Briefing Note 1

Innovations to Promote Growth Among Small Scale Irrigators

Farmers all over Malawi, especially those in areas served by major rivers and lakes, are moving into irrigation-based farming. Irrigation allows farmers to deal with the challenge of unreliable rainfall due to climate variability and climate change, and yields per unit area have been shown to be much higher when compared with rain-fed farming. The vision of the government, with the support of donors and NGOs, is to improve agriculture through promoting irrigation. This has the aim of raising both incomes and food security for farmers, and growing a more thriving economy. Thus, developing irrigation has focused on rehabilitating old schemes and establishing new ones. Technologies such as the treadle pump have also been promoted to improve access to groundwater for irrigating maize.

Our research recognises that despite the renewed optimism about irrigation in Malawi, there is a long history of failure in irrigation development. Most of the schemes developed soon after independence fell into disrepair and collapsed. To ensure that current efforts contribute positively to growth in small-scale irrigation, our research analyses what farmers are doing now and the conditions in which they operate.

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E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL
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About this briefing note

Fieldwork was undertaken in Nsanje District in the Lower Shire Valley, a strategic location for irrigation development in Malawi. Nsanje is prone to droughts and flooding, and land scarcity is a growing challenge as the population also continues to expand. Livelihoods for most people are based on farming.

Research was conducted in two principal locations. The first is a large rice scheme established by government in 1969 and recently rehabilitated – Muona Scheme; and the second is the treadle-pump based Chitsukwa Irrigation Scheme. Ethnographic research during 2013-4 was supplemented with a household survey and key informant interviews.

Preliminary analysis of our data gives rise to a series of headline findings. **The aim of this briefing note is to focus on those findings that we believe will be of particular interest to farmers and irrigation scheme management.** It forms the basis for discussions with these research participants. Responses to this last phase of fieldwork will help to shape our eventual conclusions and recommendations.

A section of Block E in Muona Irrigation Scheme showing a damaged secondary canal and a poorly maintained tertiary canal. Such poorly maintained canals are problematic when it comes to delivering water around the block once the farming starts.

This maize crop in Chitsukwa Irrigation Scheme has been irrigated using a treadle pump. The tied ridges help conserve water thus reducing irrigation frequency. The fields belong to a local lead farmer.

This research project is funded by DFID-ESRC under its Growth Research Programme.

Your feedback on the issues raised here is most welcome and will be incorporated into final project findings and recommendations.

If you have any comments on the points raised in this brief, please contact Dr Canford Chiroro on c.chiroro@sussex.ac.uk OR Dr Elizabeth Harrison on e.a.harrison@sussex.ac.uk

Key Messages

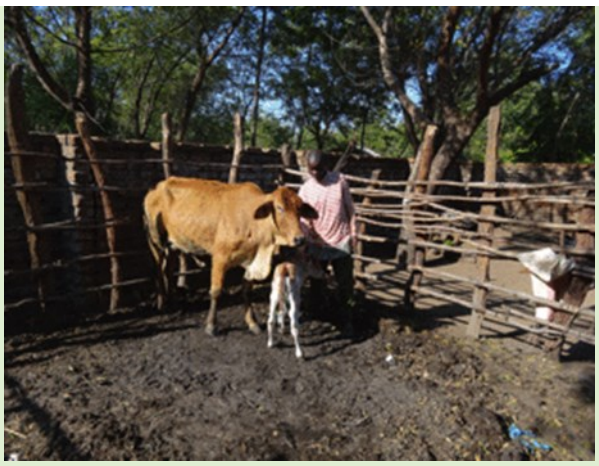
- Despite the apparent success of irrigation in terms of improved productivity, livelihoods remain precarious for a range of other reasons. Irrigation development can also result in conflict between agriculturalists and livestock farmers.
- Irrigated plots are of varying quality as a result of the layout and design of schemes. This has negative effects on water management. Allocating similar watering duration will not result in fair allocations. Farmers on higher ground may require more watering to make up for their disadvantage and this decision should be clarified with all water users.
- Rights and responsibilities over land and water are often unclear, which results in conflict. Attempts to resolve these conflicts may be complicated by the overlapping of institutions and jurisdictions. Formalization can also result in the exclusion of farmers who had previously accessed water in the scheme.
- Support for irrigation development is increasingly provided through irrigation schemes managed by committees who are concerned to establish uniformity of practice, for example in the timing of planting. However, this ignores the fact that households have different and varying capabilities. In particular, differences in ability to access farm labour result in failures to operate uniformly.
- Farmers innovate to improve new technologies such as treadle pumps. New agricultural technologies and innovations such as treadle pumps sometimes result in changes in patterns of accessing land and consuming water.

Farmer carries treadle pump after a day's work in Mchacha James. Maize is the main crop grown under irrigation in this area.

Muona Irrigation Scheme

The Impact of Irrigation on Livelihoods

There is evidence of success in irrigation with farmers reporting improved food security and asset accumulation. But success should not only mean an increase in yields; the costs of producing such yield, including for land preparation and labour, need to be taken into account. Farmers in both Chitsukwa and Muona reported that they sometimes fail to secure enough food despite the harvests attained. This shows that it is important to consider the larger picture: farmers also need investments in roads and better markets, access to credit, information and farming knowhow.



Last year I harvested 80 bags of rice. This year I am targeting 120 bags. Irrigation has really changed our lives here. We don't eat much rice, but we have enough to exchange for maize and feed our families all year round. This cow and that solar panel you see was bought with money from selling rice. Male farmer, Muona Irrigation Scheme

Before we started irrigating we used to harvest six bags from an acre of land in the dry land. With the treadle pump, we are getting ten bags from a point one (ha), that's an area more than twice as small as an acre! Initially no one believed it would work; we had never seen it before. Now everyone is using it. Male treadle pump farmer, Chitsukwa Irrigation Scheme

In GVH Mchacha James, the success of the treadle pump has changed the local landscape. From only one farmer in 2004, the scheme now has 2645 farmers. Some were previously fishermen and pastoralists who depended on selling livestock to buy grain, but can now produce maize on their own. However, the expansion of irrigation here has led to encroachment into pastures often resulting in conflicts between irrigators and pastoralists.

In Chitsukwa there are claims that irrigation is expanding into areas that were previously used for cattle grazing. This is increasing conflicts over land as livestock farmers fail to secure fodder from their livestock and irrigators complain that cattle destroy their crops and silt canals

Some irrigators are angry that livestock grazing in their fields destroy the tied ridges that cost money to prepare. They prefer to burn the maize residues so that cattle are not attracted to their fields. However, this further reduces feed for cattle and increases tensions between irrigators and livestock farmers.

Challenges in sharing water for irrigation

In Muona, irrigated plots are of varying quality as a result of the layout and design of the scheme. Some of the blocks were not leveled when the scheme was constructed and have a slightly higher elevation. This has negative effects on water management. If each block is allocated the same duration of watering, this will not result in fair allocations. Farmers on higher ground require more watering to make up for the difficulty in delivering water into their plots, and this decision should be clarified with all water users.

The unlevelled blocks E, F and G are also affected by anthills, which effectively reduce the area available for planting crops. Removing anthills is expensive, costing as much as the value of two bags of rice equivalent. Once the anthill has been destroyed, spreading it all over the field could improve soil fertility, but upsets the levelling even further.

Some blocks such as Block D, shown in this picture, are prone to water shortage, so much so that some farmers prefer to grow maize in order to guard against possible water inadequacies. Salinisation affects parts of this block, effectively reducing land area available for farming.

"Our hopes of being 'part of the scheme' were raised when we heard that the scheme would be rehabilitated. We have since been told that there is no funding for levelling the scheme Female farmer, Muona Irrigation Scheme"

Within the better-levelled blocks in Muona Irrigation Scheme, those plots located on the lower end of blocks tend to receive more water than the slightly elevated ones. In typically dry seasons farmers in these plots may receive slightly more water and therefore produce a higher yield than those in other parts of the same block. In wet years, as shown in this picture taken in the 2014 season, they suffer from excessive water. This problem is magnified by the poor maintenance of the drainage systems. Some conflicts over excess water were observed in Muona.

Land and water rights

There are some very bad apples in the scheme. Some landowners may rent the same plot to five people! Yes, we know some landowners are poor, but this is very wrong. It robs others of their annual food supply and income. Scheme committee member, Chitsukwa Irrigation Scheme

The water in the Tangadzi belongs to the scheme (Muona). If they want to use it, then they should pay. We are paying. Female farmer, Muona Irrigation Scheme

The term 'ownership' is used in relation to land control despite the lack of clarity of entitlement to land. Some people are entitled to land on the basis of inter-generational transfers and others are renting from this group. In Muona, there is both recognition that the government 'owns' the land and farmers also pay a lease in order to secure their rights to the land. In Chitsukwa, land is under customary tenure but may still be disputed and conflicts are quite frequent. The overlapping forms of jurisdiction for land result in short term relationships between 'landlords' and 'tenants' as each tries to protect their own interests.

Those with customary rights to land do not have automatic rights to water unless they pay a water user fee and are formally registered as a water user group or association. The formalization of water rights leads to the exclusion of those who are not part of the schemes but had formerly accessed water, such as the people in the area of Magreaver, adjacent to Muona.

The need for uniformity and the problems of poverty

In Muona the extension officer tells farmers when to prepare their seedbeds and when to start transplanting rice seedlings. However, compliance with this is low as many farmers are balancing labour requirements on both irrigated and dry land. Poorer farmers also delay because they may also have to do *ganyu* for others to get money to buy inputs. This is a problem because there are different demands on water depending on the stage of development of the crop. It creates conflicts as some farmers want water in their fields while others do not.

In Chitsukwa, conflicts related to timing are more focused on the question of when fields might be opened up for communal grazing. Delays in planting also lead to challenges with maintenance of canals. Early planters may take advantage of residual moisture and the overflowing canals, but in late season there are often too few farmers to clear the canals. Early season de-silting of canals under a local development fund often results in canals being dug too shallow since the water is high at the time of digging.

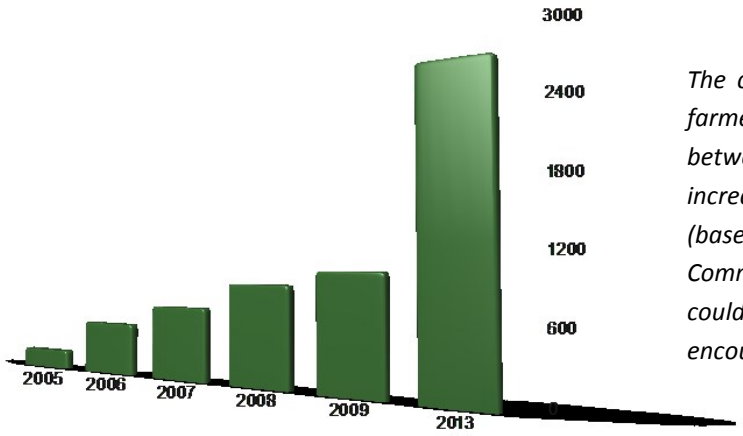
In Muona Irrigation Scheme the design of the scheme is such that farmers closest to the tertiary canals receive water first, and once their fields are saturated they release the water to their neighbours. In dry years this is a problem because they may choose to retain the water and not open gaps for neighbours to access water. The picture above shows where two farmers are at different stages: one farmer (A) is weeding and her neighbours (B) are still preparing land. When farmer A's rice matures she may not want any water passing through her field, yet farmer B's crop will be at the stage where demand for water is highest. These differences are a common cause of conflicts between farmers in the scheme.

In this picture the maize crop in the foreground has been harvested, while that in the background is yet to mature. Differences in timing of planting create challenges for both managing water and timing of opening the fields for grazing.

Farmers' innovations have reduced labour demand

Farmers in Chitsukwa believe that the treadle pump was originally too hard to use, until they removed some rubbers and made it lighter. The lighter version could be operated by a single person, and even children could help out. This, of course, also stimulated more people to adopt the treadle pump. At between 6 and 8 hours to irrigate 0.1ha, further improvements in the efficiency of the treadle pump would be beneficial. Farmers have resisted the motorised pump, which irrigates the same unit of land in 2-3 hours. It is not financially viable for the maize-only farming system, and there are fears that it could upset land availability since current access is partly enabled by failure of landowners to afford enough labour to use the land they own.

Farmers' innovation with the treadle pump has centred on making it lighter to use and replacing spares by locally and cheaply available alternatives.



The chart shows the changes in the total number of farmers operating in Chitsukwa Irrigation Scheme between 2005 and 2013. The number of farmers increased rapidly from 176 in 2005 to 2645 in 2013 (based on records held by the Scheme Executive Committee). The ease with which the treadle pump could be used, following its modification, was one encouraging factor.

Yet in some cases farmers may face challenges in taking up innovations developed elsewhere as a result of different arrangements for labour, land and water access. In the case of Muona, the promise of high yields offered by the System for Rice Intensification (SRI) which has performed very well in India and China, is being hampered by several factors including the lack of adherence to a cropping calendar by farmers, which means that farmers demand water at different times, and a water distribution system that depends on water passing through one field to reach the other farmer, as opposed to an ideal situation where each field receives water from the tertiary canal and releases excess to the drain on its other edge.

If farmers in Muona are to benefit from the lower input demand under SRI, as shown in Table 1, then there is a need for local innovation, which takes into account the realities in arrangements for sharing water and access to labour. SRI farmers with the support of local extension services would have to figure out how to manage the alternate wetting and drying of the fields, as opposed to total saturation common under conventional practice. A flexible approach by those promoting the technology would help create an environment within which farmers can innovate and develop their own version of SRI that takes into account local constraints and opportunities.

This table compares conventional farming and SRI. SRI would reduce the labour and input requirements, but practical implementation is a challenge. Source: field data.

Per 0.1hectare	Conventional	SRI
Seed	15kg	2-3kg
Basal fertiliser	10kg	5kg
Weeding labour	8hours	2-3 hours
Yield	450-500kg	750kg