

Simple tools, huge impact: How the Virtual Irrigation Academy is changing livelihood in Malawi

“My family is healthy and happy because we have adequate food to eat,” says Joseph Mkaka from Mlongola village in Chikwawa district in Malawi. “During the last season, I registered a good harvest of beans, which earned me MK 144,000 (about US\$ 195). Yields from my garden (0.12 ha) increased from 75 kg to 360 kg,” says Mkaka. In real terms, income from the harvest improved by MK114, 000 (US\$155) from MK 30,000 (US\$ 40.8) in the previous year. Besides, securing food for the family, Mkaka also added two goats to his stock after the sales.

Another farmer, Fanny Makwinja from Matabwa village registered yield growth from 25kg to 66kgs on a 15x50 plot (0.075ha), which earned her MK 26,400 (US\$ 35.9). This, Fanny attributes to her ardent application of irrigation monitoring tools, soil and crop management and practices. “I am not the only one benefiting, two other farmers who did not receive irrigation monitoring tools are using information derived from the tools to make irrigation decisions on their plots,” she explains.

Mkaka and Fanny are just two among the 132—plus—farmers in Malawi who are being supported under a project named “A Virtual Irrigation Academy to Improve Water Productivity in Malawi and Tanzania.” Among other things, the farmers have been trained to use monitoring tools to make decisions on when and when not to irrigate, when to regulate amounts of salts in the soil and how to ensure that the fertilizer applied in their plots is effectively used.

A total of six irrigation schemes in the two districts of Chikwawa and Dedza were selected to pilot the innovations. The schemes are: Kasinthula Cane Growers Irrigation Scheme; Nanzolo Irrigation Scheme; Mthumba Irrigation Scheme; Matabwa Irrigation Scheme; Bwanje Irrigation Scheme; and Tadala Irrigation Scheme.

Through the project, farmers in these locations now see a reason to live and look to the future since they were provided with simple monitoring tools such as Chameleon Readers, Sensors and Wetting Front Detectors for monitoring moisture levels and nutrient content in the soil. Since inception, the project has deployed a total of 9 Chameleon Readers, 132 Chameleon Sensor Arrays and 120 Wetting Front Detectors to 132 farmers to learn efficient water use and nutrient management by doing.



Joseph Mkaka (standing) of Matabwa Irrigation Scheme, Malawi testifies the benefits of using VIA monitoring tools during an experience sharing and learning meeting in Malawi in October 2017

A Wetting Front Detector shows the depth that water has infiltrated into the soil and captures a water sample for in-field testing of nutrients using colour strips, while a Chameleon Sensor displays the level of soil water suction using blue, green and red lights as information signals. It is these colours which the farmers use to determine when and when not to irrigate.

In its articulation of national priorities, the Government of Malawi views smallholder irrigation as a tool for increasing agricultural production for improved livelihoods and economic status of the rural communities. The project was designed to improve the profitability of irrigation farming through informed use of water, regulation of salts content in the soils and fertilizer management.

Launched in 2015, the four-year project is meant to improve water productivity and on-farm profitability through efficient water and nutrient management. It is a brainchild of the Commonwealth Scientific and Industrial Research Organization (CSIRO) in partnership with the Australian Centre for International Agricultural Research (ACIAR). In Africa, the project is being undertaken in Malawi and Tanzania. In Malawi, the Department of Agricultural Research Services (DARS) in collaboration with the Department of Irrigation (DoI) are the lead implementers.



Mr. John Lucius and Ms. Fanny Makwinia (centre) from Matabwa in Chikwakwa district explain Chameleon colour patterns to other farmers during an M&E and learning day in October 2017

The Association for Strengthening Agricultural Research in Eastern and Central Africa (ASARECA), the body mandated to coordinate sub-regional research in the sub-region coordinates and provides technical backstopping to the project in the two countries.

The specific objectives of the VIA project include; refining and deploying farmer-friendly monitoring tools that measure amount of moisture, nutrients and salts in the soils; developing a “Virtual Irrigation Academy”(VIA) through on-line visualization of data from the monitoring tools linked to a virtual discussion, learning and teaching space with skilled

Box 1: John Lucius, Matabwa village in Chikwawa district

Gone are the days of irrigating by trial and error. I used to irrigate my bean garden once every week, which caused rotting of pods. After the introduction of the tools, I reduced the frequency to twice monthly. I learnt that the water requirements for beans and maize are different. Before the VIA tools, I used to harvest 30kgs of beans on 15x35 (0.05 hectares), but now the yield from the same plot has grown to 66kgs.

facilitators; determine how the VIA promotes social and institutional learning that improves irrigated farm productivity; and develop partnerships for sustainable out scaling of VIA and monitoring tools.

The VIA project complements new major irrigation investments that are being rolled out in Malawi. It is meant to disseminate innovations arising from lessons learnt on design and construction of irrigation infrastructure, including lessons learnt in building a system of social and institutional learning to improve the profitability and sustainability of irrigation farming.

Lack of knowledge by smallholder farmers on when, how much and how often to irrigate has been a major problem in nearly all irrigation schemes in Malawi. Under irrigation or over irrigation often led to poor yields, which was aggravated by variable rainfall patterns, which exposed farmers to shocks of droughts.

Baseline information shows that over 50% of potential irrigable areas within irrigation schemes in Malawi have not been utilized mainly because of inadequate irrigation water. Even areas where irrigation water is supplied sometimes experience crop failure as a result of drying up of rivers. Interestingly, not all the water channeled to the farms may be needed at all times as most farmers tend to over irrigate. The scramble for water often led to conflicts among members of the schemes and between farmers in the up-stream and downstream schemes.

Winds of change start to blow

However, just two years since the launch of the VIA activities in these areas, farmers are reporting exciting early trend. In all the schemes, farmers note that the number of irrigation intervals have reduced on average from four to five times a month to once or twice a month, signifying a 50% water saving. "This implies that water has been saved and made available to increase area under irrigation," says Dr. Isaac Fandika, Research

Mrs Nyalugwe, Matabwa irrigation scheme, Chikwawa district

I am non-VIA farmer, so I do not have monitoring tools in my garden, but I have been following (mimicking) what my VIA neighbour does. As a result, I harvested 120kg of beans compared to 40kg before I started mimicking. The food I harvested is adequate to sustain the family until the next harvest, which was not the case before. Like the VIA farmers, I am now able to save time for income generating activities such as selling rice. I used money from the rice sales to buy iron sheets for roofing my house.



Mrs Nyalugwe, a non-VIA farmer from Matabwa Irrigation Scheme, testified that she adopted VIA practices from her neighbour who was using the monitoring tools and she reaped the benefited as a result

Scientist Department of Agricultural Research Services, Kasinthula Agricultural Research Station, Irrigation and Drainage Commodity Team in Malawi. “Farmers who previously did not have access to adequate water can now access it.”

In Tadala scheme for example, the area under irrigation has increased from 6 ha to 11 ha, signifying 83 percent expansion. Farmers in Matabwa irrigation scheme say whenever the tools show that they don’t need to irrigate, they often advise the village headman, who is in-charge of controlling water release, to channel it to farms with water deficiency.

Productivity improves

The VIA project has resulted in significant changes in productivity among participating farmers. The benefits from using the Chameleon moisture sensors and the Wetting Front Detectors are multiple and create knock-on effects. On average, farmers used to get a range of 0.5 to 0.8 ton/ha of beans and between 1.4 to 1.8 ton/ha of maize, but currently both yield for beans and maize has improved to 1 to 1.5 ton/ha and 2 to 2.3 ton/ha respectively.



Mrs Joyce Maluza from Tadala Irrigation Scheme gives her experience to other farmers in Malawi in October 2013

Over irrigation (four to five) times a month, often led to saturation of the soil, which caused rotting of pods and accumulation of salts, which is dangerous for plant life. Excess water leached nutrients beyond the root zone, which rendered them unavailable to the crops. Frustrated, some farmers thought the fertilizers were fake. However, they have now noticed that the problem was improper management of water. Farmers now have more time to undertake secondary income generation streams such as brick laying, besides sparing time for leisure, making African doughnuts (*mandazi*) and pan cakes for sale; indulging in recreation or joining brethren in religious worship and fellowship.

Conflicts no more

Before the VIA, the incidence of water sharing conflicts was becoming a social problem with security repercussions. The village leader, commonly referred to as headman, had to resolve four to six cases a week. However, today weeks pass without cases related to water sharing.

Mrs Joyce Maluza, Tadala irrigation scheme

I stopped irrigating my crops every time I got access to water. This improved water and nutrient uptake efficiency, which led to high maize yields. From a 0.0225 ha plot, I harvested eight bags with 80 green cobs per bag, which earned MK 38,000 (US\$ 51.7). I used the money to buy 350 kg of grain maize. This was a much better harvest compared to what I got the previous season (25kg of maize grain).

Farmers are also able to determine areas for further research. For instance, research in tomato is underway after farmers realized that the depth for placing sensors in tomatoes plots was not right as tomatoes could start wilting even when the tools showed that water was still sufficient.

How the Virtual Irrigation Academy works

The Virtual Irrigation Academy (VIA) combines new irrigation monitoring tools with an on-line communication and learning system. The VIA tools—the Chameleon sensors and Wetting Front Detector capture data from the schemes on a daily basis and send it to the website. Country leaders use the data to study the situation to inform the process of mentoring extension workers and record the dialogue between farmers, extension workers and scientists for analysis of how learning occurs. The VIA includes training resources such as videos on equipment installation and maintenance, interpretation of data, and documenting success stories which can be shared with other farmers in the project countries. The monitoring tools have been designed to fit the mental model of farmers and to give an output that is linked to action. For example, information on soil water suction, nitrate concentration and salinity levels are illustrated by colours that represent action thresholds and not by numbers with complicated units.

Social learning

Each country is expected to form three learning coalitions comprising farmers, extension workers, a district irrigation officer and research and project staff. Each coalition will be located around an irrigation scheme, and will build case studies. The learning coalition is required to train at least one additional irrigation community each year using VIA knowledge. They are also required to mentor that community and to ensure they receive the monitoring tools they request. The project plans to set up at least 24 irrigation communities, consisting of between 20-50 farming households, using this approach by 2019. Women and youth who are often marginalised and excluded

Thenford Alumando- Matabwa Irrigation scheme, Chikwawa district

Initially, we scrambled for water because we irrigated three times a week, which kept us in the fields most of the time. Since the introduction of the monitoring tools, we irrigate only four times in the whole cropping season of about 120 days. Before I started using the monitoring tools, I harvested 150kgs in a 0.03 ha plot. Now that I have been using the monitoring tools—just look at that (maize) crop over there—I expect to harvest 250kgs from it. If I sell all the 250kg at the government set price of MK 170 per kg, I will earn MK 42,500 (US\$57.8).

from the development initiatives are prioritised in the selection of farmers and project staff to increase impact and sustain the project.

Why the Virtual Irrigation Academy?

The Comprehensive Africa Agriculture Development Programme (CAADP) estimates that only 13 million hectares of land have been developed for irrigation, a far cry from the full potential of 46 million hectares. As a result, the New Partnership for African Development (NEPAD) has stated that irrigation area needs to expand six times (by 6 per cent per year), with an annual injection of \$42 billion. The Malabo Declaration, signed by African Heads of State in June 2014 agreed to this proposition, noting that efficient and effective water management systems through irrigation is critical to ending hunger in Africa by 2025.

Other pictures



(Above) Mr. Thenford Alumando displays colours of the chameleon sensor. (Right) Mrs. Mary Minano explains how the Wetting front Detector works. (Both farmers are under VIA at Matabwa Irrigation Scheme)



(Above) VIA farmers upbeat with demonstrations during an M&E and learning day...then they sang and danced (below)



Written by Ben Moses Ilakut, ASARECA. Originated jointly with Moses Odeke and Malawi project leaders, Dr. Isaac Fandika, Geoffrey Mwepa and Jonathan Chikankheni during interactions with farmers at a monitoring mission in October 2017.