Prioritising Policies for Driving Inclusive Agricultural Transformation in Malawi

Value Chain Selection

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EXECUTIVE SUMMARY

This body of research aims to identify and prioritise agricultural value chains best suited to drive Inclusive Agricultural Transformation (IAT) in Malawi. As the country is currently developing pathways to implement the Malawi 2063 development plan to build an inclusively wealthy, self-reliant, industrial upper-middle-income nation, it is imperative to align and focus public and private investments on economic activities that can make the biggest contribution to key policy and developmental outcomes. Our Policy Prioritisation through Value Chain (PPVC) analysis ranked seventeen different agricultural value chains according to five overarching composite indicators. First, market-led carefully captures elements of future potential and competitiveness of a value chain related to current and projected market dynamics. Second, agricultural transformation reflects the ability of each value chain to contribute to economic growth beyond the farm-gate and to what extent diet quality can be improved. Third, social inclusiveness is a measure revealing the extent to which a value chain can create jobs in the agri-food system and its effectiveness in reducing poverty. Fourth, the value chain scans are our quantitative assessment of current policies, investments, scalability and agroecological considerations for each value chains based on industry engagements. The fifth and final composite indicator covers climate indicators.

This report contains a detailed discussion of Malawi's economic and policy landscape and relevant spatial context, followed by the methodology applied in conducting our PPVC approach. The final ranking of prominent value chains according to their ability to contribute to different development outcomes, highlights which value chains are best positioned to drive the type of agricultural transformation needed in Malawi. Here is the final ranking based on the combination of the five indicators with the green colours and low numbers indicating the best ranking.

Value Chain	Market Led	Ag Transformation	Inclusive Growth	VC Scans	Climate	Final Ranking
Mangoes	3	1	10	3	3	**1**
Macadamias	1	12	4	10	7	**2**
Bananas	7	6	12	9	1	**3**
Soybeans	12	17	1	1	5	**4**
Sweet Potatoes	9	7	5	12	2	**5**
Pigeon Peas	4	14	8	5	4	**6**
Sugar	10	3	13	6	6	**7**
Aquaculture	13	4	2	7	15	**8**
Poultry	8	2	17	4	8	**9**
Groundnuts	5	9	15	2	11	**10**
Beans	6	13	9	13	9	**11**
Rice	16	11	3	8	13	**12**
Pigs	2	5	14	14	16	**13**
Tobacco	11	15	6	16	12	**14**
Cotton	17	16	7	11	10	**15**
Maize	15	10	11	17	14	**16**
Goats	14	8	16	15	17	**17**

Each of these five composite indicators are made up of a select number of individual indicators we use as proxies for the respective composite indicators, of which we present the normalised scores (transformed to value between 0-1) to show the relative performance of each value chain for each indicator used in the PPVC ranking. Values with a high score and green colour indicates good performance, whilst low and red colours poor performance and anything in between this continuum a yellow or orange colour. In total, we compiled 16 individual indicators each analysed individually and comparatively in the report. Final ranking is based on the Garret Ranking approach of which we'll briefly summarise the main findings below, followed by some policy considerations.

Composite	Market-Led					Agricultural Transformation		Social Inclusiveness		VC Scans				Climate			Final Rank
Individual Indicators	Intensification	Domestic cons growth	Export potential	Input costs / output	RTA 5-year average	AFS GDP	Dietary Change	Poverty	Job Creation	Policy Support	Investment Support	Scalability	Agro Ecology	Production Volatility	GHG Emissions	Water use requirements	Garrett
Mangoes	0.3	0.8	0.9	1.0	0.0	0.3	0.5	0.2	1.0	0.9	0.7	0.8	0.6	0.7	1.0	1.0	1
Macadamias	0.0	1.0	0.9	0.7	1.0	0.1	0.8	0.2	0.1	0.3	0.8	0.8	0.5	0.7	1.0	0.7	2
Bananas	0.5	0.7	0.9	0.7	0.0	0.2	0.5	0.2	0.7	0.4	0.4	0.8	0.7	0.9	1.0	1.0	3
Soybeans	0.6	0.6	0.8	0.5	0.0	0.1	1.0	0.0	0.1	0.9	1.0	0.9	0.8	1.0	0.9	0.6	4
Sweet Potatoes	0.0	1.0	0.9	0.7	0.0	0.6	0.4	0.7	0.1	0.2	0.3	0.5	0.5	1.0	1.0	0.8	5
Pigeon Peas	0.1	0.9	0.8	0.9	0.4	0.3	0.6	0.1	0.2	0.3	0.6	1.0	0.9	0.7	1.0	0.9	6
Sugar	0.0	0.9	0.9	0.7	0.1	0.3	0.2	1.0	0.1	1.0	0.8	0.8	0.0	0.4	1.0	1.0	7
Aquaculture	0.3	0.8	0.9	0.3	0.0	1.0	0.1	0.8	0.3	0.6	0.4	0.6	0.9	0.6	0.6	0.0	8
Poultry	1.0	0.8	0.9	0.2	0.0	0.2	0.0	0.9	0.3	0.4	0.9	0.6	1.0	0.9	0.1	1.0	9
Groundnuts	0.4	0.6	1.0	0.7	0.2	0.4	0.1	0.7	0.1	0.7	1.0	1.0	0.8	0.5	1.0	0.1	10
Beans	0.3	0.8	0.8	0.9	0.1	0.3	0.6	0.1	0.2	0.0	0.3	0.5	0.7	0.0	1.0	0.9	11
Rice	0.3	0.7	0.8	0.3	0.0	0.7	0.3	0.6	0.0	0.5	0.8	0.7	0.6	0.0	0.8	0.5	12
Pigs	0.7	0.8	0.9	1.0	0.0	0.4	0.1	0.8	0.2	0.0	0.0	0.4	1.0	0.3	0.2	0.6	13
Tobacco	0.2	0.3	0.8	0.8	0.5	0.0	0.9	0.1	0.1	0.2	0.3	0.4	0.1	0.8	0.0	0.7	14
Cotton	0.1	0.0	0.8	0.3	0.1	0.1	0.8	0.1	0.1	0.6	0.3	0.5	0.4	0.6	0.6	0.6	15
Maize	0.7	0.8	0.6	0.0	0.0	0.3	0.5	0.6	0.1	0.4	0.2	0.0	0.1	0.0	0.8	0.5	16
Goats	1.0	0.8	0.0	0.5	0.0	0.1	0.2	0.7	0.1	0.4	0.3	0.4	0.0	0.5	0.3	0.3	17

1 **Mangoes:** Good rankings across most indicators, with particular strong off-farm linkages to downstream industries. Mangoes was ranked highest in dietary change and climate, as well as strong market-led prospects based on competitiveness and export potential. This VC is easily scalable, Malawi has a suitable agro-ecology and strong investments made in the past decade will drive future growth, supported by strong local demand.

2 **Macadamia:** A fast-growing and emerging VC with strong processing linkages and large potential for exports. Highest ranked on market-led due to competitiveness and relative trade advantage. Strong developmental impacts on job creation with relatively low GHG emissions. This VC is also scalable and recent investments in orchards and cracking facilities suggest policies should be supportive of growth.

3 **Bananas:** After the devastating impact of bunchy top disease, this VC is well-positioned to contribute to poverty alleviation and improving livelihoods through dietary diversity and extra cash incomes to farmers. Although fewer off-farm linkages, it performed well in the market-led indicators such as intensification opportunities and domestic demand growth. Well ranked on climate and can replace current imports.

4 **Soybeans:** There has been a large expansion in this oilseed VC in the past few years due to increased investments and policy support. Farmers are increasingly switching from crops such as maize and tobacco to soybeans support farm incomes, but also contributes to off-farm job creation if a larger proportion of raw can be processed into oil and oilcake, of which excess capacity exist, but there is limited local demand for feed.

5 **Sweet Potatoes:** Many households grow sweet potatoes and there is a growing domestic demand. It impacts poverty through additional farm income, with substantial share of processing activities taking place. The VC is well-adapted to climate change and produce stores well, with high rankings for climate, inclusiveness and improving diets. Downsides includes low farm productivity and large post-harvest losses.

6 **Pigeon Peas:** Malawi is known for being a high-yielding producer of pigeon peas with a large potential to contribute to the economy through exports, or by selling produce into the growing local market. It grows well despite the challenges posed by climate change and Malawi has a suitable climate for production. There is limited scope for greater intensification and this VC does not have as strong off-farm linkages to the economy.

7 **Sugar:** One of the few VCs that utilise the country vast irrigation potential, scores well in indicators such as domestic market growth, competitiveness, export potential and has strong off-farm value addition linkages through milling. Despite strong policy support in the past, this VC is negatively affected by flooding and extreme weather conditions and makes marginal contributions to poverty reduction and job creation.

8 **Aquaculture:** Fish farming in ponds ranks well in its ability to impact poverty and this VC links well with other industries such as feed and fish processing. Although lagging other VCs on competitiveness, increased availability, and consumption of fish as lake capture stock are on the decline makes this VC a contributor to improving diets and the abundance of natural resources (water) leads to being ranked 8th.

9 **Poultry:** the broiler VC performs well in agricultural transformation since it is well integrated into other value chains such as oilseeds, feed and meat processing. It ranked favourably on climate and the qualitative scans with evidence of investments, backed by a suitable agro ecology. However, the bulk of poultry production is currently uncompetitive and does not rank highly on inclusiveness and emits high levels of GHG emissions.

10 **Groundnuts:** There has been investment in this VC in recent years due to the export potential in the region and groundnut production can be easily scaled. A conducive agro ecology support production but currently this VC ranks low in terms of social inclusiveness and only makes marginal impact on improving diets.

11 **Beans:** Performed well in the market-led indicator (6th) due to relatively good input cost efficiency ratio and in terms being social inclusive. Production is highly volatile from one year to the next as planted areas are affected by volatility in rainfall and other climate related impacts. Beans ranked moderately in aspects of potential growth and agricultural transformation.

12 **Rice:** Is the 2nd largest consumed staple in Malawi behind maize and grown by many smallholder farmers and ranks well in terms of social inclusiveness. Low productivity and lack of using advanced agronomic practices limits this VCs market-led opportunities, although policy support in the form of input seed subsidies and dedicated policies have supported growth. Impacts of climate change makes production relatively volatile.

13 **Pigs:** With limited policy and investment support in the past, this VC ranked well in market-led and agricultural transformation but poorly in for inclusiveness, VC scans and climate. The linkages between farmers and processors are currently weak due to the informal nature of markets, limited slaughter facilities inhibits further growth and scores poorly in terms of GHG emissions.

14 **Tobacco:** Efforts are underway to wean the country off this export-oriented crop as shown in the VC scans. Though it ranked well in competitiveness, limits to further intensification and the current investments to diversify tobacco farmers to other crops explain the low overall ranking. Tobacco is by far the largest emitter of GHG emissions, uses a large amount of water, with limited poverty reduction abilities.

15 **Cotton:** Despite this VC ranked highly for policy support, this has not translated in more private sector investments. Rather, processors are leaving the industry due to a variety of reasons, one being the impact climate change and limited off-farm market opportunities to competitively process cotton into lint. This limits agricultural transformation and the inability to grow cotton at competitive yields results in the low ranking.

16 **Maize:** The bulk of the country's maize production is done at very low levels of productivity and limitations on the domestic markets means this VC ranked low on market-led. Since the bulk of produce are consumed by producing households or traded informally, agricultural transformation is limited. Despite significant policy support through input subsidies, the impact of climate change and the continued mono-cropping of maize dependent on rainfall and the unhealthy levels of maize consumption results in a poor ranking.

17 **Goats:** Still characterised by informal marketing and extensive grazing systems, this VC has had limited investments and policy support in the past. Although the country has potential to intensify current farming systems overall competitiveness are lacking. Goats ranked the lowest on climate.

POLICY PRIORITIES

The results presented in this report highlights an important feature prioritising value chain for policy and investments in that **trade-offs exist between different policy and development outcomes**. Whilst some value chains consistently rank moderately high in several of our indicators, not any single value chain performs well or significantly better in all of them. Our approach sheds light on these nuances within each value chain by showing the comparative differences between the seventeen value chains to support prioritisation decision making.

That the top three value chains are all within the horticultural sector supports the view that **a policy shift towards long-term crops focussed on exports or import replacement can yield substantial benefits** to Malawi's development pathway. Fruit value chains are particularly labour intensive and contributes to much needed dietary diversity of a wider range of food items. Investments in these value chains are also often multi-generational, contributes to alleviate Malawi acute forex shortages and often have strong off-farm processing linkages.

Our ranking results for **maize in the 16th place are at odds with the current implied value chain priorities of the Government of Malawi** in which more than 40% of the total agricultural budget is dedicated to maize production through maize seed and fertiliser input subsidies. Also, other traditional crops in Malawi such as rice, beans, cotton and tobacco were amongst the lowest

ranked to drive IAT, which suggest current efforts of diversification towards higher ranked alternatives should continue.

Several emerging value chains in Malawi such as **soybeans, aquaculture, poultry and groundnuts, although ranked between 4th and 10th, present large opportunities to drive IAT in the future**. If many of the same shortcomings leading to lower rankings can be addressed through effective policy and investments, growth in any one of these will lead to improvements in the other due to their integrated nature and interconnectedness. Promoting such value chains can make wide developmental impacts on and off the farm to benefit the economy.

Our ranking results also have bearing on current policy discussions in Malawi around **commercialisation, mega farms, value addition and expanding irrigation potential. Our market-led indicators reveal which value chains are best positioned to be propelled by market opportunities in the next few years**. Finding policy options to successfully integrate smallholder farmers to access markets and modernising value chains will be essential to drive IAT in the face of increasing land pressures as population growth continues.

Creating an enabling environment of policy certainty and clarity, investing in public infrastructure and solving monetary and fiscal policy incongruencies **will support more agricultural and agro processing exports** and set the country on a pathway to realise its long-term ambition of becoming a self-reliant and inclusively wealthy nation.

1. INTRODUCTION

Malawi is developing national policies and plans to guide the implementation of the Malawi 2063 (MW 2063) of its National Planning Commission (NPC, 2020). MW 2063 is the country's overarching long-term development plan with the aim of building an inclusively wealthy and self-reliant industrialised, upper-middle-income nation in the next few decades, which strongly hinges on the country's agricultural sector. The country is still largely an agrarian economy with the broader agri-food system contributing around 44% of the Gross Domestic Product (GDP), providing opportunities for improved food security, employment creation and export earnings (GoM, 2020). It is for this reason that the agricultural sector is earmarked to drive the development agenda as is stipulated in almost all policy documents of the past two decades and is re-affirmed in the new long-term plan. A key Pillar of MW 2063 is agricultural productivity and commercialisation, which sets out to unlock the still dormant potential for growth in agricultural value chains through the transformation of the sector towards greater production and productivity.

To achieve the goal of growth in agriculture and to further develop upstream and downstream sectors of the economy closely related to farming, will require a shift from the low productivity and subsistence-orientated agriculture, still prevalent in most of the country, to a highly productive and commercialised agricultural system (NPC, 2020). This focus on commercialisation is not something new within Malawi's agricultural policy space. The National Agriculture Policy (NAP) envisioned that by 2020 the country's agricultural sector would increasingly be oriented toward profitable commercial farming through specialisation, output diversification and value addition in downstream value chains (GoM, 2010). Furthermore, the National Agriculture Investment Plan (NAIP), which is the main implementation vehicle for the NAP, provides the investment framework for the agricultural sector through coordination and prioritising investments by various government and non-state actors (GoM, 2018). Although these policies do well to establish a clear framework and specifically mention the importance of creating an enabling policy and investment environment to drive inclusive agricultural transformation, there is often a need for more concise and targeted strategies that take the budgetary constraints facing policymakers into consideration. Indeed, there is widespread evidence that many African governments have a clear, albeit high-level understanding of the policies required to drive agricultural transformation in their countries, but successful implementation and priority setting remains problematic. Though considerable cross-country differences exist, Eldridge et al., (2020) suggest several observations when assessing the agricultural policy landscape on the African continent. Firstly, national visions for agricultural transformation often exceed the national capacity to implement the proposed polices. Secondly, these policies are often approved without securing the necessary resources for implementation; and thirdly, poor coordination and overlapping mandates can create confusion during implementation. Finally, political obstacles such as sustained leadership and conflicting stakeholder interest can undermine policy implementation, while donor activities could fragment and undermine country-led processes.

Malawi has embarked on another phase of formulating agricultural policies and priorities in line with its new long-term development plan, starting with the release of the first 10-year MW 2063

Implementation Plan (MIP-1). MIP-1 seeks to set in motion the implementation to achieve the objectives of Pillar 1 through agricultural diversification, irrigation development and expanding anchor farms, amongst others (GoM, 2021a). The bold interventions proposed by the MIP-1 do well to prioritise specific interventions and identify the lead institution with the estimated cost, but it is not clear how these public investments will target specific value chains within the various projects listed. One of the ways to support the implementation of MIP-1 is to provide a clear methodological framework to identify and prioritise cost-effective, tractable, and affordable policy and public investment recommendations for specific value chains. The continued economic hardships faced by Malawi, exacerbated by the global pandemic and the impact of the Russian invasion of Ukraine, will continue to put even more pressure on fiscal spending to reach the targets that have been set by the policy framework. Unless there are significant opportunities for, and investments made by the private sector, the proposed inventions will not yield the envisioned returns to reach the 2063 developmental goals. There is, therefore, a need for a clear methodological approach for identifying and prioritising public and private sector investment in specific value chains, and importantly, highlighting opportunities for growth beyond the primary agricultural sector.

This study builds on the new policy direction set out in MW 2063 to select specific value chains and policy interventions to drive inclusive agricultural transformation (IAT) in Malawi. For purposes of this research, IAT is defined as productivity-led growth that originates in the agricultural sector but spurs rural economic growth beyond the agricultural sector and delivers broad and accelerated impacts favouring the poor across both rural and urban areas (Eldridge et al., 2020). The methodology applied in this report has been developed by the Bureau for Food & Agricultural Policy (BFAP) and the International Food Policy Research Institute (IFPRI) and is referred to as Policy Prioritisation of Value Chains analysis (PPVC). The methodology has been successfully applied in four African countries, with local policy think-tanks involved in the different project phases but especially in leading the iterative process of policy development communication. In Malawi, the PPVC team has partnered with the MwAPATA Institute to support in-country research efforts, whilst the Alliance for a Green Revolution in Africa (AGRA) supports policy advisory services and implementation more broadly.

In short, PPVC is a replicable and market-led approach developed to assist policymakers to prioritise cost-effective policies and investments. It is based on a combination of modelling platforms, and detailed analytics combined with a stepwise approach to narrow down and rank selected value chains according to their ability to drive IAT. This is done to ultimately provide insights to policymakers on the policy options available for specific value chains by modelling the farm-level and wider economywide impacts of various interventions or policy options.

This report describes the outcome of the first phase of the PPVC project in Malawi and presents a ranking of a group of carefully selected value chains that can drive inclusive agricultural transformation in Malawi. This is done by compiling a portfolio of development outcome indicators: market-led, agricultural transformation, social inclusiveness, qualitative value chain scans and climate change. Analysing each component in detail adds to the existing body of literature on value chain analysis in Malawi. However, there may be trade-off across these developmental priorities, whilst others complement or strengthen one another. Since policy prioritisation often

involves difficult and delicate trade-offs between many alternative options, we combine these priorities into a single composite indicator and rank seventeen value chains according to the PPVC methodology.

This report starts with a comprehensive overview of Malawi's agricultural economy, followed by a spatial contextualisation and an overview of the current policy landscape which broadly affects agricultural value chains. We then proceed to explain the methodology used to select, analyse and rank the selected value chains for further prioritisation in the next step of PPVC: Deep Dive Analysis.

This research effort is underpinned by various stakeholder engagements and inputs from policy makers to support the implementation of the findings. The presented rankings are not an absolute measure for prioritisation, but rather a relative assessment based on the selected indicators, which can now be used as a benchmark to analyse value chains in Malawi and to assist in crafting interventions for sustained growth.

2. MALAWI'S AGRICULTURE & POLICY LANDSCAPE

2.1 AGRICULTURE'S CONTRIBUTION TO MALAWI'S ECONOMY

Malawi is a land-locked country situated in south-eastern Africa spanning 118 484 km^2 and neighbouring Mozambique, Zambia and Tanzania. The country gained independence from British rule in 1964, adopted multiparty democracy in 1993, and has since enjoyed stable democratic governance. With a population of roughly 19 million people, there have been some notable improvements in selected developmental indicators, yet the country continues to be considered amongst the poorest in Africa and the world (Finmark, 2021). The average Gross National Income (GNI) of a Malawian is the third lowest globally at US$380 (2019) and around 70% of the population lives under the $1.9/day poverty line (World Bank, 2021a). Malawi faces several challenges to transition from amongst the poorest towards the envisioned low middle income status by 2030. Most notable are the rapid population growth and low agricultural productivity on an already constrained land resource (Mangani et al., 2020).

Malawi's Gross Domestic Product (GDP) totalled US$ 11 billion in 2019, with average annual real growth in the prior decade a healthy 4.8% (GoM, 2021b). However, in 2020, partly as a result of the COVID 19 pandemic, economic growth stalled to 0.8%. In 2021 the economy grew by 3.9% suggesting some recovery, but this is still significantly low considering the lower base established in 2020. Malawi is still considered an agrarian economy due to the importance of agriculture's contribution to GDP and the proportion of the population dependent on the sector for their livelihoods.

Figure 1 provides a perspective on the sectoral breakdown of GDP and employment (including the self-employed) to illustrate the importance of agriculture in the economy. Agriculture contributed 24% to GDP in 2019, making it the largest single sector of the economy. Although a detailed breakdown of the manufacturing sectors' GDP is not published, it is clear that agro-processing industries such as food, beverages and tobacco dominate gross output within manufacturing, with

77% of the total (NSO, 2019). Thus, the total contribution of the wider agriculture and food value chain is estimated at around 33% of the national economy, whilst other sources report an even higher share of 44% (GoM, 2020).

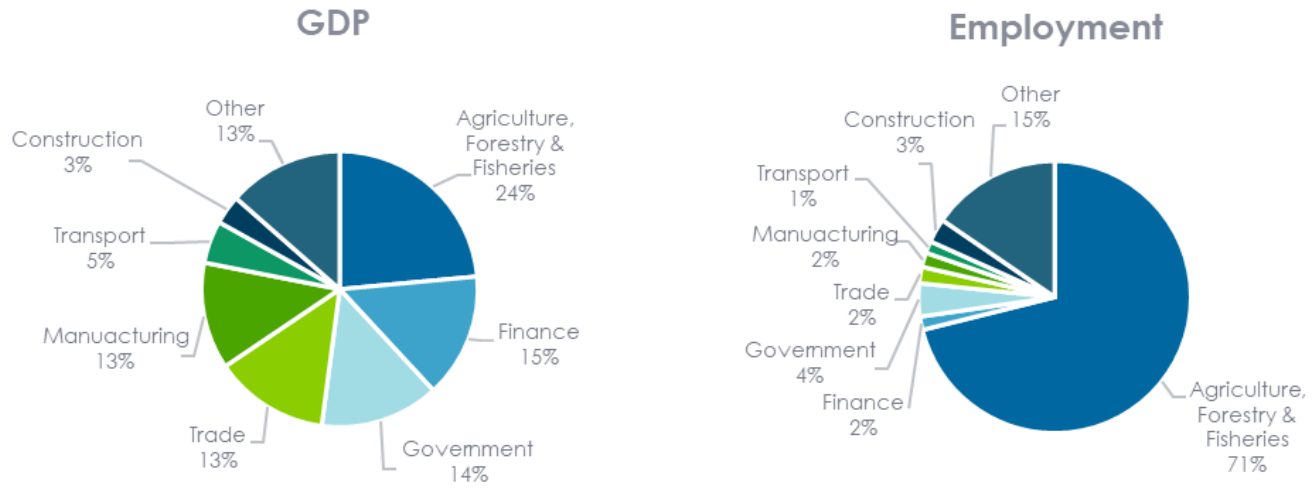

FIGURE 1: AGRICULTURE'S CONTRIBUTION TO THE MALAWI ECONOMY 2018/19
Source: NSO, 2020

One such example comes from analysis generated through the research undertaken in this report by means of IFPRI's Social Accounting Matrix (SAM) for 2019 in which the contribution of the entire agri-food system (including processing, trade & transport, food services and input supply) are combined to reach 44% as given in Table 1. Thus, although the primary agricultural sector contributes 24% to the Malawian economy, off-farm portion of the value chain adds another 20% if those sectors that are part of the wider agrifood system are included.

TABLE 1: THE CONTRIBUTION OF THE AGRI-FOOD SYSTEM TO MALAWI GDP

Item	GDP ($ billions)	% Share
Total Economy	10.4	100%
Agrifood system	4.6	44.4%
Primary agriculture	2.5	24.4%
Off-farm AFS	2.1	20.0%
Processing	0.9	8.4%
Trade & transport	0.8	7.9%
Food services	0.1	0.8%
Input supply	0.3	3.0%
Rest of the economy	5.8	55.6%

Source: IFPRI, 2022

In terms of employment, agriculture creates jobs and livelihood opportunities for 71% of the working age labour force. Of the 4.4 million employed individuals in 2018, 17% were formally employed in agriculture and earning a wage, while 77% (3.3 million) were self-employed as smallholder farmers. The historic performance of the agricultural sector has been volatile, mainly due to the country's dependency on rainfed crop production, predominantly dryland maize. Figure 2 provides a view of the agricultural GDP growth rates from 2003 to 2020, clearly showing significant year-on-year changes from the long-term average of 3.2% growth per annum.

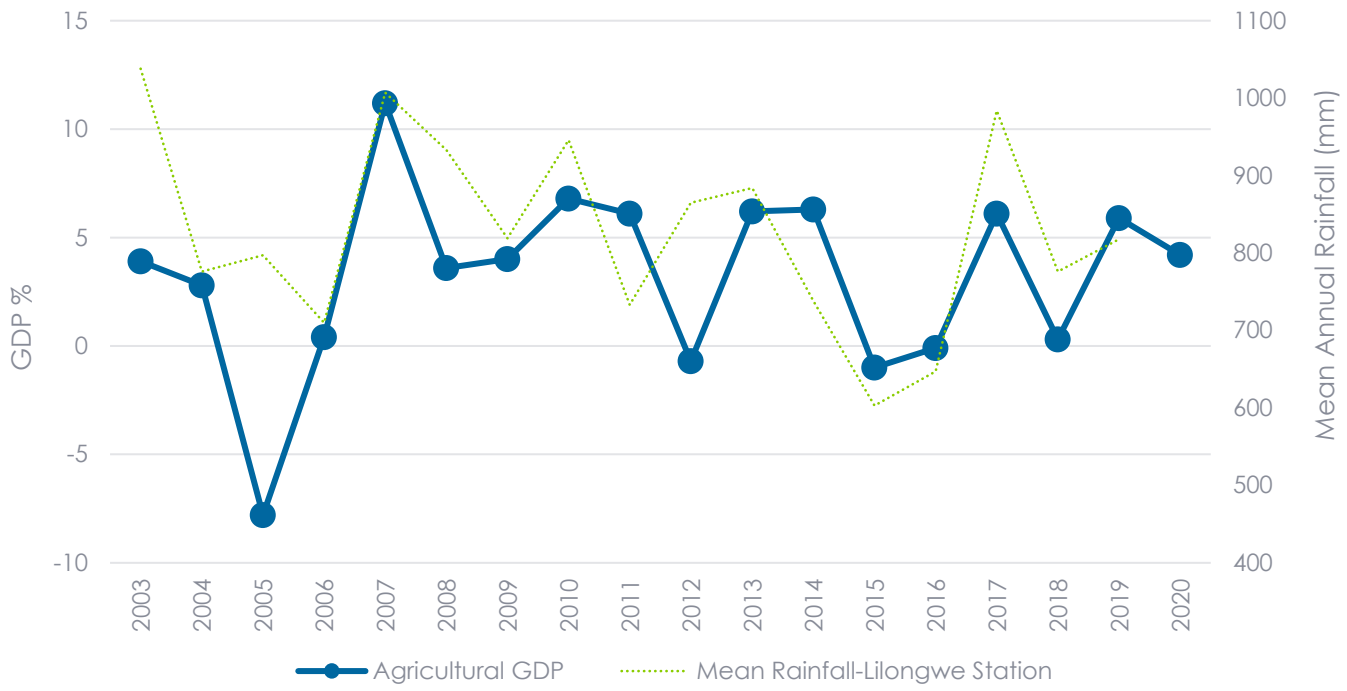

FIGURE 2: AGRICULTURAL GDP PERFORMANCE, 2003-2020
Source: NSO, 2020

The GDP growth rate is compared with the annual rainfall in one of the country's largest maize-producing regions, Lilongwe, and the strong GDP/rainfall correlation is evident. Malawi has one main rainy season and very limited irrigation farming to mitigate against climate-related shocks. There have been several good seasons where agricultural GDP expanded above the target of 6% per annum, but the consensus is that growth in agriculture has not been sufficient to drive poverty alleviation at large (Mangani et al., 2020).

The weak performance of the agricultural sector is not only due to erratic rainfall patterns but also due to a lack of coherent policy guidelines and several structural weaknesses in the functioning of agricultural markets (World Bank, 2021b). Despite the Malawian Government spending a substantial share of the national budget on agriculture (on average>10% and amongst the highest in Africa), this has not translated into significant economic transformation or growth. Thus, it could be argued that the larger proportional spend dedicated to farming has not yielded the desired return on investment.

Malawi's agricultural sector has a distinct dualistic structure, with a large number of smallholder farmers producing staple food crops such as maize, cassava, rice, sweet potatoes and legumes on small (<1ha) pieces of land. In stark contrast, there are also a number of estate farms that primarily focus on the production of high-value cash crops such as tobacco, tea, sugarcane and macadamias on larger commercial farms (Finmark, 2021). In recent years estates have also ventured into the commercial production of crops such as paprika, cotton and horticultural (GoM, 2010). These farms make a significant contribution to agricultural exports, provide the bulk of formal agricultural employment, and contribute around 25-30% of agricultural GDP (CCARDESA, 2022). The remaining 70% share of agricultural output comes from smallholder farmers.

In terms of land distribution, Anseeuw et al., (2016) estimated that around 23% of total farmland holdings are estate farms which are generally bigger than 20 ha. The remaining farmed area can then be subdivided into medium-scale farms (5-20 ha) using 30% of the land, small-scale farms (2-5 ha) 19% and around 51% made up of farms smaller than 2 hectares. The vast majority (68%) of land tenure is in customary titles, followed by 20% as government-owned and 12% as private land (CIAT & World Bank, 2018). There is, however, some evidence that the share of medium-scale farmers has increased in recent years, which were found to be mostly urban-based professionals, entrepreneurs and/or civil servants acquiring land (Anseeuw et al., 2016).

Finally, Malawi's agricultural context can also be summarised in terms of the most important agricultural value chains and products in terms of production and consumption measures. This points to the current production capacity of the agricultural economy, as well as provide an indication of the relative demand for agricultural and food products. Starting with production, within primary agricultural GDP, the largest contributing industries in 2019 were maize (28%), leafy vegetables (12%) and pulses (9%), followed by fish (6%), groundnuts (5%) and other vegetables (5%) (IFPRI, 2023). In terms of the estimated value of production (measure for turnover at farm gate), however, cassava (16%), sweet potatoes (16%) and poultry (12%) were the largest agricultural industries measured using international dollars as calculated by the FAO (2022). The first two should be interpreted with caution since the literature have pointed to the possibility that crops such cassava and sweet potato production volumes could be vastly over-estimated within official statistics due to the nature of production and therefore also inflate the gross production values (Kilic et al., 2021). Next, pigs, maize, potatoes and mangoes were listed as the highest gross production value in 2020. Other notable industries in Malawi include pigeon peas, sugar, tomatoes, cattle and tobacco (FAO, 2022).

In terms of national supply of agricultural and food products, Malawi's top 25 consumed product are given in Figure 3. The per capita use of maize and maize products dominates the total food basket with an estimated food supply per capita use of 140 kg per person per annum, amongst the highest in the world (FAO, 2023). Thereafter, cassava, other fruits (mainly mangoes) and other vegetables were all large consumer items, but significantly lower than maize. This highlights an important feature of Malawian diets in that they are poor in overall quality, both in terms of a lack the quantities consumed and the presence of all food groups recommended amounts. The imbalance of such a high intake of energy from a single source, in this case maize, has several negative implications on human health and food security (Schneider, 2022). The high per capita consumption level of plant-based products, relative to that of animal proteins is evident in Figure 3 where pig meat was the highest ranked food group ranked 13th overall with around 11kg per person per annum, followed by poultry meat with 6.6kg in the 20th position. However, as will be seen in the analysis done in this report, many of the existing livestock industries have seen strong consumption growth in recent years, which make them important value chains to consider for the future.

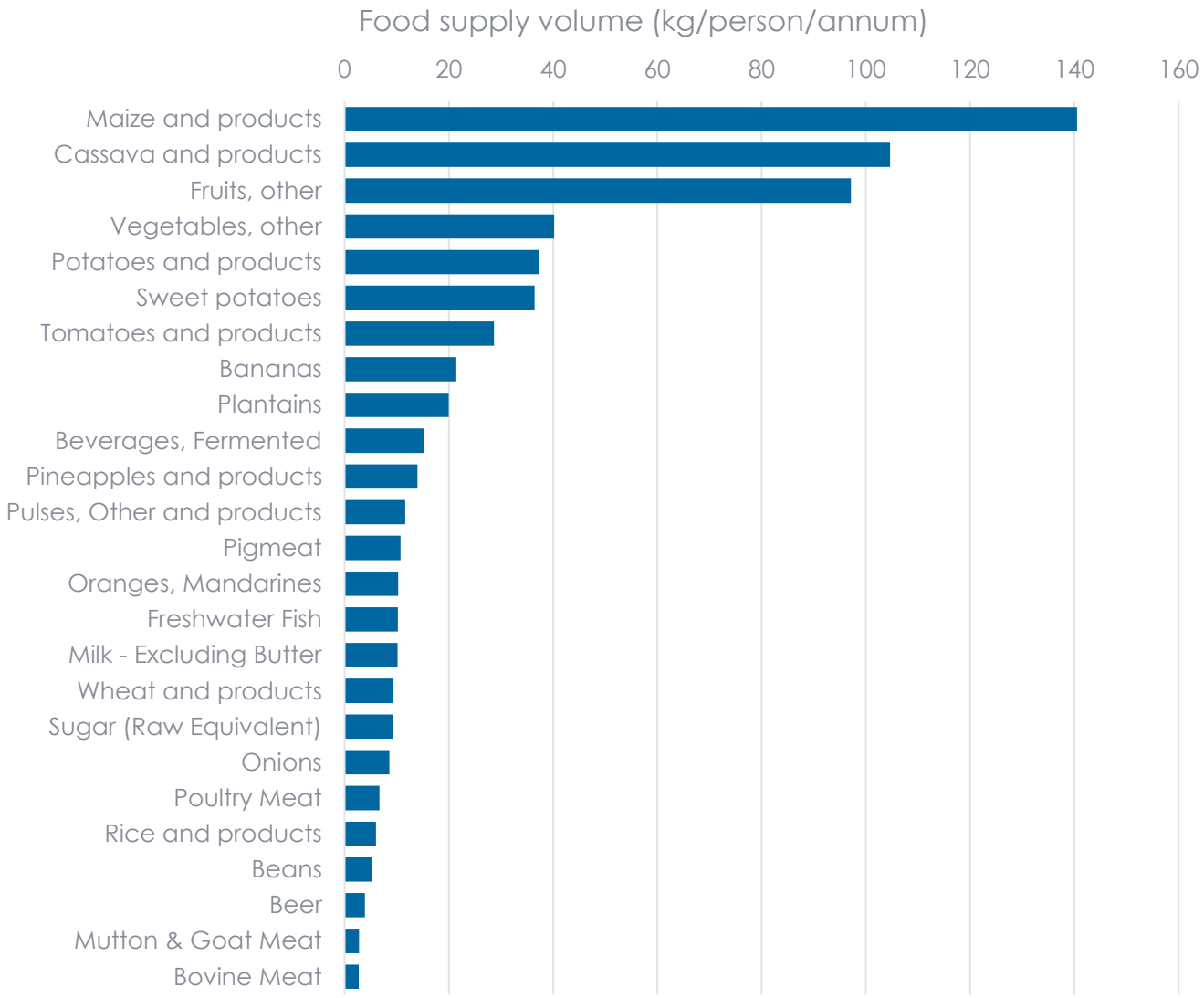

FIGURE 3: TOP 25 PER CAPITA AGRICULTURAL FOOD COMMODITIES UTILISED IN MALAWI
Source: FAO, 2022

Malawi's agricultural trade performance is summarised in Figure 4, which shows the agriculture and food trade balance measured in the value of trade between 2002 and 2020. The first impression suggests a healthy and growing positive terms of trade over this period, albeit declining in recent years. By far the largest exported product in Malawi, tobacco, accounted for around 94% of the total trade balance such that, without such exports, the country would move to a net importer position for agriculture and food products. Other important export industries contributing to the positive trade balance includes tea, sugar and oilseeds (mainly pigeon peas). In contrast, Malawi is still heavily dependent on a growing share of imports of vegetables oil (palm and soybean) and cereals in the form of wheat imports (ITC, 2022).

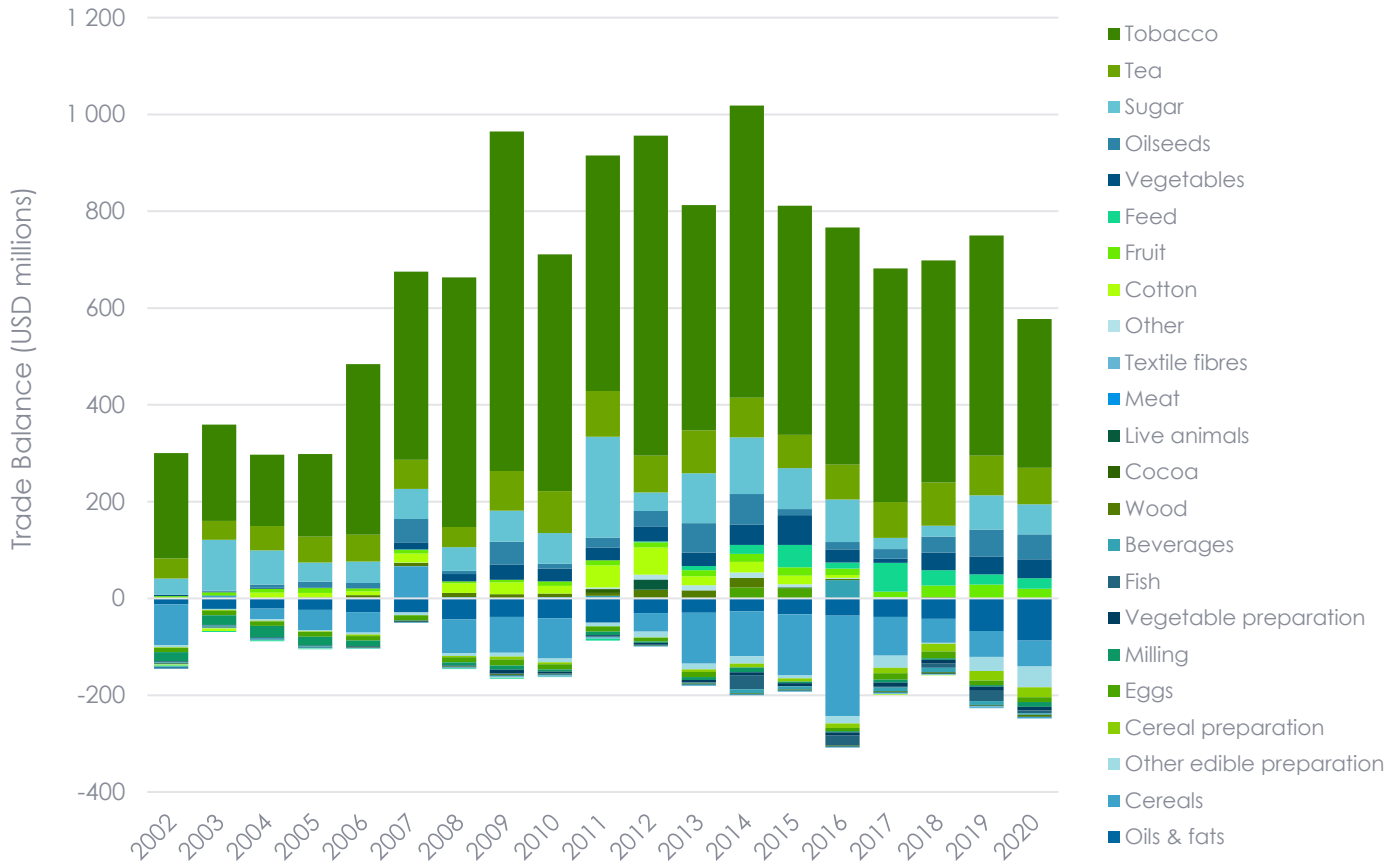

FIGURE 4:MALAWI'S AGRICULTURE AND FOOD TRADE BALANCE IN VALUE, 2002-2020
Source: ITC, 2022

2.2 SPATIAL CONTEXTUALISATION

Around 20% of Malawi's surface area is made up of water, much of it is Lake Malawi (CIAT & World Bank, 2018). Of the 9.4 million hectares of land area, around 5.65 million hectares is demarcated for agricultural purposes, but only 3.6 million is considered arable land suitable for crop farming. However, only around 2 million hectares of available arable land is currently utilised (CIAT & World bank, 2018; AGRA, 2018). Malawi has a wide range of natural resource endowments with a diversified base comprising abundant water resources and unique flora and fauna (GoM, 2015). As can be seen from Figure 3, the main land cover types in Malawi are predominantly dedicated to agriculture, largely field crops, followed by forest, herbaceous plants, forest plantations, shrubs, built-up areas and water bodies. There are growing concerns about the deterioration of the natural resource base and the environment that has been affected by the direct and indirect impact associated with population growth, deforestation, uncontrolled fires and degradation in the form of losses in soil fertility and erosion, siltation and pollution (Phiri & Nyirenda, 2022).

The country is currently experiencing considerable pressure on its natural resources, brought about by a combination of factors that include rapid population growth, land scarcity and limited off-farm employment opportunities. The end result is the continued mono-cropping of maize, by far the most

dominant crop planted in Malawi, with an average area planted of 1.9 million hectares between 2018 and 2021, as reflected by the Annual Production Estimates (APES) published by the Ministry of Agriculture, Irrigation and Water Development (MoAIWD, 2022a). Maize has been the main focus crop of the different forms of the input subsidy programmes over the years, but evidence is emerging that the country is at a tipping point where the degradation of soils in the form of loss in soil organic matter is below minimum levels, resulting in crops having marginal responsiveness to fertiliser (Mangani et al., 2020).

Malawi has a generally mild sub-tropical climate, but with substantial variation due to spatial and geographic differences, particularly driven by elevation (Jury, 2014). The climate variability is also influenced by the presence of Lake Malawi, a large water body spanning around 29 600 km^2, which cover nearly two-thirds of the country's length (Wood & Moriniere, 2013). The country can be divided into some 12 different climatic zones (Figure 3), but these can be grouped into three major ones: the semi-arid Shire Valley and Lakeshore Plain, the semi-arid to sub-humid Medium Altitude Plateaus and the sub-humid High Altitude Plateaus and hills (RCRC, 2021). The semi-arid areas of Shire Valley are located in the Southern parts of the country in low lying areas where the Shire River flows from Lake Malawi towards the Southern border and indicated in light pink colour in the centre map of Figure 3. The other semi-arid areas are also characterised by low altitude and is located alongside the Lakeshore plain all along the Lake Malawi. These areas are also well known to be prone to flooding since water flows from the high rainfall region towards these plains.

The sub-humid Median Altitude areas are located around the base of the High Altitude plateaus, spread throughout the country, whilst the High Altitude Plateaus and hills are mainly located to the North of the country which records the lowest mean temperatures and frost periodically. In terms of rainfall, the Lakeshore plan north of Nkhata Bay and north Karonga (Northern most parts of Malawi) receive the highest total annual rainfall, with some of the highest plateaus such as Nyika have recorded more the 2 500 mm rainfall per annum (Wood & Moriniere, 2013).

Malawi's irrigation potential is estimated to be 407 000 hectares, with various efforts underway to expand from the 145 000 hectares currently irrigated (MoAIWD, 2021). Despite recent growth in irrigation investments, largely driven by the Irrigation Master Plan and Investment Framework (IMPIF), a significantly larger area under irrigation is needed for the country to break its dependence on the rainfed cultivation of maize. In brief, the most important crops currently grown under irrigation include sugarcane, tea, macadamia nuts and tobacco which is mostly grown by the estate sector, whereas a mix of different field crops are grown by smallholders (MoAIWD, 2021).

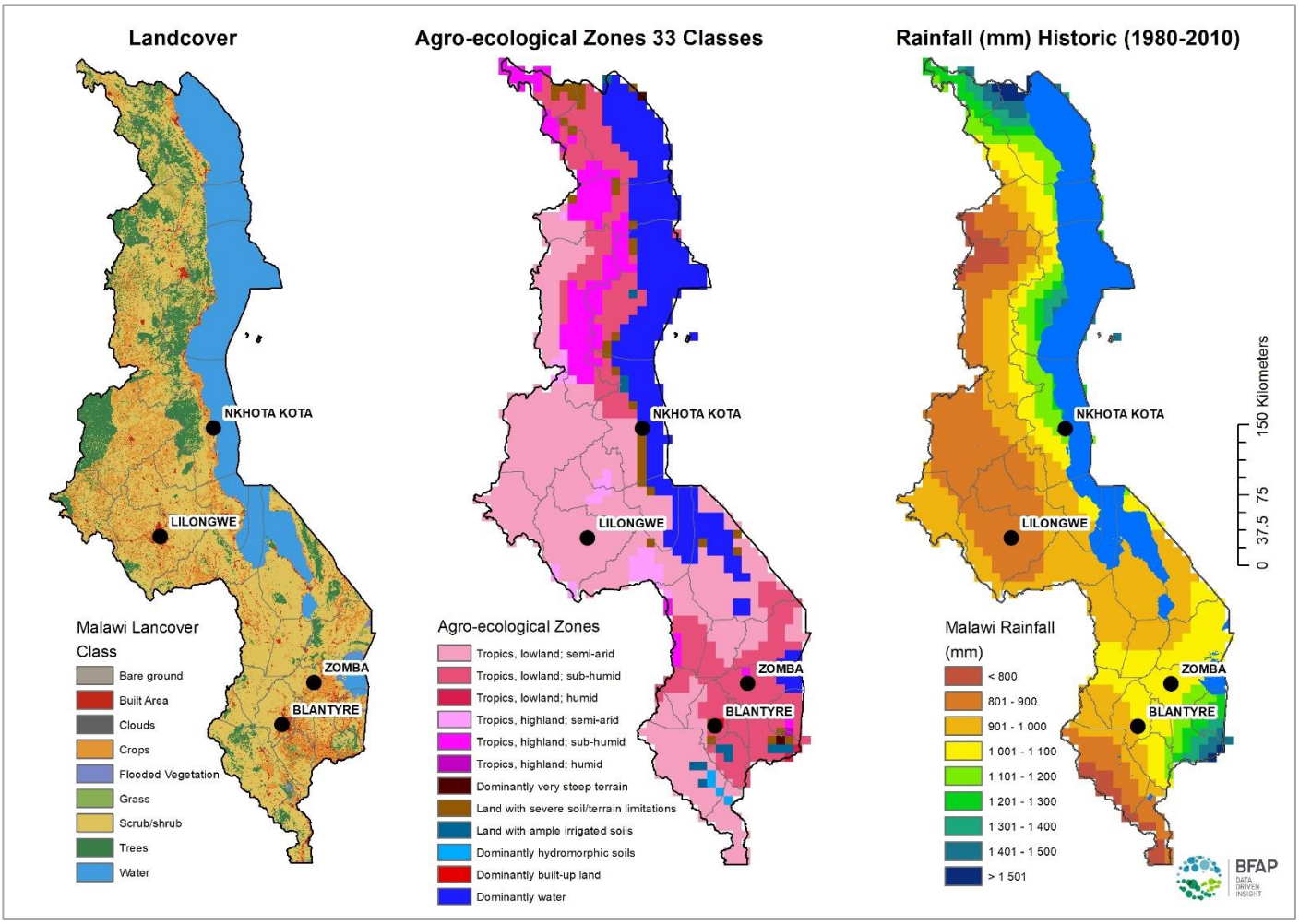

FIGURE 5: MALAWI LANDCOVER, AGRO-ECOLOGICAL ZONES AND HISTORIC ANNUAL RAINFALL
Source: Own compilation from various

2.3 AGRICULTURAL POLICY LANDSCAPE

This section aims to provide a brief synthesis of Malawi's policy landscape as it relates to and influences agricultural value chains and markets. We start at the broadest macroeconomic level which has bearing on stability and conduciveness of the economy for investment, planning and market functioning, assessing both the monetary and fiscal policy direction of the Government of Malawi (GoM). Thereafter we review national and ministerial agricultural policies, followed by agricultural policies from legislation passed by the Malawi Parliament.

2.3.1 Monetary Policy

Malawi's monetary policy is formulated and implemented by the Reserve Bank of Malawi (RBM) and aims at maintaining price and financial stability as set out in the Reserve Bank Act of 2018 (GoM, 2019a). The RBM was established as an independent institution that is responsible to pursue the monetary policy objectives of the government by influencing the supply of money and credit using instruments such as credit operations (interest rates), open market operations (liquidity) and reserve requirements. The Bank's Monetary Policy Committee (MPC) implements a forward-looking

framework and adopts an annual inflation target of 5% in the medium term within a 2% symmetric band since 2014 (GoM, 2021c). This is done using mainly two monetary policy tools: the Policy rate (the interest rate that commercial banks earn on deposits), and/or by buying and selling government securities (RBM, 2022a). The country is currently in a phase of monetary tightening after the Policy rate had been declining consistently since the end of 2016. As with most countries around the world, Malawi's inflation has increased significantly in recent months due to the global spillovers of the Russian invasion of Ukraine and as supply chains correct in the aftermath of the global pandemic. Figure 4 provides a perspective on monetary policy and inflation, showing the difficulty the country faces in lowering inflation towards the target, while simultaneously addressing numerous other macroeconomic challenges. The RBM has not managed to lower inflation to 5% since the setting of the target and the reality and challenge for agricultural value chains is that capital will remain at high interest rates to the borrower, placing significant constraints on investments.

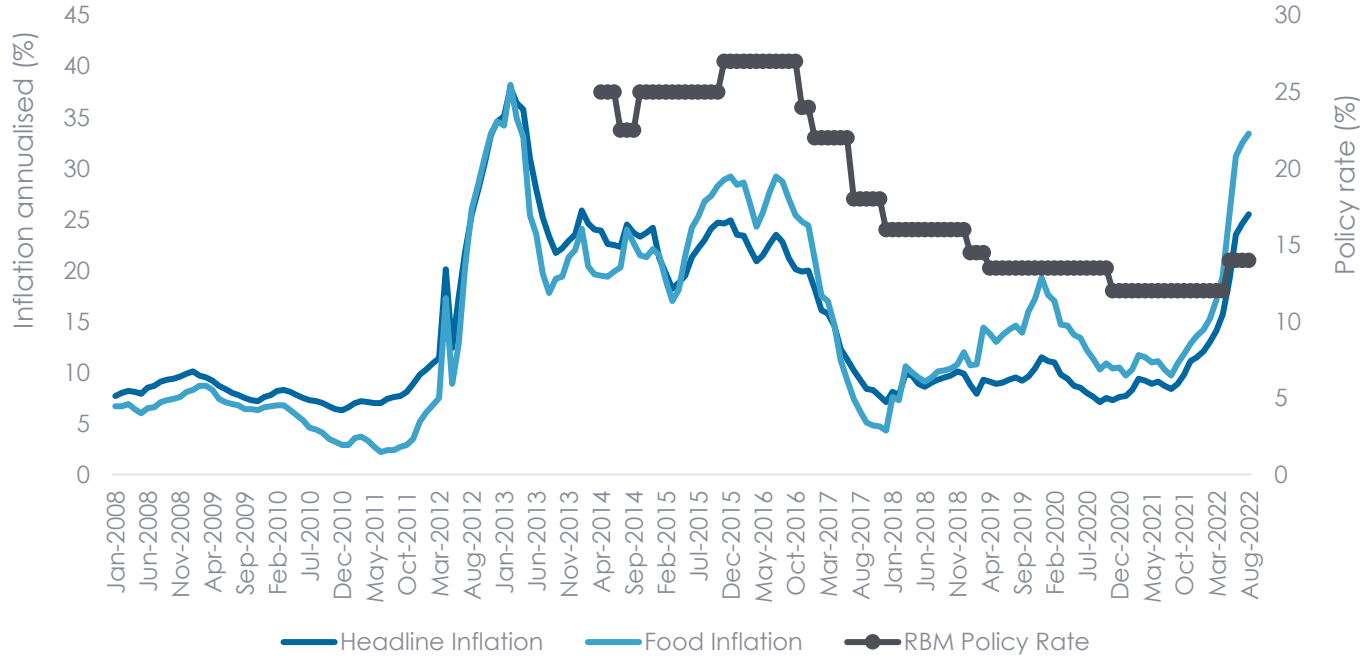

FIGURE 6: MALAWI INFLATION AND THE POLICY RATE AS SET BY THE RBM
Source: RBM, 2022

The current difficulty that the MPC faces in bringing inflation into the target range, according to the price stability mandate, relates to the balancing of other monetary policy objectives of the Bank, which is to maintain financial stability through implementing its exchange rate policy and managing foreign reserves (GoM, 2019a). Prior to 2012, the Malawian Kwacha had a fixed exchange rate pegged to the US Dollar with a few devaluations taking place in 2006, 2010 and 2012 (Montfaucon et al., 2021). Malawi adopted a floating exchange rate regime in May 2012, allowing the Kwacha to adjust to local and international market development. This resulted in a 49% devaluation by mid-2012 (Figure 5) (Montfaucon et al., 2021). However, although the RBM employs a floating regime there are still significant interventions in the currency market that have resulted in an overvalued currency at times, leading to a 25% devaluation in May 2022 (RBM, 2022c). The current exchange

rate still seems to be overvalued because of the apparent gap between the exchange rate in the informal market and the formal market.

The Bank monitors the foreign exchange market and intervenes in cases where excessive volatility poses a risk to broader financial stability. The RBM generally aims to hold a minimum of foreign exchange reserves equal to the value of three months of imports, but this task is made difficult by shortages of foreign exchange as the country's import bill continues to rise, whilst the main source of export earnings in the form of tobacco exports have been declining in recent years (Pauw et al., 2013). Furthermore, periodic instances of decreased budget support from several development partners culminate in a severe shortage of foreign currency, which has been exacerbated following the global impacts of COVID-19 and the Russian invasion of Ukraine in March 2022. The GoM, therefore, employed what is referred to as a "flexible exchange rate managed float regime" in which several short-term exchange controls have been instituted to support the value of the currency. These measures have led to the currency being overvalued and the RBM decided to let the market clear on the 27th of May 2022 and indicated the aim of buying foreign currency. The 25% devaluation is visible in Figure 5. Additional measures taken by the Bank include the compulsory sale of 30% of all export proceeds to Authorised Dealer Banks, whilst the remaining 70% can be kept in foreign currency-denominated accounts.

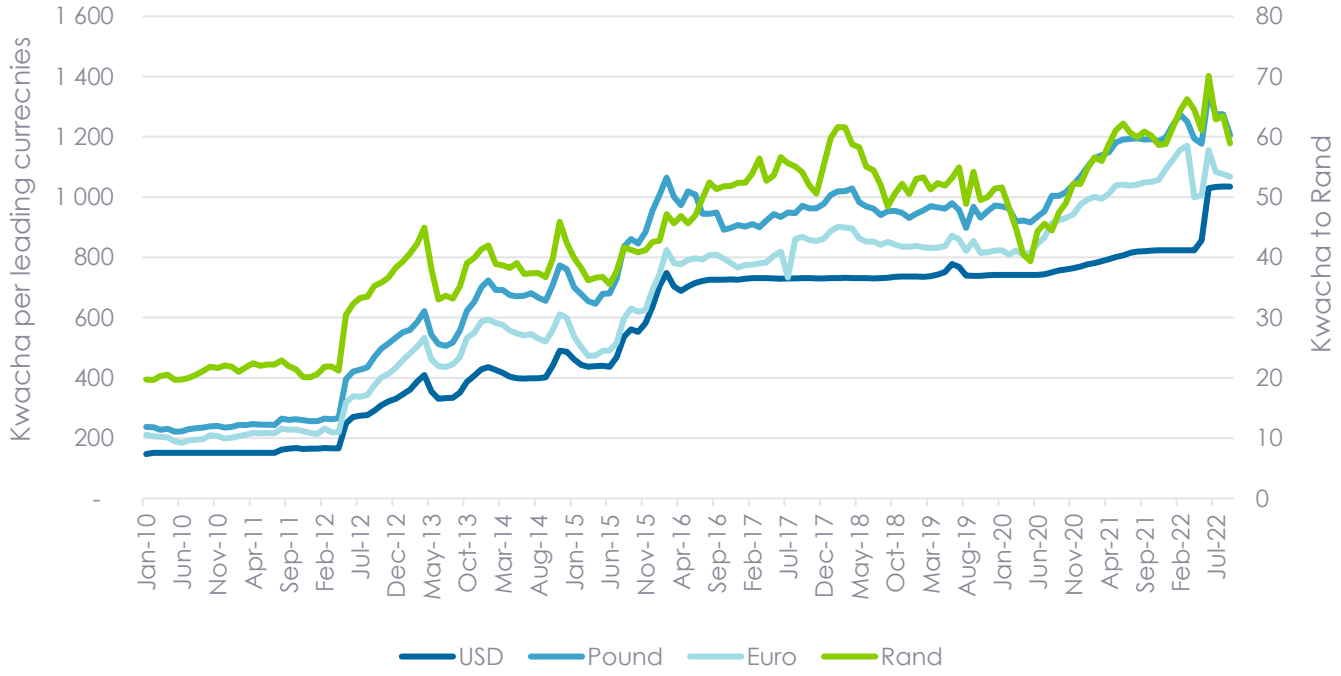

FIGURE 7: VALUE OF THE MALAWIAN KWACHA AGAINST MAJOR CURRENCIES AND THE RAND
Source: RBM, 2022

Unfortunately, the decisions affecting the value of the Kwacha mostly work against efforts to lower inflation. Furthermore, although the devaluation makes exports more competitive in the short run, the additional exchange controls dilute forex earnings for exporters and result in the official rate of the Kwacha trading at a lower valuation than the parallel, informal currency market.

The inflation and exchange rate policy objectives are therefore often in conflict, which has a bearing on agricultural value chains. Devaluating the currency in a highly import-dependent country harms consumers as domestic prices for imported goods rise, but the country is also highly dependent on the agricultural sector to provide the bulk of foreign export earnings. Thus, when the currency is overvalued, agricultural exports are constrained, leading to lower reserves and national economic growth (Pauw et al., 2013). Additional exchange controls on exporters also disincentivise formal sector agricultural exports.

The prevailing disconnect between the monetary policy objectives of price and financial stability has several implications for the selection of agricultural value chains for prioritisation. First, consistently high inflation rates dampen the prospects for local market demand growth for products, since an already poor consumer base is further constrained. High prices also filter through to producer prices, weakening the cost competitiveness of all value chains, particularly input-intensive industries. The continued struggle to lower inflation means the RBM has to maintain a relatively high Policy rate, making access to capital and repayment of existing debt untenable. Lastly, the exchange rate regime and decisions affecting the value of the Kwacha mean that if the currency is overvalued, it adds to the structural weakness of this import-dependent economy in terms of foreign reserves shortages, promotes rent-seeking and corruption, but makes imports potentially cheaper. Alternatively, if the currency is undervalued it promotes agricultural and other exports that support an inflow of foreign currency reserves so badly needed but are generally inflationary and lead to more expensive imports, including farming inputs.

2.3.2 Fiscal Policy

Malawi's fiscal capacity to support economic and social development is constrained for several reasons. The government's ability to generate revenue has not matched the expansion of public spending commitments, leading to routine annual fiscal deficits that need to be financed through increased borrowing, estimated to be 8% of GDP for the 2021/2022 budget (GoM, 2022a). A large portion of public spending is now dedicated to interest payments to service the debt, shrinking the portion available for important priorities that could positively contribute to income generation and development. Figure 6 provides a breakdown of the most recent 2022-23 Budget Framework as it was published by the Minister of Finance & Economic Affairs in February 2022. The total budget for 2022-23 was estimated at MK 2 840 billion, financed from domestic revenues (58%), grants from foreign governments and international organisations (11%) and the remaining 31% from net borrowing (GoM, 2022b).

Of the total earmarked spending, 18% is allocated to interest payments on government debt, while the single biggest ministerial allocation is for the Ministry of Agriculture (10%), followed by other important priorities such as health (6%), roads (5%) and water (5%). Figure 6 further disaggregates the 10% budget allocation to the Ministry of Agriculture into the major funded programmes and projects, providing some context on value chain prioritisation within these expenditure decisions. Importantly, parts of the MW 275 billion allocation to the Ministry of Agriculture are jointly funded by development partners for specific projects, whilst other programmes are specifically funded by government funds. For instance, the 40% allocation for the Affordable Input Programme (AIP) and the allocation for maize purchase by the National Food Reserve Agency (NRFA) and the Agricultural Development and Marketing Corporation (ADMARC) comes from the Ministry's Other Recurring

Transactions (ORTs), which are funded exclusively by the government. The AIP is therefore by far the biggest budget item for agriculture and makes up 4% of the total available spend from the fiscus.

The AIP was introduced during the 2020/21 cropping season to replace Malawi's Farm Input Subsidy Program (FISP). FISP was introduced in the 2005/6 agricultural season which initially targeted 1.5 million rural smallholders receiving coupons to purchase 2 bags of fertiliser. The main justification for its implementation and continuation has been to improve maize productivity and therefore ensure food security at household and national levels by increasing access to improved farm inputs (AGRA, 2017). The GoM introduced FISP against the backdrop of recurring food shortages and the notably poor harvest of 2004/5, caused by drought and limited availability of commercial fertilisers. The initial subsidy covered around 65% of the commercial fertiliser price, aimed at reaching poor rural households that have access to land and human resources, but who cannot afford fertiliser (Arndt et al., 2014). As part of the subsidy, farmers also received maize seeds with a choice of hybrids or open-pollinated varieties. FISP evolved over the years due to a combination of changes, to support more efficient systems, better targeting of rural and poor households and distribution improvements, whilst broadening the programme to include seeds of other crops (groundnuts, beans, soybeans, cowpeas, rice and sorghum). Towards the end of FISP in 2019-20, the general aim was to reduce the number of farmers supported by the programme and to lower the subsidy contribution on fertiliser to around 75%, with a much stronger role for the private sector in the distribution of inputs through voucher systems. Despite some improvements, there are mixed findings on whether the programme has been successful given the high cost of implementation and unintended negative consequences such as the crowding out of private sector investment and the unsuccessful ineffective targeting of beneficiaries. Some studies do point to associated direct and indirect benefits both to the agricultural economy and across the rest of the economy, but there is growing view that the net cost outweighs the benefits.

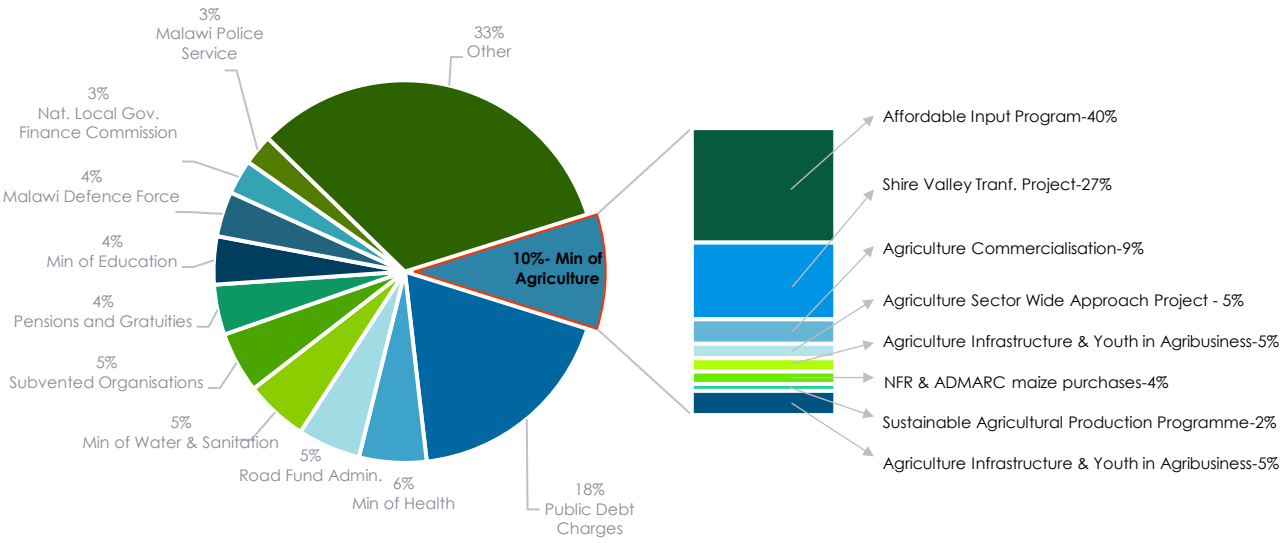

FIGURE 8: MALAWI'S APPROVED NATIONAL BUDGET ESTIMATES FOR 2022-23
Source: GoM, 2022

Despite the continued debate on the FISP, the newly elected Tonse Alliance Government introduced the new Affordable Input Program (AIP) to replace FISP with largely the same policy rationale, but with a substantial increase in coverage. Whereas FISP provided subsidised inputs to around 900 000 farmers in 2019/20, the AIP provided 3.5 million farm families with inputs in 2020/21 (Nyondo et al., 2021; MoAIWD, 2021). Another notable change was the exclusion of pulses, with only maize, sorghum and rice seed covered by the new seed subsidy. Around 345 000 tons of fertiliser (NPK and Urea) was distributed against an estimated total fertiliser use of 400 000 tons in the 2020/21 season (MoAIWD, 2021). A total of 13 463 tons of maize seed was distributed through AIP, with marginal quantities of seed for rice and sorghum procured through the programme. Although the largest part of the subsidy provides fertiliser to farmers, the AIP is mainly prioritising maize as a value chain on food security grounds.

In addition to the AIP, the MoA is currently running three major projects. The largest of these is the Shire Valley Transformation Project, which in 2022/23 made up 27% of the total agricultural budget allocation. This is a long-term project (14 years) which started in 2018 with support from the World Bank, the African Development Bank (AfDB) and the Global Environment Facility (GEF) to harness the irrigation potential of the Shire Valley through the development of gravity-fed irrigation from the Shire River. The project envisions development of 43 000 hectares of irrigated crops, benefitting around 100 000 farm families (MoAIWD, 2022b). Targeted crops are mainly those already grown in the region, but specific outcome indicators are specified for cotton, pigeon peas, soybeans, maize and beans. This, to some degree, suggests that the program is targeting these value chains for expansion once all infrastructure is completed (ADB, 2022).

The Agricultural Commercialisation Project (AgCom) is the second biggest (9%) project by fiscal allocation and is a collaboration between the MoA and the Ministry of Trade & Industry, financed through a loan from the World Bank. This country-wide programme seeks to increase commercialisation by integrating small and emerging farmers (<8ha) into agricultural value chains. The project provides consulting and technical services, matching grants for capital investments, a blended credit facility, and public infrastructure. The project specifically states that its participants decide which value chains to be prioritised for implementation, but should be within the crop, livestock and fisheries products (MoAIWD, 2022c).

Finally, the Agriculture Sector Wide Approach Project (ASWAp) is another jointly funded project involving the European Union (EU), United States Agency for International Development (USAID), the Norwegian Government, Irish Aid and the government of Flanders. ASWAp is a prioritised and harmonised investment framework meant to improve harmonisation, alignment and donor coordination in the agricultural sector in Malawi. It aims to improve the effectiveness of investments aimed at food security and sustainable agricultural growth and to strengthen the natural resource base on agricultural lands by doubling the area under sustainable land management as a basis for securing ecosystem services and sustainable agricultural productivity. The core objective is to reduce the number of agricultural projects with similar objectives by jointly supporting existing projects by the MoA. As such, the focus of this project is more on institutional development and capacity building, project coordination and some infrastructure spending, and less on prioritising specific value chains for development (World Bank, 2013).

2.3.3 National Planning and Sectoral Policy

Thus far this document has covered the broader macro-economic policy landscape as it relates to both monetary and fiscal policy decisions by the GoM and related institutions. In terms of the latter, spending decisions are normally guided by development plans and policies from various ministries, as drafted by the government in office. Thus, although the budget allocation formulated by the Minister of Finance needs to be approved by Parliament, the overarching policy narrative still guides spending priorities and is therefore important when assessing policy prioritisation for specific value chains. In this section, we review the agricultural policy landscape in the recent past with a focus on the past two decades through a schematic diagram (Figure 7).

Before 2000, Malawi's global policy alignment was influenced by the Structural Adjustment Programmes (SAP) that were initiated with support from the World Bank and the International Monetary Fund (IMF) in the 1980s trying to wean the country off various forms of state intervention and towards market liberalisation. Prior to the move towards SAP and during its implementation, the transition had mixed results, largely due to a combination of factors that included fiscal indiscipline and a deteriorating terms of trade, which was followed by an oil price shock and civil war in Mozambique (Arrieta et al., 2022). During this reform period, there was also a series of regional policy developments of socio-economic, political and security coordination that led to the formation of the South African Development Community (SADC), of which Malawi is a member. In terms of specific national policy planning, Malawi's development was articulated in 10-year development plans called Statement of Development (DEVPOLS). The various iterations of DEVPOLS since independence in 1964 were mainly orientated towards state intervention, but allowed the private sector to thrive, albeit with strong political underpinnings (NEC, 2000).

In 2000, there was a significant change in policy planning towards a long-term strategic approach to development with the publication of the Malawi Vision 2020. This 20-year framework set out a multi-sectoral approach to development used to guide the formulation, implementation and evaluation of short- and medium-term plans for both the public and private sectors. The visioning process was developed as a consensus between the government and the people and had a strong focus on good governance and sustainable economic growth, but faced several challenges to implementation and therefore did not succeed in realising the development potential (NPC, 2020). Vision 2020 placed little emphasis on the role of agriculture to achieve the long-term vision.

During the implementation of Vision 2020, the country aligned its policy focus to that of the Millennium Development Goals (MDGs), and since 2015, the Sustainable Development Goals (SDGs). Malawi is also part of the African Union (AU) and the Maputo Declaration, which was launched in 2003 after the 1st Conference of Ministers of Agriculture. In response to the apparent stagnation of African agriculture, signatories agreed to implement the Comprehensive Africa Agriculture Development Programme (CAADP) where 10% of each county's national budget would be committed to spending on agriculture and the implementation of CAADP (AU, 2003). Additionally, the process of closer cooperation and support in the New Partnership for African Development (NEPAD) was requested in a bid to pursue several development issues within agriculture on the continent. To date, Malawi is one of the only countries to have achieved this 10% budget allocation to agriculture. The Maputo declaration was followed by the Malabo Declaration

through which CAADP had the objective of achieving 6% annual growth in the agricultural sector and committed to achieving the four pillars of CAADP.

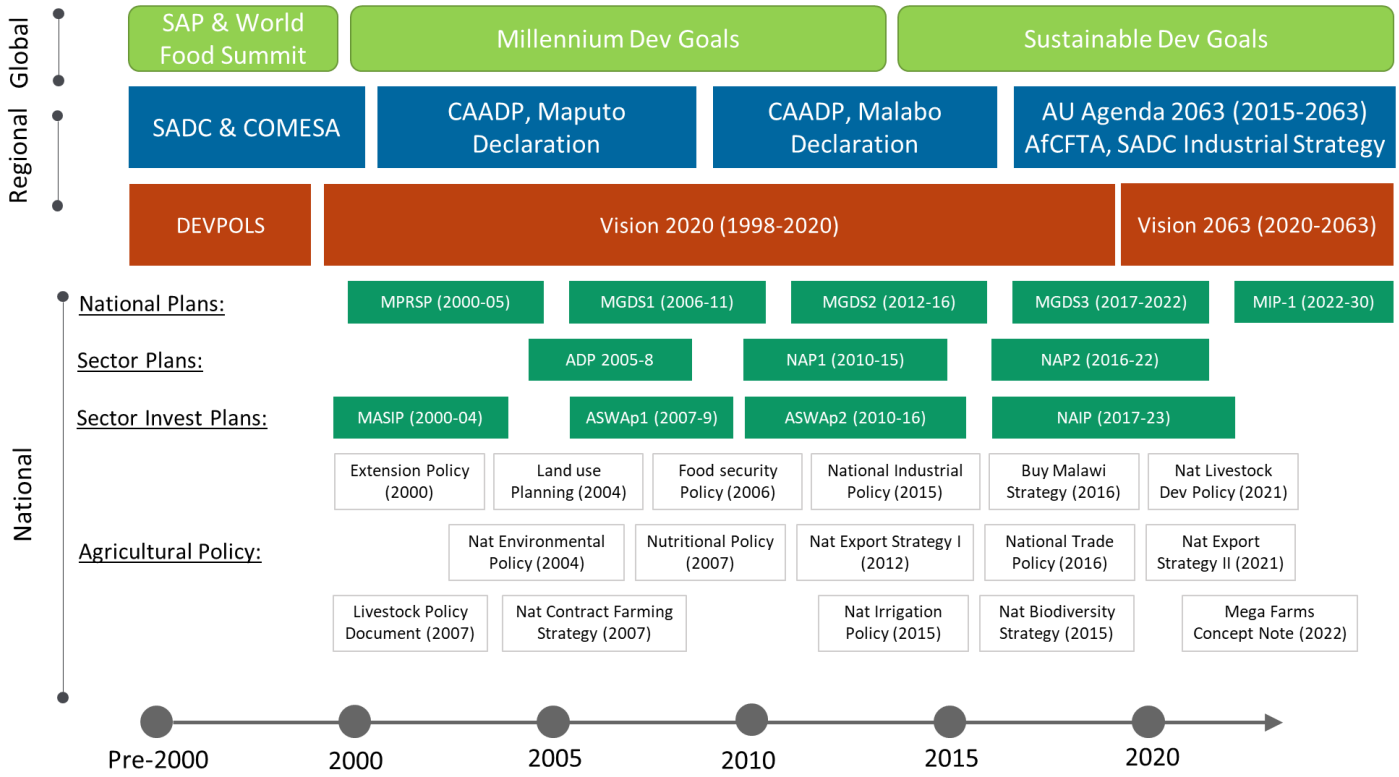

FIGURE 9: MALAWI'S POLICY FRAMEWORK
Source: Own compilation from various sources

During the implementation phase of Vision 2020, the Malawi policy framework was set up in several national and sectoral 5-year plans, which were meant to operationalise the long-term vision. At the national level, the Malawi Poverty Reduction Strategy (MPRS) was followed by three iterations of the Malawi Growth and Development Strategy (MGDS), of which the last one ended in 2022. These strategic 5-year documents were introduced to serve as a single reference document for policymakers, which articulated the main policy direction of the government. The MGDS I (2006-2011) had Agriculture and Food Security as a Key Priority Area, with the goal of increasing the contribution of agriculture to economic growth. A broader definition of the sector also included the development of the agro-processing and food manufacturing sectors. The result was specific policy targeting of value chains such as cotton, tea, tobacco and sugar, accompanied by specific growth targets (GoM, 2006). The MGDS II (2011-2016) continued to recognise the importance of agriculture in fostering economic growth and Agriculture and Food Security was once again listed as a Key Priority Area. The objective was supposed to be achieved through expansion in the county's traditional agricultural products such as sugar, cotton, coffee and tea, as well as diversifying away from tobacco into wheat, cassava, macadamia nuts, fruits, pulses and vegetable commodities, among others (GoM, 2011).

By the time of the drafting of the MGDS III (2017-2022), Malawi committed itself to the AU's long-term pan-African vision called Agenda 2063. It was also the final national development policy under Vision 2020 (GoM, 2017). Agriculture and climate change management were listed as Key Priority Area through which increased production and productivity, increased irrigation and diversification were the intended outcomes. A synthesis of the MGDS documents spanning from 2006 to 2022 suggests that, while there was a strong policy focus on agriculture to drive the country's development, there was limited success in implementation.

Whilst the MGDS were meant to address national policy priorities, sector plans were introduced to operationalise implementation. Prior to MGDS I, the agricultural sector did not have a coherent policy, but rather many sub-sector policy documents. The Agricultural Development Program (ADP)(2006) was meant to enhance coordination in the implementation of sector priority programmes by all stakeholders but was short-lived since in 2007, the GoM formulated the Agricultural Sector Wide Approach (ASWAp) to harmonise investment and support programmes in agriculture according to the goals set out by the MGDS I (GoM, 2010). Then, in 2010 the Ministry of Agriculture and Food Security published its first National Agricultural Policy (NAP I) to establish greater national agricultural policy coherence, whilst also providing a premise for the development of sub-sectoral or industry-specific policies and legal frameworks. Thus, since the first NAP, agricultural policy formulation had to align with this new sectoral plan, of which the sectoral investment plans became the budget framework to spearhead the implementation of the NAPs. ASWAp II (2011-2015) was published as the main investment plan under the NAP I with support from various donors, consultants and government institutions (MoAFS, 2011). These two policy documents were published during a time of strong policy focus on fertiliser and seed market interventions as the main focus area for policy support, although they tried to also address several other policy areas. In terms of specific value chain prioritisation, these policy documents were mostly mute on targeted policy actions that would help achieve outcome indicators. By the end of the MGDS II, another cycle of sectoral policy documents was published, first the NAP II in 2016 and then the National Agricultural Investment Plan (NAIP) in 2018. At the time of writing, these are the current agricultural policy documents and provide a perspective targeting value chain priorities. The NAP II introduced a significant shift in agricultural policy from its focus on food security towards the country being more oriented towards commercial farming through specialisation, diversification and value addition (GoM, 2016). The envisioned agricultural transformation took on a more heterogenous perspective whereby in addition to continued support to smallholders, medium and large-scale commercial farmers were included in public investments. NAP II policy priorities were listed as sustainable agricultural production & productivity, sustainable irrigation development, mechanisation and market development & agro-processing. A long list of the major crops is listed with targets set for yield improvement over the implementation period for both dryland and irrigation farming, whilst livestock population targets were set for beef and dairy cattle, goats, sheep, chickens, pigs and aquaculture.

As part of the implementation of NAP II, the National Agricultural Investment Plan (NAIP) was published by the Ministry of Agriculture to serve as the medium-term investment framework. It continues to be the main implementation vehicle for agricultural policy in Malawi. The NAIP highlights the importance of private sector investment and seeks to ensure that agricultural growth is inclusive, sustainable and climate-smart, as identified in the sixteen intervention areas. In terms of

targeting specific value chains, the NAIP mentions the challenge of the dominance of maize and tobacco and the need to diversify. The NAIP introduces prioritisation for the first time in agricultural policy documents using IFPRI's CGE model in combination with stakeholder consultations and alignment to other policy frameworks. This process of selection yielded results which identified the following specific sub-sectors and value chains as priorities under NAIP II: Oilseeds (cotton & soybeans); legumes (groundnuts & pigeon peas); horticulture (mangoes, bananas, papaya, oranges, macadamia & cashew nuts); livestock (beef & dairy); roots (cassava, potato and sweet potato) and rice (GoM, 2018).

Asides from the NAIP, several other policy documents have been released in recent years that are worth mentioning. Two National Export Strategies (NES) have been published, the first (NES I) in 2012 and more recently NES II in 2021. These have been drafted and implemented by the Ministry of Trade and Industry. One of the main objectives of NES I was to develop three priority clusters for export diversification, including oil seeds (sunflower, groundnuts, soybean and cotton), sugarcane, and manufacturing products, whilst at the same time continuing to support current export value chains such as tobacco (GoM, 2012). NES II also lists several agricultural exports as part of its priority products including tobacco, sugar, coffee, tea, cotton, groundnuts, macadamia, cashew, kidney beans, pigeon peas, chickpeas, cowpeas, mangoes, maize seeds, berries, chillies, vanilla, spices, meat and poultry, fish and cannabis (GoM, 2021d).

Finally, there was a significant change in Malawi's national planning coordination with the establishment of the National Planning Commission (NPC) through an Act of parliament (NPC, 2021). Whereas national planning was previously conducted within different ministries of government, the NPC has now been mandated to develop long and medium-term development plans and oversee their implementation as an independent and separate legal entity from the GoM. The NPC's first major task was to publish the MW 2063 after the Vision 2020 implementation period ended, which is now the long-term development plan for Malawi for implementation toward 2063. It differs from the country's previous long-term plans in that it has specific monitoring targets to track progress and the NPC is mandated to oversee its implementation beyond political regimes (NPC, 2021). MW 2063 sets out a transformation in development with a mindset change built on focusing on wealth creation instead of the previous focus on poverty reduction, and transforming the structure of the economy away from its import dependence and towards an industrialised exporting economy (NPC, 2020). The new trajectory in development planning and coordination has also ushered in some significant changes in the role of the agricultural sector. Similar to Vision 2020, MW 2063 places the agricultural sector at the centre of its development strategy, but has a much stronger focus on the commercialisation of farming, agro-processing development and expansion in exports driven by global and regional competitiveness. The first Pillar of MW 2063, called Agricultural Productivity and Commercialisation, seeks to create an enabling environment as the country transitions from low productivity and subsistence farmers to a market-oriented and highly productive commercial agricultural system with strong linkages to the rest of the economy.

The NPC also published the MW 2063 first 10-year Implementation Plan (MIP-1) which replaces the MDGS series of implementation plans under Vision 2020, and seeks to operationalise the MW 2063 (GoM, 2021a). Focus areas under MIP-1 on the first pillar of MW 2063 provide some material insights into how the country aims to achieve the objective of having a productive and commercialised

agriculture sector through initiatives such as agricultural diversification, irrigation development, anchor farms, and structured markets, to name a few. Under each of the listed outcomes, prioritised interventions are given for implementation. Under these, there are no specific policy levers identified to prioritise specific value chains, apart from referring to the NES list of priority value chains. Under the outcome for improved agricultural diversification, MIP-1 proposes fiscal incentives for the production of high-value non-traditional crops such as industrial hemp, cut flowers, horticulture, rice, wheat, legumes, cotton, macadamia, pulses and livestock products defined under NES II (GoM, 2021a).

In terms of sector plans the Ministry of Agriculture will be tasked to develop new NAP III and NAIP III policy documents in 2023, which should provide more details on policy prioritisation of value chains in support of the MW 2063 and MIP-1. At the time of writing, the most prominent and recent ministerial policy documents published by the Ministry of Agriculture is the National Livestock Development Policy and a concept document on the establishment and management of Mega farms (GoM, 2021e & GoM, 2021f).

2.3.3 Legislative Policy

The legislative policy environment as it relates to the agricultural sector is different from the policy documents reviewed in the previous section in that the legislative environment is governed by Acts of Parliament that form part of the laws of Malawi. These laws set out standards, procedures and principles that must be followed and, if not, those responsible for breaking the law can be prosecuted. Thus, whereas policy sets out the goals and planned activities of a ministry, laws may need to be passed to enable governments to put in place the necessary institutional and legal frameworks and policy instruments. At the same time, however, laws must be guided by current government policy.

With this distinction in mind, we do not review an exhaustive list of all acts affecting the agricultural sector, but rather summarise those of relevance to the functioning of agricultural markets and prioritisation of value chains. Perhaps the most important of all of these are the Special Crops Act of 1963 and the Agriculture (General Purposes) Act of 1987 (Duchoslav et al., 2022). The former provides the legislation regulating the production and marketing of crops deemed important to the economy which includes cashews, coffee, cotton, groundnuts, macadamia, tea, tobacco and tung (tree of Chinese origins bearing seeds that contain tung oil). The General Purposes Act covers all crops not declared as special crops as listed above. IFPRI published an excellent review of these Acts, both of which are frequently used to justify intervention by the government in agricultural marketing and trade (Comstock et al., 2019). In short, the two acts provide the Minister of Agriculture wide-ranging powers to intervene in agricultural markets, the most notable existing uses being the licensing of buying, selling, or marketing of crops, setting of minimum and maximum prices for products and prescribing export procedures. These regulations provide virtually unchecked powers to the Minister of Agriculture without describing the conditions under which interventions should be exercised. Aside from the multiple concerns raised by agricultural stakeholders on the acts themselves, there is generally insufficient capacity within the MoA to implement and enforce interventions that use these legislative mandates (Duchoslav et al., 2022). Due to the many challenges of these two outdated pieces of legislation, the MoA has attempted to draft the Crops Bill intended to replace both the Special Crops Act and the General Purposes Act into one, with

many proposed changes. In May 2022, a draft copy of the Crops Bill was circulated for inputs from agricultural stakeholders at short notice and it contained selected improvements such as the establishment of a regulatory authority that regulates scheduled crops and requires the Minister of Agriculture to consult stakeholders before making policy decisions. The Minister is also required to take into consideration market realities when prescribing minimum prices and the Bill provides for the first time a framework for appealing decisions made by the Crops Authority (GoM, 2022c).

Aside from these improvements, the pertinent challenges that the Crops Bill aimed to improve upon, such as the unchecked ministerial powers and the insufficient capacity to enforce regulations, are not addressed (Duchoslav et al., 2022). At the time of writing, it was unclear what the next steps were in the process to pass the Bill and if any further amendments were forthcoming.

Another important Act impacting agricultural markets is the Control of Goods Act which was first passed in 1968 and amended in 2018 (GoM, 2014), which resulted in significant changes to the law. The Act was designed to regulate the import and export of goods and is placed in the ambit of the Minister of Trade & Industry. As it relates to agricultural trade, the Minister of Trade & Industry, after consulting the Minister of Agriculture, can implement regulations controlling the import and export of any of the agricultural products listed in the schedule. Using these provisions, the Ministry of Trade & Industry issues permits to exporters or importers, which have been widely used in the past to invoke bans on exporting agricultural products such as maize, sugar and soybeans, to name a few. Edelman (2016) shows how the impact of such discretionary trade restrictions on maize exports has been ineffective in improving food security in Malawi or in lowering or stabilising local consumer prices. Also, the enforcement of trade bans between 2005-2007 and again between 2011-2013 were ineffective to halt maize exports through the various informal channels (Edelman, 2016).

Another focus area for legislation affecting agricultural value chains is those regulating the use of farm inputs. Before the liberalisation of agricultural trade in the 1980s, procurement and distribution of inputs to smallholder farmers was done by two State-led companies, the Agricultural Development and Marketing Cooperation (ADMARC) and the Smallholder Farmer Fertiliser Revolving Fund of Malawi (SFFRFM). In 1993, the GoM liberalised fertiliser importation, distribution and marketing, which resulted in only a select few private firms participating in agro-input trading (GoM, 2007). Since then, there has been some progress made in terms of new legislation with the passing of the new Seed Bill (GoM, 2022d) and the 2022 Fertilizer Bill which has been assented into law.

There are also a number of acts that are dedicated to specific agricultural value chains such as the Cotton Act (GoM, 2014) and the Tobacco Act (GoM, 2019b). Both of these are examples of regulations published by parliament to create structured markets aimed at improving market functioning. In both cases, industry commissions are established (e.g., the Cotton Council of Malawi and the Tobacco Commission) to regulate and promote the development of their respective industries, having powers to grant licenses, issue export permits, and ensure the enforcement of quality standards, to mention a few.

This brief review of the policy landscape indicates that the policy process, and coordination and implementation of these policies and laws are highly complex and difficult to navigate. Despite the best efforts of planners, legislators, civil servants and various agricultural stakeholders, the current agricultural policy landscape has not translated into real agricultural growth rates above the

targeted 6% per annum, nor is there much evidence of agricultural transformation underway. Our holistic approach to value chain analysis and the purpose of this report is to contribute in this regard by ranking value chains according to their ability to make a significant contribution to inclusive agricultural transformation.

3. THE PPVC APPROACH

The primary objective of PPVC is to support the GoM in identifying priority value chains, and helping them plan and implement targeted policy interventions in a way that maximise the benefits to society and the economy relative to the cost of those interventions. This is done through a replicable and market-led approach in which a selected number of Malawian value chains are ranked according to their potential to drive inclusive agricultural transformation (IAT). The ranking methodology combines a portfolio of indicators grouped into five broad policy or development outcome indicators, which is used to facilitate the prioritisation of three value chains for further Deep-dive analysis in the second phase of PPVC in Malawi. The five broad policy indicators include 1) market-led, 2) agricultural transformation, 3) social inclusiveness, 4) value chain scans and 5) climate as well as the portfolio of indicators associated with each are listed in Table 1 and explained in more detail in the next section in which describe the different steps in value chain ranking process.

TABLE 2: PPVC INDICATORS USED FOR RANKING VALUE CHAINS

Market-Led		Agricultural Transformation	Social Inclusiveness	Value Chain Scans	Climate
Potential	Competitive-ness				
Intensification	Input cost / use	Agricultural Food System Growth	Poverty	Policy Support	Production Volatility
Domestic consumption growth	Relative Trade Advantage (RTA)	Diet Quality	Employment	Investment Support	GHG emissions
Regional export potential				Scalability	Water use Requirements
				Agro-Ecology	

Source: BFAP & IFPRI, 2022

Step 1: Identify Value Chains that can deliver on IAT.

The first step involves the creation of a "long list" of value chains to be considered in the PPVC ranking exercise. Our selection process involves considerations such as the strategic importance and growth opportunities of value chains that align closely with government policy ambitions as reviewed earlier in this report. The motivation for narrowing down the set of value chains that are considered for PPVC rankings stems from a few considerations. First, a particular value chain needs to be established in the Malawian context for it to be able to make a significant impact on agricultural transformation. Niche and upcoming value chains are excluded on the grounds that

any policy interventions would only have marginal economy-wide impacts on critical development outcomes such as economic growth, employment and poverty reduction at the national level. Furthermore, to develop indicators for each value chain a threshold set of data needs to be available for the models and analytics used in the rankings. The review of Malawi's policy framework suggested that there is currently no specific list of value chains prioritised by the GoM, although there are implied priorities through spending decisions and the various policy and legislative documents that are available.

To ensure that the long list of value chains selected for the PPVC ranking approach is representative of industries that have a significant opportunity to contribute to agricultural transformation we conduct an iterative validation exercise assessing the relative importance of a list of 48 value chains. We assess each value chain's contribution to agricultural gross production value (size of the industry), 5-year growth rates, trade levels and performance (import & exports), the number of farmers involved, and the share of farmers that sell produce (commercial intent).We consider different weighting options for aggregating these value chain indicators into a single indicator that can then be used to construct the long list of value chains:

1. Balanced weighting approach where equal weights have been allocated to the following variables: Gross Production Value & 5-year annual growth; export value & 5-year annual growth; Import value & 5-year annual growth; Number of farmers; Share of producers that sell produce [8 indicators 12.5% equal weights]
2. Trade favoured approach where a higher weight has been allocated to the four trade indicators (GPV = 20% & 5-year growth = 10% & trade & 5-year growth = 70%)
3. Commercialisation focus approach where the share of farmers that sell their produce gets a 30% weight, whilst export indicators get a 35% weight GPV = 35%.

The results of the weighted approaches are given in Table 2, which provides an indication of which value chains are consistently amongst the highest ranked, according to the pre-selection exercise. Aside from this initial ranking, the research team also actively engaged several stakeholders to obtain feedback on which value chains should be included in the PPVC analysis. Once all these activities were concluded, 17 value chains representing crops (field and cash crops) and livestock (including fisheries) sub-sectors were ultimately selected for the value chain ranking exercise. These are shown in Table 3.

TABLE 3: SHORTLISTING DIFFERENT WEIGHTED APPROACHES TO SELECT VALUE CHAINS

Balanced

Rank	PPVC
1	Pigeon peas
2	Mangoes & Guava
3	Sweet potatoes
4	Bananas
5	Groundnuts
6	Soybeans
7	Beans
8	Pigs
9	Goats
10	Poultry
11	Avocado
12	Maize
13	Pumpkins
14	Mustard
15	Irish potatoes
16	Rice
17	Tomatoes
18	Sheep
19	Cow peas
20	Cassava

Trade Favoured

Rank	PPVC
1	Pigeon peas
2	Soybeans
3	Mangoes & Guava
4	Chick peas
5	Sunflower
6	Sweet potatoes
7	Cassava
8	Dairy
9	Poultry
10	Beans
11	Macadamia
12	Peas
13	Maize
14	Goats
15	Eggs
16	Groundnuts
17	Rice
18	Bananas
19	Pigs
20	Tobacco

Commercialisation

Rank	PPCV
1	Soybeans
2	Groundnuts
3	Tobacco
4	Pigeon peas
5	Sugarcane
6	Poultry
7	Leaf tea
8	Sunflower
9	Aquaculture
10	Rice
11	Coffee
12	Irish potatoes
13	Sweet potatoes
14	Pigs
15	Beans
16	Tomatoes
17	Goats
18	Cow peas
19	Maize
20	Onions

Source: Own compilation

TABLE 4: SHORTLISTED VALUE CHAINS USED IN PPVC

Final Selection	Value Chains
Field Crop	Pigeon Peas
Field Crop	Soybeans
Field Crop	Groundnuts
Field Crop	Sugar
Field Crop	Rice
Field Crop	Maize
Field Crop	Beans
Field Crop	Cotton
Livestock	Poultry
Livestock	Pigs
Livestock	Goats
Livestock	Aquaculture
Cash crop	Tobacco
Horticulture	Mangoes
Horticulture	Bananas
Horticulture	Sweet Potatoes
Horticulture	Macadamias

Source: Own compilation

Step 2: Develop Partial Equilibrium-models for each selected value chain.

Various economic models are employed throughout the PPVC process to generate the quantitative indicators used in the value chain ranking process. BFAP's Partial Equilibrium (PE) model is one tool

among a range of analytical and forecasting models that can provide quantitative simulations and evidence-based support to policy planning and decision-making. The BFAP models have been widely applied across many different agricultural commodities and are built on a dynamic, recursive partial equilibrium framework, based on balance sheet principles, to establish equilibrium where total supply (comprising production and imports) must equal total demand (comprising local consumption and exports) for any given product. Model specification is generally based on well-accepted structures and parameter specifications of supply and demand. Parameterisation is based on a combination of econometric estimation and elasticity assumptions based on a literature review, theoretical consistency and specialist judgement on the nature and functioning of the selected value chain markets.

The dependence on historic data, both for estimation and calibration purposes, implies that significant emphasis has been placed on the quality of the historic data feeding into the model. The model is particularly effective in bringing together a combination of econometric estimates and specialist inputs into a consistent simulation structure. In the case of the PPVC Malawi analysis, the 17 value chains models are calibrated using historical data from 2010 to 2019, while the outlook projections are for 2020-2030.

Initial commodity balance sheets were compiled based on a range of secondary data sources, supplemented by official data from the Ministry of Agriculture. While the official national data provided the starting point for balance sheet compilation, complementary data from the other listed sources provided opportunities for validation and alternatives where required. The PE models are generally used to construct variables related to the market-led indicators such as domestic market growth, regional export potential and opportunities for intensification in production, and provide the basis for our value chain analytics.

Step 3: Conduct farm-level benchmarking analysis and compile additional indicators.

PPVC also includes a list of indicators used in our value chain rankings that relate to important features such as farm-level competitiveness, as well as the relative trade advantage (RTA). Step 3, therefore, includes a farm-level benchmarking analysis comparing the typical Malawian farming enterprise with that of an international benchmark. This analysis provides the basis to assess how competitive Malawian value chains are at producing one unit of output against the associated cost. This is then used to calculate both the intensification and input cost/use indicators under the market-led composite indicator.

Step 4: Develop an Economy-wide CGE RIAPA model and indicators.

The Rural Investment and Policy Analysis (RIAPA) modelling and data system developed by IFPRI is used to conduct forward-looking, economy-wide analysis and serves as a simulation laboratory for experimenting with policies, investments or economic shocks. At the core of RIAPA is a standard recursive-dynamic Computable General Equilibrium (CGE) model. For PPVC rankings, the Malawi Social Accounting Matrix (SAM) was updated and calibrated using 2019 as the base year. The SAM is consistent with the rebased National Accounts (GDP at factor cost) and Supply and Use Tables from the GoM and incorporates data from the latest 2019/2020 Integrated Household Survey (IHS

2019/20). RIAPA separates the economy into 90 sectors/products, of which 36 are in agriculture (i.e., crops, livestock, forestry, and fisheries) and 20 are in off-farm agri-food processing and food services. The remaining non-agricultural sectors are still indirectly linked to the agri-food system via their supply of inputs into agri-food production and in generating incomes that consumers use to purchase agri-food products. A key feature of RIAPA is that supply of labour and cropland are constrained in the model, and so expanding production in a value chain requires a reallocation of resources away from other value chains. The final allocation of land, labour and capital across sectors is determined by their marginal returns (i.e., where they can be most productively used) and this specification allows RIAPA to capture a key dimension of agricultural transformation, namely diversification into higher-value farming and the movement of labour out of agriculture into more productive nonfarm sectors, possibly within the agri-food system.

Households in the model earn incomes based on land, labour, and capital endowments, and consume goods and services. By separating households by income group (per capita expenditure quintiles) and location (urban and rural areas), the model provides information about the inclusiveness of production patterns and prices emerging when a value chain expands. The RIAPA household groups are linked to their corresponding households in the IHS 2019/20. Simulated changes in commodity-level consumption for each household in RIAPA are passed down to the survey to estimate changes in poverty status and diet quality.

RIAPA is also used to generate two sets of composite indicators that represent agricultural transformation and social inclusiveness associated with value chain growth. The transformation indicators respectively show how effective a value chain is in generating growth in the downstream (off-farm) agri-food system, as well as its effectiveness in improving diet quality. The social inclusiveness indicators provide growth elasticities of each value chain's ability to reduce poverty and the effectiveness in creating jobs across the agri-food system.

Step 5: Conduct qualitative value chain scans and scoring.

Step 5 in the PPVC ranking exercise involves a qualitative assessment of value chains that complements the model-based, quantitative analysis. This step starts with a detailed review and assessment of each selected value chain in terms of four different indicators relevant to PPVC: 1) Policy Support; 2) Investment Support; 3) Scalability; and 4) Agro-Ecology. Extensive industry stakeholder engagements further informed the qualitative scoring results in combination with desktop research and a literature review. The Appendix provides a detailed write-up of the qualitative scans for each value chain.

Step 6: Develop climate indicators.

The climate indicator is a new addition to the PPVC methodology. The need for an additional composite indicator arises from the focus on sustainable development of value chains with a strong emphasis on the impact on the environment. The selected climate indicators, therefore, aim to capture the various value chains' contribution to climate change, as well as measure their resilience to climate change on a high level. Three indicators were chosen based on their pragmatic applicability in our ranking framework, their 'representativeness' of the topic in question and data

availability. The three indicators were Greenhouse Gas Emissions, water use requirements and production volatility.

Step 7: Utilise statistical methods to consolidate final rankings.

The final step involves a process of concluding the final rankings of the selected value chains. Though there are several different ways of consolidating a final ranking, we purposefully cluster indicators into different themes and do not employ any differential weights across these indicators. The reason behind this is that final results are presented in such a way that, although ranked according to the final composite indicator score, the value chain ranking per theme is presented such that policymakers and investors can interpret the results according to their narrative of the relative importance of different development outcomes. It will become very clear once the results are provided that value chains tend to score well on certain indicators and poorly on others, which highlights the kind of trade-offs that are apparent in prioritisation decisions. Thus, the strength of this approach is the attempt to quantify these differences in a combined ranking of value chains. In the final analysis, though, the rankings are not an absolute measure, but rather a relative measure of a value chain's ability to drive inclusive agricultural transformation.

The analytics and research undertaken to compile the rankings that are presented in this report could also be used to inform policy and planning on its own accord and have successfully been used in other countries in assisting policy research such as Flagship documents and other policy documents. Once all of the indicators are compiled, the rankings are finalised using the well-known Garrett Ranking technique. This will be explained in the next section.

4. SELECTION CRITERIA

Whereas the previous section described the different steps used in ranking the chosen value chains, this section provides detailed explanations of the selection criteria and indicator calculations grouped under each composite indicator.

4.1 MARKET-LED

The Market-Led cluster consists of five indicators capturing different aspects of a value chain's market *potential* and *competitiveness*, and hence provides the business case for expanding and/or upgrading the value chain, whether through private or public investments or policy reforms. The indicators have been selected to include an overview of market dynamics, with a focus on growth potential (as opposed to the absolute size of the markets). Those that capture elements of potential (indicators 1-3) provide high-level measurements of the growth potential of a value chain measured by the scope and scale for future growth, both at farm and at the end market as projected by the BFAP PE model. Competitiveness indicators (4 & 5) measure the competitiveness of a value chain in terms how it competes with leading producing nations in producing a unit of output relative to costs and to what extent a value chain is competitive in the export market, relative to other exporters. All five indicators are combined into one weighted composite indicator, using the following functions:

Intensification (Production): Is calculated as the inverse of the ratio[1] of local projected yields from the PE model ($YLD_{Local\ avg\ 2030}$) and a reference yield ($YLD_{Reference\ yield}$):

$$Y_{Intensification} = 1 - \frac{YLD_{Local\ avg\ 2030}}{YLD_{Reference\ yield}}$$

$Y_{Intensification}$ provides an indication of the potential for further intensification of production. A high value indicates a higher potential for intensification (i.e., the gap between projected yield and the reference or potential yield is large, leaving a lot of room for improvement). The reference yield is taken as the yield that is currently achieved by commercial growers (or breeders in the case of livestock).

Domestic Consumption growth (Consumption): The projected volume of domestic consumption of each commodity is generated using the BFAP PE model. The projected average annual growth in domestic consumption ($Y_{Consumption\ Growth}$) is then calculated using the least-squares growth method (described at the end of this section and the results given in the Appendix). This indicator measures the projected average annual growth in domestic consumption given a set of macro-economic assumptions about population growth, per capita income growth, income elasticities etc. introduced in the partial equilibrium framework. Higher projected consumption growth represents a growing local market or demand which indicates potential for value chain upgrading.

Regional Export Potential (Trade): The average annual growth in import volumes by Malawi's trade partners in regional or global markets over the past 5 years provides a useful indicator of Malawi's future export potential. This indicator can be calculated for both primary (e.g., soybeans) and secondary products (e.g., soybean cake & oil) of a value chain. For ranking purposes, the focus will be on the combination of the raw and processed products.

Input cost efficiency ratio (Input costs): Is calculated as the local cost of production per unit of output efficiency, measured in terms of yield, divided by world benchmark production costs per unit of output efficiency.

$$Input\ cost\ efficiency\ ratio = \frac{Production\ Cost_{Local}}{YLD_{local}} / \frac{Production\ Cost_{World\ benchmark}}{YLD_{World\ benchmark}}$$

Benchmark costs and yields are taken from various markets (e.g., maize in the US, rice in Thailand, or macadamias in South Africa). An input cost efficiency ratio greater than one indicates that production costs per unit of production in Malawi are higher than the industry benchmark. Crop budget information was used for field crops to calculate a cost per hectare. For livestock commodities, various approaches were followed. For chicken and aquaculture, the cost per weight gained was used, while for pigs and goats, the carcass weights versus the relative cost of caring for animals was used.

Relative Trade Advantage (RTA) (Trade): RTA is a measure of competitiveness, which combines a nation's export and import share of a commodity in the international market as well as the nation's export and import share of all commodities:

[1] *In this instance the ratio is expressed as a percentage. That is why the inverse can be calculated as the difference between the ratio and 1.*

$$RTA_{ij} = RXA_{ij} - RMA_{ij}$$

RTA_{ij} = Relative Trade Advantage for country i and commodity j
RXA_{ij} = Relative Export Advantage for country i and commodity j
RMA_{ij} = Relative Import Advantage for country i and commodity j
X = Exports,
M = Imports,
k index of all commodities,
n index of all countries.

An RXA greater than 1 indicates that the country has a competitive advantage in the commodity under consideration; it reveals a higher state of competitiveness since it has a strong export sector. In the case of RMA, a value less than 1 indicates a comparative advantage as the country is less dependent on imports for that commodity.

The average growth in RTA over the past 5 years is calculated for each value chain. The RTA can take on values between $-\infty$ and ∞ with the "competitive-advantage-neutral" point being 0. A negative (positive) RTA indicates that the country has a relative competitive disadvantage (advantage) while the magnitude indicates the importance of imports (exports) relative to the country's overall trade position.

4.2 AGRICULTURAL TRANSFORMATION

The RIAPA CGE model is used to examine the economy-wide effects of productivity growth in each value chain relative to a baseline scenario where value chains follow a business-as-usual growth path. Since our focus is inclusive agricultural transformation (IAT), our interest spans beyond primary agriculture, i.e., we are also interested in understanding how agricultural productivity growth affects producers in other parts of the agri-food system (AFS) or consumers of food more generally. Figure 8 presents definition of the AFS that is adopted in the RIAPA framework, as seen from a supply-side perspective. The AFS includes farmers (or primary agriculture), but also agro-processors in the manufacturing sector, and all those actors involved in the food trade, transport, and other sectors (such as restaurants).

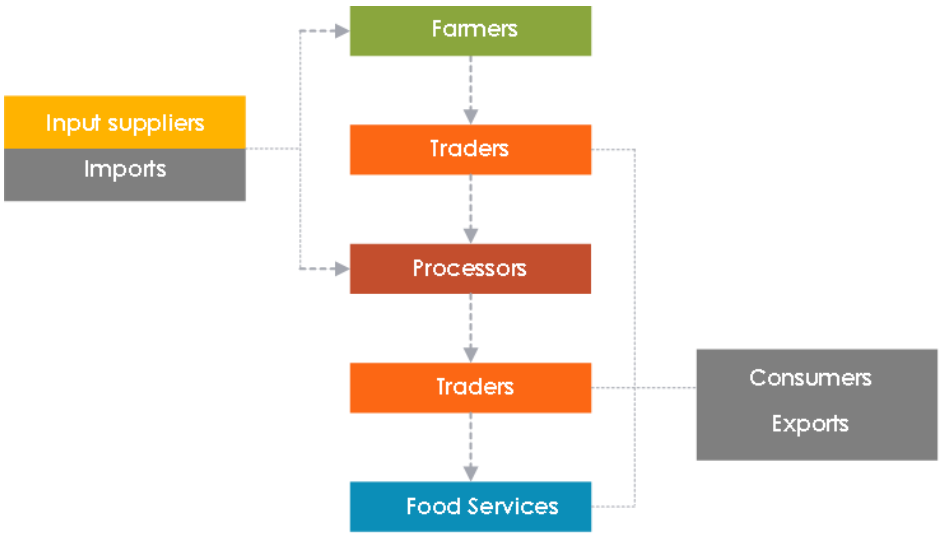

FIGURE 10: AGRI-FOOD SYSTEM (AFS) WITHIN THE RIAPA MODEL
Source: IFPRI, 2022

When production in a value chain expands, it requires factors of production and other resources that are in limited supply. The RIAPA model accounts for this competition for resources and measures the associated trade-offs (i.e., there are winners are losers). The final allocation of land, labour and capital across sectors is determined by their marginal returns (i.e., where they can be most productively used). This specification ensures that RIAPA captures a key dimension of agricultural transformation, namely diversification into higher-value farming and the movement of labour out of agriculture into more productive nonfarm sectors.

Two indicators are used to measure the effectiveness of a value chain in contributing to agricultural transformation.

AFS Growth: This indicator measures the effectiveness of on-farm productivity growth in a value chain in generating growth along the entire AFS. It is simultaneously a measure of the importance of the off-farm components of the value chain (e.g., the processing or trade potential) and the strength of the inter-sectoral linkages between the targeted value chain and other parts of the AFS or the economy. It is calculated as the change in AFS GDP per unit of growth in on-farm component of the targeted value chain.

Diet quality: This indicator measures the effectiveness of a value chain in improving diet quality, using a variable called the Reference Diet Deprivation (ReDD) index, which measures the incidence, breadth, and depth of diet deprivation (or consumption shortfalls) across six essential food groups in a healthy diet. Food consumption gaps are driven both by income changes and relative food price changes, which cause consumers to adjust their consumption baskets. The diet quality indicator is calculated as the percentage change in the ReDD index per unit increase in agricultural GDP within the targeted value chain.

4.3 SOCIAL INCLUSIVENESS

The RIAPA model is also used to compile two indicators used in the social inclusiveness composite indicator. The RIAPA model groups Malawi's population into 15 groups (i.e., rural/urban,

farm/nonfarm, and expenditure quintiles). Households earn incomes based on land, labour, and capital endowments, and consume goods and services. Separating households allows RIAPA to gauge the inclusiveness of production patterns and prices emerging when a value chain expands. Household groups within RIAPA are linked to their corresponding households in a national survey. Simulated changes in commodity-level consumption for each household in RIAPA are passed down to the survey where they are used to adjust consumption patterns of individual survey households and determine their poverty status.

Poverty: The poverty-growth elasticity measures the effectiveness of a value chain in reducing poverty. Households can either be linked to a value chain through employment or they benefit from lower prices of goods produced by the value chain. The poverty indicator is the percentage change in the national poverty headcount rate per unit increase in agricultural GDP in the targeted value chain.

Employment: An employment indicator measures the effectiveness of a value chain in creating jobs across the AFS as defined before (see Figure 8). It reflects the relative employment intensities within value chains, both on and off the farm, but also the trade-offs associated with the expansion and contraction of value chains growing at different rates. The indicator is calculated as the percentage change in AFS employment per unit increase in agricultural GDP in the targeted value chain.

4.4 VALUE CHAIN SCANS

The qualitative value chain scans were conducted to provide key qualitative information on the existing and future potential of the value chains relative to one another. The scans and ground-truthing were done for each of the 17 value chains and information was obtained from in-country value chain actors. The value chain scans combine to form another composite indicator consisting of four indicators to assess the qualitative attributes of each value chain. A qualitative scoring method based on a Likert scale is adopted whereby each value chain is given a scoring between 1 (low score) and 3 (high score) based on the guidelines in Table 4 below. The four indicators are:

Policy Support: High-level qualitative indication of existing or potential public policy support for the development of the specific value chain.

Investment Support: Qualitative indicator of significant current or potential public, donor or private sector investment in the sector or specific value chain.

Scalability: Qualitative indicator of the potential of the specific value chain or sector to kick start complementary multi-region/multi-value chain development.

Agro-Ecology: Qualitative indicator of potential to expand the area under production for crops and livestock, based on the natural resource stock such as topography, soils, access to water etc.

TABLE 5: SCORING FRAMEWORK FOR THE QUANTITATIVE SCANS

Score	Level of Policy Support	Current & Potential Investment Levels	Scalability	Agro-Ecology
1	No clear direction on policy support for commodity	No evidence of any potential public or private investments	Isolated without complimentary VCs or links to regional markets.	Water, land and other natural resources are a major constraint to expanding production
2	Commodity listed in official investment plan with a more detailed plan	Evidence of investments (public/private), but no firm commitments yet.	Potential links to other VCs, but not widely produced.	Natural resources are constraints but there are opportunities to overcome them (e.g., irrigation, dams etc.)
3	Clear post-investment plan policy implementation and support	Concrete evidence and tangible projects and investments	Major opportunities for import replacement, export opportunities plus a link to complementary value chains.	Natural resources are not a constraint and production can be expanded (i.e., due to land and water availability etc.)

Source: Own Compilation

4.5 CLIMATE

The composite indicator for the climate consists of three indicators that present the best fit for use in the PPVC framework.

Production volatility (CV): The production volatility indicator aims to capture the production risk and therefore a value chain's resilience to more extreme climate volatility associated with climate change. The PE-models provide yield and production data for the 17 value chains under consideration for Malawi, based on historical data. The variation in yield and production not explained by known factors (i.e., the error terms) are assumed to be climate-driven. The indicator is the coefficient of variation (a measure of volatility) of the error term, which is calculated using the equation below:

$$coefficient\ of\ variation\ (CV) = \frac{\sigma}{\mu} \times 100$$

σ is the standard deviation of the error terms and μ is the mean of error terms for each value chain's yield or production.

Green House Gas (GHG) Emissions: GHG emissions are often used as a measure of the contribution of a sector or the economy to global warming and climate change. We triangulate data from Broeze (2019), Petersson et al. (2019) and Reyes-Palomo et al. (2022) to estimate a database of GHG emission associated with each value chain in Malawi. It calculated emissions throughout the value chain activities into account and represents a food value chain. An important note on the use GHG emissions is that many agricultural products, including in certain livestock production systems, capture and store atmospheric carbon dioxide through a process called carbon sequestration. In some cases, this has led to documented cases whereby offsets a large share of GHG emissions (Reyes-Palomo et al., 2022). Ideally using net GHG emissions where carbon sequestration is included for each value chains' final emissions, but such data is not readily available. Therefore, in the case

of Malawi, we use the two available data sources which were combined to define a "best fit" list of GHG emission estimates for the selected 17 value chains, and given these emission estimates per food product unit, the rankings were assigned: highest ranking (1) for lowest estimated GHG emission per food production unit. Standalone literature studies were undertaken to accurately represent value chains that were not represented in either data source listed above (i.e., aquaculture, cotton and tobacco).

Water use Requirements: This indicator is compiled using Mekonnen and Hoekstra's (2011; 2012) comprehensive set of water requirements (m^3 from green, blue and grey water sources) needed to produce a ton of food product (classified by a comprehensive list of HS codes) in 222 countries. These water requirements were compiled for the 17 value chains under consideration in Malawi, and where Malawi-specific water requirements were not available, they were supplemented with South African numbers from the same database. Furthermore, aquacultural products were not represented in the database and water requirements for aquaculture from other literature were used.

4.6 FINAL RANKINGS TECHNICAL NOTES

The detailed discussion on both the composite indicators and those that inform them provides the basis to finalise the rankings for PPVC needed for value chain selection for Deep-dive analysis. In an attempt to make all indicators useful for rankings, each is standardised using the minimum-maximum transformation such that each indicator now has a discreet value between 0 and 1. Table 5 presents the full list of variables, showing the weight distribution of how each indicator feeds into the final composite used for ranking all the value chains. At this stage of PPVC implementation, we use an equal weighting across sub-indicators to get to the composite indicator, which in turn has an equal weight (1/5) across the five composite indicators.

Once all the indicators were completed and assessed for any anomalies that could skew ranking results, the final ranking, which includes all indicators, was compiled using the Garrett ranking approach (Garrett & Woodworth, 1985). Orders of merit are transformed into units of scores by using the equation below (converting orders of merit to percentage positions) and the Garrett table (converting percentage positions to scores):

$$Percent\ Position = \frac{100(R_{ij} - 0.5)}{N_j}$$

where:

- R_{ij} is the rank given for the ith factor by the jth respondent (or indicator)
- N_j is the Number of Factors (value chains) ranked by the jth individual (or indicator)

TABLE 6: INDICATORS AND WEIGHTS USED FOR FINAL RANKINGS

Composite Indictor	Weights	Sub-indicators	Weights
Market-led	0.2	Intensification	0.2
		Domestic Consumption	0.2
		Regional Export Growth	0.2
		Input cost/use	0.2
		Relative Trade Advantage	0.2
Agricultural Transformation	0.2	AFS Growth	0.5
		Diet Quality	0.5
Social Inclusiveness	0.2	Poverty	0.5
		Employment	0.5
VC Scans	0.2	Policy Support	0.25
		Investment Support	0.25
		Scalability	0.25
		Agro-Ecology	0.25
Climate	0.2	Production Volatility	0.33
		GHG Emissions	0.33
		Water Use Requirements	0.33
Total	1	Total	5

Source: Own Compilation

Finally, scores are added for each factor (value chains in our case) and divided by the total number of indices used. The final ranking of value chains is assigned according to mean scores: the highest mean score ranks first and the lowest mean score ranks last.

The Garrett Ranking approach gives us a "group consensus & preference" way of thinking about the final ranking of commodities where the group is made up of indicators we choose to combine. Essentially it is still a weighted average of the indicator results, which is richer in interpretation than just a weighted average ranking result. The final ranking of value chains presented in the next section was completed using the Garret ranking technique.

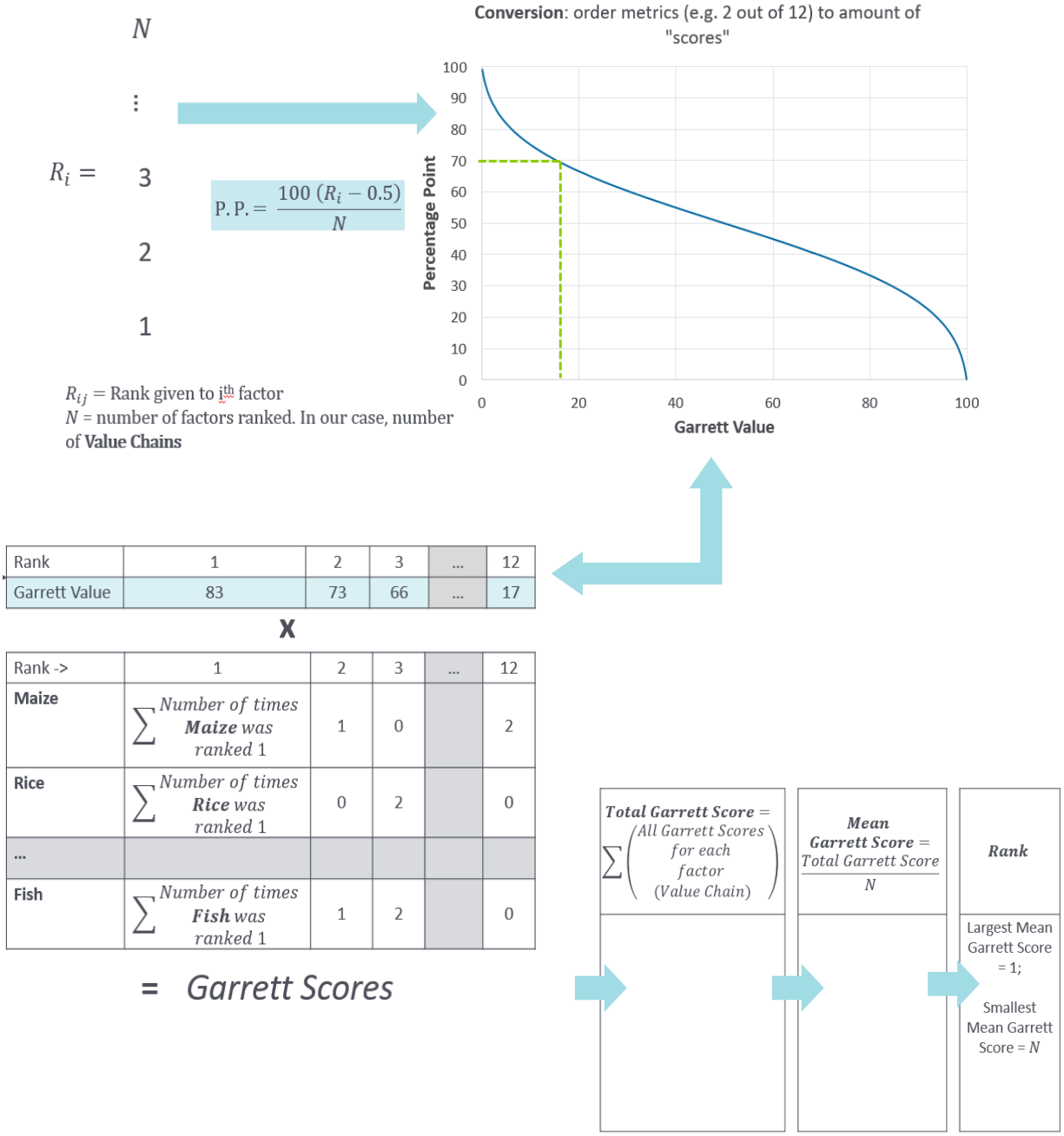

FIGURE 11: ILLUSTRATION OF THE GARRETT RANKING TECHNIQUE
Source: Own compilation

5. RESULTS

The PPVC ranking exercise provides interesting insights into the relative performance and potential impacts of the 17 value chains included in the analysis. While we highlight the most important findings here, the detailed narrative of each value chain is provided in the Appendix. We first

present results for each of the individual indicators, and thereafter the composite indicators used in the final ranking. The composite indicator is of course sensitive to how individual outcomes are weighted – we use equal weights within each cluster of outcomes as well as equal weights across them under an assumption that each cluster is equally important – and so a different set of weights may alter the final ranking. While we do not present outcomes under such alternative weights, readers will be able complete their own assessments using the individual outcome scores.

5.1 MARKET-LED RANKING

Figures 10 and 11 provide the ranking results for each of the 5 indicators used in the market-led composite indicator. The former shows aspects of market potential and the latter measures of competitiveness. What is already evident from the outset is that no single value chain scores the highest in every indicator, yet some score consistently high, whilst others do not. It is the combination of consistently high scores that will ultimately yield a high ranking.

Starting with the potential opportunity for intensification, Figure 10 shows the top three value chains were all in the livestock sector, namely goats, poultry and pigs. This reflects the current low base of productivity in these sectors compared to international best practice, which indicates that there are opportunities for significant improvement. Maize and soybeans present similar opportunities, but with quite different characteristics. Whereas the livestock industries have had limited policy and investment support, maize (and to a lesser extent soybeans) have benefitted from extensive subsidy support to improve intensification outcomes.

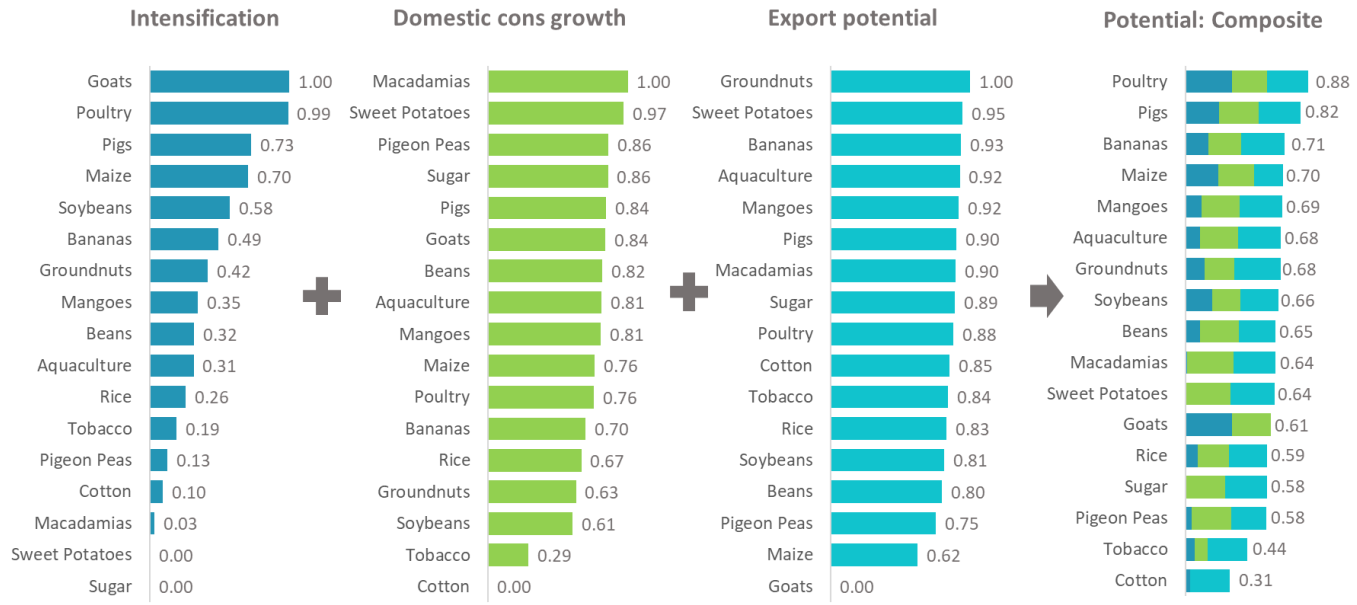

FIGURE 12: MARKET-LED INDIVIDUAL INDICATOR RANKING AND POTENTIAL COMPOSITE
Source: Own compilation

In terms of the projected domestic consumption growth, macadamia nuts stand out largely due to their initial small base relative to other value chains, whilst sweet potatoes and pigeon peas made up the rest of the top-ranked value chains. The positive outlook for domestic growth in consumption for both pigs and goats reinforce their high rankings, as per capita consumption of these more

affordable meat options is set to grow rapidly in the next ten years. Groundnuts were the top-ranked value chain for regional export growth, followed by sweet potatoes, bananas and aquaculture. Export-oriented value chains such as mangoes, sugar and macadamia also feature in the top ten. When combining all these indicators into a composite, poultry, pigs and bananas ranked the highest in terms of the market-based potential for growth.

Figure 11 presents the final two Market-led indicators, namely the ratio of input costs to output and the relative trade advantage (RTA) indicators, which, when combined, present a measure of competitiveness. The results reveal that those value chains that are already performing well and are exporting are also those that are comparatively more competitive in producing outputs per unit. Macadamia nuts, pigeon peas, tobacco and mangoes are all value chains that contribute to Malawi's foreign exchange reserves, as do groundnuts, cotton and sugar. All these value chains scored high in the RTA indicator relative to others, largely because Malawi is either a net importer of products or only produces sufficient volumes to supply local demand. Yet, when assessing the ranking on the input cost to output ratio, the indicator is less skewed. This highlights the difficulty in promoting export growth in a land-locked country; although current production can be produced competitively, unlocking export opportunities is constrained by the high cost of transport, which is associated with weak infrastructure and long distances. Mangoes, pigs and pigeon peas fared the best in the input cost-to-use indicator. The composite indicator shows that macadamia nuts, pigeon peas and tobacco were ranked highest within the market-led indicators for competitiveness.

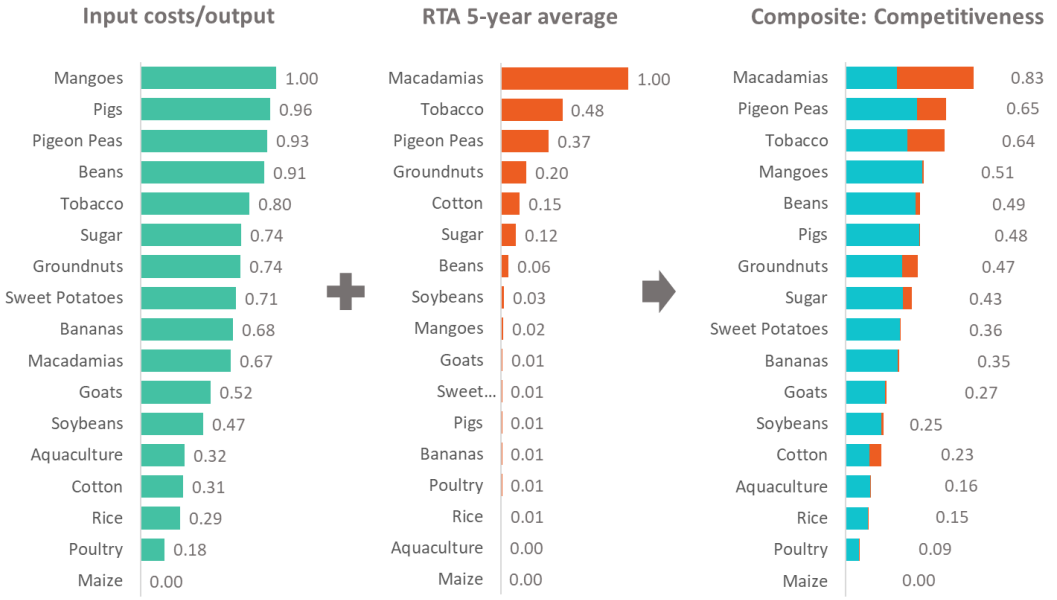

FIGURE 13: MARKET-LED INDIVIDUAL INDICATOR RANKING ON COMPETITIVENESS
Source: Own compilation

The final step is to combine all the market-led indicators into a single composite indicator, as given in Figure 12. The bars are decomposed to show the contribution of each individual indicator to the final composite score. The colours correspond to those used in Figures 10 and 11, while the labels show the initial ranking of a value chain in that particular indicator. Macadamia nuts were ranked highest on the market-led indicator owing to the expected domestic market growth and export potential, while scoring well in the other indicators (with intensification prospects the exception).

Pigs were ranked second due to their good performance on both intensification, input cost/use and domestic market growth projections. Mangoes were ranked third mainly for the same reasons as macadamia nuts. This value chain has a significant competitive advantage in the region with its input cost to output ratio on par with international benchmarks, largely because of the suitability of the crop in Malawi. Pigeon peas, groundnuts and dry beans made up the top five according to the market-led ranking, whilst rice and cotton were ranked lowest due to consistently low scores on all the indicators.

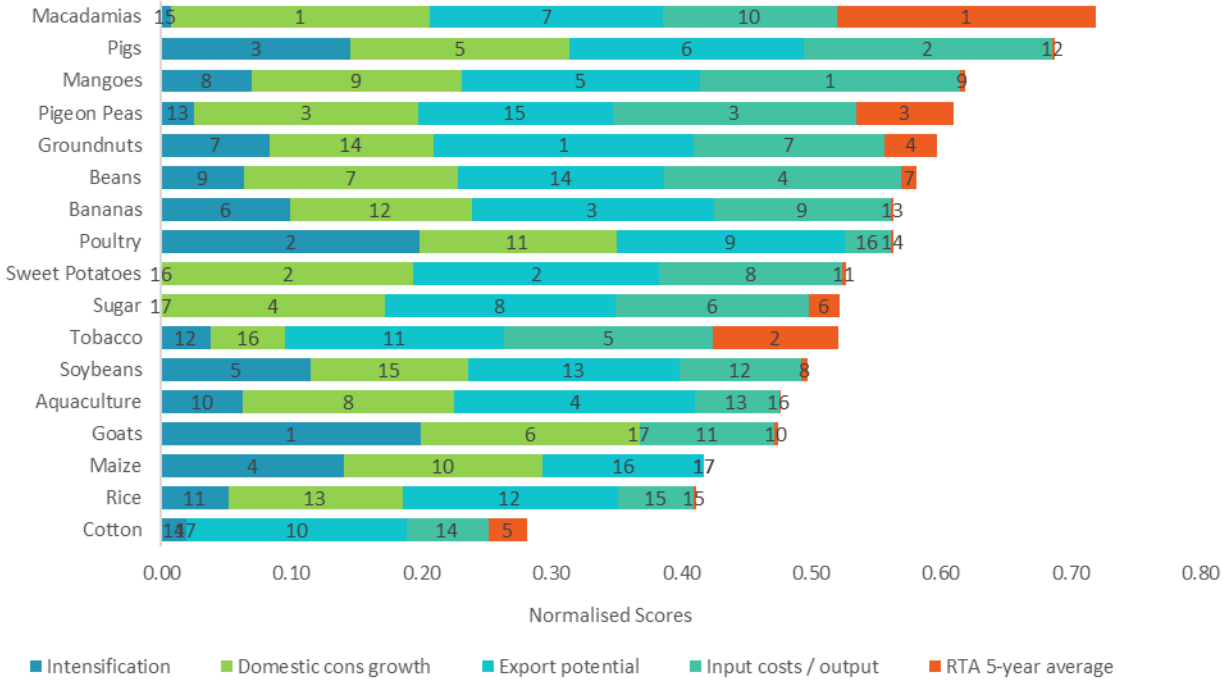

FIGURE 14: MARKET-LED COMPOSITE INDICATOR RANKING
Source: Own compilation

5.2 AGRICULTURE TRANSFORMATION RANKING

Figure 13 shows the ranking results for the two indicators used to assess agricultural transformation potential, namely AFS growth and diets, with the combined composite ranking on the right. The best performing value chains in terms of the AFS growth indicator are sugar, poultry and pigs, followed by aquaculture, sweet potatoes and groundnuts. The sugar value chain has strong off-farm processing linkages, both within the value chain (i.e., sugar refining) and to other downstream industries (e.g., beverages), which allows sugar to have disproportionate AFS growth effects. Sugar, however, has weak impacts on diet quality, in part because it does not have strong income effects for low-income households in Malawi, but more importantly, because sugar is not considered an essential food group in a healthy diet.

Poultry and pigs also relatively strong off-farm links to meat processing, which explains those sectors high ranking in terms of AFS growth effects. And unlike sugar, these sectors also perform relatively high on the diet quality indicator. Animal-source foods are an important element in a healthy diet, and so productivity growth in these sectors raise the supply and reduces prices of these meat products, thus reducing consumption shortfalls. However, the best-performing value chains in terms

of diets are fruits (i.e., mangoes and bananas). As in many other countries in Sub-Saharan Africa, fruit consumption levels in Malawi are well below their required levels, and so growth in fruits value chains has significant potential to reduce those consumption gaps and improve the diet quality score.

It could come as a surprise that soybeans are ranked last on agricultural transformation since it is a value chain known for its downstream linkages to animal feed and oil crushing. As pointed out in our value chain scans in the Appendix, Malawi has significant oilseed processing capacity that is currently underutilized. The country also continues to be a net importer of crude soybean oil and exports considerable quantities of raw soybean, suggesting that the primary production and linkages to the rest of the manufacturing sector are somewhat disconnected. Thus, although we would expect growth in this value chain to translate into strong growth beyond the farm, our model results suggest otherwise. We should note that the model is calibrated to input-output data from 2014 – the latest official data available for all sectors – and that the oilseed sector has experienced significant changes in recent years. The transformative potential of this sector may therefore be understated, which is why these results should be interpreted also in the context of the market-led and qualitative assessments.

Combining the two indicators results in mangoes, poultry and sugar being ranked the highest amongst the 17 value chains in terms of the agriculture transformation composite indicator. Aquaculture, pigs and bananas were ranked fourth, fifth and sixth respectively.

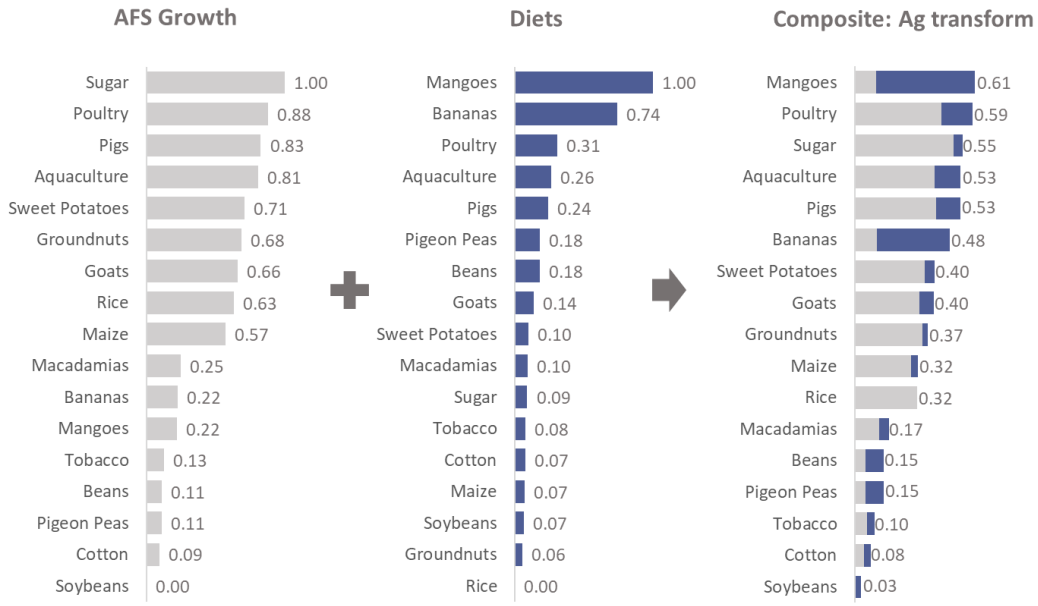

FIGURE 15: AGRICULTURE TRANSFORMATION INDICATORS AND COMPOSITE
Source: Own compilation

5.3 SOCIAL INCLUSIVENESS

Aquaculture, rice, and sweet potatoes all have strong poverty-reducing effects. The strong poverty effect of Malawi's burgeoning aquaculture sector likely reflects the strong upstream linkages to feed sectors (and indirectly to maize and soybean) as well as forward linkages to food trade and

transport sectors (i.e., a lot of fish is destined for urban markets where prices are higher). Many of the actors involved in fisheries, maize, or food trade tend to be poor, which may explain the strong poverty effects. Both the rice and sweet potato sectors have relatively high GDP-to-output ratios, which means a large share of value-added (or profits) accrue to farmers, resulting in relatively strong poverty effects for these two sectors.

Although GDP effects for soybeans are low, the sector scores highly on the employment indicator. The structural shifts caused by this sector lead to an increase in employment in low-wage, employment-intensive off-farm sectors with lower levels of value-added or GDP. In contrast, strong employment effect of the tobacco reflects relatively strong employment growth on tobacco farms. On the whole, the soybean, aquaculture, and rice sectors score highest on the composite score for social inclusiveness.

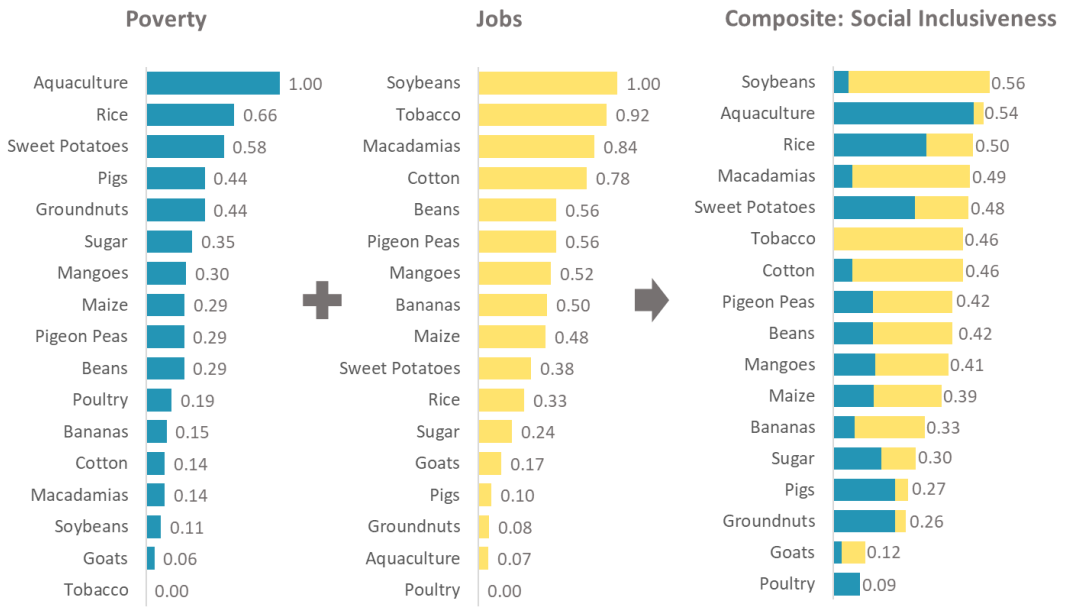

FIGURE 16: SOCIAL INCLUSIVENESS INDICATORS AND COMPOSITE
Source: Own compilation

5.4 VALUE CHAIN SCANS

The qualitative value chain scans produced four indicators. The qualitative scores are transformed into normalised scores, which yielded the results presented in Figure 15. We briefly reflect on the ranking results here, whilst a more detailed summary is given in the Appendix to provide further discussion on the findings. In terms of policy support there were several examples of where value chains were mentioned in numerous policy documents, whilst others had dedicated policies already in place. Also, stakeholder feedback affected the ranking outcomes. Sugar ranked highest for policy support and is an industry that has a National Adaptation Strategy supporting the industry as it adopts the EU's sugar reforms. This was developed to support the Malawian sugar industry as quotas and guaranteed prices are being phased out. Mangoes, soybeans and groundnut all ranked high under policy support, owing to these being mentioned in all of the major policy documents (NES, NAP, NAIP, etc).

Cotton is another example of a value chain with strong policy support, having its own dedicated Cotton Act (2014) and currently functions under the second edition of the Malawi Cotton Development Strategy. The GoM also tried to revitalise the cotton industry through an upscaling model whereby significant public funds were invested to boost smallholder production between 2011-2014. One would have expected maize to be higher on the ranking in terms of policy support since the bulk of the country's input subsidy programme is dedicated to maize production. However, there is a growing policy narrative developing in Malawi that supports efforts to wean the country from its dependence on maize production and the challenges faced by the subsidy's implementation. The same applies to the tobacco value chain that has received significant support in the past, but the recent policy position is more towards diversification away from tobacco than expanding investment to boost production further.

Groundnuts were the top ranked value chain in terms of the Investment Support indicator, followed by soybeans and poultry. A large new investment in 2022 in a groundnut processing facility with significant capacity, and plans to invest significant private sector funding in smallholders and in research and development means that groundnuts are ranked first. Soybeans have also benefitted from investments in more crushing capacity and increased manufacturing of some value-added products. Poultry's high ranking is partly due to evidence of investments in new breeding facilities, modern broiler houses and some partnerships formed to expand production. The private investment in macadamia production both in the form of new orchards established and more cracking facilities resulted in a 4th position ranking. Not surprisingly, value chains such as cotton, beans, maize and pigs show little evidence on the ground of new investments, as is the case of cotton where some value chain actors have been seen exiting the industry rather than investing more capital. Some of the reasons behind this trend is also discussed in the Appendix.

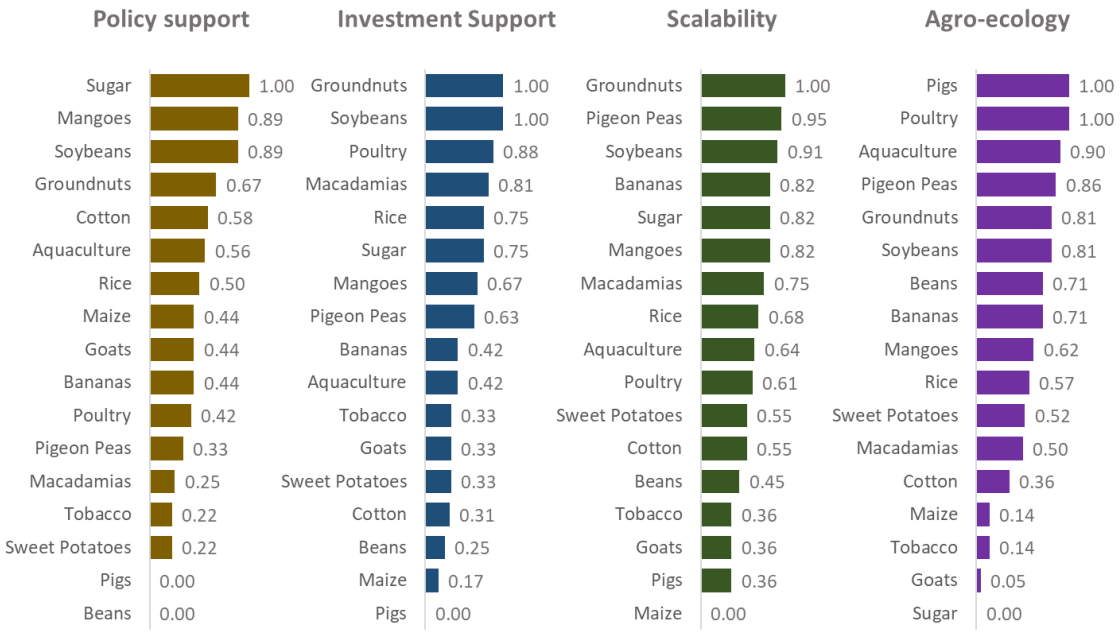

FIGURE 17: QUALITATIVE VALUE CHAIN SCANS INDICATORS
Source: Own compilation

Groundnuts, pigeon peas and soybeans were ranked highest on the scalability indicator. This is somewhat related to the investment environment but also based on the relative ease with which value chains are complementary in that farmers can easily switch from existing crops (maize) to these alternatives. Bananas, ranked fourth, can also be scaled significantly, especially from the current low production base as Bunchy Top Disease has been decimating thousands of hectares. Now that new virus-free plants that are easy to multiply are being widely distributed, the scalability of this value chain has improved.

The final exercise of the value chain scans was Agro-Ecology. In the context of Malawi's deteriorating natural resource capital through soil degradation, land erosion and deforestation to name a few, the results indicate that animal-based value chains performed well in this ranking. The reason pigs, poultry and aquaculture were ranked highest is due to their relatively lower requirement for land in intensive production systems. Groundnuts, soybeans and dry beans have nitrogen-fixing characteristics if the appropriate farming techniques are followed. Bringing these crops into rotation with maize or as replacements for maize is seen as a positive development, and large parts of Malawi's agricultural land is suitable for the production of these legumes. Bananas and mangoes scored well due to Malawi's climatic suitability for growing these trees, which are also much needed for reforestation efforts.

Figure 16 shows the final ranking from the value chain scans based on a composite indicator of the four indicators discussed above. As before, the labels show each value chain's initial ranking in that particular indicator. Soybeans, groundnuts and mangoes were the highest ranked value chains and poultry and pigeon peas completed the top 5.

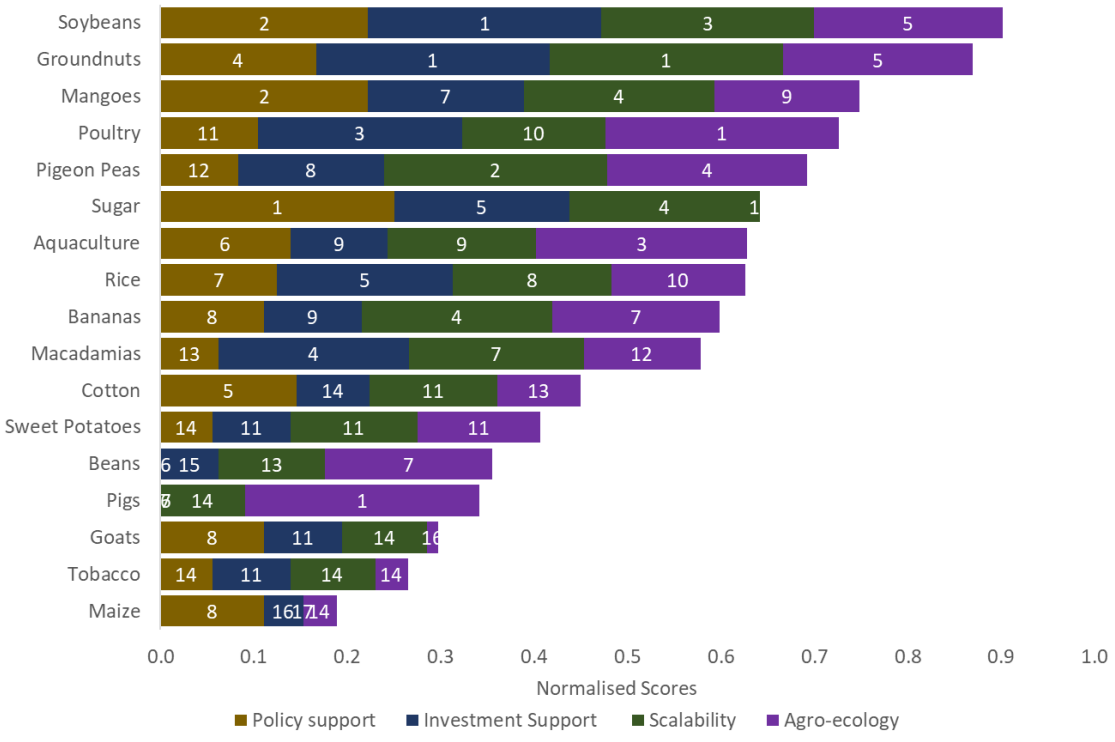

FIGURE 18: QUALITATIVE VALUE CHAIN SCANS COMPOSITE INDICATOR
Source: Own compilation

5.4 CLIMATE

Climate is the fifth composite indicator and is composed of three individual indicators measuring production volatility, GHG emissions, and water use requirements (Figure 17). Sweet potatoes, soybeans and poultry performed the best of all the value chains, in terms of production volatility, with bananas, tobacco and pigeon peas making up the top six. The ability to consistently produce products in volume shows the resilience of these value chains to weather shocks. In contrast, maize was ranked lowest on this indicator, largely depicting a value chain that is highly dependent on summer rainfall, which has been volatile in recent years. Production is similarly volatile in the rice and bean value chains.

When it comes to Greenhouse Gas Emissions, sweet potatoes, mangoes and bananas ranked highest due to their relatively low emissions per unit of the final product. In general, this indicator penalises livestock value chains since these are well-known to have higher emissions compared to crops due to the transportation, cold storage, deforestation and the metabolic processes in livestock all contributing to emissions. Aquaculture, goats, pigs and poultry were ranked lowest, just above tobacco. The tobacco value chain was ranked last in terms of GHG emissions by some margin owing to the significant emissions released into the atmosphere at virtually every step of the value chain, not to mention the environmental impact on water in toxification and the generation of waste.

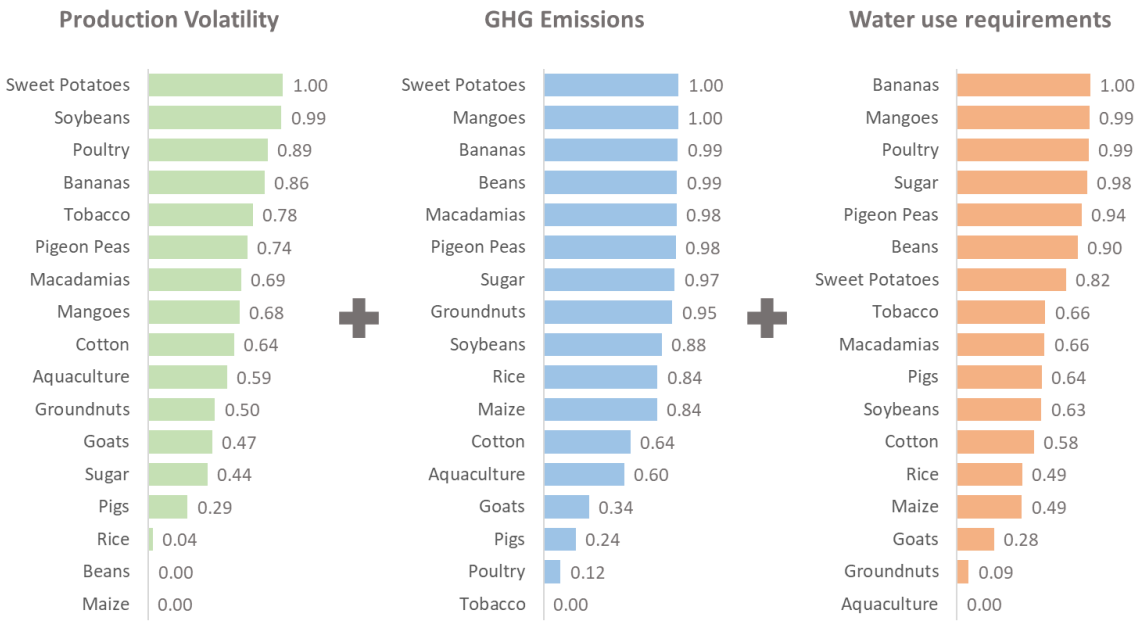

FIGURE 19: CLIMATE VARIABLES INDICATOR RANKINGS
Source: Own compilation

The final indicator under climate is water use requirements. Bananas, mangoes and poultry performed best, while goats, groundnuts and aquaculture ranked last. Combining these three indicators into a single composite yields the results shown in Figure 18. Bananas, sweet potatoes and mangoes were the value chains that ranked highest for our climate composite indicator.

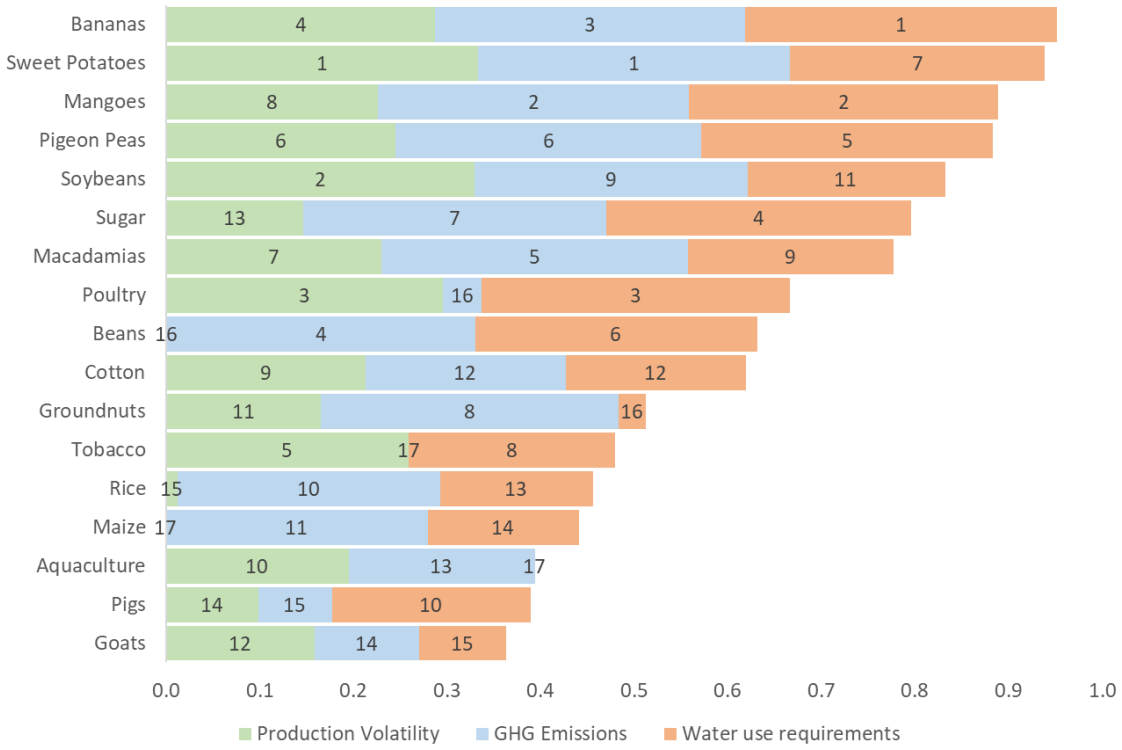

FIGURE 20: CLIMATE COMPOSITE INDICATOR RANKING
Source: Own compilation

5.5 FINAL COMBINED RANKING

All the individual indicators can now be combined into a single composite indicator to come up with a final value chain ranking. As has been evident from the discussion, each value chain had a unique set of rankings and often scored well in some indicators and poorly in others. The PPVC approach allows us to assess the various trade-offs in the selection and prioritisation of particular value chains. In Table 6, presents a matrix of indicators for each value chain as well as the final ranking assigned. Green cells reflect a high ranking, yellow cells a middle ranking and red cells a low ranking. Table 7 then includes only the five composite indicators and final rankings based on the final Garrett rankings approach.

Mangoes were the top ranked value chain based on the indicators used in our PPVC methodology, followed by macadamias and bananas. It might come as a surprise that the top three were all horticultural products, but there are several reasons why they present the best opportunities in Malawi. These include their important role in reforestation, in climate change mitigation, and in their role in supporting better quality diets. Mangoes and macadamia nuts are both well positioned to exploit export opportunities, which is imperative in the context of persistent shortage of foreign currency. Expansion in the banana value chain will result in import replacement, and hence also save foreign exchange, which is one of the reasons why the banana sector has received flagship status from the Ministry of Agriculture, despite the current policy emphasis on crops and to a lesser extent livestock.

TABLE 7: MATRIX OF VALUE CHAIN RANKING RESULTS OF ALL INDICATORS IN NORMALISED SCORES

Composite	Indicator	Pigeon Peas	Soybeans	Groundnuts	Sugar	Rice	Maize	Beans	Cotton	Poultry	Pigs	Goats	Aquaculture	Tobacco	Mangoes	Bananas	Sweet Potatoes	Macadamias
Market-led																		
Potential	Intensification	0.1	0.6	0.4	0.0	0.3	0.7	0.3	0.1	1.0	0.7	1.0	0.3	0.2	0.3	0.5	0.0	0.0
	Domestic cons growth	0.9	0.6	0.6	0.9	0.7	0.8	0.8	0.0	0.8	0.8	0.8	0.8	0.3	0.8	0.7	1.0	1.0
	Export potential	0.8	0.8	1.0	0.9	0.8	0.6	0.8	0.8	0.9	0.9	0.0	0.9	0.8	0.9	0.9	0.9	0.9
Competitiveness	Input costs / output	0.9	0.5	0.7	0.7	0.3	0.0	0.9	0.3	0.2	1.0	0.5	0.3	0.8	1.0	0.7	0.7	0.7
	RTA 5-year average	0.4	0.0	0.2	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.5	0.0	0.0	0.0	1.0
Inclusiveness																		
Poverty	Poverty	0.3	0.1	0.4	0.3	0.7	0.3	0.3	0.1	0.2	0.4	0.1	1.0	0.0	0.3	0.2	0.6	0.1
	Job Creation	0.6	1.0	0.1	0.2	0.3	0.5	0.6	0.8	0.0	0.1	0.2	0.1	0.9	0.5	0.5	0.4	0.8
Ag Transformation																		
GDP Contribution	AFS GDP	0.1	0.0	0.7	1.0	0.6	0.6	0.1	0.1	0.9	0.8	0.7	0.8	0.1	0.2	0.2	0.7	0.2
Dietary Change	ReDD	0.2	0.1	0.1	0.1	0.0	0.1	0.2	0.1	0.3	0.2	0.1	0.3	0.1	1.0	0.7	0.1	0.1
Qualitative Scans																		
Scans	Policy Support	0.3	0.9	0.7	1.0	0.5	0.4	0.0	0.6	0.4	0.0	0.4	0.6	0.2	0.9	0.4	0.2	0.3
	Investment Support	0.6	1.0	1.0	0.8	0.8	0.2	0.3	0.3	0.9	0.0	0.3	0.4	0.3	0.7	0.4	0.3	0.8
	Scalability	1.0	0.9	1.0	0.8	0.7	0.0	0.5	0.5	0.6	0.4	0.4	0.6	0.4	0.8	0.8	0.5	0.8
	Agro-ecology	0.9	0.8	0.8	0.0	0.6	0.1	0.7	0.4	1.0	1.0	0.0	0.9	0.1	0.6	0.7	0.5	0.5
Climate																		
Climate	Production Volatility	0.7	1.0	0.5	0.4	0.0	0.0	0.0	0.6	0.9	0.3	0.5	0.6	0.8	0.7	0.9	1.0	0.7
	GHG Emissions	1.0	0.9	1.0	1.0	0.8	0.8	1.0	0.6	0.1	0.2	0.3	0.6	0.0	1.0	1.0	1.0	1.0
	Water use requirements	0.9	0.6	0.1	1.0	0.5	0.5	0.9	0.6	1.0	0.6	0.3	0.0	0.7	1.0	1.0	0.8	0.7
Final Rank	Garrett	6	4	10	7	12	16	11	15	9	13	17	8	14	1	3	5	2

Investment in fruit value chains is different from that of annual crops in that the investment is a long-term, multi-generational investment, with an average life span of around 20-40 years before the productive capacity of trees starts diminishing. Successful integration of smallholder farmers into these value chains, as well as the employment opportunities that will be created in these labour-intensive industries, should have a significant impact on rural livelihoods. Malawi has a unique advantage in that most agroecological regions in the country are moderately to highly suitable for growing mangoes, bananas and macadamias, and in some cases, it is possible to earn a price premium in international markets because with Malawian fruits ripen earlier than some other Southern Hemisphere producers. There are, however, scalability constraints in that these fruit trees takes several years from planting to when they are ready for harvest. This is a concern for many smallholders of which many do not have short-term sources of income to offset the loss of income from alternative uses as the trees reach bearing age. Finally, the opportunities for off-farm value adding to both macadamia nuts and mangoes are already in motion with fairly large-scale private investment in drying, cracking or juicing in recent times.

In fourth place, the soybean value chain was the highest ranked annual crop and considered by many the suitable alternative in the drive towards diversification away from maize and tobacco farming. From a climate perspective, soybeans have shown significantly lower production volatility, especially during dry spells which heavily affected other crops such as maize, rice and pigeon peas. One important competitiveness challenge for this value chain is the low utilisation of existing crushing capacity, because raw beans are still being exported. However, soybeans can create significant job opportunities in downstream industries due to strong linkages with animal feed, oil crushing and manufacturing of human food products. The value chain scans and feedback from industry stakeholders showed that there is currently strong policy and investment support for

soybeans and the benefits of producing the crop in terms of agroecological and scalability considerations make this value chain especially appealing. The soybean value chain is well integrated with other value chains such as the feed-intensive poultry and aquaculture industries: this suggests that policy solutions to boost competitiveness in soybean production and processing would also benefit other value chains that are currently ranked low.

Sweet potatoes and pigeon peas were ranked 5th and 6th in the final ranking owing largely to their good performance on climate indicators and inclusiveness. The Appendix provides more details on the specific characteristics of these value chains. Sugar, a large export value chain was ranked 7th overall and performed well in agricultural transformation, value chain scans and climate. It should however be noted that despite concerted policy support, the phasing out of EU sugar reform and challenges with expensive transportation and milling overheads places constraints on future growth.

The highest ranked livestock value chains were aquaculture 8th, followed by poultry 9th. Whilst the former scored well in terms of inclusive growth, poultry performed well in agricultural transformation. Unfortunately, livestock value chains generally scored poorly on climate indicators owing to their relatively intensive use of water and high levels of GHG emissions. In a country such as Malawi one could argue that these industries could create net benefits to both society and businesses if supported by various adaptation strategies to boost climate resilience, whilst at the same time address the large deficit in animal protein consumption that can improve the national diet. Furthermore, increased populations of animals and fish under sustainable production systems can contribute to the increased availability of animal manure used in cropping systems and address persistent challenges of resource management and over-fishing in Lake Malawi.

TABLE 8: FINAL COMPOSITE AND RANKING

Value Chain	Market Led	Ag Transformation	Inclusive Growth	VC Scans	Climate	Final Ranking
Mangoes	3	1	10	3	3	**1**
Macadamias	1	12	4	10	7	**2**
Bananas	7	6	12	9	1	**3**
Soybeans	12	17	1	1	5	**4**
Sweet Potatoes	9	7	5	12	2	**5**
Pigeon Peas	4	14	8	5	4	**6**
Sugar	10	3	13	6	6	**7**
Aquaculture	13	4	2	7	15	**8**
Poultry	8	2	17	4	8	**9**
Groundnuts	5	9	15	2	11	**10**
Beans	6	13	9	13	9	**11**
Rice	16	11	3	8	13	**12**
Pigs	2	5	14	14	16	**13**
Tobacco	11	15	6	16	12	**14**
Cotton	17	16	7	11	10	**15**
Maize	15	10	11	17	14	**16**
Goats	14	8	16	15	17	**17**

Source: Own compilation

6. CONCLUSION AND NOTES ON VALUE CHAIN SELECTION

The PPVC analysis presented in this report highlight interesting aspects related to prioritization of policies and investment in agricultural value chains in Malawi. The analysis is timely as the country embarks on a revision of key agricultural policy documents. Our replicable and market-led approach using various modelling platforms and analytical tools was used to select and rank Malawian value chains according to their potential to drive inclusive agricultural transformation. The overview of the agricultural economy, the spatial contextualisation and the policy landscape scan provided the basis for this prioritisation exercise. There is a growing consensus in Malawi about the need to re-think the agricultural development strategy, as past policies and investments have not created the necessary environment for economic growth, job creation, increased investment and a thriving agro-processing industry. Chief among these is the highly contentious input subsidy programme that not only captures a substantial proportion of available public resources in agricultural value chains but has resulted in various negative unintended economic consequences such as crowding out investment, poor targeting of beneficiaries and corruption. The new emphasis on long-term development plans to drive commercialisation, diversification and value addition within agricultural value chains should support a drive away from subsidising maize, one of the lowest ranked value chains from our ranking analysis.

It is evident that laws such as the now outdated and difficult-to-implement Special Crops (1963) and Agriculture Act (1987) should be replaced by a more structured market approach that supports transparency in decision-making, mechanisms to enhance market functioning and the development of institutions that will encourage diversification away from the over-reliance on tobacco to generate export earnings. The persistent challenges noted in this report regarding the monetary policy ambiguities and forex shortages point to the importance of focused investments to unlock the country's export potential. Despite the known difficulties associated with land-locked countries in trading cost-effectively in international markets, Malawi has seemingly little alternative than to build exciting new export industries, starting with those that already show areas of competitiveness. Our ranking results show that the two highest ranked value chains according to the market-led methodology were mangoes and macadamia nuts. These are two industries that are largely developed to export both raw and processed products to the region and beyond and have up to this point been driven by private-sector investments. Not only are the production systems used in these tree crops highly labour-intensive at the farm level, but they also generate significant off-farm economic opportunities. Since dried mangoes and macadamia products are not as perishable as other fresh fruits like citrus, apples or grapes, there is less need for a sophisticated cold chain. Therefore, the relative cost to transport products from these two value chains is lower per unit of the value of production compared to grains, oilseeds and most meat products.

Bananas, the third ranked value chain, are somewhat different because it is currently a food crop imported from countries such as Tanzania, hence the industry represents an immediate opportunity for import substitution. The challenges posed by disease outbreaks means that growth in this value chain was lacking in the past several years, but now, through concerted efforts by the government and donors, there is a more positive outlook for the industry. Together with mangoes and macadamias, the prioritisation of these three top ranked value chains also represents a strong focus on climate and sustainability. These all ranked high on climate and agroecology. At the time of

writing, fruit value chains have been mentioned in some policy documents, but there is limited policy direction within the fruit sub-sector, despite the relative climatic suitability of growing these crops in Malawi.

Soybeans, sweet potatoes and pigeon peas also ranked high, which suggest that there are opportunities for these value chains to be further unlocked if the correct policy and investment environment can be created for these value chains to thrive. For livestock subsectors, aquaculture and poultry emerged as the highest ranked and presents opportunities for the country to transition towards better dietary diversification and to provide stronger linkages to the input sectors such as feed and other inputs (fingerlings and day-old chicks).

As we conclude, the results from our market-led and replicable value chain ranking revealed some of the difficult and contrasting trade-offs that needs to be made when prioritising value chains in Malawi. Given our five broad policy outcomes, those ranked high had the most consistent scoring, on average, between all of the indicators, but there was not a single value chain that outperformed all others in most of them. Selecting value chains for the next step of Deep-dive analysis will need to carefully balance current high priority macro-economic challenges (forex shortages, diversification and food security) with more prevalent opportunities in non-traditional fruit value chains.

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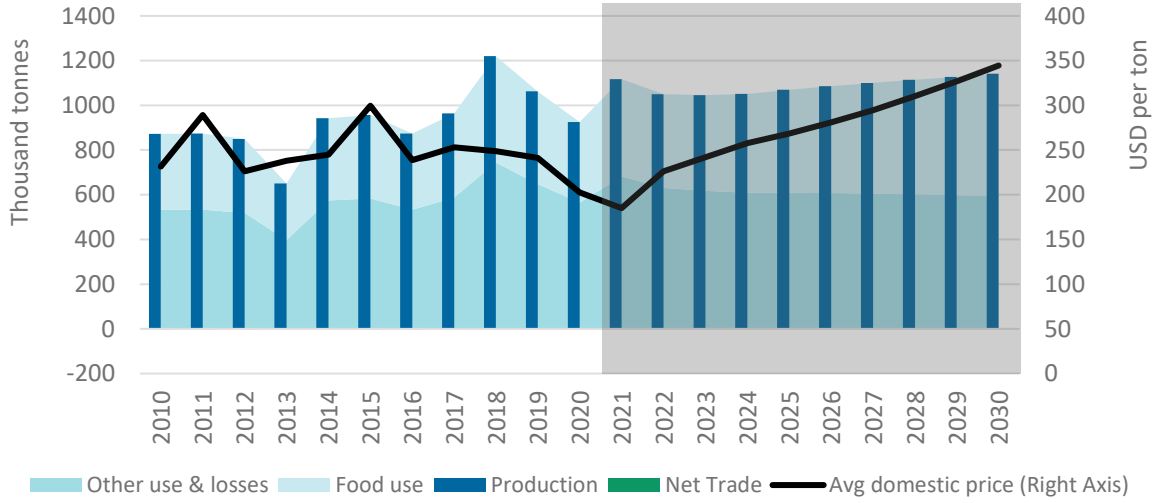
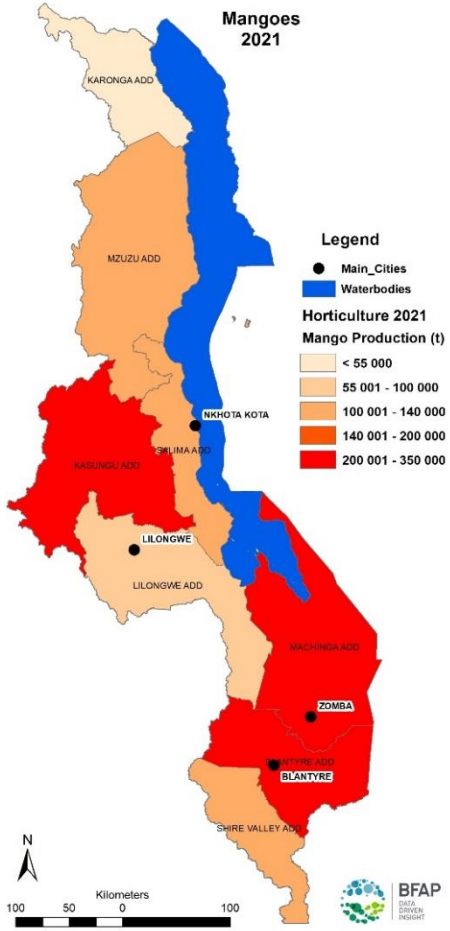
MANGOES

Mangoes are a tropical evergreen fruit tree with a high level of suitability in almost all of Malawi's districts. Although the mango market is predominantly based on informal trade of local varieties, there is significant opportunities within this value chain. A large investment in the past decade has resulted in the establishment of improved varieties and expansion in area planted in combination with processing capacity. The country is now exporting early-season fresh fruit and a growing volume of dried products are being marketed. Aside from the commercial farming operations of Malawi Mangoes, around 925 000 households in Malawi grow mango trees, but 99% of trees are scattered and not planted in orchards. Around 5 000 smallholders grow mangoes on plantations, mostly feeding into the formal value chain. Mango consumption makes a significant contribution to dietary diversity and current commercial smallholder yields are close to 20 tons/ha, indicative of its suitability in Malawi's climate.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Absolute (period)	% Change per annum
Area ('000 Ha)	57.1	54.5	25.5	-0.4	-0.1
Yield (tons/Ha)	9.7	0.0	4.5	4.1	4.0
Production ('000 tons)	1 409.0	236.6	3.9	366.0	1.8
Domestic Cons ('000 tons)	549.3	91.8	3.9	279.8	4.0
Dom Cons Value (MWK Million)	106 256	88 933	24.6	151 160	10.5
Exports ('000 tons)	0.2	0.5	-	-	-
Imports ('000 tons)	0.0	0.0	-	-	-
Net Exports ('000 tons)	0.2	0.5	-	-0.1	-5.0





Qualitative Scan & Scoring: Mangoes

2.3	2.3	2.5	2.3
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
As is the case for most fruit value chains, The major agricultural policy documents have not really focussed on fruits. It does however feature in some policy documents. For instance, the NES II mentions mangoes as an important agricultural commodity and it is listed as one of the priority products under the food category[1]. The NAP[2] suggest that there are efforts underway to increase the commercialisation of crops, including mangoes. The NAIP[3] states that fruits such as mangoes should be prioritised due to its contribution to poverty reduction and dietary diversity. Although mangoes receive limited direct government support[4], various literature studies cite the high potential for mango production in Malawi and there is a sense that mangoes feature more prominently in policy discussions partly due to the opportunity to export fruit[5].	The GoM constructed a horticulture shelter in Kanengo that can be used for packaging mangoes and other fruits and vegetables for the market[6]. Malawi Mangoes was established in 2009 in the Salima district and sources mangoes and bananas from a blended supply chain comprising of its own anchor farms and a significant smallholder program. In 2014 the Global Agriculture and Food Security Program (GAFSP) invested around $15 million in capital investment to develop a mango nursery, expand plantations and processing capacity in the form of a ripening chamber and another processing line for Malawi Mangoes[7]. The company is set to expand operations further in the near future. They provide extension support, services in tree grafting and other services to farmers. The Department of Agricultural Research Services has been conducting research in evaluating and propagating high yielding mango varieties[8]. Chitedze Research Station, LUANAR and the Malawi industrial Research and Technology Development Centre have developed small-scale fruit processing equipment for farmers[4].	99% of the mangoes produced in Malawi are of local varieties. Investing in producing high yielding improved varieties can increase yield significantly, leading to scalability of volumes and better quality[6]. Most mangoes are traded informally, and introducing formal trade can foster significant scalability of both fresh and processed mangoes, which in turn will minimise the substantial wastage. There is a large scope to increase exports of mangoes from Malawi for both fresh and dried products. Scalability is dependent on wider investment in improved varieties that are demanded in international markets[6]. Untapped irrigation potential could significantly increase mango yields and quality but requires investment in electricity, infrastructure and roads[6]. However, the scalability of mangoes is challenged by: Mangoes are highly perishable and technologies to improve the handling and transportation of mangoes are required to reduce post-harvest losses[6]. Theft, diseases and destruction of the fruits by children or animals are	Mangoes are a tropical evergreen fruit tree that is grown in almost all districts of Malawi though its quality is higher in the Northern and Southern parts[4]. Mangoes grow well from sea level up to 1,200 m, but fruit production decreases at higher altitudes[10]. Mangoes can tolerate a wide range of weather conditions, from hot and humid to cool and dry. However, the climatic conditions will determine whether mangoes can be grown commercially. The optimum temperature range is 12°C - 37°C, and mangoes have zero frost tolerance[10]. Low rainfall of less than 500 mm/year restricts fruit yields, whilst high rainfall greater than 2 000 mm/year can negatively impact yields as vigorous vegetative growth will replace reproductive growth[6]. Most farmers do not irrigate mango trees and rely solely on the annual rainfall for their trees[6]. Mangoes require fertile and deep soils to accommodate the large root system, which can extend up to 6 meters deep[10]. Mango trees have a relatively high water requirement and only bear fruit during the summer rainy season, which occurs from October through February[5].

	There are also mango projects implemented by Self Help Africa (SHA) in partnership with the private sector in Salima District[9]. The Trees of Hope Project to develop technical specifications, and a Plan Vivo Payment for Ecosystem Services (PES) project involving rural communities in Malawi to estimate carbon benefits from planting and managing mango orchards on smallholding farms in Malawi[4].	other challenges limiting the expansion[6]. Mangoes are sold in heaps and sorted based on their quality and without any packaging, both in rural and urban areas, making them prone to deterioration due to their perishability[4].	Climate change is expected to impact on mango production in a number of ways. Increasing temperatures are expected to lead to more rapid growth patterns and delays or avoidance of growth cessation at the beginning of winter[11]. Flowering is also expected to be affected since it is dependent on cooler temperatures during floral induction[11].

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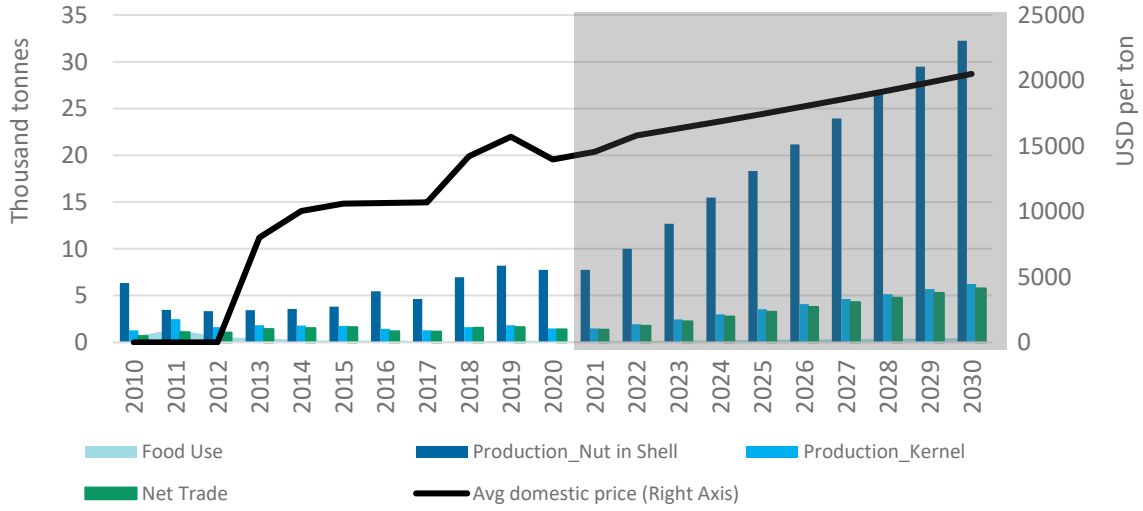
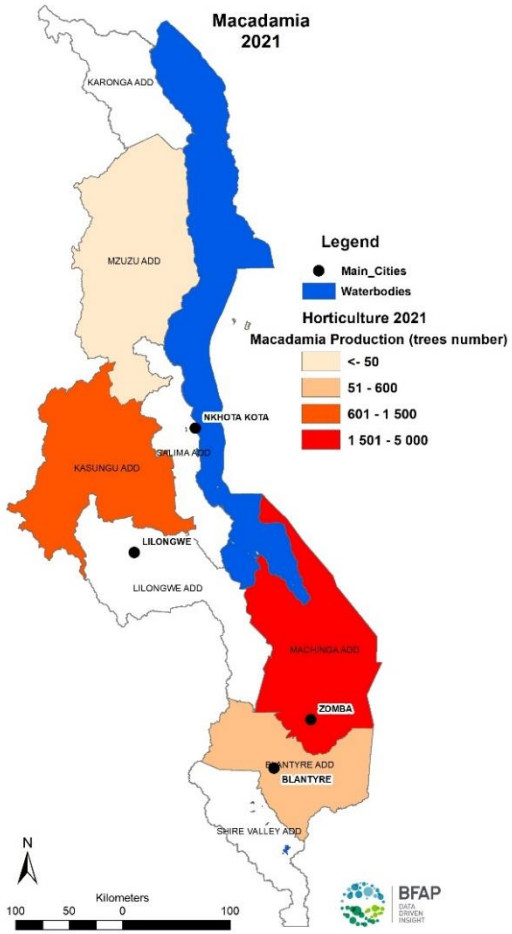
MACADAMIAS

Macadamias were introduced in Malawi in the 1960s at the Bvumbe Agricultural Research Station, and commercial plantings soon followed on selected estates. This value chain is focused on supplying quality kernels for export whilst the processing industry has also grown in recent years. Success in this technical and capital-intensive industry is driven by selecting the correct cultivar mix, good agronomic practices and pest control to deliver quality nuts in the shell. Thereafter processing margins are dependent on obtaining high crack-out rates and delivering products to the international market competitively. Large parts of Malawi are highly suitable for macadamias to thrive and the recent trend towards expansion in irrigated fields is expected to support growth in the future. Around 4 000 smallholders currently produce macadamias whilst around 24 estates produce the bulk (90%) of the total harvest. Current average yields are around 600 kg/ha of nut-in-shell.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change (period)	% Change per annum	Absolute (period)	% Change per annum
Area ('000 Ha)	10.4	4.1	8.6	2.8	1.7
Yield (tons/Ha)	0.6	-0.2	-2.4	1.5	13.8
Production NIS ('000 tons)	6.6	1.8	6.2	24.6	15.5
Domestic Cons ('000 tons)	0.1	-0.4	-26.4	0.4	6.8
Dom Cons Value (MWK Million)	1 460	2 921	3.6	8 277	18.7
Exports ('000 tons)	1.5	1.0	6.8	-	-
Imports ('000 tons)	0.0	0.0	-	-	-
Net Exports ('000 tons)	1.5	0.9	6.5	4.4	15.7





Qualitative Scan & Scoring: Macadamias

1.4	2.6	2.4	2.1
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
Macadamia nuts are mentioned in the NES II as one of the products with potential under the AGOA response strategy and listed as one of the priority products under food[1]. The NAP[2] and the NAIP[3] mention the important contribution of macadamia nuts as an export crop. The proposed new Draft Crops Bill 2022 includes Macadamia as one of the scheduled crops to be included under the new regulatory framework[4], The Malawi Macadamia Association (MMA) opposes some of the policy decisions and how it will influence the export market prospects in the future[5]. In 2017 GoM enacted a policy that mandates buyers of the crop to consider 60% of the smallholder crop as grade A. This was done to increase the smallholder farmers' profits and promote the crop. However, enforcing this policy is still a big challenge[5]. Macadamia smallholders have reported the lack of agricultural advisory services, lack of organised markets for their crop, and the lack of support for infrastructure development from the ministry as it focuses too heavily on crops such as maize and tobacco[5]. There is limited support from the GoM in supporting infrastructure	Though there is limited public investment in the macadamia value chain, private sector and NGOs have made several investments recently, mainly in the form of expanding existing area under production and in processing facilities for dehusking, grading, curing, cracking and packaging[4]. The newly formed Malawi Macadamia Association (MMA), consists of around 24 commercial macadamia producers and 2 established independent smallholder groupings. MMA was reconstituted as solely focussing on macadamias and formed from the previous Tree Nut Growers Association[5]. There are seven processors of macadamia nuts in Malawi. These processors are mainly involved in dehusking and packaging the raw nuts for international markets[6]. The Highlands Macadamia Cooperative Union Limited conducts and coordinates various activities of seven primary cooperatives in Malawi. HIMACUL is involved in macadamia nut aggregation activities, including bulking macadamia nuts from its member farmers, further drying and grading of the crop, and further facilitation in the transportation of the nuts to processors and trading[6].	Estimates and future projections suggest that scalability of this value chain is already in motion since only around 40% of current plantings are bearing, with 2020 being the largest annual planting expansion on record; the annual crop is expected to grow to 10 000 tons in 2026, even larger than our projected growth from the PE-model[8]. Macadamia production in the past has mainly been under rain-fed systems, whilst there is a strong shift towards irrigated orchards[8]. The macadamia value chain is primarily focused on exports with more than 90% of the produce exported. The key export destination is South Africa, primarily for the snacking market and due to more advanced processing requirements[6]. Malawi is expected to have new export markets in China and Vietnam due to the increasing demand for nuts and nut products[6]. Macadamia is now a fully established crop and competes with other crops for land in Malawi. Having been set up by the commercial estate sector, the macadamia industry is currently well established with strong growth potential[6].	Large parts of Malawi (57% of area) are highly suitable of macadamia production[8]. Climate change represents a significant threat to macadamia production. Extreme weather events such as heatwaves, flooding, and droughts have been highlighted as the key challenge to macadamia production, especially in the country's Southern parts. In addition, changing climatic conditions cause shifts in general land suitability for macadamias to grow. Macadamia trees are climate-sensitive, especially during the flowering phases where certain temperatures, relative humidity and soil moisture levels are required. In the dry season, irrigation is required as rainfall becomes more erratic[10]. Natural resources are not constrained in expanding production, especially if irrigation potential can be harnessed. However, due to climate change, Southern Malawi is affected by rainfall patterns which cause floods and drought. It is also characterised by high population density and high land pressure. Therefore, a more sustainable strategy for improving production would be the increased use of improved varieties.

development in this value chain to assist smallholders to enter the market due to the relatively high capital start-up costs[5].	HIMACUL and some commercial estates are responding by increasing nursery/seedling production to be made available and affordable to smallholder farmers[6]. GIZ has been working on improving the macadamia value chain by promoting more smallholder farmers in macadamia production as a way of diet and income diversification, training smallholders in farm business management, and the facilitation of linkages between public and private actors within the value chain[6]. AgDevCo has also made a significant investment in improved technologies of production and processing facilities. The investment of £1.6 million in Tropha Estates in 2014 was to develop a 500ha irrigated macadamia hub farm and a thousand-ton processing facility[7].	Macadamia is also an important nutritional crop and demand for the product is growing globally[6]. Lack of access to quality seedlings is a challenge for many smallholders in Malawi, which limits further scalability. The country has a limited number of certified seedling supplies to cater to the growing demand. Another limiting factor is the general high cost of seedlings, which becomes prohibitive for many smallholder farmers in the country, despite a significant portion being sold at subsidised rates[9]. There are large tracts of land in the Central and Northern regions that are suitable for production and available for expansion[9]. Some factors that are negating scalability is a significant challenge of organised theft of nut in shell which enter the local market illegally. Crop theft and rising security costs create disincentives to invest[8].	A study has assessed the potential impact of climate change in Malawi's suitability of macadamia production. It found that under current climatic conditions 57% of Malawi is suitable for production, whilst with current climate projections suitability is set to decline by around 18%. This will also lead to regional differences with the Northern areas expected to be the least impacted by suitability changes due to climate change[11].

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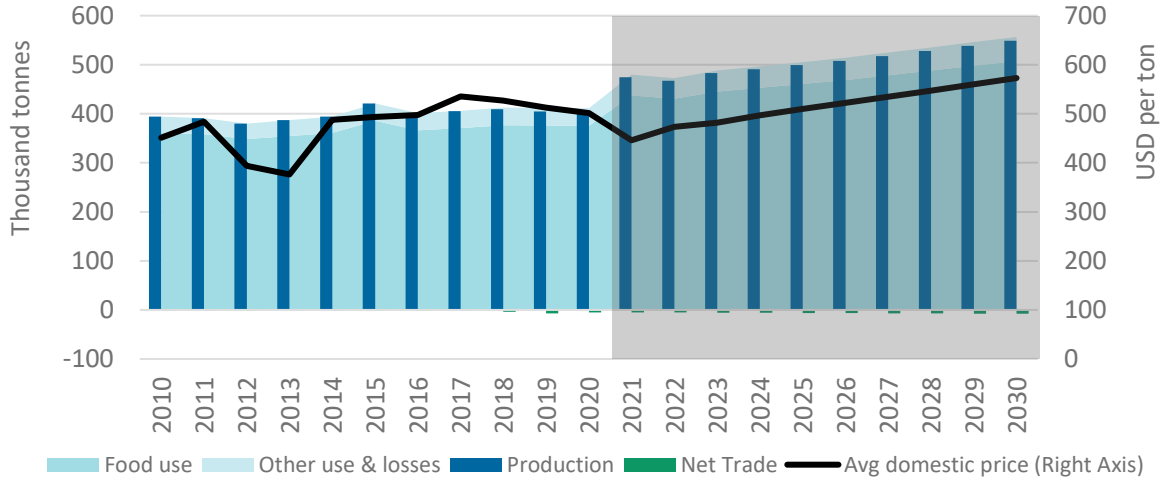
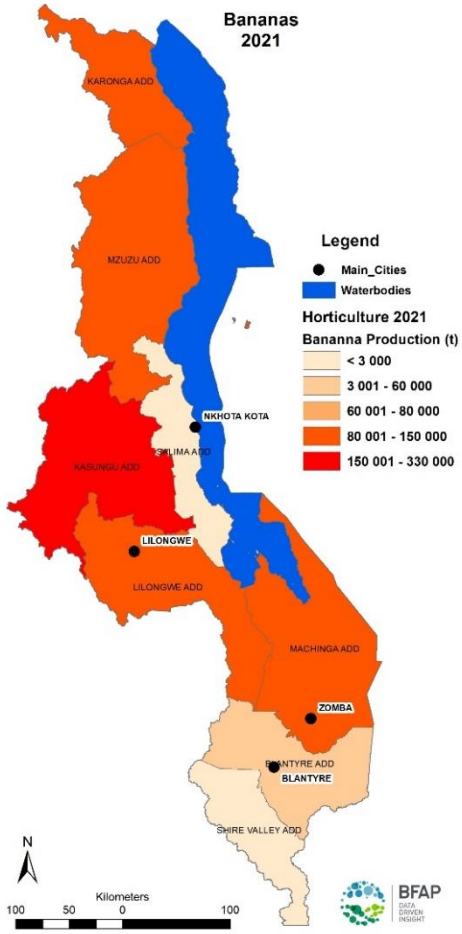
BANANAS

Bananas are a semi-perennial crop with a near annual crop cycle under optimum conditions. Malawi's climate is highly suitable for banana production and is an important source of income for smallholder farmers. Around 300 000 households are involved in production, with 95% of trees scattered in smallholder fields and the remaining 5% produced in planted orchards. Production has been negatively affected by the spread of the banana bunchy top virus that has decimated around 30 000 hectares over the past three decades. Renewed focus on distributing virus-free plant material is yielding good results with concerted efforts by GoM and donors to revive production. Bananas are the cheapest fruits in Malawi and are widely marketed through the country's fresh produce markets and through rural and informal channels. Malawi currently imports bananas from the region, which suggests this value chain could easily be scaled to replace imports. Current average yields are estimated at around 30 tons/ha but could easily be scaled through access to virus-free plant material, improved management practices and wider irrigation uses.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Absolute (period)	% Change per annum
Area ('000 Ha)	13.4	-4.7	-2.4	0.8	0.2
Yield (tons/Ha)	30.2	8.7	3.1	3.2	0.4
Production ('000 tons)	406.3	10.9	0.6	143.4	2.4
Domestic Cons ('000 tons)	374.3	14.8	0.7	133.2	2.4
Dom Cons Value (MWK Million)	153 398	135 752	23.9	121 278	5.6
Exports ('000 tons)	0.0	0.0	-	-	-
Imports ('000 tons)	3.9	7.2	89.1	-	-
Net Exports ('000 tons)	-3.9	-7.2	-	-2.7	4.3





Qualitative Scan & Scoring: Bananas

1.7	1.8	2.5	2.5
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
The MoA has selected the banana industry as its flagship program. This is done to end the importation of bananas, mainly from Tanzania and Mozambique[1]. There are plans for revamping the banana value chain by procuring one million suckers to be distributed to 1 500 farmers[1]. The MoA advocates the production of other food crops, including bananas[2]. In 2020/21, some key milestones of government support for bananas include training, the establishment of 54 community nurseries and providing around 20 000 suckers to farmers[3]. The NES II mentions bananas as an important agricultural commodity but it is not listed as a priority product[4]. The NAP[5] suggest that there are efforts underway to increase commercialisation of crops which includes bananas. The proposed new Draft Crops Bill 2022 includes bananas as one of the scheduled crops to be included under the new regulatory framework[6]	Hortnet established a private tissue culture laboratory and invested in tissue culture technology to mass-produce good quality and disease-free planting material[3]. Malawi embarked on efforts to revamp the banana sector in 2019 as part of a 5-year programme funded by the EU and FAO with the MoA[7]. The Agriculture Sector Wide Approach project distributes disease-free plants financed by the World Bank. GoM has advised all farmers to chop down their banana trees and then to re-plant them in two years to control the banana bunchy top virus[8]. A feasibility study was conducted and a workshop and field visits were done to establish capacity for the indexing and production of virus-free planting materials for bananas in Malawi[9]. The Roots, Tubers and Bananas (RTB) Research Programme was launched in 2012. Such projects support the banana industry to address the challenges related to the use and spread of infected planting materials and the potential of local and export markets for bananas. Include the following[6]. Malawi Mangoes project that imports indexed planting materials	There is high demand for bananas both on the local market and for export. This gives room for growth specifically since it is the most affordable fruit grown in the country[8]. Malawi imports bananas and other fruits from South Africa due to the seasonal supply window and availability of fruit. A large opportunity exists to immediately replace imports and scale production[8]. Bananas are easily multiplied since the plant does not require grafting to propagate successfully. This simplifies the production process. This does assist in scaling production but also spreads the risk of viruses in the transportation of infected plant materials[8]. Bananas can be processed to form products such as banana chips by drying them, which may extend shelf life[8]. Banana yield and quality are low due to drought, low fertility and poor management practices; optimum yield can be obtained through irrigation systems and improved fertilizer application[8]. However, the scalability is challenged by: Low prices of bananas, which demotivates potential investors[8].	Bananas are produced throughout the country with the five major districts being Mulanje, Thyolo, Nkhata Bay, Karonga and Chitipa[8]. In terms of required resources, banana production in Malawi can take place in most areas where adequate rainfall and water are available[5]. Bananas can be grown without irrigation, but flowering and fruit set is dependent on availability[5]. Bananas are a relatively drought-tolerant crop[9]. Unlike many other crops, banana production is set to benefit from increasing annual temperatures in most subtropical and tropical climates, increasing suitability for production. This is due to the shortening of production cycles, albeit offset by a greater water requirement[10].

	used in their own production aimed at the banana pulp industry. World Vision International's Food Security project helps in promoting production through the supply of clean planting material and technical information.	Bananas are susceptible to disease, most notably the banana bunchy top virus, which affects productivity[5]. Poor road network resulting in poor access to markets forcing them to sell at local and oversupplied markets at lower prices[7].	

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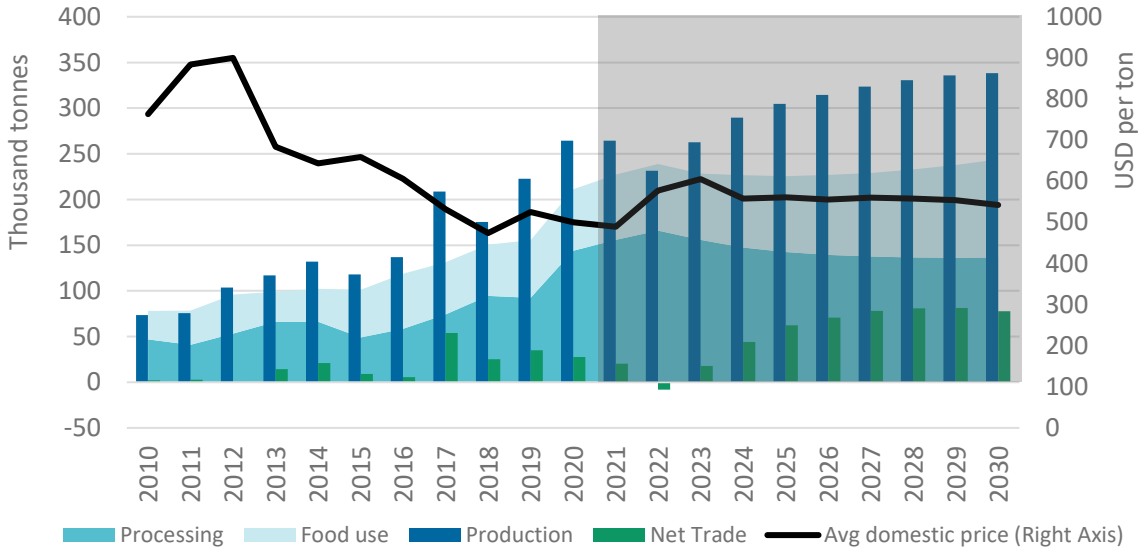
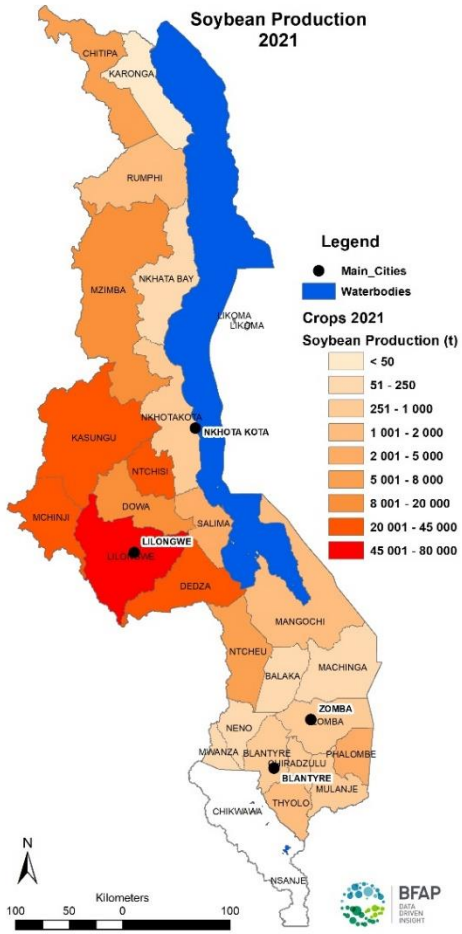
SOYBEANS

Soybeans are one of the fastest growing legume crops in Malawi, seen by many as an excellent alternative to diversify the country away from its dependence on maize and tobacco farming. The area planted has increased by around 11% per annum between 2010 and 2019, with total production also supported by modest yield improvements. Soybeans are predominantly (95%) farmed by around 500 000 smallholder farmers under rain-fed production systems, with the average yield between 2017-2019 reaching 1.1 ton/ha. This value chain has seen strong investments in crushing capacity in recent years as it continues to benefit from strong policy support in the form of input subsidies, donor support and a focus on enabling value addition beyond the farm-gate. There are however some concerns over competitiveness throughout the value chain as the country continues to import soybean oil, whilst beans are exported informally and crushing capacity is not fully utilised.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Absolute (period)	% Change per annum
Area ('000 Ha)	190.0	127.2	11.5	28.2	1.8
Yield (tons/Ha)	1.1	0.1	0.5	0.2	1.4
Production ('000 tons)	202.3	149.5	12.0	74.1	3.2
Domestic Cons ('000 tons)	156.5	83.6	8.0	43.5	1.0
Dom Cons Value (MWK Million)	56 162	51 468	20.6	36 706	2.8
Exports ('000 tons)	38.3	24.8	21.2	-	-
Imports ('000 tons)	0.4	-7.8	-28.5	-	-
Net Exports ('000 tons)	38.0	32.6	37.5	42.7	25.9





Qualitative Scan & Scoring: Soybeans

2.3	3	2.7	2.7
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
Soybeans are strongly supported by policies, but implementation is a challenge. The NAP[1], NAIP[2] and NES II[3] all include soybeans as an important priority crop for Malawi. The latter identifies soybeans as a priority product to increase incomes, improve food security and trade/export development. NES II aims to raise exports and soybeans as part of one of the four core areas and highlights oilseed cake as a priority manufactured product[3]. This comes after soybeans were also included in NES I with sunflower, groundnut and cotton as priority industries[4]. The proposed new Draft Crops Bill 2022 includes soybeans as one of the scheduled crops to be included under the new regulatory framework[5]. ASWAP I and ASWAP II included soybeans under food security as one of the commodities for stimulating the diversification of food production for improved nutrition at the household level by increasing productivity[6]. FISP included soybean seed as part of the subsidy program but was not included in the new AIP[7]. Soybeans are also included in the Agricultural General Purposes Act such that it has a minimum farm	Public investment in the form of an input subsidy of soybean seed has impacted on the area planted, improved yields and dietary diversity[10]. Donor funding and projects also target the soybean value chain development. This includes donors like USAID, GIZ, UKAid (FCDO), EU, World Bank and IFAD, among others, investing in the soybean value chain[11]. There is continued expansion in the production of hybrid seeds and new varieties by seed companies[11]. Strong investment from the private sector into technologies and crushing capacity for soybean processing into oil, solvent extraction and oilcake[12]. Companies such as Sunseed oil, Mount Meru, LAPE and others have recently invested in processing capacity. Still some future plans to invest in processing equipment for human consumption products such as soya milk and margarine. Crushing capacity in 2018 was estimated at around 400 000 tons[13], whilst the most recent figure mentioned by the eight largest processing companies stood at 512 000 tons. Given our current estimate of soybean processing at 150 000 tons annually, this implies	The rapid expansion in area planted has shown that producers easily switch to soybean production, diversifying from crops such as maize and tobacco. Large potential to scale production further if demand for the crop continues to grow in the region given availability of excess crushing capacity[10]. Scalability is somewhat affected by the current market structures in that soybeans are still mostly traded in the open market dominated by traders and informally exported in the region[11]. Despite its potential, the soybean value chain has been constrained by prolonged bottlenecks in quality seed distribution and the broader availability of high-yielding varieties[14]. The scalability of soybean production is strengthened by the strong demand for both human and animal consumption and linkages to the poultry and industrial sub-sectors[15]. Current low levels of inoculant use could easily be scaled to boost farmer yields[15]. The anticipated strong growth in feed-intensive livestock industries such as poultry, aquaculture and	Soybeans are well adapted for production in all agro-ecological zones in Malawi[17]. Climatic and agronomic conditions throughout the country are favourable but not optimal for growing soybean[11]. Due to its suitability, proximity to markets and the location of processors, the bulk of production occurs in the country's Central region[16]. Most production is on very small, rain-fed plots leaving the crop vulnerable to weather events and climate change[16]. Soybean is a drought resistant crop that does well in warm, moist conditions, but requires well-distributed rainfall. High moisture is however needed during germination[18]. Using the correct farming practices and post-harvest techniques, soybeans are good nitrogen fixing crops, although they are also known to extract large amounts of potassium from the soil[18]. Soybean area planted is expected to be negatively affected by climate change, but might experience positive effects on future yields[19].

gate price determined by the Ministry of Agriculture on an annual basis[8]. The soybean value chain has also been affected by regulations under the Control of Goods Act such that traders need licenses to trade, which has resulted in occasional export bans of soybeans[9].	that only around 30% of crushing capacity is currently being utilised. Malawi predominantly grows non-GMO soybeans which leads to some premium in price levels achieved[13].	pig farming will increase the demand for soybean oilcake and indirectly for soybean production.	

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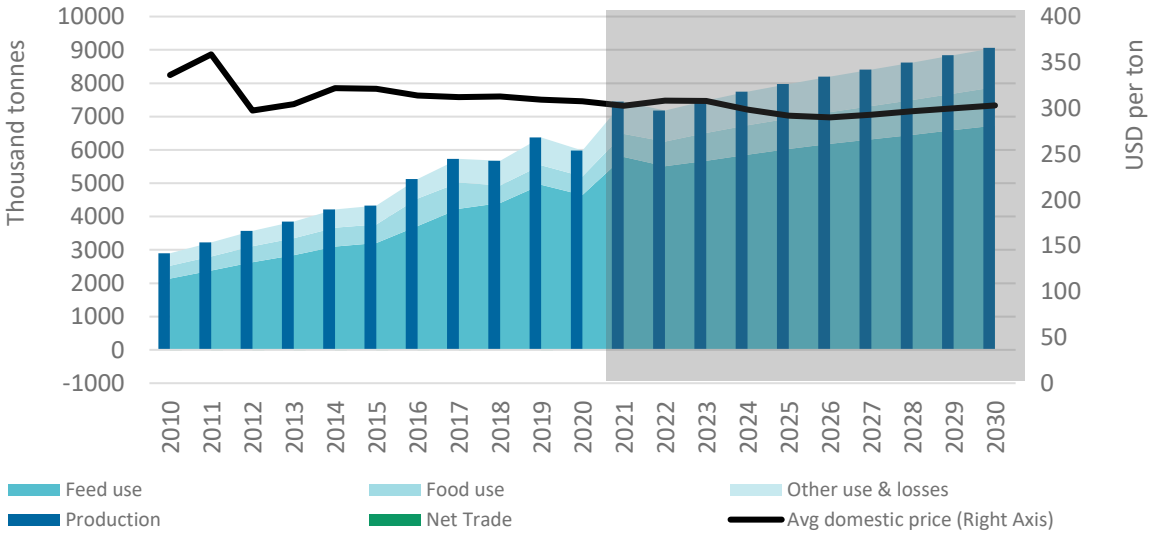
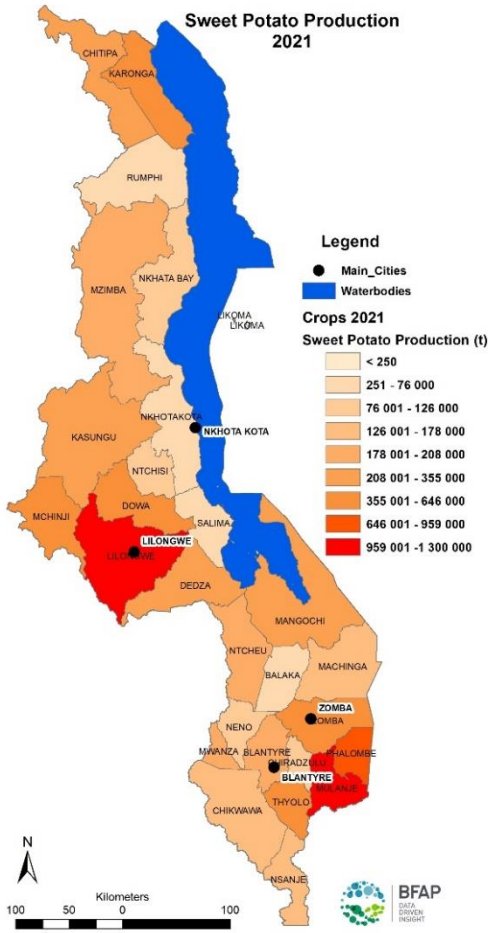
SWEET POTATOES

Sweet potatoes are one of the most important food crops in Malawi. Although some have suggested that official production numbers are over-estimated, the crop continues to be one of the most planted crops in the country. Around 300 000 households produce sweet potatoes, a crop that stores well, is adapted to extreme weather conditions and performs well in marginal agronomic conditions. This value chain makes an important impact on nutritional outcomes in Malawi, particularly in mitigating Vitamin A deficiency by increased consumption of Orange-Fleshed Sweet Potato, which has been widely distributed and adopted as a result of concerted efforts by the government and the International Potato Centre (CIP). Despite its importance, the value chain continues to be characterised by low farm productivity and informal trade. Significant investments in seeds systems, irrigation and reduction in post-harvest losses are needed to drive growth.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Absolute (period)	% Change per annum
Area ('000 Ha)	281.6	63.9	4.2	21.4	0.6
Yield (tons/Ha)	21.0	9.1	4.5	8.1	2.7
Production ('000 tons)	5 923.7	3 471.7	8.7	3 079.2	3.3
Domestic Cons ('000 tons)	637.1	207.3	5.6	595.3	6.3
Dom Cons Value (MWK Million)	154 009	132 886	25.5	199 688	7.3
Exports ('000 tons)	0.1	0.0	-	-	-
Imports ('000 tons)	0.0	0.0	37.5	-	-
Net Exports ('000 tons)	0.1	0.0	-	-0.1	-8.1





Qualitative Scan & Scoring: Sweet Potatoes

1.3	1.7	2	2.2
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
The sweet potato value chain has limited policy support in Malawi. The NAP incorporates sweet potato as it aims to establish effective, demand driven agricultural innovation systems for research and technology generation and dissemination[1]. Under the NAP, sweet potatoes are also under consideration for fast-track infrastructure investments for smallholders and large-scale irrigation schemes in line with the objectives of the National Irrigation Master Plan and Investment Framework[1]. The National Nutrition Policy and Strategic Plan (2007 – 2011) is a plan addressing nutrition disorders and deficiencies among the population. Therefore, sweet potato, especially orange flesh sweet potato, is indirectly promoted[2]. The NAIP[3] mentions the potential of sweet potatoes to contribute to food and nutrition security, hence its selection as a value chain study under NAPAS. GoM has also directed the implementation of Orange-Fleshed Sweet Potato programs with the International Potato Center (CIP) as their main research and development partner[4].	The CIP has been working with the MoA's Department of Agriculture Research Services (DARS) and the Department of Agriculture Extension Services, NGOs and local communities to develop, cultivate and distribute new Vitamin A rich and climate appropriate sweet potato varieties[5]. Breeders from Malawi's Department of Agricultural Services and the CIP have developed and released nine new varieties for farmers[6]. Between 2009 and 2019 the six largest orange flesh sweet potato projects jointly reached more than 300 000 beneficiaries directly: they received planting material[4]. Universal Industries partnered with Feed the Future for Innovation and CIP to develop a value-added strategy in Malawi. Through the partnership, Universal Industries tested and commercially launched four sweet potato-based products to the market. It also built a sustainable supply chain by providing sweet potato farmers with training in proper production and storage, improved sweet potato vines, and a formal sweet potato market[7]. Sweet potato is also promoted under the production of drought tolerant crops, and sweet potato	Roots and tubers such as orange-fleshed sweet potatoes have strong potential to contribute to food and nutrition security[9]. Low productivity, poor storage, and limited access to clean seed remain challenges that need to be addressed if its production and utilisation are optimised[12]. Increasing the uptake of orange flesh sweet potato is an effective strategy to combat Vitamin A deficiency[4,10]. Scalability of this value chain is limited by[9]: Limited access to clean planting material for multiplication and the need for training to produce disease-free planting material. No official quality control system for sweet potato planting material. Lack of access to credit facilities to purchase large quantities and lack of storage facilities to enhance regular supply to processors. Scalability of production can be strengthening by: Wider dissemination of information and extension services. Investments in vine multiplication and dissemination of. Providing business development support for scalable processed products (flour, juice, body cleaner,	Sweet potatoes grow well in all areas in Malawi and in all types of soils, and have moderate drought resistance[11]. Climate change poses new threats to agriculture, thus drought-tolerant root crops such as sweet potato have become increasingly practical compared to maize[12]. Sweet potatoes store well as a famine reserve crop, tolerate extreme weather conditions, and perform well in fringe soils, which makes them ideal for food security[13]. The biodiversity in sweet potatoes includes significant heat tolerance and would therefore have the potential to produce under extreme high temperatures. Studies show that this crop has impressive potential to adapt to climate changes[14].

	vines are given to smallholder farmers[4]. The Technologies for African Agricultural Transformation (TAAT) project provided 500,000 beneficiaries with biofortified sweet potatoes and simple irrigation facilities[8].	dried chips, biscuits, crisps and sweet beer). Promotion of irrigated winter production in 'hotspot' areas (Balaka, Machinga, Mangochi) to ensure year-round supply to processors.	

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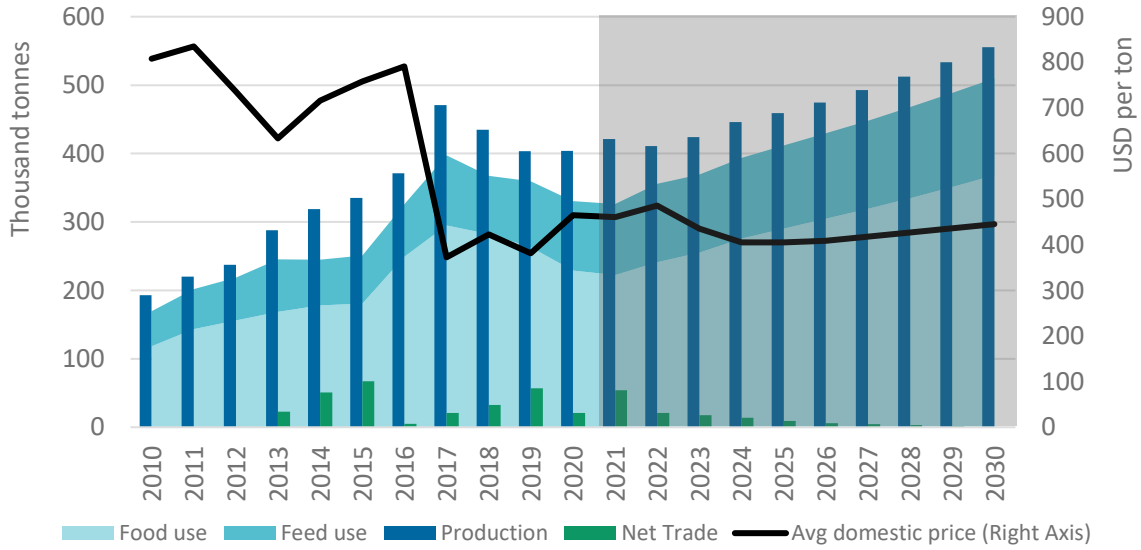
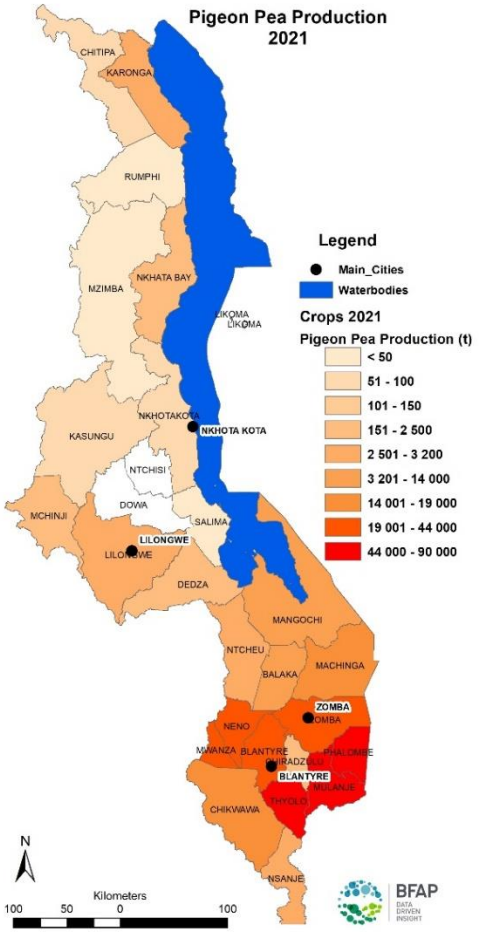
PIGEON PEAS

Pigeon peas are one of the most important legumes in Malawi. The country is one of the leading producers of pigeon peas in Africa and they count amongst a handful of crops that are exported. This drought tolerant crop is well-suited to Malawi's growing conditions and is mainly farmed by around 936 000 smallholder farmers, with production concentrated in the Southern regions of the country. It is usually intercropped with maize and dry beans, with average yields of around 1.6 tons/ha. Although having many uses, pigeon peas are produced mainly for household consumption, whilst around 23-25% is marketed either as raw grain or a small proportion is processed into Dhal. Malawi competes with Tanzania in exporting pigeon peas to India, which is the country's major export market, but prices have been under pressure since around 2017 as India has expanded their production of the crop.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Level Change	% Change per annum
Area ('000 Ha)	252.6	69.5	3.6	53.7	1.8
Yield (tons/Ha)	1.6	0.5	6.2	0.2	1.5
Production ('000 tons)	403.1	210.5	9.7	158.7	3.3
Domestic Cons ('000 tons)	247.0	144.9	10.3	122.1	4.7
Dom Cons Value (MWK Million)	76 592	69 130	22.4	76 203	6.0
Exports ('000 tons)	36.8	57.1	43.8	-	-
Imports ('000 tons)	0.0	0.0	N/A	-	-
Net Exports ('000 tons)	36.8	57.1	43.8	5.5	-2.8





Qualitative Scan & Scoring: Pigeon Peas

1.5	2.3	2.8	2.8
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
The Ministry of Agriculture (MoA) signed a Memorandum of Understanding (MoU) with India in 2021, allowing exports of 50 000 tons annually for the next 5 years. It targets minimum yearly quantities of imports from Malawi[1]. It is unclear whether this will stimulate increased exports. Prior to the introduction of the Affordable Input Program (AIP), the Farm Input Subsidy Program (FISP) included pigeon peas as part of the input subsidy but was excluded with the introduction of AIP in 2021. Some have called on the GoM to include legumes once again[2]. The AfDB has approved a new project which will include pigeon peas in its seed subsidy[3]. Pigeon peas are mentioned in various policy documents such as the National Agriculture Plan (NAP), National Agriculture Investment Plan (NAIP) and more recently in the 2nd National Export Strategy (NES II), which mentions the crop as a priority product, targeting markets such as India, USA and UAE[4]. The proposed new Draft Crops Bill 2022 includes pigeon peas as one of the scheduled crops to be included under the new regulatory framework[5]. Pigeon peas are included in the Agricultural General Purposes Act with a minimum farm gate price	There are currently limited new investments by the private sector and donor-funded projects in the pigeon pea value chain with excess processing capacity not fully utilised to manufacture Dhal products[8]. RAB industries and Atlas are major processors, with a combined processing volume of 250 000 tons[9]. There are also several other companies involved in the processing of pulses, including Export Trading Group (ETG), Transglobe, Produce Exports and Bharat Trading Company, which all have established market contracts in India[10]. Investment in seed production with GoM working with ICRISAT, CIAT and the Malawi Seed Industry Development Project to increase utilization of legumes[11]. The declining market prices and challenges associated with pests and diseases are hampering further investment[12]. There have been calls by the industry for a more structured approach to the marketing of pigeon peas, since informal trading and low prices given to farmers is leading to farmers moving to other crops. Recycled seeds limits yield improvements. Some investment in warehousing facilities for aggregation and	The average land sizes that smallholders dedicate to this crop is very small at around 0.15 ha, with many choosing to intercrop with maize and beans. Less than 1% of smallholders grow pigeon peas as a pure stand. This limits further scalability of the value chain if farmers are hesitant to dedicate larger land resources to this crop[15]. Average yields are still much lower than the NAIP target of 2 t/ha and currently range between 0.7-1.5 t/ha[16]. Malawi harvests between July and August, which coincides with a period of high prices in India. Delivering products consistently in this market window could result in scaling of production. Scalability of pigeon peas is largely tied to the demand growth from India and policy certainty that their market will not be closed to protect their smallholder producers as has been the case in the past. The Indian Ministry of Commerce and Industry[17] has extended the unrestricted imports of pigeon peas to March 2023. Extension support systems and seed availability hinder scalability. Switching between pigeon peas and maize is a relatively easy transition for smallholder farmers in that if prices support the value	Pigeon peas are mostly grown in the Southern region of Malawi, while crop suitability maps indicate that the Central and Northern regions are relatively more suitable[18]. Pigeon peas are well adapted to semi-arid tropics, and large areas in Malawi are either suitable or highly suitable for production. The crop is relatively drought-resistant compared to maize, tobacco and cotton, making it a suitable diversification strategy to mitigate against climate variability[19]. The Southern growing regions are affected by erratic rainfall patterns that cause floods and droughts which hamper further expansion, although there is strong growth in areas such as Karonga and Chitipa. Pigeon peas are used in rotation systems to boost soil fertility through nitrogen fixing, while they improve soil structure through their deep root system, and the abundant leaf fall provides green manure[20].

determined by the MoA on an annual basis[6]. Pigeon peas are also regulated under the Control of Goods Act[7].	purchases of micro processing equipment at farmer cooperative level. NASFAM and the Nandolo Farmers Association are active in the pigeon pea market[14].	chain, pigeon pea production can be easily scaled in terms of area planted.	

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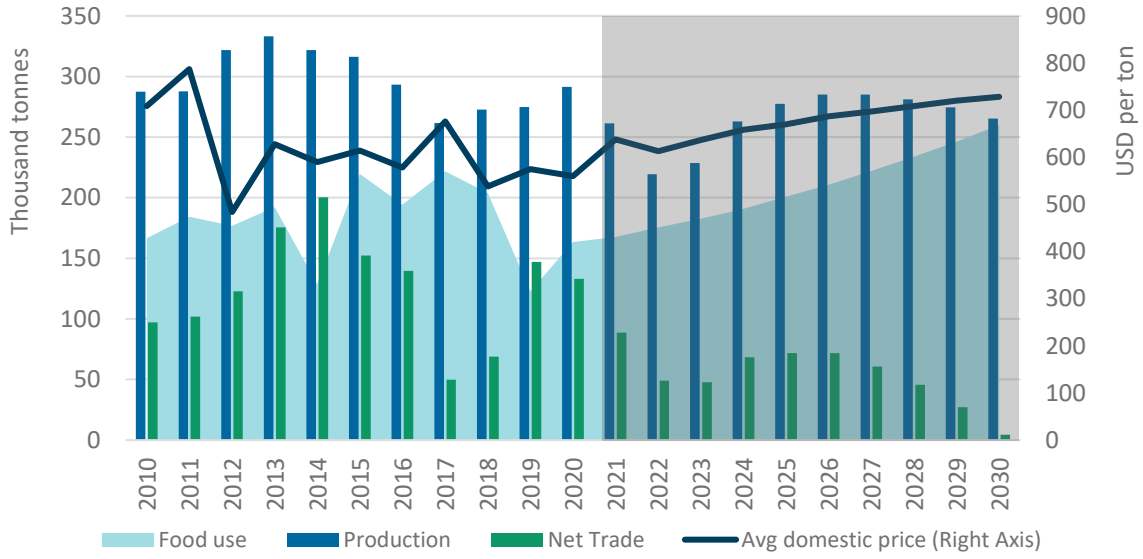
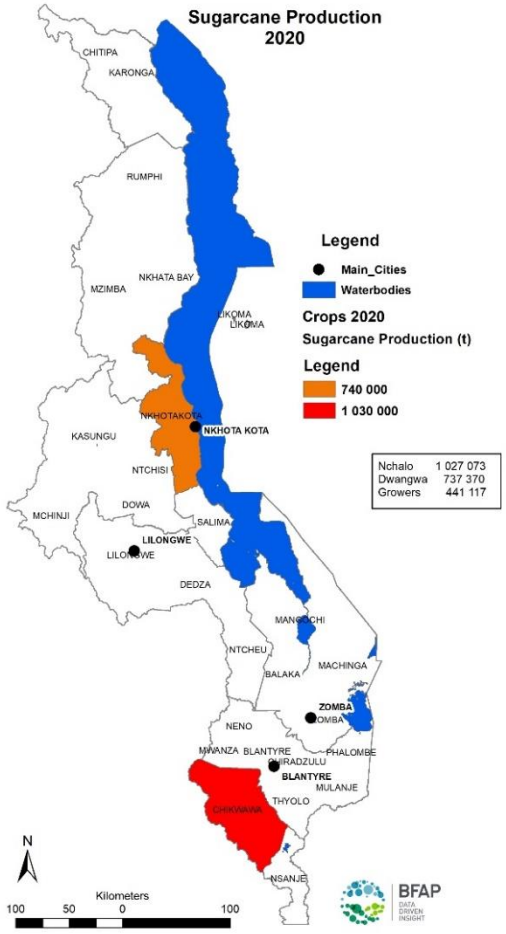
SUGAR

Malawi's sugar value chain is focused on exporting processed sugar from the production of sugar cane mainly grown on estates, although outgrower schemes have become more prevalent. Malawi has ideal growing conditions for the production of sugarcane, which is one of the reasons the country produces excellent yields with a high sucrose content. Processing of cane into sugar is predominantly done by one large company known to make a large contribution to the economy through exports, job-creation and outgrower schemes. Future growth of the value chain is hampered by what some NGOs suggest are anti-competitive market behaviour, labour challenges and broader sustainability and health concerns. The National Adaptation Strategy (NAP) has supported the industry to adapt to the EU Sugar Reform as the country's sugar quotas and guaranteed prices are being phased out. Sugar faces similar challenges to other value chains in that transport is expensive, while large milling overheads and low prices often disincentivise larger smallholder plantings.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Absolute (period)	% Change per annum
Area ('000 Ha)	26.5	1.8	0.1	-1.6	0.7
Yield (tons/Ha)	107.5	-0.4	0.1	0.6	0.3
Cane Production ('000 tons)	2 846.3	181.0	0.2	-157.1	1.1
Sugar Production ('000 tons)	269.7	-12.9	-1.3	-26.1	0.9
Domestic Cons ('000 tons)	182.7	-43.7	-0.2	96.5	4.7
Dom Cons Value (MWK Million)	84 653	40 941	18.6	109 530	8.5
Exports ('000 tons)	90.3	50.9	-2.5	-	-
Imports ('000 tons)	1.7	1.1	14.2	-	-
Net Exports ('000 tons)	88.6	49.8	-2.7	-128.6	-19.5





Qualitative Scan & Scoring: Sugar

2.5	2.5	2.5	1.3
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
The sugar sector as a whole, from production, processing to export, has received increased policy attention in the last decade. The NES I focuses on three prioritized export-oriented clusters for diversification, one of which is sugar cane products. Sugar is also now prioritised for export diversification and value addition in the NES I and NES II[1&2]. The National Adaptation Strategy (NAS) is the GoM's adaptation strategy to the EU Sugar Reform. It aims to enhance the competitiveness of the sugar and cane sector by increasing factory capacity and sugar cane production through efficiency improvements in both field and factory operations[3]. Under the NAP sugar cane value is also supported by facilitating the creation of new structured markets. This is to achieve fair prices and increase the profitability of non-traditional agricultural market commodities[4]. The government aims to diversify and scale-up production of key export crops, such as sugar cane, to boost and stabilise export revenues that are currently over-reliant on tobacco. Furthermore, this should be done to sustainably reduce poverty and food insecurity[3].	Public and donor investments have focused on large-scale collective irrigation schemes for smallholder cane growers. Promote private investment in sugar processing plants and increasing the number of mills to allow for more processing options for growers in Malawi[9]. AgDevCo, a social impact agribusiness investor, announced a $1.6 million investment into a Malawian sugarcane cooperative for fixed and working capital expenditures[10]. Under the auspices of the Capacity Building Project for Outgrowers, the EU provided technical support to smallholder farmers and the managers of outgrower schemes. The project prioritises the empowerment of farmers to take sugar cane growing as a business through the provision of training in business planning, cane growing, cane factory operations, marketing and performance evaluation. Illovo Malawi has made significant investments in the sugar cane value chain. It invested in a sugar warehouse and projects designed to reduce the company's environmental footprint and increase water efficiency. The company has made significant investments in irrigation infrastructure and had a project to	Sugar is currently the second-largest export revenue earner after tobacco. In addition, it is the second most valuable crop after tobacco, contributing 9–12% of Malawi's foreign exchange earnings[15]. Malawi's sugar quality contributes to its high demand on the international market. This with competitive yields make sugar scalability high from a competitiveness perspective[16]. The drive under NAS will continue to force the industry towards increased competitiveness through better yields and increasing factory capacity through efficiency improvements in both field and factory operations[15]. Scalability is affected by the difficulty smallholders face switching into cane production given the availability of more profitable crops in case of unfair and non-remunerative prices[16]. Farmers are said to receive low farm-gate prices that are not in line with movements in the export price. Thus, farmers struggle to negotiate competitive prices due to the monopsony of sugar cane purchase, weak land tenure rights and lack of information[15]. There is only one company buying, selling and processing sugar and	Malawi has ideal agro-climatic conditions for growing sugar cane: warm rainy summers coupled with cold, dry and sunny winters, resulting in generally high annual cane yields and levels of sucrose content[17]. Sugarcane is intensively cultivated in the Nkhata Bay, Nkhotakota, Salima and Chikwawa districts. The Nkhata Bay and Nkhotakota districts are high-altitude areas with an average annual rainfall of 1 490mm, mainly between December and April. The crop is rainfed in Nkhata Bay. The major source of irrigation for the sugar industry in Nkhotakota is the Dwangwa River that drains into Lake Malawi[18]. Chikwawa is a low altitude area (< 150 metres above sea level with half of the average rainfall received in Nkhotakota. Water is drawn from the Shire River that flows out of Lake Malawi. Because of the topography of Chikwawa, the district is prone to annual flooding from water movement from the Shire Highlands and groundwater discharge into the river[18]. The various challenges faced by smallholder farmers and estates has been compounded by the impact of severe climatic conditions. Recent examples include flooding in major production areas.

The policy direction for sugar is also provided in the Sugar Cane Product Cluster in which the GoM undertakes to[5]: •Facilitate the establishment and operationalisation of support institutions for the sugarcane products sector. •Facilitate and ensure that the sector has access to information by addressing the farmer-processor disconnect. •Fully enable and ensure continued support to sugar cane products to act as an industry forum for collaboration amongst stakeholders. The proposed new Draft Crops Bill 2022 includes sugarcane as one of the scheduled crops to be included under the new regulatory framework[6]. A recent example of how the Ministry of Trade has affected trade of sugar through the Control of Goods Act[7] is the export ban of sugar from Malawi to rectify supply shortages in the local market in May 2022[8].	convert existing irrigation systems to drip irrigation which is more effective and efficient in terms of water use[11]. The GoM has also commenced works on a 530 ha project (out of 6 293 ha) of the Chikwawa Green Belt Irrigation Scheme in the Salima District. These include building a lake pump station, booster pump station, reservoir, pipeline, site office, workshop, ablution block and pivot-irrigation areas, with overall progress at 80%. Under the Scheme, the GoM has secured lines of credit for $10 million and $40 million respectively from the Indian Government for irrigation and mechanisation and set up a sugar processing plant in Salima district[12]. Several processing activities for sugar value added products exist, including the use of molasses and bagasse used in ethanol factories[13]. Research on sugar is conducted by Sugar Corporation of Malawi (SUCOMA) and Dwangwa Sugar Corporation (DWASCO) under the Illovo Group of Companies. In addition, a quarantine facility at Bvumbwe Research Station has been funded by SUCOMA. Micro finance agencies prioritise smallholder sugar cane and offer savings schemes to sugar cane small holder farmers on a large scale[14].	sugarcane in Malawi, to which producers pay a high milling fee which leads to losses hindering the scalability of sugarcane production in Malawi[9]. Scaling larger irrigation expansion is constrained by investments needed in irrigation infrastructure.	

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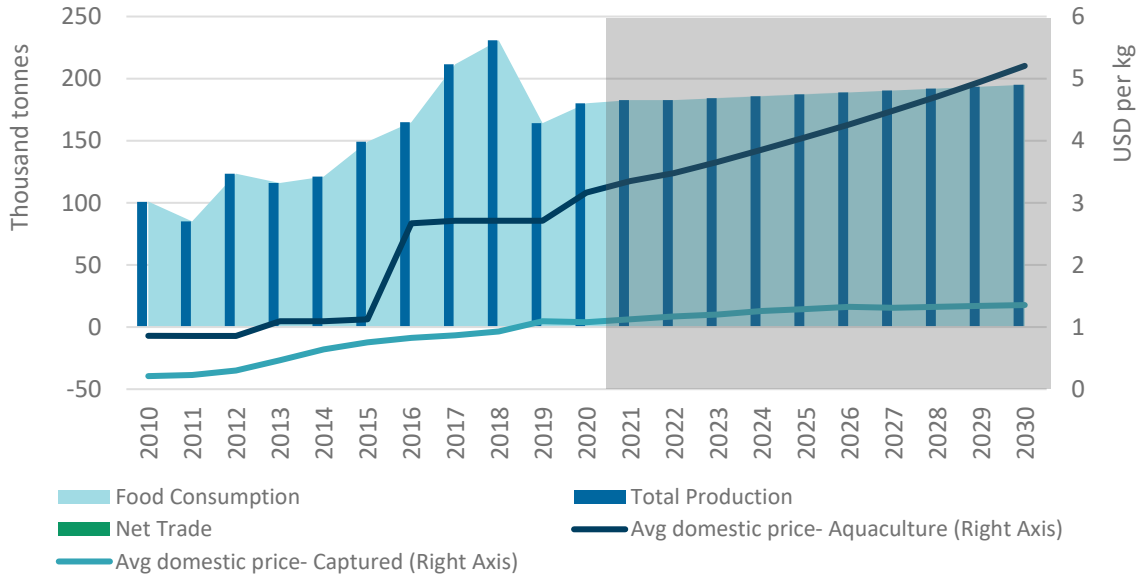
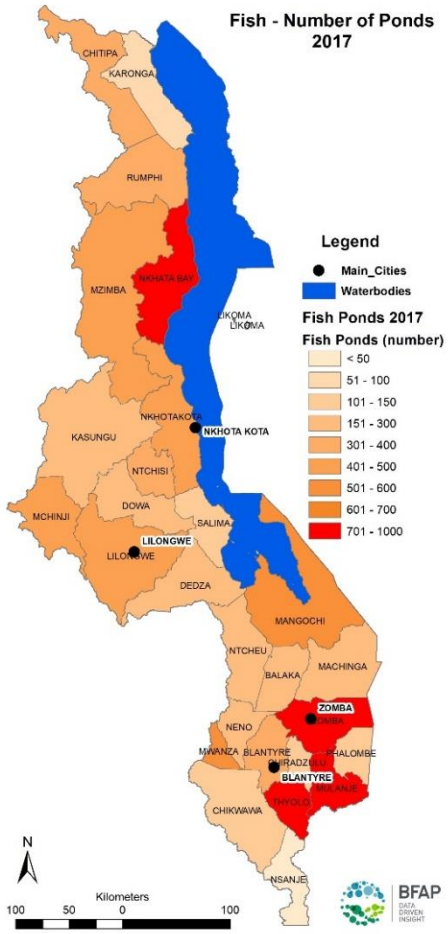
AQUACULTURE

Aquaculture and capture fisheries play a significant role in food and nutrition security in Malawi since fish consumption contributes between 60-70% of total annual protein intake. Although the bulk of fish consumption comes from capture fisheries, the focus on aquaculture is due to the decline and overfishing in Lake Malawi characterised by weak enforcement of fisheries regulation, resulting in dwindling catch rates from lakes and rivers. This presents an opportunity to supply a growing market sustainably through aquaculture. Fish is the most affordable source of animal protein in Malawi and aquaculture production is mainly done in intensive production systems well integrated with the feed value chain and is particularly labour intensive. The total number of fish farmers active in aquaculture is approximately 16 000, farming fish in around 10 000 ponds across the country. Fingerling production adds opportunities within aquaculture as a critical input supplier to fish farmers.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Level Change	% Change per annum
Production Aquaculture	10.2	7.6	20.2	4.2	4.1
Aquaculture Production Weight	0.6	0.6	1.8	0.0	0.0
Fingerling Production	12 303	14 631	15.8	8 375	4.1
Domestic Cons ('000 tons)	10.2	7.6	20.2	4.2	4.1
Dom Cons Value (MWK Million)	21 391	20 629	57.1	45 031	10.3
Exports ('000 tons)	0.0	0.0	-	-	-
Imports ('000 tons)	0.0	-0.2	-	-	-
Net Exports ('000 tons)	0.0	0.2	-	-	-





Qualitative Scan & Scoring: Aquaculture

1.8	1.8	2.2	2.8
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
Aquaculture is an important sector in Malawi because it is potentially the main driver of sustained fish supply to the nation to match the increasing protein needs of the population to compensate for the dwindling fish catches under capture fisheries[1]. Several policies aim to support aquaculture in Malawi. The National Fisheries and Aquaculture Policy (NFAP) identifies aquaculture as its second policy priority area and aspires to expand the sector to make up for dwindling fish catches. NFAP's specific focus on aquaculture is the following[2]: Appropriate regulatory measures for sustainable aquaculture development are put in place. Small-scale aquaculture production is promoted as a business. The National Inland Fisheries and Aquaculture Policy[3] (2019) also promote the aquaculture value chain through various interventions. Aquaculture is also mentioned in the NAP[4], NAIP[5] and notes the challenge of overfishing along lake shores, insufficient access to quality fingerlings and feed. Policy objectives seek to sustainably increase production and consumption of livestock, aquaculture and capture fisheries[4]	Thirty large scale commercial fishing units were licensed to tap the offshore deep-water fish resources[6]. Close to 500 small scale fishing licenses and 49 sanitary certificates were issued[6]. The country currently produces around 10 million fingerlings[6]. Several investment opportunities in aquaculture are listed[7]: Commercial pond fish farming along Lake Malawi Investment in cold rooms and fish transportation infrastructure Setting up fish processing facilities in Mangochi Fish feed production Multiplication of fingerlings. Promotion of sustainable agricultural growth for improved income, employment, and food security, under KULIMA, a 5-year project funded by the European Union[8]. WorldFish has established a pond-based hatchery in Southern Malawi to increase distribution of quality fingerlings to rural fish farmers. The hatchery contains two monosex ponds to separate males and females and a breeding pond, fitted with a fish fry collection point,	Limited private sector investment in aquaculture and lack of technical support affects the scalability of this value chain[10]. The aquaculture sub-sector has the potential to increase fish production in the country through enhanced aquaculture production, especially at the commercial level. The aquaculture subsector can also be one of the major sources of fish product exports, thereby contributing to Malawi's economic growth[2]. There is great potential for aquaculture growth by targeting large scale operations and promoting aquaculture as a business at various operational levels (small, medium or large), fish supply will increase[2]. Catches of fish from the Lake Malawi and Lake Chirwa have declined due to a complex combination of factors, some of which include localised overfishing in some inshore stocks, climatic influence that results in drying up of Lake Chirwa and weak capacity to enforce fisheries regulations. This creates an opportunity to develop aquaculture farming as markets will be available. Lack of availability of commercial inputs in the supply chain has been highlighted as one of the main	Aquaculture is dependent on water resources of which Malawi has a large endowment from big lakes and various ponds and rivers. The natural resource management of these stocks are critical. In one sense aquaculture provides an opportunity to sustainably supply fish but is also dependent on stocks and water availability impacted by pollution and overfishing. Several climate-related issues threaten the sustainability of both the fisheries and aquaculture sub-sectors. Impacts occur due to both global warming and associated physical changes as well as from the frequency, intensity and location of extreme events[2]. Rainfall patterns have been affecting aquaculture fish production. For example, in 2018, 9 000 metric tonnes of fish were harvested from ponds and cages compared to 12 000 metric tonnes harvested in 2017. This was largely due to low rainfall in most of the aquaculture ecological zones, which led to the drying up of fish ponds[11]. Climate change leads to poor distribution and amount of rainfall that affects the water availability in ponds and reduces breeding grounds of fish, thereby affecting fingerling populations[9].

The NAIP[5] aims for aquaculture development through the restocking of dams, fish cages and pond culture, aquaculture demos, and training for fishers on improved management and technologies.	where young fish can be harvested and transported to other farmers[8]. Two commercial companies, Maldeco and Chambo Fisheries continue to invest in intensive systems using quality inputs[1]. Maldeco is the single largest fishing company in Malawi specialises in the production of Chomba. The company has three divisions, aquaculture, capture fisheries and a feed mill operation[9].	limiting growth factors for the sector and must be addressed if the industry is to commercialise and grow sustainably[12]. Most smallholder pond fishing in Malawi takes place in ponds smaller than 300 m^3 and is characterised by low input use systems[11]. Consumers in Malawi mainly demand fresh fish and there are currently very limited processing activities in the aquaculture value chain[13].	

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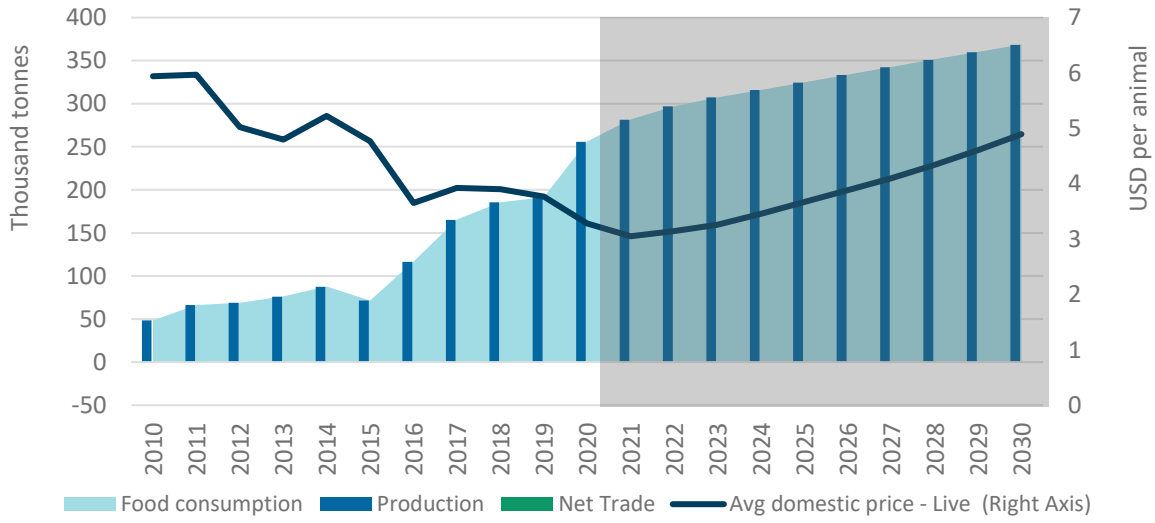
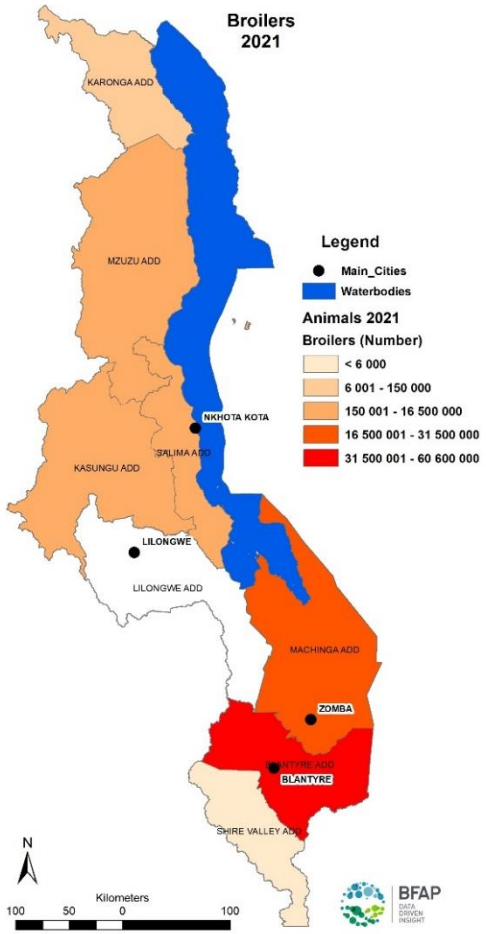
POULTRY

Poultry is one of the largest industries by value in Malawi if total consumption is valued at market prices, and makes a large contribution to the economy. Around 1.3 million households are involved in chicken rearing and the total chicken population currently stands at around 140 million birds with an approximate 50% split between indigenous and improved breeds. Around 190 000 tons of poultry meat is consumed, mostly in the local market. Malawi's poultry sector is unique in the sense that around 80% of the market consists of sales of live birds, thus still largely an informal market, although excess meat processing capacity exists. Most smallholder systems are currently categorised as being uncompetitive in converting input costs into poultry meat due to the high cost of feed and of day-old chicks, but there is potential to improve these systems. The poultry market is expected to grow by 10% per annum towards 2030, in line with the growth prospects given by the Poultry Farmers Association, but excessive input prices for feed and chicks stifle further expansion.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Level Change	% Change per annum
Production ('000 tons)	180.5	142.4	15.1	112.7	3.3
Indigenous Birds	93.1	68.5	15.0	29.8	2.4
Broilers	87.4	73.9	15.3	82.9	3.8
Domestic Cons ('000 tons)	180.7	142.8	15.2	112.7	3.3
Dom Cons Value (MWK Million)	906 425	923 752	30.2	1 780 475	9.2
Exports ('000 tons)	0.1	0.0	-	-	-
Imports ('000 tons)	0.2	0.4	35.6	-	-
Net Exports ('000 tons)	-0.2	-0.3	-41.9	0.0	0.8





Qualitative Scan & Scoring: Poultry

1.6	2.8	2.1	3
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
Smallholder poultry producers lack a strong voice to influence policy or regulatory reform due to weak poultry farmer associations[1]. Compared to crops, there are limited policy and development strategies for livestock in general and poultry in particular. This is partly due to there being no specific rules governing poultry production, processing and trade, nor specific regulations and incentives related to the poultry sector. There is also limited poultry regulatory frameworks in terms of food safety, consumer protection and quality standards[1]. The Department of Animal Health and Livestock Development under the MoA published their Policy Document on Livestock in Malawi that governed the livestock sector from 2006 to 2011[2]. The only reference to poultry specifically states that the GoM wants to encourage expansion of and improve poultry production and to increase the availability of poultry and poultry products. Following some broad statements relating to animal health and livestock development in the NAP[3], the MoA recently released its new National Livestock Development Policy for 2021-2026[4]. The policy vision is for the development of a livestock sector	Recent investments in the poultry value chain have largely been made by medium to large players. The two dominant broiler operators enjoy a market share of between 70-80% of the market and produce around 24 million broilers annually. International breeding companies provide parent stock to producers of layers and broilers. Apart from Black Australorp chickens, there are no specialised hatching services for indigenous chickens in Malawi[1]. AgDevCo invested around $2 million in a Malawian poultry operator in the form of Kapani food and feed wholesaler in 2017. It includes seven new modern broiler houses and a state-of-the-art abattoir with ancillaries to double output[6]. Central Poultry is Malawi's largest processor and marketer of chicken meat. This integrated company breeds and rears its own chicks and has invested in their own feed mill and other poultry related businesses to enhance their competitiveness[7]. There are several initiatives under way that support investment in the poultry value chain. The Poultry Supply Chain Partnership links farmers to the poultry value chain as breeders for table egg production and/or broilers[8].	Poultry's scalability is somewhat tied to the interconnectedness and growth of other industries. Increased demand for poultry and lower prices for chicken meat suggest there is large potential to scale production. The poultry industry wants to expand breeding and layer production through partnerships with private sector partners. Traders and aggregators want to increase production and forward contracts through partnerships with private sector partners[2]. There is a growing market demand for poultry products in Malawi, driven by rapid urbanization and a growing middle class with increasing disposable income[1]. Poultry farming is still predominantly traditional, and access to affordable inputs remain a challenge for most smallholders[1]. Despite the significant contribution of the total chicken population in Malawi and supplying nearly all the poultry meat and eggs consumed in rural areas, the potential of the indigenous poultry industry remains largely untapped, and production scales are extremely low[1]. A large share of the urban market remains untapped due to undersupply[1].	Poultry production systems are somewhat shielded from specific agro-ecological considerations in Malawi since most intensive systems require limited land and water resources. The predominant production system is free-range, in which chickens are left to scavenge for food during the day and are housed overnight [3]. Some commercial production systems are completely automated, environmentally controlled, or semi-automated with open houses; this system mostly uses improved exotic strains for broilers and layers[3]. Water is critical in poultry rearing, especially in hot areas, where inadequate water supply may result in less efficient production systems[7]. Too high temperatures result in increased water consumption, hence wet droppings. This, in turn, results in an environment conducive to the development of coccidiosis. Too much heat can lead to heat stress, and birds can die from heat prostration[7]. Too low temperatures increase feed consumption to maintain a good body temperature[7]. Climate change in poultry is expected to increase the risk of disease outbreak[8].

that will be increasingly business-oriented through sustainable integration into crop systems, intensification, diversification and through value addition by 2026. However, the policy rarely speaks specifically to poultry support[4]. Support to poultry comes in the form of the Central Veterinary Laboratory which ensures and provides evidence-based quality assurance for essential poultry inputs and poultry meat products[1]. The poultry industry has an unfavourable policy environment and weak regulatory institutions, which remain the most important barriers to Small and Medium Enterprises and exclude them from participating in the core market system[1].	Through the Poultry Supply Chain Partnership, farmers have a direct market link to the poultry industry for their soybean, a key ingredient in the production of chicken feed produced by these companies[2]. Christian Service Committee, with support from Sanovo Technology Group and Lactosan-Sanovo ingredients group, is busy drafting a project to improve farmers' skills in poultry farming practices[8]. Promoting Chicken Farming in Champhira Malawi is a project training farmers in semi-intensive systems of rearing chickens[9]. Department of Agricultural Research Services (DARS) coordinates poultry training through its network of research centres in places including Bvumbwe and Chitedze. LUANAR also plays an important role in poultry research producers[1]. CASA's poultry strategy aims to boost smallholder output to commercialise and reach an estimated 39 000 smallholder producers[1].	Poultry has a short production life cycle and low capital investment such that smallholders can easily enter the market and scale production[1]. Poultry production is directly linked to soybean, sunflower and maize production, which are key poultry feed ingredients. Malawi is mostly self-sufficient in the production of these crops; therefore, the poultry sector can easily expand[1]. Poultry prices have generally been declining since 2013 due to increased competition, improved productivity and a declining cost of production from greater economies of scale needed to compete[1]. The high cost of poultry feed accounts for 60% to 70% of total production cost, which hinders farmers from accessing commercial feeds[1].	

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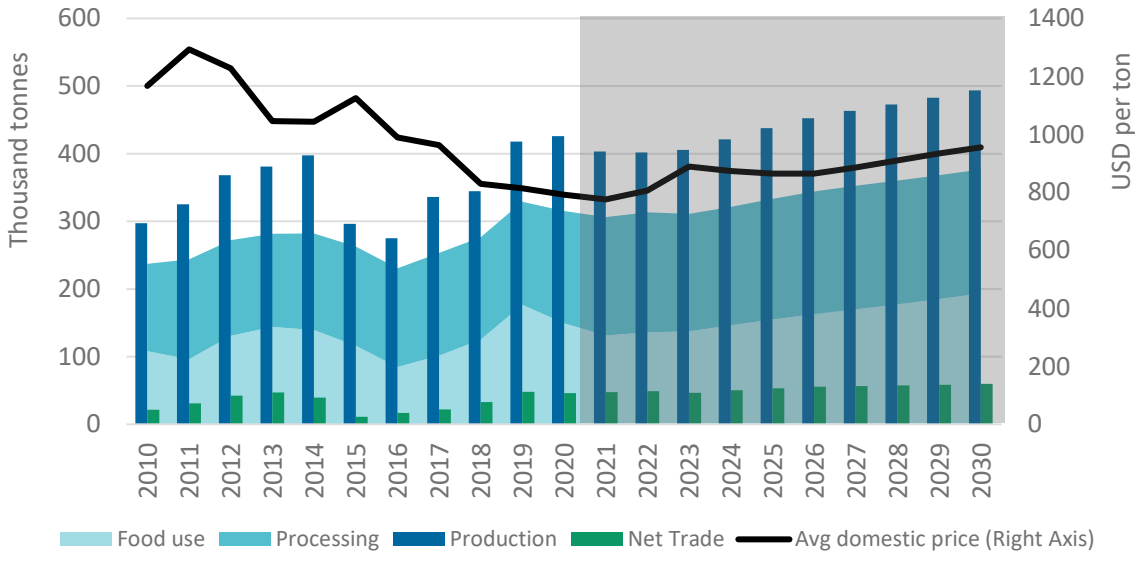
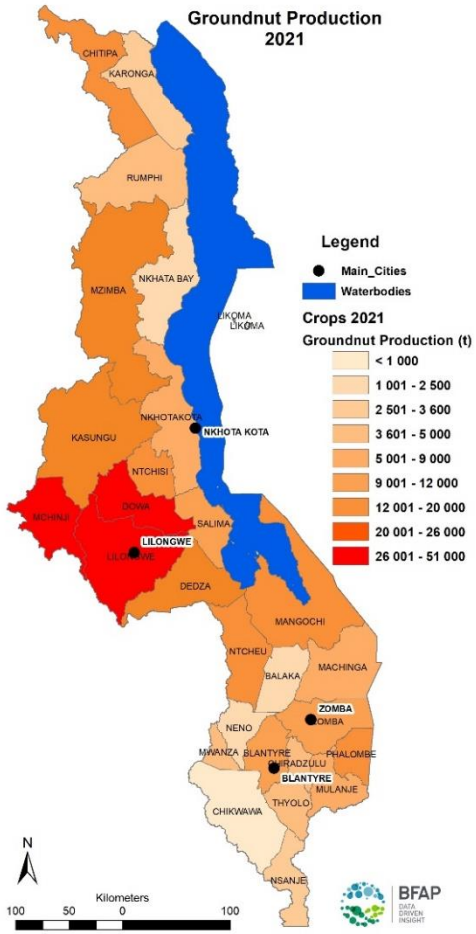
GROUNDNUTS

The groundnut value chain in Malawi is characterised by its wide adoption as a cash crop due to its utility in being easy to produce and requiring limited cash inputs, whilst also quite easily traded in local markets. Production is concentrated in the Central region and around 98% of the area planted is done by around 900 000 smallholder farmers. Yields are fairly low compared to international benchmarks and are currently at a national average of 0.9 tons/ha. High levels of aflatoxin in groundnuts continue to be a major obstacle to the industry and have significant implications for human health and the marketing of products. There are however various initiatives underway to mitigate and manage this risk to the industry. A recent large investment in a groundnut shelling plant is expected to increase market demand for the crop as value-added products are expected to be exported, whilst greater extension support and contract farming are expected to increase yields.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Absolute (period)	% Change per annum
Area ('000 Ha)	392.5	144.3	4.2	3.2	0.6
Yield (tons/Ha)	0.9	-0.1	-2.1	0.1	0.6
Production ('000 tons)	358.2	119.3	2.1	34.2	1.2
Domestic Cons ('000 tons)	330.3	97.6	2.8	44.2	1.4
Dom Cons Value (MWK Million)	222 274	202 879	18.8	219 406	6.4
Exports ('000 tons)	34.3	26.2	-0.5	-	-
Imports ('000 tons)	0.1	-0.1	-4.0	-	-
Net Exports ('000 tons)	34.2	26.3	-0.1	4.6	1.5





Qualitative Scan & Scoring: Groundnuts

2	3	2.8	2.7
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
Similar to the soybean value chain, groundnuts feature in almost all of the major agricultural policy documents such as the NAP[1], NAIP[2] and NES II[3] amongst others. This is largely due to its benefits to food security, crop diversification, export opportunities and potential for commercialisation. FISP included groundnuts as a national priority, specifically regarding increasing income and self-sufficiency for poor households but was excluded in the first round of the AIP[4,5]. Groundnuts are also considered as one of the prioritised commodities for export-oriented clusters for diversification under the National Export strategy I & II [2&3]. The proposed new Draft Crops Bill 2022 includes groundnuts as one of the scheduled crops to be included under the new regulatory framework[6]. ASWAP identified groundnuts as a priority commodity. It is included in Commercial Agriculture, Agro-processing & Market Development[7]. Groundnuts are also included in the Agricultural General Purposes Act such that it has a minimum farm gate price determined by the MoA on an annual basis[8]	Groundnuts use to be one of the major export crops in Malawi and reached a peak in production before declining significantly in the 1990's. However, the recovery of this value chain has been driven by concerted efforts by NGO's and donor initiatives, as well as government programmes[10]. In 2022, Pyxus Agriculture Limited, a sister company of Alliance One Tobacco, invested in a state-of-the-art groundnut processing facility in Lilongwe. This $3 million investment was supported by the Presidential Delivery Unit and is already operational. The facility has a processing capacity of 50 000 tons per day and is expected to manufacture value added products such as peanuts, oil, flour, fiber and peanut butter[11]. Prior to this big investment some industrial processing of groundnuts into peanut butter, confectionary nuts, and blanched nuts took place. Smaller scale localised production of cooking oil from groundnuts is done by rural enterprises through initiatives such as the 'One Village One Product (OVOP)'[12]. Research institutions such as Seedco Malawi, ICRISAT and Chitedze research station are conducting research to support this value chain.	Scalability is mainly constrained by dealing with the challenges posed by aflatoxins and improving the formal marketing of the product. Some argue that all groundnuts should be sold and exported through a 'structured' market whereby the commodity is only traded and exported through official and documented channels such as the commodity exchange[10]. Most groundnuts are traded through an underdeveloped and informal market system[1]. Since investments have been made in increasing processing capacity, it is expected that a combination of contract farming and more commercially inclined operations will lead to significant scaling in the future. Smallholder yields can be significantly improved by using better genetics in terms of seed and by benefitting from improved extension support from the private sector. The growth in regional export market opportunities to markets such as South Africa, Zimbabwe, Tanzania and Kenya, and to some Asian countries such as Singapore, will promote scaling prospects[13]. Relative to crops such as maize and beans, a larger share of smallholders that grow groundnuts (57%) report selling their produce. It is a good	Groundnuts are grown in most of the eight agro-ecological zones in Malawi. However, production is concentrated in the Central region[13]. Groundnuts have moderate drought resistance and have relatively high soil fertility requirements[15]. Water, land and other natural resources are available for groundnut expansion, particularly if moving out of maize and tobacco farming. The agro-ecological advantages of the nitrogen fixing nature of groundnut further supports this diversification. Groundnuts are normally grown using rainfed systems. Erratic rainfall and dry spells during critical periods of plant growth affect production[16]. Potential Climate Change impacts towards 2050 of around 2 degrees Celsius increase in temperature and a decline in average precipitation is expected to benefit groundnut production, although yield will be slightly affected negatively[17].

The groundnut value chain is listed under the Control of Goods Act such that traders need licenses to trade, although export bans have not been as common in this value chain[9].	Various donors and research institutions are also supporting the groundnut value chain to address and action interventions related to the toxicity levels of aflatoxins due to improper storage[12].	diversification crop since it provides income and food to households and contributes to dietary diversity of household consumption[14]. Malawi should develop varieties with higher oil content to match the needs of the processing industry[13].	

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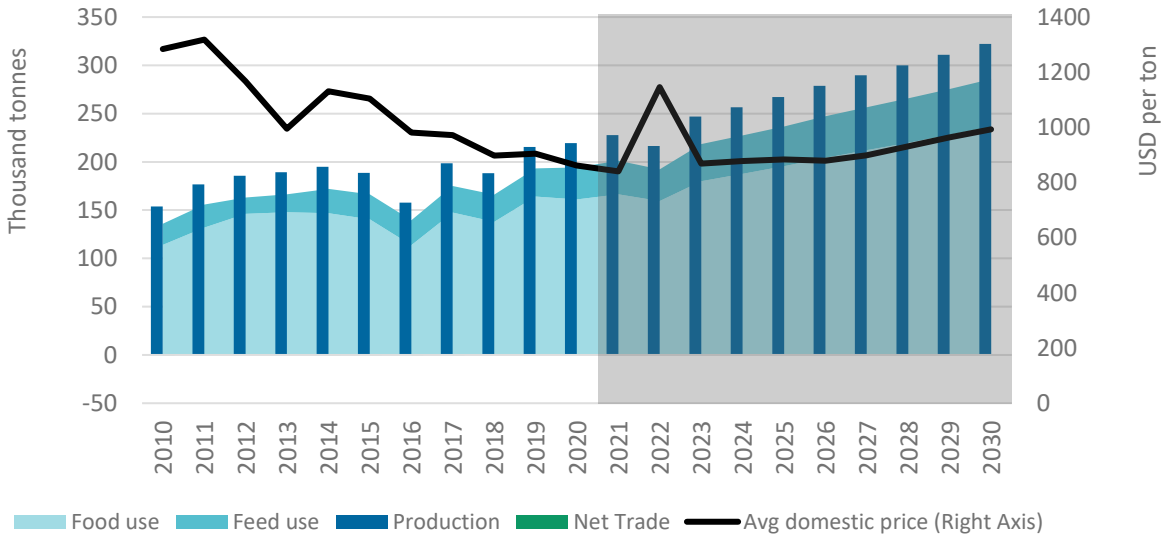
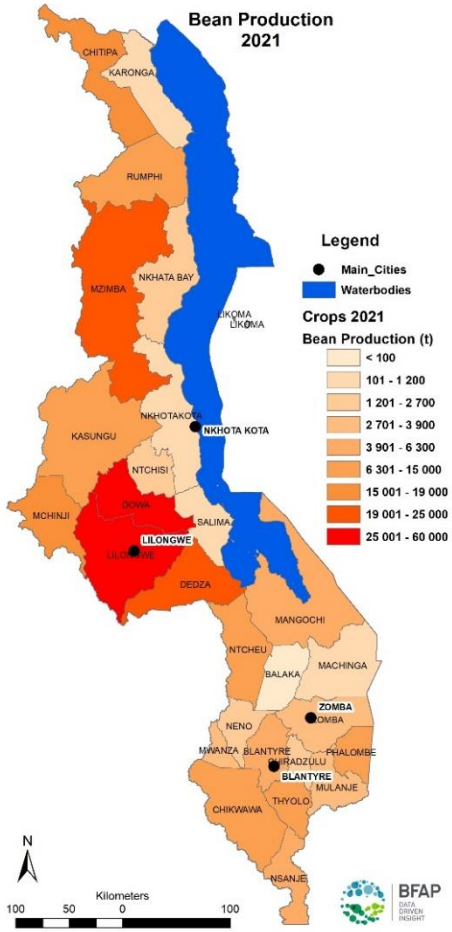
BEANS

Unlike many of the value chains already discussed, dry beans are not a prominent crop in Malawi, although many efforts have gone into improving farmer competitiveness. Bean farming is mainly undertaken by around 550 000 farm households of which only around 28% sell their produce. However, since beans are rich in protein, adding energy in addition to fibres, as well as some important micro-nutrients, the bean value chain makes a significant contribution to food security in Malawi. Declining per capita consumption rates have been reported for beans in recent years, which has a series of implications, especially if alternative protein sources are not consumed to offset this decline. Investments in bean breeding programs have targeted yield enhancement and drought tolerance, but the average yields remain at a meagre 0.6 tons/ha. The entire bean crop is consumed locally, and the area planted has grown from around 227 000 hectares to around 350 000 tons in 2022.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Level Change	% Change per annum
Area ('000 Ha)	346.7	70.4	2.5	35.0	1.1
Yield (tons/Ha)	0.6	0.1	-0.5	0.2	3.0
Production ('000 tons)	200.7	61.7	2.0	103.0	4.1
Domestic Cons ('000 tons)	200.7	61.6	2.0	103.3	4.2
Dom Cons Value (MWK Million)	144 990	132 450	18.5	155 329	6.0
Exports ('000 tons)	0.0	0.0	-		
Imports ('000 tons)	0.0	-0.2	2.3		
Net Exports ('000 tons)	0.0	0.2	-	-0.1	-16.6





Qualitative Scan & Scoring: Beans

1	1.5	1.8	2.5
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
The bean value chain does not feature strongly in any main policy document in the agriculture sector. Under FISP beans were subsidised to smallholder farmers through access to seed[1]. The National Agricultural Research Service (NARS) and CIAT have developed high yielding, drought tolerant, and disease resistant varieties. The Department of Crop Development, Planning and Extension Support provides farmer field schools to impart knowledge and skills for increased production on-farm. The proposed new Draft Crops Bill 2022 includes beans as one of the scheduled crops to be included under the new regulatory framework[2]. The Department of Agriculture sets minimum prices for beans[3], whilst beans are regulated for imports and exports and local trade under the Control of Goods Act[4].	There is limited evidence of widespread investment taking place in the bean value chain. Some investments are made mainly in the form of seed system support. The Bean improvement program has been implemented in the Department of Agricultural Research Services since 1996. Joint collaboration exists with CIAT and the Pan-Africa Bean Research Alliance, Bunda College of Agriculture and other private players[5]. In 2005, Demeter Seed Ltd (DS) and Farmers' World were given new varieties for multiplication. In addition, the MoA provides information about the major bean growing areas and adapted/preferred varieties[6]. Demeter bought 200 kg of breeder seed from Agricultural Research Services (DARS) for multiplication through a public-private partnership, whilst DARS-CIAT/PABRA provided continuous training and support through facilitated interactions between researchers and DS staff during the cycles of seed multiplication Seed companies such as Seedco and Pannar have facilitated processing and commercialization of bean seed and products	Beans, when grown in rotation with other crops such as maize or tobacco, improve soil fertility, hence it is easy to scale it up[6]. The common bean (Phaseolus vulgaris L) is one of the most important foods and cash crops for Malawian smallholder farmers. The crop is a significant source of protein, and demand has grown due to the scarcity and the relative high prices of animal protein[7]. A better understanding of the preferred characteristics of common beans has the potential to increase the quantities of beans consumed and, thus, improve diet quality[8]. Some of the factors limiting the scalability of beans in Malawi include[6]: Lack of information about newly released bean varieties Beans have higher sowing and lower seed multiplication rates which result in lower financial returns compared to hybrid maize. Inadequate knowledge and skills in bean seed production post-harvest management and market. Very little processing is undertaken in the beans value chain.	Beans are grown across the country in the agro-ecology categorised according to high, medium, and low altitude. However, beans are cultivated less along the lake shores and in the Shire valley because the crop does not adapt well in those regions[5]. Beans have low drought resistance[9]. Climate change is expected to reduce bean yields by 1.8% towards 2050[10]. Common bean experiences high production fluctuations associated with high rainfall conditions variability, often resulting in excess demand.

	NGOs are supporting guidance in crop production technologies The Seed Trade Association of Malawi provides support to farming communities to impart knowledge and skills for increased on-farm production; facilitate farmer-friendly agricultural policy advocacy.		

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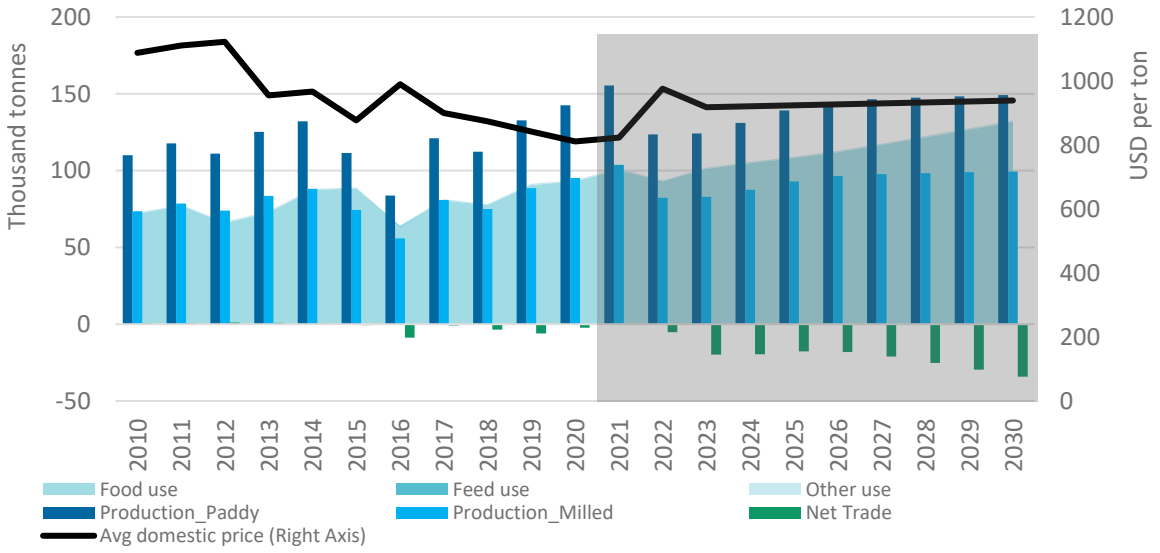
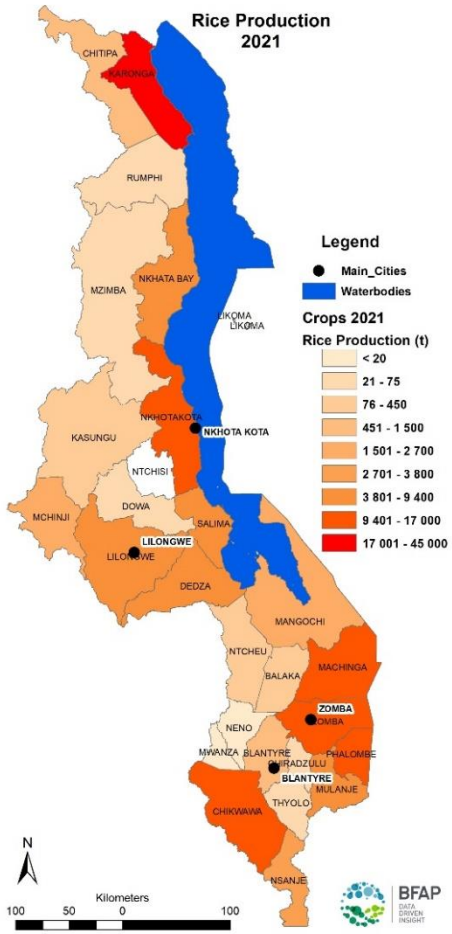
RICE

Rice is considered a strategic crop in Malawi owing to its potential for import substitution and if marketing systems function well, could be exported into the region. Being the country's second most consumed cereal after maize, rice production is mainly grown by smallholder farmers. Around 200 000 smallholders produce rice on area of around 60 000 hectares, with an average yield of around 2 tons/ha. Long term trends suggest that the continued expansion in area planted since the 1990's has been in line with consumption growth. The country's rice production is however affected by several challenges such as low productivity, poor agronomic practices, limited access to improved seed adaption, as well as market access challenges. This value chain has recently received increasing support from a policy perspective since the GoM envision growing production toward exporting rice by developing storage capacity and improved better market arrangements through warehousing systems.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Level Change	% Change per annum
Area ('000 Ha)	62.7	6.6	0.6	9.4	1.7
Yield (tons/Ha)	1.7	-0.2	-1.7	0.0	0.7
Production ('000 tons)	109.6	-3.3	-1.0	18.6	1.9
Domestic Cons ('000 tons)	73.1	-2.2	-1.0	12.4	1.9
Dom Cons Value (MWK Million)	75.4	1.5	0.3	38.9	3.5
Exports ('000 tons)	0.1	-1.2	-38.1	-	-
Imports ('000 tons)	3.6	5.5	27.7	-	-
Net Exports ('000 tons)	-3.5	-6.7	-	-24.0	28.0





Qualitative Scan & Scoring: Rice

1.8	2.5	2.3	2.3
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
The current rice value chain policy is captured in the Malawi National Rice Development Strategy 2014-2018[1]. It aims to create a vibrant rice value chain that contributes significantly to household wealth creation and national economic growth[1]. The NAP aims to establish effective, demand-driven agricultural innovation systems for research and technology generation and dissemination to facilitate timely and equitable access to high-quality farm inputs[2]. The rice sub-sector is also guided by the Crop Production Policy and other existing GoM policy documents, such as the Food Security Policy (2006)[1]. However, the Malawi government has not formulated policies specifically on Systems for Rice Intensification (SRI), nor has there been sufficient policy deliberation on this topic. SRI is a system based on transplanting young seedlings raised in an unflooded nursery and planted in the field instead of planting seeds. This is done at reduced plant density and leads to better and reduced water application[3]. Policy support for rice is mainly to increase household income, national food security and export earnings through sustainable rice	The GoM provides farmers with rice seeds through FISP and rice was included in the new AIP[3]. Smallholder Irrigation and Value Addition Project (SIVAP) aimed at increasing agricultural production and productivity through intensification of irrigation and crop diversification, specifically for irrigated rice and horticulture and crop diversification[4]. The Sustainable Agri-Business Initiative (SABI) is piloted as an integrated value chain project in Southern Malawi, bringing together farmers, millers, and the government to resolve inefficiencies in the value chain and innovative pilot schemes such as warehouse receipt systems[7]. The Bwanje Valley Irrigation Development Project (Grant Aid: 2006 to 2008) is one of the biggest irrigation schemes in Malawi. Through this project, rice production increased significantly. The scheme attracted investment in the form of a dam from the European Union to promote the production of irrigated rice in the dry season due to water shortages in the Namikokwe river[8]. NASFAM markets about 4 000 tons of paddy rice each year on both local and international markets on behalf of the farmers. NASFAM provide rice milling facilities in Karonga town and provides loans to members for 20kg	The MoA has identified potential new sites for irrigation schemes; hence expansion in rice is possible if these sites are developed. Rice yields are low because of limited access to irrigation as well as limited knowledge of best agronomic practices for rice production; therefore, increasing access to irrigation as well as provision of extension services to ensure that farmers follow good agronomic practices gives room for further scaling of this value chain[1]. The low yield of rice is also attributed to a lack of access to necessary inputs, such as fertilizers, insecticides, and pesticides. This means that Malawi has the potential to increase rice productivity through increasing access to inputs[1]. Building rice storage facilities can help farmers to store their produce for sale later in the season at better prices that can motivate them to expand rice production[1]. Scalability is constrained by current formal market functioning for rice, whereby making contracts with farmers can as well help fetch better prices and motivate to expand rice production[1]. Malawi has a potential of more than 200 000 hectares on upland slopes	Rice has low drought resistance[12]. Rice is a tropical plant that thrives in hot and warm climates. It grows best in warm daytime temperatures, but extreme heat events over 35°C for even a few hours can damage plant processes and lead to lower yields and sterility. Rice is also sensitive to cold temperatures, which can slow growth and damage the plant causing smaller or failed harvests. Warmer minimum (night-time) temperatures also reduce yields[12]. Higher elevation zones are warming rapidly. As a result, they may become more favourable for rain-fed rice production[12]. Climate Change effects on rice due to hot temperatures directly will lower yield. This was evidenced in the Southern stations, where a large impact on rice was apparent after 2005. Simulated yields in one station were halved due to the impact of extreme temperatures[12]. However, precipitation varies across the country, with the highlands, lakeshore, and South receiving adequate precipitation to support rice production and other high-value commodities[12]. Winter rice production depends almost entirely on irrigation water, and the plants are susceptible to breaks in water availability,

production, marketing and utilisation[1]. Instruments include increased coordination and collaboration among stakeholders throughout the rice value chain and measures to enhance the ability of cooperatives to improve farmer livelihoods[3]. Rice-specific policy is aimed at developing a strong rice market fuelled by demand and the production of value-added products[1]. The MoA sets minimum prices for both paddy and milled rice[4], whilst rice imports and exports are regulated under the Control of Goods Act[5]. The proposed new Draft Crops Bill 2022 includes rice as one of the scheduled crops to be included under the new regulatory framework[6].	of certified Kilombero rice seed for planting. Norway has supported the development of rice production through various climate-smart rice cropping systems, including SRI initiatives, in which rice can perform well when water supply is limited. Recommendations for technical support/capacity building on SRI are given to countries within the existing programmatic framework supported by Norway[10]. The Irrigation Rural Agricultural Development Project (IRLADP) rehabilitated four irrigation schemes. It has focused on constructing and improving irrigation structures for food security and climate adaptation[10]. APPSA Seed project in Malawi started in May 2017, and 12 irrigation schemes have been covered and 5 sites under upland conditions. The project's main purpose is to increase the availability of certified seeds among smallholder farmers by improving the delivery system, starting with the breeder and basic seeds. APPSA Seed project in Zambia, Malawi and Mozambique has trained more than 1 341 rice farmers in seed production and seed multiplication in Zambia and Mozambique[11].	and in upland valleys that can be used for rice production[1]. NASFAM Commercial promotes rice marketing by linking farmers to buyers both at local and international markets by facilitating the aggregation, thus reducing the high transaction costs involved in dealing with individual farmers[7]. Currently, only a little over 2% of arable land is under irrigation, more land is available where the expansion of irrigation of rice is possible[10]. Malawi has large water bodies, rivers, lakes and dambo wetlands, there is large scope for sustainable rice production expansion for the domestic market and export[10]. Rice production can easily be scaled through better coordination and collaboration among stakeholders throughout the rice value chain and enhance the ability of cooperatives to improve farmer livelihoods[3].	particularly during seedling establishment and flowing stages. With warming temperatures, demand for water to irrigate rice will increase[12]. Rice is a water demanding crop, requiring substantially more than any other grain crops grown in Malawi[12]. Rice does not require continuously saturated soil. It grows very poorly if it is water-stressed, particularly during its transplanting and reproductive stages[12]. The central region of Malawi is another large rice producing area. Rice is grown both as rain-fed during the rainy season and is irrigated along the lakeshore during the winter[9]. The Northern Region also produces rice, especially in the Northern Lakeshore zone, and some rain-fed rice in higher elevations inland[12].

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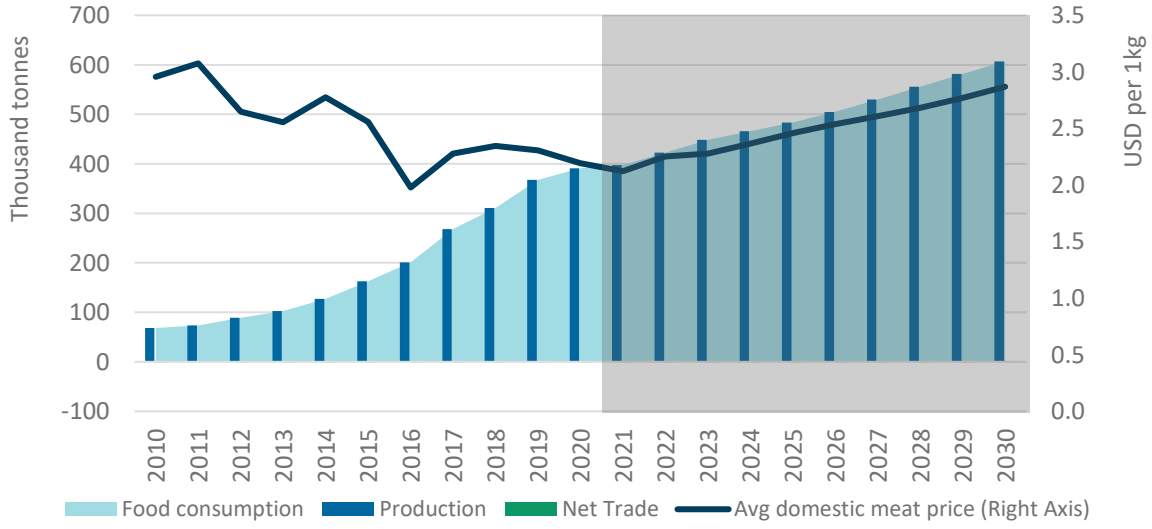
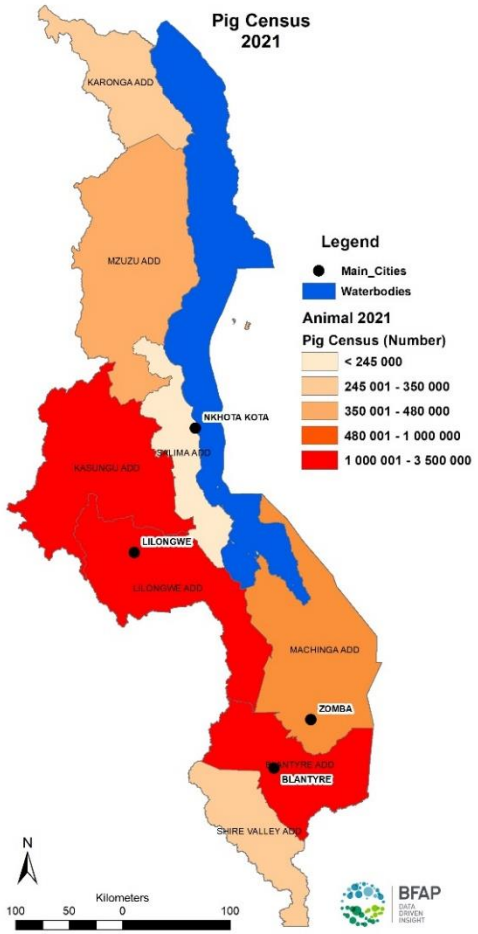
PIGS

The pig value chain in Malawi is underdeveloped with linkages between farmers and processors difficult to establish for several reasons. The country's pig herd has been growing over the years and currently around 11.6 million pigs are slaughtered annually, resulting in marketed swine meat of around 315 000 tons. Pig herds are mainly concentrated in close proximity to urban markets close to the major cities of Lilongwe and Blantyre. Around 310 000 households are involved in pig production, with the national average slaughter weight at 27kg per pig. The value chain is constrained by the unavailability of formal slaughterhouses across the country, while limited cold chain operations result in pigs mostly being sold in the informal market through live sales. Disease outbreaks have also affected production expansion in recent years, with African Swine Fever becoming endemic and resulting in a significant number of culled swine per year.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Level Change	% Change per annum
Slaughters ('000 head)	11 594	10 716	17.8	3 828	2.6
Slaughter Weight (Kg/animal)	27.3	3.3	2.2	6.1	2.0
Pork Production ('000 tons)	315.5	299.7	20.0	216.4	4.5
Domestic Cons ('000 tons)	315.5	299.6	20.0	216.5	4.5
Dom Cons Value (MWK Million)	573 476	675 380	37.2	994 469	8.7
Exports ('000 tons)	0.0	0.0	-	-	-
Imports ('000 tons)	0.1	-0.1	-1.3	-	-
Net Exports ('000 tons)	-0.1	0.1	-	0.0	6.9





Qualitative Scan & Scoring: Pigs

1	1	1.7	3
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
The national livestock policy of 2006 envisioned increasing the availability of quality livestock and livestock products by promoting local production through the enhancement of service delivery[1]. The newly released National Livestock Development Policy articulates Malawi's policy support for the livestock industry. It replaces the now expired Livestock Policy of 2006, but specific pig interventions are not articulated in the policy[2]. It is envisioned that policy support for livestock will increasingly be business-orientated through sustainable integration, intensification and diversification. Also, to improve value additions throughout the value chains[2]. Promote participation of large, medium, and small-scale players in livestock production through increased investments, improved livestock extension services, and appropriate fiscal policy measures[1]. To prevent and control animal diseases to create an enabling environment for the improvement of livestock production[2] To facilitate specialised training on all livestock commodities (beef, dairy, pig, poultry, non-conventional stock and small ruminants)[2].	Many NGOs promote pig farming as part of their household income and livelihood enhancement programmes owing to its ability for mass reproduction and quick income returns[3]. Several piggery associations have been formed under various development programmes that aim to promote pig farming, e.g. Thyolo Piggery Association and Mgwirizano Piggery Association in Mulanje[3]. GoM facilitates specialised training on all livestock commodities (beef, dairy, pig, poultry, non-conventional stock, and small ruminants)[2]. NGOs help farmers in sourcing hybrid pigs for crossbreeding with local breeds[2]. Piggery Incubation Breeding Scheme is a project in which pigs are distributed among youth clubs[4]. There are a few cases of investments into small-scale piggeries that have been made in recent years. An example of this is Mothers Choice meat processing, butchery and restaurant[5]. Ori meats are currently one of the biggest suppliers of pig meat in Malawi, processing various pork products such as sausages, bacon and other by-products[6].	Pig production is easily scalable since current demand is not met by local production with processors importing pigs for processing[6]. The livestock sector in Malawi mostly depends on affordable locally available feeds. Intensive production of pigs is well connected with the grains and oilseeds industries[7]. Current pig marketing channels are informal and poorly developed. There is a need for initiatives to develop interventions to enhance the ability of pig farmers to access marketing opportunities and diversify their links with the markets[6]. The pig Industry has also been greatly hampered by the unavailability of formal slaughter and cold chain facilities, which are largely owned by individuals who do not handle pigs due to their religious beliefs[4]. The other constraint affecting the pig industry is the frequent outbreak of African Swine Fever, which is endemic throughout the country[4]. NGOs have mostly relied on government veterinary staff, which is hampered by insufficient capacity and further scalability in smallholder systems will require building more capacity and training of veterinary staff to contribute to the growth of the pig industry[4].	Pigs are farmed in most areas within Malawi due to favourable temperatures (low to medium temperatures). Pig production is however affected by occasional high temperatures and resulting heat stress due to climate change[7]. The impact of Climate Change affects pig farming in the following ways: Low sow fecundity. Reduced weaning weights of piglets. Increase in numbers of stillborn piglets. Decreased milk production from lactating sows, which affects the growth rates, morbidity and mortality of piglets[7].

Promote quality feed production and monitor the use of feed additives[2]. Support and promote regulated development, conservation and utilization of indigenous and approved exotic breeds.[1]			

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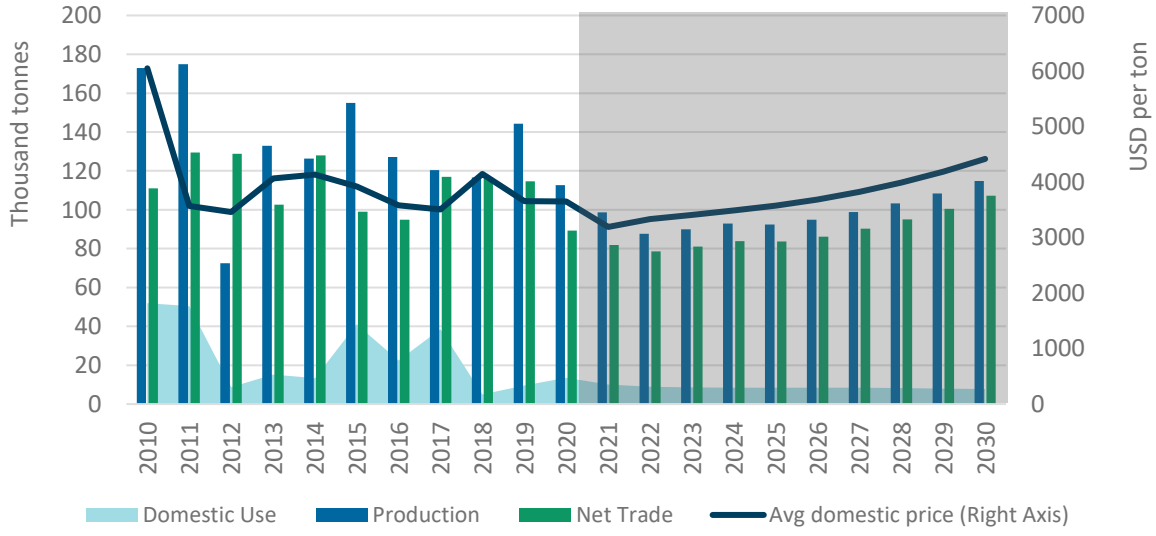
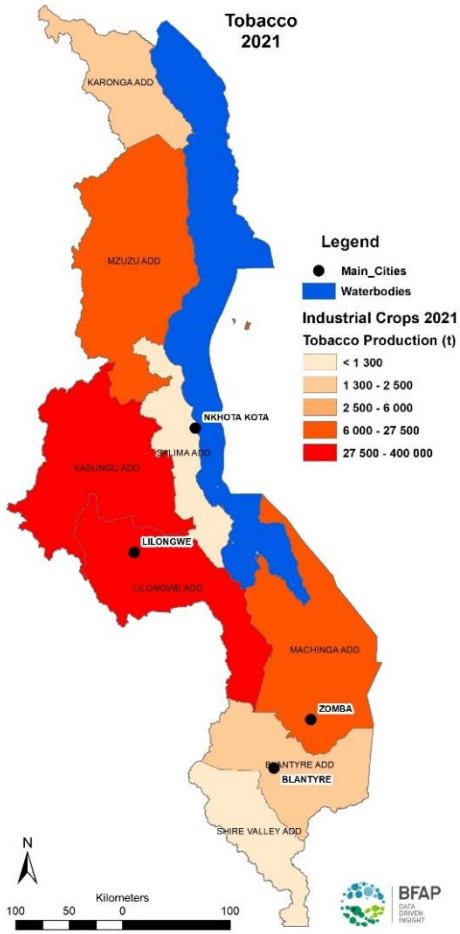
TOBACCO

Malawi is one of the world's most tobacco-reliant countries with products from this value chain contributing approximately 50% of the total foreign exchange earnings. Malawi is also the third largest producer of burley tobacco (behind Brazil and the USA). Concerted efforts worldwide to reduce tobacco consumption through control policies and trade barriers have resulted in tobacco markets becoming more unstable and leading to lower prices for smallholder farmers in recent years. Agricultural policy priorities have shifted towards diversification away from tobacco production, yet it remains an important source of income for the approximately 150 000 smallholder growers producing tobacco. The value chain is particularly focused on processing and is one of the few examples of a structured market in that tobacco can only be produced under contract farming arrangements and sold by auction. Malawian tobacco yields on average around 1.1 ton/ha and totals around 127 000 tons per annum.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Level Change	% Change per annum
Area ('000 Ha)	116.6	-57.2	-2.2	-8.6	-0.7
Yield (tons/Ha)	1.1	0.3	1.1	0.2	1.7
Production ('000 tons)	127.1	-28.7	-1.1	2.1	1.1
Domestic Cons ('000 tons)	17.7	-42.4	-13.2	-5.8	-3.7
Dom Cons Value (MWK Million)	48 008	-18 178	5.1	-9 009	0.2
Exports ('000 tons)	132.9	-10.6	-1.6	-	-
Imports ('000 tons)	16.9	-14.2	-5.0	-	-
Net Exports ('000 tons)	116.1	3.7	-0.9	18.1	2.3





Qualitative Scan & Scoring: Tobacco

1.3	1.7	1.7	1.5
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
Tobacco is an important value chain in Malawi considering it is mentioned in many policy documents such as NES I[1], NES II[2], NAP[3], NAIP[4] etc. However, there has been a recent shift in Malawi recognising the negative impact of tobacco in terms of human health. Malawi 2063 mentions there is an over-reliance on this crop and a need to diversify[5]. Tobacco remains an important export crop, particularly in the context of consistent shortages of foreign reserves and therefore continues to be a priority export cluster[2]. A newly established Malawian Think-tank, MwAPATA, has been formed based on looking for alternatives to tobacco farming in Malawi. The policies that support tobacco production in Malawi are largely based on the belief that tobacco is an important crop for economic development because Malawi has long relied and continues to rely heavily on tobacco production as its major cash crop[6]. Contract farming arrangements in the agricultural sector, including the Integrated Production System (IPS) is focused on the tobacco subsector[7].	Three of the big four transnational tobacco companies, Philip Morris International (PMI), Imperial Brands and British American Tobacco (BAT) purchase tobacco leaf from the two leading leaf distributors in the country: Limbe Leaf and Alliance One. Japan Tobacco International (JTI) is another large buyer of leaf imported from Malawi[8]. A Chinese National Tobacco Corporation (CNTC), the largest tobacco company globally, also buys small amounts of tobacco from leaf purchasing companies Limbe Leaf and Alliance One[8]. Alliance One purchases tobacco, processing, storage, packing, shipping, and sells leaf tobacco in North and South America, Europe, Africa, and Asia. It primarily offers flue-cured burley and oriental tobaccos used internationally in branded cigarettes[9]. JTI also invests in providing leaf technicians who work as agriculture advisers, supporting farmers across the country and promoting the tobacco industry. This ensures farmers produce a quality crop, improving their production volumes and earnings[10]. The public investment under the input subsidy program provides fertilisers for tobacco.	Tobacco is the main exported product for Malawi. However, given the long-term negative market trend, efforts are underway to promote diversification into food and other cash crops[11]. Tobacco exports generate a substantial contribution to total government tax revenue in the form of tax levied at the auctions, together with export taxes and other requirements imposed by the Reserve Bank of Malawi[12]. Diversification away from tobacco production has been identified as a priority for Malawi. In some respects, a transition away from tobacco has already started, which suggest that this value chain will not be scalable, nor is it well integrated into other value chains. The global move to regulate and minimise the harmful impact of tobacco use makes the market more volatile which has resulted in fewer farmers planting tobacco and production generally declining in recent years[11]. There is also a shift in policy that advances an agenda toward diversifying agricultural production away from tobacco and recognition by individuals within institutions that have historically supported tobacco production that tobacco is not viable[13].	Tobacco is grown in all regions of the country but is concentrated in the Central parts[14]. The soil types in Malawi are suitable for tobacco growth and is suitable in all regions in Malawi. Tobacco has low drought resistance[15]. Climate change has brought dry spells, late rains, and floods in some areas, affecting tobacco production in Malawi.

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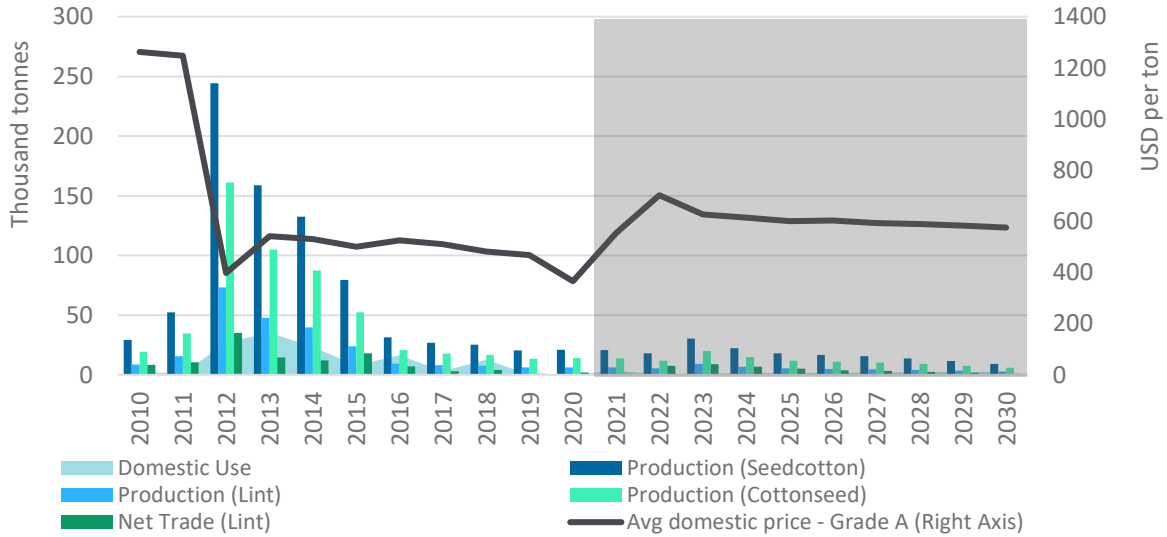
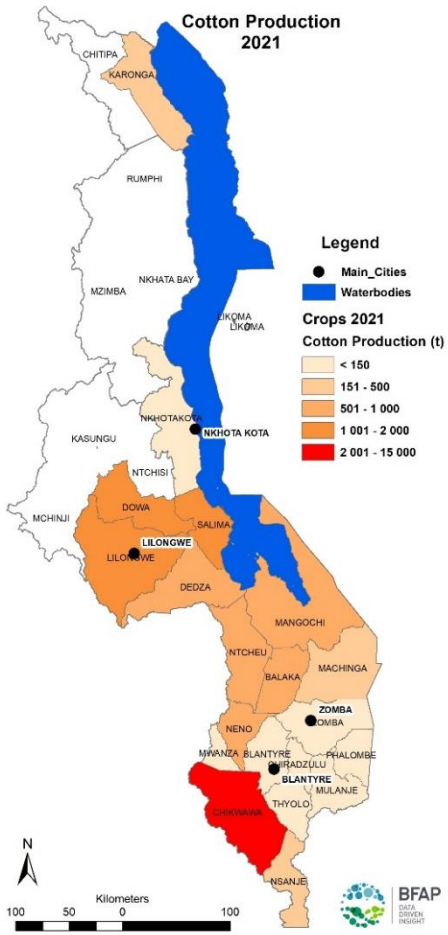
COTTON

Cotton remains an important industrial crop for Malawi, generating export revenues, value added and cash incomes for farmers. The industry has gone through several challenging periods, especially since state support was phased out through market liberalisation in 1991. Prior to this, cotton was bought by ADMARC and processed by state-owned gins. Several private firms have entered the market since then, which are vertically integrated and procure the bulk of cotton from around 40 000 smallholder farmers. Despite its importance as a cash crop, yields are generally low (<0.6 t/ha). A big government injection into the industry after 2011 resulted in a large increase in area planted and a three-fold increase in production, but attempts to set up a cotton development fund sustained through levies from the ginners and farmers have failed. Despite strong policy support through contract farming and the cotton development strategy, continued poor management of pests and disease, high capital requirements and environmental factors continue to hamper growth in the cotton value chain.

Partial Equilibrium Output Growth rates (Least squared growth rates)

	2017-2019	2010-2019		2019-2030	
Indicator	Absolute level	Level Change	% Change per annum	Level Change	% Change per annum
Area ('000 Ha)	42.7	-4.5	-9.0	-26.5	-5.9
Yield (tons/Ha)	0.6	0.0	-4.7	0.1	-2.0
Production Seed ('000 tons)	25.9	-2.4	-13.7	-14.3	-7.9
Domestic Lint Cons ('000 tons)	7.8	-0.7	-13.7	-4.3	-7.9
Dom Cons Value (MWK Million)	9 822.0	4 877.2	-1.9	-3 235.7	-4.3
Exports ('000 tons)	2.7	-8.4	-26.5	-	-
Imports ('000 tons)	0.1	-1.0	-	-	-
Net Exports ('000 tons)	2.7	-7.4	-24.5	-	-





Qualitative Scan & Scoring: Cotton

1.9	1.6	2	1.9
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
Cotton enjoys strong policy support in Malawi. It is included in the following policies and specifically mentioned in the NAP[1], NAIP[2], Cotton Act (2013)[3], Textile and Garments Strategy[4], National Irrigation Policy NES I[6] & NES[7], National Contract Farming Strategy[8], Trade Policy[9], Industry Policy[10] and Buy Malawi Strategy[11]. Cotton has its own Malawi Cotton Development Strategy (MCDS)[12], a medium-term strategic framework for the cotton sector to be implemented over five years (2019/20 – 2023/24)[1]. It is the second cotton sector strategy in Malawi and builds on the successes and challenges of the previous one (2011-2016). The Cotton Act (2013) consolidates all laws and regulations relating to cotton production, processing and marketing and matters incidental thereto[3]. The Act also led to the creation of the Cotton Council of Malawi to provide for the regulation, improvement and development of the cotton industry[14]. The GoM launched a special programme aimed at the revitalisation of the cotton value chain called the Cotton Production Up-scaling Model (CPUM) between 2011-2014. Around $10 million were invested to support smallholder	This value chain has benefitted from large investments by both public and private sector in the past, although recent investments have moved out of the country. There is a widespread view that these investments have not translated into more production by small-scale farmers, who continue to switch to producing other crops. Subsequent to the investment made by government under CPUM, the Contract Farming Model was introduced (2013-2015) leading to ginners attempting to resuscitate production by investing 2 billion MK. Although production increased on average by 7 000 tons during the implementation period, the initiative was discontinued due to the high default rate by farmers, which amounted to 1.3 billion MK[12]. Current seed crushers include Capital Oil Refinery Industries (CORI), the Malawi Cotton Company and other new entrants. Cottonseed is absorbed by the cotton seed crushing and seed industries. The seed is crushed into edible oil and sold either domestically or regionally, while the seed cake, a cotton seed by-product, is mainly exported to South Africa and Zambia[12]. Currently, there are only two companies involved in the manufacturing of textiles (fabrics),	In the past cotton has remained one of the largest agricultural export industries, although this contribution has shrunk in the past few years. Malawi has a large domestic market for textiles and clothing, growing at an average rate of 14% between 2011 and 2015[12]. However, garment manufacturers are facing stiff competition from the second-hand clothes and cheap Chinese garments being imported into the country, which has led to some of these manufacturers either exiting or relocating their businesses. The performance of the garment manufacturing sub-sector is also constrained by the lack of new investment and the unavailability of long-term financing for manufacturers. The high cost of borrowing from the financial sector limits further investment[12]. The domestic cottonseed crushing industry is also facing the same competition from cheap imported edible oils. Other policy issues include high electricity prices, limited access to finance, poor roads and arduous logistics[12]. Currently, there are only two companies engaged in the manufacturing of textiles[12]. By increasing cotton production to desirable levels of over 50 000 tons, for instance, the country will be able	Malawi's climate is ideally suited for cotton production, with a long, frost-free period, plenty of sunshine, moderate rainfall and ideal temperatures of 32°C during the planting season[16]. The main growing areas are in four agro-ecological zones suitable for cotton production: low altitude (Shire Valley), lakeshore, medium altitude and high altitude. In the past, the Shire valley has accounted for over 50% of total national seed cotton production, but this share has dwindled as other areas such as Machinga have expanded. The Southern region upland areas around Balaka account for 30% of production, whilst the Lakeshore area around Salima accounts for the remaining 20%[17]. Cotton production is severely affected by climate change since cotton grows in vulnerable agro-ecological regions. This has resulted in pest breakouts which negatively affect production levels[18]. Cotton has moderate drought resistance[19].

farmers, which led to production increasing significantly to on average 148 000 tons of seed cotton. CPUM then tried to continue the initiative through the development of a cotton development fund financed through levies from farmers and ginners, which failed due to ginners being blamed for under reporting on cotton buying and substantial cotton moving through informal channels by farmers[14]. Despite opportunities existing in international markets, especially for garments and textiles, the local policy environment is still constrained by the current tax regime on textiles and fabrics that favours the importation of textiles and fabrics over locally produced textiles and garments.	namely, Mapeto-David Whitehead and Sons (Malawi) Limited (MDWS) and Knitwear Industries Limited, while the Malawi Council for the Handicapped (MACOHA) does weaving at its Bangwe factory[12]. Mapeto spins less than 5% of the country's lint into yarn, which is then exported or weaved into loom cloth before either being exported or sold to the local consumer market. Cotton is processed in a number of ways, including crushing, ginning, spinning, weaving and garment manufacturing[15]. The country has excess ginning capacity for the present seed cotton production volumes. There are four ginners currently operating in the industry that process raw cotton to lint, but some ginners have left the market in recent years[14].	to reasonably meet the demand for domestic cotton seed crushers, which will, in turn, reduce dependence on the importation of crude oil and save foreign exchange[12].	

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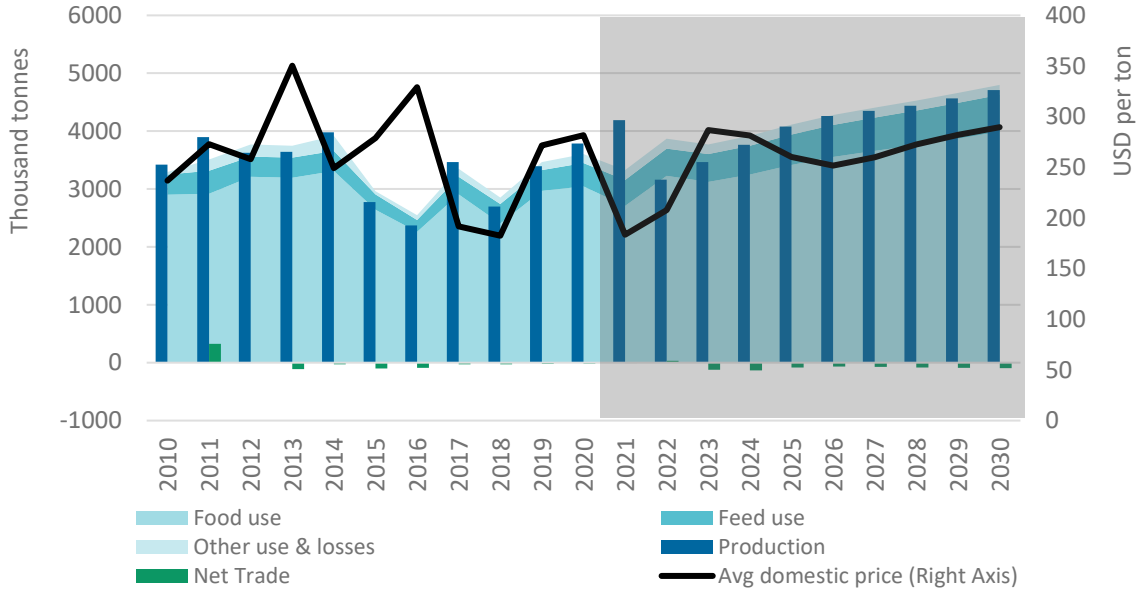
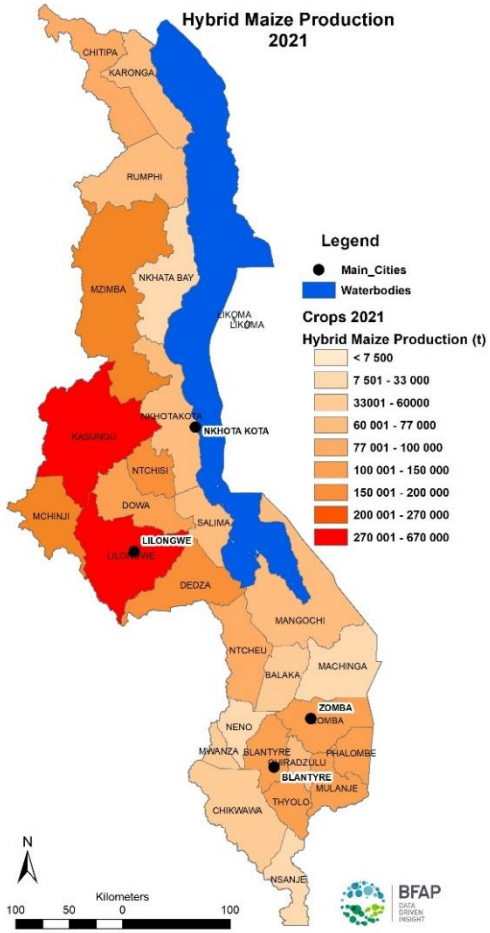
MAIZE

Maize is Malawi's most important staple food and is often referred to as a political crop since close to 3 million smallholders produce the crop, which receives the bulk of the seed and fertiliser input subsidy. GoM prioritises maize production due to its importance to food security considerations at the national level. Current yields range from around 1.6 tons/ha for smallholders to around 4 tons/ha maize farmed on estates. Since most of the planted area is under mono-cropped production utilising rainfed systems on very small pieces of land, maize production is heavily reliant on consistent rainfall during the rainy season. It is also well documented that the maize value chain has been affected by various market interventions by the state, either in the form of price setting, storage decisions, input supply and trade bans to name a few.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Absolute (period)	% Change per annum
Area ('000 Ha)	1 714.4	36.2	-0.3	223.7	1.4
Yield (tons/Ha)	1.9	-0.1	-2.5	0.2	1.2
Production ('000 tons)	3 184.7	-27.5	-2.7	928.2	2.8
Domestic Cons ('000 tons)	3 224.0	171.0	-1.8	1 196.8	3.3
Dom Cons Value (MWK Million)	553 427	666 178	16.9	500 717	6.7
Exports ('000 tons)	6.3	-42.8	-38.9	-	-
Imports ('000 tons)	34.2	-12.3	0.7	-	-
Net Exports ('000 tons)	-27.8	-30.5	-	-75.1	17.8





Qualitative Scan & Scoring: Maize

1.7	1.3	1	1.5
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
GoM policy has prioritized maize production for food security[1]. Malawi 2063 mentions that maize has become somewhat too politicised in the past[2]. Enhancing agricultural productivity and increasing the use of improved seeds and fertiliser is mentioned in various policy documents[2,3,4]. Export and Import bans on maize has significant implications for the functioning of the market. Malawi introduced a maize export ban which led to the loss of export revenue, and it reduced the domestic market prices of Maize[1,5,6]. Regulation of maize markets interventions and prices by setting ceiling prices are done under the General Purposes Act[1,7,8]. The proposed new Draft Crops Bill 2022 includes maize as one of the scheduled crops to be included under the new regulatory framework[9].	The GoM heavily supports maize production because maize is a staple food crop. Several programs have been developed and implemented to support and increase maize production. Programs such as the farm input subsidy, free stater packs to provide farmers access to high-quality seeds and fertiliser to improve maize productivity[1,10]. ADMARC also supports maize production by regulating maize prices, ensuring that farmers obtain profits. Each year, ADMARC is allocated funds to buy maize from farmers[1,8]. The private sector, such as seed companies like Seedco, Bayer, and Demeter, produce hybrid maize seeds for farmers. Processing of maize into maize flour is done by both private and public sector. In terms of processing, maize is used in beverages, agro-processing, plastics and packaging, and assembly manufacturing companies[10].	Maize is exported to other countries to earn foreign exchange when no export bans are in place and if the country had good rainfall, but imported during time of scarcity. Maize is usually traded in raw form without being processed, but processed maize is locally sold. Maize production and prices remain highly volatile despite a favourable agro-ecological environment and large government subsidies[12]. Poor road connectivity to markets and the high cost of transport reduces the competitiveness of this value chain. Hence improving road infrastructure and increasing market access can improve the maize value chain[11]. Heavily subsidised maize seed and fertiliser have not been well-targeted in the past, hence proper implementation will increase maize yields[11]. Maize price volatility is associated with government interventions, including ill-timed procurement or stock releases, mixed signals on price controls or procurements, and uncertainties on the imposition or lifting of export bans[11]. There is weak fiscal management, lack of fiscal space, and inappropriate policy interventions in agricultural markets, especially the maize market[11].	Malawi has mainly one growing season for rainfed maize production and heavily depends on sufficient rainfall for good yields. Climate change, which causes an increase in temperature and reduced or delayed rainfall, is expected to impact climate-sensitive crops such as maize negatively, thereby causing a reduction in the extent of suitable production areas as well as reducing the productivity of remaining areas across the country[14]. Recently Malawi experienced new trends in temperature with more frequent hot days, warmer night-time temperatures, and warmer temperatures – this will negatively affect maize growth and reduce maize yields[15]. Water requirements for maize vary greatly depending on variety, soil and temperature, but generally, it does best between 500 and 800 mm/growing season rain. Maize is thus particularly vulnerable to dry spells in the rainy season that occur during silking. An increase in the length and frequency of dry spells in mid-season threatens maize yields, especially when the dry spell coincides with the flowering stage[15].

		Agricultural productivity has stagnated due to farmers' dependence on a single rainy season and vulnerability to weather-related shocks, low soil fertility, significant postharvest losses, and weak market linkages. Overcoming these challenges would increase maize productivity and profitability[1].	

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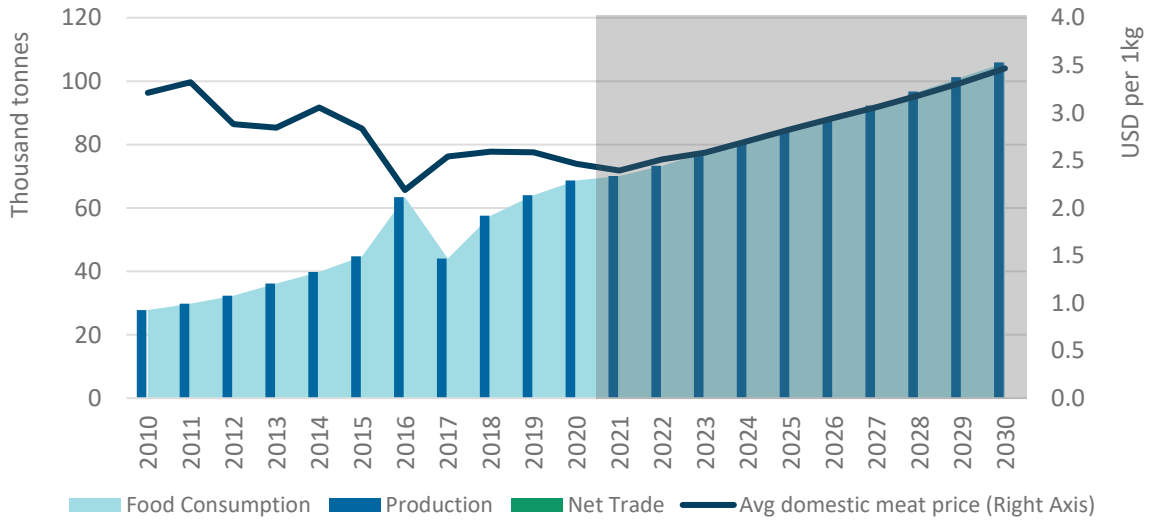
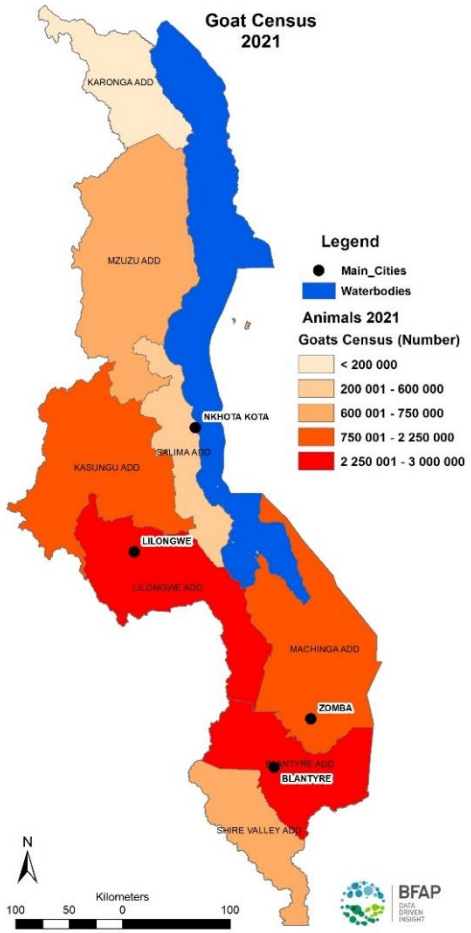
GOATS

Goats in Malawi are mostly kept in small flocks and within extensive grazing systems. The market is predominantly based on live sales and informal marketing in rural areas with around 700 000 households rearing goats. The average national herd of 9 million goats between 2017-2019 makes it bigger than cattle, pigs and sheep. Goat production is concentrated close to the major cities of Lilongwe and Blantyre, although large volumes are consumed in rural areas. Goat farming is a profitable business, with production expanding around 9% per annum in the past decade and projected to continue to grow towards 2030. Its meat is amongst the cheapest meat products in Malawi largely due to the low cost of production. Constraints for further growth are dependent upon the value chain moving toward more uniform carcass weights and ensuring a consistent supply of quantity and quality demanded by the market. Although several investments have been made by donors and NGOs in this value chain, large private sector investments have not materialised.

Partial Equilibrium Output Growth rates (Least squared growth rates)					
	2017-2019	2010-2019		2020-2030	
Indicator	Absolute level	Level Change	% Change per annum	Level Change	% Change per annum
Slaughters ('000 head)	5 999	3 604	9.2	3 283.9	4.0
Slaughter Weight (Kg/animal)	9.8	0.0	0.0	0.0	0.0
Mutton Production ('000 tons)	55.2	36.2	9.4	37.2	4.5
Domestic Cons ('000 tons)	55.2	36.2	9.4	37.2	4.5
Dom Cons Value (MWK Million)	111 967	124 237	26.9	219 651	9.5
Exports ('000 tons)	0.0	0.0	-	-	-
Imports ('000 tons)	0.0	0.0	-	-	-
Net Exports ('000 tons)	0.0	0.0	-	0.0	-





Qualitative Scan & Scoring: Goats

1.7	1.7	1.7	1.3
Policy Support	**Investment Support**	**Scalability**	**Agro-Ecology**
Similar to the policy support mentioned in other livestock value chains, the overall policy objective is to increase the availability of quality livestock and livestock products by promoting local production through the enhancement of service delivery[1]. A review of the 2006-2011 National Livestock Development Plan suggested that livestock have a weak or vague mix of policy and strategy statements that leads to a lack of implementation[2]. Under the new National Livestock Development Policy: 2021-2026 there are several interventions concerning goat production: Livestock restocking programmes for vulnerable households to improve resilience and livelihoods. Other interventions are more generic to prevent and control animal diseases to create an enabling environment for the improvement of livestock production[2]. The previous policy for livestock had more specific objectives for goat production: To increase goat and sheep populations and offtake. Promote production and expansion of ownership for goats and sheep.	Large private sector investments in the goat value chain have not realised in Malawi. This is partly due to the marketing constraints resulting in a mismatch of consistent supply of sufficient quantity and quality of production[3]. However, numerous public sector and donor-supported investments have been made in the goat value chain. Thyolo Goat Distribution Scheme is a project which was implemented by Oxfam in which the organization distributed goats to beneficiaries[4]. The Rural Livelihoods Support Programme by IFAD implemented the Livestock pass-on system project, and it was noted that the system can be implemented on a large scale[5]. The EU-funded project improved livelihoods through sustainable intensification and diversification of market-oriented crop-livestock systems in Southern Malawi[6]. WFP promote nutrition prevention efforts towards ensuring availability and access to diversified, safe and nutritious foods at household level through the provision of inputs and implementation of small livestock through goat pass-on schemes[7]. The African Goat Improvement Network (AGIN) is trying to improve goat production in Malawi through	Scalability in goat production is relatively easy due to the low productivity levels of smallholder farming systems. It is a cheap system of keeping goats hence it has the potential to grow[8]. Increased availability and distribution of improved breeds will make a significant impact on both meat and milk production[8]. Scalability is challenged by a lack of organised markets which results in informal trading of goats at low market prices[8]. Intensive goat farming is labour intensive, hence only applicable to a small portion of goats produced[8]. When goats are combined with other enterprises conflict may arise as goats tend to feed on young crops and there are therefore additional capital requirements needed for fencing and feed[9]. Goats prefer browsing than grazing hence maximum utilisation of a variety of herbage. However, under confined conditions goat diets need to be supplemented with formulated feed rations[9].	Goats are more susceptible to heat stress caused by climate change than sheep and cattle[10]. Heat stress results in reduced food intake and lower reproductive capacity of goats[10]. Goats among other livestock are raised in diverse environments. They are generally raised in mixed crop-livestock systems, which are characterised by more crop-livestock interactions[10]. The livestock sector in Malawi mostly depends on locally available feeds whilst the low-input goat sector mostly depends on grazing and free-range system[10]. Since goats are mostly reared using extensive grazing systems, agro-ecological constraints are more pronounced than compared to intensive systems such as poultry and pigs. Goat farming requires more land, yet overgrazing is affecting the natural resource base.

Facilitate the establishment of organized small ruminants marketing systems. Promote the conservation of the indigenous goats and sheep[1]. Goats received policy support through FISP and AIP in that rural farmers that cannot utilise fertiliser and seed are given the option to access kids for production as part of the input subsidy program.	selection in community-based breeding programs[8]. 225 000 farmers participating in goat pass-on Programs, with 45 000 goats annually distributed[7].		

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