MALAWI
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Priorities for Irrigation Investment in Malawi

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MALAWI'S GROWING DEPENDENCE ON AGRICULTURE

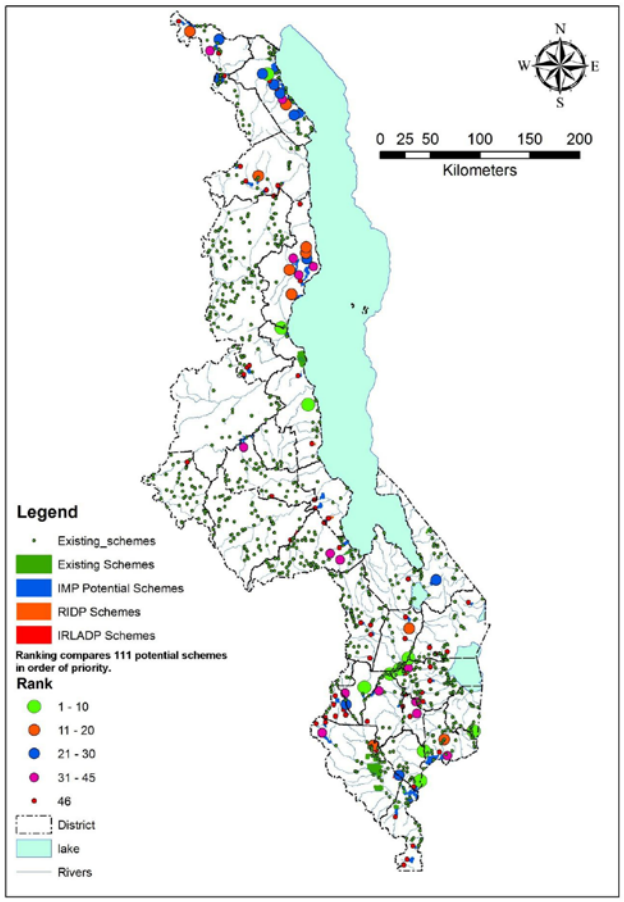
Malawi is characterized by a high population growth rate, a high dependence on rain-fed agriculture, and high vulnerability to the effects of climate change. With the population projected to increase from 18.3 million in mid-2017 to 43 million by 2050, food demand will also increase, further aggravating Malawi's food security situation, especially if strategies to enhance food production under a changing climate are not prioritized.

Irrigation is a key solution to food insecurity in the face of rapid population growth and recurring droughts and floods, as agriculture remains the main livelihood for most Malawians. About 408,000 hectares of agricultural land could potentially be irrigated, which corresponds to approximately 7 percent of agricultural land. Currently, only 108,000 hectares (a quarter of the potential irrigable area) have been developed for irrigation, with targets set at reaching a total irrigated area of 220,000 hectares by 2035. Such irrigation expansion would require US$2,146 million for initial infrastructure, and US$278 million as annual recurrent costs—not to mention, significant political will. Promisingly, in 2014, the Government of Malawi took steps to accentuate the importance of irrigation to the country's food security and overall economy by merging the Ministry of Agriculture and Food Security with the Ministry of Irrigation and Water Development to form the Ministry of Agriculture, Irrigation, and Water Development (MoAIWD). The MoAIWD was responsible for revising the National Irrigation Policy (NIP) in 2016 to address critical issues that affect the country's irrigation sector, including customary land tenure disputes and poor operation and maintenance of infrastructure.

This policy note explores priorities for investment in irrigation in Malawi, and examines the trade-offs between investment in new irrigation infrastructure, versus rehabilitation and maintenance of existing irrigation infrastructure. By reviewing empirical studies and government publications, the note examines investment trends in the irrigation sector, and further identifies possible channels through which maximum benefits can be accrued from irrigation in Malawi.

Malawi's irrigation sector is made up of smallholders using mainly informal irrigation systems, and private large-scale estates mostly using formal systems (Figure 1). As of June 2016, smallholders irrigated a total land area of 41,053 hectares benefiting 348,572 smallholder farmers, while estate irrigation covered 53,500 hectares. While smallholder irrigation has increased significantly over the years, irrigation on private estates has remained generally static. This may be attributed to difficulties in identifying new land for large scale irrigation development and lack of access to capital.

Figure 1: Existing and potential irrigation schemes in Malawi

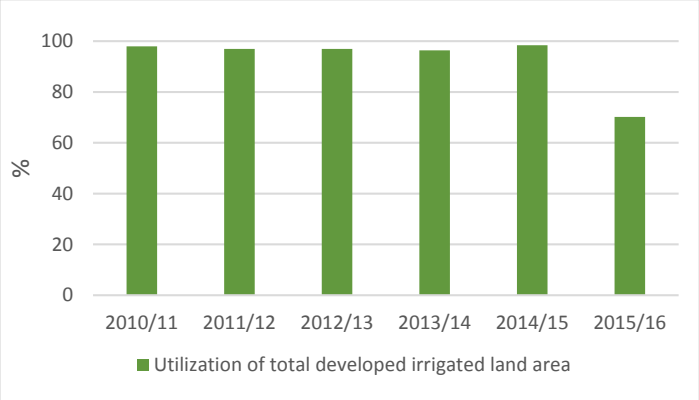


Source: SMEC (2015).

Malawi's limited irrigation area results in low agricultural productivity and variable crop production, contributing to food deficits during droughts and floods. The World Bank estimates that droughts, on average, cause GDP losses of almost 1 percent annually, with larger losses for extreme droughts. Furthermore, total flood-related annual average losses were US$26 million in the southern region of Malawi alone. Malawi's vulnerability to the impacts of droughts and floods on agriculture, food security, and poverty could be reduced through the expansion of irrigation.

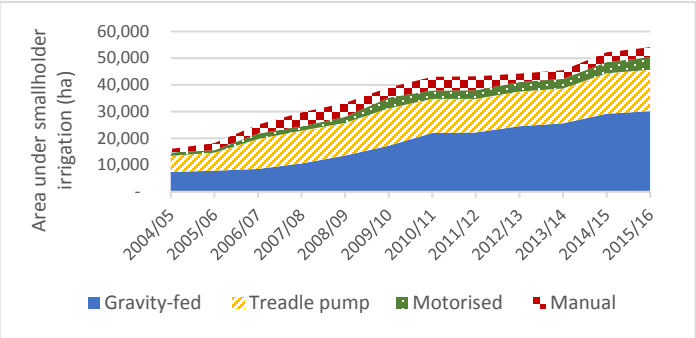
In recent years, there has been a sharp decline in utilization of land that has been developed for irrigation, which has declined from 98 percent in 2010/11 to 70 percent in 2015/16 (Figure 2). This large decrease in utilization has been attributed to several factors, including limited financial resources and El Nino weather patterns, resulting in dwindling of water resources. An estimated 5,000 hectares of irrigation infrastructure valued at about MK2.6 billion (US$5.3 million) were damaged by the floods of 2015. The Shire Valley registered utilization levels of just 33 percent in 2015/16 due to the large body of sand displaced by the floods, which delayed land preparation activities in most fields (MoAIWD 2016$_a$). In addition, high fuel prices and electricity tariffs also negatively affected utilization of motorized pumps.

Figure 2: Utilization of irrigated land in Malawi



Source: Computed from data obtained from National Local Government Finance Committee. The area under smallholder irrigation has been slowly increasing over time (Figure 3). Gravity-fed schemes, which benefit hundreds or thousands of smallholder farmers, and treadle pumps, a traditional technology attractive for micro-irrigation, remain the most common irrigation technologies in use and are both relatively affordable. These technologies are generally preferred to motorized pumps due to the high cost of fuel and scarcity of diesel or electricity to run the pumps. However, governance of gravity-fed schemes for smallholders remains a challenge, as in other developing countries, due to failures of collective action and lack of incentives.

Figure 3: Area under smallholder irrigation in Malawi



Source MoAIWD (2016b) and Nhamo (2016)

Looking ahead, the irrigation sector is venturing into solar powered pumping systems. Despite their heavy initial investment cost, solar pumps make it possible for water resources to be accessed in remote rural locations, require no fuel, and minimal maintenance. Solar pumps lessen the high fuel and maintenance costs associated with motorized pumps: operational and maintenance costs for a solar system are relatively low at US$50–100 /ha (Smith et al. 2014). Furthermore, the falling costs of PV panels used by solar pumping systems makes them more affordable.

BENEFITS OF IRRIGATION

Irrigation has been found to benefit food and nutrition security, productivity, rural income generation, and the economy as a whole.

A. Nutrition

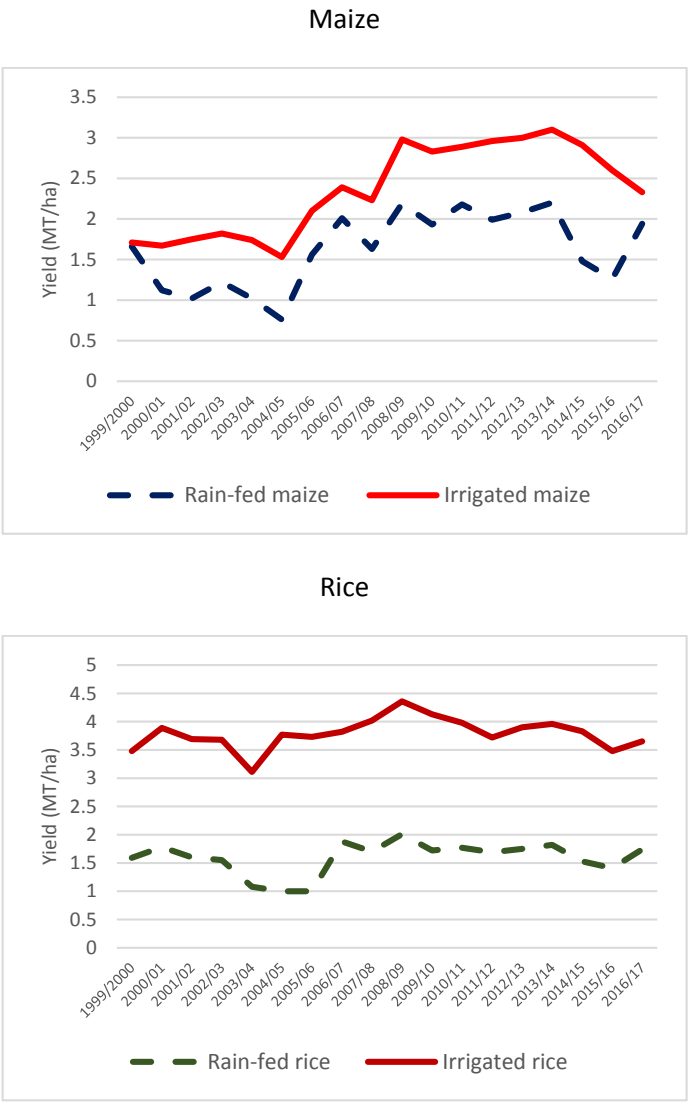
Irrigation can have direct effects on nutrition through increased agricultural production per unit area, diversification of crops, and indirect benefits through increased access to safe water, thereby improving sanitation and reducing the burden of disease (Benson, 2015). However, the pathways through which irrigated farming can improve nutrition outcomes are indirect, since household food security does not imply better nutrition. Nkhata et al. (2014) found that irrigating farmers in the Bwanje Valley in central Malawi have higher welfare and are generally more food secure than their non-irrigating neighbors. This enables the production of a broader diversity of crops such as vegetables, which frequently will then be consumed by farm households. Irrigation can also either promote or undermine the health status of farming households through better access to safe water or exposure to parasites such as malaria-causing mosquitos respectively.

B. Yield gains and reduction in yield variability

Irrigation not only increases crop yields but also enhances fertilizer response and reduces yield variability. Farms that invest in both irrigation and fertilizer have the highest yields and lowest yield variability for the majority of crops. Irrigation therefore offers synergies with Malawi's Farm Input Subsidy Program (FISP) while also strengthening the resilience of agricultural production (SCHUENEMANN ET AL. FORTHCOMING).

Figure 4 shows a comparison between yields of rice and maize over time, under rain-fed and irrigated agricultural systems. Yields of both crops under irrigation are higher than yields under rain-fed agricultural system. Further, the variation in yields under irrigated agriculture are lower (24 percent for maize and 7 percent for rice) than those under rain-fed agriculture (29 percent and 18 percent for maize and rice). This indicates the productivity enhancing nature of irrigated agriculture.

Figure 4: Yields of selected crops with and without irrigation in Malawi



Source: Nhamo et al. (2016) and MoAIWD's Agriculture Production Estimates Survey (APES)

C. Increased rural incomes

Irrigation development represents one of the best opportunities to boost rural incomes (SMEC, 2015). This can be achieved through improving farmers' access to input and output markets, and diversification in crop production from cereal production (particularly maize) to higher-value crops that can be sold on both domestic and export markets. Smallholder farmers with access to irrigation, even quite small irrigated areas, have the capacity to produce a much wider range of crops which helps to improve the quality of their diets as well as generating year round income.

D. Economy wide benefits

Irrigation development can also bring about indirect benefits to the economy as a whole. These benefits are due to income and employment effects in the agro-industrial and non-farm sectors of the rural economy. The contribution of irrigation to agricultural sector GDP in Malawi is in the range of 7 to 12 percent, and to the economy as a whole in the 2 to 4 percent range (SMEC 2015).

Scheunemann *et al*. (forthcoming) find increasing irrigated land area in Malawi by 300,000 hectares increases agricultural GDP by 7%, primarily by opening up a winter season. Through employment, price and wage effects, it also increases industrial GDP by 3.8% and service sector GDP by 6% assuming there is unemployed labor. Furthermore, irrigation expansion increases household welfare increases for both farm and non-farm households, with the poverty headcount rate decreasing by 7.8% for farm households and up to 9.2 percent for non-farm households..

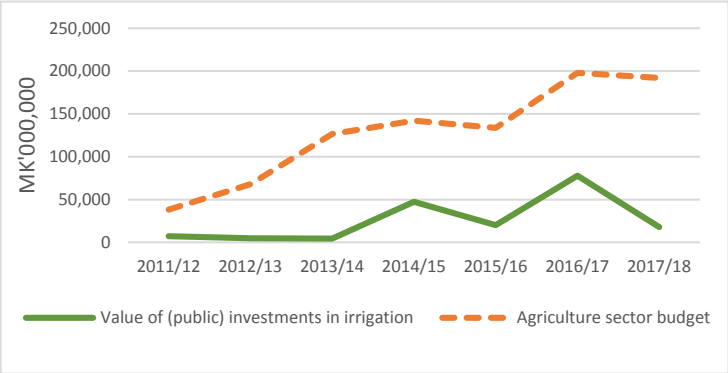
COST AND FINANCING OF IRRIGATION INVESTMENTS IN MALAWI

Irrigation development is capital-intensive and so it competes with many other investment needs, given limited funding. Initial investments are high, and these are costs that smallholder farmers in Malawi cannot bear due to their limited financial capital. On the other hand, maintenance and operation costs need to be borne by the farmers in order to achieve financial sustainability of the investments.

The Irrigation Master Plan (IMP) estimates that a US$2.1 billion initial investment is needed for developing 116,000 hectares (US$18,500 per hectare). A further US$2,397 per hectare is then needed for annual recurrent costs. The IMP consists of four mutually supporting components to be implemented between 2015 and 2035: (1) the development of selected new irrigation schemes (116,000 hectares), (2) sustainable management of existing schemes, (3) building the capacity of Malawi's relevant institutions and (4) human resources, and management of the master plan implementation. With the total cost estimated at around US$2.4 billion, nearly 89 percent represents development expenditures while only 11 percent represents recurrent costs, mainly irrigation scheme operation and maintenance.

Financing in the irrigation sector mainly comes from public funding through the national budget and support from development partners. Over the years, there have been fluctuations in funding for the sector (Figure 5). For instance, there was a significant increase in sector funding from fiscal years 2013/14 to 2014/15 as a result of the increase in development partner capital expenditure, mainly from the World Bank and African Development Bank. However, there have been some decreases in funding in recent years due to declined commitments by development partners. Funding for the Green Belt Authority is also projected to decline from 0.10 percent of the total national budget in 2013/14 to 0.02 percent in 2017/18 fiscal year, presenting a potential challenge in undertaking.

Figure 5: Financing in irrigation and agriculture sectors



Source: Ministry of Finance - Budget Statements 2011/12 to 2017/18

The private sector has demonstrated a willingness to invest in irrigation development and there are several successful examples of irrigated outgrower schemes associated with commercial estates with processing facilities. The IMP financing framework indicates that the contribution of the private sector is expected to increase from US$76 million in Phase I to US$211 million in Phase III of the IMP, accounting for 17%of total IMP cost. Malawi's development partners have also expressed strong interest in supporting irrigation development both financially and technically: their contribution to the IMP expected to be 55 percent over the lifetime of the Plan (SMEC 2015).

However, Schuenemann *et al.* (forthcoming) argue that currently, monetary returns to irrigation in Malawi are small and not likely to cover the high investment and maintenance cost envisaged by the IMP. In order to accrue maximum benefits from the IMP, investments need to target not only area expansion, but also rehabilitation of existing irrigated area, and to pay more attention to maintenance and operation costs.

CONCLUSIONS AND POLICY RECOMMENDATIONS

The potential benefits of irrigation in Malawi include increased yields, reduced yield variability, increased employment and incomes, crop and dietary diversification, as well as indirect impacts on nutrition and health. These benefits support irrigation's inclusion in Malawi's ongoing national development plans. However, initial irrigation investment costs are very high, and farmers need to have a greater role in the maintenance and rehabilitation of irrigation infrastructure to ensure sustainability of the investments. While substantial investments are being made to expand the area under irrigation, rehabilitation and maintenance of existing schemes are allocated insufficient financing. In order to address this imbalance and maximize the returns from investment in irrigation, the following need to be taken under consideration:

1. Due to high initial costs, most capital investments in irrigation will need to be publicly funded by Government and/ or development partners.
2. Greater attention needs to be paid to the financial sustainability of irrigation investments, particularly meeting their recurring operational and maintenance costs.
3. Lower cost irrigation systems using gravity-fed and solar technology should be promoted to decrease the costs of production).
4. Research and development on current irrigation practices, the productivity enhancing effects of irrigation by crop, and the wider economic benefits of irrigation need to be expanded.

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