Leveraging Urbanization for Inclusive Development in Malawi

Anchoring the secondary city development of Salima and Chipoka in a modernizing fruit value chain

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EXTENDED ABSTRACT

Agricultural development in Malawi faces an important conundrum. While agriculture is the backbone of the economy, many smallholders will not be able to farm their way out of poverty. Shrinking farmland size severely limits the total income that can be earned from farming, even at much higher levels of productivity per area farmed than are now achieved. Urbanization embedded in the modernization of locally relevant value chains provides a promising pathway to inclusive development as it serves to simultaneously raise farm incomes, create income-earning opportunities off the farm, and create specialized urban hubs that can boost urban economic growth through agglomeration economies.

After laying out these concepts conceptually, we apply them to a specific example of a modernizing mango value chain in Salima/Chipoka. Salima and Chipoka form an urban cluster about 100 km from the capital Lilongwe, located on the lakeshore of Lake Malawi. The Malawi Secondary Cities Plan has identified this cluster as one of eight that are to form an interconnected network of secondary cities, geographically spread across the country, with productive activities in each anchored in the economy of their rural hinterlands.

Our approach is market-led, so we first establish that there is indeed growing market demand for mangoes globally and that Malawi has a suitable climate and agroecology to produce mangoes competitively. We then show how, through the development of a modern value chain that exports dried and fresh mangoes, farmers can access that market profitably. Compared to the traditional local market for mangoes, such a modern value chain is spatially long, focused on product differentiation, and realizes significantly higher value addition.

After establishing the business case for the modern mango value chain, we ask whether there is also a development case to be made for it. We conclude that this development case is strong because the modern value chain creates three important effects. First, it increases the total value added to the local economy and therefore income generated. Second, around 60 percent of total value added is paid out as wages to people working off their own farm equivalent to 522 full-time jobs, while simultaneously raising farm income. Third, the spatial concentration of the mango value chain in the Salima/Chipoka cluster creates entrepreneurial opportunities to provide specialized goods and services to the entire fruit value chain well beyond production alone. One vision for the future of Salima/Chipoka could be as a hub for horticulture, with an eco-system of forward and backward linkages, and an increasingly specialized workforce catering to a modernizing horticultural value chain.

We then look toward the future and model existing growth in the modern mango value chain, as well as three scenarios to accelerate it. In the first one, the Government of Malawi negotiates a lower tariff for mango exports to India. A second one considers an investment to establish more integrated medium-scale commercial farmers that results in a 200-hectare expansion in area planted to mango. The third one implements a targeted extension program to improve the yields of existing mango farmers.

This report and its recommendations are not intended to be prescriptive, nor are the usefulness of its findings limited to mangoes in Salima/Chipoka. The location and value chain were chosen to highlight the potential of anchoring secondary city development in a modernizing agricultural value chain to create jobs off the farm in a country that desperately needs them.

INTRODUCTION

In Malawi, as in much of Sub-Saharan Africa, urbanization is one of the most significant demographic shifts currently underway. There are both opportunities and challenges associated with an increasing proportion of the fast-growing population living in urban areas. Among the opportunities are prospects for urban areas becoming growth poles, with agglomeration economies spurring urban productivity. A variety of urban-rural linkages can spread the benefits of urban growth more widely into the rural economy. Urban areas create demand for food grown in rural areas; they can be places where rural dwellers access goods, services, and information; and they can present off-farm job opportunities, providing complementary or alternative livelihood strategies for low-productivity smallholder farming. At the same time, growing urban areas can present significant challenges, among which are crime, unemployment, pollution, and congestion.

In the Malawi 2063 development vision statement for the country, urbanization is identified as one of the three pillars on which the nation will build to achieve its development aspirations (NPC 2020). This is timely because Malawi is currently one of the least urbanized countries in the world and, although it is urbanizing at a rapid pace, there is still room to steer the urbanization process to ensure that it aligns with the primary goal of the Malawi 2063 vision of inclusive wealth creation. The stakes are high, because choices made now will lock the country into an urbanization pathway for decades to come.

One of the most farsighted parts of the Malawi 2063 vision lays out plans to transform eight current urban centers into an interconnected network of secondary cities.[1] These cities are spread along the country's north-south axis to ensure an equitable geographical distribution of the benefits of urbanization. Economic activities of each urban center are to be anchored in the local economy of the surrounding areas, such as value addition for cities that lie in areas with high agricultural potential, fisheries for those by the lake, and hubs for cross-border trade for those connected to borders, whether by land or lake.

However, there is currently a dearth of more in-depth research and understanding on which policies and investments are needed to set such a process in motion. This is problematic, because when these opportunities are poorly understood, they risk being poorly managed, which could be one of the biggest lost opportunities for achieving Malawi's development goals. Mapping, understanding, and planning for urbanization is key for building effective institutional and policy frameworks to guarantee that these urbanization processes are advantageous for the economy and the society, particularly through contributing to inclusive wealth creation that benefits large numbers of both rural and urban dwellers.

In this report, we combine the latest insights in value chain analytics and rural-urban dynamics to explore how agri-food systems can be developed to spur sustainable economic growth in both urban and rural areas. We start by discussing these ideas more broadly, discussing research on the interlinked roles of agriculture, value chains, and secondary cities in a country's development pathway. We then discuss these ideas more concretely through the lens of the fruit value chain in and around the urban cluster of Salima/Chipoka. In our market-led analysis, we aim to identify policies and investments that are needed to unlock improved

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[1] From north to south, these are Karonga, Nkhata Bay, Kasungu, the Salima and Chipoka cluster, the Mangochi and Monkey Bay cluster, Liwonde, Luchenza, and Bangula.

profitability, inclusivity, efficiency, and, therefore, growth from this value chain within Salima/Chipoka and its hinterland. By doing so, we aim to make a concrete proposal to advance the operationalization of the third pillar on urbanization of the first 10-year implementation plan (MIP-1) under the Malawi 2063 vision and to inform on the investments and policies needed to unlock economic growth in a specific secondary city and its rural catchment area.

THE ROLE OF AGRICULTURE IN DEVELOPMENT

The Malawi Secondary Cities Plan (MSCP) sets out to coordinate cross-sectoral planning for managing urbanization across Malawi toward the implementation of the Malawi 2063 development vision (GoM 2022). MSCP identified eight catalytic locations for strategic investments meant to create vibrant secondary cities. The need to plan for more urban areas is grounded in projections that Malawi's population is expected to double in the next 25 years and to reach 45 million by 2063 and the unlikely prospect that a large share of these future Malawians will be able to thrive through primary agricultural activities alone.

Most farming households in Malawi already farm areas of land that are too small for them to generate sufficient income to meet their basic needs, a situation that will only worsen under continuing high levels of population growth (Benson and De Weerdt 2023). This calls for a three-pronged approach in which:

- A smaller group of emerging commercial farmers are empowered to prosper through more productive farming on larger pieces of land.
- Rising incomes from agriculture create demand for local goods and services, invigorating the local non-farm economy and offering employment opportunities off the farm.
- As the country urbanizes, the engine of economic growth will shift from the rural to the urban areas. Urban areas will attract businesses catering to both downstream and upstream segments of agricultural value chains.

In a landmark paper published in the American Economic Review in 1961, Bruce Johnston and John Mellor stress the importance of the agricultural sector in facilitating economic development. They highlight five inter-sectoral linkages and proposed that a "balanced growth" strategy is needed to simultaneously promote agriculture and industrial development since agricultural development often precedes economic growth in other sectors. These linkages include the supply of surplus labor from agriculture to the industrial sector, the supply of food from agriculture for domestic consumption, agricultural utilization of industrial output, the supply of savings out of agriculture for industrial investment, and the supply of foreign exchange from agricultural export earnings to finance imports of intermediate and capital goods (Johnston and Mellor 1961).

In a review paper, Dercon and Gollin (2014) start with the original Johnston and Mellor contribution and discuss what has happened in the 50-odd years since its publication. After discussing the various theoretical and empirical strands of the literature, they cautiously conclude that the bulk of the evidence suggests that broad-based growth in agriculture does indeed have a larger poverty reduction effect than growth in other sectors. But, so their argument continues, the strength of the relationship between agricultural growth and poverty reduction is not the only consideration for policymakers. Equally important is the question of whether such growth is achievable, what public resources are needed to make it happen, and what the alternative uses are of those same resources (Dercon and Gollin 2014).

To bring this reasoning back to the Malawian context, if all Malawian farmers could be lifted out of poverty simply by farming more productively and commercially, then an approach that primarily aims to bring about these productivity gains could hope to deliver inclusive growth. As demonstrated by Benson and De Weerdt (2023), most Malawian smallholders, even if they could farm at substantially higher productivity levels, would not achieve sufficient income gains through farming alone to move out of poverty. The amount of land at their disposal for farming is the most important constraint preventing this from happening. It follows then, that if the country aspires to lift everyone out of poverty, then that will necessarily coincide with many people leaving agriculture.

There are at least two development pathways that offer such opportunities off the farm. The first pathway is rooted in the literature on the linkages between the rural farm and nonfarm sectors, reviewed and detailed in Haggblade, Hazell, and Reardon (2007) and Mellor (2017). In this model, once a sufficiently large group of farmers is able to engage in lucrative, commercial farming—which in Malawi will likely include a transition to farming larger plots of land—their incomes increase. Some of that income will be spent locally on goods and services their neighbors can provide. The production of these goods and services will typically be labor-intensive and require little capital, and they are unlikely to be easily sourced from outside the community. This will provide local job opportunities off the farm in carpentry, building, transport, local beer brewing, catering, bicycle repair services, and the like.

Modernizing value chains can catalyze such a process by simultaneously raising farmer incomes and expanding the off-farm sector. Reardon et al. (2022) contrast the structure and conduct of traditional, transitional, and modern value chains. Traditional value chains are spatially short, have little quality differentiation, limited value addition, and link to farmers through spot markets. A modern value chain is spatially long, differentiates by quality, imposes standards, and tends to offer more reliable and structured markets to farmers through, for example, contract farming or auction floors. Such modern value chains have significantly more development potential compared to traditional ones, because they add more value in all segments of the value chain. Importantly, as a value chain modernizes, the share of value added that is produced in its post-harvest segments goes up significantly. This has the potential to initiate the virtuous cycle of higher rural commercial farming incomes driving an expanding off-farm sector, as described in the paragraph above.

A second set of opportunities off the farm will be related to urbanization. As countries develop, an increasingly larger share of their population will start living in urban areas, and the primary engine of economic growth shifts from the rural to the urban sectors in the economy. Agglomeration economies make urban areas more attractive locations for companies, compared to rural areas. In economies growing from a deeply agricultural base, these companies will, at least in the initial phases, include many that cater to the downstream and upstream segments of the country's agricultural value chains. Government policies and investments can determine, to some extent, how this urbanization takes place. For example, investments can be concentrated in a small number of larger cities to boost efficiency-enhancing agglomeration effects there, while investing in reducing congestion costs. Another strategy is to spread investments into developing a larger number of smaller towns and cities. The strategic decision of the Government of Malawi, as evidenced in the Malawi 2063 vision and through the Malawi Secondary Cities Plan, is to ensure an equitable geographical distribution of urban areas through the establishment of a network of eight secondary cities, which will

become a core part of the national urban fabric, alongside the four existing cities of Lilongwe, Blantyre, Mzuzu, and Zomba. As will be discussed next, this is a defensible position.

THE ROLE OF SECONDARY CITIES IN DEVELOPMENT

Conceptual perspectives

Concentrating investments in mega-cities could offer economies of scale and scope. A large concentration of people and firms in a single location can boost productivity. Duranton and Puga (2004) distinguish three mechanisms through which this happens. First, larger agglomerations allow their inhabitants to share indivisible facilities, like a sports stadium, a swimming pool, or high-quality educational and medical facilities. A smaller urban location may not have the population size to be able to afford this. Second, a larger pool of people and firms will improve matching between employers and employees, but also between buyers and suppliers and between entrepreneurs and financiers. Third, people who live in close proximity are more likely to learn from each other; and as workers switch between employers, skills and knowledge are diffused more widely, further boosting learning and growth.

Increased concentration of firms and workers allows companies to access a wider pool of specialized skills, services, and goods. By co-locating in proximity, companies can establish strong upstream and downstream business linkages, engage in mutually beneficial relationships, and exploit economies of scale. This allows for the development of more intricate value chains, consisting of specialized actors along them. Specialized geographical hubs concentrating on specific economic sectors can foster such agglomeration economies and play a pivotal role in shaping and nurturing robust value chains. Some of the most well-known examples are Wall Street as a financial hub, Hollywood as a hub for film, and Bengaluru (Bangalore) as a hub for software and IT development. Closer to home, and of more immediate relevance to Salima/Chipoka, we will refer to the example of Paarl in South Africa as a secondary city serving as a hub for its surrounding horticultural sector.

This 'magic of agglomeration', through which companies and people become more productive through close proximity can be tempered by congestion costs, however. As cities become denser, housing prices rise, commuting times increase, and problems like noise, pollution, and crime can worsen. A city's ability to reduce such costs related to congestion, while at the same time fostering agglomeration economies, will determine its economic success.

Perhaps the most important downside to concentrating investments in cities is the implied geographical concentration of these investments. A more equitable spatial distribution of urbanization across a larger number of smaller secondary cities has the advantage of bringing urban areas closer to the rural population. Cattaneo, Nelson, and McMeony (2021) show how in low-income countries, 43 percent of the rural population lives within one hour travel time of a town with a population of 250,000 people or less, while only 7 percent live that distance from a city of over one million people. Africa's cities tend on average to be far from where the poor live, and that distance impedes any efforts seeking to positively affect the lives of the poor (De Weerdt, Christiaensen, and Kanbur 2021).

It is therefore theoretically ambiguous whether the growth of cities matters more for poverty reduction than the growth of towns. The empirical evidence, however, tends to come down in

favor of small-town growth. Dorosh and Thurlow (2013) develop an economy-wide model of Ethiopia and find stronger linkages between small towns and agricultural production in rural areas, compared to cities. They show that investments enhancing the synergetic relationship between small towns and rural agriculture can lead to a more inclusive growth path. Gibson et al. (2016) measure urban growth in Indian cities and towns over two decades and conclude that at India's stage of development secondary town growth is more beneficial to poverty reduction than big city growth. The authors note, though, that at later more advanced stages of development cities may overtake towns as drivers of inclusive development.

The research literature has made progress in uncovering some of the channels through which these positive effects of urbanization on rural poverty take place. A primary channel is through increased demand for food (Cali and Menon 2013). With increased income and opportunity costs of time, food demand patterns change. Preferences will shift to more diverse foods of higher quality with improved packaging and with a higher degree of processing to save on preparation time—a shift that brings with it significant business and employment opportunities if the food value chain can modernize in response (Cockx et al. 2018; Gollin and Goyal 2017).

A second and related channel is through the effect of urban centers on the modernization of value chains. Urban proximity plays a key role in transitioning traditional value chains into modern ones (Reardon, Liverpool-Tasie and Minten 2022). In Ethiopia, Vandercasteelen et al. (2021) find that each additional hour of travel time to an urban center reduces dairy farmers' milk productivity by almost 1.0 liter per cow per day, a reduction of 26 percent. This effect is explained through urban proximity, which allows farmers to partake in modern value chains and provides access to commercial milk buyers and milk processing companies. In Ethiopia, teff is the key ingredient for the nation's staple food, injera. The profitability of teff production and associated productivity levels of land and labor are strongly related to urban proximity (Vandercasteelen et al., 2018).

A third channel is through the labor market. In research on Malawi, Van Cappellen and De Weerdt (2023) investigate empirically what happens in surrounding rural areas when urban areas grow. They show that in a local context of significant rural underemployment, nearby urban growth has important effects on people's ability to supply more hours of work. However, this mainly happens through an increase in the hours worked as casual (*ganyu*) laborers at the expense of work on the family farm.

A fourth channel is migration. In Tanzania, more permanent moves away from rural farming in favor of more lucrative urban livelihoods were much more likely to involve moves to smaller, close-by secondary towns than to the largest cities (Ingelaere et al. 2016).

The proximity of small towns and secondary cities to the rural poor should make them attractive vehicles for policymakers interested in promoting broad-based development. According to Diao et al. (2023), several policy areas should be promoted to enhance small commercial and transitional farmers' competitiveness to be able to pursue market opportunities.

- Invest in infrastructure, such as roads connecting secondary and tertiary cities. This can contribute to economic agglomeration and a critical mass of services that support agricultural value chains, which will reduce transaction costs.
- Promote education and training programs that target rural youth to develop the kind of skills that modern agriculture demands.

- Facilitate farmer groups to collectively supply emerging agricultural market opportunities in urban markets.
- Cut unnecessary red tape that inhibits and discourages the development of small and medium enterprises.
- Governments should also actively promote agriculture and rural non-farm employment synergies for rural development and agri-food system transformation.
- Identify engines for regional growth through consultations with the private sector.

Finally, Diao et al. (2023) advocate conducting value chain diagnostics to identify strategic interventions that are flexible in terms of the approaches used and which can be used with different mixes of partners across diverse rural areas. This last recommendation in part motivates the study here on mango value chains around Salima/Chipoka.

The Salima and Chipoka Secondary City

Salima and Chipoka form a cluster of two nearby, well-connected urban centers located on the central lakeshore plain on the western shore of Lake Malawi. This cluster was selected as a planned secondary city in part due to its good connectivity and wealth-generation prospects (Malawi Government, 2022). Chipoka is well connected with a convergence of three forms of transport—railway, road, and water—which presents an opportunity for inter-border trade through its connection with the Nacala and Beira corridors. The urban cluster benefits from its proximity to the capital city, Lilongwe, which is about 100km away along a decent tarmac road. This, in combination with its attractive lakeshore, makes it a popular destination for both local and international tourists.

Salima town is the headquarters of Salima district. The district consists of 2,142 square kilometers of land. It adjoins Nkhotakota district to the north and Dedza district to the south along the lakeshore. Salima district registered 478,346 inhabitants in the 2018 population census. The population of the district had grown at an annual rate of around 3.4 percent since the previous 2008 census (NSO 2021). Within the district, the residents of Salima and Chipoka make up the bulk of the non-rural population, which makes up 9 percent of the district's total population. The remaining 91 percent of the population is scattered throughout the eleven sub-district Traditional Authorities that make up the district. The left map presented in Figure 1 shows where people live in Salima district. Higher population densities are visible in the darker areas of the map, in which Salima town and Chipoka urban stand out. The ports, rail lines, and the road network are also depicted. The right map in Figure 1 shows in stippled green where maize production is concentrated in the district, while the brown shaded pixels show the relative density of cattle.

Figure 1: Map of Salima District showing urban areas and agricultural production
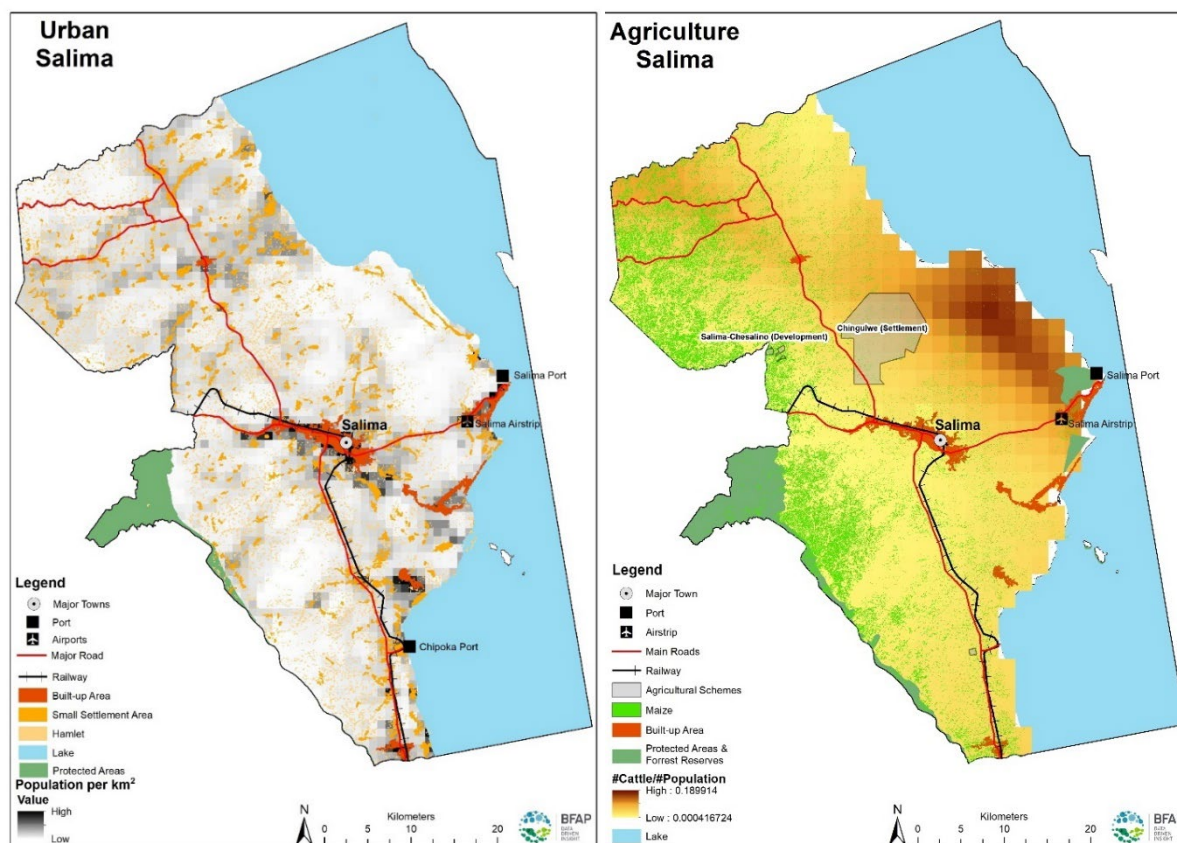
Source: Authors' compilation using various sources

Agriculture is the most important sector in Salima district both in terms of the share of the total population dependent on farming for their land-based rural livelihoods, but also by nature of the linkages with the urban areas of Salima and Chipoka towns (Figure 2). Around 94 percent of all rural households engage in farming activities and 70 percent of all employment opportunities come from agriculture.

Figure 2: Share of employment per sector in Salima District
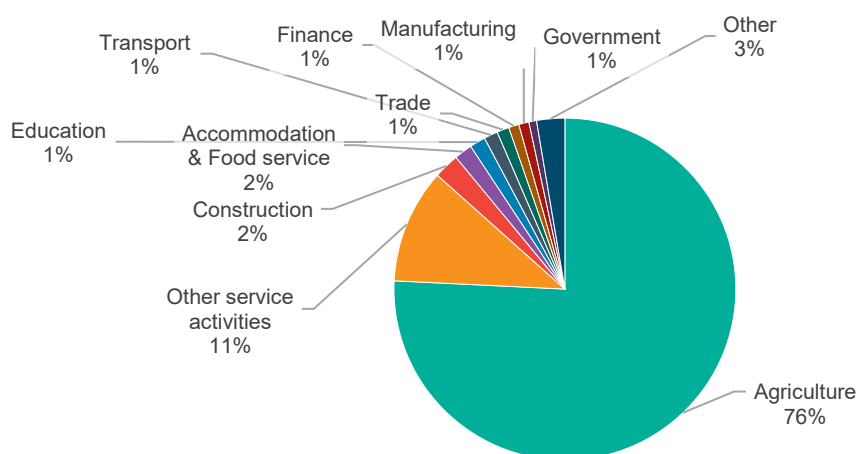
Source: GoM, 2021

The district is home to several estate farms active in agricultural value chains, including sugar, fruit production, maize, pulses, tobacco, and cotton (GoM 2023). A small proportion of the population in Salima district is engaged in the commercial or industrial sectors, doing so on a small and informal scale through activities such as maize milling, brickmaking, carpentry, and other services. Most such commercial and industrial activities are concentrated in the trading centers of Salima town, Senga Bay, and Chipoka.

In contrast to the development pathways underway in many Sub-Saharan African countries, the number of agricultural households in Salima district has been increasing, rather than decreasing, over time—from around 117,000 in 2018 to 131,000 in 2022 (GoM 2023). In terms of employment, 76 percent of all employed persons were reported to work in the agriculture, forestry, and fisheries sector. The only other sector with a share larger than ten percent of all workers was 'other service activities'. The small share of urban-based employment opportunities still largely reflects a district economy focused on rural economic activities, whether in the smallholder or commercial agricultural sectors. Of the 76 percent share of agricultural employment, the Salima District Council reports around 66 percent are engaged in smallholder farming activities, with the remainder employed on estates.

Though agriculture's importance to the district economy is well articulated in terms of the number of people that rely on it to generate livelihoods, the entire agricultural value chain can be considered largely traditional. It is spatially short with produce either consumed by households or traded locally in the region and very limited value addition takes place, except for some processing of sugar, maize, and selected fruits. There are very few intermediaries operating in the agricultural value chains in Salima district that transform and process agricultural outputs or that supply products and services, such as storage, transport, wholesaling, or retail, to farmers or consumers reliant upon those value chains.

Table 1: Land cover classes in Salima district

Class	Hectares	Share of land surface, %
Tree Cover	6,270	2.9
Shrubland	31,076	14.5
Grassland	83,796	39.1
Cropland	84,605	39.5
Built-up	3,033	1.4
Bare or sparse vegetation	3,477	1.6
Herbaceous wetland	1,969	0.9
Total Land surface	214,226	100.0
Permanent water bodies	121,274	-
Total Salima District	335,500	-

Area Planted in Hectares

Maize, Groundnuts, Rice, Soybeans, Sweetpotato, Cow Peas, Cassava, Drybeans, Cotton, Tobacco

Source: FAO, 2022

The current utilization of land in Salima district also points to it being in the traditional phase of value chain development. Crops are grown on an estimated 85,000 hectares (ha). Table 1 gives the breakdown of the land cover classes, which we combine with data from the Salima District Council to assess the kind of agricultural activities on the ground. Asides from the land allocated to the growing annual crops, another 84,000 ha is grassland utilized as grazing areas for animals, while currently, only 6,000 ha is under tree cover. Salima's cropland is

mainly dedicated to the production of maize (60 percent), groundnut (14 percent), and rice (6 percent). Most of these crops are farmed by smallholders for household consumption. Average yields for maize have been trending at around 1.9 mt/ha (metric ton per hectare) based on estimates generated by the Salima District Council, while the 2019/20 Integrated Household Survey's estimated average maize yield for the district was around 1.4 mt/ha. Estate yields are consistently higher than those of smallholders, although estates plant much smaller areas under grains. For example, in 2022, estates only planted 337 ha of maize, obtaining an average yield of 3.5 mt/ha. Although agricultural land currently under estates is around 12,000 ha, utilization of that land has been constrained due to several factors, including low prices for cotton and tobacco in recent years. Other estates have been more active in expanding existing production activities, as can be seen in the involvement of estates in mango production in the past decade. The total area under irrigation in Salima district is around 1,400 ha. However, the potential irrigable area is estimated at around 10,000 ha (GoM 2023).

The importance of agriculture to support rural livelihoods is well articulated within Salima's Socio-economic Profile (2023). The value of home consumption of various agricultural products accounts for the largest proportion of rural income, which includes both cash and non-cash income. Yet the available land per person is often too small to generate sufficient income or food to ensure broad food security for the farming household or to lift it out of poverty. Though Salima's poverty headcount rate is not that much different from the rest of Malawi, the continued impact of rural (and urban) population growth means that the average household landholding of 0.4 ha—and the even smallholder household average area planted under crops of 0.27 ha—is not sufficient to provide for household needs.

Using available land per capita, Figure 3 highlights an important consideration for the scope of this study. Under the status quo population growth scenario given in the MSCP, access to land will become over time significantly more constrained in Salima district than what is currently the case (GoM 2022). The average landholding per person in Salima declines to 0.2 ha by 2040 and to 0.1 ha by 2063. Furthermore, if current land under smallholder production remains at 85,000 ha, the actual average land available per person to farm crops is substantially lower at 0.08 ha in 2040 and 0.04 ha in 2063.

Figure 3: Salima District population and land per capita, trends with projections
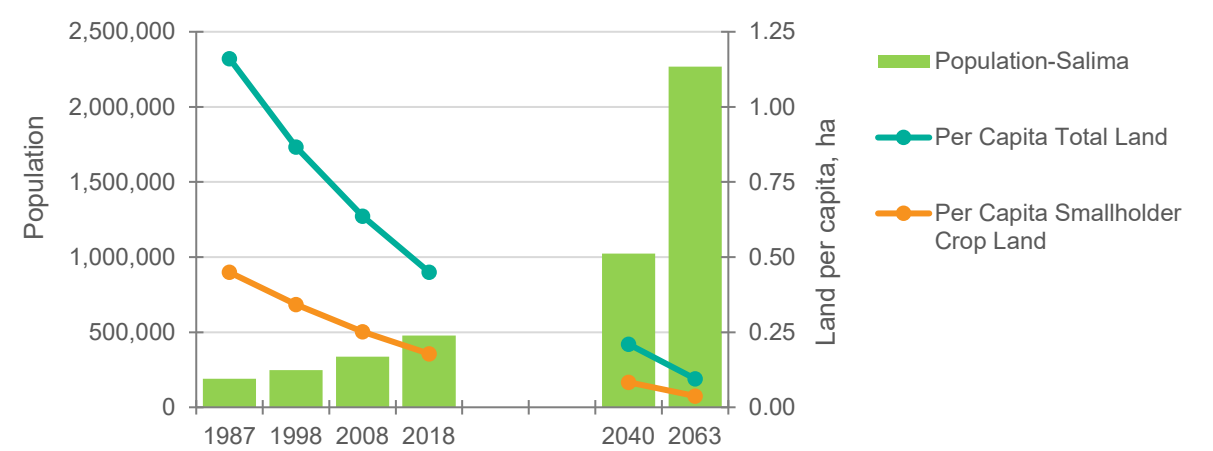
Source: GoM, 2021

Under such a population growth scenario, the importance of implementing various interventions to reach the goals set out for Salima/Chipoka under the MSCP becomes striking and urgent. In Salima district, rural-based livelihoods cannot be sustained by growing rainfed cereals such as maize, even if yields can somehow be multiplied from current levels. There is therefore a need to transition the district toward a sustainable pathway in which population growth can be steered and balanced between growing economic opportunities in both urban and rural areas, but importantly, that the share of urban population growth occurs at a faster pace through rural-urban migration.

Not only is there a need to guide the population and urbanization process, but there is also a fundamental change needed in rural areas in the way that agriculture can better contribute toward developing sustainable livelihoods through economic growth and aiding advancement in industrialization in urban areas. In short, there is a need to identify economic industries that can significantly contribute to transitioning the current traditional agricultural economy into one that is more integrated and labor-intensive, and which can attract investments that facilitate the type of urbanization needed to ensure decent livelihoods for both urban and rural dwellers in the district.

Value chains for secondary city development in Salima district

The MSCP spatial guide for development in Malawi has identified Salima/Chipoka as one of the eight catalytic locations for strategic investments meant to create vibrant secondary cities. Through a combination of promoting land use efficiency in areas where demand for land is high, diversification of economic opportunities in rural areas, and coordinated development of strategic clustering of assets and projects, the MSCP highlights the need for secondary city development to contribute to establishing infrastructure, rural-urban linkages, and operational and cultural feedbacks between the more traditional urban and rural settings. The Malawi 2063 development vision sketches out the interactions envisioned between the different pillars of the vision, which include enhanced agriculture productivity and commercialization, industrialization, and urbanization (NPC 2020). More productive agriculture will produce products and supply agro-based industries to anchor the development of secondary cities, which in turn provides the push for industrialization. Industrial firms will both use inputs from and supply goods to other sectors of the economy, including back to agriculture. Finally, urbanization through well-planned and serviced secondary cities will realize and exploit further economic opportunities through growing demand for services, tourism, urban development, and logistics, which in turn creates higher-paying jobs in urban areas (GoM 2022).

Salima/Chipoka has been earmarked for secondary city development due to its proximity to the capital city, Lilongwe, and its untapped potential for expanding tourism. The fact that existing infrastructure, such as Chipoka port and the railway and road networks, is available to streamline development is another reason. It is envisioned that Salima/Chipoka becomes a secondary city through its role as a lakeside logistics and industrial center and a multi-modal hub for commercial development. Through a combination of strategic investments in infrastructure, aquaculture, and tourism, urbanization in Salima district can be steered in such a way that, moving toward 2063, the urban population share reaches 50 percent of the total population, which implies a significant boost in urban densities. Even under such an optimistic scenario, the MSCP still notes that "*there is a need to further urbanize in order to make smallholder farming viable*", since the land available per household will only be 0.42 ha (GoM 2022).

We build on the ideas and framework presented in the MSCP by exploring how agri-food systems can assist in spurring sustainable economic growth in Salima district in both urban and rural areas. Clearly, there is a need for a significant move away from the status quo in realizing the kind of urban and rural development envisioned.

Pienaar et al. (2023) conducted a comprehensive analysis to identify value chains that can drive inclusive agricultural transformation in Malawi. This has a bearing on the kinds of transition that are needed for Salima/Chipoka city—value chains that can make a large contribution to economic development need to be prioritized. Their analysis identified and ranked value chains with the best ability to contribute to agricultural transformation by looking at different policy outcomes, including market-led growth, social inclusiveness, agricultural transformation, climate considerations, and value chain scans.

The results revealed several important findings about the ability of different value chains to contribute to inclusive agricultural transformation. Among the highest-ranked value chains, three can be grouped within the horticulture sub-sector—mangoes first, macadamia nuts second, and bananas third. The market-led focus of this methodology to prioritize value chains for policy and investment prioritization suggests that instead of having a "farmer-first" approach that aims to raise farmer productivity, one should rather have a "market-first" approach. The latter asks what market opportunities exist for a particular value chain before proceeding to look at how farmers can access the market to profitably participate. This slight change in development thinking underscores the need to develop competitive value chains based on sound economic considerations, such as production suitability, climate, regional growth prospects, and the potential to unlock comparative advantages. Mangoes, macadamia nuts, and bananas all scored well in aspects of the market-led indicators. This suggests that in these value chains in Malawi, there already exists the potential for domestic or export market growth or some elements of global competitiveness (Pienaar, et al. 2023). Adding that these value chains also scored well on other development indicators, such as job creation and improving dietary change, and that mangoes, macadamia nuts, and bananas perform well under climate change suggest that a focus on these value chains is well placed to drive long-term development in Malawi. In addition, both mangoes and macadamia nuts have strong potential for growth in off-farm value creation through drying, juicing, and cracking. These activities provide strong linkages to the rest of the economy.

We use this same approach to identify value chains that can anchor secondary city development in Salima district. The rationale for selecting a fruit value chain to drive agricultural development instead of more traditional crops such as maize or groundnuts, which are both currently produced in Salima, is based on the following realities:

- There is already momentum and growth in fruit production in Salima district, primarily due to the large investment made by Malawi Mangoes Pty Ltd in the past decade to both farm and process mangoes primarily for exports.
- Salima has a relatively suitable climate to produce sub-tropical fruits and is endowed with water sources for irrigation.
- Given the envisioned development for Salima/Chipoka in the MSCP in terms of utilization of existing infrastructure and logistics, is clear that the fruit value chain can immediately utilize existing or proposed services planned for the city.
- There is evidence of scalability and developmental impact in the mango fruit value chain, which is documented in later sections of this paper.

- Fruit trees are fundamentally different than annual crops in that they have a longer, multi-generational investment horizon and income-generation timeframe of between 20 and 40 years.
- Fruits have a comparatively higher value per unit of production when farmed through the intensive use of inputs. This creates higher returns per unit of land, while also requiring more labor than is needed in the grain, oilseed, and livestock value chains.

In this study, we focus on the mango fruit value chain in Salima district and conduct a deep-dive analysis in which we assess the market opportunity for Malawi to produce significant quantities of mangoes. We describe the mango market potential by looking at global, regional, and local characteristics of mango supply and demand. We then pivot the analysis to examine how the mango value chain is contributing to Salima district's rural and urban economy. We then introduce three policy and investment levers to assess to what extent upgrading the mango value chain can contribute significantly to economic development in both the urban and the rural areas of the district. Finally, we speculate on second-round development effects, both through local multipliers and through agglomeration economies.

THE MANGO VALUE CHAIN—A DEEP DIVE

Mango (*Mangifera indica*) globally is among the most important commercially grown fruit. Belonging to the *Anacardiaceae* (or cashew) family of plants, the mango tree is an evergreen mainly grown in tropical and warmer sub-tropical regions. Its center of origin is within a large area encompassing Myanmar, Bangladesh, and India (Tharanathan, Yashoda and Prabha 2006). Edible mango originated in India and was domesticated there around 4,000 years ago, from where production spread to other parts of the world (Wang, et al. 2020). According to Rey, et al. (2006), Arabs propagated mangoes and introduced the plants through trading posts in East Africa. In 1330, it was recorded to be grown in eastern Somalia. In South Africa, the Dutch planted mango trees shortly after the founding of the Cape Colony in 1653, but further development failed there due to unsuitable climatic conditions (ARC 2022). There is little record in the historical literature on mango production in Africa until the 1900s, when mango production was noted to be rising, especially in West Africa. Commercial production on the continent started in the 1960s, primarily aimed at exporting mangoes to Europe. Mali was the leading mango exporter initially, with Côte d'Ivoire, Burkina Faso, and Senegal becoming dominant mango exporters from West Africa starting in the 1980s (Rey, et al. 2006).

The gradual move of mango production toward the eastern and southern parts of Africa is not well documented. Several countries in these regions have recently shown strong production growth. Many have informal mango value chains with trees of indigenous varieties scattered across the rural landscape, the fruit from which is traded in domestic markets. Most local or national mango value chains on the continent are still in the traditional phase of agri-food system value chains, as will be discussed in the next section of this paper.

Our aim with diving deep into mango value chains globally, regionally, and locally in Malawi aimed, first, at assessing if mango value chains in Malawi can transition from the traditional stage toward the modern to benefit the country. Once we have established if there is a strong business case for mangoes grown in Malawi, we then focus our analysis on developing a detailed flow map of the mango value chain in Salima district in which we summarize the main economic activities of the different value chain actors. The improved understanding gained of

the Salima mango value chain allows us to document the channels through which economic activities within the value chain result in higher incomes for both rural and urban-based actors.

Global market context

Global mango production has shown consistent and significant growth in the past decade, as shown in Figure 4. India is the world's leading producing nation by some margin with 20.4 million mt produced in 2020, 43 percent of global production. China and Indonesia are the second and third largest mango producers, followed by Mexico, Thailand, and Pakistan. Global production grew from 38.3 million mt in 2011 to 47.6 million mt in 2020, an average annual growth rate of 2.5 percent with annual average increases in total production of about one million mt. Among the leading suppliers of mangoes, China and Egypt showed the strongest growth over the 2011 to 2020 period with mango production growing by 13.8 and 8.1 percent per annum, respectively.

Figure 4: Global mango production, by country, 2011 to 2020
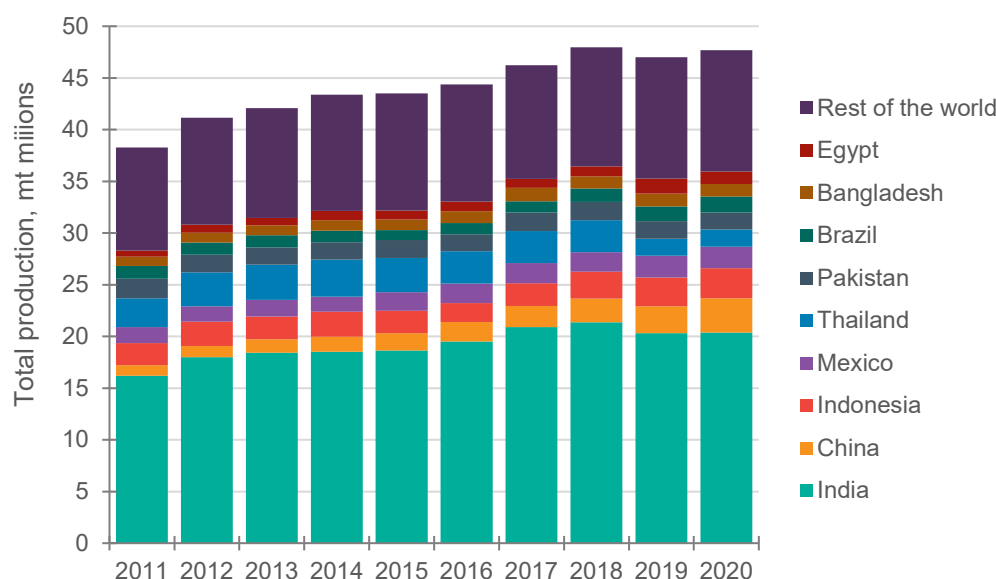
Source: Authors' compilation using various sources.

Malawi is a small player in terms of global production volumes with a share of 0.6 percent of the total, according to global mango production statistics. Yet, as discussed in the next section, the country is among the larger producers of mangoes on the African continent.

The growth in volumes shown in Figure 4 has been driven by both expansion in area planted and yield improvement. Figure 5 shows trends for both of these metrics at the global scale. Area planted to mangoes globally grew from 4.8 to 5.3 million ha between 2011 and 2020, while the trend in yield has increased faster than the area planted, stabilizing at around 9.0 mt/ha in 2020.

Figure 5: Global mango area planted and average yield, 2011-2020
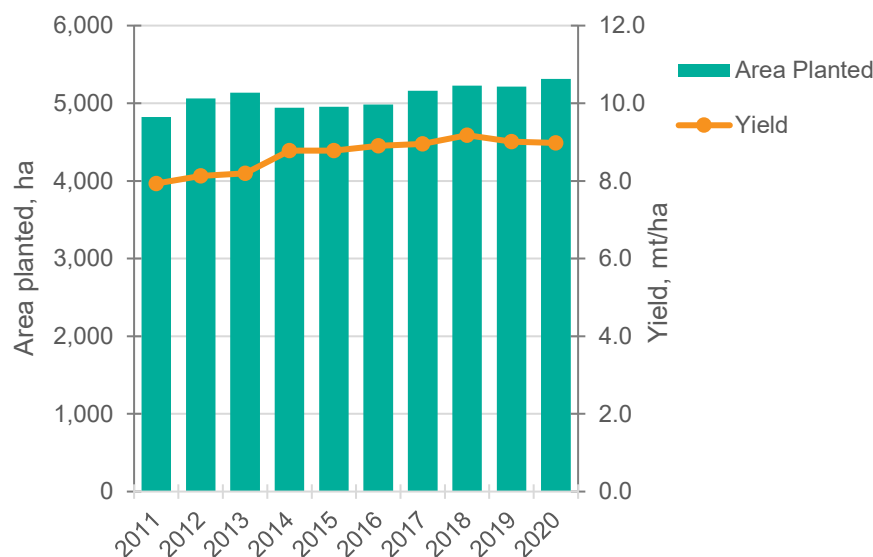
Source: Authors' compilation using various sources

These global trends are highly dependent on variation in India's production, since it makes up such a large proportion of global production. Indian mango yields have been on an upward trajectory since the early 2000s, with a yield improvement of 3.7 mt/ha in the past two decades. National yields are also dependent on factors such as whether the crops are irrigated or not and the suitability of climate and seasonal rainfall patterns. India's mango sector involves an estimated 5 million farm holdings on which an estimated 32 percent of mango orchards are irrigated. The bulk (83 percent) of India's mango producers farm on pieces of land smaller than one hectare, depicting an industry dominated by smallholder tree farmers. In terms of post-harvest losses, between 9 and 13 percent of India's mangoes end up as waste (GoI 2018). This highlights another feature of global mango supply chains in that their operations are influenced by the perishability of the product and whether value-added activities include any processing to extend the shelf life of mango products. Mangoes can be processed in several ways—fresh cut, dried, pulp, juice, and a few other industrial uses. Furthermore, unripe mangoes can also be used and processed into products such as achar (pickles of South Asian origin), chutney, and dehydrated products. This range of options presents mango-producing countries with an opportunity to utilize their mangoes to reach a higher step in economic development through value addition (Owino and Ambuko 2021).

Assessing the global export market for mangoes highlights a few important characteristics. The major producing countries are not necessarily also the major exporting countries since regional consumption and population distribution affect where mangoes and mango products are consumed. Figure 6 shows the world exports of mangoes by volume of the major exporters. Note that the top three producers, India, China, and Indonesia, which together produce 56 percent of global supply, are not among the largest exporters. Instead, Mexico, Thailand, and Brazil are the largest exporters of mangoes, followed by Peru, Pakistan, and then India.

Total exported mango volumes expanded from around 850,000 mt in 2003 to 2.2 million mt in 2021 (ITC 2022). These exports, a combination of fresh and dried products, have grown by an annual average growth rate of 5.4 percent since 2003. The value of these exports has grown faster than global production, which suggests strong demand growth for mangoes.

Whereas the volume of exports expanded by 5.4 percent per year, their value grew by 11.2 percent per year during the same period, indicating broad price support for exported mangoes as demand has outpaced supply in importing markets. The global export market in 2021 was valued at USD 3.1 billion.

Figure 6: Global exports of mangoes and mango products by volume and value, 2003 to 2021
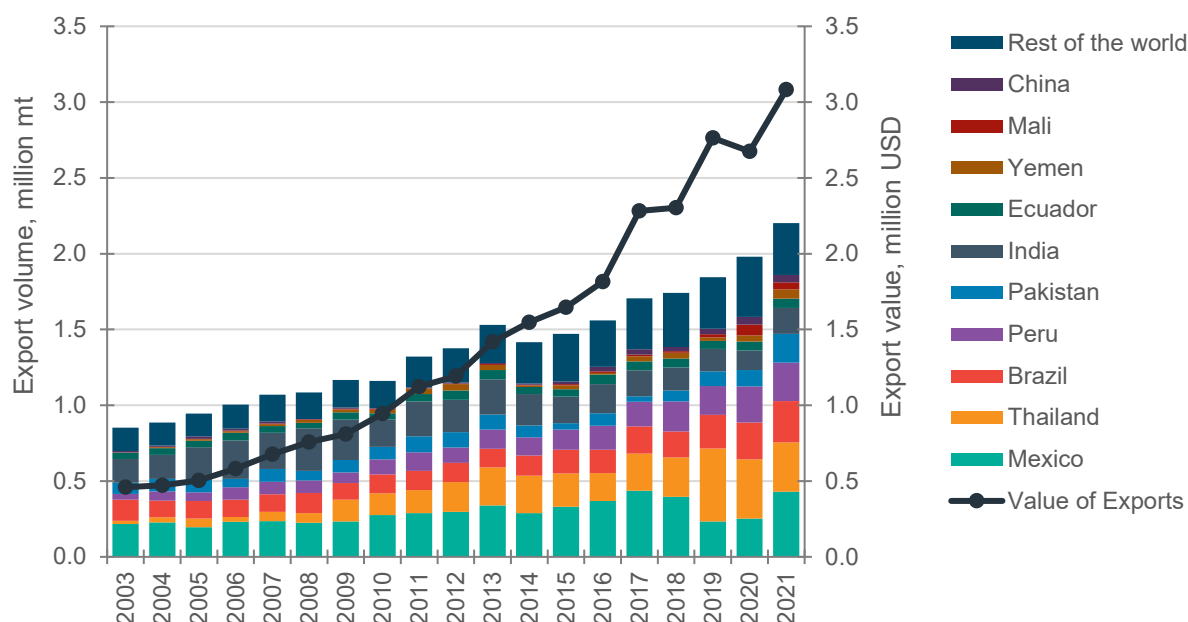
Source: ITC, 2022

These dynamics in the global supply and exports of mangoes suggest that prevailing market conditions are that demand is outstripping supply, with a large expansion in trade in mangoes in global commodity markets. The global drive toward healthy eating in general and income growth coupled with urbanization are resulting in changing diets. As incomes rise, the share of household food spending allocated to traditional staples declines while expenditures on fruits, as well as protein-rich foods, ready-made meals, and convenience snacks, grow. The onset of the global pandemic in 2020 further accelerated the move toward more healthy diets. In consequence, the demand for mangoes, both fresh and dried products, has continued to grow. The many health benefits of mango consumption are well documented in the literature, being a rich source of polyphenols, micro-nutrients, and other health-enhancing compounds—it is widely cited as a "super fruit" nutritionally (Lauricella et al., 2017; Vithana et al., 2018). These characteristics will continue to drive consumption growth into the future—a recent study suggested that the global mango market will grow by almost 5 percent per annum through 2030, indicating that recent historic growth rates will continue (Fresh Fruit Portal 2022).

The left graph in Figure 7 shows trends in global mango imports both in volume (left axis) and value (right axis) terms, a generally good proxy when assessing changes in demand for products. The right graph gives a breakdown of the major importing markets based on 2021 import volumes. Globally, imported mangoes increased from around 612,000 mt to 2.3 million mt between 2002 and 2021, with the import market value at USD 2.8 billion in 2021. (This is slightly lower than the value reported for global exports since we exclude major re-

exported products within the major importing markets.) Over this period, annual global imports of mango increased by 1.7 million mt, with an average annual growth of 7.2 percent. The value of imports has grown faster than the volumes, indicating that prices have been increasing during this period. In 2021, the average import price per kg traded was USD 1.20/kg, which is substantially higher than the USD 0.60/kg realized in 2002 (ITC, 2002).

Figure 7: Global imports of mangoes and the major importing countries by volume
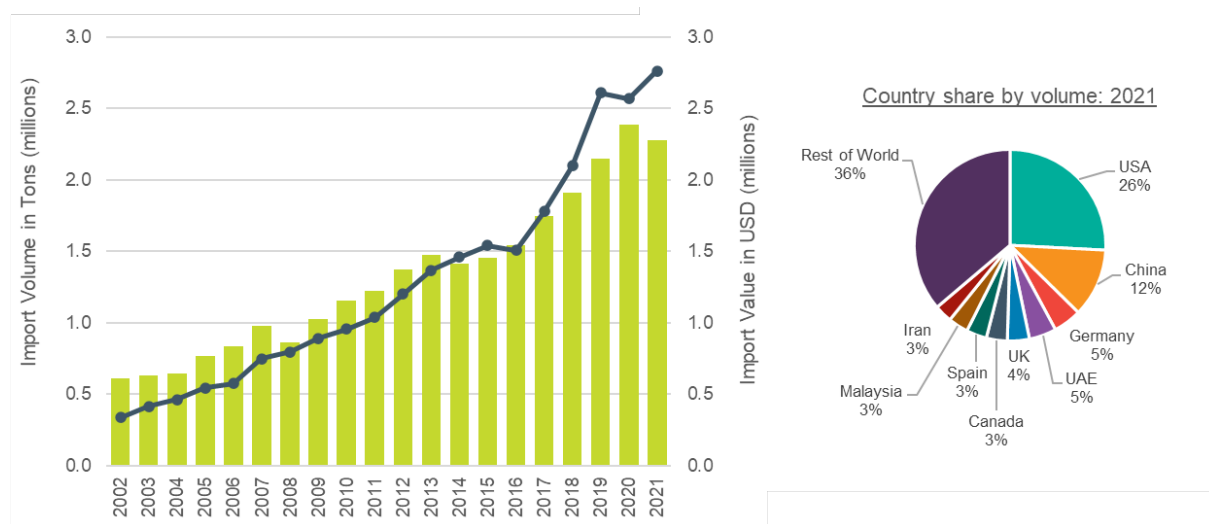
Source: ITC, 2022

USA is the world's leading importer of mangoes with 26 percent of total imports, making it an important player whose import decisions will affect mango markets globally. China, Germany, and the United Arab Emirates were the next largest mango importers in 2021 (ITC 2022).

Global demand for mangoes is largely driven by three overarching factors. First, the macro-economic conditions and consumption drivers in large importing markets, such as USA, countries in Europe, and parts of the Middle East, will determine future growth prospects for emerging exporters of mangoes. This is important since many of these countries do not have the required climatic conditions to produce mangoes, thereby necessitating imports.

The second and third factors relate to the spatial distribution of global mango consumption and importantly, seasonal variation in when and where fresh mangoes are harvested and traded on world markets. Figure 8 maps the share of global mango consumption volumes by country or region. These consumption volumes are estimated by compiling crude balance sheets in which a nation's or region's own production volumes are added to imports and exported volumes subtracted, based on 2020 data. Without making any provision for losses and wastage, this figure provides insights into global demand for mangoes. India, by far the largest producer, is also the largest consumer of mangoes globally, which implies that both the consumption and supply in India in any particular year will affect global markets. Around 43 percent of all mangoes produced globally are consumed within India, making their per capita consumption the highest in the world by some margin. Although India exports significant volumes, the consumption of nearly 20.2 million mt by their 1.4 billion inhabitants is significantly higher than consumption levels anywhere else.

Figure 8: Estimated global distribution of mango consumption volume in 2020.
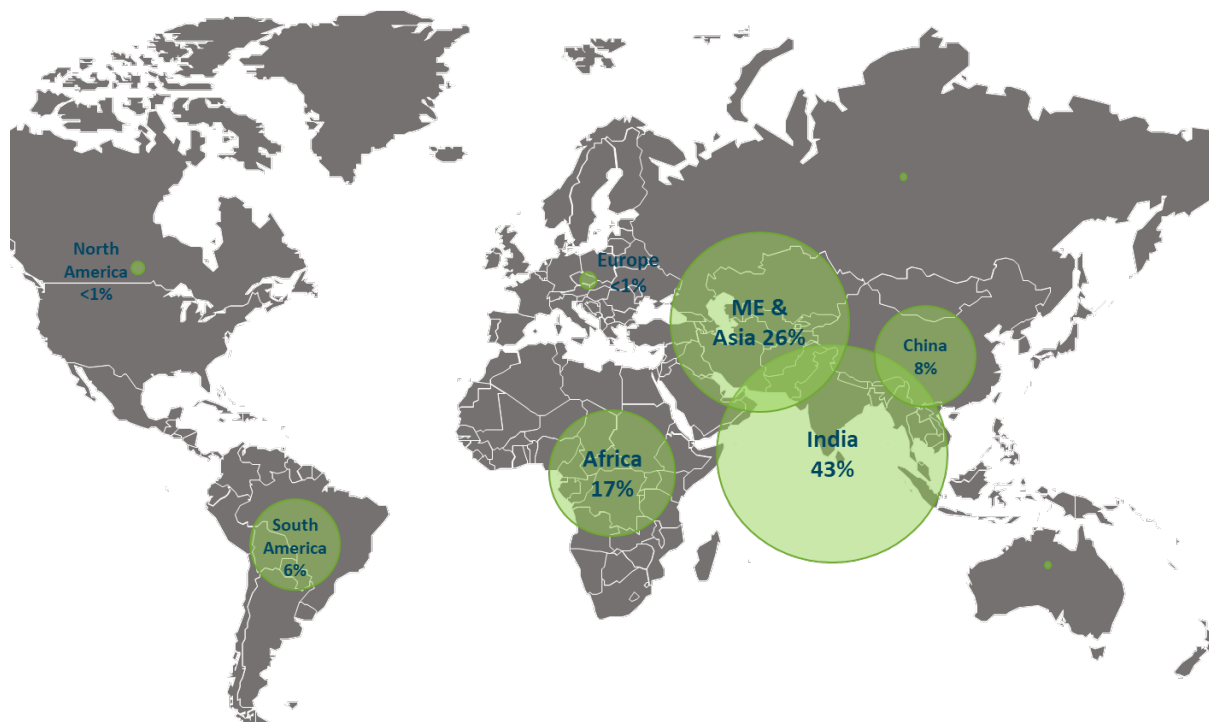
Source: Authors' compilation using ITC, 2022 & FAO, 2022

If one combines India's share of total consumption with that of China (8 percent) and the rest of Asia and the Middle East (26 percent), then around 77 percent of global mango use is concentrated in these markets, whereas the rest of the world—North and South America, the African continent, Europe, Russia, and Australia/Oceania—have a much smaller combined share of 23 percent. However, mango utilization in some of these comparatively smaller markets is growing fast, as shown in Table 2. India's per capita consumption of mangoes of 14.5 kg/person/annum in 2020 was more than two times bigger than the next largest consumers on a per capita basis, the rest of Asia and South America. However, in all three, these consumption levels in 2020 are quite similar to what they were in 2012. In contrast, while still at relatively low levels, per capita consumption levels in China more than doubled and in North America more than quadrupled between 2012 and 2020.

Table 2: Per capita mango consumption trends, by global region

Area or country	Mango utilization (kg/person/annum)		Volume growth (mt)
	2012	2020	2012-2020
India	13.76	14.46	2,418,000
China	1.04	2.55	2,447,000
Asia (excl. India & China)	6.76	6.68	4,632,000
South America	6.02	6.65	698,000
North America	0.12	0.54	256,000
UK	0.85	1.04	22,000
Europe (excl. UK)	0.31	0.49	134,000
Africa	0.01	0.01	2,482,000

Source: Authors' compilation using ITC, 2022; FAO, 2022 & UNCTAD, 2022

North America and China, together with Europe, are also the regions currently with the largest share of total imports. This suggests that there is still some margin for growth in these regions as they are coming from a low base when compared to the levels observed in India and Asia. USA consumption levels are still a fraction of these more traditional markets. In Africa, mango consumption is a mere 5 grams/person/year, so Africa could be a significant growth area for mangoes in the future if broad income growth can be realized on the continent.

The per capita utilization growth can also be expressed in terms of the total volume growth in each market, which is also presented in Table 2. The volume of products consumed in absolute terms, whether on a relatively small per capita basis for large populations or high usage per person for smaller populations, is large for a fruit value chain. India and China still represent the largest growth in volume terms. However, fast-growing mango markets, such as North America and other parts of Asia, still present opportunities for growth as more people consume mangoes, whether in fresh or processed form.

Table 3: Major harvest times for leading mango producers globally and for Malawi

Country	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
India			L	D	D	D	L					
China				L	D	D	D	L				
Indonesia							L	D	D	D	L	
Mexico			L	D	D	D	L					
Thailand			L	D	D	D	L					
Pakistan				L	D	D	D	L				
Brazil	L								L	D	D	D
Bangladesh				L	D	D	D	D	L			
Egypt							L	D	D	D	L	
Peru	D	D	L									D
Ecuador	L								L	D	D	D
MALAWI	D	D	L						L	D	D	D

Source: Authors' compilation

Finally, our assessment of the global mango market ends with a view of seasonality considerations. Since fresh mangoes are highly perishable and ripen quickly at ambient temperatures, the supply of fruit at the time of the year when supply from elsewhere is low provides opportunities for exporters. In addition, prices normally fall in the global market when large volumes are available. Table 3 shows the spread of harvest times monthly for major producing countries and for Malawi—using a dark green color when the bulk of the crop is harvested and light green at the start and end of harvest periods. Countries in the northern hemisphere tend to harvest mid-year, while those in the southern hemisphere harvest at the turn of the year. Combining insights from Figure 8 and Table 3, the mango harvested domestically to serve the high levels of consumption in India, China, and the rest of Asia is between April and July. This leaves a large window of opportunity to mango-producing nations in the southern hemisphere, including Malawi, that can supply those Asian countries from October

through to February, potentially at premium prices. It should be noted, however, that seasonal variation and harvest times are also dependent on the mango varieties produced, farm management practices, and post-harvest techniques, such as the use of ripening chambers, which enable producers to steer harvesting periods to some degree.

Figure 9: USA fresh mango imports per month by volume and price, 2021
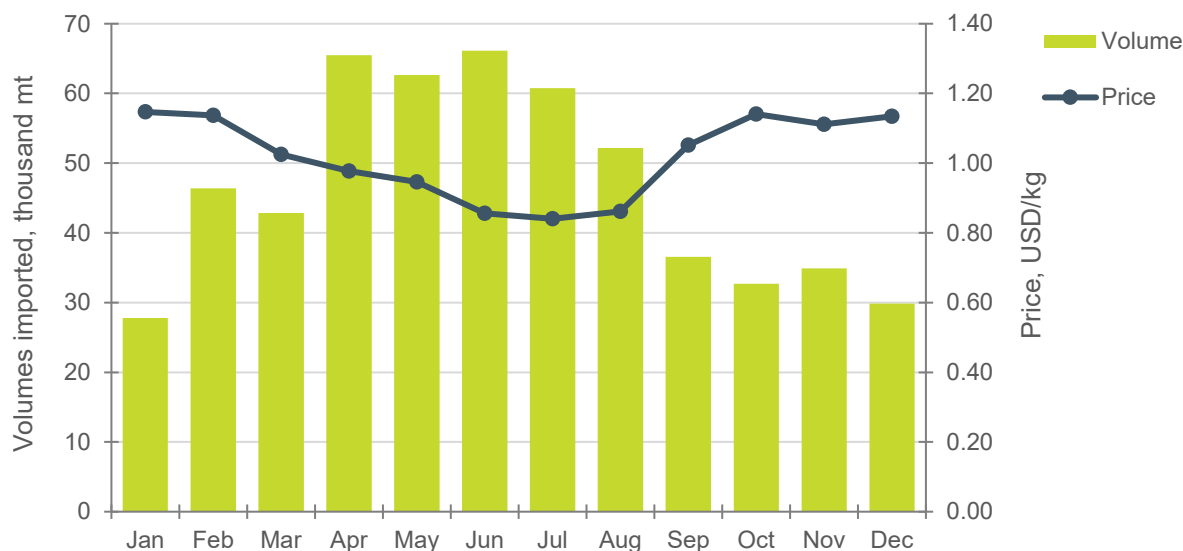
Source: USDA, 2023

To illustrate the seasonal impact of different harvesting periods with price movements, we use the USA import market as a reference. Since this is the world's largest import market and the country does not produce significant volumes of the product, Figure 9 shows the clear peak of fresh mango imports to the USA in 2021 from April to July (USDA 2023). During this period, import prices drop significantly from above USD 1.00/kg during months outside of this window to USD 0.84/kg at the lowest point in July. The USA market is supplied in the major window by Mexico, the Philippines, and Thailand, while Peru and Ecuador are the main suppliers in the minor import window at the turn of the year. These seasonality-induced price movements present an opportunity for Malawi, which is known for being one of the world's earliest-producing areas in the southern hemisphere with the main harvest period between November and February. Although these seasonal fresh mango market dynamics will not be present in markets for dried and other forms of processed mangoes, an opportunity is available to a select group of countries able to produce mangoes during the window of low supply to the global fresh mango market.

Regional market context

Whereas the previous section examined supply and demand in the global market for mango, this section focuses on the regional market. The region we examine is made up of major African mango producers, but we also touch on those in South America, several of which supply mangoes during the same market window as Malawi—Peru, Brazil, and Ecuador. Although South American countries together produce around 13 million mt or 27 percent of global mango production, their volumes have recently grown by 5.5 percent per annum. African nations in aggregate now produce about 9 million mt (FAO, 2022). While noting the challenges

with official agricultural production statistics in most African countries, Egypt is still considered the largest producer of mangoes on the continent with around 1.2 million mt produced in 2020. Malawi is Africa's second biggest producer, followed by Nigeria and Kenya. Mali, Sudan, and Tanzania produce around 500,000 mt each (Figure 10).

Figure 10: South American and African production of mangoes, 2011-2020
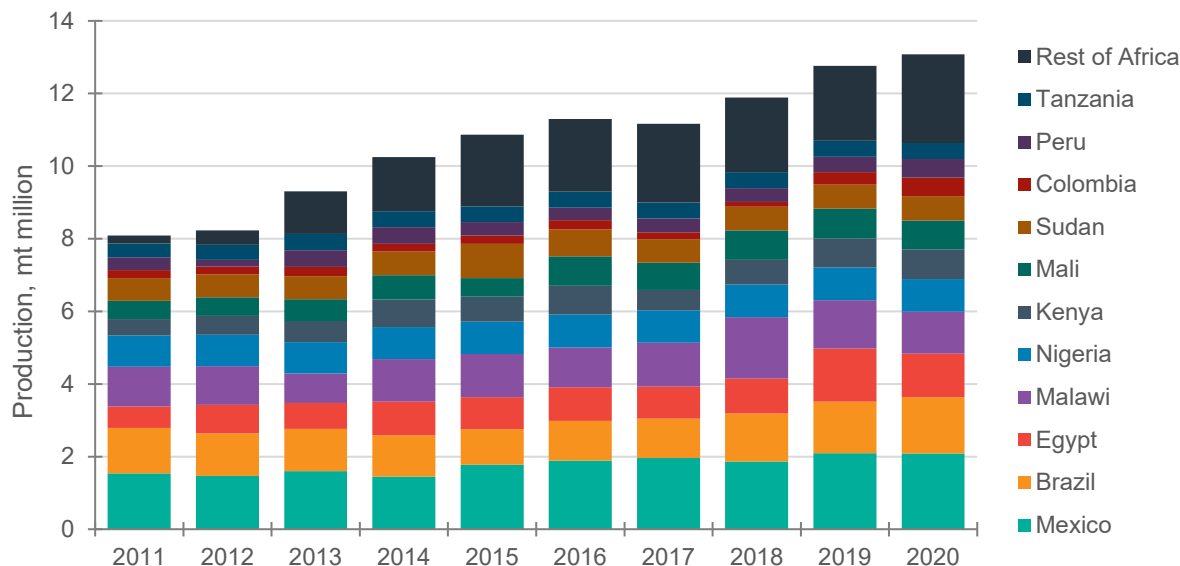
Source: Authors' compilation using various sources

There has in recent years been growing interest in developing mango value chains in Africa, with value chain studies in countries such as Kenya (USAID 2015; Bien and Soehn 2022; Fleming 2020), Mali (Kergna, Dembélé and Oluwole 2017), Côte d'Ivoire (Grumiller et al. 2018), Ghana (Nugawela 2015; Okorley et al. 2013; Grumiller et al. 2018; Arnoldus and Clausen 2019), Ethiopia (Kabeta and Dangia 2020), Senegal (Gross 2021) and Sierra Leone (Arinloye, et al. 2017), to name a few. There is broad consensus that their suitable agroecologies and relatively low costs of production provide a comparative advantage to these African mango-producing countries, but one which has been largely untapped to date. There is evidence of increased investment by the private sector in mango value chains in several of these countries, both in primary production and processing, to export both fresh and dried products.

However, many of these producing countries lack the appropriate infrastructure and competencies to overcome many technical, commercial, financial, and legal challenges that prevent them from supplying sufficient mangoes to meet the growing global demand. Common challenges in the region include pest control, particularly fruit flies, and phytosanitary issues (Kergna, Dembélé and Oluwole 2017). High levels of product wastage occur because critical infrastructure is often absent, or mango orchards are poorly managed. Costs of transportation both domestically and to export markets remain high. Many small producers are unable to access technologies and technical training that would enable them to produce mangoes more efficiently and profitably. The bulk of mango production in Africa is done by smallholder farmers who invest very little resources in maintaining their trees. The trees commonly are randomly scattered across farmers' fields and not planted or managed in dedicated orchards focused on optimizing production and quality.

The continued and rising use by developed countries of technical non-tariff measures to improve food safety for their consumers of internationally traded products poses a barrier to small farmers in developing countries producing food crops for export, such as mangoes. Traore and Tamini (2022) show that the effects of enforcement of Minimum Residue Levels (MRL) for pesticides in force among OECD countries reduce the likelihood of African countries producing mangoes for fresh exports, even though that enforcement is broadly trade-promoting as it offers an advantage to those producers able to be compliant. Bien and Soehn (2022) similarly identified several key regulatory challenges the Kenyan mango export value chain must address and meet to be able to export their products profitably and sustainably. Other African producers face these same regulatory challenges.

In addition, there broadly is a mismatch between the type and quality of mangoes that export markets demand and what many African countries can supply. Poor infrastructure and insufficient storage limit aggregation. Political barriers between countries increase these costs. Limited processing capacity further constrains growth. Although there is strong growth in production volumes on the continent, these factors result in a situation in which a very small proportion of the mangoes produced in Africa are formally traded in international markets.

Figure 11: African mango export volumes and exports as a share of total production
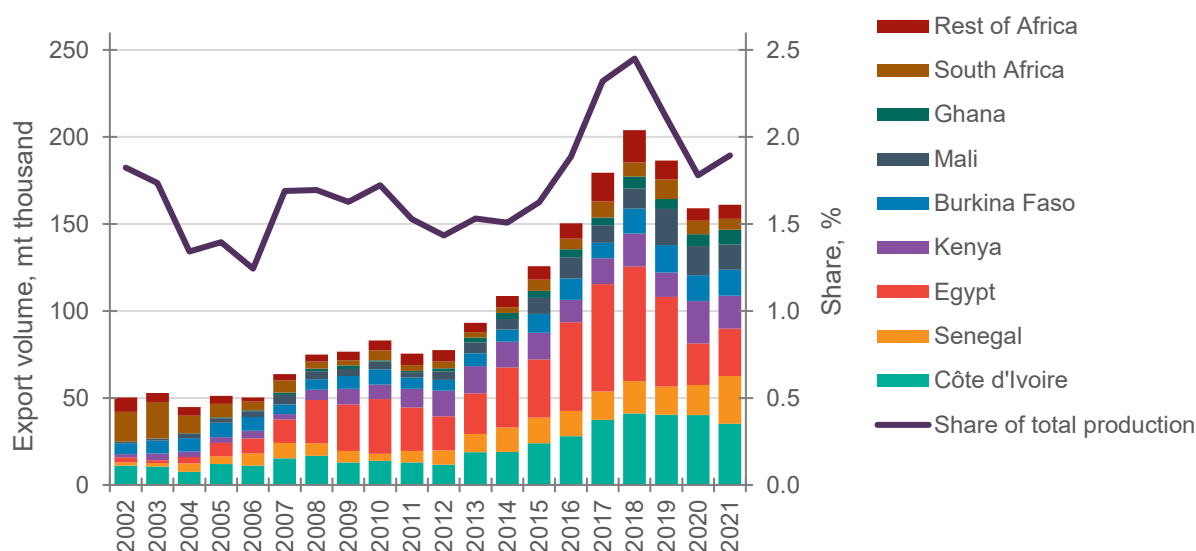
Source: ITC, 2023 & FAO, 2023

Figure 11 provides some perspective on the extent of these market access difficulties. It shows the total export volumes consigned from African mango exporters (left axis) and the share of the total mango production that is exported. Despite strong growth in export volumes over the past two decades, only 1.9 percent of mangoes are exported. Thus, African exporters have struggled to take advantage of the growing demand for mangoes worldwide. This highlights another feature relevant to the Malawian context—mango exports are done in an extremely competitive international trading environment and gains made previously can easily be reversed. In the case of Egypt, the decline in its export volumes since 2018 has been driven by a combination of climate-related shocks—extremely high temperatures during critical growing periods leaving fruits unable to be harvested—and disease outbreaks affecting one of the country's major growing regions, Ismailia. (Fructidor 2021). With any agricultural commodity, there are risks involved in investing, knowing that produce quantities and

quality are affected by many exogenous and endogenous factors that often are outside of the control of the farmer or other value chain participant.

Domestic context

The Malawian mango value chain has been summarized in a few previous studies (Mbeye 2016; Nyirenda et al. 2019; CDI 2011; Ngoleka 2013) and has received notable media coverage due to the establishment of Malawi Mangoes, a company that formalized parts of the value chain. In broad terms, Malawi has a suitable climate for mango production. The bulk of the country's mango output comes from smallholder farmers managing trees scattered across the rural landscape.

Total production can be estimated using a triangulation of information from several datasets. The fifth Integrated Household Survey (IHS) of 2019/20 estimated that around 925,000 Malawian households produced mangoes—99 percent of these mango-producing households do not have their trees in orchards, but, rather, they are scattered in their farm fields (NSO 2020). The last official agricultural census for Malawi was undertaken in 2006/7. The census data indicated that three-quarters of all smallholder farmers had at least one fruit tree and that 10.7 million mango trees were owned by smallholder farmers in Malawi (NSO 2010). According to the Agricultural Production Estimates System (APES) of the Ministry of Agriculture, national mango production stood at 1.36 million mt in 2022, up from around 1.0 million mt in 2012. However, the data reported by APES is based on information obtained while the mangoes are still on the tree, so the actual production figure at harvest might be much lower due to spoilage because of pests, wind damage, or other reasons. Data from the 2019/20 IHS suggest that the average national yield was around 58 kgs per tree from a total of around 6.1 million trees. We adjust these national numbers to reflect the national mango harvest for marketable produce. Based on discussions with mango farmers and value chain operators, Nyirenda et al. (2019) estimated that 58 percent of farmers' total mango harvest is lost post-harvest, implying that actual yields of marketable mangoes are significantly lower than the official estimates.

Using a combination of these and other sources and insights from industry role players, we compile a partial equilibrium model for mangoes in Malawi. Such models are widely used to provide quantitative simulations and evidence-based support to policy planning and investment decision-making in agricultural sub-sectors. A dynamic, recursive partial equilibrium framework is based on balance sheet principles to establish equilibrium—total supply (comprising of production and imports) must equal total demand (comprising of consumption and export) for any given product. Supply and demand interlink in the model based on several behavioral equations and informed by historical data. In building the model, which will be used in later sections to assess the impact of policy and investment levers on the mango value chain in Salima district, we develop a split between the formal and informal markets to better reflect these two very different types of channels through which mangoes are traded in Malawi.

Figure 12 shows the historic and baseline outlook of mango production in Malawi, broken into informal (traditional) and formal (modern) production volumes. Based on the data triangulation process described, the national total production of marketable mangoes in Malawi in 2022 was estimated at 550,000 mt. National production is expected to grow under trends in

the current baseline, largely due to more trees being planted and further strong growth in output from the formal mango value chain. The supply response in recent years has been driven by higher prices in the local mango market, resulting in more trees being planted by smallholders. The significant growth in volumes in the formal value chain (green line) is largely due to the large on and off-farm investments made, resulting in growing production from a mixture of large commercial farms and transitioning growers integrated into the formal value chain.

Figure 12: Malawi mango production and outlook in volume, by informal and formal production, 2012-2030
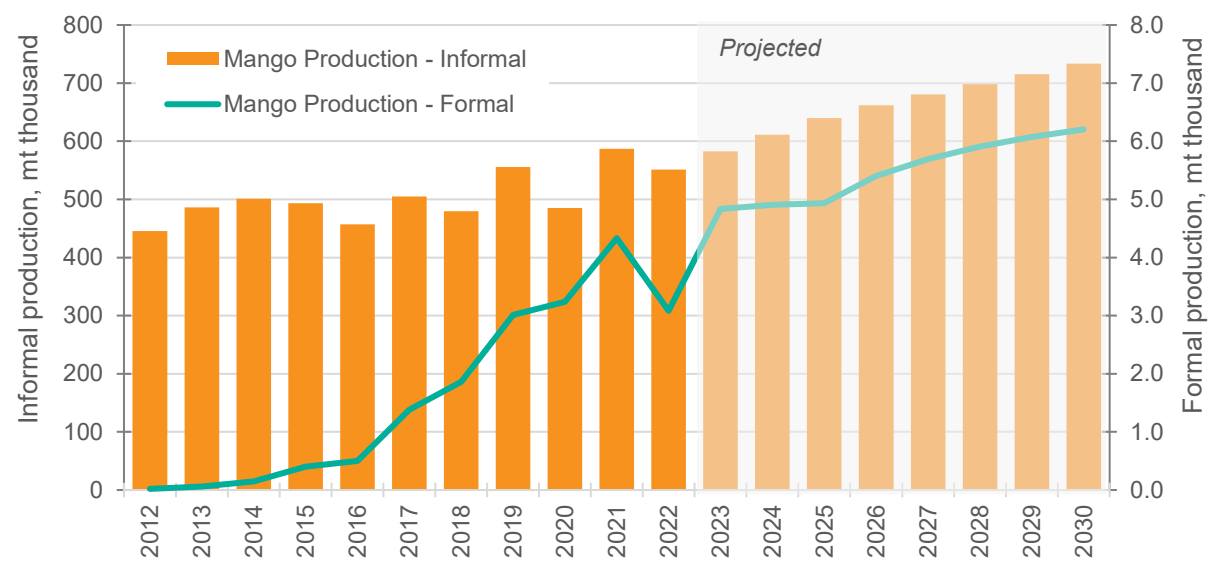
Source: Authors' compilation

This modern segment of mango output in Malawi is characterized by the production of improved mango varieties, including Tommy, Kent, Kitty, Keit, and Alphonso. These mostly are larger than the main local variety, Dodo, and are more suited for the formal market, whether fresh or processed. The contrast between the formal and informal market, as will be described, are quite stark, but it does not mean that the one cannot benefit from the other.

Seasonal differences in harvest times across different mango-producing countries globally, presented in Table 3, shows that Malawi is in a good position to supply mangoes from November to February when global supplies are low and prices are high. This applies mostly to fresh exported mangoes, since dried products have a much longer shelf life. However, to benefit from this advantage it has in the global mango market, Malawi much overcome the major challenges to accessing mango export markets that were noted, including regulatory barriers, cold-chain logistics, and ensuring safe products with good quality. The challenges can be resolved by the modern mango value chain in Malawi assisting actors in the traditional value chain to overcome these challenges and also gain access to the global market.

We have determined that there is growing market demand for mangoes globally, which Malawi can supply. However, we still need to assess whether Malawi has a suitable climate and agroecology to produce mangoes competitively for the global market. We develop a spatial mango suitability index using a multi-criteria decision analysis approach using spatial data for Malawi in a Geographic Information System. The data used includes climate variables, terrain, and soil characteristics, through which we establish important parameters indicative of

the suitability of a location for mango production. We use the mango suitability criteria of Sys et al. (1993) for establishing different suitability classes. The resultant map of the variation in land suitability for mango production in Malawi is shown in Figure 13.

Figure 13: Map of land suitability for mango production in Malawi, with inset map for Salima district
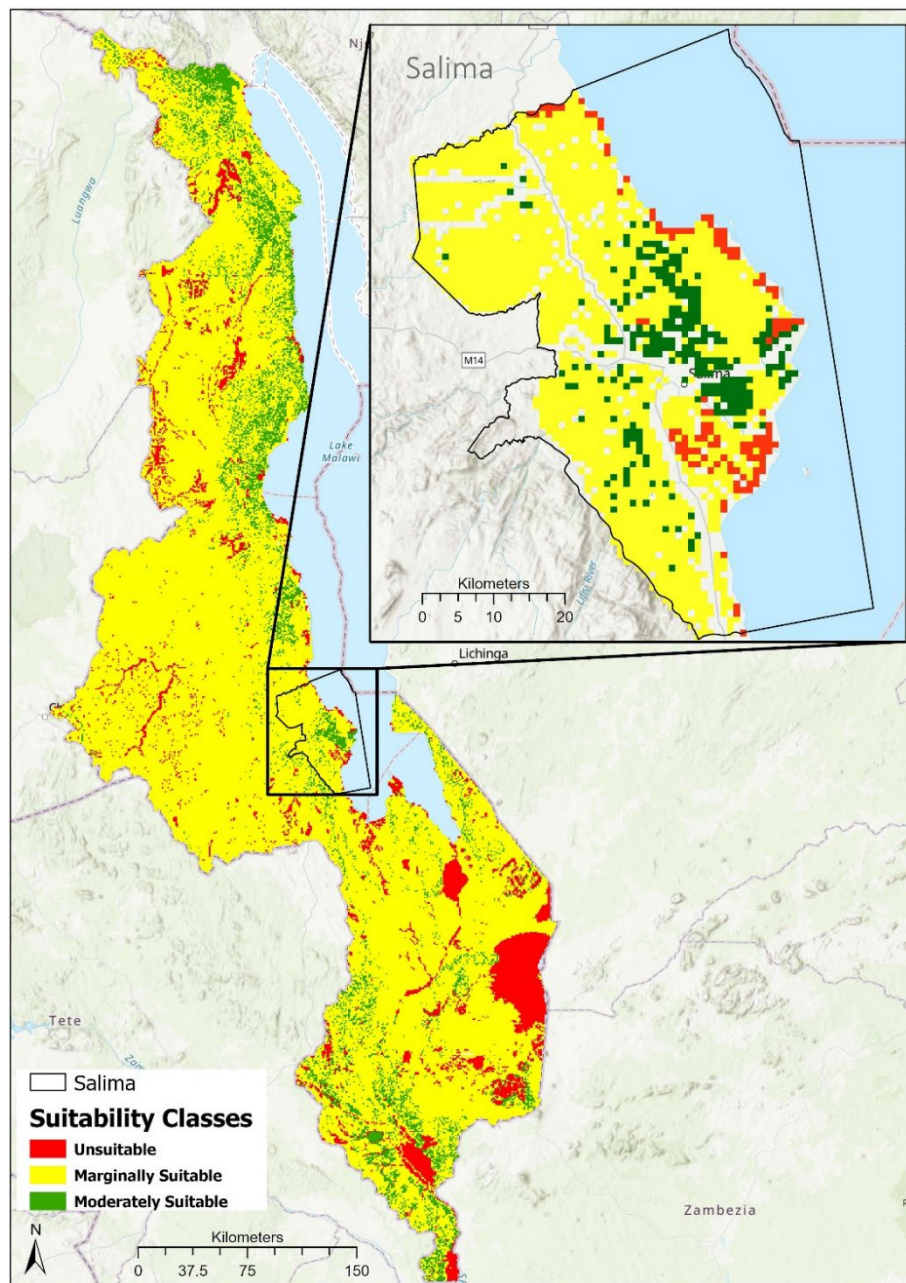
Source: Authors' compilation

Several additional characteristics are important when assessing suitability for mango production across Malawi. Mangoes are terminal-bearing—the fruit is borne only on new growth. This means that new branches must first sprout and harden before the tree can flower. However, new branches sprout only after harvesting. Thus, it is important that all fruit must be harvested and that pruning takes place at the right time, since there are only around 40 days between new growth and the onset of flowering. Several factors are required to get the flowering period right—correct hormone levels, sufficient water at the proper time, an ideal air

temperature, and sufficient energy reserves in the tree. This is a complicated process and requires careful management. The climate is the main factor that determines when and how well a mango tree flowers. As mangoes originated in the monsoonal tropics, where rains fall six months of the year and there are only minor temperature variations, mango trees have evolved to flower all year round. This means that trees in subtropical areas, like Malawi, must be stressed to induce flowering at the ideal time. Withholding water prevents vegetative growth and induces stress. Irrigation will then stimulate vegetative growth and better flowering. The challenge, however, is to irrigate at the right time to "wake the trees up" and ensure that flowering takes place when climatic conditions for pollination and fruit set are favorable.

The reason for mentioning such agronomic details in support of our assessment of mango suitability in Malawi in Figure 13 is that, while no areas of Malawi are judged to be highly suitable for mango production, many areas are moderately suitable. These are mainly found spread along the lakeshore plain from north to south, as well as in the Lower Shire Valley region in the far south. Selection of the correct mix of cultivars and the application of extensive knowledge on mango orchard management are critical to ensure the production of high-quality fruit at competitive yield levels on sites moderately suited for mango production. Through the correct application of water, timely pruning, and appropriate fertilizer application, most agroecological shortcomings in moderately suitable sites can be overcome so that good mango yields are obtained. This is an important consideration for scaling the mango value chain in the country—the application of good technical knowledge will be required.

Finally, there is a distinct advantage in having areas suitable for mango production spread from north to south in the country, as it creates a natural spreading of harvest times. With earlier harvests in the south and later harvests in the north due to the timing of the rainy season, mango exporters and processors can benefit from this extended harvest season nationally. Moreover, the use of mango cultivars that have shorter or longer growing periods can further extend the period over which mango is harvested across Malawi, providing additional economic opportunities that can be exploited in the mango value chain.

THE SALIMA DISTRICT MANGO VALUE CHAIN

The mango value chain in Salima has a distinct difference from other mango-growing regions in Malawi in that the country's biggest off-farm mango processing facility is in Salima town. The Malawi Mangoes company was established in 2011. The company's operations consist of a large farming operation and a 10,000-square-meter facility to process mangoes for fresh export or as value-added dried mango products.

Analyzing the mango value chain within Salima district provides an appropriate case study for assessing the potential for agricultural value chains to drive secondary city development. We are able to document the role that existing value chain linkages play in terms of job creation, particularly through supply linkages between smallholder mango farmers in the district and actors in the formal value chain and through the utilization by those value chain actors of services from local businesses. With mango production in Salima district, we have a situation in which a traditional value chain is linked to a modern value chain, with 'traditional' and 'modern' reflecting different stages of value chain development (Reardon, Liverpool-Tasie and Minten 2022). While when describing stages of transformation in value chains, Reardon

et al. (2022) mostly refer to entire food value chains in the aggregate, while here we use the same terminology specifically for mango value chains in Malawi.

In the traditional stage of value chain transformation, the value chain is spatially short with much of the market concentrated in rural areas and village markets and with minimal value-added activities. The urban share of the population reliant upon traditional mango value chains is low. The wholesale and logistics sectors of such value chains are small and local, since the mangoes are not transported far distances. There is little product quality differentiation or application of market standards, and limited opportunities for economies of scale or scope, with the local mango variety produced in Salima district being traded along roadside markets or sent to the regional wholesale market in Lilongwe. In general, enterprises handling mangoes are small, and informal spot market relations dominate exchange transactions without any contracts. Finally, the technologies that are utilized, if any, are labor-intensive per unit of output.
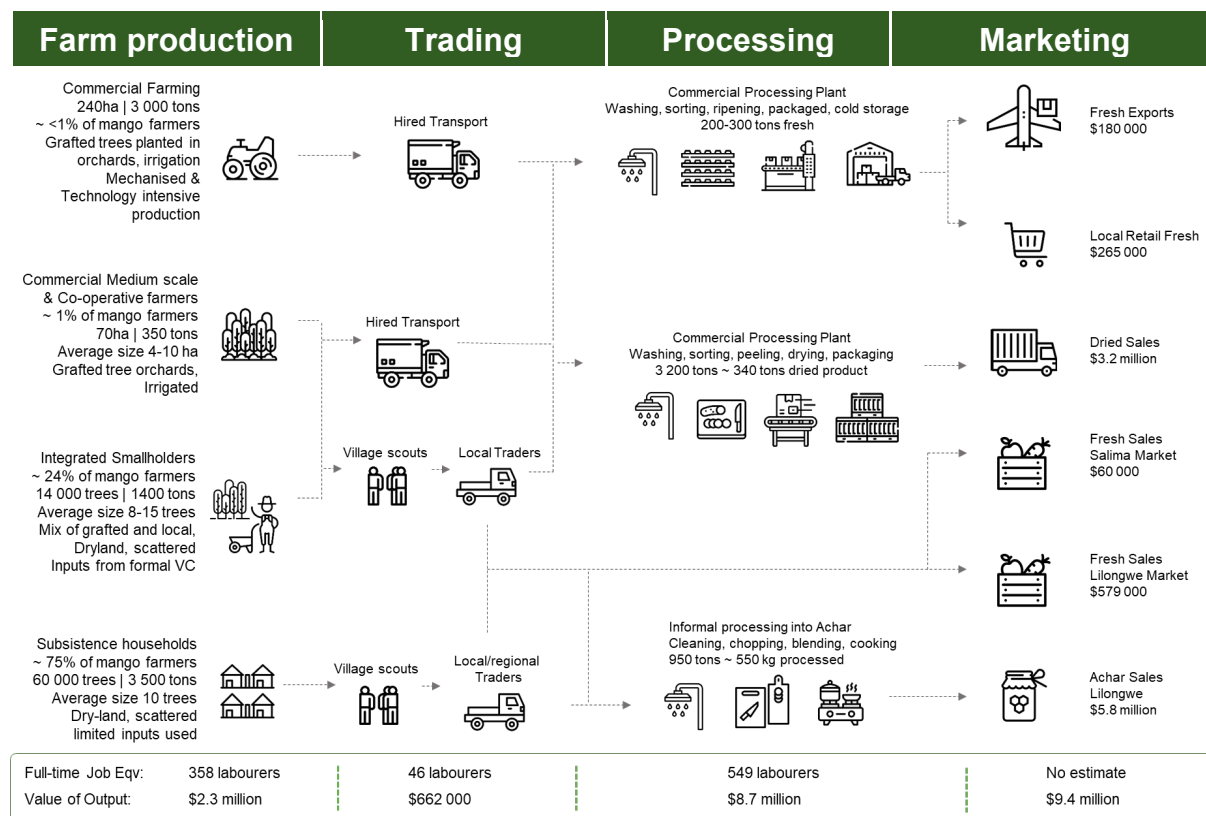
In contrast, in the modern stage of value chain transformation, the value chain spatially is relatively long, and the urban share of the population that is served by the value chain is high. Products such as mangoes, either in fresh or processed form, are produced far from the markets in which they are ultimately obtained by consumers, as retail markets and large processors interact directly with large logistics and wholesale firms transacting in a longer and more complex supply chain. That supply chain caters for a range of additional market outlets, such as the food service sector, fast-food chains, or enterprises that focus on product differentiation. For mangoes in Malawi, this translates to mango products being produced using processes that ensure quality standards are met to ensure food safety for consumers within the global market. The modern mango value chain is characterized by being capital-intensive and quite mechanized.

Mango value chain map: Current state

Figure 14 provides a schematic representation of the current mango value chain in Salima district. This value chain map was compiled using information from businesses, survey data from farmer visits, and cross-checking using official data from the Salima District Council. The mango value chain has elements of all three stages of value chain development, from traditional to transitional to modern.

Starting at the upper left, the modern mango value chain consists of several large-scale and fully commercialized farms with a combined volume of annual production of around 3,000 mt. This produce supplies the modern value chain's processing facility. Between 200 and 300 mt are supplied as fresh fruit to the export market or for local formal retail in Lilongwe. The remaining mangoes from the commercial farms, as well as those supplied by other mango farmers integrated into the modern value chain, are processed into around 340 mt of dried mango products, which either are exported or sold in regional retail stores. The annual total value of products from the modern value chain was estimated at around USD 3.7 million in 2021. The modern mango value chain in Salima district is characterized by its supply of products into international or formal domestic markets through modern value chain support services, including transport, packaging, and for other technical requirements, and a large marketing effort.

Figure 14: Diagram of Salima district mango value chain for 2021/22 season

Farm production	Trading	Processing	Marketing

Commercial Farming 240ha | 3 000 tons ~ <1% of mango farmers Grafted trees planted in orchards, irrigation Mechanised & Technology intensive production — *Hired Transport* → **Commercial Processing Plant** Washing, sorting, ripening, packaged, cold storage 200-300 tons fresh → Fresh Exports $180 000 / Local Retail Fresh $265 000

Commercial Medium scale & Co-operative farmers ~ 1% of mango farmers 70ha | 350 tons Average size 4-10 ha Grafted tree orchards, Irrigated — *Hired Transport* → **Commercial Processing Plant** Washing, sorting, peeling, drying, packaging 3 200 tons ~ 340 tons dried product → Dried Sales $3.2 million

Integrated Smallholders ~ 24% of mango farmers 14 000 trees | 1400 tons Average size 8-15 trees Mix of grafted and local, Dryland, scattered Inputs from formal VC — *Village scouts → Local Traders* → Fresh Sales Salima Market $60 000 / Fresh Sales Lilongwe Market $579 000

Subsistence households ~ 75% of mango farmers 60 000 trees | 3 500 tons Average size 10 trees Dry-land, scattered limited inputs used — *Village scouts → Local/regional Traders* → **Informal processing into Achar** Cleaning, chopping, blending, cooking 950 tons ~ 550 kg processed → Achar Sales Lilongwe $5.8 million

	Farm production	Trading	Processing	Marketing
Full-time Job Eqv:	358 labourers	46 labourers	549 labourers	No estimate
Value of Output:	$2.3 million	$662 000	$8.7 million	$9.4 million

Source: Authors' compilation

Product quality and safety are paramount in the modern mango value chain. Both the large commercial farms and the modern processing facility are subject to numerous audits and require globally recognized accreditation to gain access to lucrative export markets for the mango products they produce. On the farms, mangoes are planted in dedicated orchards with carefully selected varieties and irrigated with precision, utilizing some of the latest farm technologies. The nature of production is intensive in terms of the application of fertilizer and other agrochemicals, while labor needs to be trained in the skills required to maintain healthy and high-yielding trees. Labor-intensive technical activities, such as pruning, weeding, grafting, thinning, and propagation, all are part of the efforts to maintain the orchards, while pest monitoring and soil and leaf samples provide important insights for decision-making on the commercial farms.

The processing facility situated in Salima town is made up of offices for staff and administrative personnel to conduct activities related to marketing, finance, quality control, and administration, while the bulk of seasonal labor works on the factory floor where conveyer belts transport raw mangoes to be washed and delivered to sorting tables. At the peak of the mango harvest season, around 700 workers are busy sorting, peeling, and packing mangoes as they pass through the highly mechanized production process. With careful sorting, some mangoes end up in the ripening chamber to ensure optimal ripeness before being exported or further processed. Mangoes allocated to processing are peeled, sliced, and placed in drying ovens under controlled temperatures to ensure that the products meet pre-approved quality specifications. Once products are ready for market, they are transported in shipping containers to the particular market to which they have been consigned.

There are also other participants in the mango value chain in Salima, both those farming mangoes and those that contribute to trading and providing other services. Through a combination of outreach activities by the modern value chain actors, several medium-scale farms and cooperatives are now producing an estimated 350 mt of mangoes annually. We classify these as transitioning farmers since they are not yet fully commercialized but have several similarities to the large-scale farms. Their position and operations in the Salima district mango value chain are described in the second row of the diagram in Figure 14. The mango trees are planted in orchards and are irrigated through the use of drip irrigation powered by solar pumps, with the irrigation water distributed through gravity-fed lines from boreholes. The farms and cooperatives grow improved varieties but under a lower input use system than what is used on the large commercial farms. However, importantly, these farms and cooperatives have access to extension support and inputs through the modern value chain and most of these farming operations sell their mangoes into the formal market with the assistance of the modern value chain actors. The mangoes that originate from these farms are mostly destined for processing, though some might also be exported in fresh form. These farmers do not yet obtain yields close to those of the larger-scale farms that employ more intensive production practices. However, the farm sizes of these transitioning farmers are big by local standards at between 4 and 10 ha.

Our next group of producers, in the third row of Figure 14, are smallholder farmers in Salima's rural areas that have benefitted from an extensive outreach operation in which mango farmers were given the option of having improved varieties grafted onto their indigenous mango trees and to integrate their mango farming activities into the modern value chain. This effort has been ongoing since at least 2011. Since then, more than 50,000 trees were grafted, reaching around 5,000 smallholders in the process. However, due to tree loss as a result of damage from grazing animals and weak management of the trees, only around 14,000 trees are currently feeding into the formal value chain through this smallholder farmer-focused program. The average integrated farmer owns between 8 and 15 trees, although there is a large variation in tree numbers. We estimate that the total annual harvest from this group is around 1,400 mt, which is sold to the processing facility or sold to local traders and destined for the fresh wholesale market. Overall, the production of improved varieties by both the medium-scale farmers and the integrated smallholders is an example of how traditional value chain participants are pulled into the modern value chain, creating significant economic value.

Finally, and in contrast, there is also a fairly large number of subsistence farming households in Salima district that each own several local mango trees. The fruit these farmers produce is bought by traders and sold into the fresh wholesale market or through informal trade markets, such as alongside roads. These activities reflect the overarching traditional value chain that characterizes the bulk of Malawi's mango production. Trees are scattered across farmers' fields, with virtually no inputs provided to the trees. The trees are grown on dry land and not irrigated. Typically, these trees are between 30 and 50 years old, never pruned, and are difficult to harvest. The average subsistence mango-producing household owns 10 trees. The aggregate annual production of all the subsistence households is around 3,500 mt. Local and regional traders use scouts to assemble harvested mangoes for collection from these farmers, and prices are typically lower than in the modern value chain. Among the reasons for the lower price is the perishability of the local mango variety, so traders will offer a lower price for the fruit to compensate for this risk, and the strong bargaining power of traders,

since traditional farmers have few alternative markets in which to sell their mangoes and limited means to access them.

Despite the large differences between these traditional smallholder farmers growing mangoes and those integrated into the formal market, mango sales still make a significant impact on rural livelihoods. We found that both the integrated smallholders and subsistence households produce other crops, as well as livestock, so the income generated from mangoes is additional. However, the close to 100,000 farming households in the district that do not own any mango trees are excluded from the benefits of producing for the local mango value chain. We estimate the combined value of mango products from Salima district that reach consumer markets through the traditional value chain to be around USD 5.7 million annually. This large value is mainly due to the substantial value added created by the local achar market in which various other expensive raw materials (oil & spices) are combined in the final packaged product. Fresh sales in the informal market were estimated to be USD 648,000 in 2021.

At the bottom of the diagram in Figure 14 are estimates of the total economic output value and full-time jobs equivalents generated through the mango value chain when all activities are combined. Except for the products that are mostly moved out of the district (fresh informal sales and achar), the total economic output of all mango value chain activities was estimated at around USD 3.8 million and created around 548 full-time equivalent jobs, based on 310 working days in a year and 8-hour workday. Thus, the current state of the mango value chain is already making a significant economic impact in the district. Important to consider when assessing the full-time jobs created by the value chain is that we use actual wage rates that differ between the formal and informal value chains and between rural and urban locations. If one adds the entire wage bill from these mango value chain activities and rework the full-time equivalence using a minimum wage level of USD 2.00 per day, the total number of workers involved is equivalent to 1,863 full-time jobs.

Gross margins analysis

Having described the structure of the mango value chain in Salima district, we briefly discuss the nature of the economic activities that take place within each node of the value chain. We estimate typical gross margins for each group of mango producers, from large-scale commercial (modern) to medium commercial and smallholders (transitional), both of which are integrated into the modern segment of the value chain, and to subsistence households (traditional) that are not integrated into the formal value chain. The numbers provided in this section have been conservatively calculated based on surveys and data made available to the research team. Though we could not survey all farms in the region, we are confident that our margins accurately reflect the margins obtained by the average value chain participant.

Table 4 shows both the gross margins calculated per mt of mango produced (or processed) on a specific unit of operation and as a share of total turnover to reflect the differences in scale between the different value chain participants. Starting from the left:

Large-scale commercial farms realized a USD 1,114 margin per hectare by producing mangoes at 12 mt/ha, which leads to a USD 95 margin per mt delivered. Since these operations are highly intensive, the cost to produce is significantly higher than the other farms leading to a lower margin over turnover of 27 percent.

Table 4: Gross margins for Salima district mango value chain participants

Items	Commercial farming	Commercial medium scale	Integrated smallholder farmers	Subsistence households	Traders	Achar	Processing
Unit	ha	ha	15 trees	10 trees	10 mt	1.5 mt	1,000 mt
Income/Unit (USD)	4,200	1,250	300	120	1,530	13,819	1.13 million
Cost/Unit (USD)	3,056	234	65	11	1,155	10,608	1.05 million
Gross Margin (USD)	1,144	1,016	236	109	375	3,211	0.08 million
Yield (mt)	12	5	1.5	1.5	10	1.5	1,000
Margin/mt (USD)	95	203	157	73	38	2,140	85
Margin/turnover (USD)	0.272	0.813	0.785	0.908	0.245	0.230	0.075

Source: Authors' compilation

The medium-scale farms only manage to harvest around 5 mt/ha. Whereas the large-scale farm realizes a larger income on a hectare, the relative costs to produce of the medium-scale farmers are comparatively lower, which results in their receiving a gross margin similar to that of the large-scale farmer. However, on a per mt basis the gross margin for medium-scale farmers is much higher. Medium-scale farmers grow mangoes at an 80 percent turnover margin, which is a margin similar to that obtained by the integrated smallholder farmers and corresponds closely with the gross margin calculated by Nyirenda et al., (2019) for Malawian smallholders of 87 percent.

The scale of operation of the integrated smallholder farmers is significantly smaller than that of the medium-scale farmers, but their trees yield higher volumes since they are not pruned and allowed to grow much bigger, albeit at the cost of being more difficult to harvest. These farmers own around 15 trees on average which produce 1.5 mt in total. Integrated small-holder farmers spend much less on inputs than those farming improved varieties in larger or-chards, and the farmers mostly utilize family labor. Inputs, such as fertilizer or chemical appli-cation, are only used if really needed. If so, such applications are mostly supplied by the modern value chain's extension support, bringing down costs to the smallholder per unit of output. These integrated smallholders received around USD 157 margin per mt sold.

Subsistence households largely sell their local varieties of mangoes into the traditional infor-mal market in which prices are lower than for improved varieties in modern formal markets. Their margins are somewhat squeezed by traders needing to make up their own margins to provide their trading services. This is an important characteristic of the traditional mango value chain for most rural subsistence farmers in that they do not have the means to transport produce in large volumes, which suggests that traders play a significant role in moving mangoes to market. This does however come at an additional cost, either through direct payment, but mostly through lower prices offered to farmers. Subsistence households harvest around 1.5 mt from an average of 10 trees per household with costs only including harvesting. The local variety sold gives around USD 73 to the household for each mt, but still realizes among the mango farming groups the largest margin over turnover of 91 percent.

Traders in the Salima area typically work on a ten-mt unit basis for buying and transporting mangoes from source to market using small trucks. In the traditional value chain, traders buy

and take ownership of the mangoes, which comes with risk. The modern value chain is different in that transport is procured as a separate service, in which case ownership is not transferred. Traders use a business model in which mangoes are bought in rural areas at competitive prices, which is their largest cost item, and they in turn organize transport, labor, and fuel to deliver mangoes to wholesale and regional markets. With a margin per mt of USD 38, the trader needs to sell the perishable fresh product at a higher price to both realize some profit after spending around USD 115 per mt to trade and to realize a 25 percent margin over income.

Mangoes sold by subsistence households through the traditional value chain channel ultimately reach the market as fresh sales—approximately 75 percent of volume—or enter the achar processing market—25 percent of volume. Achar processors operate in a semi-formal (transitional) and informal (traditional) market producing packaged products in which sliced mangoes are blended in a mixture of spices, oil, and other raw materials into the final retail product for consumption. The high margin per mt of USD 2,140 is due to the large value-added costs of labor, transport, buying mangoes from traders, other raw materials, electricity for cooking, and packaging, relative to mangoes being sold as fresh. Achar processors, therefore, generally have a smaller margin over turnover, but a large margin per unit of mangoes utilized.

Finally, as raw mangoes from the modern and transitional farmers reach the urban value chain processor, this step activates by far the largest value of income due to the scale of operation. The intensive use of goods and services in exporting and drying mangoes for local and international retailers increases the price of the final products substantially, similar to the achar example. Producing dried and exported products requires large amounts of fixed capital, including buildings, equipment, machines, and electricity, coupled with intensive use of labor and other inputs. The modern processor has the lowest margin over turnover at under 8 percent, but still manages to return USD 85 for every mt of raw mango processed. The multiplication of value-added from the farmgate to when the mango product is dispatched from the processing facility is significant, adding around 2.9 times the value of the original mango by drying or exporting into the modern value chain. The processors buy mangoes from farms and spend money on inputs, such as labor, packaging, electricity, marketing, extension, technical support, and transport, which totals roughly USD 1.05 million per 1,000 mt of raw mangoes processed. The income generated from sales of those processed mangoes is USD 1.13 million. It is important to recognize that the type of labor utilized in such operations is typically higher skilled than labor employed on farms, which means that labor costs in the urban factory are also significantly higher, on average, compared to rural areas.

First round development impacts

In the previous section, we discussed the main economic activities of different participants in the mango value chain in Salima district. We broadly group each value chain actor into either modern, transitional, or traditional according to the definition used by Reardon et al. (2022), although they are technically part of the same value chain. Documenting the gross margins and detailing how mangoes flow through the different segments of the value chain from farm to consumer allows us to assess the first stage economic impact of mango production, processing, and sales, which is simply how the value added gets distributed to workers, farmers, and firms. This will allow us to establish the developmental impact of the mango value chain,

per actor within it, which is crucial in any assessment of whether the value chain can lead to inclusive development and anchor secondary city advancement.

We are interested in understanding the relative importance of the mango value chain in the economy of Salima district. Lacking district-level GDP indicators, one interesting metric is to assess its importance compared to the total consumption of households within the district, a metric we can calculate from the IHS.

In Table 5 we summarize consumption indicators for Salima district using the IHS5 dataset (NSO 2020). Total household consumption includes consumption from any source—be it purchases, home production, or transfers—adjusted to reflect expenditure in US dollars in 2021 prices to align with our value chain assessment. Measured through such a household consumption lens, we value the Salima district economy at USD 123 million, reflecting the total value of what households in the district consumed.[2] Around 81 percent of total consumption is from rural households, who make up 91 percent of the population, while the 9 percent of the population in urban households account for 19 percent of total consumption. Urban households consume, on average, USD 2,245 per annum compared to USD 1,040 for rural households.

Table 5: Salima district population and total expenditure estimates, 2021

	Rural	Urban	Total
Salima Population			
People	433,400	43,100	476,500
Households	95,500	10,100	105,600
Salima Economy			
Annual Consumption, all households, USD million	99.3	23.7	123.0
Annual Consumption per household, USD	1,040	2,245	1,156
Annual Consumption per capita, USD	229	526	256

Source: NSO, 2020; GoM, 2021

The 2019/20 IHS data shows around 4,000 households farm mangoes in Salima—3.6 percent of all households at the time of the survey. Through our assessment of the mango value chain, we suspect that the actual number of mango farming households in 2021 was likely double that at around 8,000. We estimate conservatively the total volume of mango production of all farms (smallholder and commercial) to be around 8 000 mt of marketable produce.

In an attempt to calculate and better describe the channels through which the wider mango value chain benefits the Salima district, we use elements of the national accounting framework used to measure economic output for a country. In estimating the value added (VA) per industry or subsector, the aggregate net income flows due to a certain economic activity can be calculated as the gross income minus intermediate expenditure. This calculation then allows for assessing the channel through which activities generate income, either as gross op-

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[2] Household consumption is an important component of GDP, but not the only one. The expenditure approach to measuring GDP would add expenditures by households, businesses, and government together with net exports to arrive at a final figure that measures the size of the district's economy.

erating surplus (profits for businesses and farmers, which we will refer to from this point forward as net earnings), or wage income to workers that provide labor in the VA process (SNA 2009).

The last column of Table 6 shows total VA in the mango value chain is around USD 2.6 million. This is only counting VA taking place within Salima district, not outside its borders. The contribution of the modern value chain to that total is significant. Without the modern mango value chain and the transitional one with the medium-scale and integrated smallholders it pulls in, total VA for Salima/Chipoka would drop by around USD 1.9 million, lowering the number of jobs, wages paid, and farm and firm income earned across Salima.

Table 6: Contribution to rural and urban value added (VA), US dollars, 2021

Value chain (VC) segment	Wage Bill		Net Earnings		
	Rural	Urban	Rural	Urban	Total
Modern	310,000	648,770	285,760	223,790	1,468,330
Transitional	12,600	154,530	245,650	53,310	466,090
Traditional	14,080	15,200	240,460	406,370	676,110
Total	336,680	818,500	771,870	683,470	2,610,530

Source: Authors' compilation

Two further levels of disaggregation provided by Table 6 are to split total VA into (i) what accrues to the urban and rural areas, and (ii) what goes through net earnings received by farmers and firms on the one hand and the people they employ on the other hand. We see a fairly even distribution between net earnings for farmers and businesses (56 percent) and wages for those employed by them (44 percent). The total VA of USD 2.6 million represents around 2 percent of total annual household consumption for all households in the district, but a much larger share for the 8,000 farms and firms and 548 workers directly involved in the value chain.

**Figure 15: Value added in the Salima mango value chain, by source**
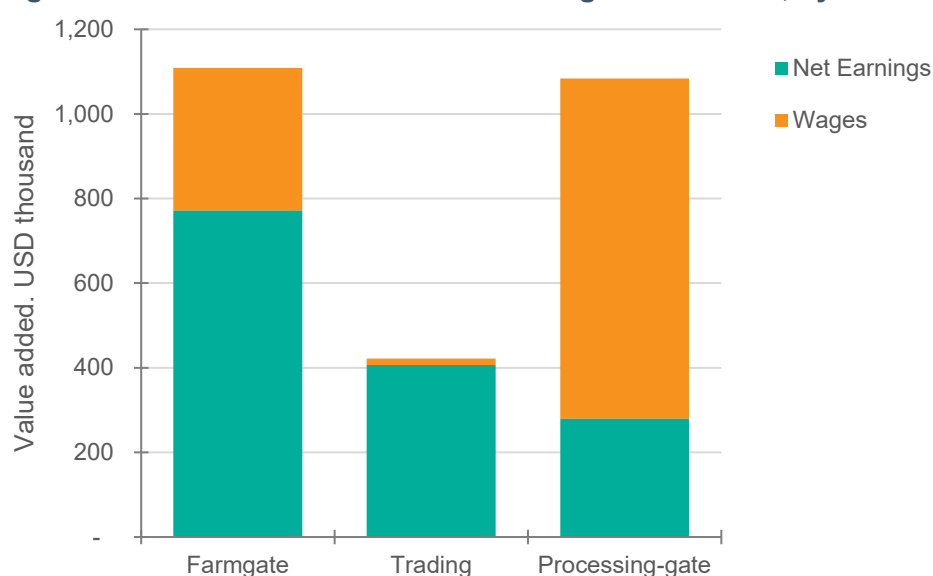
Source: Authors' compilation

Figure 15 gives another illustration of how the benefits of the mango value chain are spread. VA at the farmgate is split between farmer earnings and wages of people they employ, which flows directly into the rural economy. Local traders spend less on wages and most VA accrues to the trader him or herself as net earnings. At the processing level, about four out of every five dollars of additional VA will flow into the economy as wages, presumably much of it spent in urban areas. The remainder will be net income for processing firms. We can conclude that the bulk of the USD 2.6 million in VA is spread quite widely among a large pool of participants in the mango value chain, providing a solid basis for broad-based and inclusive development.

Figure 16 provides an estimate of the VA per mt between the different value chain channels.[3] We find that the modern value chain has the strongest linkages to both rural and urban wages, in addition to providing net farm and firm earnings. The figure tells us that for every additional mt of mango that can be produced and sold through the modern value chain, around USD 474 of VA is generated and the four sections in the bar tell us how those USD 474 are distributed across wages and firm/farm net earnings in rural and urban areas. Urban wages are the biggest share of the total, reflecting the substantial contribution of the processing facility located in Salima town. Important for rural transformation is that the modern value chain has by far the largest rural wage component due to the large volumes of fruit that need to be harvested because of the high yields on the large-scale commercial farms, along with all other technical and labor-intensive tasks, such as pruning, weeding, and trellising, needed to meet the quality standards required for international retail markets.

Figure 16: Value added different mango value chain channels, USD/mt
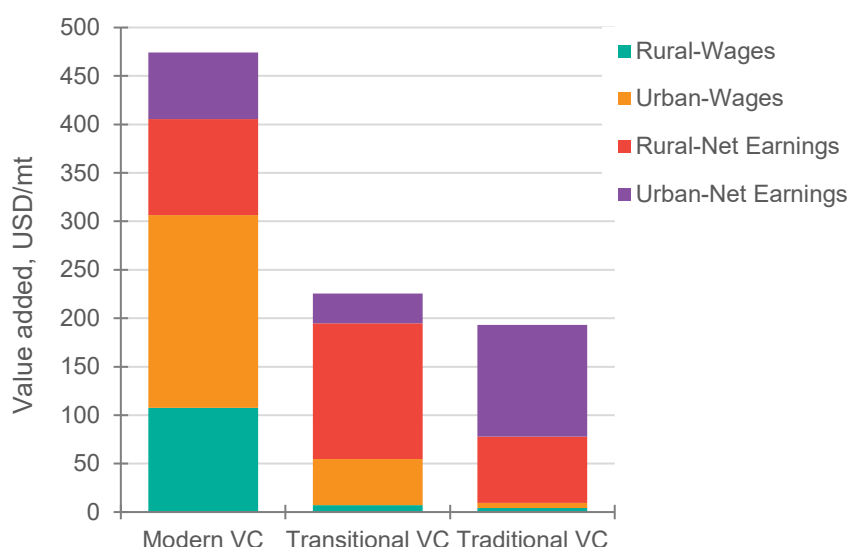
Source: Authors' compilation

For every additional mt of mango passing through the transitional value chain channel, an estimated USD 225 of VA is generated. The transitional value chain is made up of medium and smallholder mango producers who are integrated with the modern processing facility. The largest share of this VA per mt accrues to the mango-farming households themselves.

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[3] Some fixed costs, such as full-time labor, might not scale proportionally to tonnage, especially in the modern value chain where the existing processing facility still has substantial capacity to scale output before needing additional investment.

Because these households do not tend to hire rural laborers for their mango farming, the effect on rural wages is negligible.[4] These transitional farmers are integrated into the modern one as outgrowers, emphasizing the ability of the modern value chain to pull in smaller-scale farmers.

The traditional value chain has the lowest impact on creating additional economic VA since activities are less labor intensive and the largest share of gross surplus per mt of output flows to traders based in urban areas. This does not imply, however, that the activities of the traditional value chain are not important. Indeed, any additional VA is income that will benefit the household in question and some part of that will be spent in the Salima district economy. Overall, the results indicate additional volumes of mango produced through the modern value chain, and to some extent through the transitional one which depends on it, have the largest potential to boost inclusive development.

Figure 17 focuses on job creation using three metrics: total full-time equivalents (FTE) employed, FTE employed per mt, and headcount of employed people at peak. Regarding the latter, since mango production is highly seasonal with harvests concentrated between November and January, many workers are only employed during the peak period. The FTE measure would scale this proportional to full-time work. For example, someone who works for 3 months in the year would count toward 0.25 FTE. FTE is useful as a standard and comparable method of measuring employment. The headcount of people employed at peak is a better indication of how many off-farm livelihoods are impacted.

Figure 17: Employment impact of mangoes through different value chain channels
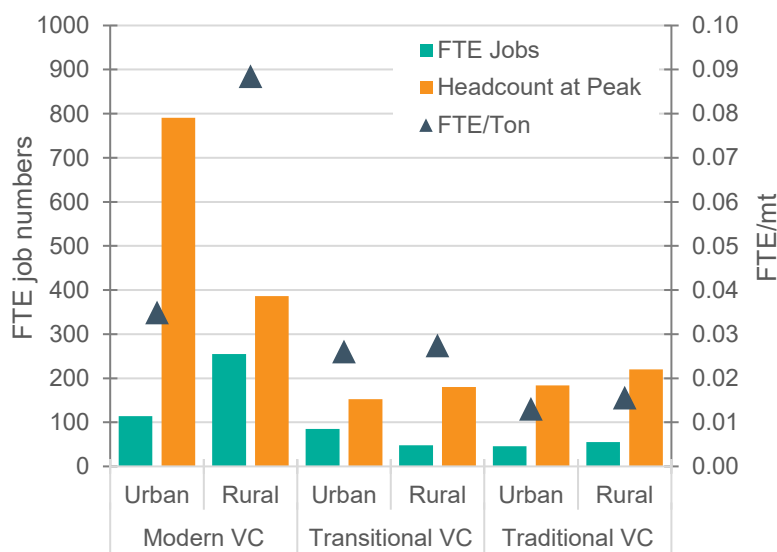
Source: Authors' compilation
FTE = "full-time equivalents"

A striking feature of Figure 17 is that, compared to the modern and transitional value chain, which creates 522 FTE jobs off the own farm, the traditional informal value chains create only 100 off-farm jobs. Own and family labor is used instead of paid workers on non-modern farms, and, in the case of the traditional value chain, no labor is required for processing. Im-

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[4] As will be noted below, their increased incomes can generate rural off-farm opportunities through a second-round effect of increased demand for local goods and services. Here we consider only first-round effects.

portant for rural transformation is the large number of jobs created in rural areas in the modern value chain. While the headcount at peak is higher in urban areas, the FTE job count is higher in rural areas, currently contributing around 255 jobs there. This points to the strong seasonality of urban job creation, linked to the need to process mangoes in a short period. Sourcing mangoes from other parts of the country, where they ripen at different times, or expanding the factory facilities to other horticultural products, could help create a longer window of full-scale operation and employment in the factory.

The triangles in Figure 17 represent FTE generated on a per-mt basis (values are read on the right axis). Every mt passing through the modern value chain creates 0.09 rural FTE, compared to 0.03 and 0.02 rural FTEs in the transitional and traditional value chains, respectively, and 0.03 urban FTE, compared to 0.03 and 0.01 urban FTEs in the transitional and traditional value chains, respectively. This implies that a continued movement of the mango value chain from traditional to transitional will have positive impacts on rural and urban off-farm livelihoods, but that the largest impact will likely come from the modern value chain with fully commercialized farmers. Such farms require more people per unit of output in rural areas and the higher output translates into growing urban employment opportunities. That said, expanding the number of households producing any mangoes or fruits, even in the traditional value chain, can make a substantial impact on non-fruit farming households. That expansion could happen on land that is less suitable for crop production and therefore not come at the expense of growing food crops.

Upgrading the value chain: 2030 scenarios

Figure 18 looks ahead to 2030 and shows the likely impact of growth in the mango value chain on jobs, wages, and farm and firm earnings in traditional, transitional, and modern parts of the value chain. It contrasts value added in the 2021 state of the value chain to 2023 projections from the partial equilibrium model. Stronger growth is anticipated in the formal mango value chain in Malawi, leading to strong growth in both the modern and transitional value chains. The combined total growth in VA from all value chain participants in Salima districts is estimated to reach USD 826,000 in 2030, bringing the total contribution to Salima's economy to USD 3.4 million. The contribution would be higher if we were to account for what gets processed into achar and the retail trade taking place outside the district.

Figure 18: Value added growth under baseline projection toward 2030 in the Salima mango value chain
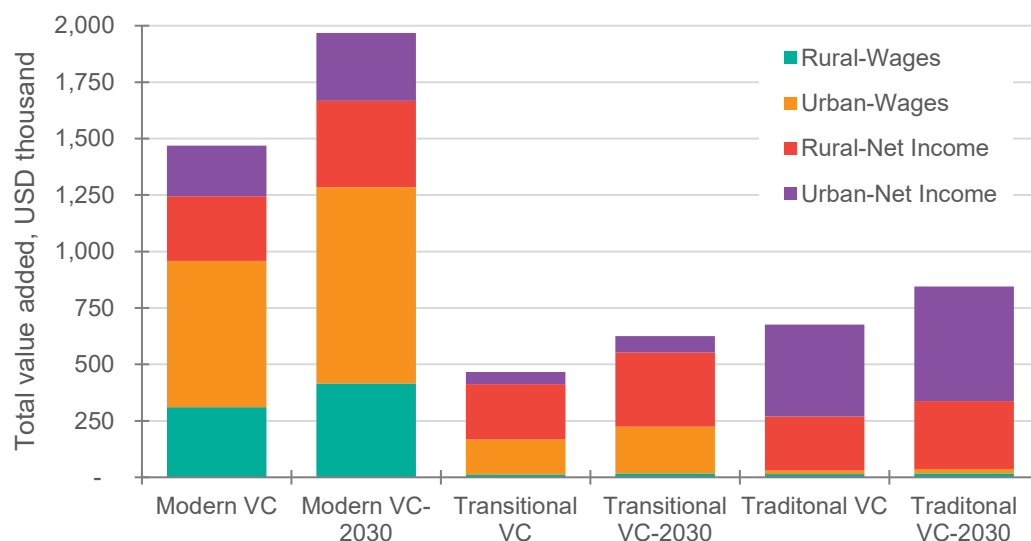
Source: Authors' compilation

Figure 19 shows growth under the baseline projections. We anticipate an additional 2,454 mt annually will move through the various Salima-specific parts of the mango value chain under baseline projections between 2023 and 2030. The number of FTE jobs created will go from 623 to 825 over this period, with 86 additional urban FTEs and 117 rural FTEs created.

Figure 19: Growth in production, jobs, and value added under baseline projection through 2030 in the Salima mango value chain

Source: Authors' compilation

Using Figure 19 as a baseline trajectory, we introduce three potential policy and investment levers to accelerate the growth of the modern mango value chain. The impact of these interventions is then carefully calculated as additional volumes enter the market through the different market channels. We consider the following interventions:

1) Improved export market access: The Government of Malawi negotiates improved market access to India, which sees the current tariff lowered from 25 percent to 10 percent of the CIF value of exports. We assume this market opens up from the 2024 season onwards.

2) Expanded production: A farm-level investment by a private sector firm or donors to establish more integrated medium-scale commercial farmers results in a 200-ha expansion in the mango area of the district. This allows better seasonal timing of production, leading to more processing capacity and higher prices.

3) Improved yields: Implement a targeted extension program that focuses exclusively on yield improvements for existing mango farmers through better protecting trees from animal damage and providing technical advice on pruning, fertilizer application, and reducing post-harvest losses.

Our partial equilibrium model is a national model but captures well output and processing in the modern value chain. The balancing of supply and demand with market forces often results in short-term trade-offs (e.g., higher exports mean less processing) and some interventions take time before responses are seen over the outlook years. We analyze these shocks from the already simulated outlook, which in this case already projects growth in the mango value chain over the next ten years. For instance, additional trees planted in the past two years will inevitably result in growing production, regardless of any policy or investment shock. Our objective with these scenarios is to assess the additional economic impact on rural and urban areas of Salima district. We assume that any additional benefit, whether wages or net earnings, will be distributed proportionally to how it is distributed in the current state.

Scenario 1: Improved access to India's mango market

The impact of improved market access to India results in an increase in price relative to other export markets from 2024 when the new market opens. Exported mangoes are mainly two varieties, Alphonso and Tommy—part of the production of the latter comes from integrated smallholders. Sizable additional fresh exports of 970 mt would result from the intervention (Figure 20). Since the new market opening results in better returns per unit delivered, there is some substitution between supplying the existing South African market and providing exports to India, where prices are now more competitive due to the tariff reduction. A larger share of fresh exports relative to dried exports results in higher returns to farmers, both the large-scale and medium-scale transitional farms, although the bulk (75 percent) of additional fresh exports originate from the former. The entire additional 1,815 mt will pass through the modern processing facility, boosting urban jobs as well, with supply-side responses to this new opportunity also resulting in additional processing toward the end of the outlook.

The aggregate impact of this intervention for Salima district is estimated at an additional VA from the mango value chain of USD 745,800, which result in the creation of 74 full-time equivalent jobs per annum. This takes place through the following mechanisms in the mango value chain:

Figure 20: Scenario 1 on improved access to India's mango market—main deviation from the baseline scenario and economic impact
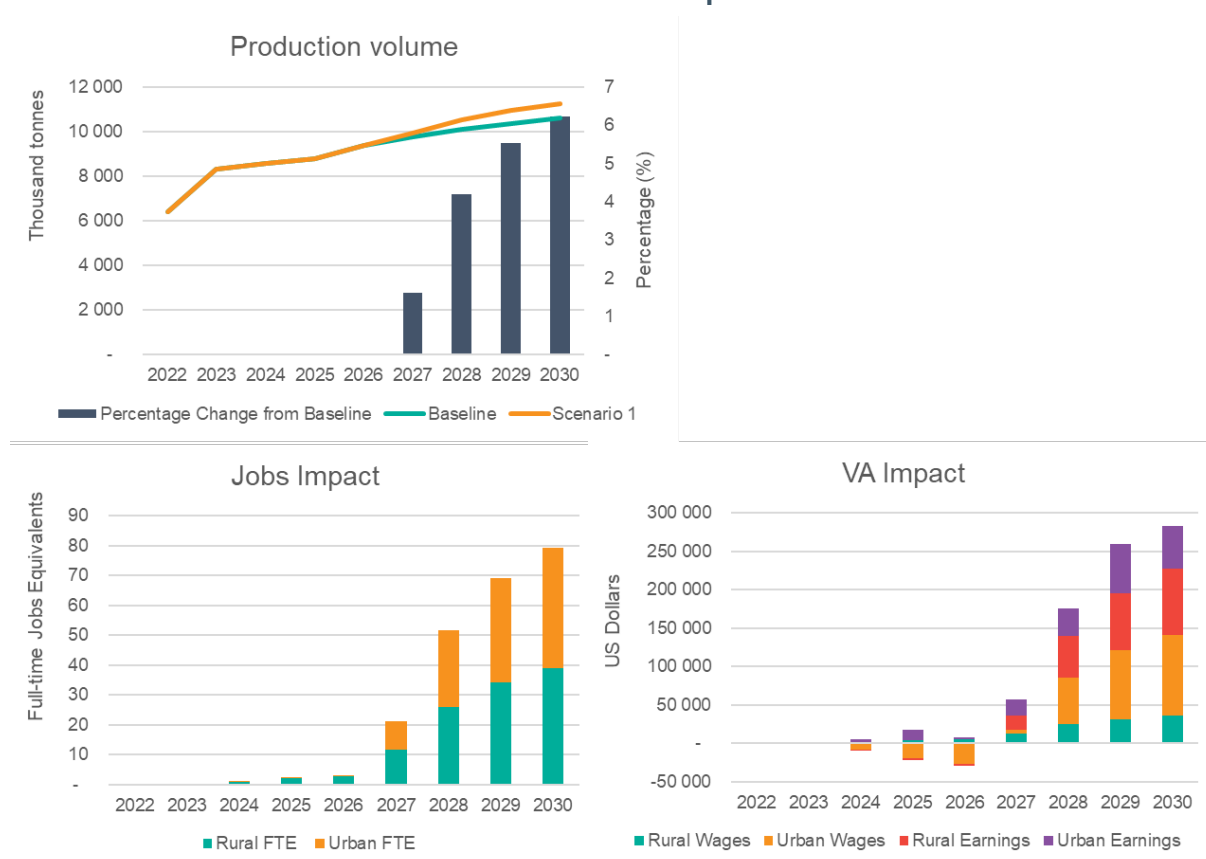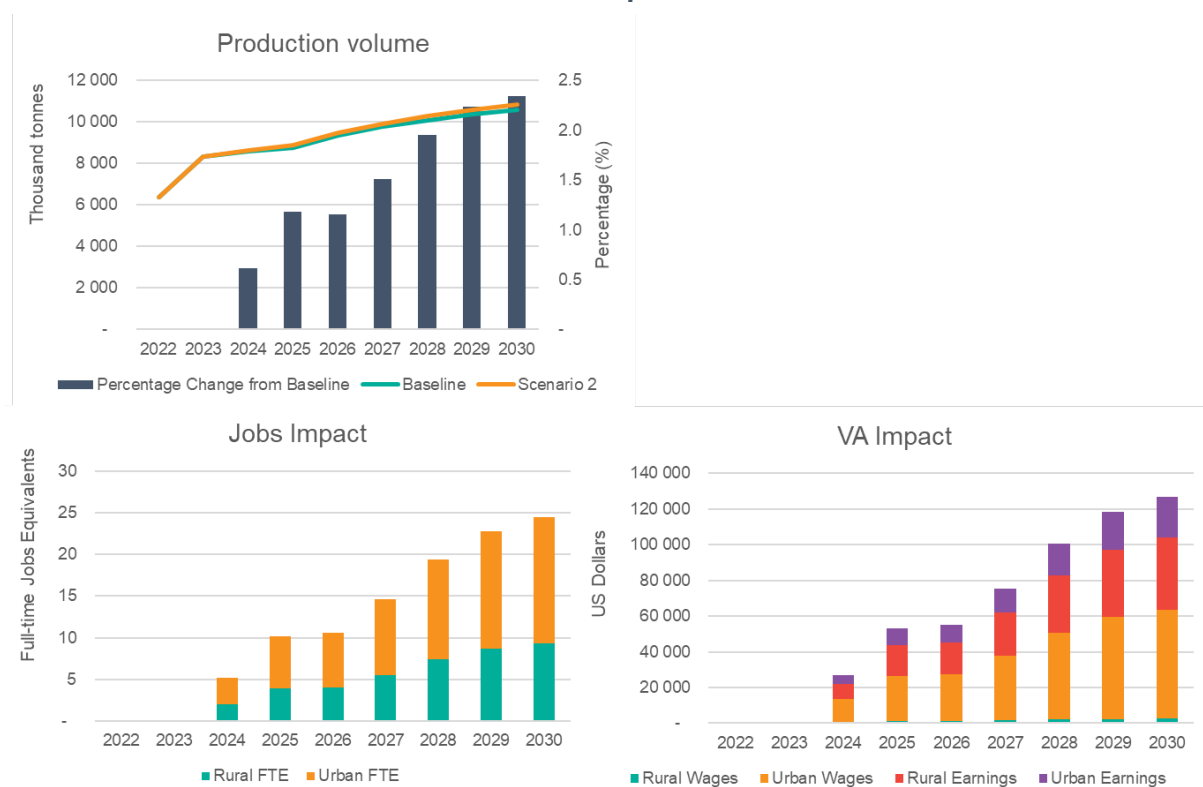

Source: Authors' compilation

- Exporting more fresh mangoes results in more labor requirements on the rural large-scale farms and the medium-scale transitional farms to improve quality and ensure export readiness. This is done by doing more treatments on the fruit to prevent sunburn and by using inputs more intensively. Total rural wages in Salima District increase by USD 115,00, resulting in 34 full-time equivalent jobs created, mainly on the modern commercial farms.

- The combination of higher export prices and larger throughput at the urban factory boosts total net urban earnings by USD 195,000, but also results in increased wages (USD 207,311) with an additional 40 laborers being employed to process more dried products every year. The impact on urban wages is slightly more subdued than would be the case if larger volumes were processed into dried, yet the addition of 842 mt of raw mangoes moved to dried and a 50 percent share of export volumes increases the amount of factory labor needed in urban areas.

- The additional export volumes to India trigger a larger than usual share of transitional farmers' output toward exports, which in turn results in a higher farm-gate price for mangoes delivered into the modern value chain. Net farm earnings improve by USD 227,000 over the baseline period from current levels, boosting net farm income to integrated farmers.

Scenario 2: 200-hectare expansion in area planted to mango

The investment under this scenario is mainly a production-side impact in which the newly established 200 hectares of mango start to bear fruit from 2024 onwards, scaled up as the trees reach full bearing age within four years. Over the outlook, an additional 1,088 mt enter the market that would otherwise not have been added without the new investment in integrated farmers (Figure 21). The bulk of the new volumes are dedicated to dried products, since establishing new transition farmers and receiving the required accreditation takes time to materialize. The other market impact of being able to better utilize existing processing capacity and, more importantly, to be able to enter the market earlier also has a slight impact on prices (+7 percent) at the farmgate and for dried exports.

Figure 21: Scenario 2 on 200 hectare expansion in mango area—main deviation from the baseline scenario and economic impact
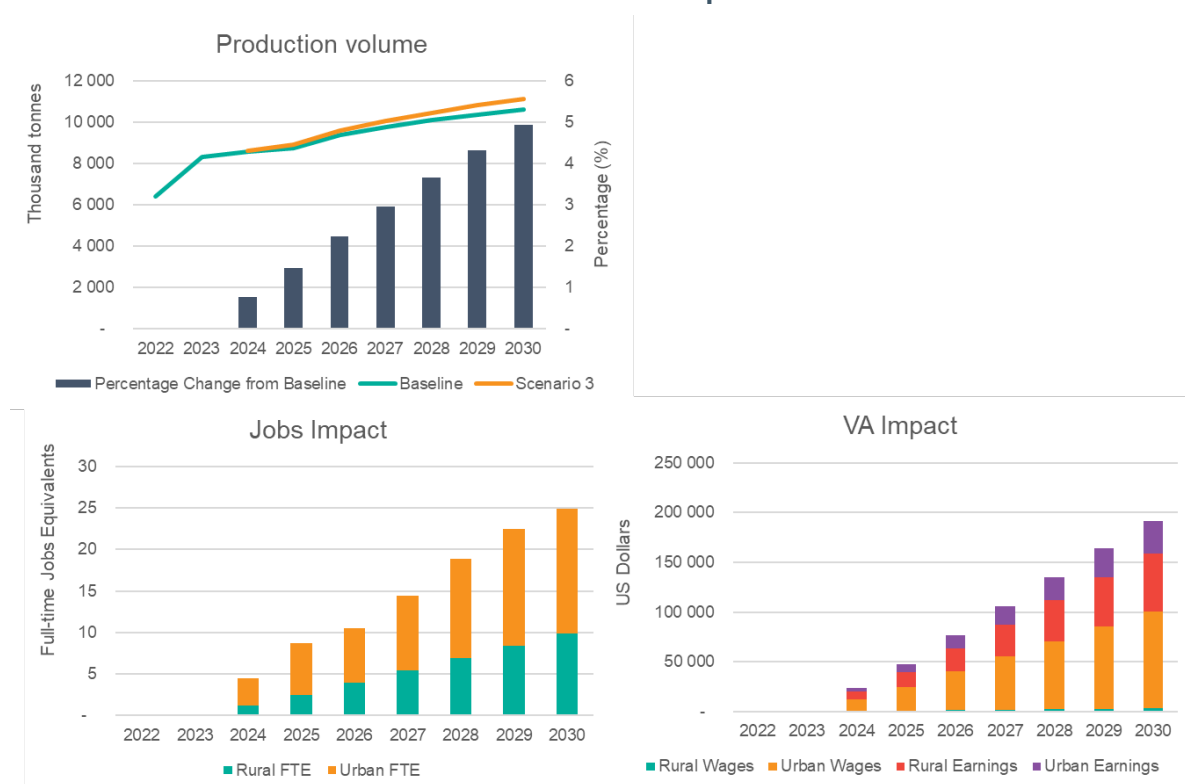

Source: Authors' compilation

- The aggregate impact on Salima district of this expansion in the area planted to mango is such that an additional VA of USD 556,000 flows into the economy over the outlook period, leading to around 24 full-time equivalent jobs being created.
- An additional 120 mt of dried mangoes are processed by the modern processor, leading to additional urban wages of USD 267,000 and more net earnings of USD 98,900 to the processor.
- Newly established medium-scale farmers in rural areas get USD 178,000 of additional net farm income, while employment in rural areas increase by 9 people employed full-time. The ability to better time markets results in a better price for the dried produce, for which the benefit is shared between higher prices at the farm gate and higher prices on the factory floor.
- Establishing integrated medium-scale farmers results in more consolidation of land.

Scenario 3: Extension program to improve yields of current mango farmers

Introducing an extension support program to enhance farm-level productivity results in a yield improvement for the integrated transitional mango farmers of around 15 percent gain in 2030 (Figure 22). This implies that, even without any investment or market lever, rural livelihoods can be significantly enhanced if farmers can transition to obtaining higher yields. The result-ant additional 2,036 mt from integrated farmers all flow into the modern value chain. We assume price levels stay consistent despite the increase in volumes. The models suggest that the bulk of this increased volume will be diverted into the drying market for sale through the modern value chain, but is expected to boost fresh and dried exports over the baseline.

Figure 22: Scenario 3 on improved yields of current mango farmers—main deviation from the baseline scenario and economic impact

Source: Authors' compilation

- Total value addition increases by USD 744,000 and another 34 full-time jobs are created in the process.
- Farmers receive an additional USD 225,000 return for their farming activities, while paying wages of around USD 13,489 in rural areas.
- Additional processing volumes result in a USD 376,000 increase in urban wages, while the net benefit of more sales results in a USD 129,000 boost in net income. This again highlights that productivity interventions on farms have a spillover impact on urban job creation in Salima, in this case leading to around 34 more employment opportunities.

Second round development impacts

Local multiplier effects

When farm incomes of rural smallholders are raised and when wages are paid out to rural or urban workers, then at least some of that income gets spent locally, creating what is called the multiplier effect. The literature puts such multiplier effects, typically, at around 1.6 to 2.5, which means that every additional dollar in the pockets of households creates a total of between USD 1.60 and USD 2.50 of economic output for the whole economy.[5] As most of this effect happens through the insertion of additional demand in the economic system when incomes go up, the exact size of the multiplier depends largely on what households spend their money on and whether this expenditure is within or outside the district.

Figure 23 provides a perspective on what different income groups spend their resources on. We divide all households into expenditure decile (ED1-10) groups according to their annual spending and show the allocation of their expenditure to various types of final goods and services. The food share in total household expenditures is higher than 60 percent for all deciles, except the highest. Much of that food will likely be supplied from within the district. Other goods and services, like housing, transport, and furnishings, may also have important local components, while expenditures on, say, communications, may largely flow out of the district.

Figure 23: Distribution of expenditure on goods and services of Salima district households, by expenditure decile
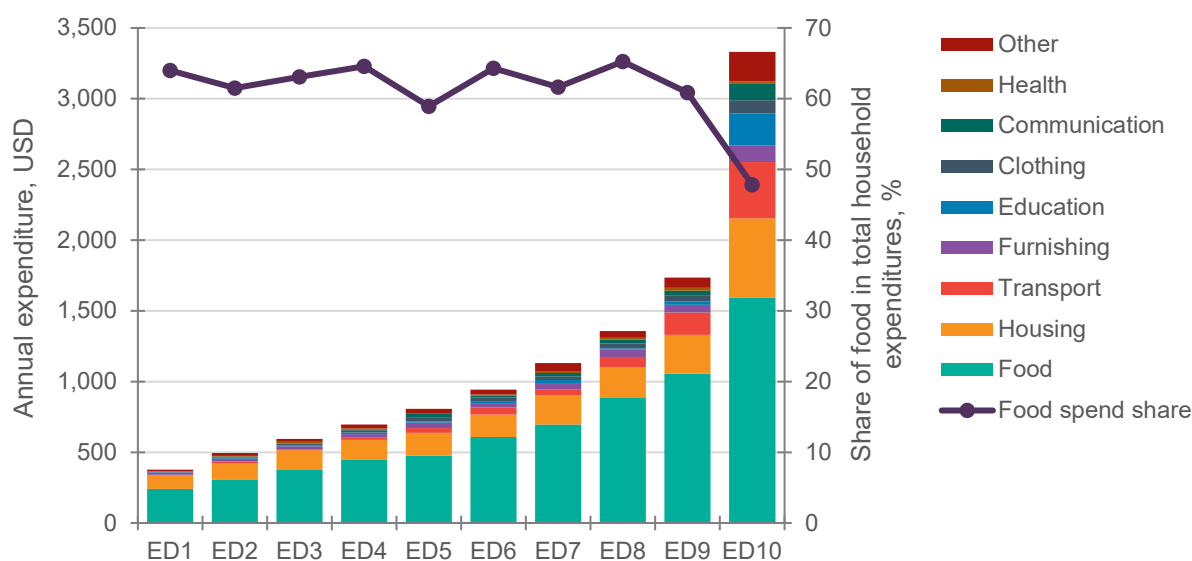
Source: Authors' compilation
ED = "expenditure decile"

Without dedicated survey work, it is hard to quantify precisely what the multiplier for Salima district will be. If the share spent locally is 40 percent, then the multiplier would be 1.7, while

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[5] Thome et al. (2013) and Egger et al. (2022) provide these numbers, respectively, for the Kenya context. How well this conforms to the situation in Malawi is not known and should be the subject of future research. Mularidharan et al. (2023) give an example from a public works program in India.

if 60 percent remains it would be 2.5.[6] Looking at the expenditure patterns in Figure 23, it may well be higher, but we bracket the potential multiplier between 1.7 to 2.5. Using the numbers from Table 6, we assume that all wages and all firm and farm profits from the transitional and modern value chain enter the local economy, while the firm profits from the modern value chain exit. That means that a little over USD 2 million is spent in the local economy, which through the multiplier effect would generate a total of between USD 3.7 million and USD 5.0 million local economic impact. This impact represents 3 to 4 percent of total household consumption in the district.

The Salima and Chipoka cluster as a multi-modal fruit hub

The other second round effect relates to the economic effects of the Salima and Chipoka cluster developing as a secondary city built on a flourishing value chain, benefiting from the kind of agglomeration economies that were discussed at the beginning of the report. By way of a model to which the Salima and Chipoka cluster might aspire, we describe the case of the town of Paarl in South Africa, which has a well-developed economy centered on fruit production.

Paarl is a secondary town located in South Africa's Western Cape province and is home to around 285,000 people. The fruit value chain dates back to around 1690 when French Huguenots established vineyards alongside the Berg River on which Paarl is situated. Fruit production has since been scaled up to include many different fruit types, such as apples, pears, table grapes, and nuts, to name a few. In most ways, the fruit value chain can be characterized as modern in that fruit and other produce are farmed on a relatively large scale—farms of between 25 and 150 ha—and involves the intensive use of a large number of inputs from urban areas. The bulk of the produce is exported fresh through Cape Town port, which is 60 km away. Fruit producers rely on many businesses located in Paarl to handle the supply of inputs, technical services, and marketing logistics.

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[6] If s is the share spent locally, then inserting one unit of income in the community gives $1 + s$ after it has circulated once, $1 + s + s^2$ after it circulates twice. If it keeps circulating, $1 + s + s^2 + s^3 + s^4 + \ldots$ and so forth into perpetuity, with the share added ultimately becoming infinitesimally small. A mathematical solution to this series is: $1 + s + s^2 + s^3 + s^4 + \ldots = 1 / (1 - s)$.

Figure 24: Map of Paarl in South Africa indicating fruit value chain activities
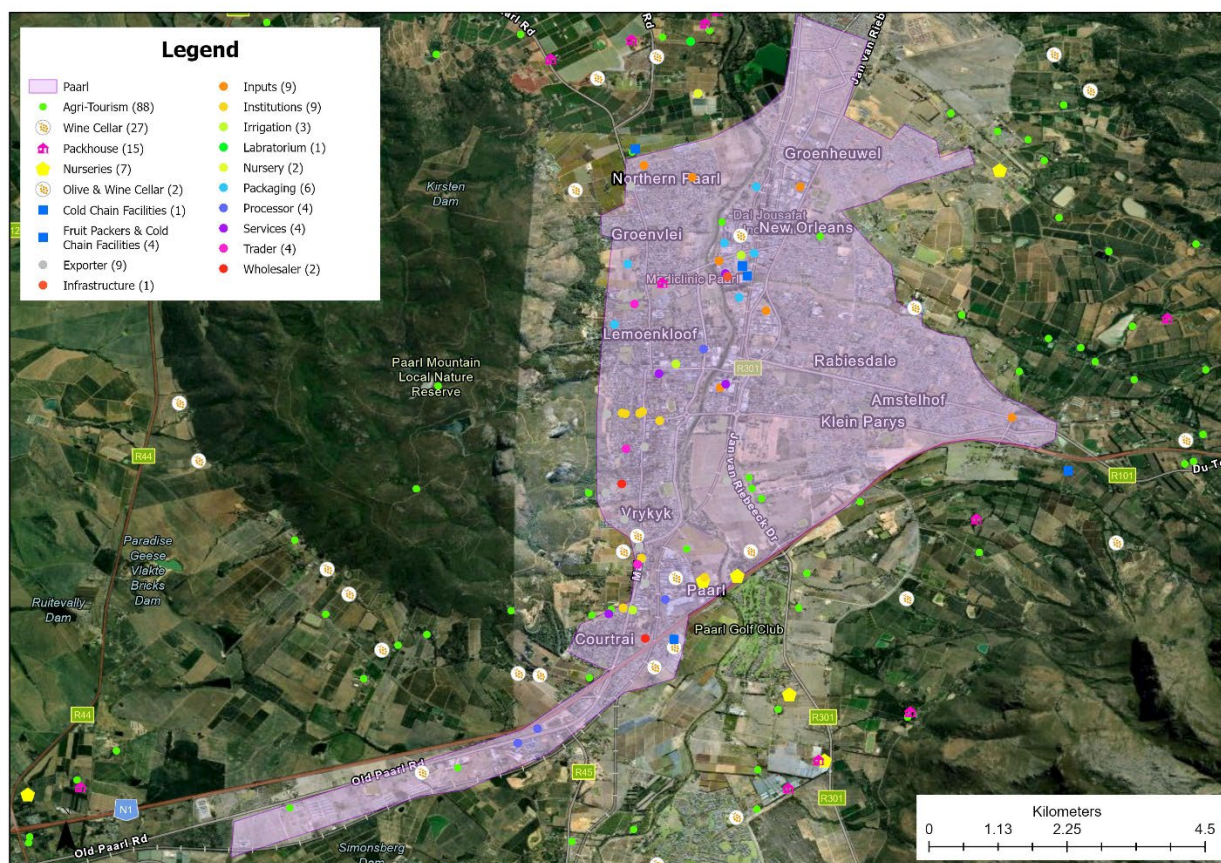
Source: Authors' compilation

Figure 24 maps the urban boundaries of Paarl and the locations of most businesses related to the fruit value chain, including producer associations, many of which have located their head offices in Paarl. The green dots are the locations of agri-tourism-related firms, which include many fruit producers. Other dots represent the locations of fruit processing or packaging facilities, fruit marketing and trading firms, and other fruit-sector-related institutions in and around this urban area.

CONCLUDING REMARKS

This report focused on the mango value chain in Salima district centered around the Salima/Chipoka urban cluster to give a practical example of a more general point: that anchoring secondary city development in market-led, modernizing value chains can have the kind of development benefits Malawi needs. It can generate more value added, generate more jobs away from the family farm, and spur agglomeration economies if an urban hub serves the value chain.

We find strong linkages to both urban and rural areas already present in an emerging mango value chain based in Salima district, which, if scaled further, can make a major contribution to economic development. Our analysis supports the notion that growth in agriculture in the form of mango production enables broad-based growth and has strong poverty reduction effects by both boosting opportunities for wage income and creating opportunities for Malawian farmers to generate earnings from their farming activities. The transition from traditional to

transitional and, finally, to modern value chains creates large benefits to farmers, off-farm workers, and both the rural and the urban economies of the district. It also supports an important move toward the consolidation of farmland into larger units with the ability to generate sustainable livelihoods as we move closer to the Malawi 2063 target year. Fruit value chains, such as mangoes, which have strong off-farm linkages, if built on market-led forces and competitiveness considerations, can help drive the goal expressed in the Malawi 2063 development vision of Malawi becoming an inclusively wealthy and self-reliant industrialized nation (NPC 2020).

Salima/Chipoka has several other value chain potentials both within horticulture (banana, chili, papaya, etc.) as well as outside it (aquaculture, sugarcane, rice, etc.). Our focus on mangoes does not imply anything about the potential business and development value of these other value chains. The development of other value chains alongside mangoes will be an important strategy to mitigate shocks in mango production and markets. It can also ensure usage of the factory at closer to full capacity and employment opportunities in the factory beyond the mango season.

Neither does the production of mangoes that are processed in Salima/Chipoka need to be restricted to Salima district. Procuring mangoes outside the district can help spread the supply of mangoes across the seasons as they ripen at different times in different locations around the country. The envisioned plans for Salima/Chipoka as a multi-modal hub, connecting rail, road, and water transport linkages, is an important advantage if it were to position itself as a hub for horticulture. Different modes of transport can be utilized not just to export, but also to bring in more fruit and other products to the urban cluster for processing.

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