CIF CLIMATE INVESTMENT FUNDS

IMPACT EVALUATION EARLY EVIDENCE SERIES

IRRIGATION TO ENHANCE YIELDS AND CLIMATE-RESILIENCE USAGE PATTERNS

Supported by the Climate Investment Fund's (CIF) Pilot Program for Climate Resilience (PPCR), and implemented by the African Development Bank (AfDB), the Sustainable Land & Water Resources Management Project (SLWRMP) in Mozambique seeks to address several pressing development challenges faced by rural farming communities, including the interlinkages between climate change, low and/or unequal incomes, food insecurity, and land degradation.

Mozambique ranks third amongst African countries most affected by adverse climate change events. The country faces frequent droughts, flooding and cyclones that affect over 58% of the population. The SLWRM project seeks to strengthen the climate resilience of farmers and boost agriculture productivity through sustainable management of land and water resources in 56 priority communities.

The World Bank Group's Development Impact Evaluation Group (DIME) is currently conducting an impact evaluation of the project, focusing on closely investigating the usage patterns and sustainability of the irrigation equipment, considering various characteristics of users. The evaluation team conducted a baseline survey, several monitoring visits, a mid-line survey in October/November of 2018, and end-line data collection in November 2019 to assess how project communities have been using the irrigation kits. This real-time approach to data collection was intended to allow the project team to make course adjustments throughout implementation, as well to inform the design of future projects.

USAGE TO DATE

As of the end-line survey in November 2019, 53 of the project's 56 kits had been delivered, and 47 communities had used the kits in the last year. Most kits were installed between June 2016 and October 2017. Across beneficiary communities, each kit serves an average of 13 households and irrigates an average area of 4.85 ha.

KIT PROVISION AND THE EFFECTS IRRIGATION

Among the farmers who at any point used or were identified as planned users of the irrigation kits during the project's lifetime, only 9% had any access to irrigation before the project interventions. By the time of the end-line survey in November 2019, 70% of these farmers were using irrigation. In total, this represents and expansion of over 100 Ha under irrigation by end-line. Figure 1 shows how many more farmers have access to irrigation because of the project's investments. When considering all farmers who utilized kit-irrigation, the difference is far greater—only a very small share of them had access to irrigation at baseline.

QUICK FACTS

DATE
May 2020

COUNTRY
Mozambique

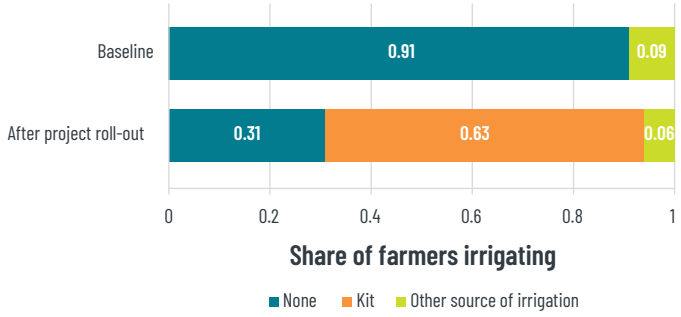
PROJECT
Sustainable Land & Water Resources Management Program (SLWRMP)

CIF FUNDING
$15.75M for PPCR

MDB
African Development Bank

PRODUCT TYPE
Development Impact Evaluation (DIME)

Figure 1.
USE OF IRRIGATION, BASELINE VS. ENDLINE



Sample is restricted to households assigned to kit at baseline or using kit at mid-line or endline. (N=1,120)

INITIAL ASSIGNMENT AND SHIFTS OVER TIME

The irrigation kits provided through the project covered a land area of either 5 or 10 ha. As a result, within each target community, only a share of farmers could be included. Selection of recipients was driven either by the communities' (50% of target communities), or via a score-based targeting of smallholders using a proxy means test (PMT) (50%). I.e., within the same target community, there were farmers with and without access to kit-based irrigation. The complementary brief titled "Beneficiary Targeting" expands on the targeting protocols and resulting effects and findings.

Tracking usage shows that, from inception to mid-line to end-line, there were significant shifts in which farmers used the kit, with utilization passing between the initially assigned and unassigned groups, as presented in the diagram below. The graphic tracks farmers who have used the kits at some point, from baseline to midline to end-line, and the related analyses have found that, while the project is able to enable access to irrigation via the provision of irrigation kits, usage is constrained by several limiting factors outside the scope of project deliverables, including an inability to purchase fuel, purchase other agricultural inputs, or secure the necessary labor. In sum, of those initially assigned kits, only 38% of households were using kits at end-line, with 40% of households assigned to kits never having used them at the time of the end-line survey. For those choosing to stop using the kits, (dark blue, orange and yellow bars in Figure 2), the reasons are presented below, with the primary constraint being the inability to afford the necessary fuel, accounting for 54% of those opting away from the kit (the full spectrum of reasons is presented in Figure 3). Based on this finding, the project team has explored options for future deployment of solar-powered irrigation kits that would thereby negate recurring costs that deterred usage.

Figure 2.
IRRIGATION PATTERNS OF END-LINE KIT USING HOUSEHOLDS

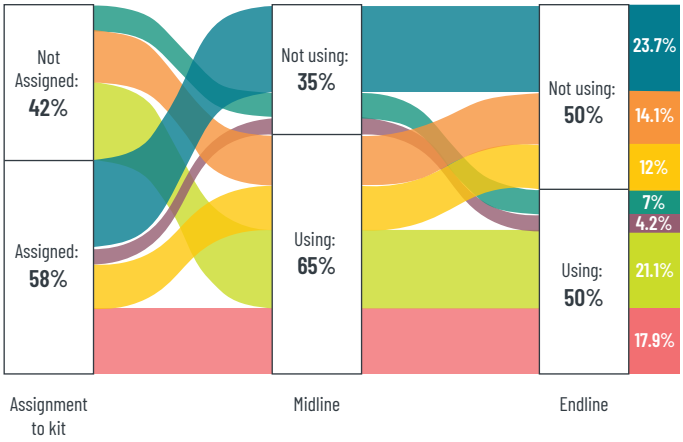
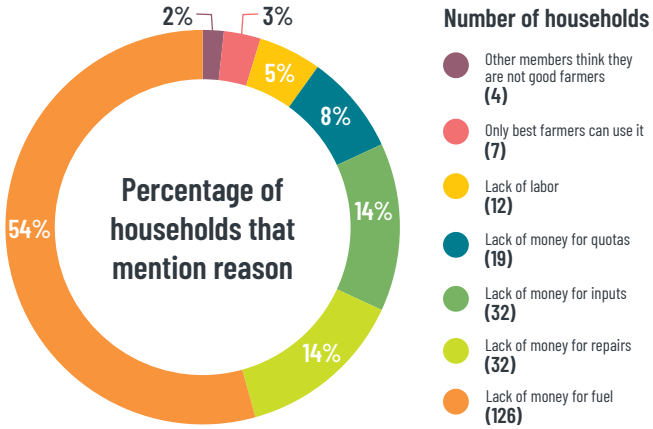


Figure 3.
REASONS FOR STOPPING USE OF THE KIT



MAINTENANCE PATTERNS

To ensure sustainability of the investments, proper maintenance of the kits is key. However, second to lack of funds for recurring input costs (fuel, agri-inputs), the usage of kits was constrained by the inability to repair minor breakages in the equipment. Over the last year, most of the installed kits had been used, yet, at the time of end-line survey in late 2019, only 84% of delivered kits were still installed and functional. 15 communities had a kit with at least one broken component. The most common malfunctioning parts were the battery (10 communities), pump (5 communities) or tubes (10 communities). A total of 42 communities had repaired the kit at some point between when the kit was received and when the end-line survey was conducted, as presented in Figure 5. The primary challenges for communities' repairing of kits was the lack of funds, the lack of technical skills or the unavailability of the necessary part in the local market.

Figure 4.
REASONS FOR LACK OF FUNCTIONALITY

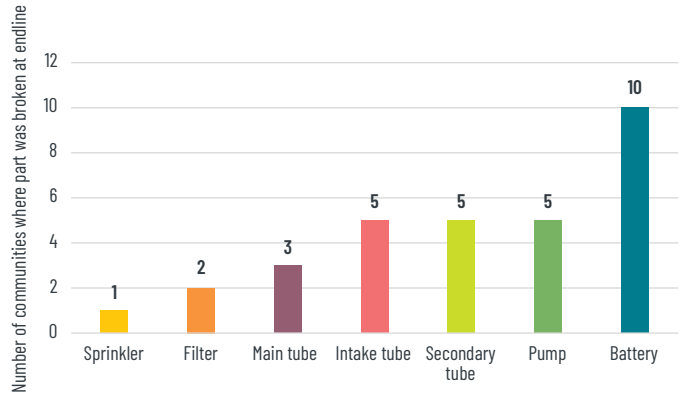
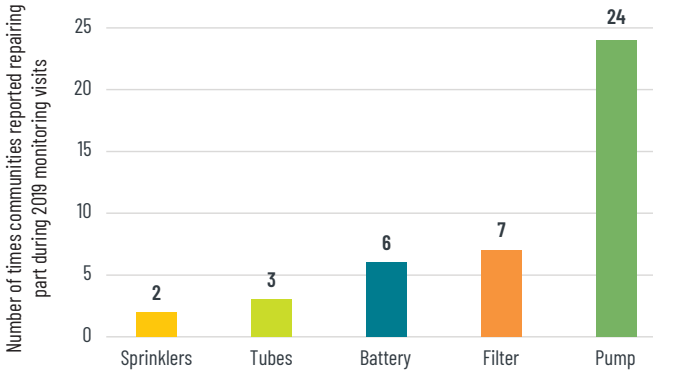


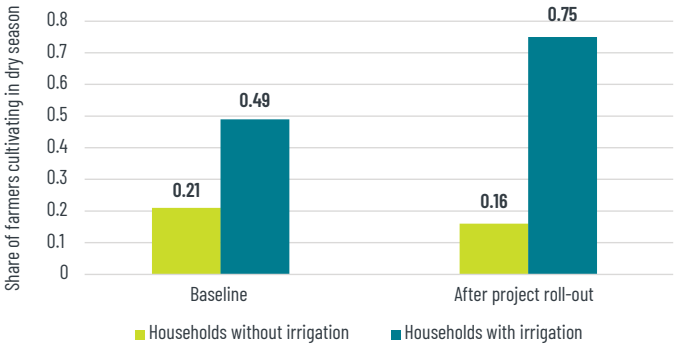
Figure 5.
PARTS REPAIRED BY COMMUNITIES



EFFECTS ON DRY SEASON IRRIGATION

Alongside increased agriculture productivity, a key objective of kit provision is the enabling of cultivation in the dry-season. At all stages of survey, the availability of irrigation shows a significant impact on dry-season cultivation, showing that farmers with access to irrigation are much more likely to cultivate throughout the year, doubling yield opportunities. At baseline, only 21% of farmers without access to irrigation cultivated in the dry season (Figure 6). That year, farmers with access to irrigation were more than twice as likely to cultivate in the dry season. After project roll-out, a still larger share of farmers with access to irrigation were cultivating in the dry season, with no substantial shifts observed for farmers without access to irrigation. The complementary brief titled “Effects in Yield” takes a detailed look at the effects and impacts of the extended cropping period.

Figure 6.
DRY SEASON CULTIVATION, BASELINE VS. ENDLINE: WITH ACCESS TO IRRIGATION VS. WITHOUT



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CHALLENGES AND NEXT STEPS

The evaluation survey has highlighted important lessons that may provide insights for designing and executing similar projects. For example, one major limitation on kit usage has been the availability of fuel for the pump unit. Taking local constraints into account, thought should be given to recurring costs and challenges, and adequate measures to address them.

1 **Equipment sustainability is a concern.** Monitoring data has shown that the sustainability of the equipment is a relevant concern. Less than three years after the first kits were installed, more than 15% were no longer functional and half had broken parts. Equipment failure is a common issue, with pump and tube problems the most recurrent ones. There may be a need to consider delivering additional community training to ensure that kits are repaired effectively, and that related costs are shared by the community so that the resource can still be utilized by all.

2 **Access to fuel is a challenge.** In more than 45% of communities where kits were installed, users reported that at some point during the previous year, they could not buy sufficient fuel to use the kits as planned. Given that this issue has been identified during the course of the project, the team explored the possibility of deploying solar pumps to overcome fuel constraints. However, the significantly larger cost of solar pumps would require that they be used to cultivate very high value crops so as to abide by sound economic rationale. The project team may consider a shift towards these kinds of value chains in new projects in areas better connected to markets.

3 **The importance of ongoing monitoring.** The impact evaluation team, working in concert with the project team, has developed a monitoring dashboard. The dashboard is able to utilize data provided by field agents during their visits to show the current location of the kit relative to where it was supposed to be placed (as determined during the selection procedures), previously known usage locations and the size of the area being irrigated. The dashboard can be used to identify communities where the kit is either not working or under-utilized, which can then allow the project team to make rapid adjustments to address issues. Figure 7 shows the dashboard interface, including the area eligible to be irrigated, the area chosen to be irrigated at the placement and selection visits, as well as the area actually being irrigated at the time of the midline review. This information is coupled with community descriptors and other relevant information from the midline review. The ongoing data collection efforts allow for rapid evaluation of these pilots.

Figure 7.
DASHBOARD INTERFACE

i2i DIME
TRANSFORM DEVELOPMENT

The World Bank's Development Impact Evaluation (DIME) group generates high-quality and operationally-relevant data and research to transform development policy, help reduce extreme poverty, and secure shared prosperity. It develops customized data and evidence ecosystems to produce actionable information and recommend specific policy pathways to maximize impact.

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