented towards private sector-led agricultural development. However, it is more geared towards attracting investments from foreign companies in the fertile Southern Highlands. We analyse these policies and initiatives in more detail below, after providing an overview of the long-term development and agriculture policies in place.

In the **Tanzania Development Vision 2025** (1995) – whose main goal is to transform Tanzania into a middle-income country by 2025 – **agriculture is earmarked as one of the key sectors for economic transformation** (Ministry of Finance and Planning, 1995). Hence, in 2010, Tanzania signed the Comprehensive Africa Agriculture Development Programme (CAADP) Compact and subsequently developed the **Tanzania Agriculture and Food Security Investment Plan** (TAFSIP, 2011). CAADP is the policy framework for agricultural development of the African Union (AU) aiming to achieve agricultural transformation, food and nutrition security, and economic growth (AU and NEPAD 2003). It implies ambitious targets such as 6% annual growth in agricultural GDP and an allocation of at least 10% of public expenditures to the sector.<sup>91</sup> It was lauded as the first continental policy framework giving African leaders the tools to effectively and coherently implement policies and track progress, such as National Agricultural Investment Plans (NAIPs) and the Biennial Review. The TAFSIP is the Tanzanian version of the NAIP, mapping the investments needed to achieve the CAADP goals.<sup>92</sup>

Despite the strong rhetoric of prioritising domestic agricultural production, **public investment in agriculture in Tanzania is well below the target of 10% of public spending**.<sup>93</sup> Moreover, the **largest part of the already tight budget is allocated to infrastructure, mechanisation and storage facilities, not agricultural investments**. Discrepancies between approved budgets and disbursed funds are also high and budget and monitoring problems hinder timely disbursements at the local government level (FAO and ECDPM, 2018). As a result, **Tanzanian rural communities have benefited little from the strong focus on agricultural growth**. Competitive electoral politics, rather than addressing the needs of rural constituencies, have led to the **consolidation of relationships between business and political elites**, underwritten by the transfer of resources to district authorities, including support to agriculture (for example through fertiliser subsidies), creating **new rents at the district level** (Cooksey, 2012). **Unproductive relations between rural communities and public representatives** have undermined larger interventions. There have also been problems with payments to farmers' groups, as well as governance issues within those groups (Cooksey, 2012).

Moreover, as in other East African countries, **Tanzanian policies have focused mostly on crop agriculture and intensive livestock keeping systems, while neglecting the importance of pastoralism** for economic growth, livelihoods and sustainable land practices. In general, the reality of pastoralists has often remained distant from or not understood by planners and policymakers, due also to the ancient stereotype of agro-pastoralists as inevitably inefficient resource users. Sectorialisation of policies fails to take into account the interdependence between crop agriculture and livestock which, by providing manure, animal

<sup>91</sup> Ten years later, Heads of State reinforced their commitment to ambitious goals related to food security, resilience and intra-African trade with the Malabo Declaration (2014; NEPAD, 2014).

<sup>92</sup> The TAFSIP covers seven thematic programme areas: (i) irrigation development, sustainable water resources and land use management; (ii) agricultural productivity and rural commercialisation; (iii) rural infrastructure, market access and trade; (iv) private sector development; (v) food security and nutrition; (vi) disaster management, climate change adaptation and mitigation; (vii) policy reform and institutional support.

<sup>93</sup> Figures of the Ministry of Finance and Planning (2016) show that, between the fiscal years 2012/2013 and 2016/2017, the average allocation was 5.5%. In the 2018/19 budget, agriculture was presented as a top priority sector, but the allocation to the Ministry of Agriculture, Livestock, and Fisheries was only 0.85% of the national total (Poulton, 2018).

ploughing and transport, plays a crucial role in soil management and critically supports local economies (Afun-Ogidan and Weijer, 2016).

In 2013, Tanzania launched **Big Results Now**, an initiative to accelerate policy implementation in a number of areas, including agriculture.<sup>94</sup> Big Results Now aimed to attract private sector investment in medium- and large-scale agriculture, notably for maize, rice and sugarcane (Sulle, 2017).<sup>95</sup> Similarly, **Kilimo Kwanza** (2009) and **SAGCOT** (2010) initiatives<sup>96</sup> **underscore a growing role for the private sector in agriculture-led economic development** and aim at strengthening technology uptake, market development, and partnerships to improve productivity and incomes, ensure food and nutrition security and enhance resilience. However, the **narrative on private sector investment has not been matched by improvements in the business environment**, which is perceived as unpredictable and unfavourable by both foreign and domestic investors and entrepreneurs (Booth, 2014; Netherlands Enterprise Agency, 2018). Investors in large-scale agriculture have suffered from export bans or changing import tariffs, high taxes or changing tax regimes. A continued heavy state presence and a certain hostility towards the private sector, particularly foreign investors, have caused the slow implementation of these initiatives.<sup>97</sup> Also, lack of capacity among officials, heavy bureaucracy, rent-seeking and the lobbying of influential importers of agricultural commodities opposed to import substitution have had an impact on the implementation of agricultural projects (Africa Confidential, 2019).

In 2016, Tanzania elaborated The **Agricultural Sector Development Programme Phase Two** (ASDP II; URT, 2016) and prioritised **government support to small-scale producers**, with only a small role for the private sector. ASDP II identified priority value chains at the level of Agroecological Zones. Maize and few other cereals largely dominate the scene of priority chains, followed by seed crops and pulses. For the Northern Highland zones, where Arusha is located, the primary crop identified is maize and the sector for diversification is horticulture.<sup>98</sup> The **National Horticulture Development Strategy** was set up in 2010, strongly in line with the objectives of Kilimo Kwanza, to make the horticulture sector globally competitive. Focus crops include banana, pineapples and tomato, all with strong export potential (HODECT, 2010). **Indigenous vegetables are not mentioned in the ASDP II nor in the Horticulture strategy.** The harmonisation of agricultural and nutritional strategies, particularly the ASDP II and the NMNAP, recently spearheaded by FAO, provides an opportunity for increased support to the production and consumption of diversified food crops.<sup>99</sup>

**In sum, agricultural and rural policies in Tanzania are inconsistent in objectives and implementation.** While the ASDP II prioritises government support to small-scale producers, a host of initiatives (Kilimo

<sup>94</sup> The interventions prioritised by the Big Results Now were: the rehabilitation or establishment of 78 collective irrigated rice production schemes; the establishment of 25 outgrower schemes for paddy and sugarcane; and the establishment of 275 warehouses for crop marketing – drawing on existing plans from the ASDP, CAADP/TAFSIP, the Kilimo Kwanza and SAGCOT.

<sup>95</sup> Under Big Results Now, ministers and other senior civil servants are held accountable for their performance, following a Malaysian model of public sector management.

<sup>96</sup> Under this initiative, smallholder farmers are seen as contract farmers, or out-growers. Foreign investors are partners in the process of agricultural transformation.

<sup>97</sup> For instance, Magufuli recently cancelled the Matching Grant Fund, a facility aimed at matching private investment in agribusiness with public funds in the context of SAGCOT, and asked the World Bank to withdraw a loan worth USD 70 million ‘after protracted wrangling over how the fund was supposed to function’. Also, the Kilombero Plantation Ltd (KPL), a 5800-ha rice and maize-growing venture, showcased as an example within the SAGCOT area of an effective outgrower project, has now been put up for sale after defaulting on a USD 20 million loan from the US Overseas Private Investment Corporation (Africa Confidential, 2019).

<sup>98</sup> Northern and Southern Highlands, where Iringa is located, are the only two areas where horticulture is prioritized as a diversification sector. Nonetheless a note clarifies that horticulture forms a diversification option in most irrigated areas as small-scale counter-season activity across agro-ecological zones (URT, 2016).

<sup>99</sup> Based on interviews with Ministry officials in Dodoma, Tanzania, May 2019.

Kwanza, SAGCOT and Big Results Now) are strongly oriented towards attracting large-scale investment in commercial agriculture. However, such initiatives are challenged by a heavy state presence, a continued hostility towards the private sector and the influence of special interests. The rhetoric of prioritising agriculture for economic transformation is not matched by strong public investment in the sector. Due to entrenched relationships between business and political elites, rural policies have scarcely benefitted poor rural communities. **Indigenous vegetables are not supported nor promoted in the relevant agriculture policy and strategy documents.**

### **Agri-input and seed policies and regulations**

Increasing small-scale farmers' access to improved agri-inputs is crucial for the sustainable performance of the Tanzanian agricultural sector. This is underlined in several policies and regulations in place, including input subsidy schemes and seed and plant breeder laws.

**Input subsidy programmes have been used as a way to increase inputs use to boost the yields and incomes** of resource-poor farmers. These programmes date back to the Nyerere era when subsidised inputs, together with extension services and tractors, were part of the villagisation process (*Ujamaa*). These subsidies were almost completely dismantled in the 1980s and 1990s. A voucher-based system, the **National Agricultural Input Voucher Scheme (NAIVS)**, was then introduced in 2008/09 hoping to better target farmers in need of support to access these inputs (mostly improved maize or rice seed and chemical fertiliser). **Some productivity increases were achieved in the two main crops** the NAIVS focused on – **rice and maize**. However, auditor reports repeatedly revealed systemic abuse and mismanagement of vouchers. According to the more critical voices, the NAIVS scheme benefited mostly large commercial seed and fertiliser companies who were guaranteed a market for their products, subsidised by the state (ACB, 2018). To qualify, farmers had to be able to co-finance the inputs. Because of this requirement, the poorest farming households were not able to benefit from the programme. Despite explicitly targeting female-headed households, the percentage of women reached was very low (ACB, 2018).

**Lengthy registration processes** for more innovative fertilisers, pesticides and herbicides, and improved seeds are deemed to be **an obstacle** for medium- and large-scale farms **to access affordable and more environmentally sustainable inputs**. Companies that produce or import these products, having to incur high costs, feel discouraged by the business climate to make long-term investments (AECF, 2016; Guijt and Reuver, 2019).

The introduction of a centralised **fertiliser procurement scheme in 2017** has resulted in only two companies now being allowed to import fertiliser in bulk (Eriksen, 2018). This caused concerns over the integrity of the government in awarding the right to import fertiliser. Previously, around 20 companies were allowed to import fertiliser in the country. The new regulation was introduced to lower fertiliser prices, but it is unclear if the desired result has been achieved (Eriksen, 2018: 25).

**Concerning seed policies**, Tanzania has strong laws regulating seed variety release, seed certification, and quarantine and phytosanitary measures.<sup>100</sup> The formal seed sector – although accounting for a relatively small amount of seed supply – attracts most public and private support and regulatory attention (ACB, 2016). **The current seed legislation does not recognise or support farmer-managed seed systems and local varieties.**<sup>101</sup> Nonetheless, policy frameworks allow for an intermediary system (between formal and farmer-

<sup>100</sup> They include: (a) the Seeds Act of 2003, read together with the Seeds Regulations of 2007; (b) the Plant Protection Act of 1997, read together with the Plant Protection Regulations of 1998; and (c) the Plant Breeders Right (No 222, 2002).

<sup>101</sup> The art 32 part 6 (VI) of the Seed Act states that '*no seed can be offered for sale unless it is certified according to these regulations.*' There are no exemptions for farmers who supply their own seed through their own seed systems.

saved or farmer-to-farmer seed systems) through the **Quality Declared Seeds (QDS) system**. The QDS system allows for quality assured seed production by individual farmers or farmer groups for use within their communities at much lower costs than formally certified seeds. **QDS is also used for indigenous vegetables** (Afari-Sefa et al. 2016; ISSD Africa, 2017). For seed producers it has the advantage that they can ask a higher price for quality seed, distinguishing their seed from other seed in the open market without quality assurance (Afari-Sefa et al. 2016, ISSD Africa, 2017).

**However, the QDS system has limitations:** QDS can only be sold within the ward where it is produced (often comprising around four villages) and it has to be produced from formally registered varieties. Another challenge is that the inspection costs, albeit lower than in the formal system, are currently not covered by the seed producers themselves but by the Tanzania Official Seed Certification Institute (TOSCI), local governments and, in some cases, development partners. TOSCI Arusha states that QDS is now allowed only for food crops. Plant genetic resource management by local communities is also not recognized or supported by regulatory frameworks (ASARECA and KIT, 2014).

**In sum, input policies and strategies are biased towards chemical input-based production systems and subject to the influence of strong input corporations**, while biological inputs are less supported and the role of ecosystem services and biodiversity is largely neglected (see 3.2.1). Seed laws are mostly geared towards the formal sector, while farmer-managed seed systems are largely unrecognised and QDS systems limited. Achieving competitive, sustainable, and food and nutrition secure food systems will require a more comprehensive approach to agri-inputs and seed – one that takes into account the environmental impacts of agricultural production and strengthens communities' ownership and resilience.

### **Policies promoting organic agriculture**

Organic and agroecological approaches can make important contributions to farmers' income, poverty reduction, food security and environmental protection (Kamau et al., 2017; Parrot et al., 2006). The National Agricultural Policy (2013) refers to **organic farming as 'a window of opportunity'** to enhance national and farm incomes (TOAM, 2015). But policy support or promotion of organic agriculture is limited. For instance, **public assistance on how to convert to organic farming is lacking**, while small-scale producers often don't have the financial resources to cover conversion costs or third party certification processes.<sup>102</sup> **Limited availability of training and funding** is an important obstacle to unlocking the potential of organic agriculture (Ton, 2013). **Expensive certification systems** currently exclude a large number of potential organic producers (TOAM, 2015). Moreover, **weak regulation** hinders the organic sector: *'the premiums associated with organic produce encourage [conventional] farmers to claim that their produce is organic, undermining the efforts of real organic farmers who have followed strict guidelines and incurred certification costs'* (TOAM, 2015: 3). Participatory certification is a promising approach to overcome some of these obstacles (see Box 7 in 4.3.1).

Some national, regional and continental organisations such as the Tanzania Organic Agriculture Movement (TOAM) and the African Organic Network (AfroNet) support the development of the organic sector in Tanzania and the East African region. These actors advocate for stronger government support to organic and agroecological approaches. Thanks to their efforts and the support of international agencies such as IFOAM (the International Federation of Organic Agriculture Movements), in 2007 the East African Community

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It can be noticed that only sale is forbidden, while barter is not mentioned. Kenyan law instead forbids even barter. This can be interpreted as a stricter approach against farmer seed systems by the Kenyan legislature, but could also be explained by the broader notion of barter which is adopted in Kenya. As a matter of fact, traders on local markets are charged a so-called 'barter tax', as they are not supposed to hold any trade licence. Also Tanzanian traders in the local markets have no trade licence.

<sup>102</sup> Interviews with programme staff at Oikos East Africa, Arusha, and TOAM, Dar Es Salaam, May 2019.



(EAC)<sup>103</sup> adopted a locally-focused regional standard for organic farming, the East African Organic Products Standard (EAOPS; AfroNet, n.d.).<sup>104</sup> The rationale behind the adoption of a common standard was to facilitate local and regional trade. Farmers complying with the EAOPS are issued a common regional mark (the East African Organic Mark, EAOM). Participatory certification is recognised as a valid assurance system.

**Figure 15: The East African Organic Mark: *Kilimo Hai***



Source: TOAM website

This institutional framework, coupled with the existence of a large informal organic sector and a growing domestic and regional demand, provides a strong foundation for the further development of the organic sector in Tanzania and the East African region (D'Alessandro, 2018).

### **Food safety regulations and standards**

Attention for and investments in food safety standards and regulations started to gain momentum in SSA countries, including in Tanzania, in the last decade.<sup>105</sup> There are several reasons for this, including an increasingly globalised food production, consumers' demand for better quality, the rise in fresh produce trade, foreign investments and enhanced technical and scientific knowledge (Trienekens and Zuurbier, 2008; Maertens and Swinnen, 2006, in Faße et al., 2015). Still, the awareness of the effects of pesticides on the health of rural workers (especially women), consumers and the environment is erratic, both among health care providers as well as farmers and consumers themselves.

On paper, Tanzania complies with global standards for agriculture commodities, most notably the GlobalGAP. Regionally, Tanzania follows EAC regulations, including the **EAC treaty** (Chapter 18 - Article 105-110 - on Cooperation in Agriculture and Food Security) and the **EAC CAADP Programme priorities**, that include references to food safety, such as the SPS Programme, the Aflatoxin Prevention and Control Project and the Harmonization of 23 EAC Staple Foods Standards.

Domestically, the country has been struggling to adapt its food regulations to national needs and possibilities. A number of private and public food safety standards exist. Both public and private standards apply to fresh produce and vegetables specifically. Public standards usually apply to the overall food sector and are mandatory, while private standards, for example set by supermarkets, are targeted to specific food groups

<sup>103</sup> Tanzania is a member of a number of regional organisations including the EAC and SADC (Southern African Development Community).

<sup>104</sup> The EAOPS was developed through a participatory, public-private partnership initiative. It is based on organic standards existing in the region as well as the IFOAM Basic Standard, among others. It has been ratified by all the EAC National Standards Bureaus. The EAOPS covers plant production, animal husbandry, beekeeping, the collection of wild products, and the processing and labelling of products. It does not cover procedures for verification such as inspection or certification of products.

<sup>105</sup> Food standards are generally classified according to the type of standard (private or public), the sphere (product or process standards) and their geographic focus (national or international; Maertens and Swinnen, 2006; Will and Guenther, 2007, in Faße et al., 2015).



or refer to organically produced products. They are voluntary and often relevant for a niche market only, mainly adopting the standards originating from international markets. **In Tanzania, traditional open ‘wet’ markets prevail, in which conditions to meet minimum food safety standards are challenging.** The lack of washing facilities at markets, for example, is an obstacle to adopt hygienic handling of fresh produce. Without addressing these conditions, public and private food standards do not have a significant impact on the main part of Tanzanian households (Faße et al., 2015).

Food safety standards and regulations suffer from a **lack of regulatory enforcement, scattered division of responsibilities, and inadequate coordination mechanisms** for implementation, especially regarding the use of pesticides (Rajabu et al, 2017, Mrema et al. 2017). Different interviewees<sup>106</sup> agree that **food safety issues around vegetables, especially pesticide residues, remain a problem difficult to tackle.** Since the coming into effect of a new Finance law in July 2019, the Tanzania Bureau of Standards (TBS) has taken over part of the mandate of the Tanzania Food and Drugs Authority (TFDA), which is now called the Tanzania Drug and Medicinal Authority. TBS undertakes quality control of food products and promotes standardisation. It also now oversees registration and certification of food produced inside and outside of the country. Several interviewees emphasised that **TFDA used to focus mainly on processed and imported products, lacking capacity and willingness to effectively check the food safety of vegetables** and other fresh unprocessed produce. This bias will likely persist after this shift of functions, as the traceability of fresh products is much more difficult than that of processed food. The responsibilities for enforcement of other regulations (e.g. water usage and pesticide residues) are scattered and responsible institutions (e.g. Tropical Pesticides Research Institute, TPRI) lack enforcement capacity (Rajabu et al., 2017; Mrema et al., 2017).

### Land policies

Tenure and customary laws regarding land ownership in Tanzania are hailed to be one of the more **progressive and participatory** in the region. The current legal framework, based on the **1999 Village Land Act** (and more recently the **2007 Land Use Planning**) acknowledges customary laws and grants communities ample rights<sup>107</sup> to decide over ‘village’ land.<sup>108</sup> This entailed a return to the central role of local institutions in land administration, as in precolonial times local chiefs and traditional councils determined access. Under colonial rule, instead, large state farms were dedicated to the production of export and staple crops such as sugar and rice.<sup>109</sup> The villagisation process, ‘*Ujamaa*’, devolved primary authority from central government to elected village councils. A new Land Policy draft was started in 2016 (Poulton, 2018).

Still, **tension between the state and communities over land control persists** (Poulton, 2018). The push for large-scale commercial agriculture and the attempts of the Tanzanian government to attract foreign investment in the agricultural sector (for example, in export-oriented horticultural crops) have put pressure on the land tenure system. The guidelines for village land use planning (VLUP), based on the 2007 Land Use Planning Act, grant village councils significant autonomy, and were found to be lengthy and impractical by government and financial institutions eager to facilitate large scale investments. Procedures to transfer village land to investors could take two years or more (Poulton, 2018). A number of concerned researchers

<sup>106</sup> These include agricultural officers (Arusha City Council, Kilolo and Iringa District Council and Iringa Municipal) as well as government officials of the Environmental unit at the Ministry of Agriculture, NGOs, academics and development partners.

<sup>107</sup> Following the 1999 Village Land Act, user rights to village land were given to village members, who have the right to sell or rent land to fellow Tanzanians from outside the village. Generally, the village council will approve or recognise this transfer. When it's common land that is sold or rented out to outside investors, village councils are only allowed to handle these transactions if it involves less than 250 ha. Larger transactions need to be approved by the district council (Poulton, 2017).

<sup>108</sup> 70% of land in Tanzania is considered 'village' land. Other categories are 'general' and 'reserved' land. Village land refers to land allocated to individuals from the communities, while the rest remains for common use.

<sup>109</sup> Many of them were privatised in the 1990s. This land is now still marked as 'general' land.

flag the risks of an increased emphasis on formalisation and individual property rights, which replaces ‘a more fluid conception of land tenure that allowed for multiple, overlapping claimants and an integration of uses’. They also signal ‘an attempt by the central state to wrest back authority over rural lands from village authorities’ (Maganga, 2017)

#### 4.1.3. Climate and environmental policies: in place but not trickling down

Climate change and environmental hazards can disrupt food availability, reduce access to food, and affect food quality. For instance, temperature increases, changes in precipitation patterns, extreme weather events, and reductions in water availability may result in reduced agricultural productivity. **Having adequate climate and environment policies in place, therefore, is crucial to the sustainability of food systems.**

The main frameworks guiding Tanzania’s policies in this domain are the **National Environmental Policy** (1997), the **Environmental Management Act** (2004) and the **National Environmental Action Plan** (NEAP 2013-2018; Vice President’s Office, 2013). Considerable awareness exists on the importance of mainstreaming environmental issues in sectoral policies and strategies for economic growth and poverty reduction to promote sustainable resources utilisation.

Climate action in the agriculture sector is guided by the **National Climate Smart Agriculture (CSA) Policy** (2015), the **CSA Guidelines** (2017) – implemented under the oversight of the Tanzania Climate-Smart Agriculture Alliance – and the **Tanzania Agriculture Climate Resilience Plan** (2014-2019; GACSA and FANRPAN, 2016). The latter operationalised the **National Climate Change Strategy** (2012). Agriculture is also key in Tanzania’s **Nationally Determined Contribution** (NDC). The NDC and the Resilience Plan both recognise the importance of indigenous knowledge for climate change adaptation and mitigation strategies, but there is **no mention of indigenous crops**. Yet, these policies are evidence of a general **understanding of the importance of linking climate change and agriculture**.

**Most policies are set at a national level but do not fully account for differentiated local contexts and suffer from weak enforcement.** This results in the encroachment of wetlands, deforestation, environmental degradation, conflicts among water users, and other environmental challenges (Osiemo and Kweka, 2019). Policy dissemination at ward and village level is challenging. The implementation of the CSA guidelines serves as a good example: integrated pest management plans and training manuals were developed in 55 pilot districts, but there was little trickling down to the village level due to budget and monitoring problems.<sup>110</sup> Also, **matching adaptation and mitigation requirements remains a challenge**, particularly for local governments.<sup>111</sup> A more iterative and flexible process for priority setting and local implementation could better take into account different local needs.

Lastly, policy incoherence is an issue: for instance, the NMNAP does not take into account climate change and the ASDP II has only a small component on climate.

<sup>110</sup> Based on interviews with Ministry officials and other Tanzanian experts (2017; 2019)

<sup>111</sup> Based on an interview with the Senior Climate Change Advisor at PO-RALG (May 2019).

#### 4.1.4. Food and agri-related policies in Arusha City: towards a sustainable food system in Arusha

As we have seen in 3.1.3, Tanzania is governed by a principle of Decentralisation by Devolution. Thus, **local governments in Arusha have considerable authority over budget administration**. However, policy guidance and resource allocation remains largely centralised, and the autonomy of urban and rural councils is limited by capacity and resource constraints. Through concrete projects, resources can be allocated directly to sub-national levels and local policies and strategies can be created.

In 2015, Arusha City joined the **Milan Urban Food Policy Pact**, signed by 115 cities worldwide and promoting city-to-city learning on developing and implementing sustainable food policies. *‘By signing the Milan Pact’* the Arusha City Council objective was to *‘learn from other cities about how to set up a sustainable and resilient food system’* in Arusha (Rebecca Mongi, Chief Agricultural Officer in the Arusha City Council, in Rikolto, 2018).

A few years later, in 2018, the City Council – supported by the Belgian NGOs Rikolto and Trias, the Dutch NGO Solidaridad, the Tanzania Horticulture Association (TAHA), and the network of local governments ICLEI – drafted an **Arusha Food Strategy**.<sup>112</sup> The Food Strategy aims to provide healthy food to the consumers in and around Arusha while increasing market opportunities for farmers (Rikolto, 2018). One of the pillars of the Strategy is the **Arusha Food Safety Initiative**.<sup>113</sup> As part of this Initiative, Rikolto, together with farmers’ groups and the Tropical Pest Research Institute (TPRI), is conducting an assessment of food safety risks (chemical, biological, physical) throughout the fresh fruit and vegetable chain *‘to identify the hotspots for action’* (Rikolto, 2018). Good storage and safe application of pesticides are key focus areas. **The Initiative should work as a pilot to develop and test a national food safety standard to guarantee the production of safe vegetables and fruits**. Training on food safety to vendors and awareness-raising on food safety risks for consumers at food stalls in local markets are important components of the Initiative.

However, the **implementation of the Arusha Food Strategy seems slow**. According to interviewees close to the project, Rikolto is the main driver of the project, while the City Council can provide little of its resources. Moreover, ICLEI had to stop activities in Arusha because of lack of funding.

Arusha City Council has also worked on an **Arusha City Master Plan** for sustainable urban development since 2015 (see 3.1.3). **Urban development plans include the creation of many green areas to preserve biodiversity and ecological corridors**, mainly along the river stretches crossing Arusha. Themis Garden is an example of such corridors. There is also an intensification of **urban gardens**, where horticultural products are grown. Promoting urban gardens can contribute to food and nutrition security and biodiversity protection. The horticultural context of urban agricultural areas in Arusha does not require mechanisation and agro-chemical inputs. However, a spread of weeds of exotic species is observed that alter the balance of ecosystems. In addition, urban gardens’ irrigation systems often rely on surface water of unchecked quality and mineral levels. **Food safety issues related to urban agriculture thus exist but differ from those in rural areas**.<sup>114</sup> Indigenous vegetables are often grown in such urban gardens, but these crops are not explicitly supported by the City Council plans and policies (e.g. the Arusha City Master Plan).<sup>115</sup>

<sup>112</sup> The process is part of Rikolto’s Food Smart Cities Initiative: ‘Rikolto supports cities in developing sustainable, inclusive, resilient and safe food systems in 6 different countries. The evidence generated from pilot activities with the cities is documented and turned into knowledge which is then mobilised to foster peer-to-peer learning and contribute to international discussions on sustainable urban food systems’ (Rikolto, 2018).

<sup>113</sup> Other pillars of the Strategy include (i) consumer awareness and behaviour; (ii) food policy; (iii) school catering, and (iv) inclusive business.

<sup>114</sup> Based on UNIMIB Animal and Plant Biodiversity fieldwork (2019).

<sup>115</sup> Based on the results of the workshop held in Arusha in December 2018.

In terms of food security, **the Council has focused mostly on food production in the drylands** (lower lands with limited water availability), as these are the areas with higher food insecurity. The main crops promoted are sorghum and guava (*Psidium guajava*), because they are more climate-resilient. Livestock activities play a key role in these areas but are faced with recurrent droughts and unpredictable weather conditions. Largely neglected by policy-makers, who historically failed to understand their needs and perspectives,<sup>116</sup> many pastoralist communities are thus shifting to crop production and other livelihood strategies. In parts of the drylands, households engaging in traditional rain-fed agriculture increased their vulnerability to drought (see 3.1.2).

**In sum, a vast array of policies, institutional frameworks and informal norms govern the Arusha's food system.** In this section, we studied nutrition, agriculture, environmental and climate policy frameworks in place and investigated their effectiveness of the ground. While nutrition has been high on the agenda, with efforts directed at multi-sectoral and multi-stakeholder approaches, agricultural policies are often inconsistent and influenced by conflicting interests of political and economic elites and ideas around the role of the state and market. Numerous environmental and climate-related policies and strategies are in place but trickling down at district and village level is challenging. None of the elaborated nutrition, agriculture or environmental plans in place refers to the importance of indigenous vegetables. **Thus, both space and need to include indigenous vegetables in nutrition, agricultural and environmental strategies is large.** Finally, the Arusha Food Strategy provides an opportunity for advancing integrated food policy initiatives but still lacks traction and funding.

The next section 4.2 describes the main actors in the local food system, their interests, incentives and interlinkages, particularly as it pertains to indigenous vegetables.

## 4.2. Mapping the main food systems actors, with a focus on indigenous vegetables

Many actors in the food system make decisions that influence the way food is produced, processed and marketed, as well as its nutritional value. These include farmers, agribusinesses, transporters, traders, financial institutions, food industries, wholesalers, retailers, restaurants, and consumers (HLPE, 2017). Each of them engages in a variety of practices and relationships that, consciously or unconsciously, regulate how the food system functions, ultimately determining its outcomes in terms of economic, social and environmental sustainability.

An important component of the research into the governance dynamics of the Arusha food system, therefore, entailed **mapping who the main actors are and understanding how they are connected**. The objective of such actor mapping is **to identify key entry points to catalyse change in the food system outcomes** by, for example, strengthening weak linkages or addressing gaps in the system (FSG, n.d.).

In what follows, we present an overview of the main actors of the Arusha food system, particularly as it pertains to indigenous vegetables. Their relations and interlinkages are then explored in the following section (4.3), with a focus on the key practices by which different actors and networks may drive or hinder a stronger integration of indigenous vegetables in the food system.

<sup>116</sup> UNIMIB Anthropology research, 2019.

#### 4.2.1. Main actors in the Arusha food system: an overview

The actor mapping exercise entailed three steps. First, we identified the main actors in the food system based on field visits, interviews with experts and desk research. Secondly, we held a multistakeholder workshop in Arusha<sup>117</sup> during which different stakeholders mapped and characterised relevant actors in the Arusha food system. In a third stage, we asked researchers and experts, both local and international, to give feedback and deepen the actor mapping.

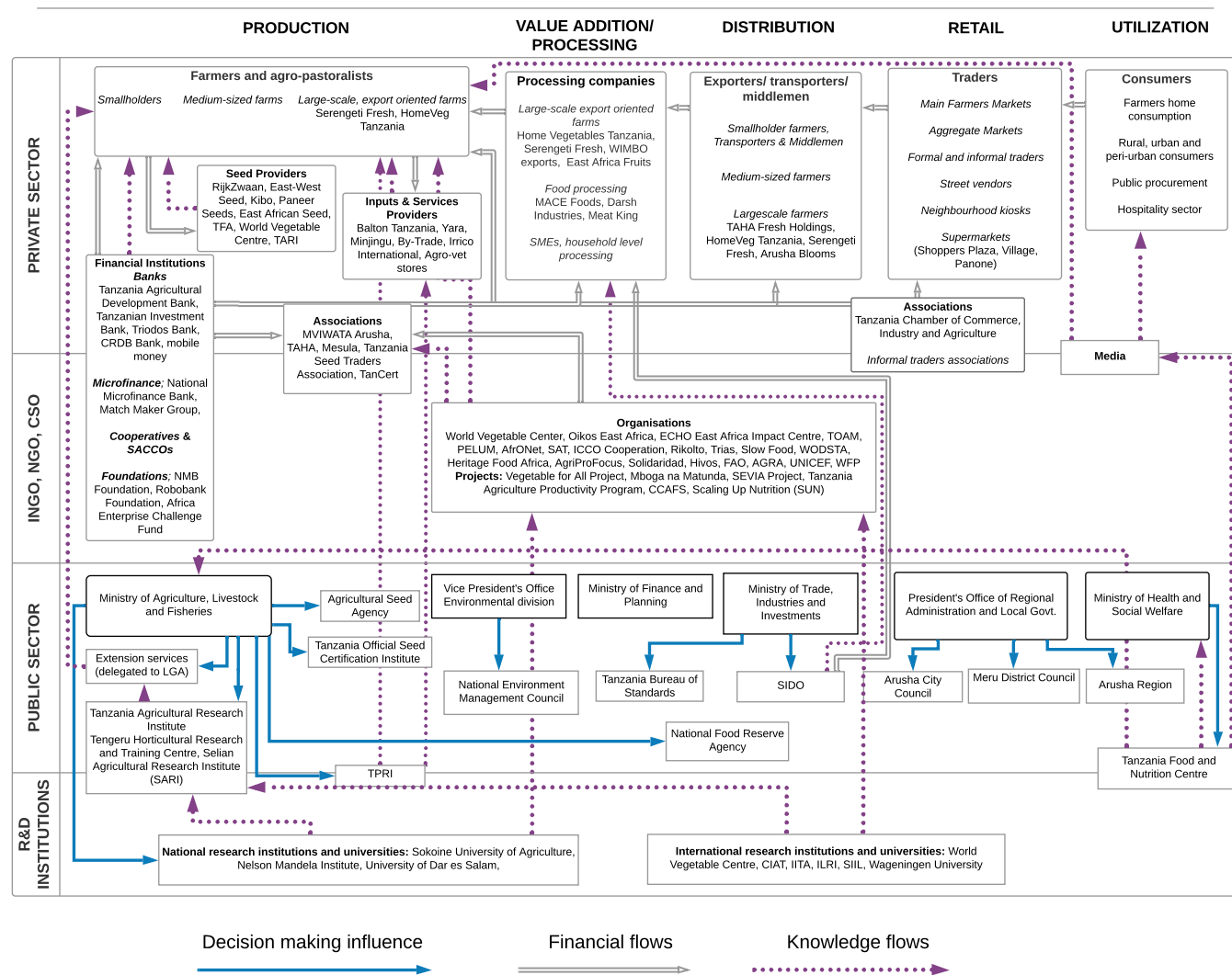
The actor map<sup>118</sup> in **Figure 16 visualises the general landscape of key actors, organisations and initiatives** that are related to the overarching issue of food system sustainability in Arusha and their interlinkages. The map focuses mainly on actors relevant to the horticultural value chain and indigenous vegetables value chain specifically. It clusters the different actors over two axes. On the horizontal axis, actors are grouped along the different food system activities such as production, value addition, distribution and consumption. On the vertical axis, actors are clustered according to their category. Distinction is made between public and private sector actors, INGOs, NGOs and civil society organisations, and research institutions such as universities and research centres. The arrows show their three types of interlinkages: financial and knowledge flows and decision-making influence.

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<sup>117</sup> The workshop was held in December 2018 and was hosted by the World Vegetable Center. The stakeholders and experts who attended had both general and specific backgrounds related to food and agriculture, nutrition, development cooperation and horticultural and indigenous vegetables value chains.

<sup>118</sup> Actor maps are defined as 'a visual depiction of the key organisations and/or individuals that make up a system, including those directly affected by the system as well as those whose actions influence the system'. (FSG, n.d.).

Figure 16: Overview of the main actors in the Arusha food system and their interlinkages



Source: Compiled by ECDPM based on field interviews with experts and desk research

To understand the roles of these actors and the connections between them, **we zoom in on a number of subsystems, largely based on the different steps in the food supply chain** such as production, processing and distribution. There are, however, also several actors and organisations that work across the food system. These are mostly the actors active in the so-called enabling environment and business services. Where possible, we will indicate with what actors in which step of the food supply chain these organisations and institutions mostly work. In some cases, there will be an overlap when categorising specific actors: for example, when a farmers' organisation is both involved in production, storage and technical support to members.

#### 4.2.2. Production and processing

The Tanzanian horticultural sector is dominated by **small-scale producers** with plots smaller than two ha. Less than thirty **large-scale producers** are active in the country, most of them located either in the area of Arusha or Manyara (Netherlands Enterprise Agency, 2017). Using different size-based definitions, medium-scale farms are on the rise, occupying five times as much farmland than large-scale farms and almost as much as all the small-scale farms combined (Poulton, 2017).<sup>119</sup> In general, there is a low level of farmer organisation in Tanzania. Our research suggests that Arusha is no exception, although some cooperatives, self-help groups and marketing associations are active in the region (see 4.3.1).<sup>120</sup>

**MVIWATA** is the national network of farmers' groups. It has a branch office in Arusha that operates at district, regional and national level. MVIWATA is a member-based association, whose main objective is to strengthen institutionally their member groups and advocate specifically for small-scale farmers and farmer groups. It offers capacity building and training and it also has a market access and a market intelligence program, to foster small farmers' integration in the market and their knowledge about market prices and trends. MVIWATA also offers capacity building in organic production according to its Strategic Plan 2017/2021. They work together or have worked together with research institutes and NGOs such as Sokoine University, the World Vegetable Centre and Trias, organisations that will be discussed later in this section.

In the horticultural sector, an important player is the **Tanzania Horticulture Association (TAHA)**, a member-based private sector organisation dealing with vegetables, fruits, spices, and flowers. Their membership includes *Comprehensive members*, who are large-scale producers, *Allied members* who are input and equipment dealers, both big and small (Yara and Syngenta are among them), and *Farmers and small processors*, who are the biggest share. Most of their small-scale producer members have 0.5 acres for vegetables as an average and 65% TAHA of members produce for domestic markets only. TAHA focuses its capacity building and advocacy efforts mostly on improving market access, production and productivity of their members, lobbying governments at different levels to improve the business enabling environment and strengthen institutional capacity. TAHA supports the use of hybrid seeds and input-intensive techniques. 90% of the resources of TAHA are coming from donors, mostly USAID (Netherlands Enterprise Agency, 2017; Beaudrault 2019).

<sup>119</sup> According to Jayne et al. (2016, in Poulton, 2017) smallholders occupy 8.59 million ha of land, medium-scaled farms control 5.86 million ha and large-scale farms hold 1.29 million ha in Tanzania. In this classification, small-scale farms own 0-5 ha, medium-scale farms 5-100 ha and large-scale farms more than 100 ha.

<sup>120</sup> There are seven Agricultural Marketing Cooperative Societies (AMCOs), twenty-seven Credit and Saving Unions, one Industrial Cooperative, three Agricultural production Cooperative Societies and two livestock-keepers cooperative societies (URT, 2016).



Competition amongst **large horticulture companies** exporting fresh vegetables is high, as fertile land is scarce and businesses compete in sourcing from the few small-scale producers able to meet the high standards required in terms of quality, quantity and consistency. **Home Vegetables Tanzania LTD**,<sup>121</sup> **Serengeti Fresh LTD**,<sup>122</sup> and **WIMBO exports LTD**<sup>123</sup> are examples of companies active in the horticulture sector targeting export markets in Europe, UK, Middle East and East African countries (Netherlands Enterprise Agency, 2017).

**Input providers** such as By-Trade, Yara, Minjingu and Balton, and **agro-dealers** supply horticultural producers with a range of pesticides, fungicides and fertilisers. As for seeds, around fifty-four **seed companies** operate in Tanzania, of which thirty are involved in vegetable seeds (Guijt and Reuver, 2019). The Alliance for a Green Revolution in Africa (AGRA) has become a major player in the domestic seed industry in Tanzania. Between 2007 and 2012 AGRA gave grants to eleven Tanzanian seed companies, more than any other country in SSA (ACB, 2016). Many companies in the SAGCOT corridor are from the input sector rather than agricultural producers, which means that they are targeting Tanzania as an outlet market, for the huge number of smallholders, rather than to invest in agricultural production straight. Currently, twelve vegetable seed companies active in Arusha also produce or sell seeds for indigenous vegetables (see Table 12). Three seed companies export to European countries, including the Netherlands (Netherlands Enterprise Agency, 2018). Some of them are also involved in initiatives to develop the vegetable value chain and vegetable seed production value chain in Tanzania and Arusha Region, such as **RijkZwaan** and **East-West Seeds**.<sup>124</sup> Many of the improved varieties of indigenous vegetables grown in Arusha have been developed by the **World Vegetable Centre**. The research centre, which has five centres across the world, has programmes on seed breeding, the vegetable value chain, healthy diets, and impact assessments. The World Vegetable Centre is a partner in projects such as Mboga na Matunda and the Vegetables for All, discussed more in detail below.

The **Tanzania Official Seed Certification Institute (TOSCI)** is a semi-autonomous government agency that was established in 2003 by the Seed Act, under the Ministry of Agriculture, Livestock and Fisheries. TOSCI tests and certifies the production of seeds by seed companies and is responsible for the certification and promotion of quality agricultural seeds produced or imported into the country for sale. The public **Agricultural Seed Agency (ASA)** was created in 2006 and produces both basic seeds and seeds for the final market. Basic seeds can also be sourced from private breeders. Other agricultural input providers (companies like TFA or Pannar Seeds, both having a branch office in Arusha) can rely on the lobbying and advocacy of associations such as the **Tanzania Seed Traders Association (TASTA)** as well as on the activities of TAHA.

<sup>121</sup> Home Vegetable Tanzania LTD is a processing and export company of horticultural products, located in Arusha. They mostly sell high value-added products like 'baby' varieties or packed products. They trade baby corn, leeks and carrots; together with packed fine beans, snow and snap peas and packed passion fruits.

<sup>122</sup> Serengeti Fresh LTD is a Kenyan packing, processing and export company located in Arusha. They export packed mung beans and other pulses, exotic fruits such as avocado and passion fruit. Their products and infrastructures are compliant with international quality standards (European and GlobalGap standards) (Match Maker Associates Limited, 2008).

<sup>123</sup> WIMBO exports LTD is a limited registered company in Usa River, in Meru district. It acts both as a collector and an exporter of high-quality production (Match Maker Associates Limited, 2008).

<sup>124</sup> They are active for example in the Seeds of Expertise for the Vegetable Sector of Africa (SEVIA) project, a collaboration between RijkZwaan, Dutch government, Wageningen University & Research and East-West Seeds, and local partners such as TAHA, Sokoine University, the World Vegetable Centre and HortiTengeru.



As we have seen (3.2.1), Arusha has a well-established food processing and transformation industry, for national standards. Despite being much smaller and having fewer companies than Dar es Salaam, Arusha displays greater quality differentiation and is endowed with numerous semi-national or nationally representative medium-sized companies (Ijumba et al., 2015). There is, however, a significant difference between urban and rural areas in terms of the level of activities. In the two industrial zones in the southern part of the city, there are a few food processing companies active, such as meat processor **Meat King**.

Relevant for the horticulture sector is **Darsh Industries**, a company that produces several consumer products such as ketchup and tomato paste. They carry the RedGold brand and are the biggest tomato processor in Tanzania. They work with out-growers in and around Arusha, who are facilitated to grow hybrid tomato varieties, supplying improved seeds and inputs to the farmers. They work together with local seed companies that use the extracted seed of the tomatoes while the pulp is used for the processed products (Dubois et al., 2015). In 2015, they were still importing the largest part of its tomato pulp for the factory to be able to run at full capacity (ibid.). For that reason, in 2015 they opened a processing facility in Iringa. This facility wasn't running at full capacity in 2017 and pilots with contract farming weren't very successful.<sup>125</sup>

For the indigenous vegetables value chain, actors engaged in processing activities such as drying are very few, and mostly at the household level for home consumption. At a larger scale, there are some farmer groups like the Tumaini group that is active in drying indigenous vegetables to sell in Kingori, their nearby village west of Arusha. **MACE Foods**, a Kenya-based company processing dried spices and vegetables for the East African and diaspora market, is starting to source indigenous vegetables from producers from the Arusha area.

There are a large number of NGOs and programs working specifically in the production subsystem. Here we introduce ECHO and TOAM. **ECHO East Africa Impact Centre** is an international NGO that works as a network and knowledge centre with a lot of expertise and experience on sustainable agricultural practices adapted to local conditions and livelihoods such as integrated pest management without chemicals. They have an important role in knowledge sharing through, for example, sharing of best practices on their website and biannual conferences that reach a regional audience. They have the largest seed bank in Arusha for indigenous species and land races and demonstration plots on their headquarters northwest of Arusha city. The **Tanzania Organic Agriculture Movement (TOAM)** is the national-level organisation promoting organic agriculture in Tanzania. They provide training, certify producers and lobby the government for more supportive policies for organic agriculture. TOAM, for example, successfully convinced the Tanzanian government not to sign the regional SADC protocol on Plant Breeders Rights without protection of indigenous seeds systems. Related to organic agriculture, other key actors are **Participatory Ecological Land Use Management Tanzania (PELUM)** and **Sustainable Agriculture Tanzania (SAT)**. PELUM is part of a regional network of organisations that lobby and advocate for food and seed sovereignty in East, Central and Southern Africa. SAT publishes a monthly magazine called *Mkulima Mbunifu* and has a training centre in Morogoro for organic production of fresh produce. **Tanzania Organic Certification Association (TanCert)** is a certifying body for organic products. TOAM is also enabled to certify organic producers and products.

Programs that are very relevant for the vegetable value chain in Tanzania are **Mboga na Matunda** and **Vegetables for All**. Mboga na Matunda is the fruit and vegetable value chain programme part of USAID's global Feed the Future Initiative. The program works with several partners in different regions of Tanzania, mostly targeting small-scale producers and other actors in the value chain with capacity building on production, marketing and consumption issues. They are mostly active in the southern part of Tanzania and Zanzibar. As with the smaller Dutch funded Vegetables for All project, the project focuses on behaviour

<sup>125</sup> Based on interviews with extension staff from Darsh Industries in Iringa (2017).

change related to the consumption of fruit and vegetables. The Vegetables for All project does have a focus on Arusha. The project is a partnership led by RijkZwaan and the Global Alliance for Improved Nutrition (GAIN) involving TAHA, the World Vegetable Centre, Dutch seed company RijkZwaan, ICCO and Wageningen Centre for Development Innovation, part of the Dutch Wageningen Agricultural University. It was implemented in four districts in the north of Tanzania, including Arusha. The project has the goal of improving the availability, affordability and consumption of nutritious foods by Tanzanian families, focusing on fruits and vegetables including indigenous vegetables.

**AgriProFocus** is a Dutch network organisation bringing together Tanzanian and international (mostly Dutch) companies and organisations involved in agricultural value chains. They aim to foster partnerships between different stakeholders that can strengthen capacities along the value chain. They do so by, for example, facilitating knowledge exchange through platforms, providing information through their website and organising fairs. **Solidaridad** and **Hivos** are two Dutch-based NGOs active in the Arusha area. Solidaridad has a long trajectory in developing fair and sustainable value chains, mostly export-oriented. In Arusha, they work in the tea and coffee value chains, but also increasingly in the livestock and fruit and vegetables for the export value chain. Hivos East Africa is working mostly on sustainable energy (including biogas installations) and gender and generational equality and women's empowerment project in the coffee value chain. Their projects on sustainable diets in Uganda and Zambia have been inspiring examples for the SASS project. Both organisations attended the SASS workshop in December 2018.

From the public sector, the main actors that are relevant for the production part are firstly the **agricultural officers** and the **extension services**, part of the ministry of agriculture but falling under the different local governments (Arusha City, Arusha rural, and Meru district). Extension services are often partners in the different projects and programs targeting small-scale producers or aiming to improve production, productivity and food and nutrition security (Beaudrault, 2019). The **Tropical Pesticides Research Institute (TPRI)** is mandated to enforce proper use and handling of chemical inputs through routine inspections, while in practice it is mostly agricultural extension officers and agro-vet dealers that provide information to farmers on how to use agrochemicals.

The **Ministry of Agriculture** has an environmental unit and extension services officials also oversee that, for example, regulations on the safe handling of agricultural chemicals and minimum distance to water sources are respected. Currently, environmental regulations at the local level are weakly enforced (CIAT and World Bank, 2016). The **National Environment Management Council (NEMC)** is responsible for environmental regulations and guidelines related to for example the ban on plastic bags and the use of Environmental Impact Assessments (EIA). Implementation seems to be done in close coordination with local level government officials such as the **Arusha City Council Head of Environment**.

Related to processing and with a considerable reach at the local level is the **Small Industries Development Organization (SIDO)**, falling under the responsibility of the Ministry of Trade, Industries and Investment (MTII). SIDO has the objective to promote the use of local technology to catalyse industrialisation at small and medium scale. They often support individual farmers or farmer groups in the food sector, for example facilitating access to technology to preserve food and providing training on small/medium-scale processing (e.g. drying of fruits and vegetables or mixing of nutritious flours with maize and soybean).

#### 4.2.3. Distribution, trade and retail

The distribution and trade part of the Arusha food system is characterised mostly by **informal traders**. Nearly two-thirds of Tanzanian farmers sell their produce at farm-gate rather than carrying it to a nearby market (Derksen-Schrock et al., 2011). In some cases, farmers take products to the market themselves, but in most

cases, **small-scale traders** (sometimes producers themselves) aggregate produce and bring it to markets. Farmers, or intermediaries, hire the means of transportation plus drivers and often accompany them (see 3.2.1).

Often, establishing formal organisations of informal actors, which may help reach economies of scale, overcome coordination problems and voice collective interests, is difficult to achieve. In Arusha, there are a few **traders' associations** that offer a platform for more informal traders at the market level. Representing often more formalised traders and shopkeepers is the Arusha branch of the **Tanzania Chamber of Commerce, Industry and Agriculture (TCCIA)**. The TCCIA's goal is to stimulate the local government to take into account the interest of small-scale entrepreneurs. They support people in issues around registration, taxation, for example by providing information on regulations around import and export and other issues. The Arusha branch of TCCIA works together with the NGO Trias on developing and providing business development services to entrepreneurs in Arusha city.

In the case of maize, an important role is played by the **National Food Reserve Agency (NFRA)**, which enters the market during major harvest periods to buy maize. The Kibaiwa market near Dodoma is the main physical maize market in Tanzania. As we have seen (3.1.2), the main source of fresh fruit and vegetables for rich and poor households in the city of Arusha are small-scale **vendors** and wet markets.<sup>126</sup> In Arusha, Samunge is the main wholesale market for leafy vegetables, counting some 3500 traders of which three quarters mostly sell horticultural products. Bigger marketplaces such as the Central market and Samunge are managed by **market authorities** together with **traders' associations**. **Supermarket managers** are currently deciding not to stock indigenous vegetables.

In terms of logistics and distribution, an important 'homegrown' player catering for the horticultural sector geared towards export is **TAHA Fresh**. Established in 2009 as a partnership between the Tanzania Horticultural Association and some large-scale producers and exporters of Tanzania, they provide logistics services to these companies. They facilitate clearance, air and sea freight and trucking to different export markets offering a 'one-stop-shop' (Netherlands Export Agency, 2018).

One of the few initiatives in Arusha that tries to develop the market for products in the region of Arusha is **Mesula (Mount Meru Sustainable Land)**. This network of producers was initiated by **Oikos East Africa** and **Istituto Oikos** and two Italian funders. The initiative started as a social enterprise, contracting farmers that have been trained by the company itself in organic horticulture and linking them to consumers and the hospitality sector (mostly expatriates and high-end consumers). Due to the increase in rules and regulations (especially on fiscal requirements, and the unpredictability of the rules and their enforcement), the institutional set up of Mesula has fundamentally changed: Mesula is no longer a company, but in practice has become the brand name for the network of farmers that have achieved organic certification through the project. An entrepreneur now buys and sells the produce of Mesula farmers as an independent trader and hosts the monthly Arusha Farmers Market, still at the grounds of Oikos East Africa.

#### 4.2.4. Consumption

**Consumers from different socio-economic spheres** are key in driving food system dynamics. In Tanzania, as in many other East African countries, organised consumer interests are non-existent or at a very early stage. In Arusha, there are **no consumer organisations** that can play a role in safeguarding consumer interests. Community health workers play an important role in nutrition awareness. Social and behavioural change are part of the Mboga na Matunda program and other Feed the Future programs such as NAFKA

<sup>126</sup> Markets selling fresh fruit and vegetables, meat, and fish, in contrast to markets selling clothes or household appliances.

(grain in Swahili), the program focused on staple crops in Tanzania. Press and local audiovisual media have reported on food safety scandals for instance on adulterated milk. **Local radios** are often linked to **religious communities**; religious and community radio stations have considerable reach and impact in awareness around food safety, nutrition and even agricultural and environmental issues. Increasingly, **social media platforms** play a role in informing consumers about health and food safety. The Swahili forum [www.jamiiforums.com](http://www.jamiiforums.com) is an example of a new information channel that can be relevant to reach households and individuals. The World Vegetable Centre has used **community radio** successfully to raise awareness of the nutritional value of indigenous vegetables. Local newspapers are an important source of information, but mostly for urban, middle-class consumers. They have much less reach in the rural areas around Arusha city.

#### 4.2.5. Enabling environment

Regulating bodies, research infrastructure, transport networks and institutional arrangements are part of the enabling environment. These can be public or private actors or organisations that are not directly involved in production, processing, distribution or trade but have an essential role in the functioning of the business and enable the food system to operate efficiently.

First of all, the **ministries** setting policies relevant to the food system are an important part of the enabling environment. As described in the previous section, often the gap between policies and practice in Tanzania is significant. Implementation is done in cooperation with **local governments**. Regional Commissioners, District Commissioners and District Executive Directors have a significant mandate in policy implementation and budget allocation. Most senior positions like these are appointed by the President or the **President's Office of Regional Administration and Local Authorities (PORALG)**. In Tanzania, the decision-making power at the local level is vested in the local Councils. As described in 3.1.3, the ruling party CCM has long had a dominant position, in local councils (Eriksen, 2018; Cummings et al., 2016; Poulton, 2017). Arusha City has been a stronghold of the opposition party, Chama cha Demokrasia na Maendeleo (Chadema) including its **Mayor Kalist Lazaro**. Lazaro defected Chadema in November 2019 when the opposition party decided to boycott the latest local government elections (Daily News, 2019). It remains to be seen how this will affect working relations between Arusha City Council, the Mayor and the central government.

Some **regulating and certifying agencies** have already been mentioned in this section (TOSCI, TPRI). Also relevant to the food system's enabling environment is the **Tanzania Bureau of Standards (TBS)**. The TBS falls under the Ministry of Industry and Trade and since the coming into effect of a new Finance law in July 2019 took over part of the mandate of the **Tanzania Food and Drugs Authority (TFDA)** which is now called the Tanzania Drug and Medicinal Authority. TBS undertakes quality control of food products and promotes standardization. It also now oversees registration and certification of food produced inside and outside of the country. Production premises such as slaughterhouses need to be registered with the TBS. Affecting all businesses and entrepreneurs is the Tanzania Revenue Authority (TRA), mandated with collecting taxes throughout the country. Local Government Authorities can charge a 0.3% service levy on companies in their districts as well as a product cess of a maximum of 3%.

The **Tanzania Food and Nutrition Centre (TFNC)** is a government institution officially established in 1973 to initiate, coordinate and catalyse nutrition activities in Tanzania (TFNC, 2012). It started under the supervision of the Ministry of Agriculture, fell under the Office of the Prime Minister and currently resides under the Ministry of Health and Social Welfare. It is semi-autonomous and functions as chair and secretariat for the multi-sectoral Technical Working Group on Nutrition comprised of line ministries, UN agencies, NGOs and other development partners. Together with the High-Level Steering Committee, this forms the Multi-Stakeholder Platform. The High-Level Steering Committee is more political, bringing together Permanent

Secretaries from the relevant sectors (health, agriculture, education, industry, finance, community development, livestock and fisheries and local government) and representatives from development partners, civil society and the private sector (TFNC, 2012).

Financial services providers are an important part of the enabling environment. The **Tanzania Agricultural Development Bank (TADB)** is a development finance institution founded by the Tanzanian Government in 2015 with the mission to support farmers and agriculture in Tanzania. Apart from the national government, it receives support from the African Development Bank (AfDB, n.d.). Other actors are local banks or international banks with local branches such as the **National Microfinance Bank (NMB)**. NMB was established as a microfinance bank in 1997 by the Tanzanian Government but has privatised it in 2005. In 2018, the Rabobank Group, a Dutch bank with its roots in the cooperative movement, was the biggest shareholder (Mohammed, 2018; FMO, n.d.). The NMB Foundation for Agricultural Development strives to strengthen the management of cooperatives and farmer organizations, with capacity building in for example business skills, production techniques and leadership (NMB, n.d.). Increasingly, banks are realizing that there is much potential for indigenous vegetable production targeting domestic and near-regional markets<sup>127</sup>. For small-scale producers, Savings and Credit Cooperatives (**SACCOs**) and informal saving and credit groups are more relevant in accessing finance than the formal banking system. The use of **mobile money** is increasing rapidly, especially among rural and lower-income groups (Anderson, 2016).

An essential part of the enabling environment for the food system is the national and international research infrastructure composed by national and international **universities and research organisations** active in Tanzania.

**Sokoine University of Agriculture (SUA)** is the leading agricultural university in Tanzania, based in Morogoro. It has different departments teaching courses and conducting research in areas relevant to production (for example breeding), processing, nutrition, environmental issues and other relevant domains. The SASS project works together with the Food Technology, Nutrition & Consumer Sciences department. Nutrition officers at local governments are often alumni of this department. The Sokoine University Graduates Entrepreneurs Cooperative provides training on food processing to support young people in agribusiness. The **Nelson Mandela African Institute of Science and Technology** is one of the more prominent universities in the field of nutrition. SASS cooperates with its Sociology department.

The **Tanzania Agricultural Research Institute (TARI)** is a semi-autonomous government institution under the Ministry of Agriculture. It is an umbrella organisation of different research institutes, responsible for conducting, regulating and coordinating agricultural research activities in Tanzania. Formally, they also advise the government on the formulation of national policies, laws and regulatory frameworks for promoting and regulating agricultural research, and have a role in setting the national agricultural research agenda and priorities together with key stakeholders.

TARI is made up of different agricultural research institutes (ARI), distributed over the country. Often, institutes have a focus on specific crops and provide research support to their designated zone. These are often cash crops such as coffee and cotton, but also staples such as rice and Irish potato. Traditionally, these institutes were very much focused on breeding improved varieties of their focus crops but increasingly they are broadening their perspective to include developing and providing expertise on processing, marketing and nutrition. The ARIs most relevant for the horticultural value chain and indigenous vegetables are **Horti-Tengeru**, focusing on horticulture and ARI Ilonga. Horti-Tengeru is located in the Arusha area and plays an important role in the development of the curriculum of agricultural extension officers. ARI Ilonga is based in

<sup>127</sup> Based on interviews done by John Msuya, Sokoine University in December 2019 and January 2020

Kilosa and plays a role in breeding seeds of indigenous vegetables. The Selian Agricultural Research Institute (**SARI**) focuses on major grains but because it is based in Arusha as well, it reaches extension officers in the region (also with information about crop rotation and the use of cover crops where indigenous vegetables can play a role. As such, they are also an important actor in the so-called local innovation system.

At the international level, the **World Vegetable Center** is an important knowledge player, already discussed in the production and processing section of this chapter. Part of the **International Center for Tropical Agriculture (CIAT)** and other **CGIAR centres** have done extensive research and implementation of research and agricultural development projects and programmes that are very relevant to make local and national food systems more sustainable. Because these centres work globally, they often facilitate the exchange between different countries and can draw from a vast reservoir of expertise on cross-cutting issues such as gender, policy reform or innovation systems. Globally, CIAT leads the CGIAR Research Program on Climate Change, Agriculture and Food Security (**CCAFS**). In Tanzania, they work together with different partners on climate-smart agriculture and smallholder resilience, such as the Sustainable Intensification Innovation Lab (**SIIL**), part of the USAID-funded Feed the Future programme. CCAFS also works together with the Ministry of Agriculture on the nexus between climate change policies and national agriculture plans. Other CGIAR centres active in Tanzania are the International Institute of Tropical Agriculture (**IITA**) which is researching the soybean value chain and other tropical legumes. The International Livestock Research Institute (**ILRI**) researches mixed crop-livestock systems and has integrated innovation platforms in their approach. Both centres are based in Dar.

A large group of international **NGOs**, local NGOs and other types of civil society organisations (**CSOs**) are active in the Arusha food system. Above, we have already mentioned a few NGOs and CSOs when they were specifically relevant to a certain part of the food system. Here we name just a few other relevant NGOs in Arusha working more generally on sustainable development. **Oikos East Africa** is a Tanzanian NGO with Italian roots working closely with Istituto Oikos, based in Milan. Their work focuses mostly on the synergies between sustainable natural resource use and poverty eradication for example in projects around wildlife preservation or developing alternative livelihoods in the dry areas of Mount Meru. They have initiated some more specific food-related projects such as Mesula and work on school gardens and feeding programs.

**Slow Food Tanzania** and **Heritage Foods Africa** are NGOs based in Arusha and Moshi focusing on the different aspects of traditional, local food products and the role they can play in the social and economic empowerment of local communities, and in safeguarding agrobiodiversity and cultural heritage. Slow Food Tanzania is part of an international network that works together with a broad array of stakeholders, such as chefs, policymakers, researchers and local farmer groups. Slow Food Tanzania and Slow Food International, together with the networks in Uganda, Kenya and the Democratic Republic of Congo recently launched the project 'Building local economies in East Africa through agroecology'. Through the project, young producers will gain knowledge and exchange experiences on sustainable agricultural practices. Heritage Foods Africa has worked together with Slow Food on key events such as the Karibu-Kilifair, an important regional tourism fair. It has strong connections with the hospitality sector in Northern Tanzania and initiated several concrete projects, for example around the oysternut or *kweme*, exploring how new markets, business models and processing techniques can maximise the nutritional, environmental and economic benefits of this indigenous nut.

**Rikolto** and **Trias**, both Belgian-based NGOs, work closely together with the Arusha City Council on the cities' food policy. At this stage, the initiative is focusing mostly on food safety but has the ambition to also tackle other challenges, for example around environmental sustainability of the local food system and employment opportunities in the food economy. Rikolto works on the development of agriculture value chains

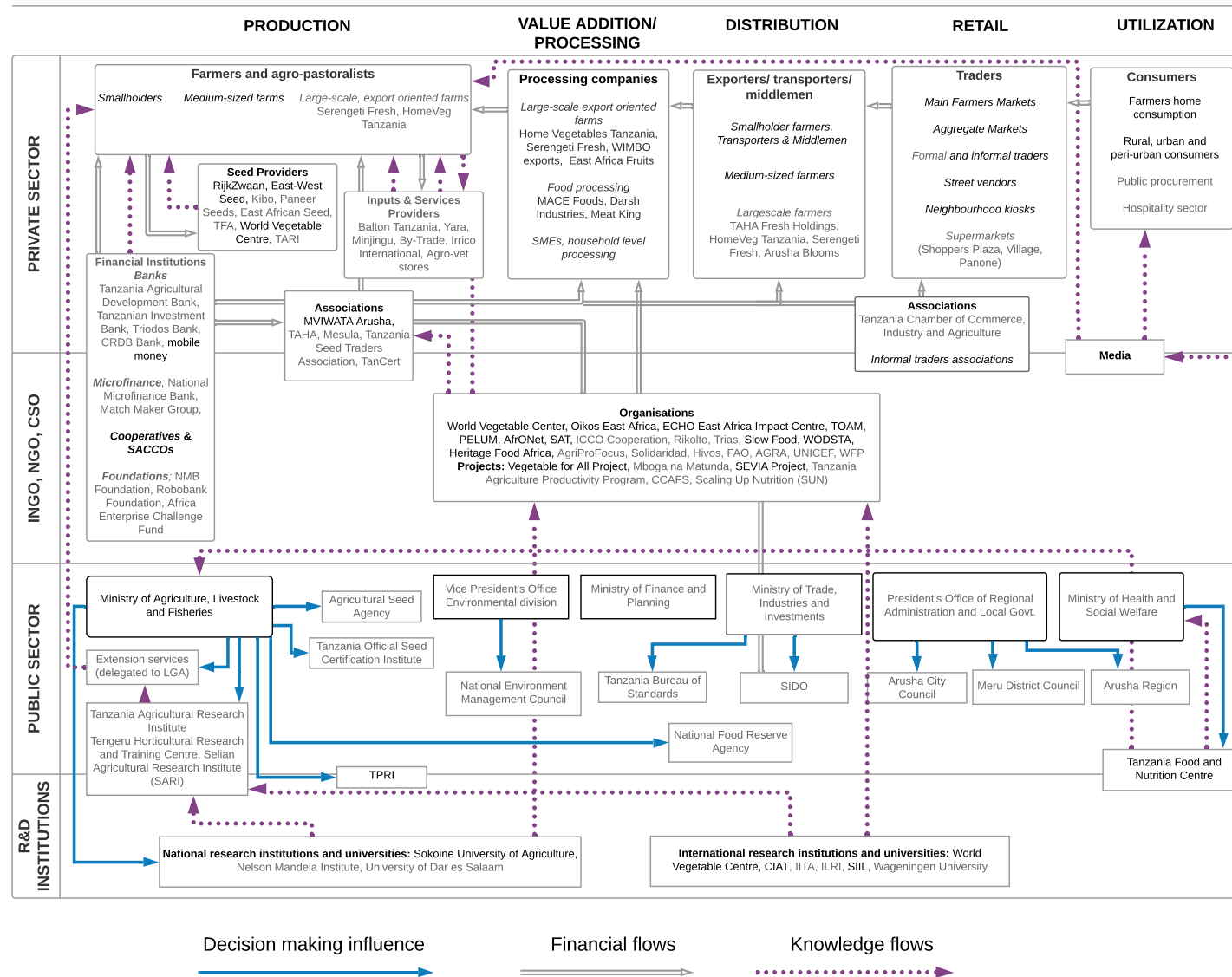
and inclusive business, while Trias focuses more on supporting cooperatives and other member-based organisations of farmers and entrepreneurs in finance and business development.

At national level, UN agencies such as the Food and Agriculture Organisation (**FAO**), the World Food Program (**WFP**) and **UNICEF** are important partners for agricultural development and nutrition. They work together in the Development Partners Group Tanzania (**DPG**) where 17 bilateral and 5 multilateral (UN counted as one) organisations try to exchange information and in the best of cases align and harmonize their efforts with each other and the Government of Tanzania and other domestic stakeholders to maximize their contribution to the sustainable development of the country.

#### **4.2.5. Main actors involved in the indigenous vegetables chain in Arusha**

Figure 17 lists the main actors and categories of actors in the food system which play or can play a role in indigenous vegetables promotion and development in Arusha.

Figure 17: Main actors involved in indigenous vegetables in Arusha and their interlinkages



Source: Compiled by ECDPM based on field interviews with experts and desk research



The main difference with the actor map of the general Arusha food system is that **the value chain is less structured and formalised, especially if you compare it with the commercial horticulture value chain, without ramifications to processors and larger scale exporting companies.** Linkages with input providers are there, for example in terms of seeds and agrochemicals, but less pronounced than for the exotic vegetables value chains such as tomatoes. However, **for some of the more popular indigenous vegetables** (such as amaranth, African nightshade and Ethiopian mustard), our research indicates that **the value chain starts to resemble that of exotic leafy vegetables, particularly in terms of input provision.** This is evidenced by the increase in linkages with formal seed companies selling improved seed of indigenous vegetables (see 4.3.1). Linkages to agro-vet stores selling agrochemicals are likely to be comparable for these leafy vegetables to those of exotic leafy crops.

This section introduced the main actors, their role and relevance in the food system. In the next section 4.3, we discuss the main drivers and constraints of indigenous vegetables integration in the Arusha food system.

### 4.3. Drivers and constraints of indigenous vegetables integration

The previous section introduced the main actors and their role and relevance in the food system. Here, we analyse the key **bottlenecks and opportunities for stronger integration of indigenous vegetables** within Arusha's food system by exploring the relations between actors, their practices, and connections along the chain.

We focus particularly on existing **vertical and horizontal linkages in the production, distribution and consumption sub-systems.** Actors at different stages of the value chain are vertically linked with other actors. For example, input suppliers are linked through producers, processors, wholesalers, distributors, and exporters, all the way to consumers. Vertical linkages are the commercial relationships that bring a product up the value chain and aim at increasing value chain competitiveness and development (Dunn, 2014). Horizontal linkages, on the other hand, connect actors performing the same activity within the value chain. They can take the form of informal functional (peer-to-peer learning arrangements), formal functional (farmers/processors associations, microcredit schemes), formal regulatory (industry associations), or formal economic linkages (cooperative unions and business groups). Their aim is to address shared constraints in the value chain. Important functions of horizontal linkages include cost and risk sharing (e.g. in activities such as processing and transport), and generating economies of scale in both input and output markets (e.g. more cost-effective access to inputs). Exchange of skills, information, and technology are also important functions of horizontal linkages as they promote collective learning (Stein and Barron, 2017).

Lastly, we discuss **cross-cutting governance issues** currently hindering a stronger integration of indigenous vegetables in Arusha.

#### 4.3.1. Indigenous vegetables production: weak vertical and horizontal linkages

The main leafy indigenous vegetables grown in Arusha are African nightshade, amaranth, and Ethiopian mustard. These vegetables can be harvested repeatedly, within a short time and with little financial input. They are mainly grown in small irrigated plots, both for self-consumption and for the market. Thanks to these characteristics, these vegetables display high productivity and are an important coping strategy during the hungry season. Profitability was also found to be higher than average compared to other crops (see 3.2.1). However, **despite high levels of productivity and profitability, indigenous vegetables enjoy a poor**

**status, as farmers with more human capital and land tend to prefer more formalised markets for exotic vegetables.**<sup>128</sup>

Indigenous vegetables **are produced by small-scale farmers** in Arusha. Therefore, we looked at their incentive environment to understand the factors that hinder the expansion of commercial production with a focus on the key vertical and horizontal linkages affecting small-scale farmers' crop decisions. In terms of vertical linkages, we looked, on the one hand, at extension support services, as these can affect farmers' practices and cropping strategies, and, on the other hand, at input and service providers. We focused particularly on seeds, as availability and access to quality seeds affects farmers' planting decisions. As for horizontal linkages, we look at how well farmers are organised, as this has implications for their ability to access resources, information and markets.

### **Extension services neglect indigenous vegetables**

Public extension services play an important role in disseminating information and providing advice on farming practices to small-scale farmers in Tanzania. Technical information regarding crop production is also derived by the private sector (e.g., input suppliers, agro-vet stores) as well as the media (e.g., radio, television, newspapers), neighbouring farmers and NGOs/rural development organizations, but the most frequent provider of advice is still the government.<sup>129</sup> Extension officers, thus, have a direct influence on farmers' choices, including the introduction of appropriate agricultural technologies and sustainable practices, as well as farm management skills such as correct land preparation, timely planting, pest diseases control, and keeping farm records.

Tanzanian farmers had relatively strong access to extension services. The farmer field school<sup>130</sup> approach at district level has improved farmers participation and practical learning. However, in recent years, Tanzania recorded **an important drop in terms of the quality and reach of extension advice** and big variations still exist between and within districts (IFAD, 2019; HANCI, 2018; Benson et al., 2017). Challenges include the **relatively low budget allocated for extension services, the small number of officers available, and poor working environments**, including a lack of reliable means of transport to reach farmers and limited financial support to carry out field demonstrations.<sup>131</sup> In addition, extension officers at ward and village level often **lack access to training and refreshment courses**, as there is little trickling down of programmes from district to village level due to budget and monitoring problems.<sup>132</sup>

In this context, **the potential of indigenous vegetables production is hardly recognised among extensionists**, as little knowledge or training is provided to them regarding their benefits and optimal production practices and technologies.<sup>133</sup> This reflects the scarce formal support that these crops enjoy and results in **biased incentives hindering indigenous vegetables support and promotion at the farm level**: the evaluation of extension performance is based on harvest increases of the main staples and exotic vegetables; nutrition targets (e.g. on diversification of production and production of nutritious food) are not integrated in agricultural extension support programmes, and public officials tend to not record indigenous

<sup>128</sup> Afari-Sefa et al. (2016) found that large farms and more educated farmers devote less of their land to indigenous vegetables, while factors such as female gender, location in Arusha and Tanga Regions, family labour, access to credit, and total input costs produce was associated with more land for indigenous vegetables.

<sup>129</sup> UNIMIB Sociology survey (2019).

<sup>130</sup> A farmer field school is a group-based learning process bringing together a group of farmers, livestock herders or fisherfolk, to learn on how to shift towards more sustainable production practices, by better understanding complex agro-ecosystems and by enhancing ecosystem services (FAO, 2019).

<sup>131</sup> Based on interviews with district, ward and village extension officers in Arusha and Meru districts (2017; 2019).

<sup>132</sup> Based on interviews with officers from the Ministry of Agriculture and Arusha and Meru districts (2019).

<sup>133</sup> There are no guidelines on how to grow indigenous vegetables, while technical packages and guidelines exist for more-supported crops.

vegetables production when data on yields are collected. As a result, **indigenous crops tend to be 'invisible' in official statistics** at village and district level, as farmers themselves often do not report them. All this points to lacking sensitisation. These factors result in low levels of knowledge on good practices and technologies for indigenous vegetables cultivation and hinder their optimal production and utilization, which disincentive farmers to invest in more efficient production of these crops.

Recent research has shown that, when production conditions are suitable, knowledge about the nutritional value of indigenous vegetables stimulates their production compared to other crops, (Afari-Sefa et al., 2016). Moreover, female farmers are more likely to plant indigenous vegetables in their plots compared to their male counterparts. Thus, there is a need to **increase awareness on nutritional benefits** of indigenous vegetables and **encourage female participation** in the sector **through the provision of adequate farm management training** and knowledge for value chain upgrading (Afari-Sefa et al., 2016).

### **Input and service providers biased towards chemical input-based production**

Intensification of horticulture in Arusha has led to increased agrochemical inputs use, particularly among farms producing exotic vegetables for export and domestic markets (see 3.2.1). For instance, Meru District is well known for its intensive tomato production in Ngare Nanyuki ward. In areas of intense cultivation, increased occurrence of pests and diseases, erosion and soil degradation are common and mainly linked to continuous cropping and the lack of crop rotation. In this context, increasing utilisation of agrochemicals is the most common solution farmers adopt to maintain yield levels (Istituto Oikos, 2011). As the literature suggests, indigenous leafy vegetables generally require fewer inputs than exotic ones, being more adapted to local climatic and soil conditions and less prone to pests. However, **small-scale producers increasingly resort to agrochemicals**, particularly pesticides, **to safeguard the production of the more market-oriented indigenous crops (such as amaranth, African nightshade and Ethiopian mustard)**. Conversely, the use of traditional methods of pest management has declined (Mrema et al., 2017; Ngowi et al., 2007). Knowledge about more sustainable production practices, based on biological inputs or ecosystem services, such as intercropping and the use of cover crops, is not yet widespread (see 3.2.1).

**Chemicals' misuse is significant** and mainly due to limited knowledge of safe application rules (e.g. failure to understand container labels or instructions regarding the use of protective gear). Products are often used without any direction and control and mixed among them disregarding compatibility. Spraying is frequently done in the wrong weather conditions, without wearing any protective clothing or caring for the proximity of people or animals. Applicators are cleaned in water channels and empty containers sometimes re-utilised (Istituto Oikos, 2011). Such inappropriate management of chemicals **increases the risk of localised environmental pollution**, leading to **biodiversity loss, reduced crop diversity and soil fertility**. It also leads to **human health risks** for producers and consumers alike, with many cases of poisoning locally reported (ACT, 2012 in AECF, 2016; Mrema et al., 2017; Istituto Oikos, 2011). For instance, the majority of 128 surveyed farmworkers surveyed in a recent study in Arusha experienced adverse health effects after application of chemicals due to poor safety practices (Manyilizu et al., 2017).

**Promotion of more sustainable cropping practices** among small scale farmers growing indigenous vegetables for the local market **could limit the use of costly and potentially harmful external inputs**. However, a lack of evidence on the impact of different agricultural management practices on specific site conditions hinders the adoption of appropriate and environmentally-friendly cultivation practices. This is compounded by farmers limited financial resources, which constrain their ability to implement knowledge or capital-intensive practices to manage soil health and control pests and diseases (ACB, 2018; CIAT and World Bank, 2017; Mkonda and He, 2017).

The principles of organic and/or conservation agriculture are disseminated mainly in the context of NGO or development agencies funded projects, such as the Mesula network, or by farmers' groups (e.g. MVIWATA; see 4.2.2). **Wider dissemination and promotion of sustainable agriculture practices is constrained by an unsupportive enabling environment.** Input policies are biased towards the use of external inputs to increase the production of a few main crops, while biodiversity-based approaches are scarcely promoted. Most **extension advice** is skewed **towards the use of agrochemicals** and improved seeds, crop storage, pest control and inorganic fertilisers, while training on how to convert to organic or conservation agriculture is still very limited.<sup>134</sup> Despite the available evidence on conservation agriculture benefits (see 3.2.1) in terms of reduced soil erosion and fertility loss, agricultural officers tend to advise farmers to undertake conventional tillage using tractors and ploughs with intensive use of fertilisers, regardless of environmental impacts (Friedrich et al. 2010, in Mkonda and He, 2017). The general mindset, among officers and farmers alike, is that agriculture without tillage or pesticides is not possible (Mkonda and He, 2017; Ngowi, 2009).

**Biased incentives of private sector actors** contribute to maintain the current situation and hinder farmers' decisions to invest in more sustainable practices. For instance, **large international input suppliers** such as Syngenta and Monsanto invest significantly in extension services and field demonstrations, pushing towards a 'conventional' model of agriculture highly dependent on external inputs. **Local agro-vet stores** only ensure the supply of seeds and inputs but are neither qualified nor motivated to provide supporting information. Many sustainable improvements, in fact, – particularly knowledge-intensive ones – cannot be easily marketed and are often geared towards reducing external inputs, which goes against agro-vet businesses. There is also a lack of improved organic inputs in the market, which pushes even organic farmers, if at risk of losing their crop, to resort to chemical inputs.<sup>135</sup> Middlemen, traders, and wholesalers focus on the logistics but do not seem to push for change in crop choice or production methods (Guijt and Reuver, 2019). Finally, brokers or intermediaries often supply resource-poor farmers with farming inputs on credit. In this arrangement, farmers are then obliged to sell the harvest at a set price, usually below-market prices (König 2008; USAID, 2013; Istituto Oikos, 2011). As a result, the person buying the crop and providing the inputs coincides, which creates a strong conflict of interest. This can incentivise farmers to increase input use in the hope of achieving a greater harvest to pay off the debt.<sup>136</sup>

### **Challenges in the supply and distribution of quality indigenous vegetables seeds**

Limited availability and accessibility of high-quality seeds of preferred varieties is another important factor constraining farmers' ability to expand commercial production of these crops (Afari-Sefa et al., 2016; Afari-Sefa et al. 2013, in Rajendran et al., 2016; Weinberger and Msuya, 2004). Currently, as for most crops in Tanzania, **informal seed networks are the major source of indigenous vegetable seeds, but they are often unable to provide reliable, good quality cultivars.** This is due to a lack of information about optimal production methods, limited availability of improved varieties, and insufficient support systems (Rajendran et al., 2016). **The formal market**, on the other hand, **seems to play an increasingly important role** as a source of affordable certified quality seed of indigenous vegetables. SASS researchers found that, while in 2004 there were only three companies<sup>137</sup> in the indigenous vegetables seeds sector in Tanzania, the market has grown dramatically since then, with at least twelve companies mapped at present (see Table 12).

<sup>134</sup> UNIMIB Sociology survey (2019) and ECDPM fieldwork (2018-19).

<sup>135</sup> TOAM representative, Arusha, May 2019.

<sup>136</sup> Oikos East Africa representative, Arusha, December 2017.

<sup>137</sup> Namely, East African Seed, Alpha Seed and KIBO Seed (Weinberger and Msuya, 2004).

**Table 12: Seed companies developing and/or marketing indigenous vegetable seeds in Tanzania**

Name	Country	Leafy indigenous vegetables
Seed Co. <sup>1</sup>	South Africa	Cowpea leaves
East African Seed <sup>1 2</sup>	Kenya	Spider plant Hairy nightshade Ethiopian mustard Amaranth
Pop Vriend <sup>2</sup>	Netherlands	Amaranth Sukuma wiki
Rijkzwaan <sup>2</sup>	Netherlands	African kale
Kibo Tanzania (SOE Kenya Seed Company) <sup>2</sup>	Kenya	Amaranth Spider plant Hairy nightshade Jew's mallow Sukuma wiki
East West Seeds <sup>2 1</sup>	Thailand	Hairy nightshade Amaranth Spider plant Ethiopian kale Sukuma wiki
Tanseed	Tanzania	Amaranth (through contract farming)
Zamseed <sup>2</sup>	Zambia	Amaranth
Know you seed <sup>2</sup>	Taiwan	Amaranth
Kenya-Highland-Seed <sup>2</sup>	Kenya	Amaranth Spider plant Hairy nightshade Jew's mallow Sukuma wiki
Kinesi Agro Services <sup>4</sup>	uncertain	Nightshade
Africasia Seed Co. <sup>4</sup>	uncertain	Nightshade

Source: UNIPV Development Economics, 2019. Data from: <sup>1</sup> Company website; <sup>2</sup> [www.accesstoseeds.org](http://www.accesstoseeds.org); <sup>3</sup> Field assessment; <sup>4</sup> TOSCI Arusha data.

Moreover, **even though the number of leafy indigenous vegetables varieties on the National Variety List<sup>138</sup> is still relatively low, it has shown a remarkable increase** in recent years: while until 2008 there were only four registered varieties, its number boomed to thirteen by 2013, including seven cowpeas (none of which specifically developed for leaves production), two Ethiopian mustard with early maturity (21-28 days), two amaranth, and two nightshade varieties. As for breeders, only two (namely, ARI Ilonga and Horti-Tengeru) are currently registered. **This trend towards commercialisation of indigenous varieties may improve the availability of quality seeds for smallholder farmers. But it also points to the importance of defining a domain where farmers rights are recognised**, with rules other than those of the formal seeds system.

<sup>138</sup> Certified seeds do not necessarily come from varieties in the National Variety List (which is where varieties with plant breeder rights are registered). For example, in 2018 TOSCI Arusha certified indigenous vegetables seeds from 5 dealers, out of which only one dealer (Horti-Tengeru) was listed in the National Variety list.

In this regard, in addition to the need for seed policy reforms (see 4.1.2), **stronger engagement of farmers in channels for improved seed, such as the QDS programmes, and training regarding the production of quality seed should be promoted** (Weinberger and Msuya; 2004). Furthermore, recent research has shown that access to quality seeds alone is not enough to address the bottlenecks in the seed supply and distribution system of indigenous vegetables. **Timely supply of indigenous vegetable seeds** is an important factor that can support the production of these crops.<sup>139</sup> Enabling policies that avoid spatial and time gaps in seed systems should be promoted, including through public-private partnerships (Afari-sefa et al., 2016). **Gender disparities in access to certified seed should also be addressed**, and women's participation in farmer-led enterprises should be promoted, for example through the formation of women groups or the implementation of targeted extension programs to improve access to certified seed (Rajendran et al., 2016). Finally, **vegetable seed supply systems could be improved if breeders and seed producers regularly assessed consumers' preferences** and factor them into their participatory breeding and seed supply systems (Daniel and Adetumbi, 2004, in Rajendran et al., 2016).

### **Weak horizontal linkages among producers**

Small-scale farmers in Tanzania often have **weak power positions** in the value chain. They depend on input and credit providers, as well as effective extension support, to start the planting season. Then, during the harvesting period, they mostly depend on traders to commercialise their production, as they are often scattered and removed from the main output markets (Istituto Oikos, 2011). In this context, **various forms of social organisations can help strengthen the position of small-scale producers** and possibly result in higher incomes by providing a range of economic benefits and social support. These organisations can improve demand articulation for technical knowledge, market information and financial services, but also create economies of scale in accessing better quality seeds and achieving the scale and efficiency necessary to access more formalized value chains and higher-end markets.<sup>140</sup> By organising into collective structures, producers are also able to share costs and risks involved in agricultural production activities and increase their bargaining power versus other actors in the supply chain. Finally, participating in farmers' organisations can promote knowledge-sharing through the exchange of skills, information and technology, and empower farmers in their ability to lobby and advocate for their interests (Vorley et al., 2012; IFAD, 2014).

**Social organisations can take different forms.** They span from registered groups to informal arrangements such as neighbouring farmers agreeing to grow the same crop to attract traders or sharing transport costs to reach the market (Vorley et al., 2012). An example of formalised groups are **cooperative societies**.<sup>141</sup> Tanzania has a long history of state-controlled cooperatives, which were strongly pushed by the government during the Nyerere's socialist era and the *Ujamaa* period. Such top-down state cooperatives lacked legitimacy and representation, and, once the market was liberalised, they struggled to compete with the private sector. Their legacy is mostly responsible for the **generalised mistrust of farmers towards this form of organisation**, as they associate cooperatives with former state cooperatives. The new regulation, the Cooperative Development Policy (2002),<sup>142</sup> addressed some of these issues by securing members'

<sup>139</sup> Afari-Sefa et al. (2016) found that farmers grow less indigenous vegetables when they perceived that seed would not be available in time for the next planting season. They also suggest this might be a reason for continued dependence of most farmers on their own farmer-saved seeds.

<sup>140</sup> For instance, farmers' organisations can act as a market aggregator or intermediary (e.g. through Farmers' Marketing Cooperatives) thus enabling farmers to provide a continuous supply (in terms of quantity and quality) to output markets.

<sup>141</sup> According to the Cooperative Development Policy (2002) and the Cooperatives Societies Act (2003), a cooperative is 'a group of people who work together voluntarily to meet their common needs through a members-owned and democratically controlled enterprise'. They are based on the values of self-help, self-responsibility, democracy, equality and solidarity. Cooperative societies can be set up with different purposes, including accessing credit (SACCOs) or improving market access (AMCOs).

<sup>142</sup> Cooperative Societies are regulated by the Ministry of Agriculture and have to respond to the Cooperative Societies Act (2003), which provides direction on how cooperatives should be set up and run. The Cooperative Societies Rules

ownership of the society and developing a constitution whereby members equitably contribute to, and democratically control, the capital and the investments of the group. Nonetheless, most farmers still largely prefer other forms of organisation. These include **various forms of farmers' groups, which can be either formally registered** with a village or district authority, with agreed by-laws regulating their functioning, **or they can be loose informal associations** of farmers that act collectively to purchase inputs, bring their product to the market, and exchange advice.<sup>143</sup> Generally, only a formalised and registered organisation can access financial support from donors or loans from microfinance and bank institutions or take part in government or NGO development programs. On the other hand, informally constituted groups are often more flexible and easier to manage, suitable for small farmers who cooperate according to their need and capabilities.<sup>144</sup> Sometimes, for specific purposes or target people (e.g. women), **self-help groups and women associations** are established among small producers at the grass-root level. Their establishment is often supported by an external agent, such as an NGO, that provides the initial tools and know-how to help marginalised categories of the community establish stronger social networks. In general, the risk with pushing exclusively for a more formalised approach to farmers' organisations is that such organisations are created with the sole purpose of participating in development projects and cease to exist after the project or programme finishes, as farmers lack the interest, management skills, trust and accountability necessary for the long-term sustainability of the organisation.<sup>145</sup> At a higher level, **farmers and farmers' groups can also benefit from the support of apex associations** (such as national, regional or international farmer organisations), as these *'allow economies of scale and increase their members' negotiating power in policymaking processes and markets'* and enable them to *'pool their assets and competencies, resulting in access to better-quality information and fostering linkages with upstream public- and private-sector players'* (IFAD, 2014: 4). In this regard, two umbrella organisations are active in Arusha: Mviwata, the national network of farmers' groups in Tanzania, and TAHA, the Tanzania Horticulture organisation. Their roles and relevance for small-scale farmers were discussed in the previous section.

**In Arusha, only a few small-scale producers are organised in formal, market-oriented structures, but most are not. However, some belong to traditional and/or social networks** that can also serve as a channel to deal with markets. Of the households sampled by the SASS UNIMIB sociologists' team (100), only about a third belong to a social organisation (34).<sup>146</sup> The biggest category is represented by women

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(2004) guides the operationalisation of the Act. The latest cooperative law was enacted in 2013. The Tanzania Cooperative Development Commission (TCDC) is where cooperative societies are registered. The Registrar of Cooperatives societies is locally represented by the District Cooperative Officer and oversees the implementation and enforcement of laws and rules related to cooperative set up.

<sup>143</sup> Farmers' organisations can give themselves by-laws or written rules, but they are more likely to have an informal type agreement sanctioned before a traditional authority, e.g. the village chief or the village committee, without registering at the district level. They can set up an administration board and elect a chairperson or work according to no written rules or hierarchy. Associated farmers can hold weekly or monthly meetings to gather ideas and face common problems or can solve problems and share good practices in their everyday working on the farm (Oikos East Africa representative, Arusha, May 2018).

<sup>144</sup> The lack of formal registration does not necessarily imply hierarchically lower levels of legitimacy (Oikos East Africa representative, Arusha, May 2018).

<sup>145</sup> Rikolto representative, Arusha, November 2017.

<sup>146</sup> In particular, 27 respondents belonged only to 1 organisation, and 8 belonged to 2. This situation is different from what observed by SASS researchers in Nakuru, where the respondents that belonged to at least one farmer organisation were 88 out of 100 respondents (see Rampa and Knaepen, 2019).

organisations (15),<sup>147</sup> followed by common interest groups (9),<sup>148</sup> self-help groups (8)<sup>149</sup> and farmers' organisations (8).<sup>150</sup> Only two respondents belong to a national farmers organisation and only one to a cooperative. The most common services include facilitated access to credit (26), profit sharing (21), and access to extension advice (15). Other important services include a saving account (13), access to farming inputs (9) and business advice (7). Interestingly, almost all respondents in a social organisation stated that membership led to increased farming productivity, and most evaluated financial assistance, including improved access to capital and improved management of savings, as the most relevant factor in this regard.

**The few farmers organised in formal or informal structures in Arusha suggests that considerable improvements in farmers' empowerment and organisational strengthening can be made.** National agricultural policies recognise the crucial role of producers' organisations in increasing farmers' competitiveness and profitability, expanding marketed production and driving value chain development, inclusive growth and reduced rural poverty (ASDP-II: 23). They also consider empowering farmers and enhancing their collective action capacity as a key area of intervention (ASDP-II: 20). However, despite policy commitments, **producers' organisations still suffer from limited resources and inadequate institutional capacity, lacking organisational, leadership, entrepreneurial and managerial skills** (ASDP-II: 22). At the same time, little evidence exists to identify progress in this area, which *'deserves significantly higher levels of attention to overcome critical constraints along the value chain through collective action'* (ASDP-II: 20). In particular, the current levels of farmers' associationism have not yet been able to address pressing market challenges, enabling small producers to bargain for better prices while providing a continuous supply to output markets.

Increasingly, **private sector actors** (traders, agribusinesses and supermarkets) **source from small-scale producers by promoting farmers' aggregation**, often with the support of external actors (e.g. NGOs; IFAD, 2016). Under this approach, some small-scale farmers around the world were able to improve their access to formal financing, technologies and know-how (Vorley et al., 2012). Sometimes, companies fund training and certification processes to ensure product compliance with global market standards such as GlobalGAP or FairTrade (IFAD, 2016). Formal registration in these cases is required for traceability, as most of these schemes target export markets (particularly the EU). Often, buying arrangements are based on *futures* contracts, meaning that farmers are assured to sell their products to a buyer at a set price at a future point in time. Nonetheless, strict quantity, quality and consistency standards raise barriers to the inclusion of small farmers, and contract enforcement can be challenging. **In Arusha and Meru, some companies in the horticulture sector, often supported by development partners, have sought to incorporate small-holder farmers in contract farming schemes**<sup>151</sup> to promote vegetable production, link producers to high-value food chains and ultimately raise rural incomes. An example of this business model is **Home**

<sup>147</sup> Of these, 10 were registered, either at the District Council (6), or at Arusha district (2), Meru district (1) and the village council (1). In 10 out of 15 cases the respondent pays a fee to be in the association. A great number of members use its services very often (11) and the assessment of the services offered is mostly good or very good.

<sup>148</sup> Of these, 6 are registered: 4 at the BRELA (Business Registration and Licensing Authority), 1 at the Arusha district and 1 at the district council. In all 6 cases a fee is paid to be in the group. The relevance of BRELA among these groups is probably due to the fact that they are created more for commercial purposes rather than exchange of help and mutual support.

<sup>149</sup> Of these, five are registered, four before the District Authority and one with the government. Members rely on their services 'very often' (7) or 'on specific times of the year' (2).

<sup>150</sup> In six cases the group is registered: three with BRELA, one with the district council and one with the water department. In four cases the respondent pays a fee to the group.

<sup>151</sup> 'Contract farming can be defined as an agricultural production system carried out according to an agreement between a buyer and farmers, which establishes conditions for the production and marketing of a farm product or products. Typically, the farmer commits to providing agreed quantities of a specific agricultural product. This should meet the quality standards of the buyer and be supplied at the time that the buyer determines. In turn, the buyer agrees to purchase the product at agreed pricing conditions and, in some cases, to support production through, for example, the supply of farm inputs, land preparation and the provision of technical advice' (FAO, 2012).



**Vegetables Tanzania LTD**, a company that, through contract farming, facilitates the formation of farmers' groups, invests in farmers' capacity building and on-field facilities, and supports these groups to access farming inputs, extension services, and storage (including cold storage). Farmers working for them must own land and should be from areas with favourable irrigation and weather conditions. Contracted producers sell their products to HomeVeg at a given price, and HomeVeg supplies to main companies such as Serengeti LTD,<sup>152</sup> who in turn have direct export markets. USAID collaborated in this project as a donor. However, contract farming is not yet widespread in Arusha<sup>153</sup> and horticulture companies and sector organisations (e.g. TAHA) **currently focus on export markets for exotic vegetables, while neglecting the local market and indigenous vegetables production particularly**. Perishability was reported as the main reason for this<sup>154</sup>, thus promoting increased production can only be recommended if perishability is reduced. The gradual involvement of horticultural investors and commercial farms owners and managers, which are currently missing in the value chain, could provide opportunities in this regard.

#### Box 7: Participatory Guarantee Systems

An alternative market arrangement with a strong component of organisational strengthening are Participatory Guarantee Systems (PGS). PGSs are certification systems for organic products based on trust mechanisms and the active engagement of stakeholders, particularly the producers, who participate directly in the development and implementation of standards and control mechanisms (IFOAM). They are mostly designed for small-scale farmers relying primarily on local markets and direct selling relations. PGSs are characterised by a strong focus on capacity building and accountability of members, the application of different social and cultural control mechanisms, and a rich and transparent exchange of information. **Besides providing a credible guarantee for the organic quality of food, PGSs contribute to expand local markets for organic products**, encouraging a closer interaction between producers and consumers and guaranteeing a fair return to producers. **Participation in a PGS can improve food and nutrition security and favour smallholder access to local, high-value markets while improving their production practices**. Moreover, participation in a PGS empowers producers by basing their activities on long-term social processes and fostering collective action (D'Alessandro, 2018). **Participatory certification in Tanzania, although still at a young stage, is recognised as a valid assurance system** for the national market by the Tanzania Organic Agriculture Movement (TOAM). PGS-certified products are granted the use of a common regional organic mark, the East African Organic Mark (EAOM), which allows trade with EAC neighbours (D'Alessandro, 2018). In 2017, there were four operational PGS initiatives and fourteen under development, involving a total of 2045 farmers. In Arusha, the Mesula organic farmers' network has achieved organic certification through PGS. The development of PGS systems can be highly relevant for the promotion of indigenous vegetables production for the local and regional market.

In sum, **producers in Arusha are poorly coordinated and supported by weak alliances among themselves, thus being ultimately driven by the agendas of the rest of the actors in the value chain, particularly input providers and middlemen**. Building stronger and more effective farmers' organisations and equipping them with agronomic and business skills will be key to improve commercial production of indigenous vegetables, allowing farmers to diversify production and complement other sources of household income. Being organised in more business-oriented models (e.g. with aggregating and marketing functions) and linked to horticultural investors would allow large numbers of producers to *'tune the quantity, type and*

<sup>152</sup> Serengeti Fresh LTD was born as an out-growing company only collaborating with large-estates, but due to the growing demand, they started collaborating with Arusha and Meru small farmers and USAID, as donor, for the necessary investments to make local farmers compliant with international standards and provide them with quality farming inputs, extension services, business and financial support (USAID, 2013; Match Maker Associates Limited, 2008).

<sup>153</sup> Contract farming schemes are more common in the Southern Highlands, particularly in the SAGCOT corridor.

<sup>154</sup> TAHA representative, Arusha, May 2019.

*time of production from their small plot very carefully, so that a continuous stream of a mix of indigenous vegetables can be produced to satisfy the demands of supermarkets'* (Muhanji et al., 2011: 201).<sup>155</sup>

#### 4.3.2. Indigenous vegetables distribution: informal vertical and strong horizontal linkages<sup>156</sup>

Leafy vegetables, which are highly perishable and generally sold unprocessed, are characterised by short value chains, with most trade happening at farm-gate and in retail and wholesale open-air markets. The leafy vegetables chain lacks cold transport and thus long-distance trade is rare (see 3.2.1 subsection 'Marketing Indigenous Vegetables'). Given these constraints, leafy vegetables would benefit particularly from efficient local food distribution. But, as we have seen, almost no contract is applied and cooperation among farmers is scarce. The **vertical linkages between farmers and traders are hampered by information deficits, market weaknesses, and infrastructure challenges**. Also, **horizontal linkages between traders are scarce**, but, compared to farmers, they are a more self-aware and organized category, and this helps them get better deals on the market (König 2008).

##### Informal vertical linkages between farmers and traders

Farmers and traders have an informal but convenient relationship: often, farmers produce too few indigenous vegetables to merit the costs of reaching markets or do not have the right contacts. Traders, who often farm themselves, come to the producers, aggregate from other farms and transport the produce to the market. As such, **traders bridge the gap between isolated farmers and more urbanised markets**. But both farmers and traders operate in a challenging environment, characterised by information deficits, market weaknesses, and infrastructure challenges.

What producers don't eat or sell in villages gets sold to traders. Farmers sell to traders as transport costs – particularly from farm to paved road – and fees make market access expensive, especially for small quantities.

*'It happens not infrequently that traders and intermediary give support to farmers in order to have an ongoing supply of fruit and vegetables. They may pay for transport or other services for farmers.'* (Central Market Assistant, November 20, 2017).

Most traders book the plot in advance, with an unwritten contract with the farmers, and buy at farmgate. Some farmgate buyers are retailers, some are wholesalers, some adopt a flexible business model changing from time to time. **High perishability** of the crop is a major risk factor in this trade. Thus, **failure to sell timely is a great concern for indigenous vegetables traders**.

**Market fees** (e.g. market taxes per bag of produce) are experienced by farmers who want to bring their produce to the market as an important constraint. Market fees can strengthen wealthier traders' power position compared to poorer farmers, who are unable to pay. Value addition at farm-level is virtually absent due to limited technology for packaging and processing. **Lacking standard methods for weighting and packing makes farmers vulnerable** to cheating from traders, who take care of sorting and packing. Moreover, some traders, particularly retailers, pay farmers only once they have sold the produce. In this case, farmers face the risk that the retailer may pay low giving reason that he/she could not sell well. Thus,

<sup>155</sup> For instance, business-support units were developed in 2004 as part of the World Vegetable Centre's FARM-Africa project (Muhanji, 2011). They received training in group dynamics, leadership, finance management and record keeping, and marketed indigenous vegetables either directly or through intermediary linkages. They also established product bulking and grading systems through common collection centres, from where they recorded delivery of the vegetables to the markets (Muhanji et al., 2011).

<sup>156</sup> Partly based on field research in Arusha by UNIMIB Sociology, 2017 and by UNIPV Development Economic, 2017.

selling to retailers is not a preferred option for most farmers. Lastly, **access to finance** for farmers is so difficult that traders, in certain instances, supply seeds and inputs on credit, to be returned by selling the whole harvest, regardless of its performance.

*'Intermediaries who have little 'capital', they approach the farmers at their plot, they see the condition of the plot and of the crops, and they pay for the future harvest from that size of plot. Farmers ask for three million for a two acres plot, but I did my own research and it seems that the market value is around seven million! Farmers are fully satisfied as they don't know anything about the market.'*  
(Northern Lights Logistic Company Assistant Manager, November 21, 2017).

In this scheme, **farmers transfer decision-making about which crops to grow and how to the traders**. As a result, farmers have low bargaining power with traders and are found to receive a low producers' share as compared to other market participants (Maro, 2008). Lower farmgate prices are mostly driven by huge post-harvest losses along the supply chain.<sup>157</sup>

**Traders, on the other hand, are caught between unpredictable supply and demand.** The main marketing constraint mentioned by retail and wholesale actors are *'too many sellers'* and *'customers don't prefer leafy vegetables'*, both pointing to oversupply and low demand (Maro, 2008). Supply of indigenous vegetables are unpredictable and constrained by lack of extension support and low seed improvements. But even when there is supply, **traders need to deal with numerous small suppliers with different quantities and quality, often producing different species of indigenous vegetables without standard compliance**. At times, traders need to harvest themselves, package the goods and prepare bundles to sell. As indigenous vegetables are sold fresh and unsorted, value addition is low. For example, 60% of Arusha's producers don't even wash indigenous vegetables before selling (Lotter et al., 2014).

**Prices at the market are volatile** due to limited consumer information, seasonality, and unpredictable supply, which can result in periods of high prices or seasonal oversupply and glut. Potential demand is likely to be there, but matching supply and demand in a limited time can be challenging. Overcoming glut is difficult as storage facilities are absent. **Because of the high perishability of indigenous vegetables, traders are completely dependent on the local market and cannot diversify risk** by linking to other markets. In these local markets, traders struggle to make indigenous vegetables visible. Retail and wholesale open-air markets generally lack a dedicated area for these crops. Nevertheless, traders are perceived as more powerful than farmers.

The relationship between farmers and traders in indigenous vegetables is mostly informal. Lacking formal contracts spur business relationships that rely more on trust, loyalty, and friendship.<sup>158</sup> These informal relationships are crucial for food distribution in the Arusha area. **By bridging isolated farmers and urban markets and providing credit lines in a scarce environment, traders can contribute to the efficiency of the marketing system, and benefit both traders and farmers.** However, farmers have a weaker bargaining position due to lacking market information. More transparent price information can create a more honest business relationship between farmers and traders:

*'It's about the farmers that have to understand that they need to build capacity to negotiate and get market info...so they become able to negotiate for themselves and by themselves.'*  
(Rikolto representative, November 29, 2017).

<sup>157</sup> As traders need to account for unsold produce and potential losses, they tend to pay lower prices per unit of produce at farmgate.

<sup>158</sup> *'Local market relationships are more about personal agreement and trust between trader and farmer'* (TAHA Marketing Manager, personal communication, November 16, 2017).

### Horizontal linkages among traders

Retailers cooperate with each other, but not regularly as competition in food distribution is high. Protecting individual interests comes before cooperation. For example, sharing information is mostly between friends and family, and retailers limit the entrance of new competitors on the markets to protect their interests. But cooperation is not rare, especially when it advances individual interests. For instance, due to high transport costs, retailers can collaborate to rent trucks. **Markets are often partly governed by market traders' associations.** At Kilombero's market, the Kilombero Market Traders Association lobbies for lower market fees and market facility improvements, while resolving collective problems among traders. Cooperation among farmgate buyers is much more limited.

**Most trade in indigenous vegetables is informal.** While formal standards and registration for market access of indigenous vegetables exist, enforcement by the relevant authorities<sup>159</sup> is low and so is compliance. Lately, small scale entrepreneurs have been targeted by stricter controls by the Tanzania Revenue Authority and a new system of licensing for small scale vendors was introduced in 2019.<sup>160</sup> This system provides a light recognition of informal vendors. Besides this regulation, however, **small-scale traders are largely neglected by policymakers** as governments have low awareness of informal networks' benefits. More comprehensive policies and projects that recognise the role of informality can enhance the efficiency of informal exchanges:

*'If states seek to better understand the reasons for widespread informality in food markets, this can lead to inclusive policies that support — rather than fight or ignore — the preferred strategies of small-scale producers. Such action could potentially help both small-scale producers and low-income consumers get more out of informal markets.'* (Vorley et al., 2012:25).

For example, Trias, a Belgian NGO, works with the Tanzanian Chamber of Commerce (TCCIA) to include small-scale entrepreneurs into policies, without necessarily proposing to formalise the informal traders. They support small-scale entrepreneurs in issues around registration and taxation and provide them with business development services.

**But rather than governments' neglect or taxes, supermarket expansion might be the largest pressure for informal traders in the coming decades** (see 3.2.2). Around the world, supermarkets eventually sell fresh fruit and vegetables and then directly compete with traditional wet markets. For farmers and traders alike, supermarket expansion would reshape their networks. Small-scale farmers often struggle to continuously supply the high quality and safe food supermarket demand, thus supermarkets mostly source from medium to large farms only. Supermarkets' concentrated value chains are generally formalised and standard-compliant. As such, when supermarkets gain market share over traditional wet markets, the space for both small-scale farmers and traders shrink.

<sup>159</sup> Relevant authorities include the Tanzania Food and Drugs Authority, the Tanzania Bureau of Standards, and the Occupational Safety and Health Authority.

<sup>160</sup> The small-scale trader license costs 20,000 TSh only once. It allows traders in Arusha to sell outside the market only, but when they enter the market, they still have to pay a market fee.

**Box 8: Lack of processing stifles producers, traders, and consumers**

Indigenous leafy vegetables are highly perishable, but proper handling and processing can extend their shelf-life and reduce waste. Currently, both proper handling and processing are limited as most leafy vegetables are sold fresh, loose, and without packaging. Proper handling is hampered by an absence of a cold chain, bad road access, and packaging technology. Drying leafy vegetables is the most used form of processing, but only conducted small-scale and for local markets. Limited investments in processing caused a dearth of processing capacity, while larger processing facilities are not interested in the 'niche' market of indigenous vegetables with its unpredictable, non-standard compliant supply. But **processing that reduces perishability** – besides value addition – **might make longer transport possible, which can persuade traders to access new markets with indigenous vegetables**, such as large urban areas or abroad. Investments in new products – such as blended flour – can reach new consumers. **Processing and storage could create a more stable supply to markets and overcome periods of glut, which discouraged producers.** A potential processing-investment case might be built around the urban or diaspora demand for safe indigenous vegetables.

**4.3.3. Factors constraining consumption of indigenous vegetables in Arusha**

Tanzanian diets are characterized by high levels of starchy foods, while fruit and vegetable consumption is deemed insufficient to provide adequate nutrient intake. Low dietary diversity contributes to high levels of food insecurity and malnutrition, particularly high levels of stunting. **Increasing consumption of fruits and vegetables provides an opportunity to diversify diets and improve the country's nutritional outcomes.** Indigenous vegetables, in particular, contain many of the micronutrients, fibre, vitamins and minerals that are crucial during pregnancy and early childhood development. Promoting their consumption is a sustainable strategy to combat micronutrient malnutrition and associated health problems, particularly for the poorer segments of the urban and rural population.

**Lack of food knowledge is the major barrier**

The existing demand for indigenous vegetables is still low, and little research has been done to identify the characteristics and determinants of consumers' demand for these crops. But understanding the drivers of dietary behaviour is crucial to create change. The evidence available indicates that **the low daily use and consumption of indigenous vegetables is largely a problem of low consumer awareness about their importance for nutrient provision, rather than insufficient availability** (Conti et al., 2019; Ochieng 2016). This stems from a lack of nutrition education, including a basic misunderstanding of nutritional needs versus hunger,<sup>161</sup> generational norms and misconceptions,<sup>162</sup> low awareness of proper cooking techniques (e.g. cooking vegetables too long to reduce their bitterness or cleanse them from pesticide residues, leading to significant nutrient loss) and cultural perceptions (e.g. indigenous vegetables perceived as 'poor people's plants'; deep-rooted food taboos concerning the effects of certain vegetables on male reproductive capacity) (Beaudreault, 2019; Muhanji, 2011).

According to Weinberger and Msuya (2004), the frequency of consumption of indigenous vegetables has declined in favour of exotic crops. Nonetheless, over the last 15 years, efforts to increase the consumption of indigenous vegetables in Tanzania and other SSA countries have been put in place by selected research institutes and non-governmental organizations, together with public health and policy experts and, to some extent, the media (Afari-Sefa et al., 2016; Muhanji, 2011).<sup>163</sup> These efforts aimed at increasing awareness of nutritional and other benefits, especially for pregnant women and children, and included demand creation

<sup>161</sup> Optimal nutrition is often confused with feeling physically full, rather than being perceived as a long-term health effect (Beaudreault, 2019).

<sup>162</sup> Dietary behavior in Tanzania is largely generational, as women learn what to eat and how to cook from their families and community elders. Thus, preferences, habits, and misconceptions about how to best prepare foods are also transmitted from one generation to another (Beaudreault, 2019).

<sup>163</sup> Examples in Arusha include: FARM-Africa project (Mujanhi et al., 2011); The Good Seed Initiative (Ochieng et al., 2017); and more recently, the Vegetables for All project.

activities such as promotion campaigns through road, cook shows, nutritional awareness and educational programs in hospitals, schools and markets. These initiatives have increased demand for selected varieties in formal and informal outlets and contributed to significantly higher dietary diversity for children under five and women of reproductive age (Beaudreault, 2019; Ochieng et al., 2017; Muhanji, 2011). Some indigenous vegetables promoted in Arusha are spider plant, amaranth, and African nightshade. For instance, the World Vegetable Centre supervised the selection of four improved varieties of amaranth, with softer, sweeter leaves, that can be harvested in 21 days and cook quickly, thus minimising both labour time and fuel consumption. These crops are now one of the most common varieties of amaranth grown by small-scale farmers in Arusha. African eggplant, particularly a small, white-skinned variety released by HORTI-Tengeru, is another example of a vegetable that was popularised through demonstration plots and agricultural fairs. Such efforts also helped assimilate indigenous vegetables in diets of ethnic groups that did not traditionally consume them (McClafferty and Zuckerman, 2014).

### **Affordability and demand: mixed trends and limited research**

Besides food knowledge, affordability and access of nutrient-dense food in local formal and informal markets are important drivers of consumers' demand for, and ultimately consumption of, indigenous vegetables. Previous research has indicated that, generally, the cost of fruits and vegetables is a barrier to widespread consumption. Fruits and vegetables are often more expensive per calorie as compared to starchy staples and do not provide the same perception of satiety as high-protein sources or fats. Nonetheless, they are often a less-costly alternative to animal-sourced proteins. Beaudreault (2019), however, suggests that **cost is not necessarily a barrier to consumption in Arusha** and that **affordability of vegetables is seasonally dependent and crop-specific**. Moreover, **spatial disparities exist**, with urban households often consuming lower intakes of fruit and vegetables, and increasingly favouring convenient highly-processed food.

**Indigenous vegetables**, particularly amaranth and Ethiopian mustard, **are often more affordable options for poorer households**. Weinberger and Msuya (2004) found that the share of indigenous vegetables consumption among all vegetables is much higher among poor households (40%) than among the wealthiest households (11%). Interestingly, this relationship also holds in absolute terms. Poor households consume, on average, nearly 1 USD worth of indigenous vegetables per capita and month, while among the wealthiest households this is only 15 cents (Weinberger and Msuya; 2004).

However, indigenous vegetables are not purely subsistence crops for poor consumers (Weinberger and Msuya, 2004). Currently, the volume of indigenous vegetables exchanged in Arusha is high and their presence in local dishes widespread. Exotic vegetables such as snow-peas, French beans and mange-tout and vegetables more commonly processed, like tomatoes, are high in demand from actors outside the local food system. But when local consumers are considered, indigenous vegetables rank high in preferences.<sup>164</sup> This doesn't seem to be fully reflected by prices and, realistically, **willingness to pay is still above market prices**, as assessed by Weinberger and Msuya in 2004. A cultural bias might explain why prices don't increase accordingly. Consumer perception and traders' businesses could greatly benefit from better market facilities and dedicated areas for wholesale markets.

As it's the case for the production of these crops, indigenous vegetables seem to be more popular among women. Further research, particularly consumer surveys and hospitality sector scoping, should be conducted to identify promoting and impeding factors to indigenous vegetables consumption. For instance, besides the

<sup>164</sup> UNIPV Development Economics research (2019).

identification of varieties preferred,<sup>165</sup> individual choices and meal practices could be studied, and the potential of innovations in vegetables preparation and consumption should be assessed.

### Food safety concerns

Another barrier to increased consumption of fruits and vegetables is the **widespread concern for food safety hazards**, particularly high levels of pesticide residues, which spur Tanzanians to not eat raw vegetables from the market. These concerns derive from the risks associated with farmers' limited knowledge regarding the correct use of pesticides or herbicides, and the existence of counterfeit chemicals in the market. This fear is also often transmitted from one generation to another and supports the transmission of misconceptions regarding cooking procedures (Beaudreault, 2019). The risk of biological contamination is also significant, due to the absence of suitable storage facilities and scarce hygienic conditions provided by market infrastructure.

In spite of increasing concerns of health hazards and several cases of poisoning locally reported, food safety has not been defined as a priority, nor by the national government or by the Arusha City Council.<sup>166</sup> **The lack of dedicated standards for indigenous vegetables, combined with the limited enforcement of food safety requirements for fresh produce, leads to difficulties in signalling to consumers the origin and safety of these crops.** As we have seen (4.1.2.), the responsibility of different public authorities regarding enforcement of food safety regulations is fragmented and the low capacity that is there is targeted more towards the export and processed food sector. Governance-related challenges to enforcing safe food in local markets include fear of alienating rural votes since stronger enforcement would most likely affect the majority of small-scale producers. For instance, there have been anecdotal reports of politicians pressuring people who try to create awareness about the food safety risk of current tomato production in Ilula, one of Tanzania's main tomato production hubs. Stronger government regulation and enforcement is likely to increase under the current President.<sup>167</sup> However, **repressive reactions of authorities towards small-scale producers and vendors to enforce stricter regulations risk having adverse effects if they are not accompanied by measures that strengthen the capacity of such actors to comply.** Recent research in this regard shows that a repressive stance of governments towards the informal market can have negative impacts on nutrition and livelihood outcomes, without significant increases in food safety compliance (Blackmore et al., 2015).

**Consumers have an interest in increasing access to both affordable and nutritious food but little capacity to organise themselves and uniformly influence the market.** There are no strong movements or consumer organisations in Tanzania, so pressure from that side is non-existent. Trust issues between consumers and vendors regarding safety and origin can lead to a drop in consumer's demand for fresh fruit and vegetables, actually reducing the much-needed rise in vegetable and fruit consumption. As already mentioned, some organisations and programmes such as the World Vegetable Centre and Vegetables for All have successfully organised demand creation activities and information campaigns targeting both rural and urban consumers. Other local actors working on improving food knowledge and expanding informed consumer choices in Arusha are Slow Food and Heritage Foods Africa. These actors and activities are, however, not yet very influential in changing perceptions of consumers on a large scale.

<sup>165</sup> Weinberger and Msuya (2004), for instance, found that consumers demand vary widely across regions, with consumers in Arusha demanding a narrow-leaved, dark green, small-sized nightshade variety, while the preference in Dar es Salaam goes to a large, broad-leaved, green variety.

<sup>166</sup> Rikolto representative, November 29, 2017.

<sup>167</sup> ECDPM field research, Arusha, May 2019.

#### 4.3.4. Cross-cutting governance dimensions hindering integration

**Agriculture and rural development policies do not explicitly promote food systems diversification and, in some cases, they are working against it** (see 4.1.2). Recognition of the importance of diversified food systems is weak, almost non-existent, and **specific support and promotion of indigenous vegetable crops is scarce**. Horticulture is identified as a sector for diversification in the Northern Highlands (Arusha and Kilimanjaro regions), but indigenous vegetables are not explicitly targeted. In general, most policy and strategy documents do not even mention indigenous vegetables. This is the case, for example, of the National Multisectoral Nutrition Action Plan and the National Horticulture Development Strategy. In addition, there are only a few research institutes that gather evidence on the agronomic, nutritional and economic benefits of indigenous vegetables. The lack of gene banks in different agro-ecological zones makes it hard to advance on DNA characterisation and the biodiversity of these vegetables is thus endangered by displacement with high-energy staple crops. Integrated seed policies including indigenous crops are not in place and plant genetic resource management by local communities is not recognised or supported.

This situation partly results from the fact that, in the past, **most government efforts to address food security have focused on increasing staples production, particularly cereals**, as key energy providers. Such policies neglected the importance of appropriate nutrition and balanced diets (Afari-Sefa et al., 2016). The bias towards cereal staples support is only **slowly changing**, partly as a result of the integrated **multi-sectoral approach to nutrition**. However, the implementation of multisectoral nutrition action plans has been only partial, especially at the local level. Given many competing policy priorities, **putting the attainment of diverse and nutritious diets high on the local agenda is challenging**. As a result, the potential of indigenous vegetables is not fully recognised. There is an important role for awareness-raising in this regard, particularly by targeting local public authorities and providing them with strong practical evidence.

Moreover, the existing **tension between different agricultural development visions** – on the respective roles of the government and private sector in driving agricultural development – has led to inconsistent and sometimes **contradicting policies. This can hinder efforts to strengthen the commercial production and processing of indigenous vegetables**. These crops are mostly grown by smallholder farmers and are constrained by factors such as poor quality and availability of quality seeds, lack of appropriate market information and support systems (e.g. cold storage) and high postharvest losses. Horticultural investors and commercial farm owners and managers could play a role in increasing investment and enabling small producers to better exploit the opportunities presented by indigenous vegetables, for example by reducing perishability. However, the **challenging business environment**, the distrust towards (non-African) business interests and the unpredictable nature of trade policies can **discourage private sector actors** from investing in horticultural value chains geared towards the domestic market. Moreover, the influence of large international input providers in extension services hinders farmers' decisions to invest in more sustainable production practices.

President Magufuli has **prioritised public investments towards hard rather than soft infrastructure**. This affects development partners efforts to strengthen knowledge infrastructures, facilitate peer-to-peer exchanges and broker value chain governance through, for example, multi-stakeholder platforms. The heavy involvement of the state in the agricultural sector can also have an adverse effect on the buy-in of private sector players in these efforts. In addition, the willingness of government officials to work across silos or take risks in trying out innovative approaches is most likely decreasing under the current President. Also, the shrinking civic space can influence the inclination of NGOs and emerging consumer organisations to advocate for better access to safe and sustainable food.



The **decentralisation process**, which has mandated local governments for the implementation of nutrition, agricultural, environmental and climate policies, **offers opportunities for synergies** at the landscape level to change current food system outcomes. Nonetheless, this **potential for increased policy integration** – for instance, harmonising activities among agricultural, nutrition and health officers at the village level – and **improved collaboration** between local governments, development partners and research institutes **has not yet materialised fully**. This is often attributed to a lack of financial and organisational resources at the local level. Although this holds for a large part, internal power dynamics within CCM and between CCM and other groups can also affect local politicians' decisions to resist against specific reforms affecting the written and unwritten rules of the game. For instance, awareness-raising on food safety risks can be discouraged by local public authorities if they feel at risk of losing farmer communities' political support.

#### **4.3.5. Overview of governance challenges and conclusion**

In this section, we discussed the key challenges and opportunities for stronger integration of indigenous vegetables in Arusha's food system. In doing so, we analysed the relations and practices of key actors, focusing on vertical and horizontal linkages along the chain. We also discussed cross-cutting governance issues currently hindering a stronger integration of these vegetables.

Table 13 summarises the characteristics of indigenous vegetable chains in Arusha, as well as the drivers and constraints identified across the production, distribution, consumption and governance domains.

**Table 13: Summary of drivers and constraints of leafy indigenous vegetables integration**

Area	Characteristics	Drivers	Constraints
Production	Small-scale production; Female-dominated; High household self-consumption; Low food safety.	High profitability; Important in nutrition security; Booming commercial seed production.	Poor social status; Lack of extension service support; Government support towards maize; Low quality assurance of informal seeds; Gender inequalities; Lack of good agricultural management; Agrochemicals misuse; Limited producers organisation; Unpredictable demand; High seasonality for some vegetables.
Distribution	High informality; Female dominated; Low supermarket share	Myriad network of traders; Credit provision by traders to producers; Strong linkages between traders.	High perishability; Lacking storage and cold chain; Local market dependent; Low processing and standards; High transport costs and market fee; No dedicated wholesale area.
Consumption	Low dietary diversity.	High nutrition profile; Generally available at markets; Willingness to pay above market prices.	Unpredictable availability; Volatile market prices; Low food knowledge; Dietary shift towards animal sourced foods and processed products; Food safety concerns; Weak/absent consumer organisation.
Governance	Inconsistent and contradicting policies; Focus on infrastructure; Low public investment in agriculture.	Multi-sectoral approach to nutrition. Decentralisation process.	Policies do not support diversification; Neglect of indigenous vegetables; Challenging business environment.

*Source: Authors' elaboration based on own research*

The next section 5 builds on the food system mapping (section 3) and analysis of Arusha's food system governance (section 4) to explore several pathways to improve Arusha's sustainability.

## 5. Pathways for sustainability through diversification

### 5.1. Introduction

This section charts **pathways to improve the sustainability of Arusha's food system** based on its mapping (Section 3), the analysis of its food governance and key actors (Section 4), and local stakeholder's needs.<sup>168</sup> Mapping Arusha's food system provided an overview of opportunities and challenges regarding the economic, environmental, and social sustainability of the food system and the potential advantages of integrating more indigenous vegetables. The food governance and key actor mapping provided insights into the overall policy environment, actor networks, and local stakeholders' needs. Against this background, several entry points to improve sustainability through indigenous vegetables were formulated and categorised by governance, production, distribution, and consumption domains. Based on SASS research and local stakeholder's needs, four promising entry points were developed into pathways by **analysing their benefits, drawbacks, and key actors**. This section furthermore reflects on potential roles of the SASS consortium to support these pathways – that will be further discussed, amended and validated at a later stage with relevant local stakeholders. The next section concludes this report.

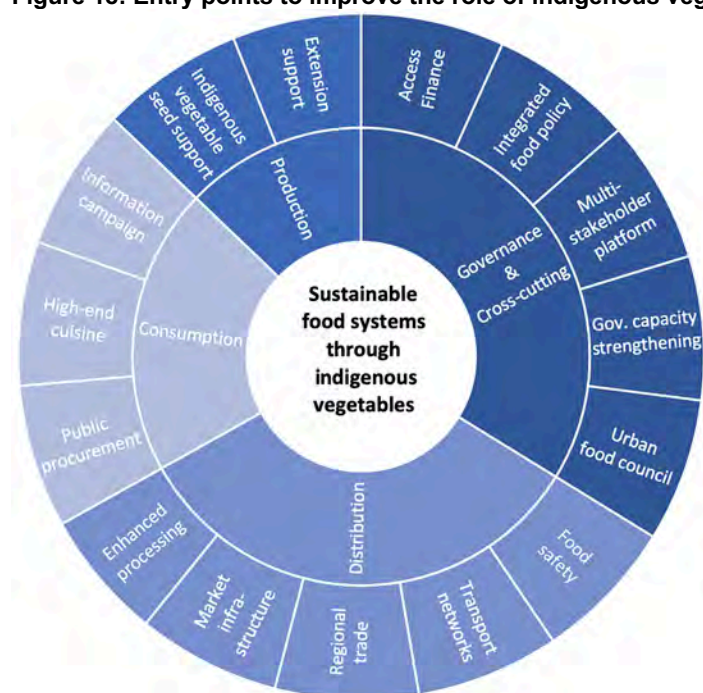
### 5.2. Entry-points for more indigenous vegetables

Research and practical experience across the world suggest that better integration of indigenous vegetables in local food systems is an important part of diversification strategies in plots, markets and plates. Increased valorisation and consumption of indigenous vegetables can result in healthier diets while taking advantage of value addition opportunities and market information can help access more reliable markets for small-scale producers and traders. At the production level, increased and smart use of indigenous vegetables, especially when farmed in rotation or as cover crops, can reduce the use of agrochemical compared to exotic vegetables and contribute to improved soil fertility. The SASS research and other sources confirm that most of these advantages are also applicable in Arusha. As such, SASS cautiously states that increased uptake of indigenous vegetables could improve multiple sustainability factors of Arusha's food system.

In recognition of the sustainability advantages that increased uptake of indigenous vegetables can bring, and in collaboration with local stakeholders, we formulate various entry points of action, categorised along governance, production, distribution, and consumption (Figure 18). While each of these entry points can improve the role of indigenous vegetables in Arusha's food system, they differ on their impact, local suitability, and political feasibility. For example, it is much easier to launch an information campaign about appropriate cooking techniques than to improve regional trade agreements or build infrastructure. Each entry point may require different stakeholders as well. As such, **each entry point requires different strategies and stakeholders to be implemented** (Figure 19).

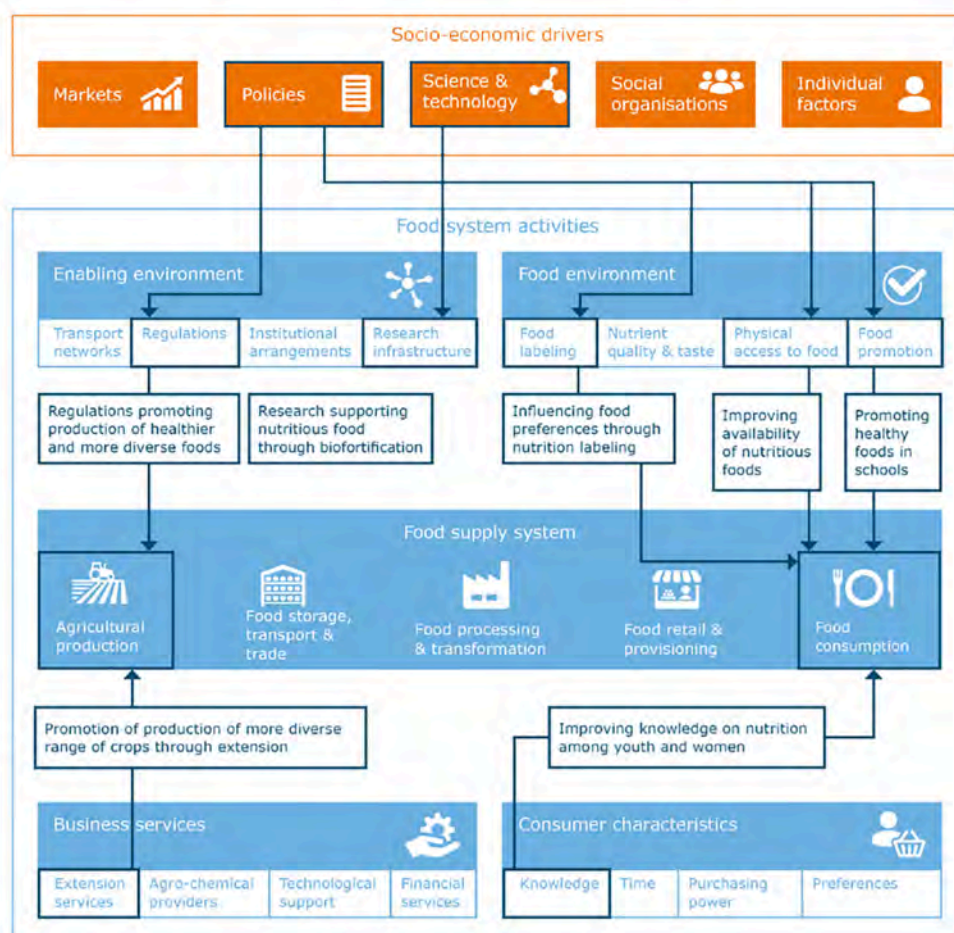
<sup>168</sup> Our objective is to stimulate dialogue rather than advancing specific solutions. As such, we propose 'pathways', instead of 'solutions', to signal their purpose as starting points for further discussion rather than end points of debate.

Figure 18: Entry points to improve the role of indigenous vegetables in Arusha's food system



Source: Authors' elaboration

Figure 19: Different entry points require different strategies in the food system



Source: van Berkum et al., 2018

Given these factors, **four promising entry points emerge** based on SASS research and local stakeholders' needs. These entry points **were developed into pathways** for solutions by analysing their advantages, disadvantages, synergies, trade-offs, key stakeholders and actors, and the potential future support of the SASS consortium. The four pathways for solutions are a) stronger chain governance through a multi-stakeholder platform,<sup>169</sup> b) more informed farmers' choices by including indigenous vegetables in extension officers' curriculums, c) improved food safety and reduced loss along the chain, and d) greater food knowledge about indigenous vegetables through information campaigns. These pathways span the governance, production, distribution, and consumption of indigenous vegetables.

### 5.3. Pathway 1 – Governance: Multi-stakeholder platform for stronger chain governance

#### Introduction

The integration of indigenous vegetables in Arusha's food system is hindered by several interrelated factors. As described in section 4.3., many of these factors relate to weak internal and external governance of the indigenous vegetables value chain. Conflicting interests between political and economic elites and contending ideas around sustainable development result in inconsistent policies and implicit bias against indigenous vegetables in nutrition, agricultural and environmental strategies. In this context, **a dedicated multi-stakeholder platform can serve as the main governance body of the indigenous vegetable chain**. This platform could facilitate dialogue and trust among chain stakeholders and act as a conduit for the chain's interests to external partners. Moreover, the platform can create consensus around interventions to promote in the chain. As a result, both the internal governance of the indigenous vegetable chain could be improved and a stronger negotiation position obtained. Once established, this first pathway creates opportunities for better design and easier implementation of Pathway 2, 3, and 4.

#### Benefits and drawbacks of platforms

Multi-stakeholder platforms bring regularly relevant actors together to **share information, discuss improvements, build trust, facilitate compromises, coordinate action and monitor development impact** (Rampa and Knaepen, 2019). A strong facilitator is crucial to maximise the platforms' advantages and minimise disadvantages. Positively, as the platform connects actors from different spheres, it includes more perspectives and increases the transparency of decision-making. Including multiple perspectives and embracing often-neglected stakeholders can lead to more coherent plans that maximise synergy. Because of the inclusion of multiple perspectives, a host of issues can be discussed, particularly often-neglected problems of marginalised actors, such as informal vendors and urban vegetable growers in open spaces. While developing plans, the platform facilitates compromises. Ultimately, resources are pooled as the platform can facilitate activities that go beyond the scale of any individual stakeholder. As such, they provide a signalling function to governments about the importance of certain issues.

However, building the necessary common language, trust, and agreement necessary takes time. Because of the many actors involved, **transaction costs can be high**. It needs to be clear, especially to private sector stakeholders, what is in it for them. Lastly, large power asymmetries and different capacities need to be addressed to safeguard the inclusivity and effectiveness of any platform. For example, less powerful actors can be supported through dedicated sessions that prepare for the actual platform meeting.

<sup>169</sup> '...Any collaborative arrangement among stakeholders from two or more different spheres of society (public sector, private sector and/or civil society), pooling their resources together, sharing risks and responsibilities in order to solve a common issue, to handle a conflict, to elaborate a shared vision, to realize a common objective, to manage a common resource and/or to ensure the protection, production or delivery of an outcome of collective and/or public interest' (HLPE, 2018: 40).

### Arusha's platform strategy and actors

In Arusha's case, a platform bringing together stakeholders of the indigenous vegetable chain can facilitate stronger chain governance, which can create reverberations throughout the chain. Stakeholders can, for example, jointly identify bottlenecks and develop shared solutions while forming a shared vision of the future while being part of implementation and monitoring efforts. Figure 17 suggests entry points for uptake by the platform. Additional suggestions include a) facilitate market information systems; b) monitor the application of safety and sustainability standards throughout the chain; and c) facilitate sharing of best practices.

**This platform can learn from, or build upon, existing multi-stakeholder initiatives**, such as Arusha's urban food council. Arusha, which signed the Milan Urban Food Policy Pact, has an eleven-member council that works on food safety, market linkages, and application of good practices in Arusha City (Rikolto, 2019). However, this government-led council has a scope that is smaller than what is needed to integrate indigenous vegetables more strongly in Arusha. The platform could also draw from the lessons of the Vegetable for All Project, by facilitating access to inclusive and responsive financial and extension services, timely and high-quality inputs and reliable markets. For integration, a dedicated – but connected with existing initiatives – platform for the indigenous vegetable chain is needed.

An Arusha multi-stakeholder platform for the indigenous vegetable chain might benefit from the inclusion of the following stakeholders: AgriProFocus, as a local facilitator; World Vegetable Centre and ECHO, as knowledge generators and fundraisers; Tanzania Agricultural Development Bank and NMB Foundation as important financial institutions to provide access to financing; Mviwata, representing smallholder farmers; local government officials; champion farmers, traders and processors; Slow Food, Heritage Food, and Tanzania Organic Agriculture Movement organisations, due to their existing sustainability projects; Tanzania Horticulture Association, due to their involvement in horticultural export chains; local traders' organisations or networks, to include distribution; and consumer advocates to bring perspectives from the consumer's side. **These proposed stakeholders – far from comprehensive – include production, distribution, consumption, and governance actors that together could strengthen interventions into the indigenous vegetables chain.**

### SASS's role

The SASS project could support this platform in several ways. First, SASS could **facilitate the platform's set-up** by bringing together the relevant stakeholders given previous experiences in multi-stakeholder dialogues – an intrinsic part of the Dutch Diamond Approach.<sup>170</sup> SASS researchers studied the interests and motivations of actors in Arusha's food system (Section 4), which helps in engaging these actors and enhancing the platform's value by linking with their own goals and spheres of influence. Clarity on a viable business model of the platform needs to be created at an early stage. Second, SASS can **help identify bottlenecks in the indigenous vegetable chain** and support the creation of shared solutions, which needs to be turned into actionable plans (e.g., a food safety plan). Third, given the multidisciplinary nature of the SASS project, the experiences of a wide range of actors – ranging from producers, traders, and consumers – were studied, which provides both contacts and understanding of their positioning in Arusha's food system. This can contribute to **incorporating these actors in the platform and facilitating consensus**. Lastly, SASS can help connect the platform **externally to national and international initiatives**, for example, GAIN's Marketplace for Nutritious Foods<sup>171</sup> or Tanzania's National Multisectoral Nutrition Action Plan.

<sup>170</sup> The Dutch Diamond Approach '...recognises the value addition of government, the private sector, civil society and knowledge institutions working in partnership to realise development results. Within the Dutch Diamond Approach, the competences of partners are combined and the various goals, funds, risks and responsibilities are pooled together' (OECD, 2016: 5).

<sup>171</sup> GAIN'S Marketplace for Nutritious foods supports diverse, nutritious and affordable market access by offering network opportunities, business support and finance access for local companies.

In sum, establishing a dedicated multi-stakeholder platform for Arusha's indigenous vegetable chain is a crucial intervention given the chain's governance challenges. Furthermore, the platform can act as a conduit to design and facilitate action plans to improve the indigenous vegetable chain, for example on food safety (Pathway 3).

## 5.4. Pathway 2 – Production: Informed choice through extension support

### Introduction

Current indigenous vegetable production is hampered by **insufficient extension support which results in less production, lower yields, and underserved commercialisation opportunities**. Extension officers are one of the main sources of production expertise for small-scale farmers. Recognising extension officers' unique positioning as intermediaries between agricultural policy and farmers, developing an indigenous vegetable-sensitive curriculum for extension officers can promote indigenous vegetable production, decrease production risks and spread sustainable production practices. Strong innovation systems with closer linkages between farmers, extension services and research institutes increase the relevance and responsiveness of extension support. It can also build on the increasing evidence of the effectiveness of peer-to-peer action research like farmer field schools (IPES, 2016). Besides reducing the current policy neglect, strengthening extension officers' knowledge on sustainable practices, the importance of informal markets and innovation systems provide farmers with more informed choices about what to grow, where to sell and how to.

### Benefits and drawbacks of curriculum change

Generally, **the importance of public extension services for technical knowledge declined under budget cuts, resulting in farmers getting more and more technical information from the private market** – such as input suppliers. Still, extension officers in Tanzania are the second most important source of agricultural information, after radio, for female farmers, which shows their importance to advance female economic empowerment (Isaya et al., 2018). But enhancing diets through diversification requires changes to extension services (Transform Nutrition, 2017). Currently, indigenous vegetables are neglected in extension services in favour of staple production and sustainable production techniques are overshadowed by an emphasis on input subsidies, particularly for fertilisers. As such, current extension services advance more input-heavy staple production rather than more agroecological and diverse production. However, changes in extension officers' curriculums are particularly feasible now as their syllabuses are currently under review, a process which takes place every five years.

**Including indigenous vegetables and sustainable production practices in extension officers' curriculums increases farmers choice.** Different farmers and markets have different needs – such as producing for household consumption or local and regional markets – therefore extension information products need to be adapted to different users and needs. The necessary shift to increase productivity and resilience of farmers through more environmentally sustainable agricultural practices, including the diversification of crops, is a highly knowledge-intensive process. Agro-vet stores and input suppliers, currently an important source of information for farmers, can only play a limited role as many sustainable improvements – particularly knowledge-intensive ones – cannot be easily marketed and often are geared towards reducing external inputs, which goes against agro-vet businesses. As such, private markets cannot provide the necessary information for long term sustainability, which requires more public information extension. Supporting changes to extension information is best coordinated with consumer information campaigns regarding the benefits of indigenous vegetables (Pathway 4) to maximise their impacts. As such, the indigenous vegetables platform (Pathway 1) can be a partner in coordinating these efforts.



**Drawbacks of this pathway** relate to the limited impact it entails addressing only part of the local innovation system. Agro-vet stores, financial services providers and market information providers, for example, will also influence the capacity of farmers to adopt new practices. There is also the risk of any changes effectuated at extension services level not trickling down to the level of households. Past experiences of working with extension services by other projects, such as the Vegetables for All and Mboga na Matunda, show that capacity building sometimes remains at the level of agricultural officers at the District Council level if there is no budget for ward-level officers to also receive training.

Shifting the focus from communicating new technologies or better management techniques towards **co-creating innovation processes can reduce systemic bias and increase applicability** even more, particularly for more marginalised players or crops. This would shift extension officers' roles from one-way sending or transferring knowledge to facilitators of an innovation process that identifies problems and opportunities in a more participatory and responsive manner. Adjusting agricultural officers' incentives from monitoring and reporting on increased production towards acknowledging the value of being adaptive to farmers' needs would support the change in focus. Given the role as 'main governance body of the indigenous vegetable chain', the platform proposed in pathway 1 could both advocate changes in the curriculum of extension officers and champion a change of officers' roles.

### Curriculum change actors

Principally, **Arusha and Meru District agricultural officers** are the main actors in this pathway as they disseminate the information about indigenous vegetable production practices. But other stakeholders can help in forming the new curriculum, monitoring its process, or help in communicating its message, which – non-exhaustively – are: the Ministry of Agriculture, Livestock and Fisheries, Tanzania Organic Agriculture Movement (TOAM), Sustainable Agriculture Tanzania (SAT), and The African Organic Network (AfroNet), as organisations that tested sustainable production techniques and can champion farmers; Sokoine University of Agriculture and Tanzania Agricultural Research Institute (TARI), as scientific and technical providers; ECHO, the International Center for Tropical Agriculture (CIAT) and other CGIAR centres, and Oikos East Africa as partners.

### SASS's role

SASS's UNIMIB Animal, Plant and Biodiversity team plans to supply their sampled farmers with farm-level specific information about sustainable production techniques of indigenous vegetables based on the farms' soil health. This could be regarded as a pilot for the responsiveness of farmers to more production information on indigenous vegetables. **SASS can help create a coalition to lobby the integration of sustainable indigenous vegetables production practices in extension officers' curriculums.** The indigenous vegetables platform (Pathway 1) offers space for such a coalition.

In summary, the production of indigenous vegetables could benefit from more extension services support, especially sustainable production information. By including indigenous vegetables in extension officers' curriculums, farmers have more choice about what to grow. The platform of Pathway 1 can help in designing and monitoring the changed curriculum and champion its implementation. But rather than top-down communication, the role of extension officers could also change towards facilitators of co-creating innovation processes.



## 5.5. Pathway 3 – Distribution: Improved food safety along the chain

### Introduction

Unsafe food along the indigenous vegetable chain is due to **weak enforcement and coordination combined with insufficient technical support and infrastructure**, particularly cold storage, **and a lack of incentives for investments in safer practices at farm and market level**. Adopting safer practices such as improved hygiene at market places or integrated pest management entails costs that need to be borne by private and public value chain stakeholders such as producers, traders, market authorities and regulating institutions. In some cases, the transition towards less chemical-intensive agriculture leads to a decline in yields before sustainable cropping practices start paying off. Bridging this time lag can be a hurdle difficult to finance, either by farmers or financial service providers. Moreover, consumers buying fruits and vegetables in most markets in Arusha do not have a way to differentiate between good quality and safe food from unsafe foods. A price premium for quality assurance can be used to finance the necessary investments.

**Improving food safety likely requires a combination of governance, processing, and safe practices that strengthen each other.** Given that safe food requires interventions along the value chain, a dedicated food safety task force, particularly inclusive of informal actors, within the multi-stakeholder platform (Pathway 1) seems the best way forward. This task force should liaise with Arusha's urban food council. This task force can discuss the delicate balancing of higher prices for safer food or the role of technology – such as drying leafy vegetables to increase shelf-life – compared to public investments – such as better transport networks. Collaborating with Arusha City Council and lobbying to integrate within existing food safety plans would increase feasibility for public interventions that are more budget-heavy, such as infrastructure. Ideally, the task force develops a food safety plan for the indigenous vegetable chain and musters a coalition to implement it. Moreover, improving food safety goes well beyond the indigenous vegetable chain as it has spill-over effects on other chains – such as improved hygiene in wet markets and better knowledge on food safety at the level of consumers.

### Benefits and drawbacks of pursuing more food safety

Studies show that **low and middle-income countries bear the brunt of food safety issues** and that this burden is likely increasing as consumers eat more perishable products and supply chains get more complex and longer. The food systems of these countries – heterogeneous, many actors, largely informal, and lacking enforcement – makes food safety governance more challenging. Current food safety governance is inadequate, incoherent, out-dated, fragmented, inappropriate, not harmonised and aligned, misses the informal sector, and has limited civil society involvement. Despite this challenging environment, poor households also take into account food safety in their consumption behaviour. Research shows that food safety is not necessarily better in formal chains compared to informal chains (Grace, 2015). Even if appropriate hard regulation is present, enforcement of compliance is tricky due to the high informality of the chain and low capacity of enforcement agencies. Furthermore, standards can raise business costs, possibly creating a standardised formal chain – with larger farmers, pricier and safer food – and a non-compliant informal chain – with smaller farmers, cheaper but less safe food.

### Food safety strategy and actors

Rather than focusing on formulating formal rules, **promoting safe practices that are adapted to the informality of the indigenous vegetable chain** might be more effective. Involving informal chain actors in food safety designs can make for more realistic plans. The food safety task force can consider a) sharing good agricultural practices at farm level to limit the inappropriate use of agrochemicals, b) improve hygiene in wet markets, c) develop a low-cost traceability system for safer food, d) improve consumer's food safety knowledge, e) select technologies fit for the many-small-actors characteristics of the chain, and f) increase processing of leafy indigenous vegetables.

Currently, **Arusha's City Council is debating food safety initiatives in partnership with Rikolto and Trias**. Rather than working in parallel, the multi-stakeholder platform (Pathway 1) can support this process given the food safety challenges of indigenous vegetables, particularly perishability. In designing and implementing the food safety plans, input can be sought from the Tropical Pesticides Research Institute (TPRI) as knowledge providers; Mboga na Matunda and Vegetables for All due to their work on good agricultural practices and linkages with processors. Community radios can bring food safety communication messages to consumers, as risk communication is part of effective risk management.

### **SASS's role**

First, while no bacterial or chemical food safety studies were conducted by the SASS teams, the food safety perspectives of a wide range of actors were captured. On this basis, SASS can support the design of food safety programming by **facilitating the inclusion of a wide range of stakeholders**. Second, SASS can lobby to embed the platform's food safety task force with Arusha's City Council and its food strategy, and help setting up monitoring mechanisms. Third, given the likely investments required to upgrade food safety, SASS can connect the task force with outside financial service providers. As the platform pools many actors and decreases the risks of the indigenous vegetable chain, more favourable finance can be sought.

In sum, improved food safety requires changes along the indigenous vegetable chain. The design of food safety programming can benefit from the **inclusion of informal actors**. As the interventions are broader than the indigenous vegetable chain, **linkages with other initiatives** are beneficial, especially Arusha's food council. A food safety task force with the multi-stakeholder platform can embed the particularities of the indigenous vegetable chain in an overall Arusha food safety plan. The SASS team, due to its knowledge of the chain, can facilitate the **design of a food safety plan for the indigenous vegetables chain**, facilitate linkages with Arusha's overall food safety plan, and promote the plan to external investors.

## **5.6. Pathway 4 – Consumption: Information campaign for greater food knowledge**

### **Introduction to the pathway**

**Lack of food knowledge hampers consumers in Arusha to have informed choice about their diets**, contributing to malnutrition. Strengthening of consumer food knowledge regarding indigenous vegetables, including benefits and proper cooking techniques, could improve consumers' choice. Increased awareness of the benefits of indigenous vegetables could lead to more consumption, which improves dietary adequacy. Also, communicating tips on producing indigenous vegetables might increase production in home gardens and small, urban plots. Ideally, a consumer information campaign targets groups, such as childbearing women, differently based on their unique nutritional needs, and employs various communication strategies, such as cooking workshops or testing kits. While more food knowledge does not automatically lead to changing dietary patterns, more knowledgeable consumers have the ability to make better informed choices about their diets.

### **Benefits and drawbacks of an information campaign**

Diets in Arusha are often nutritionally inadequate. This inadequacy is partly driven by a lack of knowledge on nutrition, proper cooking techniques, traditional perceptions, and taboos around particular foods (Section 3.2.3). As a result, malnourishment is high, especially child malnutrition. **Diversification of diets** through higher consumption of indigenous vegetables can alleviate certain micronutrient deficiencies and contribute to an overall reduction of malnourishment (Section 3.2.4). But while both political commitment to improve nutrition and diverse foods is in place, consumers in Arusha often do not know the nutritional benefits of

indigenous vegetables and political commitment often does not trickle down to achieving impact on the ground.

There are various ways to provide nutritional information. **National nutritional guidelines** provide country-specific advice on adequate diets and can be the reference point for more specific dietary advice. Today, Tanzania does not have a national food-based dietary guideline but is in the process of formulating one. Local programs can communicate proper nutrition - such as in schools - or specific cooking techniques in workshops. Also, local campaigns can tackle cultural practices that limit dietary diversity. Specific groups require special attention, such as pregnant or breastfeeding women.

On the farm, farmers should have **access to the knowledge** necessary to grow nutritious crops (Pathway 2) to diversify their self-consumption. Off-farm, markets should be accessible and the products available, safe, and affordable. While indigenous vegetables are generally available, poorer households have difficulties accessing them. Thus, while campaigns can communicate proper information and techniques, it does not alter the affordability of a healthy diet - which can be out of reach for many.

### Information campaign strategy and actors

Radio is the most important communication channel for Tanzanian female farmers (Isaya et al., 2018). **Community radio spots** can be combined with poster distribution, cooking workshops, and school nutrition class. Already, several programs working on improving food knowledge and expanding informed consumer choices in Tanzania and Arusha are a) the World Vegetable Centre working on dietary guidelines and distributing seed kits, b) Slow Food Tanzania and Heritage Food providing cooking demonstrations and school gardens, c) Vegetables for All cooking demonstrations, d) Save the Children nutrition and nutrition-sensitive agriculture programs, and e) Tanzania's National Multisectoral Nutrition Action Plan.

### SASS's role

SASS's nutrition team from UNIPV is developing posters that communicate the benefits and proper cooking techniques of indigenous vegetables based on their research in Arusha. A 'plate', in which nutritionally adequate proportions of an average meal are depicted, is being designed as a **simple but powerful way to give nutrition advice**. As UNIPV's team analysed childbearing-age women specifically, they are best placed to support campaigns that cater to their specific needs. Sokoine University of Agriculture, a local SASS partner, has an extensive track record of working on community nutrition and can provide additional knowledge support to nutrition programs on community radio.

In summary, lacking food knowledge hampers informed consumer choice and contributes to malnutrition. Nutrition advice about indigenous vegetables can lead to more consumption, although less so for the poorest. Communicating tips on producing indigenous vegetables can increase the diversity of self-consumption for those with access to land. Each campaign needs to be adjusted for its specific audience, and ideally incorporates a combination of radio, schools, posters, and workshops. The SASS project has the information and tools - such as posters and a 'plate' - to contribute to a consumer campaign.

## 5.7. Pathways' overview

The previous section formulated and discussed four pathways for stronger integration of indigenous vegetables in Arusha's food system. Table 14 summarises Arusha's current food systems and the improvements that the various pathways could bring. At the moment, Arusha's food system is dominated by 'traditional' elements (HLPE, 2017) and suffers from widespread malnourishment, high poverty, and ecosystem degradation. **Implementation of any pathway alone would not fundamentally alter Arusha's food system, but incrementally improve its economic, social, and environmental sustainability.**

This section presented the entry points formulated based on SASS's research and local stakeholders' needs. **Four promising entry points were developed into pathways for solutions, categorised by governance, production, distribution, and consumption domain.** Pathway 1 suggests a multi-stakeholder platform that serves as the main governance body of the indigenous vegetable chain. Pathway 2 targets the inclusion of indigenous vegetables in extension officers' curriculum so that farmers have more production options. Pathway 3 focuses on food safety and suggests a dedicated food safety unit within the platform that starts from the informality and many-actor characteristics of the indigenous vegetable chain. Pathway 4 proposes a nutrition campaign that enhances informed consumers' choices. These pathways will be further discussed, amended, and validated at a later stage with relevant local stakeholders. The next section concludes this report.

**Table 14: Summary of the current food system performance and possible implications of the various pathways, with positive (+) and negative (-) sustainability dynamics**

	Characteristics	Social sustainability	Environmental sustainability	Economic sustainability
Current food system	High population growth; Dominance of small-scale farming; High degree of informal food distribution.	<ul style="list-style-type: none"> <li>+ Low obesity;</li> <li>+ Lack of open conflicts;</li> <li>+ Higher life expectancy than country average.</li> <li>- High malnutrition, esp. &lt; 5 years;</li> <li>- Low dietary diversity, particularly vegetables;</li> <li>- Low food knowledge;</li> <li>- Small-scale farmers' poverty;</li> <li>- Gender bias;</li> <li>- Large urban-rural gap.</li> </ul>	<ul style="list-style-type: none"> <li>+ Fertile mountain slopes;</li> <li>+ Water availability.</li> <li>- Low diversification;</li> <li>- Fragile mountain slopes;</li> <li>- Pressure on water resources;</li> <li>- Pressure on available land;</li> <li>- Declining soil fertility;</li> <li>- Insufficient pesticide management.</li> </ul>	<ul style="list-style-type: none"> <li>+ Trade hub for Kenya and EAC;</li> <li>+ Lower poverty levels than country average;</li> <li>+ Irrigation.</li> <li>- Low yields;</li> <li>- Higher poverty than global;</li> <li>- Bad road infrastructure.</li> </ul>
Diversification pathway assumptions and outcomes	Stronger support for indigenous vegetables; Efficient local value chains; Policy environment conducive for indigenous seeds and production; Extension services support for smallholders.	<ul style="list-style-type: none"> <li>+ Improved nutrition;</li> <li>+ Increased support for farmers organisations;</li> <li>+ Increased seed autonomy;</li> <li>+ Female economic empowerment.</li> <li>- More vegetables do not reduce undernourishment;</li> <li>- Costs of diets might increase;</li> <li>- Gender-related tensions in households.</li> </ul>	<ul style="list-style-type: none"> <li>+ Increased resilience;</li> <li>+ Increased soil fertility;</li> <li>+ Agro-biodiversity enhancement.</li> <li>- Unlikely to stop encroachment on Mount Meru.</li> </ul>	<ul style="list-style-type: none"> <li>+ New economic opportunities for smallholders, esp. women;</li> <li>+ Diversification decreases risk-profile.</li> <li>- Lower crop output;</li> <li>- Vulnerability to local market conditions.</li> </ul>

Source: Authors' elaboration based on own research

## 6. Conclusion

This report analysed the economic, social and environmental sustainability of rural and urban Arusha and studied the potential role of diversification and indigenous vegetables to advance sustainability. **We mapped Arusha's food system and analysed its governance**, particularly the drivers and constraints of better integration of indigenous vegetables. We also provided insights into the overall food system policy environment, actor networks, and local stakeholders' needs – especially with regards to the horticultural sector. Building on these insights, **we identified several entry points to improve the sustainability of Arusha's food system through indigenous vegetables** categorised by governance, production, distribution, and consumption domains. Based on a political economy analysis and discussions with local stakeholders, **we developed four promising entry points into pathways for change** by analysing their likely benefits, possible drawbacks, and potential key actors involved. We also outlined the potential roles of the SASS consortium in supporting these pathways.

Our research shows that **stronger integration of indigenous vegetables can increase the adequacy of diets**, particularly for children under five and childbearing-age women, by lowering undernutrition. As most producers are women, integration can also support women's entrepreneurship. As indigenous vegetables have a short shelf-life, more integration would also benefit urban-rural linkages. Environmentally, **stronger integration of indigenous vegetables can increase resilience to climate change, improve soil fertility, and safeguard agro-biodiversity**. Economically, **indigenous vegetables integration opens new economic opportunities for smallholders**, especially women, while market diversification decreases their dependency on a single crop. For these benefits to materialise, **an integrated strategy that takes into account the complex interlinkages, interests and incentives of the different actors in the food system is needed**.

In this report, we showed that **several bottlenecks** pertaining to governance, production, distribution, and consumption **hamper households, policymakers and businesses in Arusha in moving towards a more diverse and inclusive food system**. Indigenous vegetables are only weakly integrated into food systems beyond the homestead and the local markets. **Weak vertical and horizontal linkages among value chain actors, power and information asymmetries and a policy and business environment unsupportive of diversification are important obstacles**. Therefore, (i) improved value chain governance through a multi-stakeholder platform could be particularly beneficial. Also, stronger integration can be supported by (ii) better-informed farmers' choices through the inclusion of indigenous vegetables in extension officers' curricula, (iii) improved food safety and reduced loss along the chain, and (iv) greater food knowledge about indigenous vegetables through information campaigns. **Each of these pathways offers distinct synergies and possible trade-offs and requires different strategies and stakeholders to be implemented**.

Given the complexity and multitude of actors involved in the necessary transformation towards more sustainability, trade-offs between different interventions are difficult to avoid. But complexity also provides opportunities for positive synergy, with changes in one sustainability aspect possibly driving progress in another. **The added value of the food system approach is to make these connections, trade-offs and synergies explicit** so that more informed decisions can be made and trade-offs minimised. Taking into account drivers, interests and incentives of key actors helps to identify viable entry points and **build coalitions towards change**.

Each food system has different characteristics and therefore a unique pathway towards sustainability. Unearthing the characteristics and trade-offs of sustainability pathways in food systems needs interdisciplinary research, which can lead to the design of context-specific programs and policies in

partnership with and owned by local actors. In Arusha, **we showed that stronger integration of indigenous vegetables could be particularly beneficial for Arusha's food system sustainability as it can promote its three pillars – social, environmental, and economic – at the same time.** For these synergies to be maximised, stronger food governance is necessary, preferably through a multi-stakeholder platform dedicated to indigenous vegetables. We hope that this report provides a first step towards a more sustainable food system in Arusha.

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*‘...stronger integration of indigenous vegetables in Arusha can increase the adequacy of diets, boost resilience to climate change, improve soil fertility, and safeguard agro-biodiversity. It can also offer economic opportunities for smallholders, especially women.’*

Ensuring the sustainability of food systems is paramount to the well-being of people and planet. In rural, peri-urban, and urban areas in and around Arusha, stronger integration of indigenous vegetables – which are generally highly nutritious, potentially require fewer natural resources, and can lead to higher profit margins – into the food system could help in achieving greater sustainability. However, despite their potential, the importance of indigenous vegetables for the sustainability of the local food system’s sustainability is routinely neglected by local and national level policymakers in Tanzania and Arusha.

Our two-year research, in cooperation with our partners from the Sustainable Agrifood System Strategies (SASS) project, shows that stronger integration of indigenous vegetables in Arusha can increase the adequacy of diets, boost resilience to climate change, improve soil fertility, and safeguard agro-biodiversity. It can also offer economic opportunities for smallholders, especially women. But the bottlenecks to stronger integration of indigenous vegetables into Arusha’s food system are many, ranging from an unfavourable policy and business environment to weak linkages between actors in the indigenous vegetables value chain and weak local knowledge.

In our research, we identify four pathways towards stronger integration of indigenous vegetables in Arusha: i) the creation of a multi-stakeholder platform to strengthen value chain governance, ii) inform farmers’ choices by integrating indigenous vegetables in the curricula of extension officers, iii) improve food safety and reduce loss along the chain and iv) enhance food knowledge on indigenous vegetables through information campaigns.

Indigenous vegetables are present in the plots, markets and on the plates in and around Arusha. But their potential is still largely unmet. It is time to unlock the true power of indigenous vegetables in Arusha’s food system.



Making policies work

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