Chapter 3

AGRICULTURE IN MALAWI

Although the agriculture sector is second to the service sector in its contribution to Malawi's GDP, agriculture is central to economic and human development planning in Malawi given the significant share of the population that engages in some agricultural activities, the importance of agricultural exports for Malawi's trade, and, of relevance here, the centrality of subsistence agricultural production to the food security of most households. This chapter provides an overview of agriculture in Malawi by examining the physical basis for production and the major crops produced, particularly maize.

Several agricultural development challenges are discussed in some detail. These include the financial challenges farmers face in profitably using commercial inputs at full market cost, why food crop diversification is problematic to achieve, and the overriding constraint of low soil fertility on crop productivity levels. In considering elements of sustainable soil fertility management, the productivity levels that farmers could obtain using inorganic fertilizer versus what they do obtain are highlighted, with some discussion of what accounts for this large gap. The chapter also points out the importance of farmers' having sound information, adapted to the local context, on how best to employ soil fertility management techniques, both organic and inorganic. The discussion also covers the fertilizer subsidy programs that have been repeatedly implemented in Malawi—their justification, the general ineffectiveness of their implementation, and the opportunity costs that these fertilizer subsidy programs represent for adopting more sustainable approaches to higher crop productivity. Later sections focus on making use of Malawi's significant water resources for irrigation, customary access to arable land, and whether the distinction between smallholder farming units and somewhat larger estate farms is of much analytical or programmatic value.

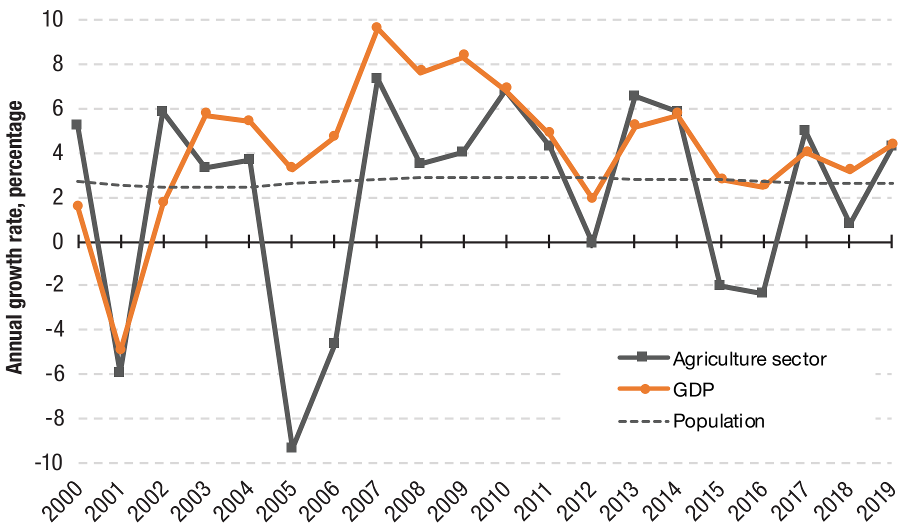
The last section of the chapter provides an overview of Malawi's current policy framework for agriculture. Food security remains central to priority-setting for agricultural development, as in the past. The reverse relationship also holds—food security strategies for Malawi principally invoke agriculture-based solutions. Strategic thinking around both agricultural development and food security should seek to move the sector away from its focus on production for food self-sufficiency at both household and national levels and toward a market-centered, more concentrated and specialized sector that, nevertheless, will reliably serve to meet the food needs of increasing numbers of Malawians working outside of agriculture.

In 2019, the agriculture sector was estimated to have contributed just over one-quarter of Malawi's total GDP (World Bank 2020). Although this is a substantial drop from providing one-half of total economic output 50 years ago, globally Malawi's economy still is among the 20 national economies most dependent on agriculture. Despite significant growth in Malawi's service sector over the past 20 years, with a small manufacturing sector and limited non-agricultural natural resources to exploit economically, agriculture remains at the center of most economic production.

The food systems of Malawi historically have been based on self-sufficient, maize-focused agricultural production, and most farming is for subsistence. Nevertheless, the country's exports are also dominated by agricultural products—over the period 2015 to 2017, 87 percent of Malawi's exports by value were agricultural products, with tobacco alone accounting for 52 percent, followed by sugar and tea, with each making up about 7.5 percent of the value of all exports. Of the 10 largest export product categories, 8 are agricultural. In contrast, only 22 percent of Malawi's imports by value were agriculture-related products, and of the 10 largest import product categories, only 2 are agricultural. Of these, inorganic fertilizer made up the greatest share, at 7 percent of total imports by value. Wheat and wheat flour was the imported food product of highest total value between 2015 and 2017 (Malawi, NSO 2020). Most of the calories consumed by Malawians are from food produced in Malawi, particularly in rural communities.

Similarly, the livelihoods of most Malawians are centered on agriculture, with much of the farming done by smallholder farming households, relying on family labor to grow their own food. Employment figures disaggregated by economic sector reflect the central role of agriculture for most Malawian households. Just under 87 percent of all Malawian households and 95 percent of rural households were estimated to have been involved in some form of agricultural activities in 2013 (Malawi, NSO 2014a). The 2013 Labour Force Survey (Malawi, NSO 2014b) estimated that 64.1 percent of the employed working-age (15 to 64 years of age) population in Malawi worked in agriculture, whereas only 28.5 percent worked in the service sector. Given the share of GDP that is attributed to each sector, the relative economic productivity of Malawians engaged in farming is significantly lower than that of those engaged in the service sector. The low level of labor productivity in agriculture in Malawi reflects the development challenges facing the sector and the barriers to significant overall economic growth in Malawi emerging from agriculture.

FIGURE 3.1 Annual growth of Malawi's agriculture sector, GDP, and population, 2000 to 2019



Source: Data from World Bank (2020).

Growth in Malawi's economy since 2000 has been positive overall, if somewhat erratic from year to year (Figure 3.1). Although between 2000 and 2019 the economy contracted in only one year, 2001, economic growth was slower than population growth in six years. Given the significance of agriculture in the economy, overall annual economic growth tracks the annual growth of the agriculture sector to some degree—the correlation coefficient between the two time series over this period is 0.55. Growth trends in the agriculture sector are more volatile than those of the economy as a whole, reflecting the exposure of the sector to production shocks, principally droughts or floods. Total value-added in the agriculture sector fell from year to year six times between 2000 and 2019.

But despite its importance to Malawi's economy, it is the centrality of agricultural production to the country's food system that has kept agriculture at the heart of Malawi's development strategies since the colonial era. Subsistence agricultural production remains the dominant livelihood strategy for a large majority of Malawian households. However, because the population is now growing by about 450,000 people each year (Malawi, NSO 2018), subsistence-oriented, low-input crop production on increasingly smaller household plots alone is not, on its own, a sustainable solution for feeding all Malawians. The government has repeatedly implemented large fertilizer subsidy programs for smallholders in order to raise productivity so that the national maize harvest meets the needs of the population. However, the success of these maize production programs is dependent on good rains, the burden they impose on the public budget is immense, and as will be discussed, there is no evidence that these programs result in any structural transformation of smallholder production systems or in a strengthened commercial orientation for the sector.

Similarly, liberalization of agricultural markets has been pursued in Malawi for the past 30 years—a policy reform agenda primarily pushed by Malawi's donors—in order to transform the agriculture sector away from subsistence production and better provide for the food needs of all Malawians. These efforts have expanded economic opportunities for some farmers through commercial crop production, chiefly of tobacco. However, thin and weak food crop markets, particularly for maize, coupled with recurrent weather-related production shocks, result in significant food price volatility in the country. Even though maize is produced and marketed widely throughout Malawi, the quantity of stocks that are traded commercially is low relative to overall production—estimates from analysis of the 2016/17 IHS4 for Malawi show that only about 15 percent of farm households producing maize reported selling any. These households sold on average about one-third of their maize production.

The thin maize market increases risks to household food security for the large share of smallholder farmers who rely on markets to acquire some of the maize their households consume. They cannot be confident that they will at all times be able to find in the market the maize their households require at a price they can afford. More important for the development of the sector, unreliable food markets deter specialization by smallholder farmers in commercial crop production—encouraging them to continue producing their own food and forgoing potentially significant profitable commercial opportunities—because it is unwise to depend on these markets either to buy food or to sell food. Given the high risk that they will not receive a price for the maize they produce that covers the costs of any commercial agricultural inputs used, most farming households cannot afford or forgo seeking credit to obtain those inputs. Unless they have income from other employment, households dependent on subsistence-oriented farming cannot afford the improved seed and inorganic fertilizer that could ensure larger harvests of maize and other food crops necessary to meet their own dietary needs and to generate a cash income.

The food insecurity and limited incomes common to many households in rural Malawi reflect in part the weak agricultural market system.

Physical Basis for Agriculture

Malawi is relatively well endowed with agricultural resources. Although generally depleted in crop nutrients due to continual cropping over many years, the physical structure of most of Malawi's agricultural soils is reasonably good relative to those in neighboring countries. The country receives quite reliable rainfall in the single rainy season that runs from December to April, and it possesses significant water resources, most notably Lake Malawi and the Shire River that flows out of the lake, which could form the basis for extensive irrigated farming zones. Precolonial settlement patterns and the spatial variability in current rural population densities across southern Africa reflect the relatively advantageous agricultural resources found in Malawi. In part because of the agricultural potential of the country, the population of Malawi has increased significantly over the past century—from an estimated 970,000 inhabitants in 1911, to 4.0 million in 1966, to 17.6 million at the last census, that of 2018 (Malawi, NSO 2018). In consequence, farms have shrunk. As estimated based on IHS4 data, the mean land area now cultivated by farming households in Malawi is relatively small in the context of Africa south of the Sahara, at 0.65 ha per household that reported growing any crops.

TABLE 3.1 Rural population densities, cropped land as share of agricultural land, and livestock production as share of agricultural production, Malawi and neighboring countries, 2016

Country	All land area, persons per sq. km	Agricultural land area, persons per sq. km	Arable land and land under permanent crops as share of all agricultural land, %	Livestock production as share of gross production value of agriculture, %
Malawi	158	257	68	15
Mozambique	24	38	12	20
South Africa	15	19	13	51
Tanzania	41	92	39	18
Zambia	13	39	16	43
Zimbabwe	27	65	25	42

Source: Data from FAOSTAT (FAO 2020).
Note: The population densities are based on the total rural population of each country and not on the actual number of residents on agricultural land. Agricultural land area is the sum of the area in the country classified as arable land (land under temporary agricultural crops or temporarily fallow), the area under permanent crops, and the area under permanent meadows and pastures.

Rural population densities in Malawi are significantly higher than those of its neighbors, which have considerably larger portions of their land area that are unsuited for cropping (Table 3.1). A much larger portion of the agricultural land in Malawi is under temporary and permanent crops than in neighboring countries, where most of the agricultural land is under permanent pasture and is not used for crops. Reflecting this difference, the share of livestock in Malawi's total agricultural production is considerably smaller than it is for other countries in the region.

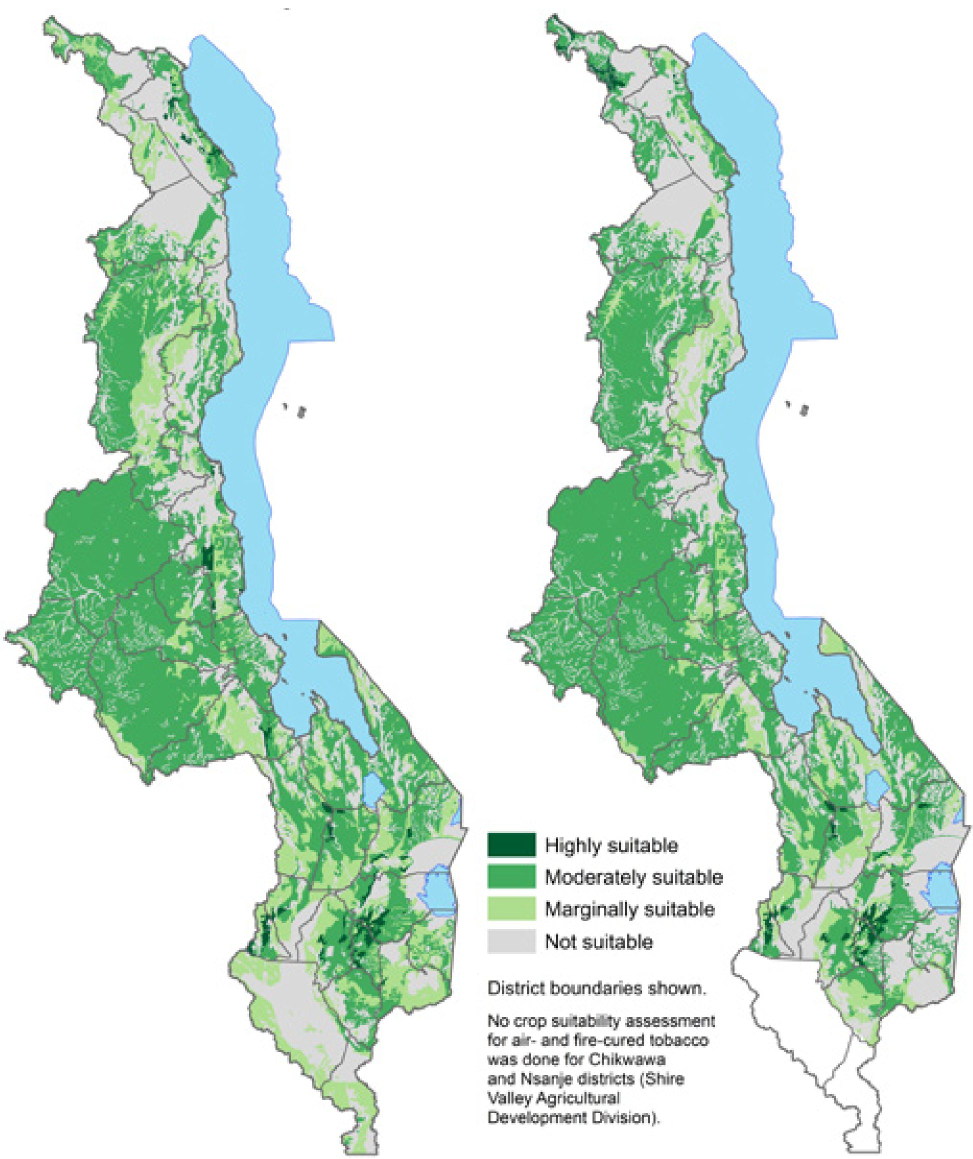
Rainfed crop agriculture is practiced throughout the country. The most productive areas are found in the mid-altitude plateau zone above the escarpment of the East African Rift Valley that runs the length of the country. This zone generally receives between 800 and 1,000 mm of rainfall annually. However, even in the somewhat less productive or riskier agroecologies of the lakeshore and in the Lower Shire Valley in the far south of the country, crop agriculture is the predominant economic activity. Figure 3.2 presents crop suitability maps for shorter-duration maize varieties and for air- and fire-cured tobacco grown under improved smallholder production practices.[1] Except in the rugged terrain and thin soils of the Rift Valley escarpment areas, the Middle Shire Valley, and the Mulanje and Nyika highlands, as well as the marshy areas around Lake Chilwa and in the Lower Shire Valley, virtually all the rest of the country has soil and climate characteristics that are at least marginally suitable for the production of these two important crops, with most areas judged to be moderately suitable.

However, agriculture in Malawi is vulnerable to production shocks, particularly extreme weather events, including droughts and floods. Annual losses from shocks to production from 1980 to 2012 were estimated to average $149 million (Giertz et al. 2015). The Malawian economy in aggregate also falters under such conditions, in which commodity production is reduced and

1 These crop suitability maps were developed by the Land Resources Evaluation Project, which was implemented from 1988 to 1992 as a joint effort of the government of Malawi, the United Nations Development Programme, and the Food and Agriculture Organization of the United Nations. The project involved a close reconnaissance of the agroecological resources of Malawi. Extensive fieldwork was done to map the soils across the country at the relatively detailed scale of 1:250,000 (1 cm = 2.5 km). Weather data were analyzed to generate averages for various indicators for use in mapping the agroclimatological zones of Malawi at the same geographic scale. The soils and agroclimate maps were then overlaid to develop a "land unit" map for Malawi. Each land unit was defined by a unique combination of relatively homogeneous soil and climate properties within its boundaries. These land units were then used with information on the optimal soil and climate conditions for growing a range of rainfed agricultural crops, as well as irrigated rice and tree species, to conduct a spatial suitability analysis for the production of each crop or tree species in each land unit. For additional detail on the Land Resources Evaluation Project and the outputs it generated, see Benson, Mabiso, and Nankhuni (2016).

FIGURE 3.2 Crop suitability maps for Malawi for short-cycle maize and air- and fire-cured tobacco under improved traditional management practices

Maize—short-cycle **Air- and fire-cured tobacco**



Source: Benson, Mabiso, and Nankhuni (2016). Analysis and mapping of information from Malawi Land Resources Evaluation Project, 1988-1992 (Eschweiler et al. 1991).

resources, whether public or private, that might have been used for productive investment are diverted to address the immediate crisis of food insecurity facing many Malawian households. Many of the economic gains made by farm households and by the Malawian economy over years of normal to good crop production are swept away in the aftermath of a poor harvest.

It is estimated that global climate change will result in increases of between 1.0°C and 3.0°C in monthly mean maximum daily temperatures across Malawi between 2000 and 2050 (Saka et al. 2013). These increased temperatures will adversely affect the production of crops that are not heat tolerant. However, given the varied topography of the country and the moderating effects of Lake Malawi on local climates, estimates across climate change models of how precipitation patterns might change in Malawi are not consistent. Although variability in rainfall both within and between rainy seasons is expected to increase (Grist 2015), there still is considerable uncertainty as to just what global climate change will mean for Malawi in terms of agricultural production and climate-induced shocks. Most observers are pessimistic.

With regard to other risks to agriculture, most farmers in Malawi are not significantly exposed to market-induced economic shocks caused by global commodity price movements. This reflects the limited involvement of these farmers in international agricultural markets rather than any inherent resilience in commercial agriculture in Malawi. Given the manner in which their value chains are organized and the significant transaction costs, particularly for transport, that they face in moving their produce to international markets, Malawian producers tend to receive low prices relative to international prices regardless of international market conditions. In addition, the marketing systems in Malawi through which the cash crops that smallholders are likely to produce are aggregated for export are not competitive, with only a few exporters operating. This is particularly the case for burley tobacco (Prowse and Moyer-Lee 2014). Producers have limited bargaining power in the face of low price offers for their crops.

Agricultural Production

The agriculture sector in Malawi can be disaggregated by the objective of production—between food production, including livestock, on the one hand, and cash crop production on the other.

Food production

MAIZE

Food production is central to the livelihoods of most rural households in Malawi. Maize is the principal food crop produced and the dominant staple food in almost all districts of the country. The crop was already incorporated into Malawian farming systems by the late 1800s, having been introduced from its center of origin in Mexico to coastal southern Africa, likely by the Portuguese, and then disseminated inland. At the start of the colonial era, maize was cultivated alongside other grains, particularly sorghum and finger millet. However, maize progressively came to dominate smallholder farming and food systems in Malawi (Vail 1983) beginning during the colonial period and continuing following independence in 1964. Malawi's current annual maize consumption is estimated at about 2.75 million tons (Babu et al. 2018). Other staples are much less commonly consumed. Today, only in Likoma district (which comprises two islands in Lake Malawi) and in areas along the central lakeshore in Nkhotakota, Nkhata Bay, and Rumphi districts does one find cassava as a common staple, generally alongside maize. Also, in the Lower Shire Valley, sorghum remains an important staple together with maize, being well adapted for the growing conditions there.

"White flint" is the preferred maize type in Malawian diets. Starting in the 1950s, agricultural researchers worked to develop improved varieties of maize adapted for Malawi, including hybrids. Although the early hybrids were softer dent varieties, by the late 1980s semi-flint varieties that better met the consumption preferences of the population had been released to farmers. More recent maize breeding efforts in Malawi have focused on disease and pest resistance, and on water use efficiency for drought tolerance. Propelled by maize technology extension programs and various subsidy programs, uptake of improved maize varieties has been reasonably good—the 2014 Welfare Monitoring Survey found that 68 percent of all households producing maize grew at least some hybrid varieties (Malawi, NSO 2015).[2] Several international seed companies operate in Malawi, with hybrid maize central to their business (Abate et al. 2017).

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2 Although F1 hybrid maize seed, in order for the crop to maintain its hybrid vigor, should be purchased new each year and not recycled, many farmers in Malawi recycle some of their harvested maize (F2 and subsequent generations) as seed in the following season, even if the maize was produced from F1 hybrid seed (Morris, Risopoulos, and Beck 1999). However, in surveys, farmers often will report such recycled seed as "hybrid," even when technically it is not (Wineman et al. 2019). Consequently, survey estimates of hybrid maize seed use by smallholder farmers in Malawi, as in much of Africa, overstate somewhat the use of F1 hybrid seed.

In parallel with maize breeding efforts, maize agronomy research has focused on soil fertility management for sustained higher levels of maize productivity. Maize production has been shown to be very responsive to the application of nitrogen and sulfur on most soils in Malawi, as well as to phosphorus, if less reliably so (Benson 1999). Such yield gains from the application of inorganic fertilizers require that the fertilizer be combined with good crop management practices that include use of improved seed adapted for prevailing agroecological conditions and resistant to common maize diseases and pests; timely planting, fertilizer application, and weeding (at least twice); somewhat higher plant populations than traditionally used; and, to maintain soil health through adequate soil organic carbon levels, the use of high-quality (low carbon-to-nitrogen ratio) organic materials, such as crop residues from grain legumes grown in rotation with maize, animal manure or compost, and biomass from agroforestry species (Malawi, MoAFS 2012; Snapp et al. 2014). The significant yield gains possible through the application of inorganic fertilizer were demonstrated to smallholder farmers in the 1980s and 1990s. However, as will be discussed, many smallholders are unable to manage their fertilized maize crop in an optimal manner due to their inability to afford the full amount of purchased inputs they require, late input acquisition, insufficient labor to adequately weed and otherwise manage the maize crop in the field, and for many, poor access to information on how best to use what fertilizer they do obtain.

Given the high price of fertilizer relative to that of maize, maize price volatility, and the position of most farmers as price-takers in agricultural output markets in Malawi, the production of fertilized maize even under good management has not been a reliable commercial enterprise. Although most Malawian farmers seek to use fertilizer in their maize production, most are unable to afford it, due to cash constraints and very limited access to credit. Only those with sufficient cash flow from other productive activities, particularly in the formal wage sector, are able to afford fertilizer. Moreover, those who use income from other economic activities to buy fertilizer generally do so with the objective of producing maize for their own consumption, rather than for sale. Under most cropping and market conditions, this makes financial sense—these households are implicitly valuing the maize harvest that they will consume at the higher consumer maize price (what they would have to pay in the market for this maize in the period of high prices before the following maize harvest), rather than the significantly lower producer price (what they would receive if they were to produce it for sale). For the Malawian smallholder under current conditions of thin maize markets, growing fertilized maize for own consumption is cheaper than relying on the market to meet household maize needs (Benson 1999). At the same time, growing fertilized maize for commercial sale without the benefit of subsidies or other distortions to agricultural input or output markets generally will not be the optimal cropping choice for the profit-seeking farmer in Malawi and, indeed, will often result in financial losses. This point is discussed in more detail later.

Most smallholder farmers, excepting those with income from other crops or nonfarm employment, do not have sufficient financial resources to pay full market price for the fertilizer they require for their maize plots. Without adequate access to fertilizer, households that rely on their own maize production

TABLE 3.2 Selected annual food crop production in Malawi, 2013/14 to 2017/18, averages for area planted, production, and yield, plus potential maximum yields

Crop	Area planted, ’000 ha	Total production, ’000 mt	Yield, kg/ha	Potential maximum pure-stand yield under smallholder conditions, kg/ha
Maize, all	1,693	3,057	1,800	7,000 (hybrid)
Irrigated	*172*	*463*	*2,680*	n.a.
Estate production	*44*	*125*	*2,830*	n.a.
Rice	63	112	1,770	5,000 (irrigated)
Sorghum	383	340	890	1,700
Millet, pearl and finger	99	81	820	2,000 (both species)
Groundnut	52	32	620	2,500
Soyabean	156	155	990	4,000
Common bean	331	186	560	2,000
Pigeonpea	245	386	1,570	2,500
Cowpea	88	39	440	2,000
Other beans or peas	35	30	860	Various
Cassava	212	n.a.	5,130	30,000 (fresh)
Sweet potato	211	n.a.	2,600	30,000 (fresh)
Irish potato	62	n.a.	3,500	20,000 (fresh)

Source: Area, production, and yield are from the annual agricultural production estimates of the Ministry of Agriculture for total national production (smallholder rainfed and irrigated, plus estate), except for yield figures for cassava, sweet potato, and Irish potato, which are from Malawi, NSO (2010); potential yields are from Malawi, MoAFS (2012).

Note: The estimates from the Ministry of Agriculture for total production and yield for cassava, sweet potato, and Irish potato are judged not plausible given the low level of consumption of these crops that has repeatedly been recorded in household consumption surveys in Malawi (see Box 2.1). The estimates of potential maximum yield assume optimal crop management, use of improved planting materials, and application of sufficient crop nutrients to achieve the production levels specified. mt = metric tons; n.a. = not available.

to feed themselves are at significant risk of running short of maize during the lean season before the following harvest. Consequently, over the past 30 years, the government of Malawi has repeatedly provided significantly subsidized fertilizer to smallholder maize producers.

Most Malawian farmers achieve maize productivity levels that are well below the potential yields (Table 3.2). Maize hybrids grown in the mid-altitude plateau agroecology, where much of Malawi's maize is grown, have the genetic potential to yield up to 7.0 tons/ha with appropriate input use and good crop management. However, given the extensive nutrient depletion in most soils cropped by Malawian smallholders, it will take many years of good soil husbandry to bring those soils back to a condition in which such potential yields can be approached. Most smallholders will be unable to make the long-term investments needed to restore the full productive qualities of the soils they farm, particularly if these investments entail significant opportunity costs in terms of meeting their immediate food needs. Consequently, somewhat lower potential maize yields, of 4.0 to 5.0 tons/ha, are a more reasonable maize productivity target in the longer term. Nonetheless, with the provision of well-informed, locally adapted, and widely available agricultural extension messages; continued breeding efforts to improve the maize varieties available to farmers; continued research on proper crop management; timely and reliable access to inputs through efficient markets; and sufficient and reasonably predictable price incentives in output markets, maize producers in Malawi can achieve significant increases over present yields, contributing to feeding the country with its staple food for some time to come. Continued investments in raising farmers' productivity, for both maize and other crops, should remain a central element in any effort to develop Malawi's agriculture sector and to increase the amount of maize and other food crops available in domestic markets.

OTHER FOODS

Although maize dominates the diets of most Malawian households, a range of other food crops is produced and consumed. Breeding to develop improved, more adapted planting materials has been done for most of these crops, but rarely is fertilizer applied to them. Other cereals besides maize include rice, which is grown primarily under lowland conditions along the lakeshore; sorghum; finger millet; and some pearl millet. There is potential for wheat production, particularly in highland areas, but only small amounts are grown. Consumption of rice and wheat is increasing among urban households. A small portion of the rice is imported, whereas all the wheat comes from outside of Malawi.

Other significant staple food crops include roots and tubers. For the last 15 years, production estimates by the Ministry of Agriculture suggest that by weight, somewhat more cassava and sweet potato than maize is produced annually in Malawi. However, household consumption surveys show that less than 5 percent of the calories consumed by the average Malawian come from either cassava or sweet potato (Gilbert, Benson, and Ecker 2019). This significant difference between production and consumption estimates reflects both the challenges of collecting accurate production statistics for roots and tubers (see Box 2.1) and the practice among many producers of cassava of planting it as a reserve crop that is harvested and consumed only if household maize stocks are depleted (Haggblade and Zulu 2003).[3] Sweet potato is a traditional crop grown in seasonal wetlands. The orange-fleshed types have been extensively promoted in recent years to increase vitamin A consumption. Irish potato is commonly grown in highland areas with reasonably good transport connections to urban centers, thus serving as both a food crop and a cash crop for producers.

Grain legume crops, or pulses, serve as both cash and food crops. Their production has received considerable attention from agricultural researchers in Malawi seeking to develop maize–grain-legume intercropping or rotational farming systems as an element of sustainable soil fertility management, although so far without significant adoption by farmers. Most groundnut is consumed domestically, but the crop has experienced booms and busts in production, primarily linked to changing demand from regional and international export markets. Similarly, soyabean and pigeonpea are of interest primarily as cash crops. Several different bean and pea types are grown for consumption, with the most prevalent being common bean (*Phaseolus vulgaris*). Typically, both the grain and the leaves of these crops are used in relishes to eat with *nsima*, the thick maize meal porridge that is the principal form in which maize is consumed in Malawi.

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3 Estimating agricultural statistics for cassava, in particular, is challenging (Keita 2003). Its cropping cycle can go beyond a year. It is frequently planted as an intercrop, complicating estimation of planted area. Cassava roots do not store well without processing, so they cannot be held for later measurement of harvest. Whether a wet or a dry root weight is used can result in significantly different estimates of production. In some food systems, cassava leaves may be more important for diets than are the roots. These factors all reduce confidence in agricultural statistics on cassava production and also account for significant differences between sources, such as between national crop production estimates and those from household surveys.

Although making similar estimates for sweet potato and Irish potato are not as difficult as for cassava, many of these same challenges arise.

Vegetables and fruits are produced in household gardens for home consumption and in peri-urban areas to serve urban markets. These foods are quite important for improving the quality of local diets, being potentially important sources of micronutrients, although much greater consumption is warranted. Of the vegetables, green leafy vegetables are the most commonly consumed and also the most significant nutritionally. The value chains associated with vegetables and fruits are rudimentary, although a commercial firm has begun exports of fruit purees and juices in the past five years.

Compared with its role in neighboring countries, livestock in Malawi is not an important component of the agricultural economy. Reflective of this, on average Malawians consume relatively small amounts of nutrient-dense animal-sourced foods—an estimated 13.4 percent of all protein consumed in 2016/17 came from animal-sourced foods. Consumption of fish is increasing, whereas that of meat and poultry is declining—fish became a more important source of protein than meat for the average Malawi household between 2010/11 (IHS3) and 2016/17 (IHS4) (Gilbert, Benson, and Ecker 2019). Though still low overall, urban consumption of animal-sourced foods on a per capita basis is about double that in rural households. The limited livestock and livestock products are primarily produced for the domestic market—few are exported.

In terms of livestock produced, poultry in particular can be an important secondary element in the agricultural livelihoods of smallholder households. Larger animals are more likely to be part of the farming systems of wealthier households in areas with adequate grazing land, as in the Northern region and in the Lower Shire Valley in the far south. Expansion of dairy production in peri-urban areas around the cities of Blantyre, Lilongwe, Zomba, and Mzuzu, particularly among smallholders with one or two cows, has been a focus of government and donor efforts over the past 15 years. In 2008, it was estimated that nationally there were 30,000 dairy cattle owned by about 8,000 farmers (Chagunda et al. 2010). Livestock markets in Malawi appear to be improving, possibly driven by increasing demand from urban consumers. With local adaptation in terms of animal mixes and scale of production to reflect locally available resources, livestock husbandry has unrealized potential for contributing to increased and more diverse commercial agricultural production (FEWS NET 2016).

FOOD CROP DIVERSIFICATION

Over the years, regular calls have been made to diversify the food system of Malawi away from its heavy reliance on maize. Several pilot efforts have been justified based on the need to do so. Diversification of the country's food production is expected to be driven primarily by increased consumption of grain legumes, vegetables, and fruits, as well as animal-sourced foods. If successful, diversification efforts would provide nutritional benefits, with greater individual consumption of fats, protein, and a range of micronutrients, and increase the resilience of Malawi's food systems, particularly to shocks to maize production, but also to periods of volatility in prices.

However, diversifying food production away from maize is not an easy task given the broad set of advantages of maize in the Malawian context and the primary nutritional demand for the carbohydrates it provides. Agroecologically, the maize varieties grown in Malawi are well adapted. Erratic rainfall patterns historically have significantly affected national production once or twice a decade, but with improved maize seed, sufficient nitrogen applied to maize plots, and good crop management, farmers should be able to consistently produce more than 3.0 tons/ha in most years, with even higher yields possible. Maize has strong cultural significance in most communities across the country—although several available carbohydrate-dense crops could substitute for maize, culturally those crops are considered imperfect substitutes. The flint maize types preferred in Malawi store well over the long annual dry season if the harvested grain is kept dry and ventilated. As a cereal, maize is reasonably easy to transport and to market without losses in quality. Although primarily grown for own consumption, maize will always find a market and can be considered a semi-tradable crop with potential for export to neighboring countries. Sales of maize are among the strategies farming households may consider for meeting their cash needs. Though this is the case with all foods produced by smallholders, there are more limited marketing opportunities for cassava, for example, which is an obvious substitute for maize in meeting the carbohydrate needs of Malawians.

Given the perceived advantages of maize production and consumption and in a context of limited land availability, a farmer's decision to plant some of their land in crops other than maize is not taken lightly. In the absence of locally adapted information for both producers and consumers on the benefits of alternative food crops; with weak markets that constrain commercial production of maize also constraining such production of other food crops; and with continuing low maize productivity levels leaving relatively little cropland available for the production of other crops, maize will continue to dominate most smallholder fields, food systems, food policies, and political discourse in Malawi.

Export crops

Although maize production dominates the agricultural landscape in Malawi and food security concerns drive much of the agricultural development planning efforts in the country, export crops also play a significant role in the overall economy. In 2004, export crops were estimated to account for just over one-quarter of Malawi's agricultural GDP and just over 10 percent of total GDP (Benin et al. 2008). Their contribution to Malawi's export earnings is considerably more significant, accounting for 87 percent of Malawi's exports by value between 2015 and 2017 (Malawi, NSO 2020).

TOBACCO

In both 2016 and 2017, about 150,000 tons of tobacco were exported with a value each year of about $540 million. Minimally processed burley and flue-cured tobacco leaf accounted for just over 52 percent of the value of all exports between 2015 and 2017. Tobacco has been the principal cash crop produced in Malawi since quite early in the colonial period, with commercial production starting in the Shire Highlands in the south of the country in the 1890s. It now is produced in most areas of the mid-altitude plateau in all three regions of Malawi, with most intensive production in Lilongwe, Kasungu, and Mchinji districts in the Central region.

After the introduction of tobacco as a cash crop by colonial European planters on their estates, smallholders became involved in its production quite quickly, initially as seasonal tenant farmers on estates. Tobacco production regulations in both the colonial and early independence periods in Malawi privileged estate production of tobacco. But when these regulations were modified to allow increased involvement of smallholders in tobacco production, particularly of fire-cured dark leaf initially and, now, air-cured burley leaf, both of which require little capital investment, the supply response of smallholders was significant (Green 2012b). Thereafter, the historical pattern has been that, as smallholder production began to dominate the tobacco sub-sector, the state would reimpose regulations advantageous to estate production, and production would revert to the estates. Prowse (2013) documents several cycles of this pattern over the past 100 years.

Malawi is in the middle of one such smallholder-dominated tobacco production period now, but this one, which began following the liberalization of tobacco production in the mid-1990s, might be permanent. The sharp uptake in burley tobacco production by smallholders since about 1995 has led to a crisis in the tobacco estate sector, which is no longer able to competitively produce burley in part because estates are unable to obtain sufficient tenant labor to do so. Estates now primarily produce only the more capital-intensive flue-cured tobacco. The annual crop estimates for the period 2013/14 to 2017/18 show that estates produced about 11 percent of the quantity of tobacco produced nationally (but about 48 percent of all flue-cured tobacco). Twenty-five years earlier, in 1990, the same production data series showed that smallholders were responsible for only 13 percent of total tobacco production.

Until quite recently, all tobacco produced in Malawi legally had to be sold bale by bale in a competitive auction system at a handful of auction floors established in tobacco-producing areas of the country, the largest in Lilongwe. However, there have never been more than 10 tobacco firms buying from the country's auction floors, with one or two of them accounting for most tobacco purchases in any year. Consequently, a fundamental concern about the tobacco output market in Malawi has been its oligopsonistic structure and evidence of collusion among buyers on pricing the leaf to the detriment of producers (Otañez, Mamudu, and Glantz 2007; Prowse and Moyer-Lee 2014). In consequence, prices that Malawian smallholder producers receive for their leaf do not closely reflect international tobacco prices.

Since about 2000, the government has increasingly allowed tobacco-buying firms to enter into direct production contracts with smallholder producers—an arrangement called the Integrated Production System (IPS)—rather than being required to purchase their leaf only on the auction floors. Under the IPS, tobacco firms provide inputs and agronomic advice to producers and maintain a high level of control over the production process during the growing season (Moyer-Lee and Prowse 2015). Tobacco firms are motivated to use this system by increasing demands from cigarette manufacturers for traceability of the leaf the firms supply to the manufacturers. IPS sales now dominate in Malawi's tobacco industry—82 percent of the burley crop and 91 percent of the flue-cured crop were sold under the IPS system in 2015. Average prices for burley were 17 percent higher when sold under IPS than when sold at auction, although there is evidence that the tobacco presented to the auction floors was of significantly lower quality (Chirambo 2016). Although smallholder tobacco producers can reliably obtain inputs and advisory services under the IPS contracts, their bargaining power in the marketplace is even more restricted than on the auction floors, because they deal with only one firm.

The proper regulatory role for government in providing oversight of IPS and other contractual relationships within farming of all sorts is an area of ongoing policy debate in Malawi. The Ministry of Agriculture developed a National Contract Farming Strategy in 2016, following several years of discussions (Malawi, MoAIWD 2016a). This strategy proposed a legal framework to better manage contracts and mitigate the risk of noncompliance by either party—the contracted farmer or the buyer—in order to create mutual benefits. It proposed mechanisms involving third-party oversight of dispute resolution between the contracted parties. However, the strategy has not advanced to become a policy upon which a legislative framework could be established. This in part reflects a pessimistic view of contract farming held by many stakeholders in the agriculture sector, particularly their distrust of the international tobacco leaf merchants who have promoted contractual arrangements with smallholder farmers in Malawi very successfully over the past 20 years (Prowse and Grassin 2020). Concerns remain about the organization and costs of fairly implementing the dispute resolution procedures within any legislative framework governing contract farming arrangements.

OTHER EXPORT CROPS

After tobacco, tea and sugar are Malawi's most important exports. Both are primarily produced on estate farms. Tea has been produced for more than a century on three to four dozen estates in high-rainfall areas of Mulanje and Thyolo districts, plus several estates in Nkhata Bay. Most of the tea estates are owned by international agribusiness firms. Sugar is produced on two irrigated, vertically integrated estates owned by the international sugar producer Illovo—one in the Lower Shire Valley in Chikwawa district at Nchalo and the other at Dwangwa on the lakeshore in Nkhotakota district. A third sugar estate began production in 2017 in Salima district. The sugar estates and a few of the tea estates obtain a small part of their cane and green tea from smallholder outgrowers in the vicinity, purchasing both commodities on the basis of seasonally negotiated pricing formulas.

Cotton is produced by smallholders along the lakeshore and in the Upper and Lower Shire Valleys. These producers sell to about a dozen ginners. Cotton has been long been promoted as an export crop for Malawi, receiving considerable government attention beginning early in the colonial period and continuing since independence. During the Kamuzu Banda era, a parastatal textile factory, known as David Whitehead, operated in Blantyre and absorbed a significant share of domestic cotton production. However, the firm closed in the mid-1990s following economic reforms that resulted in increased competition from imported textiles and clothing, particularly secondhand clothing, and has not been able to sustainably restart production since. Cotton prices have been variable over the years, with consequent booms and busts in production. More than with the other export crops, international cotton price swings are transmitted to local producers, because the ginners sell their generally minimally processed product to the international market at those prices. These international price movements, when coupled with variability in production due to weather and pests, result in significant instability in prices, and hence production volumes, from year to year.

The National Export Strategy, formulated in 2012 and revised in 2020, designates oilseeds—particularly soyabean, groundnut, and cottonseed—as one of its three product clusters for generating significantly increased export revenues for the country (Malawi, MoIT 2012, 2020). Of these crops, groundnut has the longest history in Malawian farming systems, produced both for processing into cooking oil domestically and regionally, and for overseas confectionery markets. In the 1990s and early 2000s as aflatoxin contamination regulations limited access to some of Malawi's traditional groundnut export markets, groundnut exports to overseas confectionary markets fell sharply. Efforts have been made since then to address the problem of aflatoxin contamination in groundnut production and processing in Malawi, with some of these efforts supported by investors from the export markets. Malawi has begun reentering those overseas markets. However, there also has been a shift in groundnut export patterns over the past 10 to 15 years, with most exports of Malawi groundnut now going to regional markets in southern and central Africa (Edelman and Aberman 2015).

Soyabean is produced by both smallholders and estates. Subsistence use of soyabean is almost nonexistent. As a cash crop, there is growing demand both domestically and regionally for soyabean from livestock producers for feed, particularly for poultry, and from food producers for cooking oil and other soya products. Over the past decade, the government has occasionally imposed export licensing restrictions on soyabean to safeguard access to local soya at low cost for the domestic poultry industry and cooking oil processors. Because these interventions have constrained exports, the average annual value of soyabean exports from Malawi has been variable. Although soyabean exports were valued at over $19 million in 2017, in the two years prior, their export value did not exceed $9 million per year (Malawi, NSO 2020).

More minor export crops include pigeonpea, which is grown by smallholders primarily in southern Malawi and is sold into the South Asia market through Blantyre-based processors, and macadamia nuts, grown primarily on tea estates as a secondary crop. Coffee also is exported from a few estates in the south and several thousand smallholder producers in the Northern region, but the subsector is not growing significantly.

Fertilizer

Sustainable soil fertility management is a long-standing and intensifying challenge to improving crop production in Malawi. For subsistence-oriented smallholder farming households, the declining fertility of their cropland also increasingly undermines their food security. Considerable research has been done over more than 50 years to identify maize-legume crop rotation, intensive intercropping, green manure, or agroforestry-based cropping systems that are effective in maintaining adequate plant nutrient levels in the soil; do not exacerbate the labor, land, or financial constraints that smallholder farmers in Malawi face; are commercially viable; and consistently meet the dietary needs of these households. Although important insights have been gained on how such primarily organic approaches to soil fertility management perform, significant uptake of such alternatives to the dominant maize cropping system (with some intercropping) has not occurred. None has consistently proved superior to the use of inorganic fertilizers across the performance metrics noted.

In consequence, inorganic fertilizer is viewed by most farming households in Malawi as critical to realizing improved livelihoods from their farming activities and to assuring their own food security. Moreover, ensuring that all smallholder farmers have access to fertilizer consistently figures in the election platforms of political candidates in Malawi. For the country's political leaders, access to inorganic fertilizer for Malawi's farming households has been one of the most important issues over the past 30 to 40 years, and for the past 15 years, a significant share of the annual government budget has gone to subsidizing fertilizer for smallholder farmers.

Crop response to fertilizer

In the precolonial and early colonial periods, smallholder agricultural systems in most areas of Malawi relied on shifting cultivation or crop-fallow systems for sustainability. Land was opened for production for several years, and when crop yields declined, new uncropped land in the vicinity was brought into production. The depleted land was left in fallow for many years, allowing crop nutrient stocks to rebuild (Allan 1965). However, the population of Malawi has increased significantly over the past century. In consequence, this land-extensive method for sustaining crop productivity is no longer practiced to any significant extent—there is simply not enough land in Malawi to do so. Households generally farm the land to which they have use rights every year, using family labor and low levels of other inputs. Given the strong subsistence orientation of most producers, the farming landscape in Malawi is dominated by maize, which is consumed in the household.

As a result, farmers remain cash-poor and unable to purchase inorganic fertilizer to improve their crop yields. Over the generations, most of the plant nutrients in the soils, particularly nitrogen, have been mined out through the growing of repeated maize crops, resulting in low crop productivity levels of around 1.0 tons/ha for unimproved local maize varieties grown without fertilizer.

Few farmers practice crop rotations that alternate maize with grain legumes—principally groundnut, pigeonpea, and soyabean—crops which fix atmospheric nitrogen and make it available through the crop residue to subsequent crops on the same plot. Although such rotations sustain soil fertility better than continuously monocropped maize, output markets for both maize and grain legumes remain too uncertain for most farmers. Because farmers cannot be confident that they will be able to purchase the maize that their households require during the grain legume period of such a crop rotation with the proceeds from the sale of their grain legume harvest, many choose to avoid that market risk and devote their land to continually producing the maize their household needs (Dorward et al. 2009). Another common method used globally to manage crop nutrient levels in agricultural soils, the manuring of fields, is similarly problematic in the Malawi context given the relatively small numbers of livestock. Most of the land that could be used for pasture is already being used for crops. With limited use of crop rotations by farmers and few other organic sources of plant nutrients, such as manure or agroforestry species, nitrogen, the soil nutrient most needed by maize, has become the principal constraint to increased maize production. Urea fertilizer, particularly, is an effective solution to this constraint.

This view of inorganic fertilizer as a central tool for raising agricultural productivity in Malawi has a relatively long history. The colonial government provided farmers with subsidized fertilizer starting in 1952 to improve the quality and yields of tobacco and to raise maize productivity so that land could be freed for legumes in rotation (Kettlewell 1965). Efforts to increase the uptake of fertilizer, including fertilizer subsidies, were part of the policy of the government of Kamuzu Banda, both to accelerate estate-led production of cash crops and for broader food security objectives. Fertilizer has remained a central policy concern for all subsequent governments.

Extensive research programs on fertilizer response in maize were conducted in the late 1950s and early 1960s (Brown 1966) and again in the mid-1970s (Bolton and Bennet 1975). The most recent national effort evaluating maize yield response to fertilizer was done in the 1995/96 and the 1997/98 cropping seasons under the Maize Productivity Task Force of the Ministry of Agriculture

(Benson 1999). Researchers from the Chitedze Agricultural Research Station outside of Lilongwe worked with all field-level extension agents across Malawi to conduct a demonstration of fertilizer response in hybrid maize on farmers' fields. Each extension agent worked with a local farmer to plant small plots of hybrid maize to which different amounts of fertilizer were applied. The extension agent monitored the plots, collecting data throughout the growing season and at harvest. These data were used in an analysis to develop area-specific fertilizer recommendations for hybrid maize grown under smallholder farming conditions in Malawi. The aim of this research was to assess what response levels could be obtained on farmers' fields under good management.

Table 3.3 shows the hybrid maize yield response to the application of inorganic nitrogen fertilizer, together with smaller amounts of sulfur and phosphorus, obtained across the two years of this demonstration program. The maize yield response patterns shown in Table 3.3 generally make sense. The highest responses are seen in the high-potential areas of the mid-altitude plateau in the Central region—Lilongwe and Kasungu agricultural development divisions (ADDs). The lowest responses are seen in the Shire Valley ADD in the far south of Malawi due to the area's rich, alluvial soils that are not as responsive to fertilizer as are upland soils, and to the area's cropping conditions, which are more variable from year to year than elsewhere in Malawi, with both floods and droughts frequently reducing the size of harvests.[4]

However, these response rates reflect the upper bounds of the responses that can be obtained under smallholder cropping conditions. The 1995/96 and 1997/98 nationwide trials were designed to reflect the potential maize productivity levels that smallholder farmers could achieve using fertilizer under good crop management and on reasonably good soils. The design of the trials necessarily sought to eliminate many of the crop management, plot siting, and pest and disease factors that might significantly reduce maize yield response to fertilizer. The protocols for implementing the demonstrations instructed the extension agent to work with an experienced farmer. That farmer was to identify an area of his or her fields that was as optimal as possible for maize production; for example, no evidence of termite or *Striga* (witchweed) infestation, not subject to flooding, not exposed to theft or wild animals, and so on. Moreover, the crop was to be managed reasonably closely, with timely planting, timely application of fertilizer in two doses, and at least two weedings.

4 In addition to these spatial patterns, the maize yield response to fertilizer declines at higher rates of fertilizer application, a pattern which is typically found with fertilizer application.

TABLE 3.3 Average hybrid maize yield response to inorganic fertilizer applied to plots on farmers' fields in Malawi, 1995/96 and 1997/98 cropping seasons, by Agricultural Development Division

Agricultural Development Division	Maize grain yield (adjusted), kg/ha				Nitrogen (N) response, kg maize/kg N applied			Overall fertilizer response, kg maize/kg fertilizer, average	Number of sites	
	Application rate, kg/ha	35:10:0+2S	69:21:0+4S	92:21:0+4S	35:10:0+2S	69:21:0+4S	92:21:0+4S		1995/96	1997/98
MALAWI	1,281	2,194	2,719	3,041	26.1	20.9	19.1	7.8	1,680	1,408
Karonga ADD	1,470	2,270	2,677	2,899	22.9	17.5	15.5	6.6	116	106
Mzuzu ADD	998	1,873	2,488	2,853	25.0	21.6	20.2	7.9	250	217
Kasungu ADD	1,197	2,163	2,780	3,092	27.6	22.9	20.6	8.4	211	186
Lilongwe ADD	1,273	2,292	2,847	3,188	29.1	22.8	20.8	8.6	312	255
Salima ADD	1,375	2,290	2,838	3,179	26.1	21.2	19.6	7.9	130	102
Machinga ADD	1,124	2,073	2,577	2,887	27.1	21.0	19.2	7.9	280	208
Blantyre ADD	1,427	2,358	2,907	3,252	26.6	21.4	19.8	8.0	241	206
Shire Valley ADD	1,713	2,393	2,636	2,904	19.4	13.4	13.0	5.4	140	128

Source: Adapted from Benson (1999).

Note: Fertilizer application rates are based on the application of urea (46:0:0 (N:P_{205}:K_{20})) and 23:21:0+4S fertilizers in units of 50 kg bags to a 1 ha area—that is, 35:10:0+2S, 1 bag of each for 100 kg/ha total; 69:21:0+4S, 2 bags of each for 200 kg/ha total; and 92:21:0+4S, 3 bags urea and 2 bags 23:21:0+4S, for 250 kg/ha total. Response rates are calculated as (maize grain yield at level of fertilizer applied – yield without fertilizer) per kilogram of nitrogen applied for the nitrogen response, or per kilogram of fertilizer applied for the overall fertilizer response. Measured plot yields were adjusted downward by 26 percent to better reflect likely yields on farmers' fields under similar good, but not so intensive, agronomic management and to account for the high moisture content in the recently harvested grain when it was weighed. The data labeled "response, kg maize/kg N applied" do not reflect exclusively a response in grain yield to the application of nitrogen, but also responses to phosphorus and sulfur. As such, the figures overestimate the response to nitrogen to a small degree. ADD = Agricultural Development Division (subnational agricultural extension planning unit).

The maize yield responses to fertilizer presented in Table 3.3 are considerably higher than those estimated from data collected through farm household surveys, particularly those that have been done as part of evaluations of FISP. Maize yield response to fertilizer is central to any cost-benefit analysis of FISP because the yield response is the basis for the benefits of the program against which the costs of providing the subsidized fertilizer and improved seed are evaluated. Drawing upon three years of data collected from just under 3,000 households over three cropping seasons in which FISP or the earlier Targeted Input Subsidy Program was implemented, Lunduka, Ricker-Gilbert, and Fisher (2013) computed a response rate of 2.71 kg of grain per kilogram of subsidized fertilizer applied—a response rate just over one-third of that observed in the 1995/96 and 1997/98 nationwide trials (Table 3.3). Although the authors found considerable variation across farm households in response rates, using this mean response level with commercial maize prices to gauge the benefits of FISP against program costs over its first four years, they found that the costs of the program were greater than the benefits obtained in three of the four years.

In a review of input subsidy programs across 10 African countries including Malawi, Jayne and colleagues (2018) found a significant difference between the rates of response to fertilizer that farmers *may* get, based on maize fertilizer trials on-farm, and those that they *do* get, based on farm household surveys. The authors found that the on-farm fertilizer trials in the 10 countries showed yield responses equivalent to between 6 and 13 kg of maize per kilogram of fertilizer, whereas farm household surveys demonstrated much lower efficiencies, of between 2 and 9 kg of maize per kilogram of fertilizer applied, with most farm households obtaining less than 5 kg of maize per kilogram of fertilizer. This substantial difference between actual and attainable maize yield responses to fertilizer is due to the various resource constraints that smallholder farming households face, including access to quality seed and fertilizer in sufficient amounts before the time of planting, control of pests and disease, timely and adequate crop management operations, and information on making optimal use of fertilizer on their crops under the particular growing conditions they face. Malawi is not unique in this regard.

Nonetheless, the response levels computed from the 1995/96 and 1997/98 nationwide trials in Malawi indicate the levels of maize yield response to inorganic fertilizer that are potentially achievable by those commercially oriented smallholder farming households that are able to surmount the various resource constraints enumerated.[5] Farmers who are experienced and have good farming knowledge; have access to reasonably good land; obtain hybrid seed and inorganic fertilizer before the planting rains come; can manage the weeds, pests, and diseases that threaten their maize crop; and are able to apply labor to the crop when required as it grows should be able to obtain yield responses from their use of inorganic fertilizer that approach those shown in Table 3.3. Although many farm households in Malawi cannot now combine all of these factors to generate these maize yield responses from their fertilizer, responses that approach such levels should be expected by commercially oriented farmers seeking to maximize their returns from investment in inorganic fertilizer.

As a target for initiatives to improve maize productivity in Malawi, a doubling or more of maize yield responses obtained by smallholder farmers should be possible. This would require significant investments in both public and private agricultural extension services and strengthened input supply systems. And even then, it cannot be assumed that it would make financial sense for commercially oriented smallholder farmers to apply fertilizer to their maize if the costs of fertilizer are high relative to the price they will receive for the maize they produce using that fertilizer. Much more reliable maize and agricultural input markets in Malawi are needed. The weak performance of Malawi's maize markets is discussed in the next chapter.

Organic approaches to sustainable soil fertility management and intensification of smallholder cropping systems in Malawi

Given the substantial financial costs that smallholder farming households must shoulder to use commercial inorganic fertilizer, considerable research has been done in Malawi since the late 1980s exploring how smallholder farming households might substantially increase their use of organic sources of plant nutrients,

5 However, in using these results from 25 years ago to guide the design of policy or programs today or to assess the likely impact of inorganic fertilizer use on national or household food security, changes in aspects of fertilized hybrid maize production under good management in Malawi should be recognized. These changes might include the following:

- Improvements in the performance of the hybrid maize varieties smallholder farming households plant. These might include varieties with improved nutrient use efficiency or those that are better able to manage water stress, seasonal changes in the length of the growing season, or increased (or new) pest and disease pressures.
- Increased variability in rainfall due to climate change.
- Increased significance of deficiencies of plant nutrients other than nitrogen, phosphorus, or sulfur, such as zinc or potassium, that limit maize productivity. Deficiencies in these nutrients may emerge through continuous cropping without nutrient inputs, which depletes soil nutrient stocks, or through soil erosion.

particularly from nitrogen-fixing legumes, to increase crop yields, particularly for maize. Among the approaches that have been examined are:

- Rotations with grain legume crops, particularly groundnut and soyabean (Gilbert 2004; Bezner-Kerr et al. 2007; Chimonyo, Snapp, and Chikowo 2019)
- Intercropping maize and shorter-season grain legumes with longer-duration leguminous species, particularly pigeonpea (Adu-Gyamfi et al. 2007; Smith et al. 2016; Chikowo et al. 2020)
- Green manure crops, particularly *Mucuna pruriens* (velvet bean), with incorporation of the biomass produced (Gilbert 2004; Robertson et al. 2005)
- The traditional system of planting annual crops under *Faidherbia albida* trees (Saka et al. 1994)
- Relay cropping or row intercropping (alley cropping) of maize with various leguminous shrubs, including *Sesbania*, *Gliricidia*, *Leucaena*, and *Senna* species, among others, again with incorporation into the soil of the biomass from the shrubs (Jones et al. 1996; Phiri, Snapp, and Kanyama-Phiri 1999; Ikerra et al. 2001; Akinnifesi et al. 2008; Coulibaly et al. 2017)

A central element of all this research, done both on-farm and on-station, has involved comparing the performance of the organic technologies against that of control plots of maize without fertilizer and maize with fertilizer at recommended application rates. These comparisons have focused particularly on the effect of these technologies on the maize yield, paying less attention to several other benefits of organic soil fertility management approaches. Among these benefits are, most notably, improved soil health (primarily due to increased soil organic matter of higher quality) compared with what can be realized with inorganic fertilizer alone, and when grain legumes are a component of the technology, crop and dietary diversity. Most of the technologies, particularly when employed with close attention to management of the biomass produced by the nitrogen-fixing species involved, provide significantly higher maize yields than those obtained at the same site from the unfertilized maize control plots. The nitrogen and organic matter that they add to the farm plots generally result in increased yields of maize and other crops in such cropping systems, with these yield benefits increasing somewhat over time. If employed in an attentive manner and if their use by farming households is not constrained by labor or land shortages, the technologies can contribute to increased maize production.

However, the organic approaches do not consistently provide higher yields than are observed on the fertilized maize control plots, with most research showing that fertilized maize yields are statistically significantly higher than yields of maize grown using the organic systems without fertilizer. This is not surprising. First, the amount of nitrogen that is fixed annually by the legumes generally is less than the recommend nitrogen application rates for maize. Second, biomass management is critical to the performance of these organic technologies—if the biomass is not quickly incorporated into the soil, its quality for soil amendment purposes degrades. Unincorporated residues are often grazed by livestock or burned in preparing for the next crop, and thus supply virtually no nutrients or organic matter to the soil. In addition, with green manure crops or row intercropping within the dominant hoe cultivation systems smallholder farmers employ, incorporating the residue requires considerable labor. As with the use of inorganic fertilizer, making profitable use of these organic technologies to increase the productivity of their crops requires that farmers have considerable knowledge and experience.

Over the past 15 years, conservation agriculture farming systems have been widely promoted and researched in Malawi. These involve a combination of several different land and crop management approaches, including limited tillage, the maintenance of soil cover, and diverse crop mixes with intercropping or crop rotations that include legumes. Such systems can improve soil quality through nitrogen fixation and increased incorporation of organic matter, suppress weed growth, protect the soil from erosion, and improve water and nutrient use. Although inorganic fertilizer certainly can be a part of such systems, organic soil fertility management approaches are more commonly used. These include some of the organic approaches to sustainable soil fertility management noted. Compared with unfertilized maize, conservation agriculture systems generally have been found to improve agronomic performance after several years of implementation. However, the economic performance of conservation agriculture systems as a whole is more problematic (Jew et al. 2020), and adoption rates are low even following promotion efforts (Thierfelder et al. 2017; Chinseu, Stringer, and Dougill 2019). The high labor requirements for implementing some components, the multiyear time horizon to realize productivity benefits,[6] and the need for location-specific modifications to the set of practices used have all been identified as significant barriers to farmer uptake of conservation agriculture (Giller et al. 2009; Corbeels et al. 2014).

Consideration of how smallholder farmers in Malawi might best deploy both organic soil fertility management technologies and inorganic fertilizer is pertinent to global discussions around sustainable intensification of agricultural systems that have been going on over the past 10 to 15 years. "Sustainable intensification" is defined as the adoption of processes that increase agricultural yields without adverse environmental impact and without bringing more land into production (Royal Society 2009). While this concept says nothing about how it will be achieved (Pretty and Bharucha 2014), in practice sustainable intensification has most commonly been advocated in discussions around safeguarding the provision of the full set of environmental services wherever agriculture is practiced, going beyond sustainable crop yields alone. Consequently, organic approaches generally are privileged in discussing how soil fertility management practices might contribute to sustainable intensification processes.[7]

However, given the significant impact of smallholder productivity levels on national food security, raising crop yields is the most important goal for agricultural transformation in Malawi. Better yields are also critical to achieving other sustainable intensification goals within Malawi's agriculture sector. However, organic approaches to soil fertility management alone are unlikely to sufficiently raise crop yields in smallholder farming systems in Malawi. Making efficient and profitable use of these organic approaches for field crops requires farmers to surmount significant knowledge barriers and make often limited labor available at specific times. Without site-specific knowledge built through farmer experience and experimentation or obtained through advice from agricultural extension experts, the risk is high that adopting farmers

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6 Particularly green manure crops and row intercropping require that farmers accept the proposition that in the medium term they will receive more maize or other food crop production in aggregate by devoting all of a plot for a season (green manure) or part of their plot continuously (row intercropping) to complementary crops than they would if they used the plot solely for maize or other food crops. Given the high risk of food insecurity that many farm households in Malawi face, their limited landholdings, and the weak markets upon which they would need to rely for food in the interim, most choose not to dedicate some of their cropland to these types of organic systems of soil fertility management that interrupt the supply of maize from their farm plots.

7 There is debate in the agricultural and related sciences literature about the definition and scope of sustainable intensification, with many commentators finding the concept highly ambiguous and one that can be used to justify any agricultural development goal. See Tittonell (2014) and Petersen and Snapp (2015), among others.

will realize poor crop harvests (Jayne et al. 2019). With insufficient labor, farm households may find that the labor they did dedicate to these organic approaches could have been more profitably employed on other tasks, whether within or outside of agriculture.

The situation with inorganic fertilizer is similar. As discussed, most smallholder farming households across Malawi realize far lower maize yield responses than they could achieve if they could make more effective use of the input. Among the barriers they must surmount are difficulties in accessing information on and building experience with how best to use the fertilizer they obtain for the specific crops they grow on the particular soils they farm (Kopper, Jayne, and Snapp 2020), with the added challenge—insurmountable for many farm households given their income levels—of accessing commercial fertilizer.

The two approaches to soil fertility management—organic or inorganic—are not mutually exclusive. Although both are problematic for many farming households to employ, both are needed for any sustainable intensification of smallholder agricultural production in Malawi.

Fertilizer subsidies

The potentially achievable maize yield responses to the application of inorganic fertilizers justify the government's repeated focus on increasing access to inorganic fertilizer as both a food security strategy and an agricultural development strategy for Malawi. Even if the average farmer cannot achieve the response rates obtained in the national demonstrations (more than 7 kg of maize per kilogram of fertilizer applied), achieving even half that response is attractive from a food security perspective. If managing any food crisis resulting from low production might require imports of maize grain, most policymakers accept the argument that it makes more sense to import one bag of fertilizer rather than import the three or four bags of maize that were not produced because a farmer did not have access to that fertilizer.

However, for many farmers, the high cost of inorganic fertilizer prevents them from increasing their maize yields. Although credit could allow farm households to purchase inorganic fertilizer when they do not have income from other sources, credit is not readily available for maize production in Malawi. Given the uncertainty of rainfed agriculture, the thin maize markets, the consequent significant volatility in maize prices, and the restricted asset base of most smallholder farmers, formal credit is effectively not available. Currently no formal credit institutions primarily oriented toward agriculture operate in Malawi at a large scale.

Consequently, supplying fertilizer directly to farmers at significantly below cost has been the solution repeatedly adopted by the government to assure sufficient maize production in the country. Fertilizer subsidies were part of the policy of the colonial government in the post–World War II period and that of the first president of independent Malawi, Kamuzu Banda. The Muluzi government, the first in Malawi's multiparty era, ended fertilizer subsidies in the mid-1990s as part of a market liberalization package advocated by Malawi's development partners. However, with declining maize production and an emerging food crisis, the Starter Pack input subsidy program was implemented in the late 1990s, which provided all smallholder farmers for free with small packs of fertilizer and improved seed sufficient to plant 0.1 ha. Then, following a food crisis in 2005, the Bingu wa Mutharika government introduced a significantly scaled-up program, FISP. This initially targeted about half of all smallholder farming households in Malawi to provide them

BOX 3.1 Justification for the scale of Malawi's Farm Input Subsidy Program

In Malawi, it is estimated that at least 80 kg of plant nutrients are lost from each hectare planted in crops each year through harvest, removal of remaining crop residues, and erosion (Elwell and Rook 1996; Henao and Baanante 1999). Organic sources, including manure and leguminous crop residues, are estimated on average to annually replenish 8 kg, resulting in a net loss of 72 kg of crop nutrients per hectare. The Farm Input Subsidy Program (FISP) package for maize includes 50 kg of the principal basal fertilizer (23:21:0+4S—applied immediately after plant emergence) and 50 kg of the main top-dressing fertilizer (urea 46:0:0—applied four weeks after basal fertilizer application). This provides 46 kg of plant nutrients on the average agricultural landholding of 0.65 ha and allows production levels of around 1.75 tons/ha to be maintained, assuming that each kilogram of fertilizer will result in 5 kg of additional grain above a base unfertilized maize yield of 1.0 tons/ha.

However, the higher national maize production levels needed to meet the staple food requirements of Malawi's growing population and to contribute to economic structural transformation will result in increased annual crop nutrient losses through harvesting and, consequently, require higher levels of fertilizer application to sustain. The National Agriculture Policy (Malawi, MoAIWD 2016b) sets a maize production target for the country of 4.0 tons/ha. The 2.25 tons/ha increase in average maize yields sought above those that can be attained under the FISP package described will require the additional application of between 120 and 200 kg of nitrogen per hectare. To sustainably achieve 4.0 tons/ha maize yields, the application per hectare of a package of 3 bags of 23:21:0+4S, 50 kg each, and 6–10 bags of urea, depending on the with sufficient inputs to produce 0.5 ha of fertilized maize, with beneficiaries responsible for paying only about 35 percent of the cost. The technical arguments for the design of FISP and the size of the inputs package offered to beneficiaries are sketched out in Box 3.1. Although there were reforms to the FISP between 2014 and 2020 under the A. Peter Mutharika government, which involved some reduction in its scope and in the size of the subsidy provided to beneficiaries, following the inauguration of the new Chakwera government, an expanded program, the Affordable Inputs Programme, was instituted for the 2020/21 cropping system.

The core of FISP is the provision of 100 kg of fertilizer and 10 kg of hybrid maize seed to beneficiaries, inputs generally sufficient to produce 0.5 ha of maize. The principal beneficiary selection criterion established early in the program was that recipients be resource-poor (unable to use their own resources to access unsubsidized inputs) but productive farmers. Excluded

fertilizer use efficiency the farmer attains, would be required. These are fertilizer application levels comparable to those used in South and East Asia, where there has been significant growth in crop yields over the past 50 years resulting in part from use of heavily subsidized fertilizer.

In the context of Africa, the FISP fertilizer package is considered ambitious. However, although there has been considerable discussion of the fiscal sustainability of FISP and recurrent calls for a much smaller program, the agronomic evidence on the nutrient inputs required to sustain production levels that meet maize demand in Malawi shows that a larger-scale fertilizer subsidy program could be justified in the absence of other efforts to make full-market-cost fertilizer use on maize a profitable financial proposition. Farmers need to be in a position to access and efficiently use inorganic fertilizer to manage soil fertility on their fields in a manner that replenishes annual nutrient losses and propels maize productivity toward the government's target of average maize yields of 4.0 tons/ha. Particularly if the fertilizer is used significantly more efficiently by beneficiaries, an enlarged fertilizer subsidy program would enable them to reach this target.

However, an enlarged program would exacerbate the important opportunity costs that Malawi now is bearing with FISP in terms of addressing the many other development challenges the country faces. Moreover, further entrenchment of FISP will forestall needed market reforms and other efforts necessary to make the use of fertilizer at full market cost a profitable financial proposition for smallholder maize farmers.

Source: Adapted from Carr (2014).

from the group of FISP beneficiaries were both the poorest and wealthiest 20 percent of farm households, with the program targeted to reach the 60 percent of smallholder farming households in the middle. Community targeting involving local traditional authorities and community committees has been used to identify beneficiaries. Later, considerations of vulnerable households were brought into the targeting decision, adding social protection objectives to the initial production focus of FISP. Beneficiaries are provided vouchers that they can use to obtain fertilizer and seed from private agrodealers at a subsidized price.

The most complete information on the scale of FISP is for the period covering the 2005/06 to 2011/12 cropping seasons (Chirwa and Dorward 2013). Over this period, the program reached between 50 and 80 percent of smallholder farming households, depending on the year—averaging 1.6 million beneficiary households. Most assessments of the performance of the program find that it has been poorly targeted, with smallholders across all welfare levels accessing the input subsidies (Nkhoma 2018). On average, 165,000 tons of subsidized fertilizer were sold each season. The overall subsidy received by farmers ranged from 64 to 93 percent of the market price for the inputs. The average net cost borne by government per year for FISP over this period was just over $115 million, but this rose to $214 million in the 2008/09 program year due to a spike in fertilizer prices on international markets. Annual costs between the 2005/06 and 2011/12 cropping seasons represented an average of 55 percent of the government's annual budget for agriculture, 8.8 percent of the total government budget, and 3.5 percent of Malawi's GDP. The input subsidy program remains the largest government project in Malawi's agriculture sector.

FISP has contributed to improving national food security simply through increasing maize production. However, all independent assessments conclude that the program could be implemented in a more efficient manner and achieve significantly broader impact, particularly at farm level. As discussed above, the levels of maize yield response to fertilizer found in evaluations of FISP are significantly lower than what can be achieved on smallholder maize plots in Malawi under good management. The opportunity costs associated with this inefficiency in program implementation at farm level are significant. Lunduka, Ricker-Gilbert, and Fisher (2013) computed the benefit-to-cost ratios for the program to be less than 1.0, meaning that costs exceeded benefits, in three of the four years of program implementation examined (2005/06 to 2008/09). Using more optimistic estimates of the maize yield response to fertilizer on the plots of FISP beneficiaries, Chirwa and Dorward (2013) estimated an overall benefit-to-cost ratio of 1.09 for FISP over the six years from 2006/07 to 2010/11—somewhat greater direct benefits than costs.

When indirect, second-round economic effects of FISP are brought into the computation of benefits, larger positive net benefits are obtained. These benefits are linked to the increased economic activity, lower food prices, and increased demand for labor that the program fosters. Using a computable general equilibrium model of Malawi's economy, Arndt, Pauw, and Thurlow (2016) calculated that these indirect benefits increase the total benefits that can be attributed to FISP by about 60 percent, boosting their estimate of the benefit-to-cost ratio of the program from 0.99 (meaning that costs slightly exceeded direct benefits) to 1.62 when indirect benefits are included.

However, there is no strong evidence that even when these second-round benefits of FISP are included, the impact of the program on the well-being of farm households, the development of the agriculture sector, or national food security is superior to that which might be achieved through allocating the resources put into FISP toward other immediate objectives, such as improved rural transport and communication infrastructure, agricultural research, or improved advisory services for farmers, among others. The high costs, obvious technical inefficiencies, and some evidence of politicization in the implementation of the FISP program have led to increased questioning of whether this is the best use of the significant public resources allocated to the program. Recognizing the potentially important opportunity costs for the overall development of Malawi associated with the inefficient implementation of FISP, coupled with a fiscal crisis for the government linked to withdrawal of donor financial support due to concerns about mismanagement, the government made reforms to the program starting in 2015/16 (Nkhoma, Bosman, and Eduful 2019). These included reducing the number of annual beneficiaries, from around 1.5 million farming households to 900,000, as well as the amount of subsidy farmers receive. These changes reduced the cost of the program significantly—the average annual government budget for FISP for the 2016/17 to 2018/19 seasons was just under $50 million, or less than half of the average annual net costs incurred by the program between 2005/06 and 2011/12.

But Malawi's political leaders have little interest in eliminating such input subsidy programs altogether. Absent compelling and broadly recognized reasons for doing so, sharply downscaling or eliminating the fertilizer subsidy program would weaken their political support (Dionne and Horowitz 2016; Nkhoma 2018). In the presidential campaign in early 2019, all major political parties confirmed that they would, if their candidate were elected, maintain fertilizer subsidies for farmers, and several parties stated that they would make the subsidy program universal with only minimal targeting. For the 2020/21 cropping season, the new Chakwera administration implemented an expansion of the FISP, the Affordable Inputs Programme, that provided subsidized inorganic fertilizer and cereal seed to 3.5 million smallholder farming households.

In the short term, the principal justification for such input subsidy programs is food security. Given its political importance, any plans to eliminate or sharply reduce the current scale of the input subsidy program would face significant political challenges. Increasing political support for a significant reduction in the scale of the input subsidy program would require a clear demonstration of how the smaller modified program would improve access to food for Malawi's vulnerable households.

The cost of FISP per delivered ton of fertilizer in 2011/12 was about $950. The costs to the World Food Programme of delivering 1 ton of imported maize to beneficiaries in rural Malawi are reportedly about $600, based on maize import parity prices in the range of $350 to $450 (WFP 2014). Assuming 5 kg of maize output per kilogram of fertilizer applied, it would cost $3,000 to import the amount of maize equivalent to what 1 ton of fertilizer supplied through FISP would produce. The economics of fertilized maize production are driven by the price ratio of fertilizer to maize, and the agronomic efficiency through which farmers convert the nutrients in the fertilizer into grain. Under current price patterns and farming systems, fertilizer subsidies remain the principal way in the near term for the government of Malawi to assure national food security, reduce its dependence on international humanitarian assistance for famine relief, and (partially) address degradation of the soils on which the country depends for its food. However, a fertilizer subsidy program is not a strategy for sustainable agriculture-sector growth or for comprehensively addressing chronic food insecurity.

Sharply scaling back the government's input subsidies to engage in a program of more sustainable agricultural development that will better ensure Malawi's food security will be challenging. Such a program would entail higher, but overall less volatile, maize prices to provide incentives for increased commercial production that would be channeled to consumers through more reliable maize markets. Given the price shocks this would entail to the welfare of many households, increased food aid and almost certainly an expansion in social protection programs would be required during the transition, even as significantly larger investments are being made in agricultural research, in expanded extension services, and in market and transportation infrastructure.

However, it also is important to recognize that fertilizer subsidies as a strategy to improve food security are dependent upon good rains. Food aid is generally not needed in Malawi following good rainy seasons. Since the 2012/13 cropping season, each year Malawi has seen large numbers of people vulnerable to food insecurity due to local droughts or floods, particularly in the Southern Region of the country, and significant efforts have been required to meet their food needs. This has been the case despite the $50 million or more spent annually by the government to support FISP. Although input subsidy programs may help in bridging structural food deficits in years of normal rainfall, such programs are not an effective way to manage the acute food insecurity that arises under poorer cropping conditions.

Increasing commercial purchases of inorganic fertilizer by smallholders should be the longer-term objective if use of fertilizer is to contribute to increased maize production for food security. However, doing so is problematic. All economic analyses over the past 20 years have demonstrated that there is little financial sense in a farmer using fertilizer on maize produced solely for commercial sale, and not for home consumption (Benson 1999; Darko et al. 2016). Malawian farmers cannot purchase the fertilizer they need with confidence that they will be able to pay for its full cost out of the proceeds from the sale of the maize produced. The price of maize, in real terms, will need to make commercial fertilized maize production profitable for Malawian farmers. But of course, any efforts by government to increase real prices for maize in order to improve the economics of fertilized maize production would almost certainly face intense political opposition given that the majority of Malawians are net purchasers of maize. However, viable alternatives to subsidizing fertilizer to maintain higher levels of maize production in Malawi in the short term are not obvious. As will be discussed in the next chapter, critical reforms are needed to improve the performance of Malawi's maize markets and to increase price stability in those markets before commercial production of fertilized maize without any fertilizer subsidies will be a significant component of the food security of the country.

Moreover, whereas the large fertilizer subsidy programs that have been implemented in Malawi off and on since the mid-1990s often have been justified in other terms, including to allow farmers to experiment with commercial inputs and to provide a social safety net for vulnerable rural households, the political rationale for these subsidies has been to ensure national food security and the household food security of beneficiaries. In their comprehensive review of the experience of Malawi with fertilizer subsidies, Chirwa and Dorward conclude that a principal, if not the primary, driver for their use is "widespread understandings among the Malawian population that fertilizers are critical to food security, that this is dependent on food self-sufficiency, and that the government has an active responsibility in ensuring food self-sufficiency and hence in enabling widespread fertilizer access" (2013, 70).

Public resources are used to overcome the problematic economics of fertilized maize production in Malawi. If conditions are right, the short-term food security of the nation may be bolstered in doing so. However, this has been done at the expense of the medium-term development of deeper agricultural markets for inputs, outputs, and credit. Consequently, it is difficult to see an easy exit from a continued reliance on large fertilizer subsidies if Malawi's markets remain underdeveloped. Strong markets are needed to effectively induce sufficient production of maize and other crops by Malawi's farmers to meet the consumption needs of Malawi's consumers at reasonable prices.

Irrigation

Despite significant surface and groundwater resources, most of Malawi's agricultural production is rainfed—only about 10 percent of the maize produced in the country between 2013/14 and 2017/18 came from irrigated plots (Table 3.2). Almost all the rain that Malawi receives falls over the five months from December to April, with most fields left uncropped throughout the rest of the year. Although substantial investments have been made in engineered irrigation schemes both for large-scale commercial purposes, particularly sugar production, and for smallholders, most irrigated crop production by smallholders generally involves very small-scale production in the dry season in local *dambo* wetlands and along the banks of streams using manual water supply systems to supplement residual soil moisture.

Of the 2.5 million ha of land estimated as being farmed in Malawi, just over 100,000 ha was estimated to be irrigated in 2015. Of this area, 37,000 ha is farmed by smallholders using manual water supply methods; just under 20,000 ha is farmed by smallholders in engineered irrigation schemes, most of which are small; and the balance of 48,000 ha of irrigated land is found on estate lands, with the two principal sugar estates in Malawi accounting for more than 70 percent of estate land under irrigation (SMEC 2015a). In 2011, it was estimated that only 0.5 percent of all crop plots in the country were irrigated (Malawi, NSO 2012). The analysis for the 2015 National Irrigation Master Plan and Investment Framework assessed the potential irrigation area for the country, based on available water, at just over 400,000 ha. However, irrigation development is capital intensive. The average cost of development for the 43 new projects prioritized under the master plan is projected to be $5,300 per hectare (SMEC 2015a).[8]

Most analysts recognize the potential for expansion of irrigated farming in Malawi to contribute to increased food crop production, significant increases in income (SMEC 2015b), and enhanced welfare for the households involved (Benson 2015). However, most assessments also highlight that formal smallholder irrigation schemes, in particular—as opposed to informal irrigated plots operated on an individual basis or irrigation on commercial estates—cannot be operated profitably and sustainably without close management and clear understanding of the economic opportunities that irrigated farming in Malawi offers, as well as the limits on those opportunities. The economics of sustainable irrigated farming in Malawi are challenging. To be profitable, whatever crops are grown must provide sufficient returns to cover the operating and maintenance costs of the irrigation infrastructure, the costs associated with effective scheme management in communal irrigation schemes, and the basic costs of production and marketing. Profitability will be determined by the choice of crops, the productivity of irrigated farming, the number of crops that can be harvested annually, and the access that farmers have to both the commercial inputs they require and sufficiently large output markets (SMEC 2015b).

In general, staple food crops have not been a good choice for smallholder irrigation schemes in Africa (Inocencio et al. 2007). In the case of Malawi, the price of maize grain is determined by the supply of rainfed maize, which under good management and with good rains can attain productivity levels similar to those of irrigated maize. Production of irrigated maize for grain is financially advantageous only in poor-rainfall seasons, which remain difficult to predict, or when grown in the dry season following a poor rainfed season for maize production nationally. More reliably profitable crops are higher-value crops whose supply is limited in the dry season. For smallholder farmers, these crops are primarily vegetables, including green maize, for sale in urban centers and towns. However, because such crops are perishable, the location of the irrigation scheme then becomes a significant consideration, with farmers in remote schemes facing significant costs in delivering such produce to market in salable condition. What is going to be produced, whether there is sufficient market to absorb what is produced, and how the produce will be marketed

8 This estimated per-hectare cost for the development of new irrigation systems is much lower than other estimates. Inocencio et al. (2007) estimated an average cost per hectare of $14,450 for the 26 systems in Africa south of the Sahara involving new construction that they reviewed.

are important considerations in the design and sustainability of any irrigation investments in Malawi (SMEC 2015b).

The idea that Malawi's vast water resources can be used to irrigate the food crops the country requires is appealing and has driven substantial investment in irrigation development, both by Malawi's development partners and by the government. Since 2010, the government has been implementing the Green Belt Initiative to expand irrigated farming in the country, ostensibly to reduce the vulnerability of rainfed food production, and hence of food availability, to poor weather conditions.[9] However, basic economic considerations show that smallholder sustainable irrigation to produce staple crops, including maize, will not be economically viable, and so will not make a direct contribution to improving the country's food security on a large scale. Although irrigating farmers are likely to see important food security benefits from their use of irrigation, these benefits will be realized primarily indirectly, as the farmers use income from irrigated production of commercial nonstaple crops to purchase staple foods. Markets for high-value food crops are the key channel for translating smallholders' access to irrigation into improved food security in Malawi. It is not about smallholders directly producing irrigated maize to supply the staple grain stocks that the nation needs.

In addition to choosing the right crops, both internal and external organizational challenges need to be addressed for production from smallholder irrigation schemes to be sustainable. Internally, effective scheme management is required so that water is distributed fairly and the costs for water used are recovered from farmers in the scheme. Such management capabilities are not readily found in rural communities in Malawi because they require both trained leadership and community consensus. Training and institutional capacity-building services need to accompany any new irrigation scheme.

Similarly, the sustainability of such irrigation schemes depends on prudent management of local resources within the watershed feeding each scheme, including management of local soil resources to reduce erosion and siltation. Consequently, watershed or groundwater management mechanisms should be set up to govern how all users of those resources, both irrigating farmers in the scheme and residents in neighboring communities, employ them in a sustainable and fair manner. Here too, training and institutional capacity-building

9 However, despite justifying the establishment of the Green Belt Initiative on food security grounds, the principal efforts of the agency have been focused on expanding irrigated sugarcane production by developing a new sugar plantation in Salima district (Chinsinga 2016). This site began production in 2017 and is primarily a vertically integrated facility, growing most of the cane it processes, although it does obtain some cane from smallholder outgrowers.

services are required, as well as acceptable mechanisms for resolving any conflicts that may arise over water use.

Irrigated farming can contribute in important ways to the growth of Malawi's economy, to supplying consumer markets with a more diverse range of food crops, and to improving the welfare of those engaged in such farming. However, it is not an easy solution to adopt, requiring significant technical analysis and expertise, capital, and effective market linkages. Nonetheless, that only about one-quarter of the potential irrigation area for the country is now exploited means there is a large investment opportunity through which agriculture can make important contributions to Malawi's economic growth.

Access to Agricultural Land

Land is critical to agricultural production. Here some aspects of access to agricultural land in Malawi are considered. First, the customary land tenure system under which most farming households obtain land to use is described, with specific attention to landlessness within rural communities. The discussion then examines the distinction between the smallholder and estate subsectors that together compose the agriculture sector in Malawi. The smallholder sector is typified by small landholdings obtained under customary tenure on which crops are grown primarily for consumption by the farming household. In contrast, estates generally involve larger areas of land obtained through freehold ownership or through long-term leasehold arrangements, on which crops are produced for sale, particularly into Malawi's export markets. This section assesses whether this qualitative distinction between smallholders and estates is now of much value for guiding agricultural development efforts.

Customary access

Most farmers in Malawi have access to the land that they farm under customary tenure. They have rights to the use of this land by virtue of their being members of a local lineage, with the jurisdiction over such land rights typically vested in local traditional authorities. To an important degree, these customary rights to land provide a safety net for most Malawian households, permitting them to engage in subsistence production if other economic options that they might pursue are not sufficiently remunerative (Ellis 2005). However, because most households farming under smallholder conditions are capital and credit constrained, and thus unable to use modern inputs and technologies on their crops, productivity levels are generally low for the farmland under customary tenure.

Customary rights to land are primarily usufruct rights. Nonetheless, with the grantee or his or her family members or descendants making regular use of the land, once the land is allocated, it is considered to be the property of the grantee or his or her family (Chirwa 2008). However, no title is provided to the users and no cadastral record of the land allocation is made. Although this system allows most Malawian households to have access to farmland, generally only small plots of land can be obtained in this manner. Based on

TABLE 3.4 Characteristics of rural households without and with agricultural land, 2016/17

Characteristic						
All households	**National**		**Rural**		**Urban**	
Households without agricultural land in 2016/17, %	21.0	(0.81)	10.1	(0.70)	67.6	(2.78)
Households without agricultural land in 2010/11, %	16.6	(0.80)	7.7	(0.66)	64.6	(3.75)
Observations, 2016/17	*12,447*		*10,175*		*2,272*	
Rural households only	**Overall**		**Landless**		**With land**	
Poor households (per capita consumption below national poverty line), %	51.9	(0.87)	35.3	(2.01)	53.7	(0.87)
Wealthiest quintile of households, nationally, %	12.1	(0.52)	25.7	(1.61)	10.5	(0.48)
Household size	4.3	(0.03)	3.5	(0.08)	4.4	(0.03)
Age of household head, years	43.7	(0.21)	37.7	(0.65)	44.3	(0.23)
Female household head, %	30.8	(0.59)	24.7	(1.55)	31.5	(0.63)
Married household head, %	70.1	(0.60)	64.4	(1.75)	70.7	(0.64)
Separated or divorced household head, %	14.2	(0.42)	13.8	(1.23)	14.3	(0.45)
Widowed household head, %	13.5	(0.42)	11.5	(1.10)	13.7	(0.45)
Never-married household head, %	2.3	(0.21)	10.4	(1.18)	1.3	(0.14)
Household head born in other district than that of current residence, %	16.2	(0.68)	30.1	(2.35)	14.7	(0.62)
Household head received no education, %	20.0	(0.61)	12.9	(1.41)	20.8	(0.62)
Household head received some primary education, %	62.2	(0.64)	53.5	(1.84)	63.2	(0.65)
Household head received some secondary or tertiary education, %	17.8	(0.60)	33.6	(1.88)	16.0	(0.55)
Observations, 2016/17	*10,175*		*1,253*		*8,922*	

Source: Author's analysis of 2016/17 Malawi Integrated Household Survey 4 data (Malawi, NSO 2017), weighted. Figures in parentheses are the sample design–corrected standard errors for the estimates.

Note: "Households without agricultural land" for the survey analysis here are those that reported not owning or not otherwise cultivating a plot during both the last completed rainy and dry *(dimba)* seasons.

analysis of the 2016/17 IHS4, the mean land area cultivated by households in Malawi that grew any crops is estimated at 0.65 ha per household and 0.17 ha per household member. Between 65 and 75 percent of all land in Malawi is estimated to be under customary tenure, with the rest being either public land (15 to 20 percent) used for public purposes, including national parks and forest reserves, or land held under private tenure (10 to 15 percent) through a freehold title or through registration of previously customary land as private (USAID 2010).

Based on IHS4 estimates, the share of rural households in Malawi that do not make use of agricultural land remains quite small, at 10 percent. However, the share of households without such land is rising, up from an estimated 7.7 percent based on the previous IHS3 survey of 2010/11. A broad analysis (Table 3.4) shows that landlessness in rural Malawi is not associated with poverty or economic vulnerability.

Rather, rural households that do not have land to farm are less likely to be poor, more likely to be in the wealthiest quintile nationally, smaller in size, and less likely to be headed by females than the norm. In terms of household formation and marital status, married heads of household are unlikely to be landless. Never-married heads of household are most likely to be landless. This likely reflects both the current occupational choices of young adults—particularly those defined for the survey to be heads of household but who are still pursuing their education—and the fact that land rights within communities are not vested in unmarried young adults but remain with the previous generation until the younger one is married. Heads of household who are not natives of the district in which they live are also much more likely not to have access to agricultural land, reflecting the importance of ties to local lineages. Finally, rural households headed by relatively well-educated individuals, who are often employed in salaried positions outside of agriculture, are more likely to be landless, while it is somewhat rarer for those with only primary education or no education at all to not have access to land.

These findings suggest that workers in landless rural households pursue livelihoods that require secondary or higher levels of education and some level of mobility, given that the heads of many landless households do not reside in their district of origin. In terms of their contribution to household welfare, these livelihoods are evidently superior to any agricultural livelihoods workers in those households might pursue. Rural households headed by teachers or medical workers, for example, likely make up a disproportionate share of landless rural households.

Closer analysis of the IHS4 data shows that landless rural households are more prevalent in the Northern region, although additional research is needed to confirm this finding because it runs counter to expectations based on relative population pressure. At the district level, a somewhat higher share of landless rural households are seen in Nkhata Bay district in the Northern region; Salima and Nkhotakota in the Central region; and Blantyre, Mulanje, and Chikwawa in the Southern region. The higher levels of landlessness in some of these districts may be associated with the sugar and tea estate workers and tenants on tobacco estates.

Given the steady growth of Malawi's rural population, the continued access to land that the customary land tenure system offers members of local lineages, coupled with intergenerational land transfer patterns within families that tend to divide land among all sons or all daughters of the next generation (depending on whether patrilineal or matrilineal landholding precepts apply), it is likely that poverty is now more closely associated with near-landlessness than with actual landlessness. Several land allocation processes are probably operating in parallel, with the result that the number of rural households that do not have access to sufficient farmland to meet their members' needs is increasing.

In the context of rising population pressure and increased mobility with people changing residence after marriage, it seems certain that local land conflicts will increase over time. The informal customary system for land access can be expected to erode as competition for land increases. The poor are more likely to lose out in such conflicts, so that rural landlessness will become more strongly associated with rural poverty,[10] and the current profile of landless rural households presented in Table 3.4 can be expected to change significantly in coming years.

Decline in significance of distinction between smallholder and estate agriculture

Larger parcels of agricultural land are held under freehold or, more commonly, leasehold terms. Land under freehold is primarily a legacy of the estates that were granted in the early colonial era to colonial settlers, particularly in the Southern region, as well as smaller parcels that were provided to Malawian farmers under some land redistribution and development programs in both

10 Issues of rural landlessness and the welfare impact of insecurity in access to agricultural land in Malawi are more closely examined in Berge et al. (2014) and Deininger, Xia, and Holden (2019), together with discussions on the challenges of creating equitable systems for granting access to land in Malawi under rising population pressures and conflicts over land use.

the colonial and postcolonial periods (Ng'ong'ola 1986). Leasehold became an increasingly common means for commercial farmers to acquire land in the 1970s and 1980s when the government promoted estate agriculture, particularly for tobacco production. Public, private (freehold), and customary land all can be leased temporarily to a user, generally for 21 years, with some leases extending up to 99 years (USAID 2010).

Although corporations used leasehold arrangements to acquire large blocks of land in the 1970s, in the 1980s much smaller blocks of land were acquired by individuals, including former estate managers, businessmen, and civil servants. Between 1970 and 1995, the number of estates larger than 10 ha was estimated to have increased from fewer than 250 to around 30,000, covering more than 900,000 ha (ELUS 1997). The Estate Land Utilisation Study estimated that 67 percent of all tobacco-producing estates in 1995 were between 10 and 20 ha in size, with only 7 percent of them larger than 100 ha (Steele 1997).

There was considerable justification for distinguishing the smallholder and estate subsectors in the colonial era and during the rule of Kamuzu Banda following independence. During these periods, the state regulated the estate sector differently than the smallholder sector. Early in the colonial period, estate agriculture was seen by the state as the basis for a productive commercial agriculture sector, although this policy bias was not sustained. After independence, under Kamuzu Banda, new efforts were made to expand the estate sector (Kydd and Christiansen 1982; Pryor and Chipeta 1990). Estate producers frequently were accorded preferential access to commodity markets, whereas the Agricultural Development and Marketing Corporation (ADMARC) and earlier parastatal marketing boards controlled how smallholders sold their produce. Legally, smallholders could sell their tobacco production only to ADMARC, at significantly lower prices than those offered to estates on commodity markets. By reducing the returns to their agricultural production, the poor prices ADMARC offered smallholders resulted in a movement of labor out of the smallholder sector into wage or sharecropping employment in the estate sector, almost exclusively on tobacco estates (Kydd and Christiansen 1982).

However, with the liberalization of tobacco production in Malawi in the 1990s, the regulatory barriers to smallholders' direct participation in the national tobacco market were removed. In consequence, the profitability of estate production of air-cured burley tobacco, in particular, increasingly became problematic. Once smallholders could produce the crop on their own account, the previously dominant tenant-based burley production systems on estates were difficult to sustain. As noted, burley tobacco production has shifted almost completely from estates to smallholders since the mid-1990s.[11] Tobacco estates continue to retain a significant share of flue-cured tobacco production, however, because it is more capital intensive.

There are few economies of scale to be realized in burley tobacco production, because the crop requires close attention by the grower to ensure high-quality leaf. Mobilizing sufficient labor, not land, has proved to be the principal challenge to profitable tobacco production in Malawi (Prowse 2013). In consequence, estates find profitable production increasingly difficult when they have to offer wages that are competitive with the returns smallholders can obtain from producing their own burley tobacco. Although the production of some field crops on estates, including soyabean and seed maize, may exhibit returns to scale on the larger landholdings of estates, the markets for such crops are significantly smaller than those for tobacco. In terms of technical considerations for most crops, there is now little to distinguish smallholder production from estate production.

Similar to smallholders, estates are not engaged in a significant way in staple food crop production for market sale. The thin markets and unpredictable price patterns for maize in Malawi result in significant disincentives for both large- and small-scale farmers to engage in commercial production. Interviews in late 2015 and early 2016 with 15 large-scale agricultural producers across Malawi found that none of them engaged in commercial maize production (Edelman et al. 2016). Although all the producers surveyed reported that they grow maize for their workers or tenants to ensure that their consumption needs are met, none of them allocate land to maize for commercial sale. Because these large-scale farmers have no confidence that they will find a profitable market for maize grain or other staple food crops, they choose other, more reliably profitable crops to produce, including tobacco. The weak markets for maize in Malawi drive estates to grow maize for their staff, but to produce no more maize than that.

Concerns continue to be expressed about underused estate land. A recent project to digitize estate land boundaries for the Ministry of Lands showed that when the boundaries for the more than 24,800 estates that could be digitized were overlaid on recent satellite imagery, only 42 percent of estate land was found to be under crops (Deininger and Xia 2017). Given the challenges to engaging in high-productivity commercial agriculture in Malawi, many estate

11 This shift in burley tobacco production from estates to smallholders replicates a pattern seen in southern Malawi relatively early in the colonial period—increasing smallholder production of tobacco led to labor constraints on undercapitalized settler estates, rendering many estates financially unviable (Green 2012a).

owners are unable to profitably bring their land into production. This is not a new concern. In the 1990s, the Estate Lands Utilisation Study was specifically tasked with considering the issue of abandoned or otherwise underutilized estates. An exploratory study found that factors associated with unused estate land included small size, absentee management, lack of capital, disputes over land rights, and illness or death of the operator (Mapemba 1997).

Despite the challenges that estate holders have repeatedly faced in profitably running their larger farms, there is evidence that entrepreneurial Malawian farmers are acquiring significant areas of customary land in order to develop larger farms of between 5 and 50 ha in size. As much as 300,000 ha nationally is estimated to have been acquired by such farmers since 2005, or about 8 percent of the land under crops in the country (Anseeuw et al. 2016). Many such farmers, particularly those acquiring larger holdings of more than 30 ha, are absentee farmers with significant nonfarm income sources who reside in urban areas and, it is assumed, will invest an important share of the returns from their farming in their urban places of residence. In contrast, medium-scale farmers with smaller landholdings, of between 5 and 30 ha, are more likely to be local residents.

Although much of this land is held under informal leasehold terms, many medium-scale farmers are able to successfully remove the land to which they gain access from customary control—the parcel is ceded to the state with the consent of local authorities, and then the farmer obtains a long-term lease, generally a 21-year lease, from the government. Although bringing this land into more formal land markets through leaseholds may increase commercial agricultural production in Malawi, it is at the cost of increased risk to the livelihood security of the communities that formerly had authority over who uses the land.

However, it remains unclear whether these emerging medium-scale farmers are qualitatively different from the many farmers who acquired small estates in the 1980s. The earlier boom in the creation of small estates was an outcome of government policy that included providing prospective small estate owners with access to low-cost credit subsidized through taxation of smallholder farming (Kydd and Christiansen 1982). In contrast, the current trend in land acquisition, at least on the face of it, does not involve government action or public investment. Rather, it seems to be wholly driven by commercial decisions made either by local farmers seeking to increase the scale of their production or by urban entrepreneurs diversifying their economic activities. Nonetheless, these emerging medium-scale farmers face the same business challenges related to crop choice and capital and labor constraints on profitability that many of those who established small estates in the 1980s found difficult to overcome. As will be discussed in more detail later, these commercially oriented medium-scale farmers are likely to be an important part of any future growth in the agriculture sector. However, their contributions to agricultural transformation in Malawi will be realized only if they can sell their produce in remunerative markets, whether domestic or export.

Current Policy Framework for Agriculture in Malawi

This chapter concludes by considering the policy framework guiding public investments in the development of Malawi's agriculture sector. The overall development vision for Malawi is expressed in the Vision 2020 document of 1998[12] and the current medium-term development plan, the Malawi Growth and Development Strategy III (2017 to 2022). The National Agriculture Policy (NAP) of 2016 reflects those higher-level development policy frameworks (Malawi, MoAIWD 2016b). Encouragingly, the NAP has a stronger emphasis than earlier policies for the sector on sustainable economic growth through agriculture and treating farming as a business, rather than simply as one in a portfolio of livelihood strategies households use to assure their basic needs. The NAP notes that "by engaging more in commercialized agriculture, wealth creation becomes the motivation. Therefore agriculture, as a business, will increasingly serve as a springboard to a better life for Malawi's farming families, providing children in those households with a much broader set of economic opportunities and career choices than their parents had" (Malawi, MoAIWD 2016b, 1). Although improved food and nutrition security for all Malawians rightly remains part of the overall goal for the NAP, the policy seeks to move the dominant orientation of farmers beyond meeting their own subsistence needs and toward more specialized production and a more diversified sector overall. Central to such an agricultural transformation is a significant increase in reliance on markets—both by farming households to secure increased incomes and, in parallel, by all consumers to meet their food needs.

12 A new formulation of the development vision for Malawi, the Malawi 2063 document, was launched in January 2021 as this book was being finalized. The goal is "to propel the country towards achieving economic independence, inclusive wealth creation, self-reliance and a high quality of life for all its citizens" by 2063 (Malawi, NPC 2020, 1). The vision is anchored on the three pillars of agricultural productivity and commercialization; industrialization; and urbanization.

However, the sectoral growth proposed in the NAP is not situated within or justified as part of a broader process of economic structural transformation that will see workers in Malawi increasingly move out of agriculture and into more remunerative activities in manufacturing or service provision. For the most part, Malawi's agricultural policy does not provide guidance for building a much more diversified economy that will assure through strong markets the food needs of all, whether working in agriculture or, increasingly, in other sectors of the economy.

The National Agricultural Investment Plan (NAIP) for 2017/18 to 2022/23 (Malawi, MoAIWD 2018) is the strategy to achieve the objectives of the NAP. "Food and Nutrition Security" is the title of one of its 16 intervention areas. In the NAIP's introductory chapter, a useful discussion is provided on how the plan is to consider food security in a significantly more holistic manner than did earlier strategies—in particular, the strategy seeks to go well beyond maize self-sufficiency. However, how to translate this change in conceptual orientation around food security into a change in operational focus for the sector is not spelled out. Under the plan, food production remains the means by which the food security of Malawi will be achieved. The five-year budget for the food and nutrition security intervention area is $209 million, but more than 95 percent of these funds are to be directed to establishing 1 million integrated household farming gardens annually. Although further details on what is involved in this food security-focused effort are not provided, it appears to be exclusively a production-oriented activity. The strategy does not provide any guidance on how the agriculture sector can play an expanded role beyond production in assuring food security through improved incomes and stronger agricultural markets, and more broadly contribute to a structural transformation of the economy away from agriculture.

The NAP and NAIP, if implemented effectively, will entail important reforms to the content of agricultural and food security policy and strategies in Malawi. A review of public expenditure patterns within the agriculture sector in recent years confirms that shorter-term food security concerns addressed through production-focused programs—particularly input subsidy programs—have dominated public sector activities in agriculture (Box 3.2). Agricultural research, agricultural extension, strategic grain reserves, and investments in agricultural market systems are all important factors in accelerating agricultural productivity growth, expanding use of reliable agricultural markets, and in this way, building resilience into Malawi's food systems. However, we see that the concentrated allocation of public expenditure toward input subsidies has been at the expense of these areas in

BOX 3.2 Recent and planned public expenditure patterns in Malawi's agriculture sector

The Monitoring and Analysing Food and Agricultural Policies project of the Food and Agriculture Organization of the United Nations examined public expenditure in support of food and agriculture in Malawi over the period 2006 to 2013 to establish the effectiveness of these expenditures (FAO 2015a, 2015b). Of all public expenditures in Malawi over this period, 17 percent were in support of food and agriculture. Input subsidies under FISP made up almost half of this amount. In contrast to FISP costs, however, expenditures on agricultural support services were much lower. Agricultural research accounted for 2.5 percent of total expenditures on food and agriculture. More troubling, the analysis estimated expenditures on agricultural extension to be only 1.7 percent. The costs of maintaining strategic food stocks amounted to 1.5 percent of public expenditures on food and agriculture. Similarly, relatively low levels of public investment were made in marketing support activities. (Most of the balance of expenditures in support of food and agriculture over this period were on rural roads, with somewhat less on irrigation.)

The five-year, $3.2 billion budget proposed under the NAIP provides insights on whether development priorities within the sector might be changing. This budget reflects total resources considered necessary to implement the plan, not simply government resources. Overall, the budget reflects the new policy stance for agricultural development in Malawi detailed in the NAP. Although food security continues to be seen as best addressed through increased household production, and subsides for agricultural inputs are a prominent component of the plan, other priorities under the investment plan are aligned more closely to a vision of a transformed, expanding, and profitable agriculture sector. More than 60 percent of the NAIP budget is allocated to capital expenditures rather than recurrent costs—these include rural road construction and maintenance (the largest expense in the budget), irrigation scheme construction,

which sustained public investment is needed. It remains to be seen whether the changes in sectoral priorities and in addressing food insecurity laid out in the NAP and NAIP will change public investment patterns in coming years.

Food security is not a sufficient objective on its own to guide agricultural development planning in Malawi to meet the longer-term needs of the economy or its people. Moreover, food security will not be assured using agricultural strategies alone. These are among the chief arguments made in this book. However, it should be expected that agriculture and food security will remain linked for some time to come. First, threats to Malawi's food security demand attention in the short term both because of the danger posed some investments in market structures, the construction of crop storage facilities, and the annual establishment of 1 million integrated household farming gardens. Significantly increased resources are to go to agricultural extension and research, with $400 million—more than 13 percent of the total budget—allocated over the five years, split 75:25 between extension and research.

A shift in development priorities and in expectations about the government's role in how they are to be achieved also can be seen in what is missing from the NAIP budget. For example, whereas access to finance is critical for commercialization of agricultural production and processing, the government does not propose in the NAIP to insert itself into financial markets. Rather, its role will be one of facilitation and risk sharing with financial firms, as well as strengthening the financial literacy and management skills of farmers and processors. Similarly, the government does not specify in detail how it will act to foster agribusiness development. Rather, the resources identified for this intervention area are those that private-sector firms have signaled they will invest under Malawi's country cooperation framework with the New Alliance for Food Security and Nutrition, which seeks to encourage greater private-sector investment in agricultural development (NAFSN 2013). Whether these financial resources will materialize is unclear. Nonetheless, the government states that its principal role in expanding agribusiness under the NAIP will be to establish a business-enabling environment with "predictable policies, supporting legislation, and infrastructure and support services" (Malawi, MoAIWD 2018, 55).

Overall, the NAIP indicates some encouraging changes in how the public sector engages in agricultural development in Malawi. However, its vision for how food security might reliably be attained for all primarily reflects the long-standing and insufficient focus on own production as the principal means by which Malawians access the food they require.

Source: FAO 2015a, 2015b; Malawi, MoAIWD 2018.

to the welfare of individuals across the country and for political economy reasons. The public investment needs associated with longer-term agendas of sectoral or broader economic transformation receive lower priority than do immediate risks to the food security of the country and its vulnerable citizens (Timmer 2015). Food crises anywhere in Malawi have often resulted in the suspension of budgets and agricultural development plans while the crisis is managed.

However, equally important in accounting for this food security focus in the allocation of public resources for agriculture is *who* is involved in implementing agriculture-sector development and support activities. Agricultural experts primarily staff the Ministry of Agriculture. The ministry is not staffed by economic policy experts who could keep attention focused on the needed longer-term economywide changes to which the sector can contribute, nor by welfare and social safety net experts who might suggest other mechanisms than enhancing subsistence production levels to meet the food needs of the most vulnerable households. The political choice to focus on longer-term public investments to bring about a structural change in the Malawian agriculture sector is unlikely to be made without a clearly articulated development agenda. Such an agenda should seek to move the sector away from production for food self-sufficiency at both household and national levels, and toward a market-centered, more concentrated and specialized sector that, nevertheless, will reliably serve the food needs of increasing numbers of Malawians working outside of the sector. This development vision would need to be endorsed by the political leaders of Malawi, who would hold to account those responsible for implementing it.