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INNOVATION LAB FOR FOOD SECURITY POLICY

Unlocking Irrigation Investments in Malawi: Rationale for the Proposed Innovative Financing Mechanism

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Introduction

Investment in irrigation is expensive and often requires a large sum of money upfront, with returns only occurring in smaller tranches over a long period of time (Small, et al., 1993; Rosegrant et al., 2002). As such, the type of financing that can work to profitably invest in irrigation needs to be specialized and must account for the nature of irrigation farming as well as the attributes of the specific value chain(s) to be irrigated (Turral et al., 2010). Standard loans simply do not work for irrigation because they are not designed to allow investors to repay loans over a long period of time in a profitable manner (Cuevas and Pagura, 2016). The high interest rates, lack of grace period before initial repayment is required or interest rates are charged, and the short repayment periods of standard loans are simply inappropriate. The institutional arrangement under which irrigation is implemented also matters and should be taken into account in the design of financing mechanisms for irrigation (Small, et al, 1993; Burney and Naylor, 2012).

In the past, financing of irrigation schemes has often been implemented through government or donor-funded projects because of the high upfront investment capital requirement, which smallholder farmers do not have and commercial banks are unwilling to provide. The low levels of irrigation management skills among smallholder farmers, bureaucracies and inefficiencies in disbursement of funds and poor project management under government and donor programs, as well as the unwillingness to finance working capital (operations and maintenance) once the irrigation infrastructure has been put in place, have often contributed to the unsustainability and failure of many of these irrigation projects (Turral et al., 2010). Indeed, in Malawi some irrigation projects have stalled because water users associations have failed to pay the electricity bills and while equipment is in place production has failed to take place. These problems associated with irrigation investment are only some of the important considerations that have made commercial banks unwilling to invest in irrigation let alone agriculture in general. Therefore, it is essential to account for these issues, in an effort of designing appropriate financial

products and support services that will allow irrigation investments to be profitable and sustainable for both farmers and commercial banks in Malawi.

This policy note is written with these issues in mind, which also form the basis of the rationale for designing and implementing a specialized financing mechanism to kick-start irrigation investments in Malawi. Details of the financing mechanism referred to in this policy note have previously been proposed and presented by the Ministry of Agriculture, Irrigation and Water Development in a concept note titled, "Intensive Irrigated Food Production."[1]

Rationale for Creating the Innovative Financing Mechanism for Irrigation

The following are reasons why investment in irrigation in Malawi is critical and why creating the innovative financing mechanism for irrigation is paramount to unlocking the necessary investments:

a) ***Irrigation can have many benefits – increased food security, nutrition, resilience, jobs, incomes, and export revenues***

Irrigation has been shown to improve food security and climate resilience, while offering opportunities for improved livelihoods from commercial production and sale of crops and livestock (Dillon, 2008; Benson, 2015). Anectodal evidence also suggests that irrigation may contribute towards improving nutrition and gender equality (Domenech, 2015). In the absence of irrigation, dry spells occurring during the rainy season can have devastating effects on rain-fed crop and livestock production, as recently witnessed in Malawi during the 2014/15 and 2015/16 farming seasons (MoAIWD, 2016). With climate change taking place while the Malawian population that needs to be fed continues to grow, irrigation will have to be an important instrument for building resilience of a robust food supply system in Malawi. There is overwhelming evidence of the variety of significant benefits from irrigation and this is why government and other stakeholders in the agriculture sector must take bold steps to scale up irrigation financing and investment in Malawi. Part of that process will require government and stakeholders to make finance for irrigation more accessible and practical by creating appropriate mechanisms, given that finance is a key constraints to irrigation investments.

Irrigation investments can also create new job opportunities for farmers, farm labourers and market participants in the value chains, and are likely to lead to diversification of farm production, especially into higher value commodities such as fruits and vegetables that promote nutrition and have lucrative export markets with potential for increasing and diversifying foreign exchange earnings of the country. Thus, creating a financing facility for increased irrigation investment will be a critical strategy for overall commercialization of agriculture, as specified in the forthcoming National Agriculture Policy. This can substantially reduce risks in farming through the spreading of investments across numerous value chains (Tarrul, et al., 2010). Moreover, irrigation investment will enable farmers to receive farm incomes more regularly throughout the year, thereby addressing cash flow problems often faced by rural farm households.

b) ***Current institutional arrangements for financing irrigation in Malawi are not properly designed and therefore are not working***

[1] This concept note is attached to this note as an Annex.

Past efforts to ramp up irrigation financing in Malawi have been limited and in cases where they existed they have mostly not worked, as witnessed by the high loan default rates, poor management of irrigation schemes, and failure to scale up irrigation despite the country being water-abundant. High loan default rates and poor management of irrigation equipment have been attributed to institutional arrangement and capacity problems i.e. investments were largely implemented through government systems and dysfunctional cooperatives or water users association, with little or no capabilities of implementing fees (pricing) of irrigation services and water access. Anecdotal evidence suggests that many farmers and villagers have also tended to treat loans or irrigation projects implemented by government as a subsidy rather than as a loan that has to be repaid with interest. As such there has been an attitude of abuse towards such subsidies and programs, resulting in defaults or damage or vandalism of irrigation equipment. Moreover, when irrigation loans have not been repaid, government systems have often failed to recover the debts with the end result of debts being written off at the expense of the treasury. It is for these reasons that the proposed institutional arrangement under the innovative financing mechanism uses the private commercial banking sector as a means of addressing some of the challenges associated with financing irrigation through government and donor-funded mechanisms.

c) Existing financing options do not account for the long-term nature of irrigation investment

Construction of irrigation infrastructure takes time, and the production cycle(s) of the value chain(s) chosen for irrigation will take additional time before the first batch of revenues can be realized. Moreover, in developing-country contexts, where irrigation is often new to farmers, additional time is needed to train farmers how to effectively manage and operate the irrigation equipment and for them to reach the level of expertise needed to efficiently operate the irrigation equipment. In the absence of training, the irrigation equipment is often inefficiently managed or damaged prematurely, thus jeopardizing profitability of the whole irrigation investment (Small and Carruthers, 1991; Small et al., 1993). These factors are critical to consider when designing financing mechanisms for irrigation and have been taken into account in the proposed mechanism.

Current financing options through commercial banks are mostly limited as banks are generally unwilling to lend to irrigation and agriculture overall. A mismatch exists between the type of financial products on offer by the commercial banks in Malawi and the type of financial products that have proven to work in other parts of the world. In particular the level of interest rates, the repayment period and the lack of a grace period tied to the production cycle of the irrigated crop make the current financial lending mechanisms inappropriate for financing irrigation investments in Malawi. It is these issues that form the rationale for creating a specialized financing facility for irrigation, with a focus on food security and nutrition of Malawi.

d) Similar Innovative Financing Mechanisms for Irrigation and Agriculture in General have worked elsewhere

Several countries have implemented similar financing mechanisms to attract the much needed investment in irrigation for improved food security, nutrition and farm livelihoods. For example, the Brazilian federal government subsidized loan interest rates for agriculture through the National Rural Credit System (SNCR), with the type of financing dependent on farm size. Large-scale irrigation farms benefited from longer-term financing at concessional interest rates based on agreements established between government and commercial banks (Westercamp et al., 2015). Financing for these agriculture loans was mainly funded through levies on the banking sector and

federal budget resources, with distribution and administration of loans open to all categories of financial institutions. However, the majority of these loans were offered by public banks as most private commercial banks deemed them less profitable. In some instances, the loans were linked with output off-take programmes with government providing crop purchasing guarantees under the food acquisition programme (*programa de Aquisiciao de Alimentos*), a strategic component of Brazil's Zero Hunger (*Fome Zero)* food security programme.

Under a separate financing mechanism, the government of Brazil also established a variety of public–private partnerships (PPP), which essentially subsidized part of the irrigation investments, while creating administrative concessions for private companies that financed completion of construction of irrigation infrastructures, with the provision that they would serve as concessionaires and provide irrigation service delivery for profit. One of the projects under this initiative is the Pontal Project located in the state of Pernambuco, near the Petrolina/Juazeiro fruit cultivation hub, which encompasses 30,000ha. The financing and concession term was set at 25 years with structured payments; 10% paid in a single instalment on the date that construction of the main irrigation works was completed, 40% payable monthly within five years when irrigated production takes place and 50% paid monthly for the remainder of the financing term period (La Porta Arrobas and Lopes Enei, 2009). In this arrangement the winning bidder for the concession contract was given the responsibility of mobilizing the necessary capital be it from private equity, commercial banks, or other sources.

Recently, Netafim (an Israeli irrigation company) has sourced about half a billion dollars to invest in drip irrigation in developing countries, particularly in China and India. The firm, working with governments and several international banks, including HSBC, Mizrahi-Tefahot Bank, Migdal Insurance and Financial Holdings, Union Bank of Israel, and Israel Discount Bank, has essentially secured government contracts to install irrigation infrastructure in the countries agreed upon through tripartite negotiations involving Netafim, the respective governments and international banks.

In Ethiopia, Netafim is implementing a $200million irrigation investment project on 7,000ha in partnership with the government-owned Ethiopian Sugar Corporation. Financing is provided as buyers' credit, fully guaranteed by the government of Ethiopia, payable in tranches against milestones of the project. Under this arrangement the credit is transferred directly to Netafim as payment for exports. The government sugar company will repay the credit over 9.5 years, and the repayment risk is insured by a consortium of insurance companies that includes Ashra Israel Export Insurance Corp. Ltd. and international insurance companies.

In the case of India, Netafim's Indian subsidiary has been working on a drip-irrigation project in the Bagalkot district in North Karnataka state, located in the country's west. When completed, the Ramthal (Marol) integrated micro-irrigation project will cover nearly 30,000 acres, covering 22 villages and benefiting around 6,700 farmers – making it the world's largest single drip irrigation project. According to Netafim, the project is worth about $60 million. Also in India, Sustainable Agro-commercial Finance Limited (SAFL) was established as a non-banking finance company through anchor investments from the International Finance Corporation of the World Bank Group, which leveraged funding from Mandala Capital Limited, a private equity fund, to the tune of US$20 million for investment in irrigation. In 2012, SAFL was accorded a certificate of registration as a non-banking finance company by the Reserve Bank of India and is subject to

reporting and supervision by the Reserve Bank of India to ensure compliance with financial laws (further details can be obtained from SAFL - www.safl.in)

In the United States, the Federal Government established the Farm Service Agency (FSA) to offer subsidized interest rate loans to family farms (Westercamp, et al., 2015). Much of the FSA's success has been attributed to linking provision of credit with close monitoring systems and capacity building service provision, to ensure that irrigation and farming activities are in line with planned projections necessary to repay the subsidized loans. As part of the process, farmers benefiting from FSA financing are expected to graduate and eventually receive financing from the Federal Credit Agency or other commercial banks, whose interest rates are not subsidized.

Finally, in Morocco, the European Investment Bank (EIB) along with other financiers including the World Bank and the African Development Bank supported the government to finance implementation of the National Irrigation and Water Saving Program with the goal of converting surface irrigation to drip irrigation on nearly 550,000 ha – a total investment value of 4.5billion. Up to 333,000ha had already been converted by 2012 and the EIB had approved a loan to the tune of €42.5million for the program to convert an additional 21,405ha of existing public land with as many as 8,000 small-scale farmers benefiting.

Conclusions

Given the rich evidence of how financing mechanisms can be designed and put in place to facilitate financing and investment in irrigation, the Ministry of Agriculture Irrigation and Water Development recommends the design and implementation of the Intensive Irrigated Food Production Programme. Substantial background research and analysis has been done to ensure that the proposed programme and innovative financing mechanism proposed is catalytic and engages the private sector as well as other stakeholders to increase investment in irrigation in Malawi without draining resources from the treasury. As such, the design is meant to leverage financing from all quarters of the sector while ensuring efficient management through commercial banks under the oversight of the Reserve Bank of Malawi. Moreover, the mechanism is designed to be self-sustaining as a long-term financing revolving fund, with the option of reinsurance to safeguard against a variety of risks. The Ministry of Agriculture, Irrigation and Water Development hopes that the proposal can be looked at objectively on the basis of evidence and what has worked elsewhere while accounting for the domestic context to ensure its practicality for smooth implementation.

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Annex **INTENSIVE FOOD PRODUCTION PROGRAMME (IFPP)**

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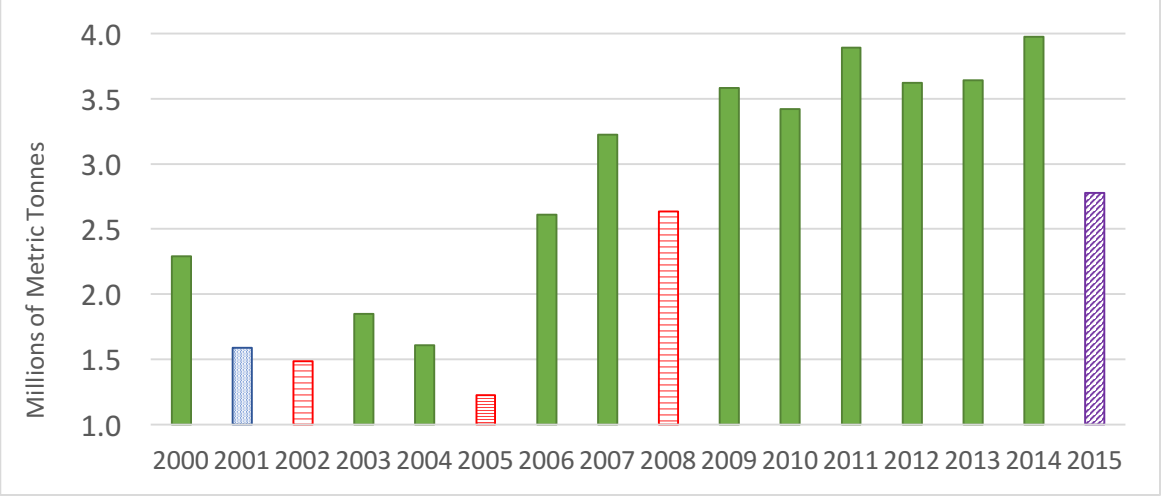
1.0 INTRODUCTION

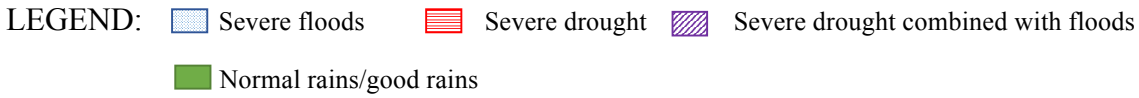
Agriculture in Malawi is highly vulnerable to the adverse impacts of climate change and extreme weather events, such as dry spells, droughts and floods. This is due to high dependence on rain-fed farming and limited investment in irrigation. According to a study by the International Food Policy Research Institute (IFPRI)[2], climate-related events have significant damaging effects on crop production and hence negatively impact food security in Malawi.

Available reports indicate that between 2002 and 2015 Malawi experienced severe drought in four seasons. The worst drought that combined with floods occurred in 2014/15 farming season when production of maize, the country's main staple, declined by about 32.2 percent (see Figure 1).

Figure 1: Weather Variability and Annual Maize Production in Malawi



[2] Pauw et al. (2010)



In addition, maize yields declined from 2.3 metric tonnes per hectare in 2013/14 to 1.7 metric tonnes per hectare in 2014/15 resulting in severe food insecurity for about 2.86 million people. Moreover, the first half of the 2015/16 farming season has been extremely poor across the Southern Africa region including Malawi, largely due to the El Nino phenomenon (FEWS NET, January 2016). According to the FAO, the 2015/16 El Nino will have devastating impacts on agricultural production at global level. As such, countries that are rain-dependent like Malawi may find it difficult to produce adequate quantities of food. Accordingly, drought emergencies have been declared across the whole Southern Africa region for 2016. Available reports indicate that main maize producing countries in the region (like South Africa, Tanzania and Zambia which have served as sources of imports in deficit years) will experience maize deficit in the 2015/016 season. Furthermore the FAO report has projected a four years food deficit in the region. These projections imply that Malawi will have difficulties in accessing food from within the region.

In Malawi, it is anticipated that the food insecure in 2015/16 will need urgent humanitarian response to the tune of US$146 million (EU - ECHO CRISIS FLASH No. 1, 2015). This has also been the case for the past flood and drought years. For instance, the cost of the 2004/05 drought-related humanitarian response in Malawi was over US$200 million (World Bank 2010).

Clearly, climate change and particularly the rainfall patterns in Malawi are becoming increasingly erratic. The fact that food production in Malawi continues to rely on rain-fed systems implies that the country's food and nutrition security is exposed to risks associated with weather and climate variability. This underscores the importance of investing in areas that will build resilience of the food supply system to ensure national food security and increased farm incomes. In this respect, it is proposed that Malawi should invest in irrigation facilities to rapidly intensify food production. Already there are some irrigation initiatives that the government has undertaken to boost crop production in the country. For instance, there are about 104,000 ha developed for irrigation. However, this is below Government estimated potential irrigable hectarage of about 385,000ha (National Irrigation Master Plan and Investment Framework, 2015) hence the need for this programme.

2.0 RATIONALE

Malawi has had devastating impacts of weather-related disasters that resulted in negative effects on food production and productivity. These effects have been quite significant on maize, the country's main staple.

Although the country produces diverse food crops, maize has remained the central crop in the food security basket for Malawi. It is therefore no surprise that maize continues to feature as the focus of food security and agriculture policy in Malawi; for example it is a priority commodity in both the Malawi Growth and Development Strategy (MGDS) and the Agriculture Sector wide Approach (ASWAp). Henceforth, a number of programmes have been implemented to promote maize production, key among them is the Farm Input Subsidy Programme (FISP) that was introduced in the 2005/06 cropping season and continues to date, whilst having undergone various reforms to improve programme impact.

Despite these initiatives, maize productivity has remained low over the years, averaging about 2.3mt per ha. This is far below the potential estimated to be as high as 10-12 tonnes per ha. In part, this is due to weather variability including dry spells, droughts and floods, which the existing programmes have not managed to address. There is evidence that productivity of maize will increase by 1.1mt per ha if irrigated under smallholder farming. With medium- and large-scale irrigation the incremental yield is relatively high with an additional 2.0mt per ha. In this respect, investing in irrigation, where environmentally sustainable, would boost productivity and complement rain-fed food production for the country.

It is also important to note that persistent occurrence of weather shocks in Malawi has led to expensive humanitarian response involving government and development partners. Available records indicate that the previous four occurrences of droughts and floods have cost the country close to US$1.0 billion. This cost is likely going to continue rising due to the forecasted need for humanitarian assistance, as climate change shocks persist, unless investment in long-term resilience of the food production system is made; hence this proposal.

This concept note therefore proposes to address the fundamental challenge by dramatically increasing the level of irrigation investments for food crop production. The goal is to achieve food security at national level by transforming Malawi into a nation that consistently produces a large food surplus every year. The programme is also being promoted to diversify food production and the country's export base.

3.0 PROGRAMME OBJECTIVES

The programme objectives are as follows:

- Increase food production and productivity through irrigation investments;
- Scale up processing and packaging of high quality food products for import substitution and exports;
- Increase supply of food products including maize, legumes, rice, cassava, potatoes, sweet potatoes and bananas for domestic and export markets; and
- Increase farm incomes and profits for private producers of food.

4.0 EXPECTED PROGRAMME OUTCOMES

The following are the expected programme outcomes:

- Increased maize production by an additional 1 million metric tonnes per year;
- Increased production of other food crops by at least an additional 140,000 metric tonnes per year
- Increase area under irrigated food crops;
- Increased foreign exchange earnings from food exports; and
- Increased food and nutrition security at national level.

5.0 PROGRAMME INTERVENTIONS

The programme will entail three components designed to accelerate irrigation development in Malawi, strengthen input supply systems for food crops (including improved and drought-tolerant maize seed), and scale up ago-processing, packaging and marketing of food products.

a) **Irrigation Development:** Encourage the development of irrigation infrastructure, including dams and boreholes, to reduce dependence on rain-fed agriculture which has led to low crop

production and productivity during years with erratic rainfall, dry spells, droughts and floods. Some of the activities under the irrigation development component will include:

i) Installation of medium to large scale solar irrigation pump systems for both ground water use and surface water diversion and storage;
ii) Procurement of small electrified and solar pumps with appropriate horsepower as determined by irrigation specialist, which will be loaned out to progressive medium-scale farmers, including private sector;
iii) Maintenance and rehabilitation of existing irrigation schemes currently not put to maximum use;
iv) Construction of new dams and water storage reservoirs in the already designed irrigation schemes;
v) Introduce anchor-farming systems in some of the government developed schemes;
vi) Explore a possibility of changing the management of irrigation schemes under local communities to allow the local to rent out land to private producers.

b) **Strengthening Seed Supply Systems:** In years of droughts normally seed production will also decline. As such the programme will endeavour to invest in irrigated seed production for major food crops. These would include maize, cassava, sweet potatoes, legumes, bananas and rice.

c) **Promotion of Agri-Food Processing and Marketing:** Under the programme, government will facilitate market linkages to enable producers to access both domestic and export markets by issuing the necessary documentation including maize and maize products in years of surplus. In addition, the programme will provide financing for investment in agroprocessing and value addition of food products, with a view of increasing profitability of food production. Part of this subcomponent will focus on improving quality of food products and food safety and will entail investing in manufacturing of high-standard packaging products as well as quality assurance equipment including machinery for detecting levels of aflatoxins in maize and groundnuts among other food products.

6.0 PROGRAMME IMPLENTATION AND FINANCING ARRANGEMENT

The execution of the programme will be led by the Ministry of Agriculture, Irrigation and Water Development with involvement of the private sector and progressive farmers. The programme will be implemented in two phases; Phase 1 will entail areas that can be implemented immediately while Phase 2 entails medium to long-term interventions.

Phase 1: Areas of Immediate Implementation

To address the looming hunger situation caused by El Nino and to begin establishing resilience in the food production systems of the country, the Ministry will engage in market operations to purchase maize and will expedite plans already in the pipeline to develop the country's irrigation potential for food production. Specifically the following will be implemented immediately:

a) ADMARC Maize Purchases

ADMARC will with immediate effect, buy maize from the local suppliers that have stocks within the country. These suppliers will include those that have shown interest in supplying maize to the National Food Reserve Agency (NFRA). In addition, ADMARC will continue to source maize from Zambia, which will beef up the local purchases.

b) Second Crop Production

The Ministry will continue its discussions with Illovo and Malawi Mangoes to engage them in maize production within a stipulated time period. In addition other large-scale commercial producers/ estate owners will be engaged to use their existing irrigation facilities to increase output from the second crop. So far, Illovo and Malawi Mangoes have agreed in principle to use their existing irrigation facilities to produce maize, but further discussions are needed. Illovo would want government to engage its own systems including supervision, while they, Illovo, manage the irrigation system at an agreed price. Malawi Mangoes have demanded a formal request, which has now been sent. Considering that government may not have capacity to produce the second crop of maize and realize optimum results as suggested by Illovo, a proposal has been put forward to allow ADMARC to work with Illovo on this noble assignment.

The Ministry will also engage emerging medium-scale farmers to either utilise their existing irrigation facilities or rent unutilized irrigable land belonging to the smallholder farmers on irrigation schemes for food crop production including maize. The Ministry will create a conducive environment for private sector participation through the introduction of competitive market prices

and offering contracts for maize purchase by the Strategic Grain Reserve. Immediate financing arrangements could also be explored with commercial banks through the Reserve Bank of Malawi, in instances deemed appropriate by the relevant line Ministries. The immediate implementation would be done through a call for "Expression of Interest" in print and electronic media for commercial and emerging farmers.

c) Deployment of Existing Irrigation Schemes

There are irrigation facilities/schemes across the country that were put in place by government and are currently farmed by local smallholder communities. However, there is indication that some of these facilities are underutilized. The Ministry will therefore, with immediate effect, assess these facilities and come up with the hectarage which could be deployed for immediate maize production.

d) Support to Residual Moisture Maize Production

There are a number of farmers with access to *dambos* or use of residual moisture to grow maize. These will be supported with inputs to produce maize during the dry season. The cost of this support is being calculated by the Ministry.

e) Distribution and Installation of Solar-powered Irrigation Equipment

The Ministry will also procure, distribute and install solar pumps (on a loan-basis) across the country, targeting areas where high potential groundwater yield of between 5 and 15 litres/second exists. It is proposed that sites, which have already been identified by the Department of Irrigation, as having potential of 10 ha of land or more would be targeted. The plan is to procure and install a total of 27 solar pumps to benefit about 1,350 farming families. It is estimated that about MK1.4 billion would be required for procurement, distribution, installation of solar pumps and construction of ancillary structures. In addition, resources would be used for community sensitization, preparation of designs and construction of associated civil works for solar-powered irrigation development.

Phase 2: Medium to Long-term Implementation

Phase 2 will consist of medium- to long-term implementation of four models of operation as follows:

Model 1: Long-term Financing at Concessional Interest Rates

Government will facilitate access to long-term dollar-denominated financing (up to 20 years repayment periods) for large-scale irrigation farmers involved in food production. Under this model, dollar-denominated loans will be provided at concessional interest rates to private investors. The funds will be sourced by government from treasury, development partners and other financial sources and routed to selected commercial banks, through the Reserve Bank of Malawi. The commercial banks that will participate in the programme will provide the service of managing and administering the programme finances over the long-term and shall sign a long-term service provision contract with Government of Malawi. As such, details of the contract shall be negotiated and set in motion through a consultative process between Government, the interested commercial banks and development partners. Under the programme, commercial banks will be required to add a specified amount of their own financial capital into the programme in order to participate. In return, participating commercial banks will be paid an agreed upon service charge of less than 1% of total funds managed by each respective commercial bank. Loan recovery will be implemented by the commercial banks through deductions from sales revenues.

Private investors participating in the programme will be issued with export licences to enable them to export their crops in the years of surplus. In case of a deficit the government will facilitate the purchase of the crop at an agreed price, based on prevailing cost of production. The estimated cost of the investment in Model 1 is about US$617.6 million as indicated under Model 1 in table 2 below. Under this model the private farmers will be able to produce about 540,000mt of maize per year and 72,000mt of an alternate crop such as soya beans or beans assuming an intensive maize-legume crop rotation system is used.

Model 2: Financing through Government Development Projects

There are several development projects currently managed by the MoAIWD that could be leveraged to finance the programme. These include the Multi-Donor Trust Fund (ASWAp-Support Project) as well as the Sustainable Agricultural Production Project (SAPP), the Shire Valley

Irrigation Project (SVIP) and the Smallholder Irrigation and Value Addition Project (SIVAP). The programme will tap into these resources to finance irrigation investments targeting about 400 medium-scale farmers with at least 10ha of land. The estimated cost of this investment in medium-scale irrigated crop production is US$41.2 million with an expected output of 28,000mt of maize and 4,800mt of an alternate crop per year.

Model 3: Green Belt Initiative Anchor farm

Under this model possibility of anchor farm system could be explored to engage progressive farmers who will be able to cultivate about at least 5ha of the GBI land. The farmers will work under the supervision of GBI holdings who will provide and manage the water resources. The farmers should be able to provide their own investment capital for the purchase of inputs and labour. GBI will assist in marketing of their products and provide any necessary support. In this model about 7,500 progressive farmers could be engaged to work in three of the GBI farms. Under this arrangement, the programme could realize about 225,000 mt of maize and 377,500mt of an alternate crop per year.

Model 4: Smallholder Irrigation Farms

Model 4 proposes the inclusion of smallholder farmers who are efficient but small, operating about 0.4ha each. About 87,500 smallholder farmers would be mobilised for the second crop and encouraged to start irrigation farming early to ensure that at least two cropping cycles are achieved between June 2016 and April 2017. It is estimated that a total area of about 35,000 hectares (Table 1) out of the developed 54,000 ha (due to dwindling of water resources) could be planted with the second crop under irrigation. The farmers would receive farm inputs on a loan basis, with recovery of the loan taking place through deductions on maize sales revenues. Investment costs associated with irrigation equipment would be paid for through collection of fees administered by a private irrigation service provide in close collaboration with water users associations. The fee structure would include maintenance costs, with repayment periods of about 20 years. About 210,000 metric tonnes of maize would be realised per year under model 4, with an additional 35,000 metric tonnes of an alternate legume such as groundnuts, harvested if an intensive maize-legume rotation system is adopted.

Table 1: Investment Costs of Proposed Irrigation Models for Intensive Food Production

	Model 1: Large-scale Private Sector	Model 2: Medium-scale Private Sector	Model 3: GBI Holdings Anchor farm model Schemes	Model 4: Smallholder Irrigation	Intensified Irrigated Food Production Programme

Timeline	Jun 2016 - May 2018	TBD	Dec 2016 - May 2018	Jun 2016 - May 2018	Jun 2016 - May 2018
Number of farmers/companies	10 large-scale companies	400 medium-scale farmers	7,500 progressive farmers	87,500 smallholders	95,410 entities
Area to be Irrigated (ha)	10 × 6,000ha each = 60,000ha	400 × 10 ha each = 4,000ha	(7,5000 × 5ha) = 37,500ha	87,500 × 0.4ha each = 35,000ha	136,500ha
Total Cost*	US$617.6 million	US$41.2 million	US$386 million	US$360.3 million	US$1.4 billion
Expected yield per production cycle (MT/ha)	4.5	3.5	3.0	3.0	3.9
Expected maize output per production cycle (MT)	270,000	14,000	112, 500	105,000	396,500
Total expected maieoutput per year after full installation (MT)	270,000 tonnes × 2 production cycles	14,000 tonnes × 2 production cycles	112, 500 tonnes × 2 production cycles	105,000 tonnes × 2 production cycles	396,500 tonnes × 2 production cycles
	540,000	28, 000	225,000	210,000	**1,003,000**
Expected Alternate Crop output (MT)**	72,000	4,800	37,500	35,000	**149,300**

Source: Department of Planning, MoAIWD (2016)

*Notes:** Cost of irrigation investments are estimated based on data from the National Irrigation Master Plan and Investment Framework (2015). The cost of putting land into irrigation is estimated at an average of US$7,593 per ha for all schemes. There is an additional estimated cost of software investments to the amount of US$2,700 per ha, giving a total cost of about US$10,293 per ha for all schemes. The software investments include estimates on environmental feasibility studies, formation of water users associations, farmer extension, marketing, on-farm inputs and labour for crop production. If part or all of the software costs are taken up by the farmers, the investment cost could be significantly reduced. Moreover, if some of the area utilized is already developed with irrigation equipment then the costs would further be reduced by a substantial amount. This is to simply demonstrate the costs are likely to be less than the US$1.4 billion estimated above.

** It is assumed that an alternate crop would be grown during part of the year hence only two production cycles lasting about 7-8 months have been assumed for maize with potential for a legume such as beans or groundnuts to be grown as a third production cycle through a crop rotation system. It is assumed that yields would be about 1 metric tonne per ha except in the case of large-scale private companies where it is assumed yields would be about 1.2 metric tonnes per ha.

7.0 POTENTIAL RISKS

Model 1 and Model 2 are likely to have lower administrative costs and challenges as they involve a much smaller number of participants. Therefore Models 1 and 2 could be implemented relatively quickly once financial resources have been mobilized. However, there may be equality challenges to implementing Model 1 and 2 since wealthier farms/ families would benefit directly. In the case of Model 1, there is also the risk that the large-scale producers may not be interested in investing in maize production. With Models 3 and 4, the risk is that the small-scale farmers will be difficult

to coordinate and are likely to have lower productivity. Moreover there is a higher chance of poor management of irrigation equipment and loan defaults.

8.0 MONITORING AND EVALUATION

Monitoring and evaluation will be undertaken by the M&E unit in the Ministry of Agriculture, Irrigation and Water Development together with the GBI. However, there will be need for an independent evaluation to determine the actual impact of the programme. The internal M&E unit will track data on investments in irrigation schemes, the quantities and value of food production and exports as well as the quantities and value of food products supplied in the domestic market. The unit will produce regular reports based on the analysis of the data captured. The Reserve Bank of Malawi will implement an M&E system that will monitor the activities of the participating commercial banks under the programme. The Government will set up a secretariat for the programme and form a technical and a steering committee that will provide guidance to the programme.