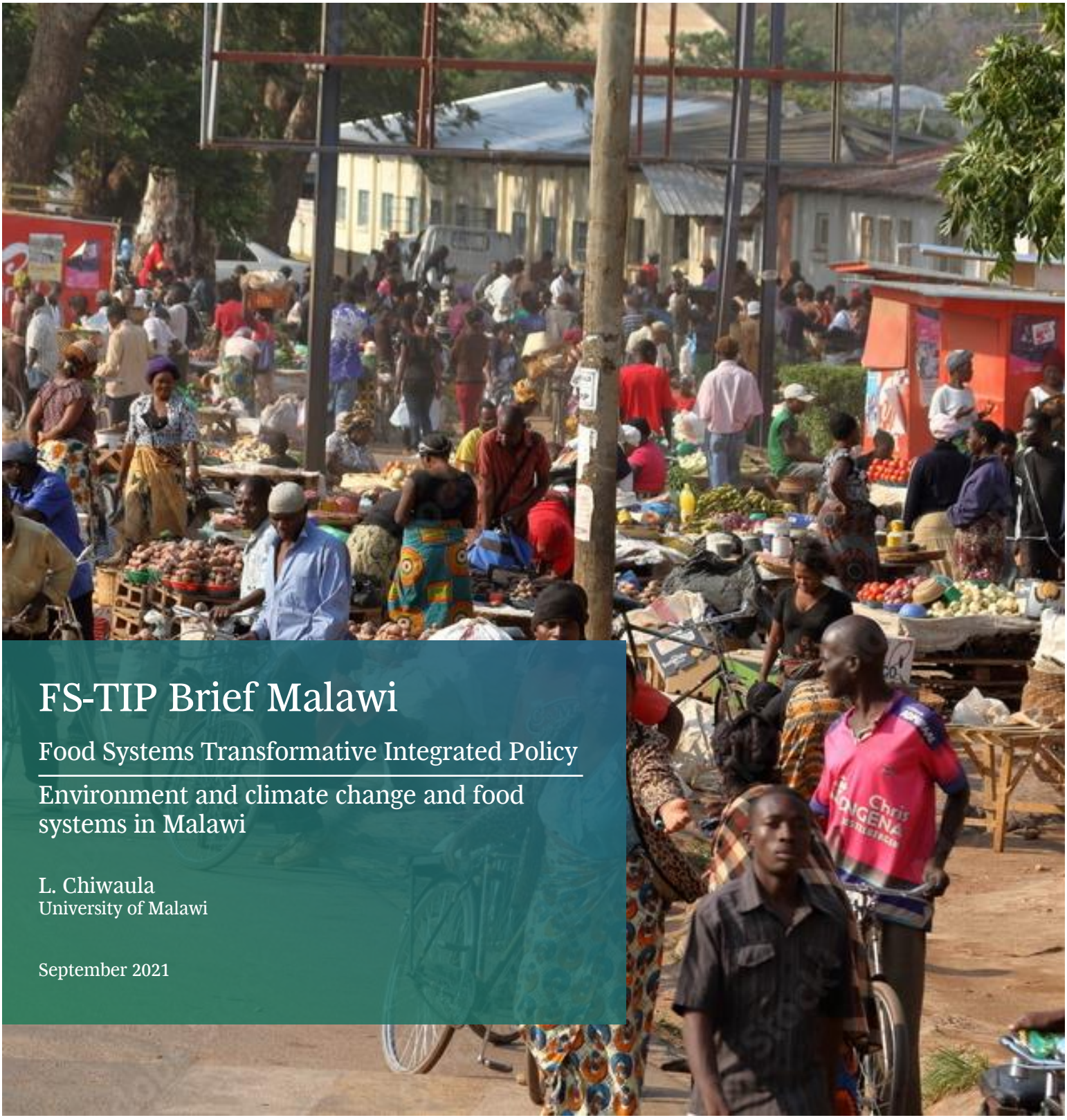

FS-TIP Brief Malawi

Food Systems Transformative Integrated Policy

Environment and climate change and food systems in Malawi

L. Chiwaula
University of Malawi

September 2021

African Population and Health Research Center

AKADEMIYA 2063

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ENVIRONMENT AND CLIMATE CHANGE POLICY BRIEF

Key Messages

- Environment and climate change are posing major challenges for food systems to deliver sustainable healthy diets to all people, and food systems are responsible for most environmental degradation and climate change.
- Heavy dependency of the Malawian economy on rain-fed agriculture increases the susceptibility of the food systems to climate change impacts.
- Malawi ranks lowly in terms of air pollution through greenhouse gas (GHG) emissions, but the levels of GHG emissions are projected to treble by 2040.
- By 2050 average temperatures are projected to increase 1-3ºC while rainfall is projected to decrease by about 3 -10%. These changes will lead to reduction in food production in the absence of any serious intervention.
- With the current policy environment and proposed climate change mitigation strategies, Malawi is projected to reduce greenhouse gases by 50% in 2040.
- To support the supply of sustainable healthy diets, climate change policies and interventions should manage the trade-offs between efficiency and sustainability goals and there should also be targeting of food value chains.

1. Introduction

It is Malawi's goal to attain sustainable health diets for its growing population, but its food systems are not supplying these diets. This is reflected in Malawi's adoption of the Sustainable Development Goals (SDGs), which among others are set to end hunger, achieve food security and improved nutrition, and promote sustainable agriculture (SDG 2); ensure sustainable consumption and production patterns (SDG 12); take urgent action to combat climate change and its impacts (SDG 13); conserve and sustainably use the oceans, seas and marine resources for sustainable development (SDG 14); and protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss (SDG 15) by the year 2030. These aspirations are also reflected in the Malawi Vision 2063 (MW2063) and various national development strategies and policy goals.

Food systems are the combination of all activities, including people's interactions and networks that exist in a society for the transformation of primary resources into final goods, and their consumption and disposal thereafter (Alarcon, et al. 2021). Activities in the food systems include pre-production activities such as input production and distribution; food production; food processing; food distribution; food consumption; and disposal of food (Vermeulen, Campbell and Ingram 2012, Clark, et al. 2020, Alarcon, et al. 2021). Food systems also include the enabling policy environments and cultural norms around food[1]. Figure 1 illustrates the food

[1] https://www.ifpri.org/topic/food-systems, accessed on 11 August 2021

systems framework highlighting the external drivers, food supply chains, food environments and consumer characteristics, and subnational food systems.

Food systems are a very important component of global and national economies. Everyone participates in the food systems for various objectives such as livelihoods, profit, environmental stewardship, as well as securing food (Vermeulen, Campbell and Ingram 2012). By their nature food systems are complex, involves many stakeholders with different interests which makes coordination of the systems complicated. As a complex system, the food systems require multidisciplinary approaches to be understood and multisectoral approaches to make them deliver sustainable healthy diets. Approaches to the transformation of food systems that do not recognise the complex nature of the systems are bound to fail.

Sustainable healthy diets are the diets with low environmental impacts which contribute to food and nutrition security and to healthy life for present and future generations (Lindgren, et al. 2018). They are protective and respectful of biodiversity and ecosystems, culturally acceptable, accessible, economically fair, and affordable; nutritionally adequate, safe, and healthy; while optimizing natural and human resources (FAO 2010, Lindgren, et al. 2018). The exact composition of healthy diets varies depending on individual needs, cultural context, local food availability, and dietary customs, but the basic principles are provided in Table 1. This diet is considered sustainable when its production, distribution, consumption, and disposal leads to low environmental impacts.

Table 1: Summary description of healthy diets for adults and children

Healthy diets for adults	Healthy diets for infants and young children
• Fruits, vegetables, legumes, nuts, and whole grains • At least 400 g (5 portions) of fruits and vegetables a day. • Less than 10% of total energy intake from free sugars (equivalent to 50 g or around 12 level teaspoons) per person per day • Less than 30% of total energy intake from fats. Unsaturated fats (e.g., found in fish, avocado, nuts, sunflower, canola, and olive oils) are preferable • Less than 5 g of iodized salt (equivalent to approximately 1 teaspoon) per day.	• Infants should be breastfed exclusively during the first 6 months of life. • Infants should be breastfed continuously until 2 years of age and beyond. • From 6 months of age, breast milk should be complemented with a variety of adequate, safe and nutrient dense complementary foods. • Salt and sugars should not be added to complementary foods

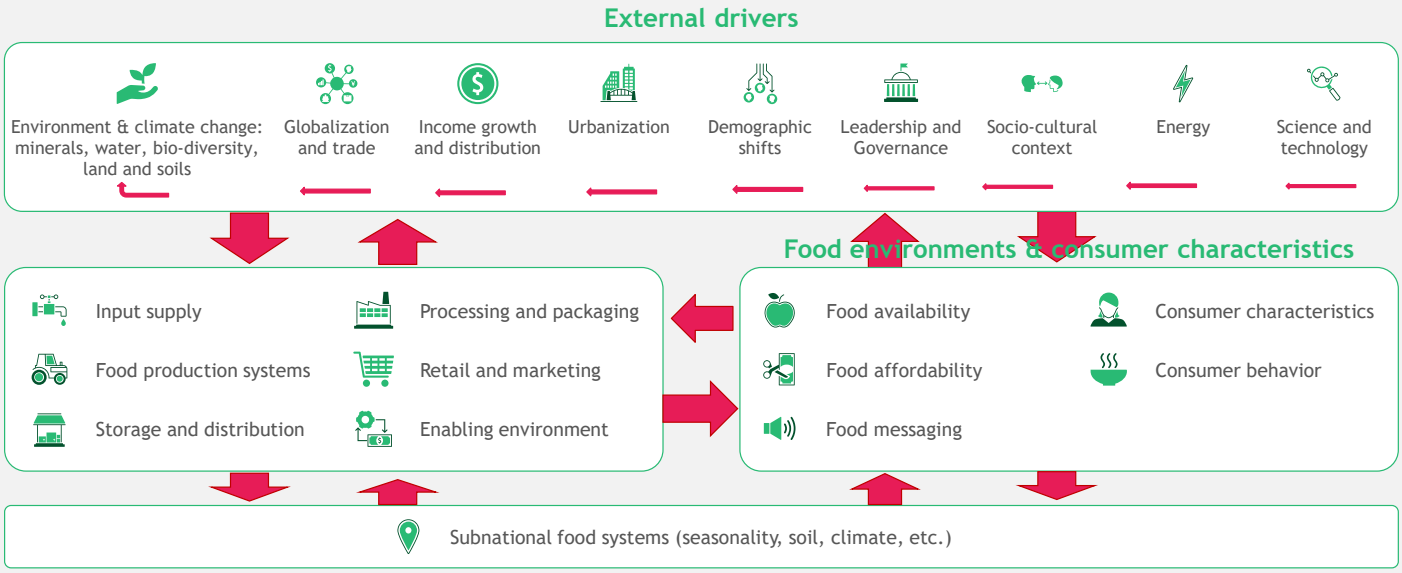
Environment and climate change influence food systems outputs and outcomes. This is the case because environment and climate change influence food systems activities and processes which in turn influence food systems outputs and outcomes. Malawian food systems fails to supply sustainable healthy diets as reflected in high levels of food insecurity and malnutrition (NSO 2020). This is partly attributed to low and fluctuating agricultural production which among many factors stem from climate change and weather variability (Malawi Government 2016a). In this case, poor food and nutrition outcomes in Malawi can partly be attributed to the failure to manage the environment and climate change sustainably. In this policy brief, we present a case for transformation of the food systems in Malawi with the aim of enabling it deliver sustainable healthy diets to all Malawians through the management of the environment and climate change.

The rest of the brief progresses as follows. In section 2 relevant concepts and their relationships are presented, while section 3 presents the overview of food systems in Malawi. Section 4 presents the state of environment and climate change and their impacts in Malawi, and section 5 presents the policy environment. Conclusions and policy recommendations are presented in section 6.

2. Environment and climate change in the food systems

Environment and climate change are very important to food systems. Environment and climate change as drivers of food systems influences food supply chains, food environments and consumer characteristics, and the subnational food systems (Figure 1). Other external drivers of food systems influences food systems directly but also through their impacts on environment because all external drivers are expected to impact the environment and climate change in one way or the other. Food systems also influence the environment and the other external drivers of climate indicating the existence of a bi-directional relationship between environment and climate change, and food systems.

Figure 1: Food Systems Framework



Source: Adapted from FS-TIP Brief #1

Environmental degradation and climate change are posing major challenges to food systems. Climate change is expected to impact the whole food value chain but will generally be strongest for agriculture, given its sensitivity to climate and its primary role in food supply and in the provision of livelihoods to poor people(Vermeulen, Campbell and Ingram 2012). Simulation models have projected that the world to experience climate change through reduction in rainfall and increases temperatures and these changes are expected to lead to significant challenges for the global food systems to meet global food demands, particularly demand for healthy diets. Global evidence show that climate change will affect agricultural yields and earnings, food prices, reliability of delivery, food quality, and food safety (Vermeulen, Campbell and Ingram 2012).

Food systems contributes to environmental degradation and climate change. Activities in the food systems are projected to lead to changes in rainfall and temperatures. Unsustainable use of natural resources and the environment in the production, consumption, distribution, and disposal of food leads to environmental degradation and climate change. This happens through land degradation, deforestation, loss of habitats and biodiversity, depletion of natural resources, and contamination of air, soil, and waters (Lindgren, et al. 2018). Globally, food systems are said to emit between 20% and 35% of all greenhouse gases (GHG) (Clark, et al. 2020). Agriculture contributes to GHG emissions through agricultural practices, and indirectly, via land-cover change as a result of opening new agricultural lands (Vermeulen, Campbell and Ingram 2012). The use of synthetic fertilizers and pesticides in agriculture, and the use of hormones in animal husbandry cause chemical pollution of marine and terrestrial ecosystems with contamination of food products and ecosystems that in turn may lead to severe health consequences (Lindgren, et al. 2018, Clark, et al. 2020). Energy use in food processing and food distribution also contributes significantly to greenhouse gas emissions.

The impacts of food systems on climate change are not uniform across food items and geographical regions. Meat from ruminants have the largest environmental impact for most environmental indicators (Clark, et al. 2020). High income countries also emit relatively higher greenhouse gas than low income countries.

3. Overview of food systems in Malawi

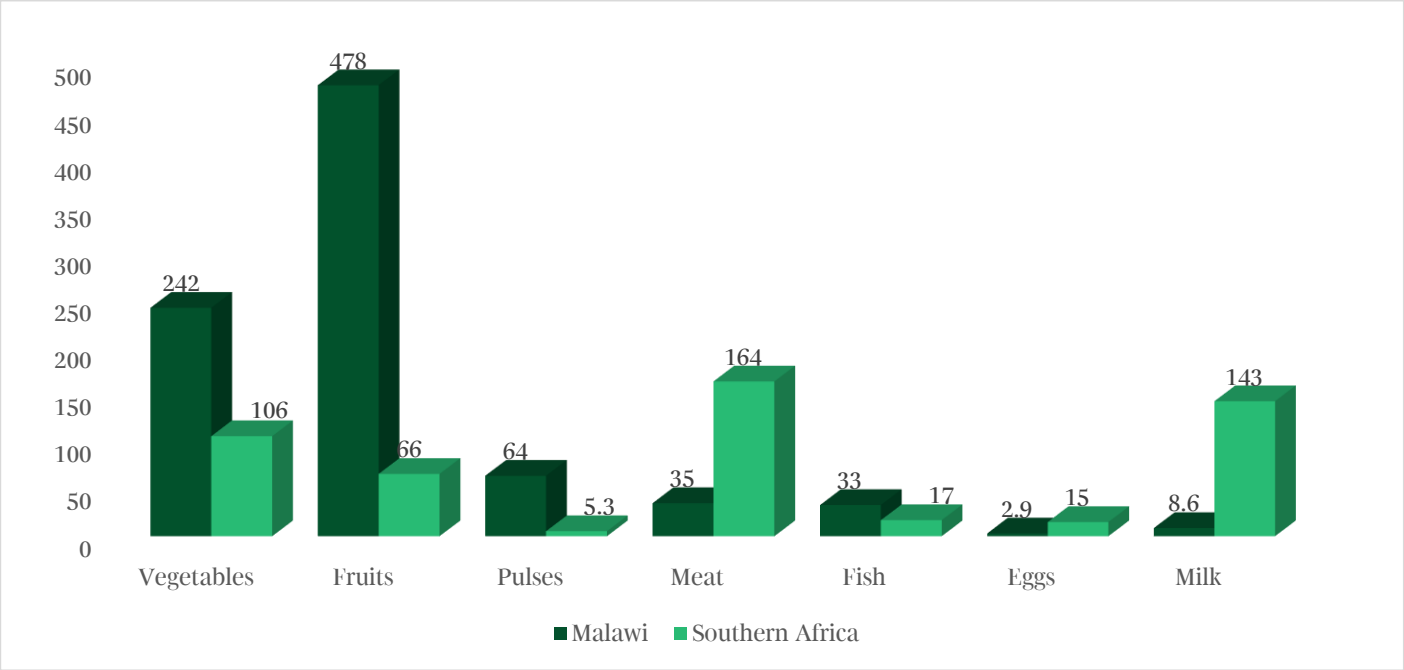
Malawi's diets are characterized by high consumption of high energy staples and less consumption of other nutritious foods. Up to 70% of dietary energy in Malawi comes from cereals, roots, and tubers, which is much higher than the global consumption and Southern African consumption of cereals, roots, and tubers. Globally and in Southern Africa, consumption of cereals, roots, and tubers contributes 50% and 54% of dietary energy, respectively[2]. Maize-based meals form the bulk of the cereal consumption in Malawi. Maize is dominant in Malawian diets because it is also grown by the majority of smallholder farmers and the crop has traditionally received a lot of policy support. For example, the fifth Integrated Household Survey data shows that 93% of farmers in the sample produced maize and the 2020/2021 national budget estimates targeted 4.2 million farming households with subsidised agricultural inputs through the Affordable Input Programme (AIP).

Fish is the main source of animal protein. It contributes over 70 percent of the dietary animal protein intake of Malawians and 40 percent of the total protein supply (Malawi Government 2020a). Other localised studies also show that fish is the most consumed animal-source food with 35-54% of 12 - 36 months old children consuming fish (Kaimila, et al. 2019). There has been a continued increase in per capita fish consumption, reaching 12.63kg/person/year in 2018, from 12.47kg/person/year in 2017 (Malawi Government 2020a). Fish consumption is high in Malawi because of the vast water resources that cover about 20% of the surface area.

Relative to the Southern African region, Malawian food systems supply more vegetables, fruit, pulses, and fish but less of meat, eggs, and milk (Figure 2). High vegetable consumption which also relates to intake largely reflect on low incomes of Malawian population and the high supply and consumption reflects an easily accessed food item.

[2] FAO, Food systems dashboard

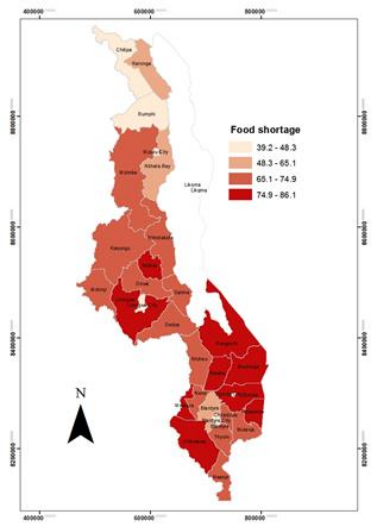
Figure 2: Supply of vegetables, fruit, pulses, meat, fish, eggs, and milk, 2017



Source: Author's illustration based on data from FAO (2020)

Food insecurity and malnutrition are persistently high in Malawi. The fifth Integrated Household Survey (IHS5) data show that up to 70.2% of households experienced food shortage prior to the survey. Higher levels of food shortage were reported for rural households (75%) than urban households (44.6%) and female headed households (78.3%) than male headed households (67.3%). The Southern region is the most food insecure region, followed by the centre and then the northern region (Figure 3).

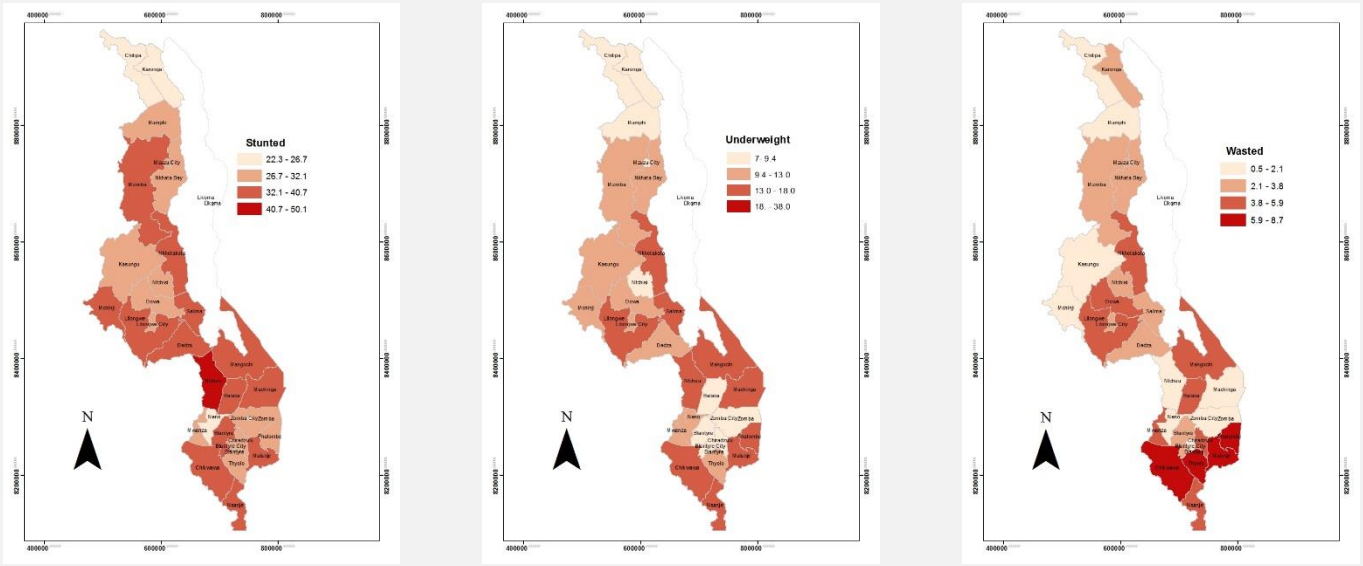
Figure 3: Incidence of food shortage in Malawi 12 months prior to 2019/2020



Source: Authors' illustration based on NSO (2020)

In terms of nutrition outcomes, up to 33.7% of children under five years old were stunted (14.2% severely stunted and 19,5% moderately stunted) (NSO 2020). Estimates in 2020 show that 35.5% of children under the age of 5 years are stunted (Malawi Government 2021) reflecting a slight decline. In the general population, prevalence of undernourishment is at 19% which is more than double the Southern African regional levels at 8.4% and global average at 9% (FAO 2020). Incidence of stunting among under five aged children is not distributed uniformly across regions, sex of household head, and residential area of the household. Under-five aged children are from rural areas (34.7%) are more stunted than children from urban area (28.1%) and there are more stunted children among male headed households (37.4%) than children from female headed households (30.1%). There is also high incidence of stunting among under five aged children from the central region than children from other regions (Figure 4).

Figure 4: Distribution of incidence of malnutrition among under-five aged children in Malawi



Source: NSO (2020)

High food and nutrition insecurity in Malawi is attributed to low agricultural productivity and incidence of shocks and stresses. In 2019 maize yield for Malawi was 1.7 metric tons per hectare, which was lower than the Southern African average of 5.0 metric tons per hectare and vegetable yield was 11 metric tons per hectare and was also lower than the Southern African average of 18 metric tons per hectare (FAO 2020). Low agricultural productivity in Malawi results from lack of access to farm inputs and poor agricultural practices. About 29.1% of households reported that they experienced food shortage because they lacked farm inputs (NSO 2020). This is the case despite the expansion of the Farm Input Subsidy Programme (FISP). According to World Bank (World Bank 2021) fertilizer consumption in Malawi has increased from 30.49kg/ha in 2005 to 35.92 kg/ha in 2018. These fertiliser consumption levels are lower than the target of 50 kg/ha espoused in the 2006 Abuja declaration (Malawi Government 2021b). The level of fertilizer use is also lower than the recommended rate for maize which is 92kg per hectare (Nalivata, et al. 2017). Adoption and use of improved seeds is also low with IHS5 data showing that only 36.8% of maize farmers grew hybrid maize varieties. Shocks and stresses such drought, poor rains, floods, water logging, and crop pest damage were also stated as major causes of food shortage among households.

4. Environmental, climate change and their impacts

The total land area in Malawi is estimated at 94, 280 square kilometres which represents 80% of the total area as 20% of the country is covered with water (World Bank 2021). Agriculture occupies 56,500 sq. km (60%), while forest area occupies 23, 257 sq. km (24.7%), while 20% of total surface area is covered by water.

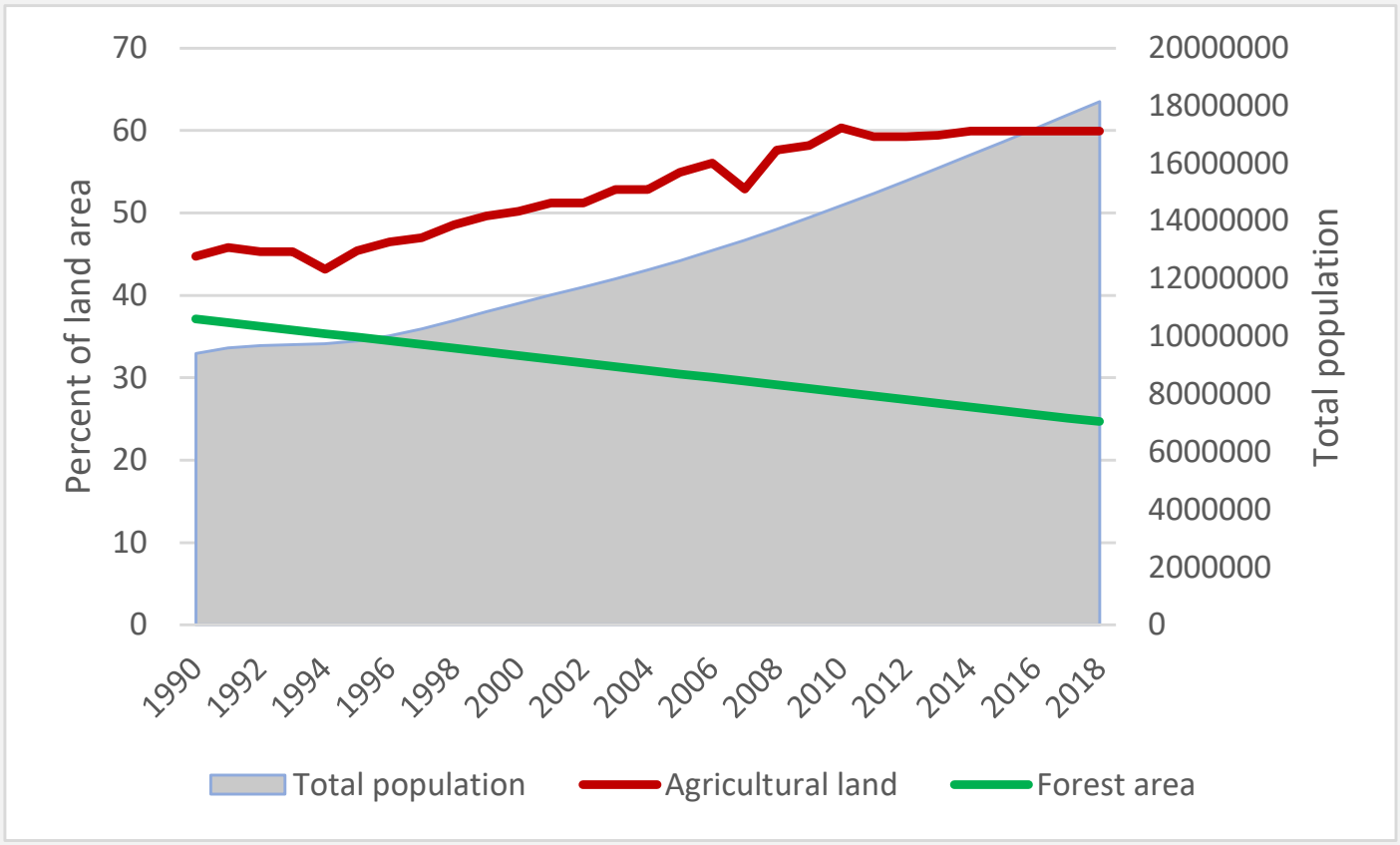
The heavy dependency of Malawi's economy on rain-fed agriculture leaves it susceptible to impacts of climate change. Over 90% of agricultural production is rain-fed (Malawi Government 2016c). Out of the estimated potential of 407,862 hectares, only about 104,634 hectares were developed for irrigation purposes by 2015 representing 25% of the potential area (Malawi Government 2016b) and 4% of total cultivated area (CIAT and World Bank 2018). This land use pattern shows that agriculture is the mainstay of Malawi's economy as most of the land area is used for agricultural production. Agriculture contributes 27.1% of GDP while close to 80 percent of the population rely on rain-fed smallholder agriculture for their livelihoods (Malawi Government 2020b). The high dependence on rainfall puts the whole economy at risk to climate related shocks. To reverse this pattern and improve resilience of the economy to climate related shocks, there are efforts to increase the amount of irrigable land.

Most of food production in Malawi is done by smallholder farmers who contributes 70% of the agricultural GDP (Malawi Government 2016a). These farmers occupy small pieces of land, whose sizes vary significantly across the regions. Land holding size in the southern region stands at 0.32 ha per household compared to 0.73 ha in the central region and 0.65 ha in the northern region (NSO 2020). Additionally, smallholder farmers face constraints in accessing improved inputs which leads to low utilisation and low productivity. Because of the size of their land and low productivity, smallholder farmers mostly produce for subsistence purposes and their common food crops include maize, rice, cassava, sweet potatoes, Irish potatoes, and legumes(Malawi Government 2016a). More than 90% of smallholder farmers produce maize. This leads to high concentration of cereals in Malawian diets. Transformation of food systems in Malawi will thus require the transformation of the smallholder production systems.

The geo-physical characteristics of Malawi's agriculture coupled with high population growth is making the country susceptible to environmental degradation. Population growth in Malawi has been high at around 2.6 % per annum for a long time. This increases demand for agricultural land. As the result, agricultural land has been increasing at the expense of forest areas. Between 1990 and 2018 agriculture area has increased from 45% of total land area to 60% of total land area while forest area has reduced from 37% or total land area to 25% of total land area (Figure 5) showing that over 80% of the forest area that is being cleared is converted to agriculture area. Throughout this period, population has been increasing showing a very strong correlation between population growth and clearing of forest area[3]. Forest areas are cleared through commercial charcoal and firewood production, illegal cultivation, and settlements (Malawi Government 2020a).

[3] The partial correlation coefficient between population and percentage of forest area is -0.98

Figure 5: Trends in percentage of forest area, percentage of agriculture area, and population in Malawi, 1990-2018

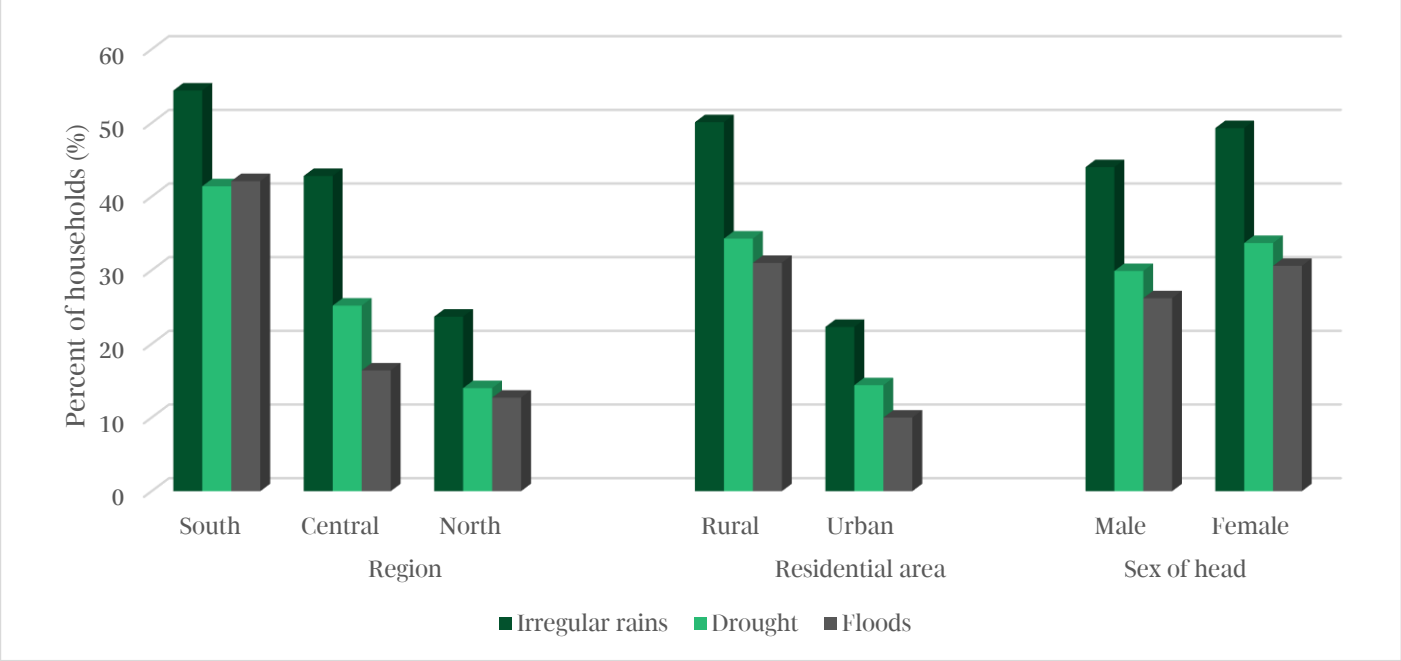


Source: Authors based on World Bank (2021)

Clearance of forest land has increased incidences of weather-related shocks such as droughts and floods through reduction of forest cover and removal of carbon sinks which would have reduced concentration of greenhouse gases in the atmosphere, hence abating global warming. As such, prolonged dry spells, seasonal droughts, intense rainfall, riverine floods, and flash floods are extreme weather conditions Malawi are now more frequent than before (Malawi Government 2016a). Over the past fifty years, Malawi has experienced more than 19 major flooding events and seven droughts with the worst flood experienced in 2015 (Malawi Government 2021b).

In 2020, 46% of households experienced irregular rains, 31% experienced drought, while 28% experienced floods (NSO 2020). This shows very high susceptibility to extreme weather events. The incidence of weather related shocks also varies with region, residential area, and sex of household head (Figure 6). Incidence of irregular rains is the most reported weather related shock. The Malawi Government estimates droughts and floods to cost the country about 1.7% of Malawi's GDP every year (Malawi Government 2016a). Falling water levels in lakes and rivers associated with increasing frequency of drought episodes are threatening the survival of humans, fish, and other natural resources (Malawi Government 2021b) which are very important to the food systems.

Figure 6: Incidence of weather-related shocks in Malawi



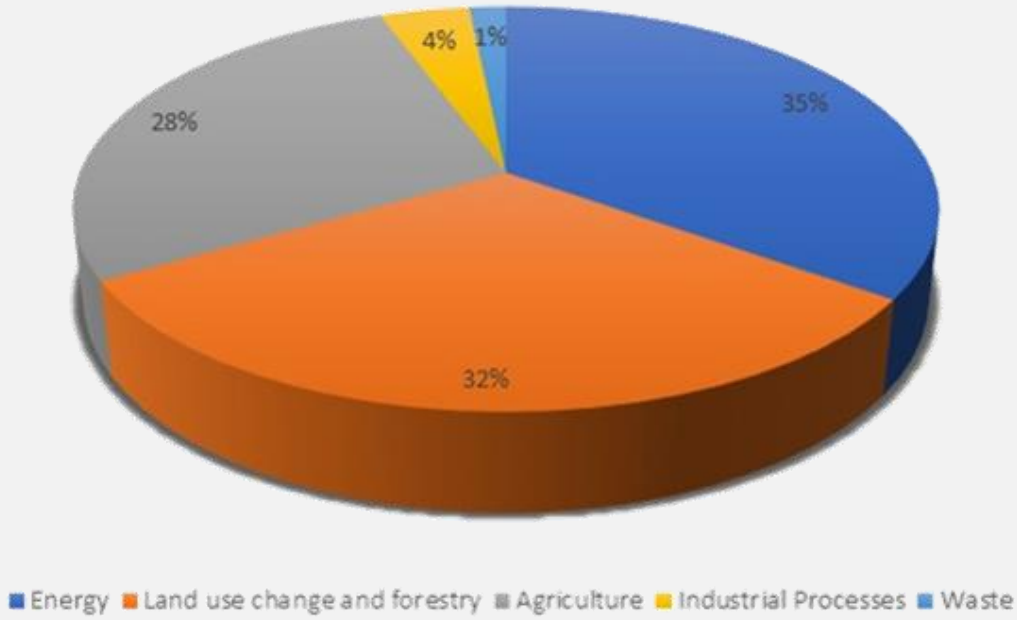
Source: Authors based on NSO (2020)

Averagely, households have low capacity to withstand the effects of shocks. High incidence of shocks coupled with low levels of resilience to shocks make many households to suffer the impacts of shocks on their food and nutrition security. The household resilience capacity index is estimated at 0.26 which is very low considering that it ranges between 0 and 1. Some of the factors responsible for low household resilience include low access to credit which stands at 12% for agricultural households, poor infrastructure, low production diversification, and weak markets. As such, most households when faced by shocks are left to handle the effects on their own.

Malawi ranks lowly in terms of air pollution through greenhouse gas (GHG) emissions. As of 2018 total greenhouse emissions for Malawi was estimated at 1.48 tonnes per capita, compared to 6.45 tonnes per capita for the world and 3.45 tonnes per capita for sub-Saharan Africa (CAIT 2020). It should however be noted that these have been increasing in the past decade and it is expected to increase in the coming years. The business-as-usual (BAU) scenario forecasts emissions to increase by more than three times by 2040 (Malawi Government 2021b).

In total Malawi emitted 26.8 metric tons of greenhouse gases in 2018 and this was largely emitted by energy, land use change and forestry, and agriculture (Figure 7). Energy use is expected to continue to be the largest driver as population and economic growth increase demand for transport, power generation and products (Malawi Government 2020b). Figure 7 demonstrates that apart from energy, agriculture also makes a large contribution to greenhouse gas emissions. This has also been reported by CIAT and World Bank (2018) who show that agricultural sector contributes 52% of GHG emissions, 74% of which comes from the livestock subsector (CIAT and World Bank 2018). The large contribution of agriculture in general and livestock production in particular to GHG emissions poses a challenge in diversifying Malawian diets away from cereal concentration.

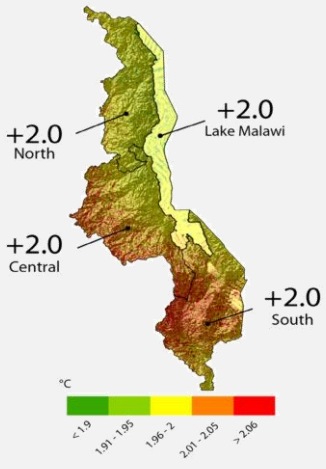
Figure 7: Sectoral contributions to greenhouse gas emissions in Malawi, 2018



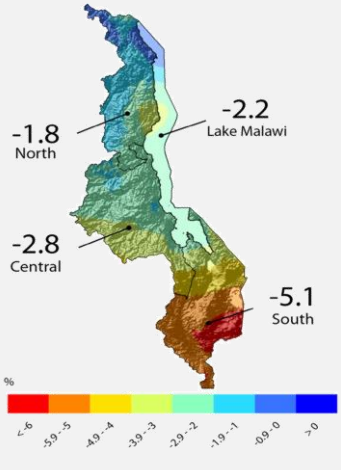
Source: CAIT (CAIT 2020)

Climate change will lead to reduction in food production in Malawi. By the year 2050, mean temperatures are projected to increase by at least 1-3°C and total seasonal rainfall for the is also predicted to reduce by 3 to 10.5 % (CIAT and World Bank 2018, Hunter, et al. 2020). The distributions of these climate change impacts across regions in Malawi have been illustrated by CIAT and World Bank (2018) (Figure 8).

Figure 8: Projected change in Temperature and Precipitation in Malawi by 2050



Panel A: Average temperatures (ºC)

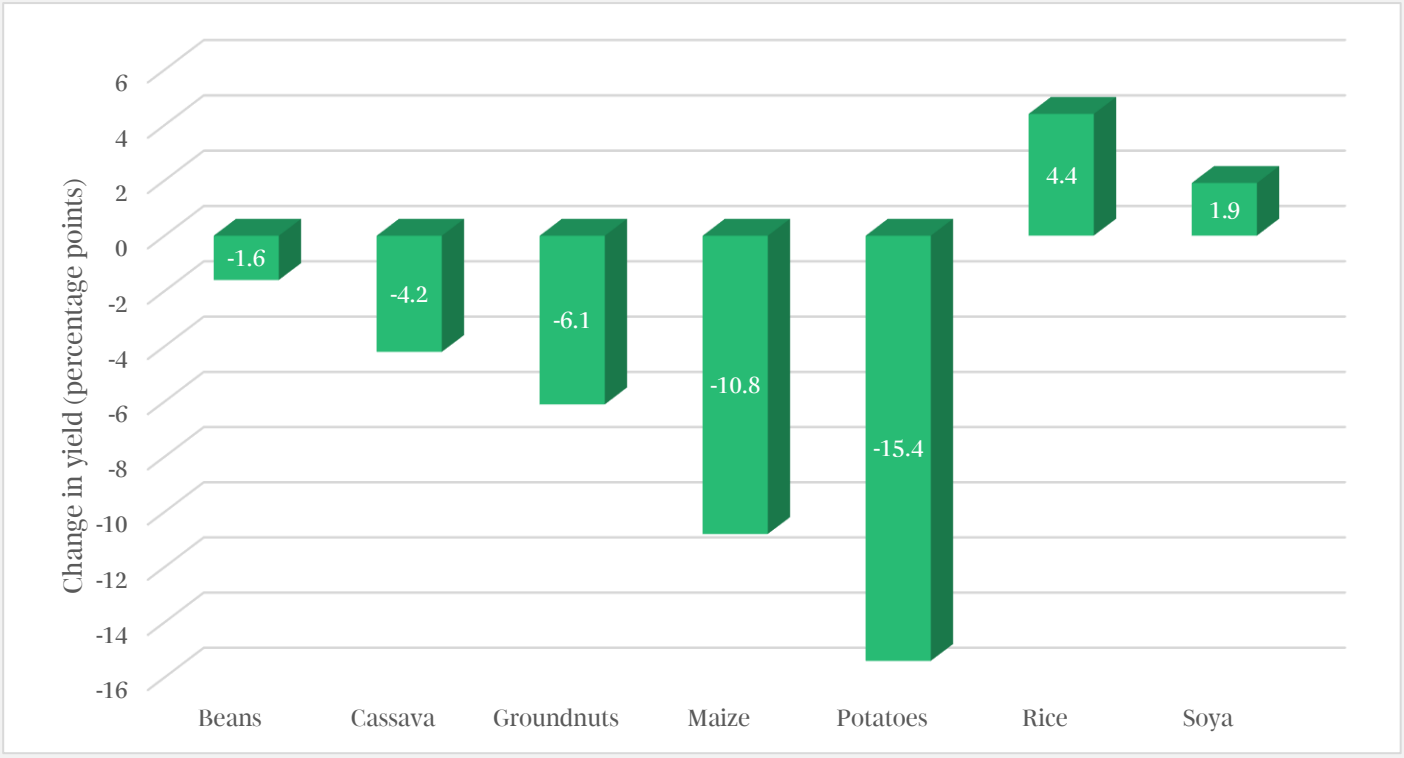


Panel B: Average precipitation (%)

Source: CIAT and World Bank (2018)

The combination of reduced and variable rainfall and increased temperature will reduce agricultural production through decreased yield or outright crop failure. Figure 9 presents the projected impacts on yields of selected crops. Positive impacts of climate change are expected on rice and soya yields. For the rest of the modelled crops, climate change is projected to lead to reduction in yield. The highest yield reduction is from potatoes whose yields are projected to reduce by 15.4% and the least reduction is projected to happen in beans production at 1.6%. Maize yield is projected to decrease by 10.8%. This means that we still need to invest in research on drought resistance varieties. Further the projections point to diversification of diets to more resilient crops such as rice.

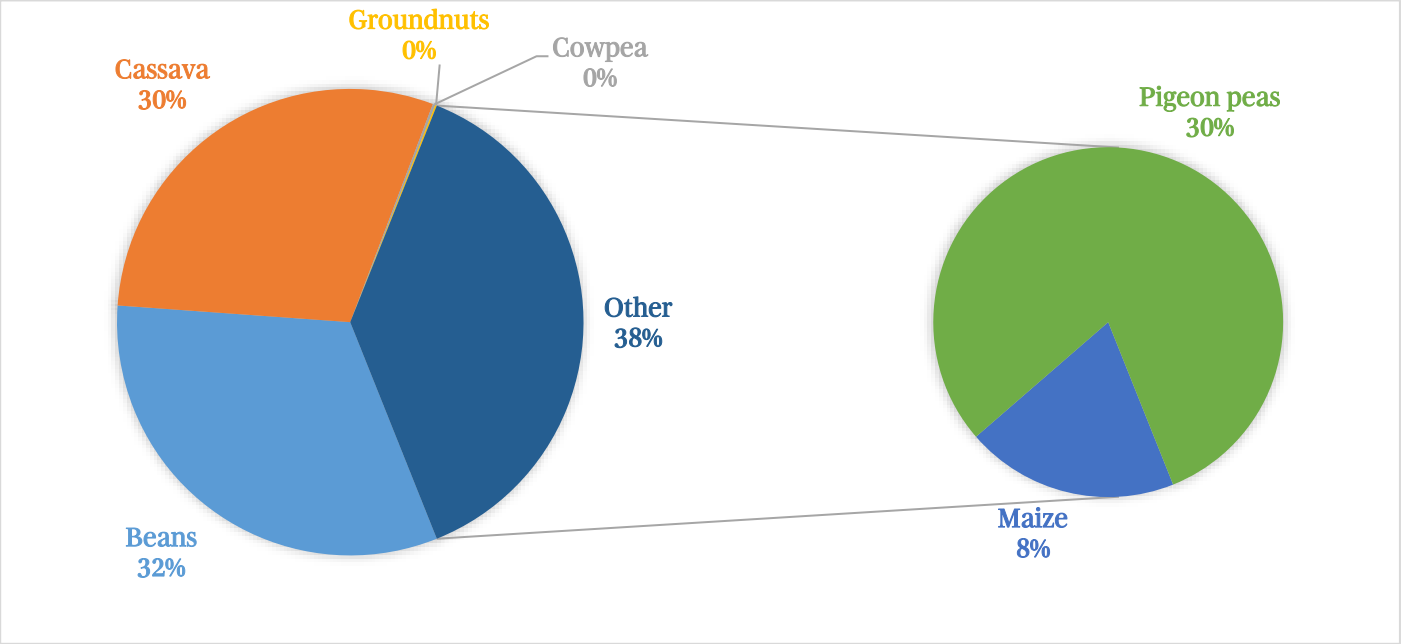
Figure 9: Projected impacts of climate change on crop yield



There may be positive effects on crop production for winter crops because increased winter temperatures may result in suitably warm conditions for irrigated production of staples such as maize and beans, as well as various horticultural crops such as tomatoes, peppers, and other assorted vegetables (Hunter, et al. 2020).

Economic costs of climate change to the food systems in Malawi are substantial. The annual costs of climate change on beans, cassava, cowpea, groundnuts, maize, and pigeon peas in Malawi is projected at USD284 million in 2050 (Hunter, et al. 2020). High costs are due to losses in the production of beans, cassava, and pigeon peas. The effects of climate change on fruit and vegetable production expected to be high because these crops are sensitive to temperature changes (Lindgren, et al. 2018) which further shows that the country is likely to be unable to provide healthy diets if climate change and its effects are not effectively checked. The contribution of maize to the total climate change effects is relatively low compared to legumes and other crops. This may lead the persistence of cereal based meals in Malawi.

Figure 9: Distribution of projected annual costs due to climate change, 2050



Source: Authors' illustrations based on Hunter, et al. (2020)

5. Policy environment

There is a conducive policy environment in Malawi for the management of environment and climate change. The current global, regional, and national policy agenda recognizes the impacts and complex interactions of environment and climate change. In the long-term development vision, "Malawi 2063", Malawians aim to manage the environment sustainably through adequate waste disposal, treatment, and recycling; air and water pollution management; and prudent water resource management driven by projected increases in water consumption and/or demand (Malawi Government 2020b). Direct climate management activities in the Malawi 2063 include prioritisation of climate smart technologies and practices in agriculture; promotion of soil and water conservation, soil fertility improvement, conservation agriculture and improve area under agroforestry; and the introduction of targeted agriculture insurance for large commercial farms and cooperatives; and diversification of food production away from maize. Although the vision illustrates these climate management activities, two of the pillars of the vision (industrialisation and urbanisation) have the potential to cause more environmental degradation and climate change due to the high demand for energy that comes with industrialisation and urbanisation.

These vision statements are actualised in sectoral specific policies. One of such is the National Climate Change Management Policy (NCCMP) seeks to guide programming of interventions for reduction of greenhouse gas emissions in the atmosphere, as well as adapting to the adverse effects of climate change and climate variability (Malawi Government 2016c). The long-term goal for the NCCMP is to reduce the socioeconomic impacts of adverse effects of climatic change and in the medium term, the country seeks to improve community resilience to climate change through the development of sustainable livelihoods and reduced emissions of GHGs. This policy is the overarching policy in climate change policy. Recognising the vulnerabilities facing the population due to climate change, the country has also developed the National

Resilience Strategy 2018-2030 whose vision is to build a country free of chronic vulnerability and food and nutrition insecurity, where sustainable economic growth creates opportunities for everyone, and where people are resilient to economic and environmental shocks that affect their lives and livelihoods (Malawi Government 2018). There are also other related policies such as the National Agriculture Policy (Malawi Government 2016a), the National Irrigation Policy (Malawi Government 2016b), National Fertilizer Policy (Malawi Government 2021b), and the National Social Policy (Government 2012). The policies aim to sustainably use resources, build the resilience of the population, and provide social support to affected households and individuals.

Further to that Malawi is a Party to the United Nations Framework Convention on Climate Change (UNFCCC) has made firm decisions and plans to move the country's pathways towards a green economy based on national circumstances and capabilities (Malawi Government 2015). In the current Nationally Determined Contribution (NDC), it is projected that Malawi could reduce emissions by around 50% by 2040 if all identified measures were funded (Malawi Government 2021b).

In general, the policy environment seem to promise to deliver on climate change management. However, the policies seem to be generic as they do not target the management of the environment for the sustainable health diets. The existing policies can lead to attainment of a sustainable diets, but these may not be healthy diets because the varying relationships between climate and different food systems have not been clearly factored in. The policies also do not target specific food supply chains of interest.

One of the elements that is conspicuously missing is the promotion of fish farming which will ensure availability of healthy animal protein while not causing serious danger to the environment as in the case of ruminants.

The policies have put forward both efficiency attaining activities and sustainability enhancing activities without clearly indicating how the trade-offs between these two sets of activities will be managed. Efficiency attaining activities such as irrigation, intensification of fertiliser use will lead to environmental degradation. It is thus necessary to establish the level of intensification that will still ensure sustainability of the natural resources.

6. Conclusions and policy implications

Malawi's food system is very susceptible to climate change impacts because of high dependence on rainfed agriculture. Reducing dependence of the food systems on rainfall is therefore paramount in the building of the resilience of the food systems. Less dependence on rainfall can be attained through investments in irrigation as well as, adoption of conservation agriculture. In general, the country needs to intensify in the promotion of climate smart agriculture to abate the climate change impacts on the agricultural sector.

Climate change and food systems are both complex phenomena and they required coordinated efforts of all stakeholders to attain the desired outcomes. The Climate Change Management Policy attempts to coordinate these efforts. It is necessary that climate change impacts of all development interventions be assessed and abated.

While we celebrate the existence of a comprehensive climate change management policy package, there are still areas that have not been fully addressed. One of such an area is the trade-off between increasing production efficiency to increase food production and sustainable use of natural resources and the environment to ensure production for future generations. For the transformation of food systems to attain sustainable health diets, there is also need to target different food supply chains with different climate management interventions.

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