A HOUSEHOLD LOAN PROGRAM FOR THE ADOPTION OF WATER SAVING TECHNOLOGIES IN JORDAN

Performance and Economics

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Executive Summary

The Hashemite Kingdom of Jordan is one of the world's most water-stressed countries. With limited and declining access to regional surface water sources, Jordan's water supply comes largely from groundwater (65%) which it is consuming at 220% of its sustainable rate. As part of the international response to this looming crisis, the US Agency for International Development (USAID) financed the Water Innovation Technologies (WIT) program from 2017 to 2022. Mercy Corps, an international humanitarian and development organization with a long history of project implementation in the water sector in Jordan, led the program, deploying a market systems development approach to household and agricultural water conservation in the northern highland governorates of Jordan.

The Household Loan Program (HLP) was an integral part of the WIT program, accounting for $6.6 million of the $27.3 million outlay (24%) on the program by Mercy Corps (including direct and indirect costs through the end of September 2021). Prior economic analysis of the cost-effectiveness of WIT activities reveals that the water saved through the program was achieved at an average unit cost of $0.36 per cubic meter, but with considerable variation. The HLP unit cost was the least cost-effective approach at just over $13 per cubic meter of water saved. This analysis did find that the water savings realized by households from many of the adopted technologies had a positive return on investment once the financial benefits of reduced water purchases were included. However, the cost-effectiveness analysis did not account for the revolving nature of the loan program. Indeed, 75% of the direct cost of the HLP went to the initial capital provided to the program for loans ($1.83 million) and the development of the automated Loan Management System ($0.34 million). These sums were not expenditures per se, but rather represent investments that would produce benefits in water savings over a longer time frame than simply the term of the initial loans made by the HLP.

To better understand the HLP, its performance and economics, a full investigation of the loan portfolio was carried out to understand the size, type and amounts of loans, their repayment status (as of March 2022), and the extent of subsequent lending. Given the decentralized, community-based nature of the HLP, performance is also evaluated by examining how the community-based organizations (CBOs) fared across these metrics, as well as differences by the gender of the loan recipients. Based on parameters emerging from a detailed analysis of the HLP performance data, a loan simulation model is developed to assess how the HLP might fare into the future, in terms of loans, fees, repayment and water saved. The simulation provides a more complete analysis of the cost-effectiveness of the HLP and, using the prior analysis of returns to households, the rate of return on investment to households. Integrating the cost-effectiveness with the household financial data, enables a comparison of the economic costs and benefits of the HLP.

The start-up and evolution of the HLP were adversely affected by a slow onset for WIT and the HLP, followed by the COVID-19 pandemic, which locked much of Jordan down (and out of the office) just as the program was gathering momentum. The initial program design (2018) met with little interest due to the expensive nature of the technologies offered, the high loan amounts and the correspondingly high monthly repayment rates. Adjustment to the program through 2019, primarily allowing lower cost, rainwater harvesting through "pear-shaped wells" (underground storage tanks) and limiting loan size met with greater success. In addition, it took time to recruit, evaluate and train a cadre of capable CBOs. The bulk of the loans made in the first round were initiated during a two-year period between mid-2019 and September 2021, when the WIT program began close out procedures.

Comparing operational performance with planned objectives for the HLP:

- A total of 21 CBOs participated in the program, more than the initial target of 10 but less than a subsequent planned number of 90.
- As originally proposed, a fully electronic Loan Management System (LMS) was developed.
- As planned, the LMS is administered by a Jordanian digital financial services provider, Dinarak, which accepted full operational control of the LMS and continues to successfully manage program transactions and the CBO, loan recipient and supplier E-wallets, following the WIT close out.
- Through September 2021, 656 loans were funded with $1.84 million in disbursements by Mercy Corps, about two-thirds of the original $3 million target.
- Through March 2022, $203,00 in repayments were revolved into an additional 100 loans by the CBOs.

Main findings from the analysis of loan program performance are:

- The program achieved its participation target of 30% for females in the loan portfolio.
- The loan portfolio was predominantly made up of the pear-shaped wells (85% of loans), with the 30 cubic meter pear-shaped wells (cisterns) with loan amounts of $3,500 the most frequent technology and loan choice.
- As of March 2021, 97% of the loan payment amounts due had been paid, with 80% of loans paid on schedule (or ahead of time), and loans with payments outstanding by more than one month represented a portfolio at risk of 14% (PAR30).

Overall the recruitment and performance of CBOs went well, given the challenges posed by the pandemic. Uptake was greatest in the Irbid, Ajloun and to a less extent Mafraq governorates with 19 CBOs participating and 99% of lending from the Mercy Corps disbursements in these governorates. Each CBO was allocated $100,000 in funds and overall performance in disbursing loans was good, with 15 CBOs using approximately the full allocation and 3 CBOs obtaining second rounds of funding. A good number of the CBOs selected were female-headed or oriented CBOs. Repayment performance varied significantly across the CBOs, with increasing challenges for CBOs with smaller loan portfolios. The greater than one month portfolio at risk (PAR30) rates ranging from 0% to 47% for CBOs with over 20 loans made with the Mercy Corps fund disbursements. Re-lending performance also varied greatly, with some CBOs not having initiated new loans with repaid capital, up through one of the high-performing CBOs that had relent 89% of repaid capital.

With respect to gender, the analysis found that females did not differ from males in terms of technology choice and size of loan. Females did have a better rate of loan repayment then men, by about 5-6 percentage points depending on how this is measured.

The main results from the economic evaluation were as follows:

- Incorporating the revolving nature of the loan into the economic analysis of cost-effectiveness lowers the cost per cubic meter of water from $13 to $1-$2, putting the HLP within the range of likely supply options for Jordan's water future.
- With low fixed loan fees (and no loan interest), loan recipients achieve a 50% rate of return on their investment due to the cost savings realized through adopting water saving technologies.
- Once the private benefits are included alongside the economic costs the HLP benefit-cost ratio improves to breakeven levels, in the two cost scenarios the program saves a cubic meter of water at either an economic net benefit of $0.10 or a net cost of $0.84.

The conclusion from the economic evaluation is therefore that investing additional public funds into the HLP and expanding the program throughout the country is well worth it from an economic and environmental perspective. Expansion of the program would increase the leverage of the initial investment by USAID and Mercy Corps in developing the LMS and the institutional arrangements that underpin the community-based approach developed by the HLP.

The HLP can be classified as a hybrid institutional arrangement, sitting between traditional grant and micro-finance models. Like grant programs, the outcome of the HLP is a public good, as improved water conservation leaves water in the ground for later sharing and use for the common good of the community. Like a micro-finance program, there is a private incentive for households to take loans. By improving the affordability of water saving technologies households save money on water purchases, avoiding the need to purchase expensive water from private tankers when household tanks run dry.

Given the shared community benefits and the ability to monetize at least some portion of the benefit, the HLP seems a sensible and effective market systems solution in the Jordanian context. As a loan program, the HLP avoids simply “giving” away money to fully fund household water conservation efforts. As the cost-effectiveness of a single round HLP is relatively low, as shown by the prior economic analysis, this would be an economically inefficient solution. A grant program would result in just a single round of technology adoption and would build no program ownership in the community. Instead the HLP pivots off both the religious motivation to save water and the financial return to households of such actions by structuring the acquisition of water conservation benefits as a loan program. As a community-based loan program, the HLP builds community ownership and revolves funds to continually increase water use efficiency in the community. The decentralized community-based structure of the HLP and the very low loan fees are likely responsible for the higher portfolio at risk figures observed with the HLP. While repayment performance is low as versus a professionally centralized microfinance program, this design also keeps program management costs low, meaning that the economic efficiency of the program is higher than would likely be observed under a traditional micro-finance program. In sum, the HLP appears to maximize economic and environmental benefits while minimizing economic costs, trading off financial performance for increased water conservation and public benefit. As such the hybrid structure of the HLP seems particularly well adapted to the cultural, economic and water context in Jordan.

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Introduction

The Hashemite Kingdom of Jordan is one of the world's most water scarce countries[1] and is situated in a region beset by conflict and exposed to a rapidly changing climate. The Kingdom has a population of 10 million people, roughly one-quarter of which are classified as refugees by the World Bank. The bulk of the population lives in the northwestern corner of the country. Freshwater supplies from Lebanon, Israel and Syria have declined over time to where they now make up a minor portion (about one-sixth) of Jordan's water supply[2]. The northern governorates have a history of depending on deep aquifers to supply water to agriculture, households, and industry. A sign of the extent of water scarcity in Jordan is that the production of treated wastewater for reuse has doubled since 2000 and supplies half as much water as surface water. Groundwater, however, remains the primary source (65%) of supply for water uses in the Kingdom. Groundwater usage levels are 220% of safe levels.[3] Due to the intensity of use, growing demand, and reduced recharge due to climate change and other factors, Jordan's aquifers are declining. For example, the primary aquifer in the north is declining at rates of 1 to 12 meters per year (m/yr) with the highest declines in the northern governorates of Irbid and Mafraq.[4] Jordan's water future is therefore insecure. A recent modeling exercise suggests that by 2100 household access to water could be reduced by half as the imbalance between demand and supply grows.[5]

In such a water scarce context, efforts to increase water use efficiency and productivity are paramount. Reducing the water required at the point of end use to meet household, agricultural or industrial needs is the simplest, most direct way to improve Jordan's water budget. From 2017 to 2022, Mercy Corps implemented the Water Innovation Technologies (WIT) program with funding from the US Agency for International Development (USAID). The program responded to a lack of awareness, availability and affordability amongst households and farmers[6] in the northern governorates with respect to water savings approaches (WSAs) – including water saving practices, devices, and technologies. Implementing a market systems development approach Mercy Corps sought to lower the transaction costs involved in ensuring that water users could acquire these WSAs. One element of this program was an innovative Household Loan Program (HLP), that delivered $1.3 million in 657 loans to households for purchasing water saving devices and technologies. The loan program was a fully electronic (e-wallet) program implemented through local community-based organizations with a loan management system developed by Souktel, a Jordan technology company, and operated by Dinarak, a Jordanian mobile money provider.

The HLP's initial approach fared poorly, but once redesigned it achieved positive results over the final years of the WIT program. As of early 2022, the initial repayments are now being recycled into new loans, and the program is now accredited by Jordan's Ministry of Social Development. Dinarak has taken over ownership of the HLP and plans on extending the program to other governorates and loan types in Jordan. Therefore,

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[1] Tetra Tech, Review of Water Scarcity Ranking Methodologies. Report for the Jordan Water Management Imitative, USAID, 2018.

[2] Ministry of Water & Irrigation (MWI). Jordan Water Sector Facts and Figures 2017. Amman: Ministry of Water and Irrigation, Hashemite Kingdom of Jordan, 2018.

[3] Hardberger, A., Aylward, B., 2021. Groundwater Governance for Conflict-Affected Countries, in: The Role of Sound Groundwater Resources Management and Governance to Achieve Water Security, Global Water Security Issues. UNESCO, Paris, pp. 77–93.

[4] MWI. "Water Year Book: Hydrological Year 2016-2017." Amman: Ministry of Water and Irrigation, Hashemite Kingdom of Jordan, 2018.

[5] Yoon, J., Klassert, C., Selby, P., Lachaut, T., Knox, S., Avisse, N., Harou, J., Tilmant, A., Klauer, B., Mustafa, D., Sigel, K., Talozi, S., Gawel, E., Medellín-Azuara, J., Bataineh, B., Zhang, H., Gorelick, S.M., 2021. A coupled human–natural system analysis of freshwater security under climate and population change. Proc Natl Acad Sci USA 118, e2020431118. https://doi.org/10.1073/pnas.2020431118.

[6] Osorio-Cortes, L. 2022, Harnessing Market Systems for Water Conservation in Jordan, https://www.mercycorps.org/research-resources/water-innovations-technologies-lessons-jordan and https://www.marketlinks.org/resources/harnessing-market-systems-water-conservation-jordan.

while not the primary goal of the program, the HLP is playing a role in driving the adoption of digital financial services in Jordan. This paper tells the story of the development and evolution of the HLP and assesses why it was successful. As part of this story, the paper assesses the performance of the program, including an analysis of the results of the program in terms of water saved, costs and benefits.

The paper begins with a quick overview of the Jordanian water context and the origination of the WIT program. The evolution of the program is briefly described followed by a full investigation of the loan portfolio including the size, type and amounts of loans, their repayment status (as of March 2022), and the extent of subsequent lending.[7] Given the decentralized, community-based nature of the HLP, performance is also evaluated by examining how the community-based organizations (CBOs) fared across these metrics, as well as differences by gender of the loan recipients. Based on parameters emerging from this detailed analysis of the HLP performance data, a loan simulation model is developed to assess how the HLP might revolve funds into the future, in terms of loans, fees, repayment and water saved. These projections inform a cost-effectiveness analysis of the HLP, with comparison to a prior such analysis for the WIT program, and the cost of water in Jordan, generally. The simulation builds on the prior analysis of financial returns to households to estimate the private rate of return on investment from the loan program. Integration of the cost-effectiveness with the household financial returns then enables a comparison of the economic costs and benefits of the HLP. Based on this analysis, discussion of the effectiveness of this community-based loan model follows along with recommendations for building on the experience with the HLP in Jordan.

Evolution of the HLP

Household Water Context

Jordan is a middle-income country with almost universal access (99.8%) to improved water sources. Fully 93% of the population has access to piped water supplies.[8] Except for the Red Sea city of Aqaba, water utilities in Jordan deliver piped water to neighborhoods only intermittently, from once per week to once every three weeks. For this reason, every household connected to a water network in Jordan (including in Aqaba) has a rooftop tank for storing water, given the intermittent nature of piped water supply. When these tanks go dry households must purchase water from tanker trucks, often at ten times the going rate for piped water.[9] While piped water quality is potable, households often purchase drinking water separately, though this varies with socioeconomic status. A study in Amman found that 52% of low income and 88% of high-income households did not use piped water for drinking.[10] Similar variation was noted in this study of the ability to store water in tanks with high-income households having 5 times the storage of low-income households. Not surprisingly, the study found that water consumption was over 2 times greater in high-income as opposed to low-income households. Interestingly, while water bills for low-income households were one-fourth that of high-income households, the annual amount spent on buying bottled water was

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[7] Monetary figures are presented in US Dollars ($), with a few figures originating in local currency also presented in Jordanian Dinar (JOD. The exchange rate conversion is USD 1.41 per JOD, this is based on a rate of USD 1.412423 per JOD that resulted from reconciliation of the loan disbursement figures in the WIT financial records with the JOD loan amounts.

[8] WHO-UNICEF Joint Monitoring Program data, https://washdata.org.

[9] Klassert, C., Sigel, K., Gawel, E., Klauer, B., 2015. Modeling Residential Water Consumption in Amman: The Role of Intermittency, Storage, and Pricing for Piped and Tanker Water. Water 7, 3643–3670.

[10] Potter, R.B., Darmame, K., 2010. Contemporary social variations in household water use, management strategies and awareness under conditions of •water stress•: The case of Greater Amman, Jordan. Habitat International 115–124.

similar across low- and high- income households and ranged from an average of 2.5 to 8 times more than the water bill for this time frame (for high- and low-income households, respectively).

Estimates of residential water use for Jordan suggest an average of 80 liters per capita per day (lpcd).[11] The Amman study figures suggest the variation from high- to low-income households was 145 lpcd to 54 lpcd. The prognosis under a business-as-usual scenario for Jordan's water supply is not promising. A recent sophisticated and interdisciplinary modelling effort examined the effects of population growth, socioeconomic development, and climate change on freshwater security in Jordan. The results suggested that in the baseline scenario residential water is expected to be halved by 2100. The long-term urgency of saving water or finding alternative supplies in Jordan is clear. In the near term, the deployment of efficient water savings approaches or the addition of water to the household budget from rainwater harvesting or recycling will also be beneficial, avoiding the unnecessary pumping of water from Jordan's aquifers. The latter benefit is significant in terms of leaving water in the ground for later (when it will be even more valuable) and power savings, given that 15% of Jordan's electricity/energy budget goes to pumping water. The good news is that these investments appear to generate important savings for households, despite the highly subsidized price of residential water supply. A recent economic analysis undertaken for WIT demonstrated that the savings in expenditure on tanker water meant that several of the household WSAs deployed by WIT had a positive return on investment.[12] Further, WIT household surveys revealed that there is widespread sentiment amongst households in northern Jordan that their religion dictates that saving water is the right thing to do.[13]

WIT Market Assessment

The WIT market assessment of awareness, availability and affordability revealed that household water saving devices and technologies (WSTs) are available in the country, but not widely so outside of Amman.[14] Water saving devices used in Jordan include a range of household devices such as tap aerators, low flow shower heads and toilets, and simple devices to reduce water use by flush toilets. Technologies deployed to meet household needs include various forms of rainwater harvesting systems and storage, as well as greywater systems for recycling. Potential water savings from implementing efficiency improvements for fixtures in Jordanian households are substantial, varying from 21% to 50%, based on a comprehensive 2008-2011 study by USAID involving 95 residential metering studies and 2,400 water audits.[15] Despite numerous efforts by government and donors to promote water conservation and alternative supplies, the WIT market assessment found no institutional, market or financing presence directly addressing these needs.

As a result, WIT identified the lack of access to finance as a key barrier to the adoption of WSTs by households in northern Jordan. This was anticipated to be a particular barrier to WIT's success, as the program was targeting underprivileged and refugee households. Baseline survey work conducted for WIT revealed that households expressed a desire to borrow to purchase on the assumption that the purchase of WSTs would reduce their water costs and on the condition that the monthly repayment amount was

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[11] Yoon et al. 2021.

[12] AMP Insights. Economics of Water Savings under the Jordan Water Innovation Technologies Project. WIT.2022.

[13] ID:RC. Household KAP Endline Survey: Final Report. WIT. 2022.

[14] Springfield Centre. Market Assessment & Intervention Strategy Water Saving Market System in Jordan. WIT. 2017.

[15] Chebaane, M. Water is Life: Residential Water Use Efficiency Guide. USAID and IDARA.

affordable.[16] The WIT market assessment also found that the lack of cost-benefit analyses of WSTs, and thus their 'internal rate of return' for households, constrains the assessment of demand as well as understanding of the need and potential for financing. However, while microfinance institutions (MFIs) might have been expected to meet this need, none had suitable credit products, and there was little interest in developing them due to a perceived high risk of developing and financing such products, the seasonality of the segment, and the relatively low awareness of the need for WSTs in the market.

Financial Inclusion in Jordan

Although recent efforts to expand financial inclusion in Jordan have yielded positive results, half of all adults still do not have an account with a formal financial institution, only 17% have borrowed form a formal financial institution, and there is a still a significant gender gap in access (women are 29% less likely than men to have an account).[17] As reflected in participant surveys, there is a lingering lack of trust in MFIs as a result of indebted women, known as 'Gharimat', being jailed over their failure to repay loans, and the perception that MFI's charge high interest rates and do not provide Sharia compliant products. On their side, MFIs face challenges due to the high cost of financing, the presence of subsidized government programs and unregulated providers which create an unlevel playing field causing distortions in the market, as well as a tax burden that disproportionately affects for-profit MFIs.

To expand access to financial services and increase operating efficiency and convenience to customers, most MFIs have begun the process of digital transformation, primarily enabling loan disbursements and repayments through digital channels, such as mobile money. Due to the high level of mobile phone ownership and well-developed telecommunications infrastructure, digital financial services (DFS) have long been seen as a vital tool to improve financial inclusion, but uptake remained very low after the introduction of mobile money into Jordan in 2014. By 2017, approximately 1% of the adult population had a mobile money wallet (or e-wallet),[18] and growth was inhibited by a strong preference for cash, a lack of trust in financial institutions, and low awareness of this technology among potential users.

However, in response to the national lockdown caused by Covid-19 in 2020, the Central Bank of Jordan allowed online registration and electronic Know-Your-Customer verification for e-wallets and partnered with government agencies and NGOs to distribute aid to vulnerable Jordanians through m-wallets. All this was supported by major efforts to raise awareness through social media platforms and television. The number of registered and active wallets has increased dramatically, with 11% of the population now registered,[19] and evidence that other use cases are gaining popularity, such as person-to-person transfers and utility bill payment. However, there remains much work to be done to ensure greater usage and acceptance of digital payments; for example, only 1% of MFI loan disbursements and 8% of loan repayments currently go through digital channels.[20]

[16] ID:RC: Household Baseline Survey – KAP. WIT. 2018.
[17] World Bank Findex data 2017, globalfindex.worldbank.org.
[18] The Digital lives of refugees, GSMA 2019.
[19] Financial Inclusion Report, Central Bank of Jordan, 2021.
[20] Microfinance in Jordan, IFC 2019.

Loan Program Design[21]

Initial Design

The WIT program began in March of 2017 and went through a major reorganization to focus on market systems development (MSD) programming in late 2017, with the FY2018 (October-September) annual plan finalized and resubmitted to USAID in January of 2018. Objectives set in that plan included mobilizing $2 million in finance for farmers and households, selecting 10 community-based organizations (CBOs) to partner with in the HLP and building their financial capacity, developing a loan tracking system, and establishing a partnership with an E-wallet (mobile money provider). Other necessary elements that were also planned included carrying out the needed development of partnerships with WST suppliers so that loan recipients could easily access the WSTs. In addition, effort was devoted to awareness-raising activities and the preparation of marketing materials.

The initial design of the HLP was based on lessons learned the Community Based Initiative for Water Demand Management (CBIWDM) project, a USAID-financed program implemented by Mercy Corps from 2006 to 2013.[22] Lessons learned under CBIWDM were that CBOs have limited capacity and thus strict criteria are needed for their selection, that strict collateral is required to minimize repayment delay and that awareness of the benefits of WSTs can limit loan demand. To address these issues, in 2018, Mercy Corps vetted ten CBOs that previously had a 90% or higher repayment rate from the CBIWDM project for a role not just as the local financial institution that would disburse loans, but also as the community organization through which WSTs could be marketed. To save time and costs for all involved, WIT contracted with Souktel, a Jordanian electronics company, to provide a fully digital loan management system (LMS) that would enable loan recipients to file and manage their loan applications, CBOs to manage their loan portfolio and Mercy Corps to oversee the HLP all in electronic form. The LMS went live in June of 2019. Dinarak, a Jordanian digital financial service provider and mobile money provider, was selected to manage the digital loan system, with CBOs receiving funds from Mercy Corps and transacting with loan recipients using E-wallets.

Mercy Corps initiated the loan program in May of 2018 by working with CBOs, that were existing and trusted partners. Additional CBOs were to be selected by invitation and by open solicitations from across all five of the selected governorates in northern Jordan (Irbid, Ajloun, Jerash, Mafraq, and Azraq). CBOs were selected based on several criteria, including having an “A” rating from the Jordan River Foundation (JRF), a leading NGO in Jordan and WIT partner. CBOs new to the program were paired with existing CBOs for training and mentoring. CBOs also received training assistance from Mercy Corps, JRF and the Royal Scientific Society of Jordan (RSS) in technical support for revolving loan fund management, overall grant management, and technical support on understanding and promoting household water technologies. As a requirement for receiving a loan, potential loan applicants were required to first attend a training and awareness session on water savings technologies provided by a staff member of the CBO offering the loan.

Progress was slow in getting the full loan apparatus up and running. The initial plan was for the revolving loan fund to have an initial funding amount of $625,000 during its pilot phase.[23] USAID fixed amount

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[21] Material in this section that is not footnoted is drawn from Mercy Corps. Assessment of the Effectiveness, Learning and Impact of WIT’s Revolving Loans. April 2020.

[22] Assayed, Almoayied, Zaid Hatokay, Rania Al-Zoubi, Shadi Azzam, Mohammad Qbailat, Ahmad Al-Ulayyan, Ma’ab Abu Saleem, Shadi Bushnaq, and Robert Maroni. “On-Site Rainwater Harvesting to Achieve Household Water Security among Rural and Peri-Urban Communities in Jordan.” *Resources, Conservation and Recycling* 73 (April 2013): 72–77.

[23] This paragraph setting out HLP targets is from the original Revolving Loan Manual prepared by the WIT Access to Finance team.

subawards (FAS) were made to each CBO to disburse funds. Depending on the program's success, the initial funding could be scaled up to a maximum of $3 million through the life of the WIT project. It was intended that loans would revolve at least once through the life of the Project for a cumulative of $4 million in disbursed loans. It was assumed that loan size would range between $500 and $7,000. CBOs would be incentivized to increase revolving capital, once they have achieved a 95% repayment rate, with the possibility of receiving additional funding. A target was set to have 90 CBOs operational by the end of the program. The Project was to require that at least 30% of recipients must be adult women.

The loan process was as follows. The applicant was provided with the loan and documentation requirements (including the requisite collateral, which varied with the size of the loan) and a list of WSTs, along with their price quotations and a list of certified suppliers. The loan recipient was charged a loan request fee up-front to the CBO, not to exceed $90 per loan. This payment was in lieu of interest on the loan, to be Sharia-compliant as mentioned earlier. Working with their CBO, applicants then submitted a loan application using the LMS. Following approval and signature of the loan agreement, Mercy Corps authorized payment of loan funds into the CBOs Dinarak E-wallet. The CBO then transferred the funds directly to the supplier. Mercy Corps had worked to develop a group of suppliers in each region that could either provide the WST to the loan recipient or undertake the necessary works, where installation or construction was required. Once the funds were made available to the CBO, the loan recipient received the device from the supplier or the supplier would install or construct the WST. In the case of construction items, after final verification of the work and sign off by the Mercy Corps engineering team, the supplier's final payment was released by the CBO. Once the device or technology was operational the loan recipient would begin making payments back to the CBO through their Dinarak E-wallet.

During the program, ownership of the loan capital remained with Mercy Corps, with transfer to the CBO upon meeting exit requirements. In other words, on project completion, the funds were the property of the CBOs. Risk mitigation factors for the various transactional elements included:

- CBO/Recipients. Loan repayments from recipients are secured by collateral that must meet or exceed the amount remaining on loan, with escalating requirements at $280 and $2,800, at the higher end to include guarantee, promissory notes, assets, etc.
- WIT/CBOs. CBO wallets do not have cash-out functionality, so they cannot withdraw loan funds in contravention of their agreement. Cost of technology is fixed based on the Project's preferred lists of contractors.
- Recipients/Contractors. Clear deliverables and installment payments are defined for contractor works and MC Jordan engineers visit and validate works post-construction.

However, by the end of 2018 little demand for loans had materialized. Loan request data show just five applications, all for the above-ground rainwater tanks, with proposed loan amounts of from $700 to $14,000.

Re-Design

Through a series of surveys, workshops and reflections, Mercy Corps determined that the primary constraints faced by local community members and CBOs was that the repayment amounts were too high and that the water saving technology list provided by WIT was too limited. Mercy Corps modified the program so that the loan payment terms were longer (3 to 6 years depending on size of loan) and the monthly repayment amounts were affordable for households, e.g. no more than $70 for medium sized loans or $100 for larger loans. The loan products were coalesced into four segments each of which required additional documentation as the size of the loan increased (Table 1). In addition, Mercy Corps added "pear-shaped" wells, a traditional underground rainwater harvesting storage system, and underground plastic tanks for storing rainwater. The pear-shaped wells, which were better known locally, and the more innovative plastic tanks, were both substantially less expensive than the concrete tanks the program had initially included. Over time, Mercy Corps also expanded the technologies available to include gray water reuse system and reverse osmosis filters. The full list of available WSTs is provided in Table 2 along with expected costs prior to implementation.

Table 1. Loan Types, Sizes and Required Documentation

Loan Type	Loan Size (JOD)	Loan Size (USD)	Required Documentation
Micro Loans	20 – 200	28 – 280	Valid ID
			Valid Family Book
			Recent water bill
			Recent electricity bill
Small Loans	201 – 2,000	280 – 2,800	All of the above and a bank note
Medium Loans	2,001 – 5,000	2,800 – 7,050	All of the above and one guarantor with proof of income
Large Loans	5,001 and Above	7,050 and Above	All of the above and one additional Guarantor with proof of income

Table 2. Water Saving Technologies and Devices Offered by the HLP

Water Saving Technology/Device	Size (m^3 of storage)	Expected Costs (JOD)	Expected Costs (USD)
Rainwater Catchments (storage)			
Pear-shaped well	10/20/30	2,500	3,500
Plastic tank (above ground)	20	1,750	2,500
	30	2,500	3,500
Plastic tank (underground)	20	2,500	3,500
	30	3,250	4,600
Cement tank	20 / 30 / 40	Over 10,000	Over 14,000
Other Technologies			
Grey Water System		1,220	1,700
Reverse Osmosis (RO)Filter		n/a	
Water Saving Devices			
Low flush toilet		175	200
Low flow showerhead		20	30
Toilet bag		4	6

Loan Program Performance

The redesign in early 2019, the launch of the LMS in June of 2019 and a series of awareness-raising events with the CBOs began to stimulate demand for the revolving loans started in mid-2019. The first transfer of funds was made at the end of July 2019. By the end of the third fiscal year of the WIT program (September 2019), seven CBOs were trained and operational. At that time a total of 55 loans had been funded, although most of these went through just three CBOs, all of which were in the Jerash governorate.[24] Importantly, 33% of the loans at this point had been made to women. The program was off and running.

In this section the participation of CBOs and loan recipients in terms of loan requests, loans made and repayments is reviewed and assessed. The data that underpins the analysis come in two packets, that determine the dimensions of the analysis:

- Information on loan requests and loans made for the original round of funding, as well as loans subsequently disbursed by CBOs from funds that were repaid, is based on data provided through September 30, 2021. These data are the same data employed by AMP Insights in their study on cost-effectiveness.
- Additional data on the loans made with the original round of funding, including repayment data is available up through early March 2022 (reflecting data extracted from the LMS on 3/11/2022),

Each of these sources is used and blended to assess loan performance.

Loan Portfolio

The total funding committed to the CBOs for funding loans came to $1.835 million or approximately JOD 1.3 million (Table 3). This was substantially lower than the original objective of $3 million in loans, but not surprising given the program's slow start. The bulk of the loan activity took place in 2020 with over 400 successful loans initiated in the LMS. Activity tailed off a bit in 2021, by which time most CBOs had exhausted their first round of funding at this time. Throughout the three years of the program the average size of loans fell, dropping from $3,000 in 2019 to $2,300 in 2021. This is primarily due to recipients taking out smaller loans on the most popular sizes of pear-shaped wells. In 2021 almost one-third of the loan activity was made up of a second round of subsequent lending, in which CBOs took funds repaid and reloaned those out, much as originally intended. The original intent was to see one dollar of second round loans for every three dollars of first round loans. The ratio achieved up until the end of September 2021 was more on the order of 1:9.

Table 3. Yearly and Total Loan Numbers and Loan Amounts[25]

Funding Rounds	Loans Made			
	2019	2020	2021	Total
Original Round				
Number of Loans	99	402	155	656
Loan Amount	$ 301,983	$ 1,144,075	$ 389,591	$ 1,835,649
Average Loan	$ 3,050	$ 2,846	$ 2,513	$ 2,798
Subsequent Lending				
Number of Loans		12	88	100
Loan Amount		$ 31,215	$ 172,611	$ 203,825
Average Loan		$ 2,601	$ 1,961	$ 2,038
Total Lending				
Loans	99	414	243	756
Loan Amount	$ 301,983	$ 1,175,290	$ 562,202	$ 2,039,475
Average Loan	$ 3,050	$ 2,839	$ 2,314	$ 2,698

[24] Mercy Corps. Annual Performance Report: Fiscal Year 2019.

[25] Minor discrepancies were found between the various versions of the LMS data provided (at the level of individual loans). These discrepancies were investigated and corrected to match the actual cash outlays from WIT to the CBOs in the WIT financial records. Following

By far the most popular technology was the pear-shaped well, accounting for 643 loans (85% of loans) and 96% of total lending (Table 4). The pear-shaped well proved far more attractive than the plastic tanks. Adoption of the plastic tanks was limited to 12 with 11 of those above ground. Aside from rainwater harvesting the only other technology adopted at a significant rate was the RO filter at 81 loans (11% of total loans). Due to its lower cost, lending for RO filters came in at only 2% of total lending. Adoption of other devices and technologies was limited. Water saving devices resulted in 13 loans and there was 1 loan for the toilet water saving kit. The grey water system featured in just 6 loans. Loans varied in size from JOD 250 for the toilet kit to a maximum of JOD 3,525, for rainwater harvesting tanks. Sizes and loans for the pear-shaped wells spanned a wide range (with most of them falling within the 5 to 65 cubic meters range in volume). The most frequent volume was 30 cubic meters for which there were 454 loans and the 25 cubic meters size with 121 loans.

Table 4. Loans and Loan Amounts by Technology

			Loan Amounts				
Water Saving Technology	Loans	%	Loan Amounts	%	Loan Average	Loan Minimum	Loan Maximum
Rainwater Catchment (Pear shape)	643	85%	$ 1,958,591	96%	$ 3,047	$ 494	$ 3,531
RO Filter	81	11%	$ 32,933	2%	$ 407	$ 223	$ 763
Water Saving Devices (5 Pcs)	13	2%	$ 5,034	0%	$ 387	$ 381	$ 388
Rainwater Catchment (Above ground)	11	1%	$ 32,839	2%	$ 2,986	$ 2,119	$ 3,531
Grey Water System	6	1%	$ 6,299	0%	$ 1,049	$ 805	$ 1,723
Rainwater Catchment (Under ground)	1	0%	$ 3,531	0%	$ 3,531	$ 3,531	$ 3,531
Water Saving Toilet	1	0%	$ 247	0%	$ 247	$ 247	$ 247
Grand Total	756	100%	$ 2,039,475	100%	$ 2,698	$ 223	$ 3,531

With the redesign of the loan program to lower loan amounts, extend repayment terms and replace expensive cement tanks with the less costly and more popular pear-shaped wells, the loan portfolio is made up of loans in the micro, small and medium categories (as per Table 1). Given the preponderance of pear-shaped wells in the loan portfolio it is not surprising that medium size loans dominate the portfolio with 64% of loans and 82% of loan value (Table 5). Small loans made up most of the remainder of the portfolio by value at 16%. Interestingly in sheer numbers of loans the second round of funding saw small loans outpace medium loans.

Table 5. Size Distribution of Loan Portfolio

Funding Rounds	1-Micro	2-Small	3-Medium	Totals
Original Round				
Number of Loans	73	133	450	656
Percent of Total	11%	20%	69%	100%
Loan Amount	$ 27,798	$ 249,740	$ 1,558,111	$ 1,835,649
Subsequent Lending				
Number of Loans	17	46	37	100
Percent of Total	17%	46%	37%	100%
Loan Amount	$ 6,603	$ 74,172	$ 123,050	$ 203,825
All Lending				
Number of Loans	90	179	487	756
Percent of Total	12%	24%	64%	100%
Loan Amount	$ 34,401	$ 323,912	$ 1,681,161	$ 2,039,475
Percent of Total	2%	16%	82%	100%

this procedure the individual loan amounts matched the cash outlay, but it appears that there was one less loan (656) made than is reported by WIT (657), for the original round of funding.

For the first funding round, total participation by females was 29% by number of loans and 31% by value of loan amounts, thus achieving Mercy Corps' target of 30% participation by females (Table 6). Loan recipients were generally older, with 90% of loans going to individuals over 29 years of age (Table 7). Interestingly, females were overrepresented in the younger age classes. Of the loan recipients under 24 years of age three-quarters were women. In terms of geographic representation, half the loans went to the Irbid Governorate (Table 8) and another third to Ajloun. Mafraq accounted for 15% of loans with the other two governorates combining for only 29 out of 756 loans. As noted in the table the distribution of loans and loan amounts does follow the numbers of participating CBOs in each governorate. But it also reflects the interest, effort and capacity of the CBOs involved. For example, Ajloun clearly had an advantage from the start due to the three CBOs that had established relationship with Mercy Corps. An interesting question is whether the level of engagement and participation is merely a result of the level of interest and capacity of CBOs from these governorates or a reflection on household demand for these technologies in the governorates.

Table 6. Loans by Gender

First Funding Round Only	Female	Male	Total
Number of Loans	189	466	655
Percent of Total	29%	71%	100%
Loan Amount	$ 567,388	$1,264,730	$1,832,118
Percent of Total	31%	69%	100%

Table 7. Loan Numbers by Age

Both Funding Rounds	Under 18 years	18 to 24 years	25 to 29 years	over 29 years	Totals
Number of Loans	3	11	60	681	755
% of Total	0%	1%	8%	90%	100%
Loan Amount	$ 7,451	$ 34,887	$ 180,006	$ 1,813,600	$ 2,035,944
% of Total	0%	2%	9%	89%	100%

Both Funding Rounds	Under 14 years	18 to 24 years	25 to 29 years	over 29 years	Totals
Number of Loans	3	11	60	681	755
% of Total	0%	1%	8%	90%	100%
Loan Amount	$ 7,451	$ 34,887	$ 180,006	$ 1,813,600	$ 2,035,944
% of Total	0%	2%	9%	89%	100%

Table 8. Loan Numbers by Governorate

Both Funding Rounds	Ajloun	Azraq	Irbid	Jarash	Mafraq	Grand Total
Participating CBOs	5	1	9	1	5	21
% of Total	24%	5%	43%	5%	24%	100%
Number of Loans	243	20	393	9	91	756
% of Total	32%	3%	52%	1%	12%	100%
Loan Amounts	$ 787,715	$ 9,499	$ 925,887	$ 20,585	$ 295,790	$ 2,039,475
% of Total	39%	0%	45%	1%	15%	100%

Data on loan amounts, number of total payments (term), number of payments due (at time of data extraction), loan repayment amounts to date, and the number of payments due to date were provided by WIT from the LMS. Due to reconciling of loans and amounts as referred to earlier this data was available for all but one of the loans in the original funding round (therefore the differences in the totals in Table 9 compared to the prior tables). The data was cleaned based on the loan amounts, the amount repaid to date and the total amount repaid to date. This resulted in several changes to the number of total payments and the number of payments due. Once completed, repayment status and amounts were computed as shown in Table 9.

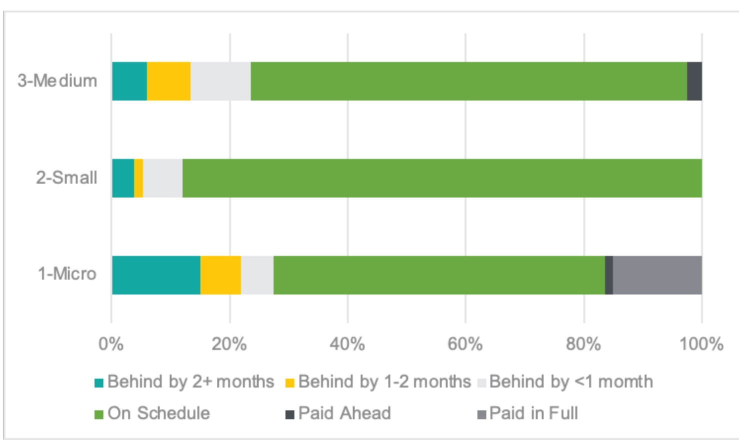
Table 9. Loan Status, Repayments and Arrears

Loan Status	Loans	% of Total	Loan Amount	Amount Owed To Date	Amount Paid to Date	Amount not Paid (Paid Ahead)	Amount Remaining still Owed
Paid in Full	11	2%	$ 4,131	$ 3,983	$ 6,356	$ (2,373)	$ -
Paid Ahead	12	2%	$ 38,270	$ 10,374	$ 11,311	$ (937)	$ 26,959
On Schedule	490	75%	$ 1,377,349	$ 424,244	$ 424,244	$ -	$ 953,106
Behind by 1 month or less	59	9%	$ 179,900	$ 49,256	$ 47,241	$ 2,015	$ 132,659
Behind by 1-2 months	40	6%	$ 122,662	$ 31,065	$ 28,103	$ 2,962	$ 94,559
Behind by 2+ months	43	7%	$ 109,806	$ 32,015	$ 22,227	$ 9,788	$ 87,579
Grand Total	655	100%	$ 1,832,118	$ 550,937	$ 539,482	$ 11,455	$ 1,294,861

A small number of loans (4%) were paid off early or are ahead of the repayment schedule. These were exclusively in the micro loan category. Fully three-quarters are right on schedule with payments. Of the loans that are in arrears, 13% of all loans are more than one month behind in payments. The Portfolio at Risk, e.g. loan portfolio at risk (behind by more than 1 month or 30 days) due to delinquency as a portion of the total portfolio is 14%. The traditional standard for PAR(30) is 5% or less. Although, repayment so far is 97% of the amount owed, the PAR(30) figure suggests that the loan portfolio is not performing as well as should be expected some 2-3 years into the program.

Whether or not the size of loans affect repayment was investigated (Figure 1). Micro loans have by far the highest "early" repayment – either in full or just paid ahead. Paradoxically, micro loans also have the most loans in arrears. While the sample is small, this may suggest that for such small loan amounts participants are more likely to regard the loan as a nuisance, and either pay it off, or take a cavalier attitude towards it and ignore the payment schedule. More significantly, medium loans have a much larger rate of arrears in payments than the small loans. Further study would be useful to validate this finding and understand which of the various determinants of repayment are the most critical.

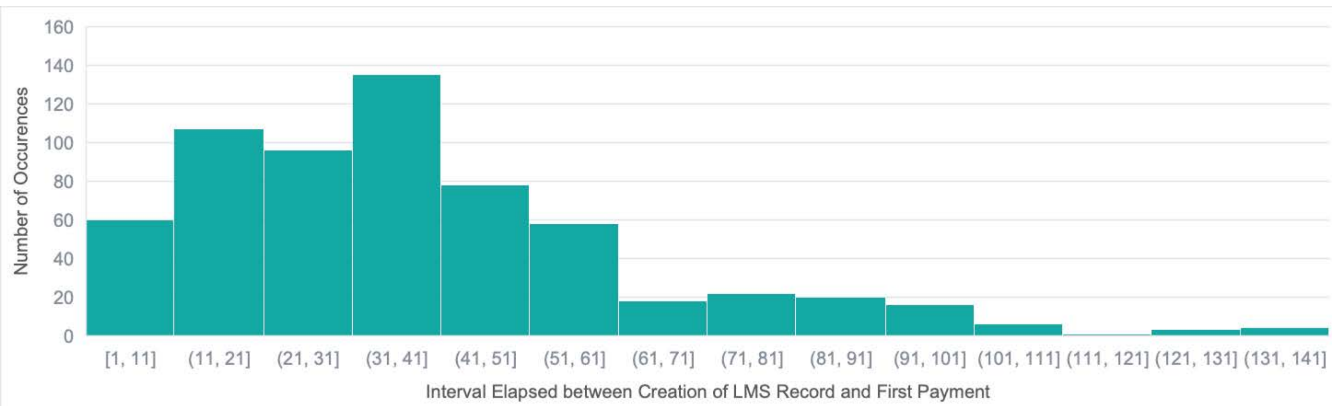
Figure 1. Loan Repayment Status by Loan Size



Overall the HLP represents a significant achievement, given the slow implementation of the LMS, the learning and redesign that took place and that the program was operated largely at a time when the country was largely shut down due to the COVID-19 pandemic. The program met with success in providing needed financing for critical and valued household infrastructure to increase household water security. The number of payments in arrears is however worrying, particularly at such an early stage in the program. Exposure to loans in arrears is driven by poorer repayment performance in the larger of the loan classes. Additional factors that impinged on project performance are explored further in the next section which disaggregates the loan portfolio by CBO.

Information provided by WIT on the first round of funding, include the date of record creation in the LMS, which is taken as a proxy of the loan application date. The date the loan was initiated (when the CBO paid the loan amount out to the supplier or otherwise initiated the loan) is also included. The accuracy of the record creation date appeared to be variable as in some cases it was after the date of loan initiation. Disregarding these cases, Figure 2 charts the days between record creation and loan initiation. With a median value of 35 days, and most loans completed inside of 60 days, this seems like rather efficient processing, in part probably due to the LMS and its ability to make applications available to all parties in rapid fashion.

Figure 2. Histogram of Interval between LMS Record Creation and Loan Initiation



CBOs

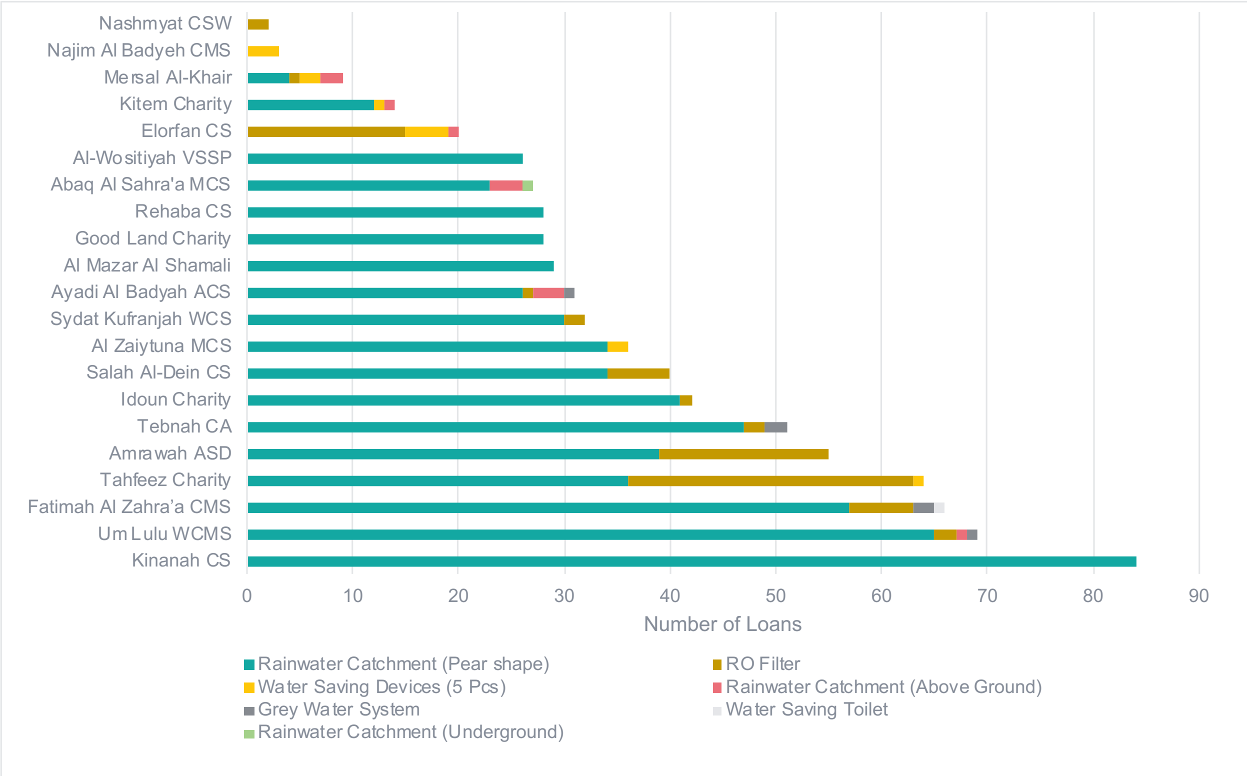
A total of 21 CBOs ended up participating in the program. Not the 90 that were hoped for at the outset but still a substantial increase over the initial set of four that passed the initial evaluation back in 2019. The full name in English and Arabic, the governorate and the abbreviation used in tables in this paper are provided in the Appendix. Notably, a number of these CBOs were women-led or chartered to address women's issues in the community. Each of these CBOs was approved by Mercy Corps for loans in the amount of $100,000. Three of the CBOS, all based in Ajloun governorate, were the top performers, each securing a commitment by Mercy Corps to a second round of funding, which they were able to deploy to varying degrees before the program concluded (Table 10). Fatimah Al Zahra'a CMS and Um Lulu WCMS placed $199,000 and $185,000 in loans respectively. These two along with Al Zaiytuna MCS were the original three CBOs brought forward from the prior program and that led the initial wave of loans in 2019. Twelve other CBOs used all or close to all the funds committed in the first round. Three others participated to some degree but did not come close to spending the approved funds. At the tail end of performance were two NGOs that between them placed 5 loans in 2019/2020 and then stopped participating.

Table 10. CBO Fixed Sub-Award Funding Amounts (and Loan Amounts in the First Round)

CBO	Funding Amounts		Original Round		Subsequent Lending			All Lending		
	USD	JOD	Loans	Average Loan	Loans	Amounts	Average Loan	Loans	Amounts	Average Loan
Fatimah Al Zahra'a CMS	$ 199,152	141,000	64	$ 3,112	2	$ 7,062	$ 3,531	66	$ 148,062	$ 2,243
Um Lulu WCMS	$ 185,254	131,160	55	$ 3,368	14	$ 47,627	$ 3,402	69	$ 178,787	$ 2,591
Al Zaiytuna MCS	$ 119,562	84,650	36	$ 3,321				36	$ 84,650	$ 2,351
Tahfeez Charity	$ 100,000	70,800	63	$ 1,587	1	$ 2,754	$ 2,754	64	$ 73,554	$ 1,149
Idoun Charity	$ 100,000	70,800	31	$ 3,226	12	$ 16,878	$ 1,407	43	$ 87,678	$ 2,039
Al Mazar Al Shamali	$ 100,000	70,800	29	$ 3,448				29	$ 70,800	$ 2,441
Salah Al-Dein CS	$ 100,000	70,800	34	$ 2,941	9	$ 22,352	$ 2,484	43	$ 93,152	$ 2,166
Tebnah CA	$ 100,000	70,800	30	$ 3,333	17	$ 34,514	$ 2,030	47	$ 105,314	$ 2,241
Sydat Kufranjah WCS	$ 99,647	70,550	30	$ 3,322	2	$ 7,062	$ 3,531	32	$ 77,612	$ 2,425
Ayadi Al Badyah ACS	$ 99,640	70,545	31	$ 3,214				31	$ 70,545	$ 2,276
Amrawah ASD	$ 99,572	70,497	39	$ 2,553	16	$ 25,706	$ 1,607	55	$ 96,203	$ 1,749
Kinanah CS	$ 99,435	70,400	64	$ 1,554	20	$ 31,073	$ 1,554	84	$ 101,473	$ 1,208
Good Land Charity	$ 98,870	70,000	28	$ 3,531				28	$ 70,000	$ 2,500
Rehaba CS	$ 98,870	70,000	28	$ 3,531				28	$ 70,000	$ 2,500
Abaq Al Sahra'a MCS	$ 95,339	67,500	27	$ 3,531				27	$ 67,500	$ 2,500
Al-Wositiyah VSSP	$ 63,559	45,000	23	$ 2,763	3	$ 7,243	$ 2,414	26	$ 52,243	$ 2,009
Kitem Charity	$ 46,285	32,770	14	$ 3,306				14	$ 32,770	$ 2,341
Mersal Al-Khair	$ 20,585	14,574	9	$ 2,287				9	$ 14,574	$ 1,619
Elorfan CS	$ 7,945	5,625	16	$ 497	4	$ 1,554	$ 388	20	$ 7,179	$ 359
Najim Al Badyeh CMS	$ 1,165	825	3	$ 388				3	$ 825	$ 275
Nashmyat CSW	$ 777	550	2	$ 388				2	$ 550	$ 275
Totals	$1,835,657	1,299,646	656	$ 2,798	100	$ 203,825	$ 2,038	756	$ 1,503,471	$ 1,989

Interest from households in the more expensive products, particularly the pear-shaped wells, was key to loan outlays. The three CBOs at the bottom of the chart had average loan size of $390 to $495. Two other CBOs had average loan size of about $1,550. From there average loan size by CBO ranged from $2,250 to $3,500. Tahfeez Charity and Kinanah CS had average loan sizes around $1,550. Examining the technologies behind the loans (Figure 3) reveals that these two CBOs took different paths to these figures. Tahfeez Charity was one of three CBOs to see substantial adoption of the RO filter. The filters made up 32% of this CBOs loan portfolio with an average loan size for the technology of $445. Meanwhile Kinanah CS made loans only for pear-shaped wells, making 84 loans all at the same amount of $1,550. The top performer, Um Lulu WCMS, made larger loans with all but four of their loans made for 25 and 30 cubic meter pear-shaped wells, and all at the same amount of $3,500. As shown in the figure only a handful of CBOs successfully promoted technologies other than pear-shaped wells.

Figure 3. Loan Numbers by Technology for CBOs



Rates of repayment (available only for the first round of funding) vary widely across the 21 CBOs (Figure 4). Panel A shows that there are seven CBOs that have more than 10% of their loans in the troubled category, i.e., with repayment in arrears by more than two payments. Another seven CBOs have more than 95% of loans on, or ahead of, schedule. The remaining seven CBOs have loans in arrears by less than two months ranging from 6% to 68%. Panel B puts repayment performance in context by showing that the CBOs with lower loan numbers tend to have more loans in trouble or in arrears. The exception is the Amrawah ASD, which while having a significant loan portfolio had 50% of its loans in arrears. As all CBOs were approved for the same loan amounts, the relationship between loan activity and arrears probably reflects the level of commitment by the CBO to the HLP. Panel B also shows the PAR(30) for each CBO. Clearly the portfolio at risk varies widely by CBO. Aside from Amrawah ASD, the other top 8 CBOs (by number of loans) all have excellent PAR(30) figures, within the standard metric of 5% or less for a well performing loan portfolio. Clearly the diversity of repayment circumstances raises the question of incentives and compliance. It appears that once the WIT Program ends all loan supervision and performance monitoring and enforcement is effectively decentralized to each CBO. It is not surprising that individual, or in this case 23 distinct organizations, display a variety of results, including some that do not meet the metrics to which traditional MFI programs are held. Particularly, when the latter are administered by a single organization for which loan portfolio administration and performance is a central goal of the social enterprise. To some extent then the high overall portfolio at risk figures, and the variety of CBO figures, are determined by the institutional arrangements selected for the HLP.

Figure 4. Repayment Status by CBO (Panel A in % and Panel B in numbers of loans)

Another area where the CBO-led model for the HLP has generated a variety of experiences is the rate at which funds returned are lent back out as new loans. Relending will depend on the supply of funds and the demand of them from within the CBO communities. Regarding demand there is not much information available except the success of the program so far and the reported satisfaction of households with the program. Another consequence of the HLP institutional arrangement is that the loan funds are not fungible between CBOs but must serve demand from within each CBO community, rather than regional or national demand. In terms of observed performance, the WIT data shows over JOD 381,000 in repayments to CBOs and JOD 144,000 in new loans (beyond the initial round) for a 38% rate of relending (Table 11). The rate of subsequent lending is uneven. For example, of the high performing CBOs, Um Lulu WCMS had redeployed 62% of repayments into new loans, while Fatimah Al Zhara'a CMS had redeployed only 12%. On the other hand, one of the mid-range group of CBOs, Tebnah CA, had relent 97% of the JOD 25,000 repaid so far. For the 7 CBOs actively engaged in putting out new loans with the repaid capital (rate over 50%), the average rate of lending out repaid capital is 75%. This figure is deployed later in the loan simulation exercise.

Table 11. Loans, Repayments and Subsequent Lending by CBO

CBOs	Initial Lending Round		Subsequent Lending		
	Loan Amounts	Payments Received	Loan Amounts	End Cash Balance	Relending Portion
Fatimah Al Zahra'a CMS	$ 199,152	$ 56,686	$ 7,062	$ 49,624	12%
Um Lulu WCMS	$ 185,253	$ 76,625	$ 47,627	$ 28,998	62%
Al Zaiytuna MCS	$ 119,562	$ 39,168	$ -	$ 39,168	0%
Al Mazar Al Shamali	$ 100,000	$ 20,397	$ -	$ 20,397	0%
Idoun Charity	$ 100,000	$ 20,511	$ 16,878	$ 3,633	82%
Salah Al-Dein CS	$ 100,000	$ 26,066	$ 22,352	$ 3,715	86%
Tahfeez Charity	$ 100,000	$ 19,367	$ 2,754	$ 16,613	14%
Tebnah CA	$ 100,000	$ 35,445	$ 34,514	$ 931	97%
Sydat Kufranjah WCS	$ 99,646	$ 17,784	$ 7,062	$ 10,722	40%
Ayadi Al Badyah ACS	$ 99,639	$ 31,306	$ -	$ 31,306	0%
Amrawah ASD	$ 99,572	$ 28,909	$ 25,706	$ 3,203	89%
Kinanah CS	$ 99,435	$ 63,443	$ 31,073	$ 32,370	49%
Good Land Charity	$ 98,870	$ 24,280	$ -	$ 24,280	0%
Rehaba CS	$ 98,870	$ 19,280	$ -	$ 19,280	0%
Abaq Al Sahra'a MCS	$ 95,339	$ 26,836	$ -	$ 26,836	0%
Al-Wositiyah VSSP	$ 63,559	$ 13,479	$ 7,243	$ 6,236	54%
Kitem Charity	$ 46,285	$ 10,852	$ -	$ 10,852	0%
Mersal Al-Khair	$ 20,585	$ 4,963	$ -	$ 4,963	0%
Elorfan CS	$ 7,945	$ 2,918	$ 1,554	$ 1,364	53%
Najim Al Badyeh CMS	$ 1,165	$ 847	$ -	$ 847	0%
Nashmyat CSW	$ 777	$ 319	$ -	$ 319	0%
Grand Total	$ 1,835,649	$ 539,482	$ 203,825	$ 335,657	38%

Gender

As stated, the HLP achieved its target of reaching female loan recipients with 30% of loans disbursed. The next set of figures examines how participation in the program varied by gender across technology, size of loans, and governorate. A female was the sole participant to choose a water saving toilet and a male the sole participant to select an underground plastic tank for rainwater storage, but generally the female choice of technology did not differ widely from that of males (Figure 5). Technology choice affects loan size, and thus there is little distinction in loan size, with women having only a slightly larger proportion of their loans at the medium size level compared to males (Figure 6).

Figure 5. Technologies Adopted by Gender (n=655)

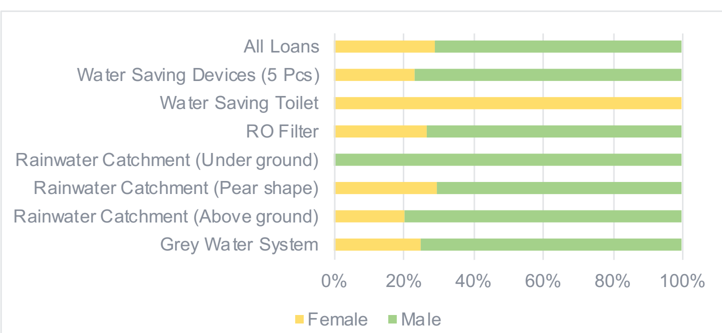
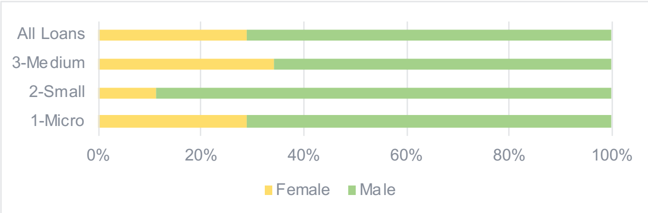
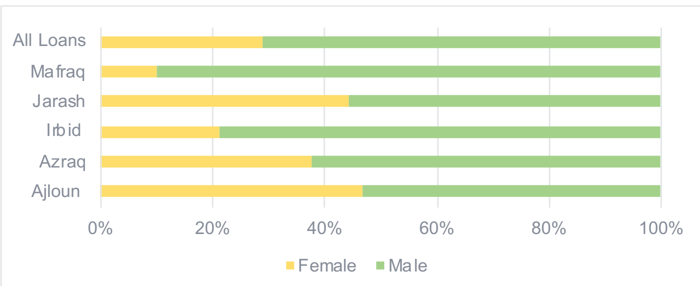


Figure 6. Size of Loans by Gender (n=655)



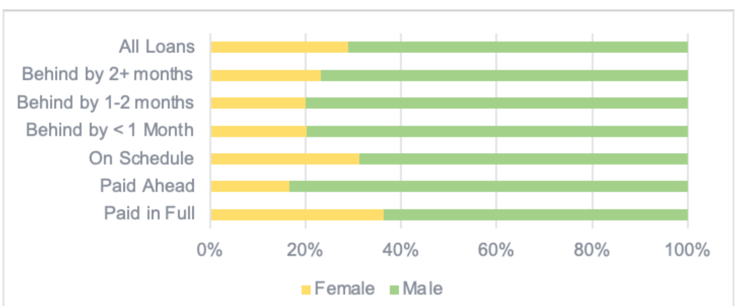
Female participation in the program varied by governorate (Figure 7). The 30% target for female participation was not reached in Mafraq (10%) and Irbid (21%). Female participation was most pronounced in Ajloun (47%) and Jarash (44%) with Azraq achieving a lesser female participation rate at 38% of loans issued.

Figure 7. Participation of Gender by Governorate (n=655)



As shown in Figure 8, females are more likely to be on schedule with their payments than males. According to WIT's final report the loan repayment rate for females is 98% and for males 93%.[26] The PAR(30), calculated as specified earlier, is 10% for females and 16% for males. While the figures differ, probably due to how WIT calculates "repayment rate", the result that females are timelier with their loan payments is consistent across both metrics.

Figure 8. Repayment Rates by Gender (n=655)



[26] Mercy Corps, Water innovation Technologies Project (WIT): Final Report, March 2022.

Loan Program Economics

The WIT Program sponsored an economic analysis of the entire program in 2022, carried out by AMP Insights (AMP).[27] AMP gathered WIT program cost information and assigned the data as direct and indirect costs to three agricultural and five household activities. Water savings data provided by the International Water Management Institute (IWMI) was gathered and adjusted to reflect the length of life of each type of water saving approach. Cost-effectiveness figures were produced for the program, the household and agricultural efforts, and each of the eight activities. AMP concluded that the cost-effectiveness of the WIT program at $0.35/m^3 was quite attractive in the Jordan context and that water conservation should be pursued as a central strategy in any national water policy. In addition, AMP used data from the WIT end-line surveys to show that many of the agricultural and household water savings approaches had positive, or close to positive, returns on investment (ROI), notwithstanding the finding that many Jordanian households were committed to stewarding water as a religious imperative. This result underpinned the positive assessment of the market systems development approach of the WIT program – i.e., that by investing in improving awareness, access, and availability to water savings approaches the program would unlock lasting efforts by water users and suppliers of conservation technologies to save scarce water supplies.

It is, however, worth noting that the Household Loan Program was not one of the standout performers in the economic analysis. The HLP was determined to have direct costs of $2.86 million, consisting largely of the loan funds, the costs of developing the loan management system, personnel costs, and associated costs of building the capacity of the CBOs. To this must be added the HLP's share of indirect costs (Table 13). As developed by AMP, the WIT indirect costs assigned to the HLP include household program indirect, WIT indirect for monitoring and evaluation and gender, as well as Jordan office indirect and Mercy Corps indirect (or the federal negotiated indirect cost recovery agreement or NICRA amount). Applying these indirect portions, AMP reports a total of $6.61 million in costs for the HLP. The program generated 0.49 MCM in water benefits from the technologies deployed over their length of life. The water benefits of the pear-shaped wells – the single most prevalent technology – were calculated by size of the tank and by the governorate (due to differences in rainfall). This resulted in a cost-effectiveness of $13.37/m^3, by far the lowest observed of the eight WIT activities.

[27] AMP Insights. Economics of Water Savings under the Jordan Water Innovation Technologies Project. Report prepared for Mercy Corps – Jordan, 2022.

Table 12. WIT Program and HLP Costs (AMP Insights)

Direct Activity	Cost (US$m)	HLP (US$m)
Ag - Demos	$0.2	
Ag - Fund	$1.1	
Ag - Incentives	$0.5	
HH - Fund	$0.8	
HH - Loans	$2.9	$2.9
HH - Media	$2.8	
HH - Schools	$0.9	
HH - Storage	$2.0	
Sub-Total	$11.1	
Loans as % of all HH		31%
Loans as % of all Direct		26%
Indirect Activity		
Ag - Indirect	$1.8	
HH - Indirect	$0.8	$0.2
Sub-Total	$2.6	
Indirect WIT		
MEL	$2.5	
G&A	$2.4	
Start-up	$1.0	
Sub-Total	$5.8	$1.5
Indirect Mercy Corps		
Jordan	$3.8	
HQ	$4.0	
Sub-Total	$7.8	$2.0
Total USD	$27.3	$6.6

Due to the nature of the AMP analysis it did not engage in detailed analysis of the HLP program, as covered above. Using the performance indicators developed above for the HLP and the AMP cost and water data, it is possible to now sketch out a more discerning picture of the economics of the HLP program. In doing so the following issues are addressed:

1. The loan funds do not represent an economic cost insofar as they will continue to revolve between the CBOs and loan beneficiaries.
2. The continued recycling of the loan funds will drive ever larger water savings that may be attributable to the program, just as AMP determined that counting water benefits of the WIT program for only the time the program was in operation, and not over the life of the technologies and/or adoptions, shortchanged the benefits attributable to the program.

This section presents a re-analysis of the cost-effectiveness of the HLP and attempts to calculate the private ROI to households and the net economic benefits of the program. The development of a loan simulation model to undertake this analysis also affords the opportunity to compare the “Islamic finance” approach taken by the WIT HLP with a traditional Western interest-based lending model.

Methods and Data

The principal effort entailed in revisiting the economics and water saved over a longer time frame is in constructing a model that simulates all elements of the HLP as it operates over the long term. Attempting this at the level of the CBO would create unnecessary complexity in the model. At the same time, as much as possible the model should hew to the HLP data and performance to date, as reviewed in the prior section. As a result, the model is constructed as if it is run by a single entity, instead of 21 CBOs based in five governorates. This eliminates some of the variety of experiences implicit in the HLP but greatly simplifies the model and makes sensitivity analysis relatively straightforward.

Loan Simulation Model

The simulation model is set up to run for 50 years (from 2019). For the economic analysis the same 5% discount rate is used as per the AMP study.[28] Such a long time horizon may be excessive, but this is very much a "What if?" simulation and with pear-shaped wells having a 50-year length of life, and the 5% discount rate, it is useful to have a longer life so that the discounted water savings can play out in full. The model retains the loan numbers (656) and outlays ($1.84 million) from the initial funding round and bases the projections for continued lending on characteristics of the loan program observed so far. To simplify the mode, the simulation uses an "average" loan as the base unit. Parameters for lending and repayment necessary to motivate the model are developed based on the loan data as evaluated earlier in the paper and include:

- Loan term – 5 years
- Loan size – $2,825 (JOD 2,000)
- Loan origination fee – $71 (JOD 50)
- Interest rate – set to zero initially
- Loan default rate – 2% per year (to reproduce the 97% of total funds repaid over the first two years as observed in program performance to date)
- Portion of cash reloaned each year is 75% of the total

As indicated earlier, due to the Islamic prohibition on usury, there is no interest charged to HLP loan recipients. Instead, CBOs receive a $71 fee, or origination charge. To compare this approach with that of traditional interest-based lending by microfinance institutions (MFIs), the loan simulation model is set up with principal and interest repayments. The WIT program is simulated with a 0% interest rate and the origination charge. MFI interest rates are often substantial to cover administrative costs, loan defaults and return to investors. A World Bank study reports a rate of 26% as the median interest rate for sustainable MFIs in 2006 (Rosenberg et al. 2009). As this MFI rate is a nominal rate (e.g. including inflation) it was reduced to 20% to adjust for Jordan's long run rate of inflation which is reported as 5.8% per year over the last thirty years (worlddata.info). Initial testing of the loan simulation model shows that such a high rate ends up causing rapid and unrealistic growth in the loan portfolio.

Typically, the high interest rates charged by MFIs are needed to cover the higher transaction costs associated with the small loan amounts in MFI programs and ensure program sustainability. In this case, these costs are not visible or known, and not included in the model. As documented earlier the rate at which repayments are recycled back into new loans is quite low. This could be because the resources necessary to continue to administer the loan program at the CBOs are absent. Implicitly, the HLP is premised on the idea that the CBO will administer the program on the backs of the origination fee (which is quite small), other funding sources and goodwill towards the community. But this may not be sufficient. To examine this issue the interest rate function in the model is used first to assess the effective interest rate represented by the origination fee and, secondly, to examine the effect of charging a relatively small interest rate charge, of 5% per annum, on loans made by the program.

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[28] Discount rates in financial or economic analysis are used to reflect the "time value of money." In AMP's study the discount rate is applied to water savings as per established practice in cost-effectiveness analysis, See the AMP Insights report for more on this approach.

Costs

As reported earlier, programmatic direct costs for the HLP total $2.86 million. The principal components of these costs are shown in Table 13. The $1.8 million in loan funds are "consumed" from the perspective of USAID and Mercy Corps when granted to the CBOs, and thus are considered a program expenditure. However, from the perspective of the economy, these funds are used for investment rather than expenditure purposes. They are therefore not an economic cost to the program. Rather the true economic cost of these funds will be the amount of the loans that go into default and are consumed at that time. Another way of looking at this is that at the conclusion of the 40-year simulation period, the CBOs will hold cash and outstanding loan principal as assets. In a cost-benefit analysis these need to be included in the calculation of net present value of the program. For the purposes of this analysis the loan funds are deducted from this cost, leaving the HLP up-front program costs of $1.03 million.

Table 13. HLP Costs

HLP Costs	USD	
Personnel	$	253,410
Equipment	$	46,512
Miscellaneous	$	72,807
WIT Champions	$	43,996
Contracts and Sub-Awards		
CBO Loans	$	1,835,658
Loan Management System	$	343,117
Jordan River Foundation	$	267,131
Total HLP Direct	$	2,862,631
Less CBO Loans	$	1,026,972

To arrive at the economic cost of the HLP for use in this analysis, the indirect costs need to be added on top of the activity costs. As relayed earlier in the AMP study the total indirect assigned to the HLP was $3.7 million. With the revised economic cost at one-third of the original figure as reported by AMP, this is proportionately a very large indirect cost allocation. There is no correct answer as to how to apportion these indirect costs if the HLP costs are pared back as described above. If the apportionment is based on proportionate cash budget shares, the indirect costs are still warranted. If based on economic costs, the allocation would be substantially reduced. Following AMP's tables and procedures, the allocations are revised for these two scenarios, with Scenario 1 maintaining the AMP indirect costs and Scenario 2 reducing these proportionally to fit the new cost figures. Revised total economic costs for Scenario 1 are $4.78 million and for Scenario 2 they are $2.65 million.

Table 14. Assignment of WIT Indirect Costs

Direct Activity	Cost (US$m)	HLP (US$m)
Ag - Demos	$0.2	
Ag - Fund	$1.1	
Ag - Incentives	$0.5	
HH - Fund	$0.8	
HH - Loans	$2.9	$1.03
HH - Media	$2.8	
HH - Schools	$0.9	
HH - Storage	$2.0	
Sub-Total	$11.1	
Loans as % of all HH		31%
Loans as % of all Direct		26%
Indirect Activity		
Ag - Indirect	$1.8	
HH - Indirect	$0.8	$0.23
Sub-Total	$2.6	
Indirect WIT		
MEL	$2.5	
G&A	$2.4	
Start-up	$1.0	
Sub-Total	$5.8	$1.50
Indirect Mercy Corps		
Jordan	$3.8	
HQ	$4.0	
Sub-Total	$7.8	$2.02
Total USD	$27.3	$4.78

Direct Activity	Cost (US$m)	HLP (US$m)
Ag - Demos	$0.2	
Ag - Fund	$1.1	
Ag - Incentives	$0.5	
HH - Fund	$0.8	
HH - Loans	$1.0	$1.03
HH - Media	$2.8	
HH - Schools	$0.9	
HH - Storage	$2.0	
Sub-Total	$9.3	
Loans as % of all HH		14%
Loans as % of all Direct		11%
Indirect Activity		
Ag - Indirect	$1.8	
HH - Indirect	$0.8	$0.10
Sub-Total	$2.6	
Indirect WIT		
MEL	$2.5	
G&A	$2.4	
Start-up	$1.0	
Sub-Total	$5.8	$0.64
Indirect Mercy Corps		
Jordan	$3.8	
HQ	$4.0	
Sub-Total	$7.8	$0.87
Total USD	$25.5	$2.65

Results

Loan Simulation Results

The HLP simulation is run three times, with the results shown in Table 15. In the “as is” simulation, with the origination fee and no interest rate, the number of loans over fifty years exceeds 6,700 loans and a total face value of loans extended of $18.6 million. Total CBO assets at year 50 are $0.76 million or about half the original asset value of the JOD 1.3 million in loan funds provided by the HLP to the CBOs. The fees earned by CBOs come to $0.48 million representing about one half the $1.07 million in loan principal that is in default. Using the interest rate feature in the simulation model and iterating to the interest rate that reproduces the fees earned results is a 0.8% interest rate. Application of a modest 5% interest rate greatly enhances the revenue received by CBOs to $2.6 million. (Note this is a real not nominal rate given the model is carried out in real terms). In these simulations it is assumed that any fees and interest earned by the CBOs are taken as income rather than reinvested in the HLP.

Table 15. Loan Simulation Results

Results at Completion ($ million)	Fee Only	0.9% Interest	5% Interest
Loan Summary			
Total Amount Loaned	$ 18.6	$ 18.5	$ 18.5
Number of Loans Made	6,763	6,759	6,750
Balance Sheet at Year 50			
Loan Amounts that are Current	$ 0.69	$ 0.68	$ 0.65
Cash at End	$ 0.08	$ 0.07	$ 0.04
Total Assets	$ 0.76	$ 0.75	$ 0.69
Loan Performance at Year 50			
Total Loan Principal Outstanding	$ 1.76	$ 1.77	$ 1.79
Total Loan Principal in Default	$ 1.07	$ 1.09	$ 1.15
Default as Portion of Total Loans	61%	62%	64%
CBO Earnings			
Interest Earned	$ -	$ 0.47	$ 2.65
Fees Earned	$ 0.48	$ -	$ -
Total Earnings to CBOs	$ 0.48	$ 0.47	$ 2.65

Cost-Effectiveness Analysis

To assess the cost-effectiveness of the simulated loan program under the two cost scenarios developed earlier it is necessary to calculate the water saved by running the HLP for fifty years. To ensure that the resulting figures are comparable with the original AMP figures, a simplistic approach is used. The present value of the water benefits derived from the HLP by AMP, as calculated to the appropriate length of life totals 0.49 MCM (million cubic meters). Dividing this amount by the number of loans made in the first round of loans returns 754 m^3 of discounted water per loan. Since most of the loans went for pear-shaped wells which AMP assigned a 50-year length of life it is straightforward to back out the annual water savings per loan, given the discount rate of 5%. This results in 41.3 m^3/yr on average in water savings per loan. This number is somewhat lower than the figure arrived at from the CBIWDM project of 49.7 m^3/yr. [29] Differences in the composition of projects (the CBIWDM figures were only for pear-shaped wells), size of the wells, geographic location, and methodology account for the difference. Notable differences in methods under the WIT program were that IWMI used a larger roof size collection area of 200 m^2, whereas CBIWDM used 120 m^2. However, IWMI used the IWMI rainwater calculator, which parses rainfall and storage against household demand on a monthly (rather than annual) basis, which should provide more accurate figures. CBIWDM simply assumed that all water collected would be consumed by the household, whereas the pattern of precipitation in the winter might mean that at times the tanks might overflow and the rainfall would not be "harvested" for consumption.

In Table 16 the AMP result for cost-effectiveness with just the one round of loans is compared to that with the 50-year period of lending and relending. The two scenarios represent the high and low-cost scenarios based on how the WIT indirect is allocated to program activities. Scenario 1 maintains the high level of indirect whereas Scenario 2 slims this indirect down to match the true HLP costs once the loan funds are removed from the expenditure calculation. The original cost-effectiveness was $13.37/$m^3$. Once the loans are revolved continuously about 5 times as much discounted water savings is produced at 2.3 MCM. This improves the cost-effectiveness to $2.59/$m^3$ and $1.65/$m^3$ for the two scenarios, respectively. While a very large reduction, these costs are still high compared to the overall WIT cost-effectiveness of $0.35/$m^3$ reported in the original study.

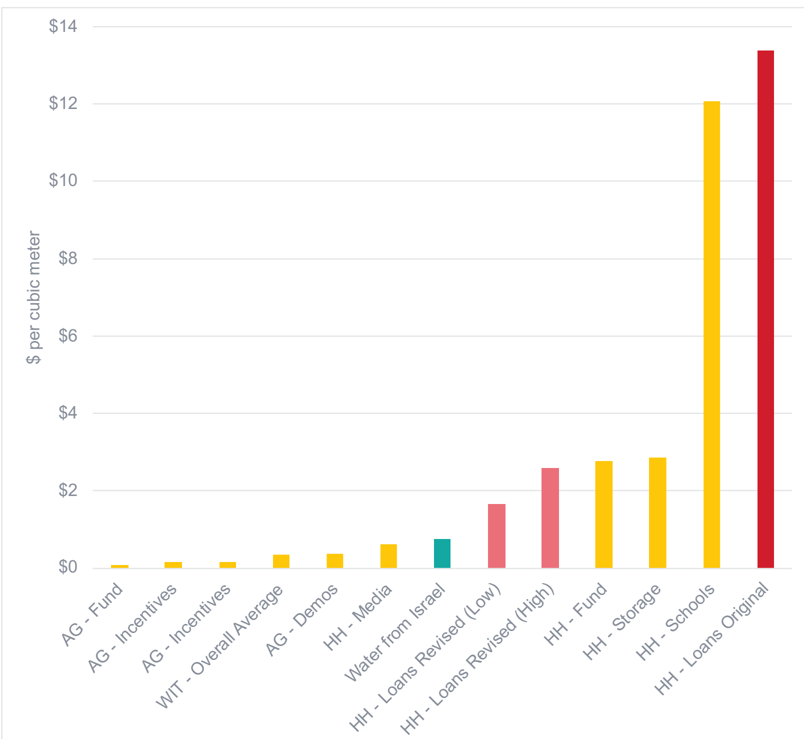
[29] Assayed et al. 2013; International Water Management Institute. "WIT Water Accounts Plan for Fiscal Year 2020 Calculation." Amended September 2019.

However, the HLP now is more cost-effective than the traditional infrastructure supply-side solution of building more storage projects, at least as implemented by WIT (Figure 9). The HLP can also be compared to a number of other alternatives that AMP identified in their report including the cost of buying water from Israel (as included in Figure 9) and more costly longer-term supply options identified in a subsequent AMP report.[30] Arguably, if the loan program were extended to other governorates in Jordan, the high up-front costs of launching the HLP would be offset by additional benefits, further improving the HLP cost-effectiveness.

Table 16. Cost-Effectiveness Parameters and Results

Cost-Effectiveness	AMP	Scenario 1	Scenario 2
Parameters			
Investment Cost (USD million)	6.6	4.8	2.7
Loan Default Amount (USD million)		1.1	1.1
Total Cost (USD million)	6.6	5.9	3.7
Discounted Water Savings (m^3/loan)	754		
Water Savings (m^3/yr per loan)	41.3		
Discount Rate for Water	5%		
Results			
Discounted Water Savings (MCM)	0.49	2.26	2.26
Cost-Effectiveness (USD/m^3)	13.37	2.59	1.65

Figure 9. Comparison of the Cost-Effectiveness of WIT Activities and the cost of Water from Israel



Notes: Yellow bars are WIT activities, the dark and light red bars are for the HLP, and the green bar is the cost Jordan incurs in buying large volumes of water from Israel each year.[31]

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[30] AMP Insights. Cost-Effectiveness of Alternatives for Meeting Jordan's Future Water Needs. Report prepared for Mercy Corps – Jordan, 2022.

[31] Lieberman, Guy, "Israel to Double Volume of Water Sold to Jordan." *Globes*, October 12, 2021.

Private (Household) Return on Investment Analysis

The AMP study of the economics of the WIT program found that a number of agricultural and household water saving approaches had positive returns on investment. For households these findings are based on the argument that households that save water can save on the costs of buying water from tankers when their household water supply runs out. This is due to the intermittent supply of water from utilities across much of Jordan and the limited size of the rooftop tanks that each family owns to address the unreliable piped water supply. AMP used data from the WIT household endline survey to validate this hypothesis and determine a governorate-by-governorate price for water from water tankers. AMP found support for prices in the range of $4.67-5.75/m^3 (JOD 3.31 to 4.07/m^3) in Mafraq, Jerash, Ajloun, and Azraq, with Irbid having a much higher price of $10.68/m^3 (JOD 7.56/m^3). These figures compare well with those cited by the CBIWDM project $4.05-$5.40/m^3 (JOD 2.87 to 3.82/m^3) for an expanded range of governorates some ten years earlier.[32] A figure of $5.75/m^3 is selected to represent the average benefit to households of avoiding the use of tanker water.

For the loan simulation the cost of a loan is the $2,825 loan amount plus the $71 origination fee. Using the 754 m^3 of discounted water benefits per loan from AMP this works out to a present value for the cost per cubic meter saved of 3.84/m^3. As the benefit to households (calculated above) is $5.75/m^3, the return on investment is thus 50% (top portion of Table 17).

AMP also cites the WIT endline survey data showing that loan program participants did not rely exclusively on these financial cost savings as motivation to participate in the program. Indeed, most respondents to the survey, regardless of governorate or technology adopted, cited their religion as a primary motivating factor for engaging with the program. This motivation does not diminish the existence of financial benefits of participation, but rather places them in the cultural context of Jordanian communities.

For the full loan program simulation the total private rate of return is 82% once the full stream of all household costs and water benefits are projected out 50 years and discounted to present. The discounted benefits equal $12.0 million while the costs of the loans to households is just $6.6 million. Note that household costs are kept low by the absence of any interest payments on the loans. The higher rate of return at the program level reflects the timing of the payments and the default rate on loans. Once installed the technologies save water, regardless of whether they are actually paid for by the loan recipient. Consistent with the AMP finding it appears that private incentives do favor adoption of these technologies.

Table 17. Household Return on Investment

Household (HH) Returns	USD
Per Water Unit	
HH Benefit per m^3 of water	$ 5.75
HH Cost per m^3 of water	$ 3.84
HH Return on Investment	50%
Results for Loan Simulation (discounted in $ millions)	
HH Water Benefit (discounted)	$ 12.13
HH Cost (discounted)	$ 6.66
HH Return on Investment	82%

32 Assayed et al. (2013).

The relatively high rate of return also suggests that higher fees or interest rates could be imposed on households before the financial incentive to participate in the loan program and purchase these technologies would be eliminated. Using the per water unit costs and benefits shown in Table 17 the origination fee and interest rate features of the model are used to explore this issue further. Increasing the loan origination fee until the private benefits just equal the private costs on a per loan basis results in an origination fee of $1,500. In other words, on average this is the hypothetical fee level that could have been charged before the decision to take the loan to invest in the water saving technology would have failed a private benefit-cost test. In the simulation model this would have generated $10 million in fees, a $9.5 million increase over the baseline scenario. The equivalent annual rate of interest (with no fees) would be 18%. Instituting such a fee or interest rate would certainly reduce the positive financial incentive for households to engage in the HLP. On the other hand, such a change would have provided considerable funding to support the HLP or CBO activities.

Economic Cost-Benefit Analysis

The information developed so far can also be used to compile a simplistic economic cost-benefit analysis of the HLP. For the economic benefits the private benefits to households are used, totaling $12 million over the life of the HLP. The economic costs consist of the costs of the technologies installed and the program costs borne by WIT (as previously reviewed). The technology costs are the fees and outlays made for the technologies. The discounted cost of these in the loan simulation total $8.2 million (Table 18). These are higher than the private costs to households ($6.6 million from Table 17) purely due to effect of the loan in spreading out these costs over a longer time frame. This leads to a negative discounted net benefit of $1.9 million for the first scenario, in which the HLP bears the full indirect costs. Under the second scenario where the indirect costs are applied proportionate to the actual HLP expenditure the net benefit is just positive at $0.2 million. Expressed in $ per cubic meter terms the economic return varies from a cost of $0.84 to a benefit of $0.10. In other words, once the economic benefits are included these technologies and the HLP are no longer as "costly" as seen in the cost-effectiveness analysis. Instead, the HLP is now on par or more attractive in economic terms than many of the other supply alternatives that Jordan has at its disposal.

Table 18. Economic Cost-Benefit Analysis

Economic Cost-Benefit Analysis (in millions)	Scenario 1	Scenario 2
Water Benefit	$ 12.13	$ 12.13
Technology Cost	$ 8.17	$ 8.17
Program Cost	$ 5.85	$ 3.72
Net Benefit	$ (1.90)	$ 0.23
Net Benefit ($ per cubic meter)	$ (0.84)	$ 0.10

One way to interpret these results would be to say what would it cost the government of Jordan to save a million cubic meters using the approach represented by the HLP? If loan recipients were charged up to the point where the incentive to buy the technology and take the loan just outweighed the cost then the government could buy one million cubic meters (MCM) for a gain of $104,000 or a cost of $840,000, depending on the cost scenario selected. These figures are attractive given that Jordan is buying 100 MCM of water from Israel each year at a price of $0.65/m^3.[33] This implies a comparable outlay (for 1 MCM) of $650,000. This cost approximates that of Scenario 1, the high-cost scenario. Investing in water conservation amongst communities within Jordan builds resilience to future water scarcity, a co-benefit of the HLP

[33] Lieberman, G. "Israel to double volume of water sold to Jordan." GLOBES. 12 October 2021.

program that is not achieved simply by purchasing water externally at market prices. here The results documented here suggest that expanding the coverage of the HLP and the funding level would be an effective approach to water security in Jordan.

Discussion

Many issues would need to be further assessed to provide a comprehensive economic assessment. For example, while tanker water prices do reflect household opportunity costs, they may not reflect economic opportunity costs of water. If tanker prices reflect price gouging or oligopolist behavior the economic benefits might be priced at a lower rate. If tanker prices do not reflect long run economic opportunity costs, they are at least an appropriate short run marginal cost, as a "spot" market price. The scarcity value of Jordanian groundwater may be higher or lower than this amount but at present there is not a good understanding of when Jordanian groundwater supplies will be exhausted or will approach such poor quality that they will be effectively exhausted.

On the cost side, the level of indirect costs charged to the HLP activity has a very large impact on the economic cost-effectiveness and the economic cost-benefit analysis. If these are reduced, as in Scenario 2, the results are more encouraging. The time taken to get the program going certainly added to the costs. The failure of the initial HLP design to attract households (and CBOs) and the redesign consumed time and resources. COVID also will have adversely affected the rollout of the program. And, as noted, the limited cash flows accruing to the CBOs from the program may be limiting the program's long-term sustainability, as evidenced by the number of CBOs that have been slow to reloan funds repaid. These program inefficiencies worked against the economics of the program. Under a more efficient program design and implementation strategy the HLP would likely have been competitive with other water supply options for Jordan and more certainly have generated net economic benefits.

The HLP tale is therefore cautionary, but the lessons learned should be useful to future programs in other countries. Jordan now has an HLP that can service the country. Additional investment in developing arrangements with suppliers and training CBOs in other governorates will be necessary, but the upfront cost of the LMS, the legal agreements and operational procedures are all in place. With these sunk costs out of the way, future program implementation should be quite cost-competitive with alternative supply options in Jordan.

Given that the CBIWDM project run by Mercy Corps successfully deployed over 1,000 loans, including many for pear-shaped wells, it can be asked why it was necessary to recreate a loan program, largely from scratch. Perhaps, this can be chalked up to the time-limited nature of the USAID project cycle, the need to recompete for grants, and the resulting staff turnover at NGOs. It is worth questioning whether such short time frames and continual recompeting of programs works against the success of market systems development programs such as WIT.

For several reasons, many of which were illustrated in the analysis, the WIT HLP program is not a traditional interest-based MFI lending program. As assessed here, the loan origination fee selected by the program pales compared to the interest costs imposed on borrowers from traditional MFI loan. In addition, decentralizing loan administration to CBOs is probably an important factor in the relatively high proportion of the portfolio at risk. The diversity of CBO experiences leads to varied performance in repayment rates. These features may make the HLP look relatively unsophisticated. On the other hand, the HLP avoided the traditional development model of simplifying granting funds to community organizations to simply "do" indoor water conservation projects. And, by keeping loan costs low, the HLP made the program more attractive to households. As simulated here, raising origination fees (or imposing high interest costs) could well have stimulated reinvestment in the program by CBOs, improving performance. Thus, the HLP sits somewhere between traditional grant and MFI alternatives.

To the extent that higher fees (or interest) would have led to higher economic costs (as opposed to providing a return to investors), these higher fees don't just reduce household incentives to invest in water conservation, they would increase the cost of water conservation and lower the overall economic return from the HLP. Keeping fees low, as per the HLP design, leads to a less costly loan program albeit with a higher attrition rate. Such an arrangement probably saves water at a higher rate and is more economically efficient than a traditional MFI program. Compared to a grant program this "market systems" approach also is likely to yield a higher and continued stream of water conservation benefits by sharing the effective costs of conservation with households through their involvement and ownership in water saving technologies. In other words the institutional arrangements reflected in the HLP may be both economically and environmentally superior to the grant and MFI arrangements, given the collective benefit of conserving water. That all said the fees charged by the HLP may be insufficient incentive for the CBOs to keep managing the loans, and to enforce repayment. Raising fees to ensure that they cover management costs, and training on loan handling, would improve the scale and sustainability of the loan program. Further assessment might examine the extent to which the results observed here are generalizable or unique to the Jordanian situation, in particular the circumstances where households face a steep spot market price for water from private suppliers.

Given the imperative to save water in Jordan, the benefit of which is hard to value and capture, the HLP model is a sensible approach to enlisting private actors for a public purpose. The HLP keeps the cost of borrowing low to encourage water saving but uses the revolving loan fund approach to take advantage of the private incentive to invest in water saving technologies. At the same time, the HLP recognizes the importance of building local capacity to promote water conservation by decentralizing funding to the community level. The only tweak in this institutional arrangement that might have been better designed, was providing a pathway for the loan capital to move between CBOs over time in response to changing demand for the funds.

Finally, there is the question of taking "credit" for water saved. The WIT monitoring and evaluation program was designed to assess the water saved during the program. The prior economic analysis and the analysis here have tried to extend this analysis of water saved into the economic realm by adjusting the water saved to the length of life of the technology or device and setting it against the costs of the program. For the WIT communal projects in which dams were refurbished, USAID funds were invested in design and construction that resulted in restored storage capacity. In that case it seems logical that WIT, Mercy Corps and USAID would take complete credit for this water. With a loan program though this is less obvious proposition. While there was an economic investment by USAID in developing the HLP, ultimately the loan recipients paid for the water saving technologies. In this case, USAID granted the funds to the CBOs for this purpose so it is natural for USAID to want to take credit. Hypothetically though, if all loans issued by CBOs were repaid in full the CBOs would end up with original funds in their e-wallets at such time as the program ended. If they then purchased a solar array USAID would have a claim to take credit for this renewable energy. Could USAID claim all the credit for the water and the energy? It might be more correct to share credit for the water saved, given USAID's investment in setting up and running the HLP and households' efforts to pay off loans for the water saving technologies.

Conclusions

This paper has explored the performance and economics of the Household Loan Program, developed by Mercy Corps as part of USAID programming to improve water management in the water stressed country of Jordan. The analysis shows that the start-up and evolution of the HLP were adversely affected by a slow onset for WIT and the HLP, followed by the COVID-19 pandemic, which locked much of Jordan down (and out of the office) just as the program was gathering momentum. The initial program design (2018) met with little interest due to the expensive nature of the technologies offered, the high loan amounts and the correspondingly high monthly repayment rates. Adjustment to the program through 2019, primarily allowing lower cost, rainwater harvesting through “pear-shaped wells” (underground storage tanks) and limiting loan size met with greater success. In addition, it took time to recruit, evaluate and train a cadre of capable CBOs. The bulk of the loans made in the first round were initiated during a two-year period between mid-2019 and September 2021, when the WIT program began close out procedures.

Comparing operational performance with planned objectives for the HLP:

- A total of 21 CBOs participated in the program, more than the initial target of 10 but less than a subsequent planned number of 90.
- As originally proposed, a fully electronic Loan Management System was developed.
- As planned, the LMS is administered by a Jordanian digital financial services provider, Dinarak, which accepted full operational control of the LMS and continues to successfully manage program transactions and the CBO, loan recipient and suppler E-wallets, following the WIT close out.
- Through September 2021, 656 loams were funded with $1.84 million in disbursements by Mercy Corps, about two-thirds of the original $3 million target.
- Through March 2022, $203,00 in repayments were revolved into an additional 100 loans by the CBOs.

Main findings from the analysis of loan program performance are:

- The program achieved its participation target of 30% for females in the loan portfolio.
- The loan portfolio was predominantly made up of the pear-shaped wells (85% of loans), with the 30 cubic meter pear-shaped wells (cisterns) with loan amounts of $3,500 the most frequent technology and loan choice.
- As of March 2021, 97% of the loan payment amounts due had been paid, with 80% of loans paid on schedule (or ahead of time), and loans with payments outstanding by more than one month represented a portfolio at risk of 14% (PAR30).

Overall the recruitment and performance of CBOs went well, given the challenges posed by the pandemic. Uptake was greatest in the Irbid, Ajloun and to a less extent Mafraq governorates with 19 CBOs participating and 99% of lending from the Mercy Corps disbursements in these governorates. Each CBO was allocated $100,000 in funds and overall performance in disbursing loans was good, with 15 CBOs using approximately the full allocation and 3 CBOs obtaining second rounds of funding. A good number of the CBOs selected were female-headed or oriented CBOs. Repayment performance varied significantly across the CBOs, with increasing challenges for CBOs with smaller loan portfolios. The greater than one month portfolio at risk (PAR30) rates ranging from 0% to 47% for CBOs with over 20 loans made with the Mercy Corps fund disbursements. Re-lending performance also varied greatly, with some CBOs not having initiated new loans with repaid capital, up through one of the high-performing CBOs that had relent 89% of repaid capital.

With respect to gender, the analysis found that females did not differ from males in terms of technology choice and size of loan. Females did have a better rate of loan repayment then men, by about 5-6 percentage points depending on how this is measured.

The main results from the economic evaluation were as follows:

- Incorporating the revolving nature of the loan into the economic analysis of cost-effectiveness lowers the cost per cubic meter of water from $13 to $1-$2, putting the HLP within the range of likely supply options for Jordan's water future.
- With low fixed loan fees (and no loan interest), loan recipients achieve a 50% rate of return on their investment due to the cost savings realized through adopting water saving technologies.
- Once the private benefits are included alongside the economic costs the HLP benefit-cost ratio improves to breakeven levels, in the two cost scenarios the program saves a cubic meter of water at either an economic net benefit of $0.10 or a net cost of $0.84.

The conclusion from the economic evaluation is therefore that investing additional public funds into the HLP and expanding the program throughout the country is well worth it from an economic and environmental perspective. Expansion of the program would increase the leverage of the initial investment by USAID and Mercy Corps in developing the LMS and the institutional arrangements that underpin the community-based approach developed by the HLP.

The HLP can be classified as a hybrid institutional arrangement, sitting between traditional grant and micro-finance models. Like grant programs, the outcome of the HLP is a public good, as improved water conservation leaves water in the ground for later sharing and use for the common good of the community. Like a micro-finance program, there is a private incentive for households to take loans. By improving the affordability of water saving technologies households save money on water purchases, avoiding the need to purchase expensive water from private tankers when household tanks run dry.

Given the shared community benefits and the ability to monetize at least some portion of the benefit, the HLP seems a sensible and effective market systems solution in the Jordanian context. As a loan program, the HLP avoids simply "giving" away money to fully fund household water conservation efforts. As the cost-effectiveness of a single round HLP is relatively low, as shown by the prior economic analysis, this would be an economically inefficient solution. A grant program would result in just a single round of technology adoption and would build no program ownership in the community. Instead the HLP pivots off both the religious motivation to save water and the financial return to households of such actions by structuring the acquisition of water conservation benefits as a loan program. As a community-based loan program, the HLP builds community ownership and revolves funds to continually increase water use efficiency in the community. The decentralized community-based structure of the HLP and the very low loan fees are likely responsible for the higher portfolio at risk figures observed with the HLP. While repayment performance is low as versus a professionally centralized microfinance program, this design also keeps program management costs low, meaning that the economic efficiency of the program is higher than would likely be observed under a traditional micro-finance program. In sum, the HLP appears to maximize economic and environmental benefits while minimizing economic costs, trading off financial performance for increased water conservation and public benefit. As such the hybrid structure of the HLP seems particularly well adapted to the cultural, economic and water context in Jordan.

APPENDIX: CBOs Participating in the HLP

Governorate	Full Name	Abbreviation	Name in Arabic
Ajloun	Al Zaiytuna Multipurpose Cooperative Society	Al Zaiytuna MCS	جمعية الزيتونه التعاونيه متعددة الأغراض محدودة المسؤوليه
Ajloun	Fatimah Al Zahra'a Cooperative Multipurpose Society	Fatimah Al Zahra'a CMS	جمعية فاطمة الزهراء التعاونية
Ajloun	Kufranjah Women Charitable Society	Sydat Kufranjah WCS	جمعية سيدات كفرنجة الخيرية
Ajloun	Salah Al-Dein Charity Society	Salah Al-Dein CS	جمعية صلاح الدين لرعاية المعاقين والأيتام الخيرية
Ajloun	Um Lulu for Women Cooperative Multipurpose Society	Um Lulu WCMS	جمعية سيدات ام اللولو التعاونية متعددة الاغراض
Azraq	Elorfan Charity Society	Elorfan CS	جمعية العرفان الخيرية
Irbid	Al Mazar Al Shamali	Al Mazar Al Shamali	جمعية شباب المزار الشمالي للعمل التطوعي الخيري
Irbid	Al-Wositiyah Voluntary Society for Student Patronization	Al-Wositiyah VSSP	جمعية الوسطية التطوعية للرعاية الطلابية
Irbid	Amrawah Association for Social Development	Amrawah ASD	جمعية عمراوة للتنمية الاجتماعية
Irbid	Idoun Charity	Idoun Charity	جمعية ايدون الخيرية
Irbid	Kinanah Charity Society	Kinanah CS	جمعية كنانة للسيدات
Irbid	Kitem Charity	Kitem Charity	جمعية كتم الخيرية
Irbid	Rehaba Charitable Society	Rehaba CS	جمعية ارحابا الخيرية
Irbid	Tahfeez for Leadership and Development	Tahfeez Charity	جمعية تحفيز للريادة والتطوير
Irbid	Tebnah Charity Association	Tebnah CA	جمعية تبنه الخيرية
Jarash	Mersal Al-Khair	Mersal Al-Khair	جمعية مرسال الخيرية
Mafraq	Abaq Al Sahra'a Multipurpose Cooperative Society	Abaq Al Sahra'a MCS	جمعية عبق الصحراء التعاونية
Mafraq	Ayadi Al Badyah Agricultural Cooperative Society	Ayadi Al Badyah ACS	جمعية أيادي البادية التعاونية الزراعية متعددة الأغراض محدودة المسؤولية
Mafraq	Good Land Charity	Good Land Charity	جمعية الأرض الطيبة الخيرية
Mafraq	Najim Al Badyeh Cooperative Multipurpose Society	Najim Al Badyeh CMS	جمعية نجم البادية التعاونية
Mafraq	Nashmyat Al-Badia Alsharqiya Cooperative Society for Women	Nashmyat CSW	جمعية نشميات البادية الشرقية التعاونية للسيدات