

Monitoring Irrigation

The African Development Bank's (AfDB) 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. The project is supported by the Climate Investment Funds (CIF) under its Pilot Program for Climate Resilience (PPCR). CIF is supporting an impact evaluation of the project, which is currently being conducted by the Development Impact Evaluation Group (DIME).

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 capacity of farmers and boost the productivity of the agriculture sector through sustainable management of land and water resources in 56 priority communities. As part of the ongoing impact evaluation there has been a focus on closely investigating the use and sustainability of the irrigation equipment. The impact evaluation team conducted a baseline, several monitoring visits and a Oct/Nov 2018 mid-line survey to assess how project communities have been using the irrigation kits. This real-time approach to data collection allows the project to make course adjustments throughout implementation, as well informing future design at project completion.

USAGE TO DATE

As of fall 2018, 52 of the 56 project communities have installed irrigation kits and 47 communities are regularly using the kits. The 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.

MAINTENANCE PATTERNS

At the time of midline survey in late 2018, 69.2% of installed kits



COUNTRY Mozambique

PROJECT Sustainable Land & Water Resources Management Project (SLWRMP)

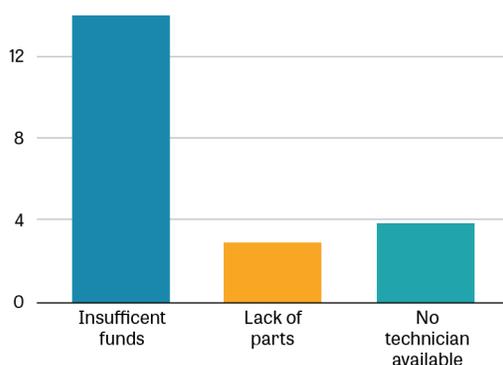
CIF FUNDING \$15.75M from PPCR

MDB African Development Bank

PRODUCT TYPE Development Impact Evaluation (DIME)

were still functioning. 21 communities had a kit with a broken piece. The malfunctioning parts in these 21 communities were the pump (10 communities), tubes (12 communities) or the sprinkler head (2 communities). A total of 32 communities have repaired the kit at some point between when the kit was received and when the midline survey was conducted.

FIGURE 1: REASONS FOR LACK OF FUNCTIONALITY



USAGE PATTERNS & EFFECTS

Of the communities where irrigation kits have been installed, more than half are using the kits every month. Figure 2 shows that, among households within the kit area, access to irrigation rose dramatically from a share of 10% to 86% over a ~3-year period.

Figure 4 shows that the average annual production value for households inside the kit area rose from

~US\$29 (1,836 meticais) to ~US\$369 (23,655 meticais), a 1,188% increase. It is important to note that this increase is driven by both the increased access to irrigation and a general increase in production due to external factors– the 2 periods prior to the project were marked by droughts in the region. To be able to separate out project impact it is critical to measure general trends in a valid comparison group.

Figure 5 shows that there was a significant difference in household production values comparing kit-access plots that did and did not utilize irrigation, in addition to a general improvement also observed among non-users. Non-irrigating households saw production values increase by ~US\$ 134 (745% or 8,467 meticais) whereas irrigating households saw production values increase by ~US\$ 374 (1,222% or 23,633 meticais).

However, it must be noted that households that did not utilize the kits may have been constrained by other resource deficiencies that themselves contribute to lower production. For example, households may have been unable to meet kit repair and fuel needs due to insufficient finances, a factor which could also reinforce other adverse effects on farming potential (e.g. lack of access to seeds, fertilizer, hours of labor, etc).

Figure 6 shows yield comparisons of irrigating households inside and outside the kit-access area. It is notable that in both groups the use of irrigation boosts production value. The dark blue and orange lines both show trends in yields on irrigated plots

FIGURE 2: SHARE OF HOUSEHOLDS USING IRRIGATION

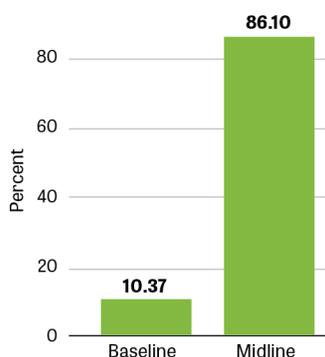


FIGURE 3: AVERAGE AREA IRRIGATED BY A HOUSEHOLD

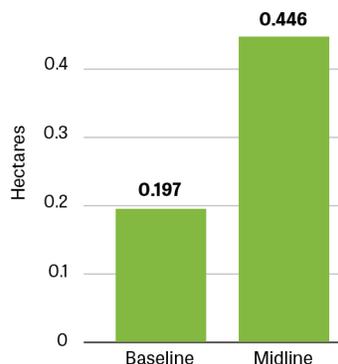


FIGURE 4: AVERAGE HOUSEHOLD PRODUCTION VALUE

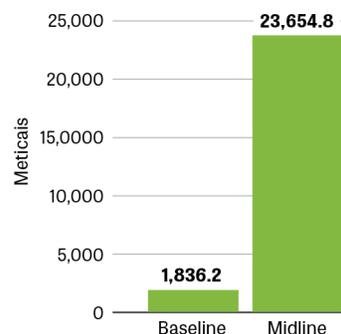


FIGURE 5: HOUSEHOLD LEVEL PRODUCTION VALUE

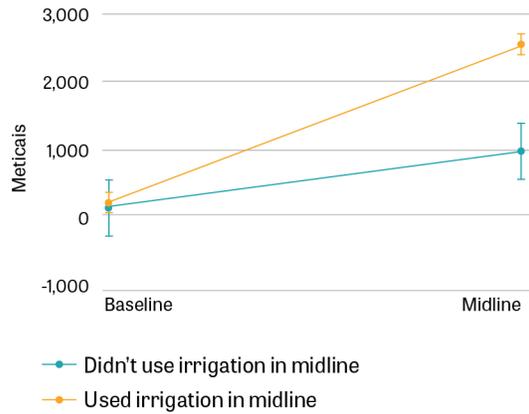
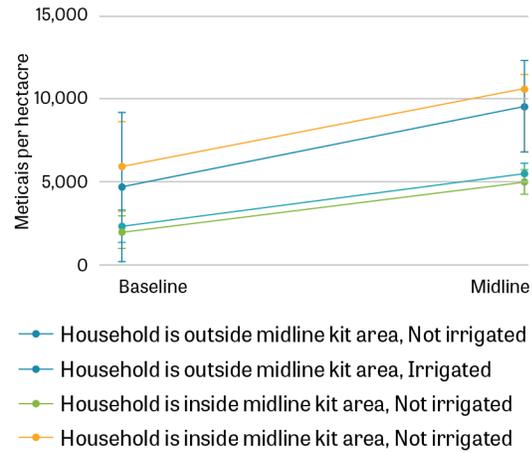


FIGURE 6: PLOT LEVEL PRODUCTION VALUE PER HECTARE



and comparing them indicates that there is no significant difference between kit-based irrigation and other sources of irrigation. This suggests that at least a substantial part of the general yield gains that new kit users experience is likely due to provision of the irrigation.

Figure 7 indicates the percentage of communities that used the kit each month. As would be expected, kit usage is at its minimum in December during the rainy season, and peaks over July and August, the height of the dry season.

CHALLENGES AND NEXT STEPS

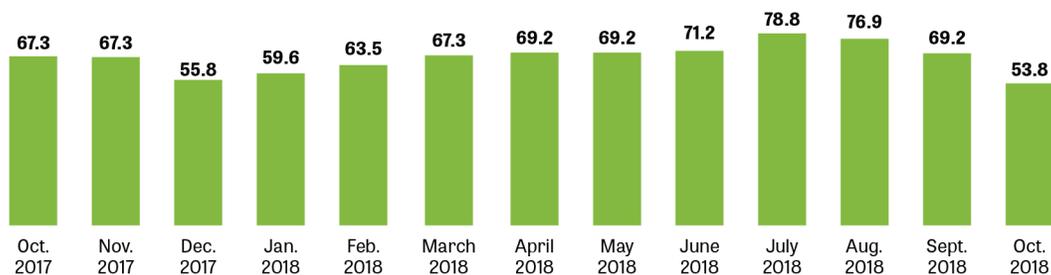
The midline survey has highlighted important lessons that may support the overall success of the project. For example, one major limitation on kit usage has been the availability of fuel for the pump unit. Taking local constraints into account, addi-

tional thought should be given to methods for capturing usage data in the long term, allowing for gauging the impact of the irrigation over time.

Equipment sustainability is a concern. Monitoring data has shown that the sustainability of both the equipment its fuel inputs are concerns. Less than three years after the first kits were installed, more than 30% are no longer fully functioning. 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.

Access to fuel is a challenge. In more than 40% 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

FIGURE 7: PERCENTAGE OF COMMUNITIES USING A KIT EACH MONTH

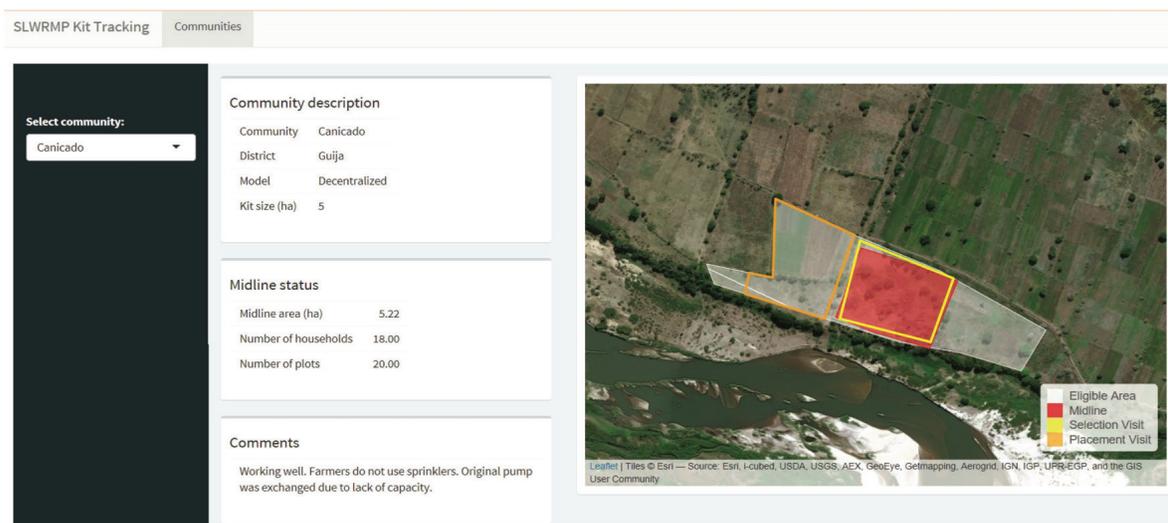


kits as planned. Beneficiaries of the kits are seemingly reluctant to contribute to fuel costs, as this resource is consumed by all project beneficiaries whether the equipment is being used to irrigate their specific land or not. However, disaggregated results show more interesting findings-- contrary to established theory on collective action failures, it was found that kits provided to a greater number of users with smaller plots were less likely to face fuel shortages. The evaluation team is currently examining the distribution of incentives that may have given rise to this difference. Given that this issue has been identified during the course of the project, there is now the possibility to work with AfDB to pilot the use of solar pumps to overcome this constraint.

The importance of ongoing monitoring. The impact evaluation team, working in concert with the project team, has been developing a monitoring dashboard. This dashboard will provide a clear

overview of the current situation in each community. The dashboard shows 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 8 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 team will pilot small complementary interventions to enhance local capacity and coordination to maintain the kits. The ongoing data collection efforts allow for rapid evaluation of these pilots.

FIGURE 8: PERCENTAGE OF COMMUNITIES USING A KIT EACH MONTH



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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