the LAB
MARKET SYSTEMS DEVELOPMENT FOR DECENT WORK

THE GREEN JOBS PROGRAMME

Market Systems Development and a Just Transition: Learnings from an ILO experience in Tanzania

Introduction

The Environment-Employment Nexus

The world of work and the natural environment are closely interconnected. Approximately 1.2 billion jobs globally depend directly on ecosystem services, with employment in sectors like farming, fishery and forestry, for instance, relying critically on naturally occurring soil renewal and fertilization, and air and water purification.[1] Environmental degradation undermines these ecosystem services and the economic activities and livelihoods that depend on them.

Moreover, human-induced environmental hazards notably climate change bear significant detrimental impacts on wider economic activity and employment. Between 2000 and 2015, for instance, approximately 23 million working-life years were lost annually due to natural disasters caused or exacerbated by human activity while conservative estimates forecast that global temperature rise will result in a productivity loss equivalent to 72 million full-time jobs by 2030.[2]

1 ILO (2018)

2 Ibid.

Find out more about Green Jobs:

Website: **www.ilo.org/greenjobs**

Email: **greenjobs@ilo.org**

Find out more about the Lab:

Website: **www.ilo.org/thelab**

Email: **thelab@ilo.org**

Twitter: **@ILOTheLab**

By Isaac Cowan-Gore
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The impacts of environmental challenges on the world of work are, furthermore, unevenly distributed and tend to exacerbate existing inequalities and vulnerabilities. They disproportionately affect workers in lower-income countries and Small Island Developing States, rural workers, people in poverty, indigenous and tribal peoples and other disadvantaged groups, a trend which is only likely to intensify.[3]

Addressing environmental pressures has thus become an essential aspect of efforts to promote decent work and poverty eradication. On the one hand, this is crucial to ensure environmental challenges do not undermine current and future livelihood and development prospects. On the other, it is essential to tapping into the opportunities that a shift towards environmentally sustainable economies entail including a net gain of 18 million jobs worldwide by 2030,[4] linked to measures on renewable energy and energy efficiency.[5]

The ILO Green Jobs Initiative & Tanzania's Horticulture Sector

Taking stock of these wide-ranging challenges linking employment and environment, the International Labour Organisation (ILO) established the ILO Green Jobs Programme to help catalyse a transition to sustainable economies that promotes decent work and ensures social justice. Its activities are aimed at advancing the state of knowledge on the linkages between labour and environmental issues, assisting policy development and promoting concrete policy responses to promote green jobs and a just transition to sustainable economies, guided by the ILO's just transition guidelines.[6]

Within its portfolio of projects, one area of increasing interest is sustainable enterprise development and the potential of "systemic" approaches, like market systems development (MSD) (see Box 1 and 2 below) to leverage market incentives to advance both decent work objectives and greening of economic activity. To date, however, while the MSD approach has earned its stripes in the poverty alleviation space, its application at the employment-environment nexus remains a novelty.

The ILO Green Jobs Programme, with support from the Government of Sweden, therefore initiated efforts to use the MSD approach to promote both environmental and employment objectives in Tanzania's horticulture sector.[7] More specifically, using market systems analysis (MSA), it explored opportunities for generating more and better jobs for women and men while increasing the environmental sustainability of the sector and increasing its climate change resilience. Here, we take a look at the findings of this MSA as a means to both expose high-potential entry points for intervention in the sector and advance the MSD and environment discussion more generally.

Box 1. Market systems development in a nutshell

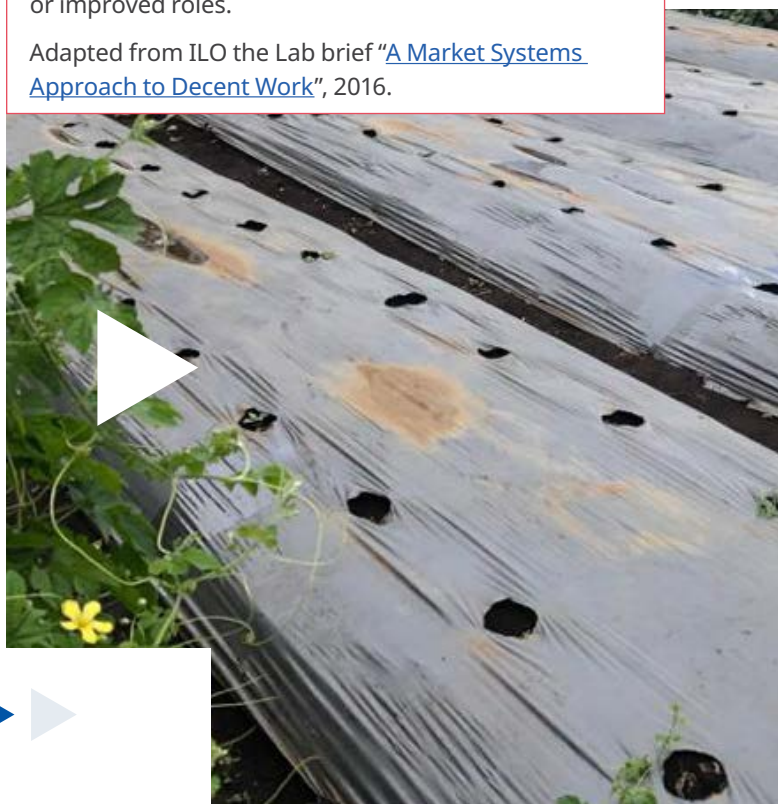
A market system is the inter-connected network of actors and factors that interact to shape the outcomes of an economic exchange. These exchanges are governed by a range of:

- *Supporting functions*. The context- and sector-specific functions that inform, support and shape the quality of exchange; such as information, skills, infrastructure, finance and access to markets.
- *Rules and Norms*. The legislative and regulatory environment, including policies, voluntary standards and social norms that guide day-to-day attitudes and conduct.

Supporting functions and rules are carried out by a wide range of market actors, from businesses to financial institutions, trade associations, regulators and government agencies. When certain rules or functions do not operate well, a market system *constraint* is created that reduces the effectiveness of the system and reduces the value captured by the people and market actors involved in the transaction.

Market systems development programmes aim to create positive systemic changes. A systemic change takes place when there is a lasting improvement in one or more market system constraints which leads to improved outcomes for target groups, be they workers suffering from poor safety and health conditions, or young people excluded from the labour force. Programmes discover why market actors have not addressed such constraints themselves, and then work on improving their incentives and capacity to perform new or improved roles.

Adapted from ILO the Lab brief "A Market Systems Approach to Decent Work", 2016.



3 For instance, over 60% of working women in South Asia and Sub-Saharan Africa are employed in agriculture which is often rainfed (Ibid.), thus rendering them particularly vulnerable to climate change induced drought.

4 Ibid.

5 The circular economy focuses on the reuse, recycling, remanufacture and repair of goods thus diminishing waste generation and creating value and employment opportunities.

6 ILO (2015)

7 Horticulture encompasses fruit, flower and vegetable production.

Box 2. Market systems development and the environment

Market systems development can play an important part in the shift towards sustainable economies. For this to happen, when undertaking MSD, social and economic goals need to be complemented by environmental objectives. This not only helps avoid unwittingly causing environmental degradation but also taps into opportunities to benefit the environment – whether related to carbon neutrality, circular economy or conservation. At the start of any new MSD initiative, it is important to set clear expectations of its contribution to sustainability. Specific objectives could be to:

- Promote the growth of and create jobs in a 'green' sector, like renewable energy.
- "Green" / Improve the environmental sustainability of a sector.
- Increase the climate change resilience of a sector.
- Ensure a do-no-harm approach in supporting sector growth.

Context

With economic growth hovering around 6 and 7% annually between 2001 and 2018,[8] Tanzania has been one of Africa's most dynamic economies of the new millennium. Along the way, it has achieved significant advances on many developmental fronts including slashing the poverty rate from 34% in 2007 to 26% in 2018 in spite of significant population growth.[9] Nevertheless, with two thirds of its approximately 58 million inhabitants under the age of 25[10] and a population growing by about one and a half million people per year,[11] pressure on labour markets is nowhere near slowing down.

Averaging approximately 4% growth annually,[12] the agricultural sector, which roughly accounts for a quarter of GDP and employs 65% of the labour force,[13] has lagged behind growth in industry and service sectors, contributing to a significant rural-urban divide and persisting poverty (in rural areas the poverty rate is approximately double that of urban areas[14]). Given the sector's dependence on a variety of ecosystem services (including regular rainfall, pollination or soil nutrient cycling), increasing environmental pressures exerted by climate change and environmental degradation associated with unsustainable farming practices risk to threaten development prospects in rural areas, bearing disastrous consequences for millions of Tanzanians.

Against this backdrop, increasing productivity and resilience against climate change in the sector is a necessity for the advancement of inclusive socio-economic development in Tanzania. Here, one area with significant potential is the labour-intensive horticulture subsector, which, as a result of population growth and urbanisation trends, is experiencing significant increases in demand, contributing to its ascent into one of the fastest growing agricultural subsectors in the country.[15]

Considering its low productivity levels compared to other countries in the region, the horticulture sector presents an extraordinary opportunity for improving and creating jobs both on and off the farm, notably for youth and women. Out of the circa half a million people employed in the sector, both groups represent the bulk of workers (between 65 and 70% are women)[16] while horticulture's small land requirements,[17] low initial capital outlays and short income earning cycles make for significant scope for additional involvement. Indeed, both groups still suffer widely from difficult access to credit and other group specific constraints that might otherwise hinder

8 World Bank (2020a).

9 United Republic of Tanzania (2019).

10 CIA (2020).

11 World Bank (2020b).

12 United Republic of Tanzania (2016).

13 CIA (2020).

14 United Republic of Tanzania (2019).

15 Tanzania Horticulture Association (2016a; 2016b).

16 Tanzania Horticulture Association (2011).

17 It is, for instance, more culturally acceptable for women to manage small plots of land, which is typical for horticulture crops more than it is for staple crops.

their ability and incentive to go into farming and turn a profit.

Considering the increasing impacts of climate change and widespread unsustainable farming practices, any strategy to develop the long-term prospects of the Tanzanian horticulture sector must integrate environmental sustainability as a key concern. As such, the following analysis provides a snapshot of the Tanzanian horticulture sector, exploring the opportunities it presents to promote jobs and incomes especially for women and youth, with attention to the potential to advance greener and more resilient practices and inputs.

The Tanzanian Horticulture Market System

In order to adequately understand the horticulture sector and identify where key bottlenecks and opportunities for sustainable and scalable intervention lie, we adopt a systemic perspective. That is, we delve into the workings of both the horticulture sector itself (section 1) and of the peripheral supporting functions and rules and regulations enabling value addition and shaping market actor behaviour along the core value chain (section 2). Based on this analysis of the horticulture market system, we present various avenues for intervention geared towards generating more and better jobs including for women and youth while supporting environmental sustainability and increasing climate resilience (section 3).

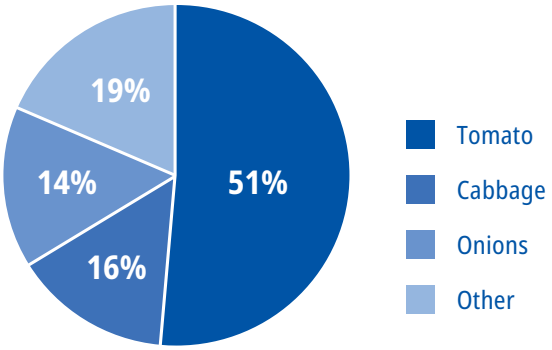
1. The Horticulture Sector

1.1 The Core Value Chain

Primary production

Horticulture production in Tanzania is mainly carried out by smallholder farmers with plot sizes typically ranging from 0.1 to 2 hectares.[18] Three major crops, namely, tomatoes, cabbages and onions, make up the bulk of production (See Figure 1 below). In recent years, on-farm productivity has been increasing. For example, in the onion sub-sector, average yield per hectare almost doubled between 2008 and 2013.[19] However, productivity levels still remain low overall, rarely capping the 10 tonnes per hectare mark, even though studies suggest it could actually reach between 25 and 45 tonnes.[20] The productivity gap is especially pronounced in the case of women farmers who suffer from additional, gender-specific constraints resulting in a further gender agricultural productivity gap of approximately 16%.[21]

Figure 1: Fruit and vegetable production in Tanzania



(Source: The Lab, 2016)

18 The Lab (2016)

19 Mzalendo Associates (2015).

20 Tanzania Horticulture Association (2016a).

21 UN Women, UNDP & UNEP (2018).

Overall low productivity levels seem to be in part due to widespread dependence on rainfall (only 2.5% of cultivated land in Tanzania is irrigated[22]). This renders most of horticulture production in Tanzania seasonal (as opposed to year-round) and can, even during the high season, lead to crop losses due to increasingly erratic rainfall patterns. The use of quality inputs and agricultural technology is also limited, and farming practices are still mostly outdated and inadequate. Overall, labour at the production stage is generally the highest cost driver with all three major horticulture crops, for example, requiring more than 6 hours of labour per growing day, most of which is typically hired labour.

Storage, Trade and Processing

Once they have been harvested, vegetables are typically stored temporarily in village collection centres, which are often ill-equipped and unsuitable for perishable crop storage, contributing to high post-harvest losses (estimated to reach 70% in 2013[23]). Besides onion producers whose product can be rather easily stored for up to 3 months, producers are unable to wait out price slumps and take advantage of incoming price hikes. In fact, apart from those affiliated to cooperatives involved in marketing, bypassing the broker-facilitated trade channel, most smallholders are price takers – even in shortage situations – which is partly due to inadequate access to market information but also a price-taker culture among farmers.

From these collection centres, the produce is brought to the market through a variety of different channels. Most horticulture products transit through rural or urban wholesale markets, with local brokers ("dalali") negotiating deals between farmers and wholesale market buyers ("wanunuzi"), who then sell the produce on to retailers or directly to institutional buyers including restaurants and accommodation businesses. Beyond this, there are some instances of direct trade (or even contract farming), notably in the case of produce expected to meet certain quality standards and destined for higher-value markets.

While limited, basic processing such as grading, cleaning, cutting and packaging does take place, mainly to serve export markets or high-end domestic markets such as urban supermarket shoppers. Beyond this, although on the rise, processing of fruits and vegetables into derivative products (e.g. tomatoes into tomato paste) also remains minimal. Overall, limited growth in processing can be partly attributed to produce often failing to meet processor quality specifications as well as rainfall dependence and the irregular supply of primary products that results from it.[24]

Marketing and Final Consumption

In looking at end-markets, it is estimated that most horticulture products (up to 90%) produced in Tanzania are sold domestically, with the rest being sold in regional

22 United Republic of Tanzania (2017).

23 The Lab (2016)

24 It appears that, to date, efforts to support development of processing into derived products has mostly been geared towards addressing oversupply without much thought put into the market dynamics at play.

export markets[25] such as Kenya and a small amount going to international markets, for instance, in Europe. In the domestic market, most end-buyers are individual consumers but there are also a number of bulk-buying institutional consumers such as hotels, restaurants, schools, government departments, hospitals, etc.).

With regards to the size of retail outlets, supermarket sales remain mainly used by tourists and financially better-off people[26] while the bulk of produce is cleared through vegetable vendors or rural and urban retail markets. Here, there is notable involvement of women, who represent the majority of hawkers and a substantial proportion of kiosk owners and market retailers.[27]

It appears that the small size of higher-value horticulture market segments in Tanzania ultimately comes down to purchasing power and willingness to pay. Indeed, while vegetable spend is only second to bread and cereals in the average Tanzanian consumer's food basket, it is still extremely sensitive to price fluctuations. In effect, beyond a small minority, most consumers neither have the means nor the inclination to pay attention to anything more than basic quality concerns, let alone food safety issues that may arise from inadequate farming practices, such as the presence of pesticide residue on fresh vegetables as a result of harvesting before the recommended pesticide withdrawal period. Consumer awareness with respect to food safety and environmental sustainability concerns, after all, remain minimal while those with an interest in higher quality, such as restaurants and hotels, typically turn to imports, which are more reliable, easily accessible and even potentially cheaper.[28]

1.2 Climate Change and Environmental Sustainability

The mounting pressures exerted by climate change and environmental degradation have far-reaching consequences for agricultural livelihoods, which are highly dependent on natural resources and ecosystem services.

Climate change induced weather variability and greater prevalence of drought and flooding are expected to

25 The Lab (2016)

26 Ibid.

27 König et al (2008).

28 The Lab (2016)

further disrupt farmers' operations. Estimates indicate that an expected 15% reduction in rainfall could cause a 16% decrease in yields by 2030.[29] Inefficient irrigation and water management are further expected to put pressure on already stretched freshwater resources (the agriculture sector alone being responsible for over 80% of the country's total freshwater withdrawal despite the majority of farming being rainfed).

Soil health is also emerging as central to sustainable livelihood generation for farmers, with unsustainable farming practices such as monocropping or overuse of chemical fertiliser depleting the soil of essential nutrients, destroying valuable soil microorganism populations, and often leading to loss of valuable top soil, the last of which is further compounded by increasing prevalence of drought and flooding. Overall, this is increasing farmers' dependence on soil conditioners and their already problematic vulnerability to erratic rainfall given lower soil-water retention capacity.

Other less direct environmental impacts are being felt and enacted by the sector. For instance, climate change is causing increases to the prevalence of pests and diseases, which is leading to many farmers suffering high crop losses and an increasing number turning to chemical-based pesticides. This, in turn, is adversely affecting the natural environment and human health, especially that of farmers, who often use these products without any protective equipment or proper training.

2. Market System Constraints

As suggested in both sub-sections above, there is significant room for sector growth and generation of more and better jobs and incomes in horticulture, especially via increased on-farm productivity, increased value addition (e.g. through processing or produce quality improvements), minimisation of post-harvest losses, or increased environmental sustainability and resilience against climate change. There are however various systemic constraints to the advancement of these positive developments such as inadequate access to and use of inputs and appropriate technology, human capital deficits, and inhibitory rules and regulations including gender norms. Here, we delve deeper into some of these constraints and consider why the market is not already addressing them.

2.1 Technology

Modern agricultural technology remains largely absent from the Tanzanian horticulture sector. Moreover, apart from in certain mountainous areas such as Mbeya and the Kilimanjaro region as well as around Dar es Salaam, access to irrigation is still extremely limited (often below 1%),[30] which is inhibiting farmers' ability to generate multiple crop cycles and, in turn, limiting general productivity levels.

29 Drakenberg et al (2016).

30 United Republic of Tanzania (2017).

With water scarcity only likely to become more pronounced due to climate change, the potential scalability of currently dominant forms of irrigation – namely, gravity and bucket irrigation,[31] which are inherently resource inefficient and labour intensive – appears to be limited. Here, drip irrigation bears great potential for high water-use efficiency. However, the large (generally upfront) capital expenses it requires prohibit adoption for most farmers given their weak access to adapted financial services and limited business culture (rendering them unlikely to even simply reach out to financial service providers).

Beyond the farm gate, inadequate storage and packing technology solutions are leading to high post-harvest crop losses. Certain producer groups have access to charcoal coolers. Otherwise, however, there is a widespread lack of cold-chain facilities but also even of more basic post-harvest handling and packaging technologies. Many farmers are unaware of the potential benefits these technologies represent, and very few local businesses are active in the agricultural packaging materials business.[32]

31 Ibid.

32 The Lab (2016)

2.2 Agricultural Inputs

Supply of agricultural inputs such as fertiliser, seedlings and crop-protection products is overwhelmingly a private sector function, with a mix of multinationals and Tanzanian companies selling their products to regional distributors who then sell them on to agro-dealers before they make their way into farmers' hands. Inputs are sometimes procured for farmers by downstream intermediary actors, for instance by cooperatives purchasing on behalf of member farmers or by off-takers operating under contract farming modalities (notably in the case of produce destined for export).

Overall use of inputs has been increasing in recent years. However, it remains rather low, especially in non-urban areas, which are typically underserved by the market. Most input companies lack the business models necessary to provide customized supply targeting smallholder farmers' needs and to reach those that are remotely located. Furthermore, where available, products are often expensive and of low quality, in some cases due to adulteration or the fact that they are counterfeit.[33]

Most agricultural inputs on the market are non-organic. There is nevertheless a small number of organic input suppliers, notably of crop protection products.[34] Moreover, many farmers use manure or plant waste as fertiliser albeit often improperly, leading to slim productivity enhancements but also potential food safety hazards as a result of inadequate decomposition.

33 Ibid.

34 For instance, an international supplier of organic crop-protection chemicals, the Kenyan Dudutech, was identified, which has technical representatives in Kenya, South Africa, Tanzania, Uganda and Zambia. For more information, see www.dudutech.com.

2.3 Agricultural Knowledge and Skills

Agricultural knowledge and skills are generally deficient in a number of major issue areas including food safety, safe use and disposal of agrochemicals, packaging and storage of fresh vegetables, water management, and several aspects of sustainable agriculture practices. Despite increasing demand, the depth, quality and reach of public extension services and private embedded services provided by certain agro-input dealers and off-takers remain limited, especially outside of peri-urban areas.

Inadequate use of inputs appears to be a major point of concern, jeopardising both human health and long-term productivity potential. Farmers for instance often unknowingly undertake practices such as mixing of different pesticides and overdosing,[35] which can contribute to resistance among pests in addition to inherently depleting beneficial insect and soil microbe populations fundamental to healthy soil-nutrient cycles and overall plant health. Furthermore, considering that those with no training on safe use of agrochemicals have a significantly (up to 100 times) higher risk of exposure than those with training,[36] it is clear that there is an urgent need to sensitise farmers on the potentially harmful effects of agrochemicals and to improve skills relative to proper handling and disposal. In crafting interventions within this space, particular attention should also be paid to farmer literacy levels and their ability to follow prescribed guidelines. Low education levels and language barriers (e.g. English rather than Swahili labelling) have been found to be negatively correlated with proper handling and access to training.[37]

Knowledge regarding soil health and biodiversity importance for farming as well as skills relative to the application of inherently resilient and environmentally-friendly horticulture production systems such as organic production or agro-forestry seem to be lacking. One area that appears to be ahead of others is integrated pest management (IPM),[38] with many Tanzanian-adapted IPM packages having already been developed and adopted by smallholder farmers in the country.[39]

2.4 Rules and Regulations

There are a number of Tanzanian laws that have been enshrined into law over the years regulating food safety as well as occupational safety and health hazards such as pesticides.[40] Unfortunately, many of these positive policy developments remain underenforced given weak control measures and the informal nature of most of the sector, which for instance renders registration of pesticide use, and even tracing to point of origin, potentially very difficult.

35 Kariathi et al (2017).

36 Ibid.

37 Ibid.

38 IPM is an effective, environmentally sound approach to pest management that utilises farmers' traditional agricultural knowledge and experience of insect behaviour and life cycles in a given agro-ecosystem. For more information on IPM and its potential, see Roitberg (2017) or Kabir & Rainis (2015).

39 Mwatawala (2004).

40 There is, for instance, the *Tropical Pesticides Research Institute Act* of 1979, the *Pesticides Control Regulations* of 1984 and the *Occupational Health and Safety Act* of 2003.

As a result of prevailing social norms and institutional constraints, gender appears to be a key determinant of on-farm productivity[41] and access to improved economic empowerment opportunities in the horticulture sector more generally. For instance, unpaid care and household responsibilities[42] traditionally imputed to women in effect monopolise many women's time and exert a significant burden on the financial resources at their disposal. Beyond the mere constraint this poses to their ability to re-invest their own resources as they see fit, the day-to-day cash requirements associated with the accomplishment of these responsibilities also leads many women to undertake petty-waged labour or trading, preventing them from accessing otherwise more productive job opportunities. Women's agency is even further constricted by norms assigning control over household assets to male household heads and, in some cases, gender-based violence by husbands seeking control over their wives' assets. In addition, norms on travelling away from home hinder women's freedom of movement, essentially reducing the range and number of employment and business opportunities[43] available to them.

On the farming side specifically, limited independent control of farming land and formal land ownership constitute key additional barriers to women's economic empowerment. In effect, while women form the majority of horticulture farmers, the majority of land is in fact owned by their husbands who assign them their land. Land ownership rights and allocation fall under customary law and, hence, the authority of village councils. Guided by traditional values, most of these councils allocate land to heads of households, which in most cases are men.[44]

41 UN Women, UNDP & UNEP (2018; 2019).

42 Unpaid care might for instance refer to the care provided to children or the elderly in the household while household responsibilities might include household maintenance, cooking, cleaning, water and energy collection or even unpaid farm-labour on plots of land managed by one's husband. For more information on unpaid care and the potential of child care to help address this constraint from an MSD perspective, see The Lab (2020).

43 For instance, market linkage arrangements involving women are, as a result, often heavily localised.

44 Mmasa (2013).

3. Opportunity

Based on this analysis of the horticulture market system, we now turn to the identification of opportunities for intervention. First, we present certain cross-cutting strategic considerations likely to be relevant no matter the specific scope chosen (sub-section 3.1). Second, we consider the specific intervention areas with high potential to advance inclusive green growth and climate resilience in Tanzania's horticulture sector (sub-section 3.2).

3.1 Strategic Recommendations

The most plentiful and evident opportunities for sector growth and associated decent work advancement appear to hinge on improvements at the production level. Here, there is scope for productivity and quality improvements to bring about significant increases in income for farmers and, eventually, also to open up higher-value markets associated with additional employment opportunities, for instance, in higher value-added agro-processing industries. Most farmers, however, appear to be stuck in vicious cycles of low yields, low income and low re-investment with little change in sight considering their generally weak access to finance and weak linkages with upstream and downstream market actors who might otherwise stimulate farmer upgrading.

- Strengthening these linkages through contract farming arrangements such as outgrower schemes (which remain relatively rare) presents an opportunity to enable improved access to crucial support services (e.g. fertiliser and training) and improve market access (notably by ensuring fair prices), which is also a key constraint currently disincentivising farmer investment.

Farmer income increases (and improvements with regard to food safety) could come at the hands of enhanced environmental sustainability, which would also result in significant improvements to farmer occupational safety and health. However, while buy-in among farmers relative to certain elements of "climate smart" agriculture[45] is high

45 Climate-smart agriculture is an approach to develop agricultural strategies that helps guiding actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. The aim of climate-smart agriculture is to tackle three main objectives: sustainably increasing agricultural productivity and incomes; adapting and building resilience to climate change; and, where possible, reducing and/or removing GHG emissions (FAO, 2019).

(notably decreasing farmer rainwater dependence),[46] most remain unaware or even sceptical of the productivity and resiliency enhancements associated with environmentally friendly inputs and practices. Moreover, demand for sustainably sourced local horticulture products remains weak.

- Considering the relatively nascent nature of Tanzanian sustainable produce markets, it is likely that dissemination of associated practices and inputs will first have to follow a cost-saving or yield-increasing rationale before it bears the potential for price premiums.
- Interventions raising awareness among farmers to the benefits of adopting greener practices and inputs should play an important role in stimulating buy-in and adoption. Additional awareness raising interventions among consumers relative to the environmentally harmful effects and potential food safety risks of chemical pesticides and fertilisers might also be considered as a means to increase end market demand for greener products.

In any case, the presence of significant gender-specific constraints notably inhibiting agricultural productivity levels suggests that proactive efforts are warranted to ensure women have access to, and are part of shaping, solutions developed.

- In order to overcome constraints faced by women in accessing support services, specific efforts to ensure inclusiveness and equity may include the strengthening of women's farmers groups in their role of improving access to inputs, credit and technology to their members.
- In order to ensure equitable and inclusive access to knowledge resources and training opportunities, gender considerations need to be taken into account, for example in designing scheduling and training delivery modalities as to facilitate women participation.

3.2 Proposed Intervention Areas

There are four major intervention areas with potential to advance inclusive green growth and climate resilience in Tanzania's horticulture sector namely access to irrigation technology, sustainable farming skills development, access to agricultural inputs, and improved post-harvest handling. As suggested below, while these intervention areas could be pursued independently, there are significant potential synergies that exist between them, indicating that an intervention strategy combining elements from each would be best suited to achieve environmental objectives.

A. Improving access to efficient irrigation technology

Improving access to mechanised irrigation technologies bears the potential to increase farmer profits by enabling increased and more stable production levels as well as potential cost-savings on labour.[47] Considering the current high prices, interventions might, for instance, support drip-irrigation technology providers to attach 'pay as you go' financing solutions to their products, as is the case for various small "pico solar" photovoltaic systems in Tanzania.[48] Here, interventions could also look to promote complementary renewable energy powered solutions such as solar powered water pumps, as well as complementary farming practices (see point B. below). Lastly, the potential of low-tech solutions for rainwater harvesting and conservation could be explored and possibly included both as a means to preserve long-term freshwater resource stocks and facilitate improved access beyond merely the most financially endowed.

B. Improving dissemination of environmentally friendly / resilient farming practices

Given low awareness and uptake, there is also great scope to disseminate skills relative to more resilient and environmentally-friendly practices, which bear the potential to help secure long-term farmer livelihoods as well as increase yields (and hence incomes) as a result of both increased productivity and diminished vulnerability to climate shocks. Here, interventions might look to partner with government and producer groups to develop public and private training solutions facilitating the spread of relatively simple and affordable practices such as intercropping, no-till agriculture, on-farm fertiliser production (e.g. of compost) or mulching. More advanced practices such as agro-forestry, might be considered for introduction as well potentially via embedded services provided by tree seedling producers. Irrigation technology providers might also have an incentive to promote complementary adoption of practices which can significantly improve soil water retention and hence increase the effectiveness of irrigation equipment (if applied properly) such as agro-forestry or mulching. In any case, it is also worthwhile to explore the potential for a role of embedded information services in promoting some of these practices.

46 Decreasing farmer rainwater dependence and vulnerability against climate-related shocks more generally is also a key priority of the Tanzanian government as outlined in its Intended Nationally Determined Contributions (INDCs) (United Republic of Tanzania, 2015).

47 If this intervention area is taken up, the overall effects of dissemination of irrigation technologies on hired labour is an area that should be further investigated. Such a development might, for instance, also lead to increased demand for labour overall considering greater production levels, especially during the off-season.

48 KPMG (2015).

C. Increasing uptake of organic inputs and environmentally friendly crop protection products

Another opportunity to advance green growth in the sector is via increased uptake of organic inputs and environmentally-friendly crop protection products (e.g. protective nets[49]), which bear the potential to increase incomes through yield increases,[50] especially in the long-run considering positive impact on soil health and biodiversity. This also holds potential to diminish exposure of farmers and surrounding populations to the potentially hazardous chemicals contained in non-organic alternatives. Here, interventions should be geared towards increasing recognition of the value of organic products, for instance, via support to leading local organic input suppliers to gather and disseminate evidence on their effectiveness (e.g. through demonstration plots), or to develop uptake-facilitating business models (e.g. outgrower schemes). Once a certain degree of uptake has been achieved, interventions might look towards leveraging attained environmental friendliness to facilitate entry into higher-value markets (for instance, increasing local sourcing by hotels and restaurants). Such an opportunity, however, will also require quality improvements, the establishment of direct trade relationships with farmers and even potentially partnerships with packaging and/or processing companies to provide solutions geared towards preserving produce freshness (see point D. below).

D. Improving Post-Harvest Handling

Lastly, an opportunity for green sector growth is that of improving post-harvest handling through technology and skills. This could significantly decrease the current high food waste levels as well as help to preserve produce freshness, and decrease food safety risks, both of which are essential to opening up higher-value markets. Interventions could consider working with leading packaging and storage solution providers and pilot business models aimed towards improving their visibility/branding, considering that many market actors along the value chain are still simply unaware of the existence and value of these products. However, while improved post-harvest handling would stimulate sector growth, in exploring interventions in this field, further analysis would be needed to understand who would benefit most from this and to what extent: farmers might for instance lose out as a result of increased supply reducing prices but benefit as a result of increased ability to wait out supply spikes.

49 Tanzanian Horticulture Association (2016b).

50 For farmers already using non-organic inputs, in the short-run at least, switching to organic might equate to decreasing yields. However, considering low levels of knowledge among farmers on how to use inputs, it is also possible that organic inputs such as compost, which include all necessary plant nutrients and operate on a slow release basis, might deliver better yields than non-organic fertilisers for which misuse can seriously diminish effectiveness (e.g. farmers applying too much or at the wrong time; farmers using the wrong type of fertiliser).

Conclusion and Lessons Learned

As demonstrated by the findings of the market systems analysis, there are a number of entry points to promote jobs and incomes in Tanzania's horticulture sector while enhancing its sustainability and resilience. Most of these opportunities are situated at the production level and relate to farming practices and agricultural inputs. However, there is also significant scope to reduce food waste through improved storage and transport, and potential to introduce renewable energy solutions in accompanying sector mechanisation, which remains extremely low.

In terms of the wider lessons that can be drawn from this experience, it appears crucial to adopt a systemic perspective to adequately identify opportunities to stimulate inclusive green sector growth. Here, projects must consider economic activities all along the value chain and how their respective material and energy inputs could be decreased or substituted for greener alternatives, and the pollution and waste they generate decreased or re-purposed as inputs for other activities and industries (for instance, agricultural waste used as fertiliser).

In determining the respective potential of different entry points, it is important to identify and evaluate the economic drivers that might underpin targeted practice changes. In Tanzania, for instance, demand for organic produce remains extremely weak, which is unlikely to change significantly in the immediate future. As such, in order to strengthen farmer incentives, demonstrating clear productivity gains or cost-savings linked to the adoption of more sustainable practices and inputs appears to be essential to their dissemination beyond a niche.

Lastly, no matter the focus of the intervention, it is clear that widespread and sustained efforts by a variety of support actors, farmers and others along the horticulture value chain are needed in order for green practices to take root and spread in the market. As such, following MSD principles, designing and leading interventions that strengthen linkages among these different actors, that sustainably build local capacity and incentives to identify and take advantage of green and resilient growth opportunities, and that have potential to be brought to scale are all vital to the sector's transformation.

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Website: www.ilo.org/thelab
Email: thelab@ilo.org
Twitter: @ILOTheLab

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