Key Messages

• Many existing small-scale irrigation schemes in the East and Southern Africa regions are dysfunctional; to transform agriculture there is a clear need to enhance investments in self-sustaining irrigation systems.

• Agricultural Innovation Platforms help develop social learning systems where knowledge generation and innovation is driven by the incentives of more profitable farming.

• Soil moisture and nutrient monitoring tools trigger a deep learning cycle for farmers and become a trusted reference point for irrigation decision-making.

• Learning, change and accountability spreads through meaningful farmer-to-farmer interactions and engagement with extension and governance stakeholders and market players to provide feed-back loops to further enhance farmers learning and behavioural change.
Irrigation is considered an important pathway towards achieving improved livelihoods and enhanced food security, and has been promoted across the sub-Saharan Africa (SSA) region. Despite governments and developmental partners investing in a massive expansion of irrigated agriculture across the continent, smallholder irrigation schemes have largely failed to significantly reduce farmer poverty, and failed to use the land and water sustainably or maintain the irrigation infrastructure. There is a complex array of reasons for this, ranging from farmers’ production skills and poor access to markets to dysfunctional institutions (Stirzaker and Pittock, 2014; Bjornlund et al., 2017).

The recently launched second Biennial Review report of the African Union Commission details the continent’s performance in respect of the Comprehensive Africa Agriculture Development Programme (CAADP) Malabo commitments. Below are key extracts from the report.

**Africa’s performance in respect of CAADP/Malabo commitments**

The second Biennial Review report (AUC, 2020) indicates slow progress across the continent towards the CAADP/Malabo commitments, with an average score of 4.03 (out of 10) against a target of 6.66 for the 2019 reporting cycle. Out of the forty-nine member states that reported on progress, only four obtained or surpassed the benchmark required to be on-track towards achieving the CAADP/Malabo commitments by 2025. On Commitment 3: Ending Hunger by 2025, only one country (i.e., Uganda) is on-track to meet the 2025 targets. Further, none of the member states is on-track to achieve the targets under Performance Category (PC) 3.1 ‘Access to agriculture inputs and technologies’. However, the member states have made good progress toward specific targets such as increasing the total area under irrigation, with 26 out of 41 reporting being on track. The challenge, though, still lies in transitioning irrigation schemes towards sustainable systems.

**Performance of TISA focal countries towards CAADP/Malabo commitments**

In the East and Southern Africa regions, for the ‘Transforming small-scale irrigation in Southern Africa’ project (TISA) focal countries (Tanzania, Mozambique and Zimbabwe), the second Biennial Review report shows that country performance in respect of the CAADP/Malabo commitments is still far from desirable. The report shows that:

- Mozambique achieved an overall score of 4.06, implying that the country is not on-track to achieve the CAADP/Malabo Declaration targets. Unfortunately, Mozambique’s performance has declined by 1% since 2017. On Commitment 3, Mozambique performed poorly with a score of 2.54 against a benchmark of 5.04. However, on irrigation targets under PC 3.1i, focusing on Increasing the size of irrigated areas (as per its value observed in the year 2000) by 100% by the year 2025, Mozambique excelled with a score of 328.2%.
- Tanzania’s overall performance of 5.08, although also not on-track, has improved by 64% from the previous report. Tanzania’s overall performance on Commitment 3 was not on-track, with a score of 4.92. The country’s score on the irrigation targets under PC 3.1i is exceeded with a score of 155.0% against a benchmark of 65% for the reporting period.
- Similarly, Zimbabwe’s overall score of 4.58 shows a 43% improvement from the previous score, albeit not on-track to achieving the continent’s targets. Zimbabwe’s performance on Commitment 3 is also not on-track, with an overall score of 2.78. Further, unlike the other two countries, whose performance is outstanding on the irrigation targets, Zimbabwe has experienced challenges, that are reflected in a score of -16.5% in the report.
Although on a relatively small-scale, TISA, funded by the Australian Government through the Australian Centre for International Agricultural Research (ACIAR), since its introduction in 2013, has made important interventions in the three countries and positive results have been realised in five government-owned small-scale irrigation schemes: Kiwere and Magozi in Iringa Region, Tanzania; 25 de Setembro in Boane District, Mozambique; and Mkoba in Gweru Rural District and Silalatshani in Insiza District, Zimbabwe. TISA has used two synergistic interventions: Agricultural Innovation Platforms (AIPs) and soil moisture and nutrient monitoring tools to stimulate change and improve the profitability of the target irrigation schemes.

**Agricultural Innovation Platforms**
Multi-stakeholder platforms such as AIPs have been widely used in a diversity of farming contexts in Africa such as crops (including seed access), honey and livestock production systems. The TISA team has used AIPs for the first time within irrigation schemes due to their ability to simultaneously address multiple constraints in complex systems; through the facilitated engagement of irrigation farmers, extension officers, government officials, input suppliers, market representatives and other stakeholders in the agricultural system.

**Soil Moisture and Nutrient Monitoring Tools**
TISA used two soil moisture and nutrient monitoring tools: the Chameleon soil water sensor array and reader; and the FullStop Wetting Front Detector along with electrical conductivity meter and nitrate test strips. These tools were introduced to farmers in the targeted schemes to enhance learning and decision-making by helping farmers learn when to stop watering – to use water more efficiently – and to better manage soil fertility. These tools helped farmers transform underperforming schemes to more functional and sustainable systems.
Below are details of outputs from TISA interventions in the three focal countries.

**Mozambique**

TISA interventions have improved the well-being of small-scale farmers in the 25 de Setembro irrigation scheme in Boane District. Participating farmers reported increases in farm income (83%) and food security (67%). Results from field observations indicated that average green maize yields increased from approximately 6 ton/ha to 18 ton/ha. In addition, green maize gross margins and the opportunity cost of labour both increased by almost six-fold due to project interventions.

As a result of self-learning from the tools provided by the TISA project, the farmers change their irrigation schedules; reducing the frequency and duration of irrigation by 85% and 53%, respectively. The time saved from the reduced irrigation has been used to increase both farm and off-farm income, which has increased the farmers ability to pay for, and their willingness to participate in scheme maintenance. This is crucial for the scheme’s sustainability, as well as for safeguarding the food security and livelihoods of the farmers and their families (Chilundo et al., 2020).

The AIP process confirmed critical challenges, such as the need for a tractor and the concrete lining of the canals, which resulted in inputs from the government and development agencies from outside the TISA budget. The availability of input markets, as well as information sources and quality also increased substantially due to the efficiency of the AIP process, which facilitated connections between the farmers and input suppliers and crop buyers. Consequently, this has saved time and money for the farmers, reduced the number of trips required to buy inputs, and made crop sales easier and more profitable (Chilundo et al., 2020).
Tanzania
In Tanzania, TISA interventions were rolled out in two small-scale irrigation schemes, Magozi and Kiwere in Iringa District. Both interventions (i.e. tools and AIPs) were implemented in Kiwere, whereas only the AIP was introduced in Magozi (because the tools are not used in waterlogged rice fields). Farmers in Kiwere made significant changes to both the frequency and duration of irrigation events. The magnitude of changes made were clearly greater for farmers with tools in their plots, but importantly also for their immediate neighbours, showing strong evidence of farmer-to-farmer learning (Parry et al., 2019). Those with tools increased the irrigation interval by 39% compared to their neighbours at 20%; and those with tools decreased the irrigation duration by 42% compared to their neighbours at 35%. The combined impact was that those with the tools reduced their irrigation duration by 65%, while their neighbours reduced it by 47%. The time saved through reduced irrigation was used to better manage their farm (31%), engage in other income generating activities (27%), do family work (19%) and farm other plots that were not cultivated (8%) (Bjornlund et al., 2018; Mdemu et al., 2020). These activities improved farm productivity and increased both farm and off-farm income.

In both irrigation schemes, through the AIP process, farmers were introduced to new higher-value crops, improved seeds and other farm inputs, new markets and farming practices. The AIP process has further contributed to value adding interventions such as establishment of rice storage and milling facilities and strengthening local irrigation organisations (Mdemu et al., 2020). Critically, this allowed farmers to sell value added products and safely store rice, and to sell when prices in the market are higher.

The combination of tools and AIPs resulted in improved food security and household incomes in Kiwere. However, in the Magozi flooded rice scheme where the tools were not introduced, the AIP contributed significantly to the increased efficiency of the irrigation scheme through improved crop productivity, market access, local level organisation (including focusing production on a few rice varieties allowing collective selling of larger volumes at higher prices) and strengthening linkages to other actors to address challenges that irrigators faced (Mdemu et al., 2020).
Zimbabwe

In Zimbabwe, TISA targeted two irrigation schemes, Mkoba in Gweru Rural District and Silalatshani in Insiza District. For farmer-level learning and decision-making, the AIP and tools approach worked well, and behavioural changes occurred very quickly. The AIP provided the initial platform for discussions and interpretation, and triggered increased farmer-to-farmer learning, experimentation, and adaptation of new irrigation regimes, which were quickly adopted by smallholder farmers (Parry et al., 2020).

By using the soil moisture and nutrient monitoring tools, farmers gained a deep understanding of the water-nutrient dynamics, which allowed them to make more informed decisions about water and nutrient management to avoid water stress, waterlogging and fertilizer leaching, and better utilisation of rainfall to reduce irrigation (Moyo et al., 2020). Putting tools in the hands of farmers was a critical entry point in transferring irrigation decision-making from local authorities to farmers. Based on learning from the tools, farmers collectively recognised the need to reduce watering and for more flexible water delivery, and persuaded managers to ease the rigid water supply system rules (Van Rooyen et al., 2020). Ultimately, the use of tools resulted in increased crop yields.

The AIPs facilitated the system’s actors to address the additional constraints that prevent farmers from translating the improved yield into increased profitability. For instance, at Silalatshani this was achieved by providing gross margin analysis training to extension officers who then realised the implications of enforcing a cropping calendar that stipulated subsistence crops with low gross margins. Consequently, the cropping calendar was removed and, with training in gross-margin analysis, farmers could make more informed crop choices and introduce higher-value crops and improved varieties. With improved market linkages, farmers could better match crop selection to market demand, engage in collective bargaining, translate increased yield into increased profitability, and access better quality inputs (Moyo et al., 2020). Farmers expressed a willingness to contribute towards part of the cost of the tools (Abebe et al. 2020).
CONCLUSION

The second Biennial Review report of the CAADP/Malabo Declaration shows that current performance of member states in agriculture, and irrigation specifically, warrants urgent transformation. Evidence from TISA interventions demonstrates that, to effectively transform small-scale irrigation systems in the East and Southern Africa regions, governments and developmental partners should consider twinning investments in hardware and technology with the introduction of multi-stakeholder processes to identify and resolve existing barriers to farmers, thereby increasing yields and converting yield increases to increased profitability. Policymakers should seek ways to advance the use of soil moisture and nutrient monitoring tools, as well as AIPs or other multi-stakeholder processes in the agricultural value chain with small-scale irrigation schemes; to catalyse economic and rural development, particularly given heightened farming uncertainties resulting from climate change.

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