Lessons Learnt: Promises, Achievements, Shortcomings, and Pitfalls of Inputs Subsidy Programs in Malawi

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Lessons Learnt: The Promise, Performance, and Pitfalls of Agricultural Subsidy Programs in Malawi

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Executive Summary

Input Subsidy Programs (ISPs) have been a central feature of Malawi's agricultural policy. ISPs have generally focused on improving smallholder farmers' access to improved seed and fertilizer for maize production, however, their form and scope have varied significantly over time. Between 1971 and 1994, subsidized inputs were universally available through farmer clubs. Between 1994 and 2005, the government introduced an 'inputs for work' program and free inputs distribution programs to deal with declining maize productivity. The 'inputs for work' program paid farmers in kind with farm inputs, while the free inputs programs (i.e., the Starter Pack and Targeted Inputs Program (TIP)) gave farmers free farm inputs. Both programs had agricultural and social protection objectives; the Starter Pack and TIP provided enough inputs to plant 0.1 hectares of land (Chirwa & Dorward, 2013).

The Farm Inputs Subsidy Program (FISP), originally called the Agricultural Input Subsidy Program (AISP), was introduced in 2005 as a rationed and targeted partial subsidy program. It was introduced partly in response to the hunger crises of 2000/01 and 2001/02, and the continued food insecurity in Malawi. The program, which was phased out after the 2019/20 season, provided enough inputs for 0.2 hectares of land (Chirwa & Dorward, 2013). The stated goals of the FISP in recent years were to improve farmers' access to quality farm inputs and to increase smallholder maize production and incomes. Beginning in the 2020/21 agricultural season, the government has committed to further improve the subsidy program by substantially revising coverage from 900,000 households to around 3.676 million farmers.

This paper reviews the existing farm and policy-level assessments of past subsidy programs (mostly the FISP) to identify the promises, achievements, shortfalls, and pitfalls of such programs to inform improved future designs. The paper also extends the existing evidence by relying on secondary data sources to analyze the trends in productivity, maize

trade, fertilizer imports, and the governments' budgetary allocations to the Ministry of Agriculture (MoA). The additional secondary data sources include government budget documents, extracts from the annual implementation reports, the National Food Reserve Agency (NFRA), FEWS NET, Malawi Revenue Authority (MRA), Agricultural Production Estimates Surveys (APES), the U.N. Food and Agriculture Organizations' data repository (FAOSTAT), and the World Bank's World Development Indicators (WDI). The paper concludes with suggestions for reforms that could genuinely contribute to sustainable productivity and welfare improvements.

The review reveals that by and large, previous subsidy programs have increased household maize production, the use of open-pollinated and hybrid maize seed varieties, and chemical fertilizer applications amongst smallholders (Dorward & Chirwa, 2011). These improvements have positively contributed to household food security and national food self-sufficiency. They have also marginally increased the incomes of farm households (Ricker-Gilbert et al., 2013). The incorporation of a legume pack into previous programs increased the household use and production of legumes, resulting in improved household nutrition, especially child nutrition (Harou, 2018). Lastly, the subsidies have improved the adoption of certain types of integrated soil fertility management practices, especially through maize-legumes intercropping systems (Koppmair et al., 2017).

In contrast with these positive impacts, the main pitfalls of previous subsidies have been:

Low maize productivity relative to potential. Maize productivity has roughly doubled to 2 metric tonnes per hectare (MT/ha) but has generally stagnated and remained lower than the potential range of 8 to 13 MT/ha reported at agricultural research stations.

Household food security and national food self-sufficiency have not been achieved. For a country that depends on maize for its food security, low maize productivity has implied low food security. Thus, Malawi has remained a net buyer and importer of maize. Between the 2007/08 and 2020/21 agricultural seasons, the country bought approximately 48,000 MT of maize, on average, to stock the Strategic Grain Reserves (SGRs) (NFRA, 2021). Unfortunately, these purchases coincided with periods of continued increases in real maize

prices and persistent food insecurity, requiring distribution of relief. Informally, Malawi imported an average of at least 14,000 MT in the same period (FEWS NET, 2021).

Low crop response rates to N fertilizer due, in part, to poor soil characteristics such as low pH (acidity) and low soil carbon (Snapp et al., 2014). The two problems are common when land is under continuous cultivation and soil and water management is inadequate. While some older data show response rates as high as 18 maize kg per kg of N (kg/kg) (Chirwa & Dorward, 2013), more recent data shows crop response rates as low as 2.6 kg/kg (Burke et al., 2020). Even the earlier findings are unimpressive compared to results in other countries (Jayne et al., 2018) and a fraction of typical agronomic response rates (Messina et al., 2017).

Extreme poverty has slightly fallen but poverty incidence has changed little, partly because of the low contribution of subsidies to food production. The proportion of those living below the national poverty line has hardly fallen since 2005. At least 51.2% of Malawians still live in poverty (an increase from 50.6% in 2011) and 20.1% of these are categorized as being ultra-poor (a decrease from 24.5% in 2011) (GoM, 2019).

Poor targeting has had important distributional effects on the benefits of subsidies. Programs lacked explicitly defined program objectives and targeting criteria, which contributed to ineffective targeting and failure to ration inputs to productive but poor beneficiaries who would otherwise lack access to commercial inputs. Combining food security and poverty alleviation objectives in the same program has generally been a major challenge to effective targeting (Lunduka et al., 2013). If the goal of the subsidy program is to increase productivity, then the poor who lack sufficient land and labor to use inputs may not be the most appropriate target—if the primary goal is poverty alleviation, the opposite may be true.

Displacement/crowding out of commercial input sales. Current estimates indicate commercial sales displacement has so far been negligible (estimated at 15 to 21%) (Ricker-Gilbert et al., 2011). However, the failure to improve targeting (and/or extensively expand beneficiary coverage) could lead to larger displacement rates, which could eventually stifle off private input markets.

Diversion and leakage are symptoms of poor targeting. Diversion is when subsidized inputs end up in the hands of unintended beneficiaries and/or on crops where farmers expect higher returns (e.g., cash crops) instead of the targeted crops (Chirwa & Dorward, 2013). Similarly, leakage is when subsidized inputs meant for Malawian farmers seep across the borders, thereby reducing the net economic gains that would have been generated from increased input use (Chirwa & Dorward, 2013).

Crowding out agricultural development investments. The subsidy program has comprised the biggest share of the government's funding to the Ministry of Agriculture (MoA). For example, between 2009/10 and 2019/20, the FISP was allocated an average of 41% of the MoA budget, while agriculture R&D was allocated 1.1%, agricultural extension 0.1%, irrigation development 0.4%, and livestock development 0.8%. Subsidy rates have also stayed high, averaging 82% of the commercial price of a 50-kg bag of fertilizer in the 2009/10 and 2019/20 periods. In contrast, the estimated subsidy rate for the 2020/21 AIP is 77%.

Subsidies may be unsustainable in the long run. Malawi's over-reliance on imported fertilizers puts tremendous pressure on the country's ability to raise the foreign exchange reserves. This ability is also weakened by the collapse of the global tobacco market, which Malawi still relies upon heavily. This, coupled with a periodic fall in the value of the Malawian Kwacha relative to major international currencies, casts doubt on the long-term sustainability of agricultural subsidies.

To address these pitfalls, we propose the following policy interventions for the consideration of policy makers:

i. *Adopt a holistic approach to improving agricultural productivity by looking beyond access to fertilizers and improved seed.* That is, consider integrating more complementary soil fertility and water management interventions (e.g., organic fertilizers, manure, compost, conservation agriculture, etc.) into subsidy programs to sustainably address soil health issues.

ii. *Segregate smallholders to improve targeting.* Considering that smallholders are not a homogenous group, they could be identified and segregated according to a pre-defined metric (e.g., landholding). Interventions could then be tailored to the specific needs of a

particular category of beneficiaries, as some will require interventions other than subsidies. Policy interventions should explicitly distinguish between social welfare and agricultural productivity objectives. Households needing social welfare interventions should be assigned to a program like the Malawi Social Action Fund (MASAF) if the subsidy program is meant to address the needs of potentially more productive farmers.

iii. *Redefine and stick to the stated program objectives and targeting criteria*. This could make future programs contribute more effectively to the general welfare of beneficiaries.

iv. *Explore innovative ways of making fertilizer supply more effective and less risky.* Consider promoting private local blending and distribution of fertilizers. Also, consider reforming the fiscal calendar to begin the first quarter of the year to provide more time for planning and implementing subsidy programs.

v. *Improve the effectiveness and fiscal sustainability of FISPs.* Gradually increase investments in agricultural R&D, extension services, and inclusive market models that are more accessible and remunerative for smallholder producers.

1. Introduction

Diverse forms of Input Subsidy Programs (ISPs) have historically been a central feature of Malawi's agricultural policy. They have focused on addressing one of the key production constraints for smallholder rural households: inadequate access to improved production inputs for maize, such as high-quality maize seed and inorganic fertilizers. Government efforts to address this production constraint have been driven by the need to address the problem of low productivity of staple food grains such as maize, legumes, and pulses, which has been an underlying constraint to improving food, nutrition, and income security of the rural households.

In terms of the actual design of subsidy programs, from 1971 to 1994, subsidized inputs were universally available through farmer clubs. A major shift in government policy towards agricultural inputs took place between 1994 and 2005, prior to the introduction of the Farm Inputs Subsidy Program (FISP), when the government introduced various input support programs to deal with declining maize productivity. In 1994, the government introduced an 'inputs for work' program, through which farmers were paid in kind with farm inputs, and a 'free inputs distribution' program, which had both agricultural and social protection objectives (Chirwa & Dorward, 2013). The latter program introduced the Starter Pack and Targeted Inputs Program (TIP) to distribute free inputs for farmers. The Starter Pack and TIP were enough to plant 0.1 hectares of land. The FISP, originally called Agricultural Input Subsidy Program (AISP), was introduced in 2005 partly in response to the hunger crises of the 2000/01 and 2001/02 agricultural seasons and the continued food insecurity problem in the country. The FISP was a rationed and targeted partial subsidy, providing enough maize seed and fertilizer to plant 0.2 hectares of land. Up until the 2019/20 agricultural season, a typical FISP pack comprised of 100 kg of inorganic fertilizers (50 kg of basal and 50 kg of top-dressing fertilizer), 5 kg of either hybrid or open-pollinated variety (OPV) maize, and 2 kg of legumes/pulses (e.g., groundnuts, soya beans, pigeon peas, cow peas, and sugar beans) (FISP Annual Implementation Reports, 2010-2020). The legume component of the packages varied from time to time due to factors beyond the scope of this study.

Fertilizer procurements comprised the largest share of the costs (79.4%) of various components of the program between 2006/07, followed by seed procurements (17.7%) and

administrative costs (3.8%). In terms of coverage, FISPs reached roughly 1.3 to 1.6 million beneficiaries with subsidized inputs between 2005 and 2016. The total number of beneficiaries dropped to around 900,000 between 2017 and 2019 (FISP Annual Implementation Reports, 2010-2020).

In terms of the implementation strategy, the subsidized inputs were, at least in theory, targeted and rationed to resource-poor farmers who would otherwise not be able to access commercial inputs but were capable of productively utilizing them (Chirwa & Dorward, 2013). Beneficiaries received inputs through paper vouchers. These vouchers defined the entitlement available to every designated beneficiary and controlled access to entitlement, to a certain extent, at designated agro-dealer outlets. The rationing was achieved by providing entitlement to beneficiaries through paper vouchers. This mechanism, in part, facilitated the effective specification and definition of the size of entitlement available to every designated beneficiary, and controlled access to entitlement, to a certain extent, at designated agro-dealer outlets (Chirwa & Dorward, 2013).

Despite some design differences with the Starter Pack and TIP, analyses suggest that FISPs faced similar challenges, including targeting inefficiencies, cost-ineffectiveness, a narrow focus on maize, crowding out the private sector, and politicization. The poor performance of successive FISPs has been attributed to a number of issues that will need to be addressed if future programs are to improve upon past productivity impacts.

Beginning in the 2020/21 agricultural season, the government committed to further improve the subsidy program through potentially substantial revisions. Subsequently, the government introduced a new program, called the Affordable Inputs Program (AIP), in which beneficiary coverage has been made almost universal to around 3.7 million farmers countrywide.[1] The stated objective of the AIP is to improve access to quality farm inputs, increase household-level maize production, and improve household income and nutrition (MoA, 2020). Despite having analogous goals and objectives, the AIP design features differ significantly from previous FISPs in terms of beneficiary coverage and input composition. The beneficiary coverage has been adjusted upwards by a magnitude of at least four and the legume component has been taken out of the program to only focus on inputs for maize

[1] https://times.mw/over-600000-off-farm-inputs-list/

production. The omission of a legume component is inconsistent with the program's aspirations to improve household incomes and nutrition, as rural households rely on legumes for income and nutrition security. However, this omission was somewhat expected considering the timing of the new program and the logistics involved in providing legume seed. The new program commenced roughly at the beginning of the 2020/21 agricultural season, and getting the quantities of improved legume seed required for a program of the AIP's magnitude from local sources would have been a formidable task.

The fact that the government of Malawi is currently undertaking potentially dramatic reforms to the process of subsidizing inputs suggests this is an important time to review lessons from past experiences. Thus, the objective of this paper is to examine the empirical evidence, from farm-level studies and secondary data, to identify consistent and contrasting research results on the impact of subsidies, and to draw important policy lessons. It updates and extends the existing evidence to inform the policy debate on contemporary agricultural input subsidies. Specifically, the paper explores (i) what the objectives and outcomes of agricultural input subsidies have been in recent years; (ii) what potential pitfalls policy makers need to anticipate when designing future programs; and (iii) how the positive outcomes can be leveraged to improve the performance and contribution of future programs.

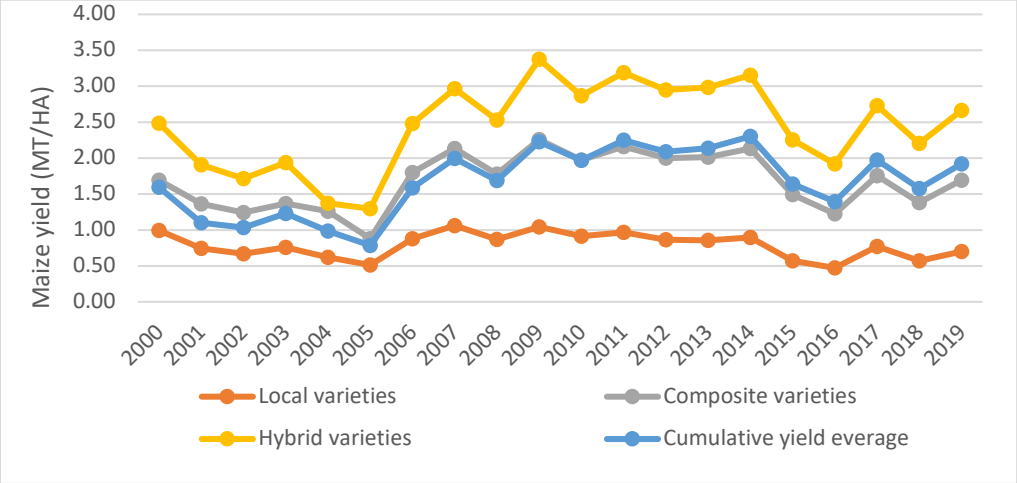
2. Methodology

The paper relies on a critical review of empirical household-level evaluations of the impact of subsidies (predominantly FISPs) and secondary data sources. The bulk of the empirical literature reviewed includes scholarly publications on FISP, MoA annual implementation reports of the FISP, FISP implementation guidelines, and other relevant policy documents. Secondary data sources include budget documents, data extracts from annual FISP implementation reports, the NFRA's maize purchase records, FEWS NET's informal trade statistics, fertilizer import records from MRA, and the APES data. Further, the study draws from international data sources, such as FAOSTAT and the World Bank's World Development Indicators.

3. The Promise

Despite slight design variations, the essential features of subsidy programs have fundamentally remained the same over time. In recent years, the stated goals of the FISP have been to improve farmers' access to quality farm inputs and increase smallholder maize

Figure 1: Average productivity in selected maize varieties (2000 to 2019)



Source: APES Data, Ministry of Agriculture (MoA)

production and incomes. Increasing domestic food production and national self-sufficiency is also often considered an issue of national security.

Sensible arguments can be (and have been) made that it is better for the Malawian government to pay for the inputs of food production before a hunger crisis than it would be to pay for (or rely on) food aid after shortages set in. Beginning with the 2020/21 agricultural season, the government substantially expanded the beneficiary coverage and revised the input composition, but the underlying goal remains the same.

In addition to increasing domestic food production in the short term, one potential benefit of input subsidies would be the generation of effective demand for commercially purchased inputs. In other words, subsidies could "crowd in" demand for the private sector from farmers graduating from a subsidy program.

4. The Achievements

4.1. Impact on household maize productivity

Production estimates by the MoA show that productivity of the maize varieties integrated into the FISP (i.e., open-pollinated and hybrids) significantly increased after 2005, when the FISP was introduced, relative to other varieties (e.g., local) (Figure 1). The increase is partly due to an increase in smallholder farmers' access to and utilization of improved maize seed in conjunction with chemical fertilizers, as these were distributed together under FISP (Dorward & Chirwa, 2011; Holden & Lunduka, 2012). Further analysis of maize productivity between 2005 and 2019 indicates the average smallholder aggregate maize yields were 1.84 metric tons per hectare (MT/ha). The average yields of local maize varieties (0.80 MT/ha) have routinely been much lower than that of hybrids (2.64 MT/ha) and composites (1.78 MT/ha) (Figure 1). This is not surprising because local maize production is not supported by subsidy policy, though it is possible that some farmers apply subsidized fertilizer on local maize.

There is disagreement in empirical literature with respect to the quantified impacts of subsidies on maize productivity. A large body of literature argues that the increases in maize productivity attributable to subsidies are considerably smaller than official estimates (Holden & Lunduka, 2012; Lunduka et al., 2013; and Messina et al., 2017). Chibwana et al. (2010) estimate yield response rates between 6 and 12 kg maize/N kg, depending on the seed variety. Ricker-Gilbert and Jayne (2011) estimate a return of 5.5 kg maize/N kg in the first year of FISP. They also observe incremental response rates if subsidies are received in multiple years, which they attribute to soil nutrient build-up and farmers' incremental knowledge on the use of inputs. Further, Ricker-Gilbert and Jayne (2012) estimate a yield response rate of 2.6 kg maize/N kg for farmers at the 10th percentile of the maize production distribution and 15 kg maize/N kg for those at the 90th percentile. Hemming et al. (2018) estimate much higher response rates across different crop varieties based on agronomic literature (i.e., 10–12 kg/N kg for local maize, 15 kg/N kg for composite maize, and 18–20 kg/N kg for hybrids). These studies typically rely on farmer recall or agronomic field trial data, which may be subject to systemic measurement error or fail to reflect the constraints of farmers on the ground, respectively. More recently, using yield cut data, GPS plot mapping, remote-sensing weather information, laboratory-assessed soil quality, and high-frequency

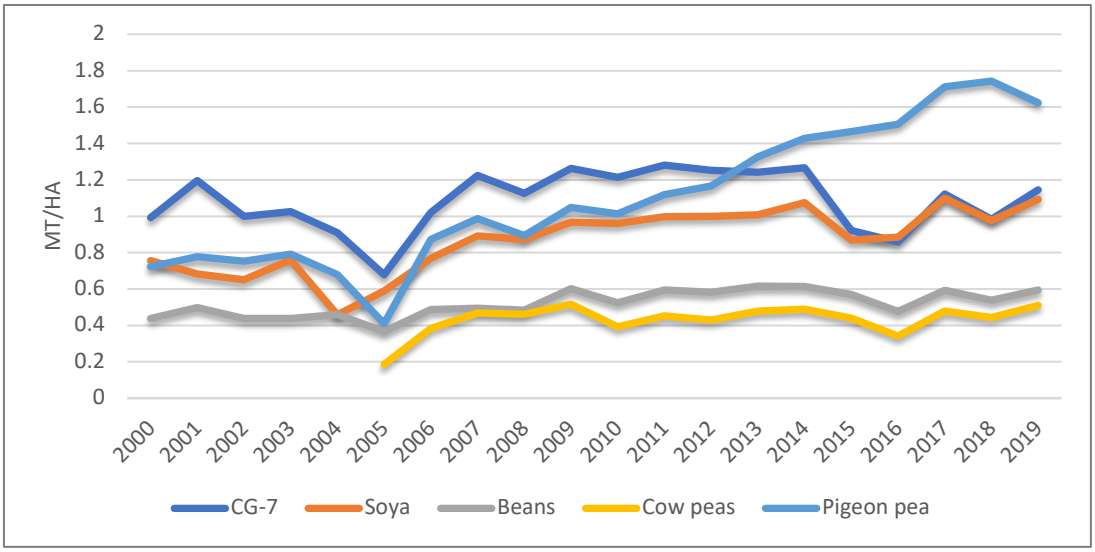
field-level panel data, Burke et al. (2020) estimate yield responses are around 2.6 kg maize/N kg on average, but could be higher or even lower depending on weed management and ecological conditions.

This wide range of estimated responses notwithstanding, and more importantly, there is clear empirical consensus about the causes of low maize productivity and how they can be mitigated. By and large, experts argue that the low maize productivity rates in Malawi are mainly attributable to low maize response rates to fertilizers. This is because of factors such as the prevailing poor soil health conditions due to poor soil biology (e.g., soil carbon and soil chemistry) (Snapp et al., 2014); soil physics (e.g., sandy soils) and poor farm management (Burke et al., 2020); poor soil quality (Marenya & Barrett, 2009); and low use of complementary inputs at the right magnitude (Katengeza et al., 2019). This casts doubts about the ability of subsidies to exclusively deliver on their promised outcomes without integrating alternative soil fertility management practices, appropriate fertilizer formulations, and agronomic practices into their designs.

4.2. Impact on the productivity of grain legumes

Historical statistics from the MoA also show that the productivity of the grain legumes that formed part of the subsidy program has improved since FISP was introduced in 2005 (Figure 2). The productivity of pigeon peas, soybeans, and groundnuts (CG-7) has increased relatively more than other grain legumes in the program between 2005 and 2019. In terms of the average aggregate yields, 1.11 MT/ha were realized from CG-7, 1.22 MT/ha from pigeon peas, 0.94 MT/ha from soybeans, 0.54 MT/ha from sugar beans, and 0.43 MT/ha from cowpeas. Nevertheless, these yields are below their respective potential yields (e.g., 2.5 MT/ha for CG-7 groundnut variety, 6 MT/ha for pigeon peas, 4 MT/ha for soybeans) (MoA, 2020). This further underscores the need for the country to continue improving the productivity of grain legumes.

Figure 2: Average productivity in subsidized grain legumes (2000 to 2019)



Source: APES Data, Ministry of Agriculture (MoA). Note CG-7 is groundnuts.

4.3. Impact on the adoption of integrated soil fertility management practices

Lastly, the subsidies have, to a certain extent, improved the adoption of certain types of integrated soil fertility management practices such as legume intercropping (Koppmair et al., 2017).

5. The Shortcomings

Early enthusiasm over the performance of Malawi's input subsidies has begun to wane in the face of underwhelming performance in several key areas, some of which are highlighted in this section.

5.1. Increases in maize productivity have stagnated and remained lower than potential

Although maize productivity roughly doubled to 2 MT/ha during the subsidy years, the rate of productivity increase attributable to subsidies has remained stagnant and the overall productivity is lower than the 8 to 13 MT/ha range reported at agricultural research stations (MoA, 2020). Relative to regional averages, only Zambia experiences higher overall yields than Malawi (2.5MT/ha), as compared to, for example, Kenya (1.6 MT/ha) and Tanzania (1.5MT/ha) (FAOSTAT, 2019). The current yield gap between smallholder and research

stations underscores the need for Malawi to continue improving smallholder productivity. One way of doing it is by integrating alternative yield-enhancing interventions into subsidy programs, such as promoting the blending and distribution of area and crop-specific fertilizer formulations to address the deficiencies in soil micronutrients across areas and crops. The existing yield gap is also one of the reasons the country has remained a net importer of maize.

Maize trade can occur either formally (by governments or companies that report their economic activity to the government) or informally (by individuals or traders who move grain across Malawi's porous borders without documentation). Informal trade is more difficult to enumerate, but evidence suggests the net quantity of Malawi's informal maize imports averaged at least 14,000 MT/year between the 2007/08 and 2020/21 seasons (Table 1). This notably includes several years where informal trade resulted in net maize exports (from 2010/11 to 2012/13 and in the 2017/18 season).

Table 1: Formal maize purchases and informal cross-border maize trade

Consumption Season	Formal maize purchases (MT)	Informal imports (MT)	Informal exports (MT)	Net informal imports (MT)
2007/08		59,650	7,493	52,158
2008/09	53,244	62,327	439	61,888
2009/10	60,975	60,318	7,758	52,559
2010/11	26,397	24,381	34,487	-10,107
2011/12	7,662	29,571	114,104	-84,533
2012/13	1,258	14,766	32,060	-17,294
2013/14	86,735	64,133	5,748	58,385
2014/15	50,649	21,679	8,372	13,307
2015/16	57,187	6,576	6,576	-
2016/17	95,251	1,750	1,750	-
2017/18	95,697	20,267	38,212	-17,945
2018/19	33,021	25,771	4,145	21,626
2019/20	20,951	30,859	8,497	22,362
2020/21	34,347	70,232	30,361	39,871
Cumulative average	**47,952**	**35,163**	**21,429**	**13,734**

Source: Government of Malawi and FEWS NET Malawi

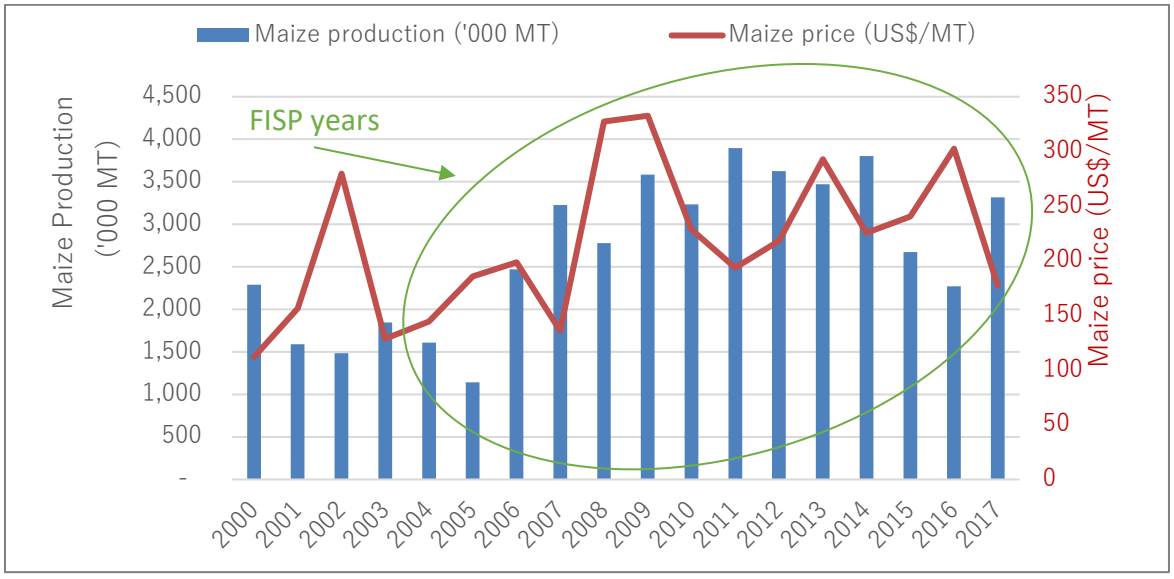
Notes: There are some data gaps for informal trade statistics for 2015/16, 2016/17, and 2018/19

Most formal trade during that time consisted of maize imports into the Strategic Grain Reserves (SGRs). On average, Malawi purchased about 48,000 MT for the SGR between 2007/08 and 2020/21. Most of these purchases coincided with continued increases in real maize prices and persistent food insecurity, especially in the lean seasons of the year, heightening the cost of relief distribution (Messina et al., 2017).

Maize prices have remained volatile and disproportionately higher in the marketing seasons that were preceded by poor harvests, despite FISP interventions (Figure 3). Unstable maize supplies and volatile prices cast doubts on the ability of subsidies alone to facilitate the attainment and sustainability of the country's food security.

Relatedly, it is important to keep in mind that national food production increases, if they were attainable, do not necessarily translate to household food security. For example, a recent Malawi Vulnerability Assessment Committee (MVAC) report found that around 10% of the country's population (1.69 million people) faced high levels of acute food insecurity between July and September 2020, despite the general good harvests experienced at a national level that year (MVAC, 2020) [2]. This required urgent relief interventions to reduce food gaps, protect and restore livelihoods, and prevent acute malnutrition.

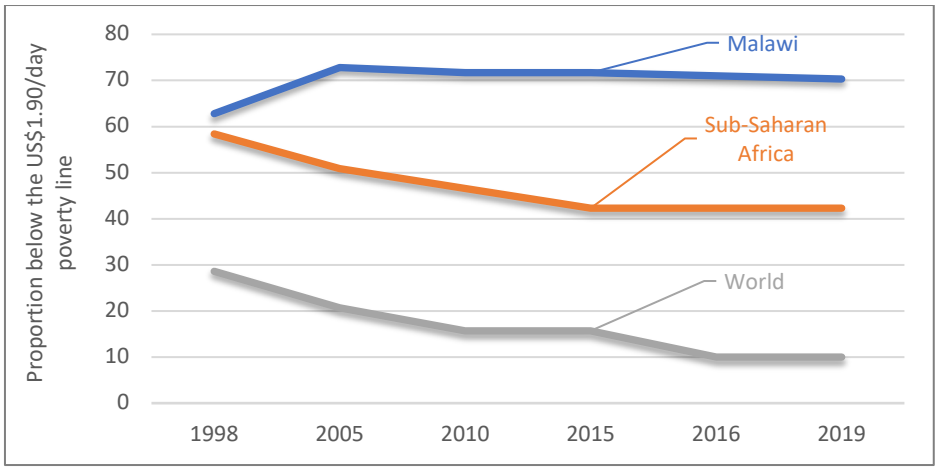
Figure 3: Maize production and prices (2000 to 2017)



Source: Agricultural Production Estimates Surveys (APES) and FAOSTAT

[2]http://www.ipcinfo.org/fileadmin/user_upload/ipcinfo/docs/IPC_Malawi_Acute_Food_Insecurity_July2020March2021_Report.pdf

Figure 4: Prevalence of the population living below the international poverty line of US$1.90/day across Malawi, Sub-Saharan Africa, and the world



Source: Estimates based on WDIs

Also, MVAC projected that around 15% of the population expected assistance with relief maize between October 2020 and March 2021 due to the floods and prolonged dry spells that caused a production shortfall and led to a slow recovery from previous seasons.

5.2. Extreme poverty has slightly fallen but poverty incidence hardly changed

Very few studies report farm household income gains from subsidies. As expected, the limited income effects are due to the small effect of subsidies on maize prices and wage rates (Dorward & Chirwa, 2011; Ricker-Gilbert & Jayne, 2011). These small income gains have resulted in little effect on the purchasing power of the poor rural households (Ricker-Gilbert et al., 2013). Overall, the incidence of poverty has not changed much since the 2004/05 season, when the FISP was introduced, and poverty rates remain significantly higher than global rates (estimated at 10%) and Sub-Saharan region averages (estimated at 42%) (Figure 4).

Considering its critical role in most Malawian livelihoods, agricultural sector growth is almost certainly necessary to put the country on a trajectory of falling poverty rates; agricultural productivity growth has been the precursor for structural transformation of virtually every agrarian economy in history (Mellor, 2017).

One way of increasing agriculture's contribution to household incomes is by improving beneficiary targeting to ensure only poor (but productive) farmers are given access to

subsidized inputs (see section 5.3) (Ricker-Gilbert et al., 2011; Holden & Lunduka, 2012). Also, poor farmers need targeted extension support because they stand to benefit the most from improving management ability (Marenya & Barrett, 2009; Chirwa et al., 2011; Ricker-Gilbert & Jayne, 2012). Technical backstopping would improve their on-farm agronomic practices to enable the efficient use of subsidized inputs and improve productivity.

6. The pitfalls of subsidies in Malawi

6.1. Low crop response rates

Literature is replete with empirical evidence regarding the endemic problem of low crop response rates to fertilizer application in Malawi and other countries. In part, this is due to soil characteristics such as low pH (acidity) and low soil carbon (Merenya & Barrett, 2009; Snapp et al., 2014; Burke et al., 2017). These problems are common in many tropical soils, when land is under continuous cultivation and soil and water management is inadequate. Consequently, while some older data show response rates as high as 18 maize kg per kg of N (kg/kg), more recent data show crop response rates in Malawi as low as 2.6 kg/kg (Burke, 2020). Even the earlier findings are unimpressive compared to results in other countries and a fraction of typical agronomic response rates. If sustained investments are not made to address these fundamental soil health issues, a growing proportion of farmers will be locked into low crop response rates to fertilizer use, with constrained effective demand for fertilizers. This will also progressively reduce payoffs to subsidies (Chirwa & Dorward, 2013) (refer to 7.1, below).

6.2. Crowding out investments in soil nutrient inputs

Subsidizing the cost of adding nutrients lowers the incentives to make investments in soil health that could improve crop response to fertilizer. For example, farmers will not be incentivized to invest in N efficiency improvements if the costs of N applications are artificially low, all things being equal. This underscores the importance of also promoting soil health improvements (also refer to recommendation 7.1).

6.3. Poor targeting

In principle, targeted subsidies ration inputs to productive but poor beneficiaries who would otherwise lack access to commercial inputs. Rationing, in turn, is easier if the specification of entitled beneficiaries, the size of their entitlement, and a mechanism for accessing that entitlement are as explicit as possible (Chirwa & Dorward, 2013). However, evidence suggests successive FISPs have not been able to effectively target specific beneficiaries. This is partly by design since the program comingles the objectives of food security and poverty alleviation. This is also partly a result of political interference. For example, greater quantities of subsidized inputs have on occasion been disbursed to households with higher assets and more land (Ricker-Gilbert et al., 2011; Holden & Lunduka, 2012; Chirwa & Dorward, 2013; Lunduka et al., 2013). This suggests that explicitly defining consistent program objectives and corresponding targeting criteria remain paramount for effective implementation and administration of future programs. Practically, this might imply implementing programs with food security and social security objectives separately, because the targeting criteria is likely to be different. This is also likely to address some of the political interference issues.

6.4. Displacing/crowding out of commercial input sales

The issues of displacement and crowding out of commercial sales are both closely associated with poor targeting. The empirical evidence on the impact of ISPs on private input markets indicate that the private sector may be affected by large subsidy programs in two ways: (i) by affecting households' decisions to purchase commercial inputs (i.e., crowding out/displacement effect) and (ii) by directly disincentivizing the private sector investment in the fertilizer market (Ricker-Gilbert et al., 2011; Kaiyatsa et al., 2019). Ultimately, the former impacts the subsidies' ability to raise the total quantity of new inputs eventually ending up on farmers' fields (Ricker-Gilbert, 2011). Displacement rates from FISP have generally been between 15% and 21% (Ricker-Gilbert & Jayne, 2011). That is, every 100 kg of subsidized fertilizer reduces the overall demand for fertilizer from the private sector by 15 to 21 kg.

6.5. Diversion and leakage of subsidized inputs

Diversion and leakage are also symptoms of poor targeting. Diversion happens when subsidized inputs are given to unintended beneficiaries who may subsequently use them on crops where they expect higher returns (e.g., cash crops) instead of the targeted crops (Chirwa & Dorward, 2013). Similarly, leakage happens when subsidized inputs meant for Malawian farmers get across the borders, thereby reducing the net economic gains that would have been generated from increased input use. Another element of leakage is when subsidized fertilizers get smuggled into parallel/secondary markets by unintended beneficiaries who may opt to sell to non-beneficiaries through those unauthorized market channels (Chirwa & Dorward, 2013; Jayne & Rashid, 2013). Existing literature estimate diversion in the range of 22% to 42% (Chirwa & Dorward, 2013; Lunduka et al., 2013). Targeting failures may reduce the cost-effectiveness of subsidies, reduce the subsidies' contribution to overall fertilizer use, or exacerbate the adverse effects of subsidies on commercial input markets (Ricker-Gilbert et al., 2011). Effective targeting would reduce these challenges by channeling fertilizers only to productive beneficiaries who only lack economic access to commercial inputs.

Table 2: Composition of the government's budgetary allocations to the MoA and selected programs in the MoA (2009/10 to 2019/20)

Season	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	Average
MoA share of GoM budget												
	14.9%	12.0%	13.3%	14.7%	20.5%	17.5%	14.8%	17.6%	10.6%	10.0%	9.7%	14.1%
Shares of MoA Budget												
FISP	44.7%	63.0%	52.6%	73.8%	45.6%	38.3%	44.0%	17.0%	25.5%	26.2%	20.3%	41.0%
Maize purchases	5.2%	0.0%	2.7%	6.8%	4.4%	5.9%	6.3%	14.8%	51.1%	7.0%	6.0%	10.0%
R&D	1.3%	1.4%	1.4%	1.0%	0.7%	0.9%	1.0%	0.7%	1.0%	1.6%	1.6%	1.1%
Agric. Extension	-	-	0.0%	0.1%	0.1%	0.1%	0.2%	0.2%	0.1%	0.1%	0.2%	0.1%
Irrigation development	0.5%	0.4%	0.3%	0.2%	0.2%	0.2%	0.5%	0.2%	0.5%	0.5%	0.6%	0.4%
Livestock development	0.1%	0.4%	0.6%	1.8%	1.8%	0.4%	0.5%	0.4%	1.1%	1.5%	0.4%	0.8%
Subsidy rate												
	95.0%	90.0%	91.9%	92.6%	96.4%	97.0%	79.0%	66.9%	65.2%	66.0%	65.8%	82.1%

Sources: FISP implementation Reports (2009-2019); Lunduka et al., 2013.

6.6. Crowding out of other critical agricultural development investments

Government budgetary allocations to the MoA over the 2009/10 to 2019/20 period have averaged 14.13%, surpassing the Comprehensive Africa Agriculture Development Program (CAADP) target of 6% (see Table 2). However, the FISP has constituted the largest share of allocations (41% on average), presumably at the expense of other important agricultural development programs. In contrast, allocations to agricultural R&D averaged 1.1%; agricultural extension 0.1%; irrigation development 0.4%; and livestock development 0.8% in the same period. The FISP's dominating role in agricultural budgets peaked between 2009/10 and 2015/16. Though still high, FISP shares fell steadily between 2016/17 and 2019/20 (Table 2).

When the costs associated with the FISP are segregated according to the main elements of the program, the analysis reveals that between 2006/07 and 2019/20 (not graphically shown), fertilizer purchases constituted the largest share (79.35%) followed by seed purchases (17.68%) and administrative costs (3.80%).

With respect to fertilizer purchases, real cost gains could potentially be realized if producers were incentivized to blend locally at scale, buy in bulk and transport into the country using the most efficient possible routes (e.g., shortest railway route), and locally distribute through the most efficient distribution channels possible. Administrative costs are expected to be further reduced with the government's recent adoption of an electronic beneficiary identification system for the AIP.

6.7. High subsidy rates coupled with low return on investment

The subsidy rates have remained high, averaging 82% (Table 2). The current subsidy program (AIP) rate is 77%. These high rates make subsidized inputs easily accessible but can lower incentives for farmers to increase maize response rates. For example, Ricker-Gilbert et al. (2013) indicate that the return on investment in fertilizer is only positive at commercial prices, when the maize-to-fertilizer response ratio is 5:1 or higher. At subsidized rates, however, fertilizer use can be "profitable" at much lower response rates. For example, at the average (82%) subsidy, the analogous break-even response ratio is just 1.4:1. While this is good news from the beneficiary's perspective, the benefit-to-cost ratio for the government is quite low.

To add context to the opportunity cost of the FISP, Table 3 compares FISP spending over the past decade to other project costs. Specifically, we have focused on other potential government investments that could increase the profitability of agricultural production. The FISP and other input subsidies accomplish this by lowering the costs of inputs. Other ways profitability can be increased, however, include raising productivity (e.g., by investing in

Table 3: Opportunity cost estimates of alternative projects in various sectors

Projects	Unit cost estimate (millions MWK/year)	Potential alternative investments to FISP per year
Farm Inputs Subsidy Program		
Average cost of a FISP (2009/10 to 2019/20)	39,000	-
Road construction		
Highest-quality all-weather road (per km)	395	99 km new roads
Lower-quality all-weather road (per km)	178	220 km new roads
Railway construction/rehabilitation		
New high-quality railway line (per km)	431	91 km new rail
Railway line rehabilitation and upgrading (per km)	127	308 km rail
Educational facility construction		
Basic primary school block (1 classroom)	45	871 classrooms
Full primary school[a]	800	49 new primary schools
Day secondary school with 8 staff houses (1 unit)	3,000	13 new secondary schools
Basic secondary school classroom	50	784 classrooms
Basic science laboratory (secondary school)	90	435 laboratories
Maize mills (e.g., for boarding schools)	20	1,959 maize mills
Training college for primary school teachers	9,500	4 colleges
Extension agency		
Chitedze research officer at professional entry level (per person)	4.13	9,440 officers
Frontline extension officer salary (per annum)	1.88	20,719 salaries
Frontline extension officer in-service training (per person)	1	39,000 trainings
High quality (durable) motorcycles	5	7,800 motorcycles
Operating costs for motorcycles	0.54	72,222 services
Demonstration plots for improved management	0.15	260,000 plots

Source: FISP review reports (2009 – 2019), cost estimates from ongoing and recently completed projects (various official sources), and the author's calculations. Notes: a- "Full Primary School" includes 8 classroom blocks, an admin block, and 8 staff houses.

research and extension) or lowering the costs of doing business (e.g., by investing in transportation infrastructure). We also compare FISP spending to the costs of educational investments that would be aimed at raising labor productivity in the long run, either on or off the farm. For example, in the last 10 years of the FISP, the same amount of spending could have added between 990 and 2,200 km of all-weather roads (compared to the current national network of fewer than 7,000 km).

Alternatively, by comparison to the status quo, rail investments could have been even greater. By last count, there were 797 km of rail in Malawi (World Bank WDI). The spending from the last 10 years of FISP could have rehabilitated 100% of that with enough left over to nearly double the existing rail network (i.e., enough to add more than 700 km of new rail).

A holistic program would require robust and sustained funding for research, development, and extension, but the costs are not prohibitively high. With about one-third of the proposed spending for the 2021/22 AIP, the government could have added 10 research officers at the station in Chitedze, recruited and trained more than 4,000 extension officers, equipped each officer with a new motorcycle, and provided the fuel and funds to operate it as well as everything needed to run a demonstration plot for improved management. This would more than triple the government's current research and extension capacities.

As for investments in education, the quantity spent on the FISP since 2009/10 could have added nearly 9,000 classrooms to existing primary schools, or built nearly 500 all-new primary schools, or built 130 all-new secondary schools. For the cost of just 3.25 average years of the FISP, a new basic science learning laboratory could have been built at every single secondary school in Malawi.

To be clear, these each represent one alternative to FISP spending. Not all of these investments could have been made in lieu of the FISP, and we have no evidence to offer in terms of which would be the best alternative, or even if it would be better than spending money on the FISP. However, at best, the FISP is an expenditure with a short-term (one-year) payoff. This table is intended to illustrate the opportunity costs of these expenditures in terms of investments in projects that could have had higher and longer-lasting payoffs.

6.8. Financially unsustainable in the long run

A large share of fertilizers used in Malawi is imported. The Malawi Revenue Authority (MRA) records indicate about MK60 billion worth of fertilizers per year were imported between the 2015/16 and 2019/20 seasons. This implies a significant portion of the country's foreign exchange reserves is spent on fertilizer imports, and the subsidy program is one of the major consumers of this fertilizer. The country's weakening foreign exchange reserves status, the declining value of the Kwacha, and the periodic fluctuations in the global fertilizer prices clearly portends tremendous and unsustainable pressure on the country's foreign exchange reserves if future subsidy spending is not curbed.

Here again, improving response rates is key, and doubly beneficial in terms of budget sustainability. Greater fertilizer use efficiency could decrease the scale of need for fertilizer subsidies but also lower the burden for buying maize to stock the national SGRs. The pooled expenditures on subsidies and maize purchases by the government represented 51.02% of the MoA budget (and 7.20% of GoM budget) in the 10-year period between 2009/10 and 2019/20 (Table 2). The subsidy component was the biggest contributor to this share. Nonetheless, the purchases for the Strategic Grain Reserves (SGR) can be expected to diminish if the country can significantly improve farm-level productivity. Otherwise, the sustainability of input subsidies is highly questionable.

6.9. Poor timing of input deliveries

Several governmental evaluations (Annual Implementation Review Reports) and empirical studies (Lunduka et al., 2013) have shown some farmers accessed subsidized inputs later than is agronomically optimal. The prevalence of late delivery is highest when implementation is burdened by logistical challenges, such as delayed contracting of suppliers and/or identification of beneficiaries. Generally, program activity timing has substantially improved over the years (though there were considerable delays in the initial year of the AIP). Improving the input delivery timing continues to be critical, because maize yields are extremely sensitive to fertilizer application timing (Xu et al., 2009).

7. Conclusions and policy implications

The Malawian government has made major investments in large agricultural input subsidies over recent years. Despite some successes, overall maize production is yet to reach its projected potential, partly because the rate of productivity increase from subsidies has been smaller than expected. As a result, maize imports continue, real maize prices have not declined, and food insecurity remains persistent. Poverty overall has changed little since the introduction of the FISP in 2004/05.

This paper sought to highlight some of the promises (objectives), achievements, and pitfalls of agricultural subsidy programs that will need to be addressed if future programs are to improve upon past achievements. We relied on empirical evidence from Malawi's subsidy programs, analyzing secondary data sourced from the government, FEWS NET, and other international sources.

The following are policy proposals that authorities may wish to consider enacting in order to improve the contribution of agricultural subsidies to the country's food basket, household welfare, and economic health.

7.1. Adopt holistic approaches to improving household maize productivity

The low productivity of maize has mostly been attributed to low maize response rates to nitrogen fertilizer application, which is due to poor soil health (e.g., low soil carbon, low soil pH), poor soil physics (e.g., sandy soils), and poor farm management practices (e.g., late weeding). These soil health issues can vary significantly by location and within particular maize fields.

To improve and sustain overall soil health on smallholder farms, programs could, on a pilot basis, integrate complementary soil fertility management practices along with agricultural subsidies (e.g., incorporating organic fertilizers, livestock manure, compost, conservation agriculture practices, maize-legumes models, crop-livestock models, etc.). Practically, this might imply greater public investment in (i) animal production to enhance the critical synergies between crop and livestock production and (ii) agriculture research, development, and extension. Similarly, intensifying maize-legume production systems could

significantly improve soil fertility by biologically increasing N and organic matter in the soil. This can also increase household nutrition through the provision of protein from legumes (Kim et al., 2019).

7.2. Unbundle "smallholders" and tailor interventions to specific categories of smallholders

Smallholders are not a homogenous group of producers. Though practically challenging, one way of improving subsidy programs would be unbundling "smallholders" to identify and tailor interventions—which may or not include subsidies—to their specific needs.

7.3. Define and stick to internally consistent program objectives and targeting criteria

Effectively identifying and delivering subsidized inputs to the intended beneficiaries requires explicitly defined program objectives and targeting criteria. If the goal of the AIP is to increase national production at minimal cost to the government, the poor who are seen as lacking sufficient land and labor may not be the primary target. If, on the other hand, the goals are poverty alleviation, crowding in effective demand, and improving food security of non-commercial farmers, the targeting criteria may be very different.

7.4. Explore innovative ways of making the fertilizer supply chain less risky and more cost-effective

Promoting the local blending of crop-specific and area-specific fertilizers and using cost-effective transportation and distribution systems could make fertilizer supply less risky and more cost-effective. This would give the private sector a greater role in fertilizer production and retail. These reforms could be implemented alongside a revised fiscal calendar (for example, one that starts as early as the first quarter of the year) to allow for more time to plan and implement subsidy activities. Furthermore, literature indicates that giving the private sector a greater role in subsidy programs, coupled with early planning and implementation of subsidy activities, could lower the procurement costs and improve the delivery of inputs to beneficiaries (e.g., Lunduka et al., 2013).

7.5. Improve the effectiveness and fiscal sustainability of fertilizer subsidies

The government could gradually start shifting its focus from subsidizing agricultural inputs to increasing investments in agricultural development programs (e.g., agricultural R&D and extension services), building systems for the provision of farmer support services (e.g., agricultural finance), and structuring and making output markets more accessible and remunerative to smallholder farmers.

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