Institutional Sustainability of Smallholder Water Systems for Productive Use

Examining the Oxfam America Horn of Africa Regional Office Water Program Interventions

An Evaluation for Oxfam America

Prepared by the

International Water Management Institute

Dennis Wichelns
Fethia Ahmed
Soumya Balasubramanya

October 15, 2012

Executive Summary

This research examines the institutional sustainability of smallholder water user associations supported by Oxfam America and NGO partners in Ethiopia, in relation to farmers' efforts to produce mostly irrigated vegetables for sale on the market.

Methodology: Researchers gathered information directly from water user associations (WUAs) in Tigray (two) and in Oromia (eight). The associations were purposively selected to represent both challenging and successful interventions, newer and older associations, small and large associations, and by types of irrigated water sources (ground water, river-diversion, lake-fed). In most cases, the newer WUAs were operating in just their first or second year of establishment, and the members were focused primarily on developing effective water delivery.

The researchers used a variety of methods to engage farmers in discussing their associations, including focus groups, individual interviews, short and long form survey in a group setting. The research looked at five categories of sustainability: Technical Capacity, Financial Management, Governance, Farm Profitability, and Land and Water Resources. All were involved in focus groups and long form survey covering these five aspects of sustainability. A short form surveys asked respondents how they would allocate a sum of money towards reducing risk across a number of scenarios that might enhance the sustainability of their smallholder water systems.

Study Limitations: While this study addresses a breadth of issues, it does have some limitations. Although the short and long form survey contained questions about different experiences for men and women, the study did not provide investigation or analysis of gender dynamics. The study looks at some issues of governance and social sustainability of WUAs, but does not explore decision-making processes and their relation to financial sustainability, equity of benefits across socioeconomic status, or how WUA leadership currently (and might better) represent member interests in farmer cooperative unions or with other actors in the market. Finally, less analysis was made on the Tigray region and also at the national level.

FINDINGS

Technical Capacity and Financial Management: The team did not find any persistent problems involving the technical capacity or financial management of an association, or any problems of inadequate or untimely water deliveries. The main threat was for members of smaller water associations who rely on a single motor and pumping station. Some associations report that they have established a small savings account for repair or replacement, but their sums are insufficient. Other associations will collect funds from members on the occasion of a breakdown. None of the smaller associations had yet had a breakdown, but the experience of the older, larger associations suggests the risk: farmers in one association, for example, have replaced their motor four times in seven years, which has affected their membership and places them at higher risk.

Governance: The associations have formed committees to address standard issues of governance through traditional and modern bylaws, and meet on a regular schedule. The older associations

have good experiences with elections, and very little conflict was reported. Most members participate in elections, including women. During the course of our visits and interviews, we met several women who serve as vice-chairs of a WUA, but we did not meet any women serving as chairperson.

Legal status for associations would be a helpful enhancement in governance, as it would allow the associations to engage in a full range of financial and market transactions on behalf of their members. Unions for water user associations could also help them attain larger discounts in purchasing inputs, and better prices when negotiating with vegetable brokers.

All of the associations in the Meki-Ziway area reported very few conflicts among users regarding water allocations or irrigation scheduling. Only in one association did we discover a non-trivial conflict involving several members of a WUA. Certain members have stopped paying the monthly membership fee of 10 ETB per month, yet they continue to divert water from the community canal into their crop fields and they extend their diversions beyond the time normally allotted for irrigation turns. Senior members expressed concern about this situation, but they have not yet developed a solution.

Farm Profitability: Most of the farmers visited in Tigray and the Central Rift Valley were pleased to have gained access to irrigation, as it enabled them to produce marketable yields of vegetables in two or three crop cycles each year. Farmers reported that when output prices are high, they can earn substantial profits. Yet when market prices are low, they can fail to earn enough revenue to offset their costs of production.

An important challenge to sustainability is that of interacting successfully in markets (input and output) when producing high-value horticultural crops, and whether farmers are able to collectively address this problem. Vegetable crops are largely perishable and they must be brought to market soon after harvest. Lacking cold storage and operating without forward contracts, most farmers have little room for bargaining over price when their crops mature. Middlemen offer low prices that might or might not cover the total cost of production. In a region where many farmers cultivate only 0.25 ha of irrigated land, it seems sensible to consider some form of cooperation in which groups of farmers join together in the purchase of inputs and the marketing of crop products.

Most smallholder households gaining access to irrigation for the first time will not have savings accounts from which to pay for inputs. Farmers need access to affordable credit. They should also have access to crop insurance, so that a crop failure due to weather or pest infestation will not cause long-lasting financial harm. Some partners are providing some farmers with crop production loans through revolving credit mechanisms, but it is not clear that such an approach is widespread or sustainable, and there is no explicit transition strategy.

Water Resources: A major challenge to sustainability pertains to long-term water availability. Several analysts have expressed concern regarding the sustainability of irrigated agriculture in the Lake Ziway region. Many farmers perceive increasing demand pressure on regional water resources. Further declines in the average level of the lake and any substantial increase in salinity,

would have potentially severe impacts on farmers, herders, and many other residents of the Central Rift Valley. The threat of increasing salinity is made more pressing by the construction of a dam at the point where the Lake discharges to the Bulbula River.

Recommendations:

- Associations should be encouraged to collect and deposit funds for machinery repair and replacement as a normal part of doing business, as opposed to assessing fees at time of breakdown. Donor organizations could spur the development of such funds by modifying their investment strategies. Rather than requiring repayment of the purchase price for initial motors and pumps, donors might instead require water user associations to establish repair and replacement funds, and even to purchase a second motor and pump station in lieu of repayment for the original.
- Oxfam America and NGO partners might wish to support pending legislation establishing legal status for water user associations in Ethiopia.
- Policy interventions that ensure competitive markets for inputs and outputs, and investments in roads and cold storage, would be very helpful. Implementing partners might also consider forming or supporting the formation of production and marketing cooperatives that would operate specifically for the benefit of smallholder farmers.
- Oxfam America can advocate for the development of accessible credit markets at both the national and regional level. Implementing partners might also be helpful in working with banks and other credit institutions to make production loans available for smallholder households. Oxfam and partners should develop a transition strategy as revolving funds come to an end, and investigate affordable credit opportunities. Credit offered by microfinance institutions is not often aligned with agricultural cycles and the unique risks involved. A more viable option might be to promote the establishment of farmer credit and savings cooperatives (SACCOs) which could join bigger SACCO unions.
- With respect to water sustainability, the research recommends a series of steps that include active participation in the Central Rift Valley Working Group, and developing data collection practices with partner NGOs to help assess the pace of any changes in groundwater depths and salinity.

In general, addressing the three major areas of concerns identified in the study – access to finance, market access, and hydrology – could brighten the future prospects for thousands of smallholder farmers striving to improve their livelihoods by producing irrigated crops for sale in local and regional markets.

1. Overview

The primary goal in this research is to examine the institutional sustainability of smallholder water systems supported by Oxfam America in Ethiopia, with particular emphasis on the use of water in crop production. Oxfam America has been supporting such interventions since 2009, in conjunction with partner organizations including the Rift Valley Children and Women Development Association (RCWDA), Sustainable Environment Development Action (SEDA), the Center for Development Initiatives (CDI), and the Relief Society of Tigray (REST). Oxfam America provides financial support for interventions that enhance smallholder access to water for irrigation, while the partners provide the technical expertise. The partners work closely with the smallholder beneficiaries to ensure they receive the technical support and training required to operate water lifting or diversion devices and produce irrigated crops successfully.

The goals of this evaluation include:

a. Assessing the determinants of institutional sustainability of smallholder water user associations, with particular emphasis on access to water and the management of water for crop production,

b. Identifying the variables that make best sense for monitoring institutional sustainability over time, and

c. Formulating recommendations for improving grassroots interventions and influencing regional investment plans and policies that impact smallholder sustainable access to water and the management of water for productive use.

2. Research Design

The research design centered on cross comparison of a selection of water user associations, using multiple research methods with farmers involved in the associations. This was supplemented by document review and key interviews at the national, regional and local level. Water user associations were purposively selected from Oxfam America's interventions in the Tigray and Oromia regions of Ethiopia, to represent both challenging and successful interventions, newer and older associations, and small and large associations.

Farmers in the more recently established water user associations had limited experience with some of the issues we normally associate with institutional sustainability, such as finance, representation, decision-making, and conflict resolution. In most cases, the newer water user associations were operating in just their first or second year of establishment, and the members were focused primarily on developing an effective water delivery program. Such an approach is sensible in the short-term, given that many farmers are producing highly perishable, high-quality vegetable crops, and they are hoping to generate two or three crops each year.

2.1 Methodology with Water User Associations:

The research team gathered information directly from farmer associations in two study areas: The Mekele-Alamata area in Tigray (two WUAs) and the Meki-Ziway area in Oromia (eight WUAs). Both areas were visited early in the course of the study, prior to developing research instruments. Based on these visits, the research team design a long-form, open-ended survey instrument (50 questions) pertaining to five categories of sustainability indicators:

1. Technical capacity
2. Financial management
3. Governance
4. Farm profitability
5. Land and water resources

Concurrent with this activity, the research team developed a set of three short-form instruments to ask participants to rank their preferences regarding options to reduce risk and enhance the sustainability of their smallholder water systems. These short-form surveys were administered to five out of the eight water associations involved in the long-form survey, given the amount of time required to complete. We chose to implement the long-form instrument at those associations we visited for the first time, while implementing the short-form instruments at associations we had the opportunity to visit twice.

The goal was to learn directly from farmers about their perceptions of risk and to elicit their recommendations for reducing and managing risk through investments. We wished also to assess farm-level priorities in addressing risks of different types, such as those pertaining to water access, irrigation operations, crop production, and access to markets. The issues and challenges posed to the farmers in the three short-form instruments are described below.

<u>Short-Form Instrument 1</u>
Issue: Insuring Against the Risk of Potential Threats to Sustainability
Challenge: We would like to learn how you evaluate the following potential risks to the long-term sustainability of your water user association. Suppose you are given 10,000 ETB[1] ($588) that you may use to purchase insurance against the risk pertaining to each of the following concerns. How would you allocate the 10,000 ETB across these potential risks? [We include ten insurance options to consider.]

<u>Short-Form Instrument 2</u>
Issue: Investing in Efforts to Reduce the Risk of Potential Threats to Sustainability
Challenge: We would like to learn how you evaluate the following investments that might reduce the risk of failure of your water user association. Suppose you are given 100,000 ETB ($5,880) per year, to invest in any of the following activities. How would you allocate that 100,000 ETB across the following possible investments? [We include ten investment options to consider.]

[1] 1 USD = 17 ETB, June 2012

Short-Form Instrument 3
Issue: Considering Other Activities in Your Water User Association
Challenge: Suppose your water user association was given a large sum of money to engage in new activities that assist farmers beyond providing irrigation water. We wish to learn which activities would make best sense, from your perspective? [We include ten activities to consider.]

We implemented both the long questionnaire and the short-form instruments in group settings, rather than asking individuals to complete the forms. We deemed this approach more appropriate, as we sought information describing risk perceptions pertaining to sustainability issues from each of the water user associations, rather than from individual farmers. In addition, we wished to enable farmers to discuss information together as they considered each of the questions and performed the ranking exercises. This approach, while not producing large numbers of observations, allowed us to observe farmer interactions regarding the information we were asking them to consider.

Interviewing farmers near Ziway, Ethiopia

In most cases, the chairperson of the association and one or more members discussed each question and developed an answer that reflected the group's perspective. The research team is particularly pleased with the time and effort that farmers invested in completing the short-form instruments that required them to consider, rank, and evaluate ten alternative strategies or investment options, as well as the efforts in the long-form survey.

Eight water user associations involved in the improved research instruments in Oromia are depicted in Table 1 below.

Table 1: Water User Associations (WUAs) Participating in Study

WUA*	Year Est.	# Members (female)	With Support From	Geographic Area (Central Rift Valley)	Short Form surveys	Long Form	Focus groups and interviews
1	2011	12 (5)	Oxfam America (OA), Rift Valley	Meki-Ziway Area, (near Lake Ziway, Oromia)		✓	✓
2	2011	12 (3)	OA, Rift Valley	Meki-Ziway	✓	✓	✓
3	2011	12 (3)	OA, Rift Valley	Meki-Ziway	✓	✓	✓
4	2011	12 (6)	OA, Rift Valley	Meki-Ziway			✓
5	2004	29 (2)	Christian Children's Fund	Meki-Ziway	✓	✓	✓
6	2001	98 (34)	OA, Rift Valley	Meki-Ziway	✓	✓	✓
7	1996	74 (17)	OA, Rift Valley	Meki-Ziway	✓	✓	✓
8	2001	13 (8)	OA, Rift Valley	Meki-Ziway		✓	✓
9	2008	242 (~35) Merged across single cooperative	OA, REST	Mekele-Alamata, Tigray			✓
10	2008		OA, REST	Mekele-Alamata, Tigray			✓

The first four associations were established in 2011 with assistance from the Rift Valley Children and Women's Development Organization, each with 12 members irrigating 0.25 hectares per person[2], pumping groundwater, and located near Lake Ziway. Farmers in WUA 5, working with Christian Children's Fund, divert water from the Meki River, which flows into Lake Ziway. Farmers in WUA 6 divert water from the Bulbula River, which flows from the southern discharge point of Lake Ziway. Members in WUA 7 cooperate in diverting water directly from Lake Ziway, via a channel that flows from the Lake to a low-lift pump station in the water user association.

2.2 Key Interviews:

The research team interviewed key informants in Addis Ababa, Mekele, Meki, and Ziway, and representatives across all selected water user associations (WUAs). Interviewees included regional and local government officials and representatives, such as cooperative offices, agricultural development offices, and offices in charge of water supply and irrigation at the district (woreda) level. We discussed also the government's plan to expand irrigated area in the region.

[2] Fifteen total associations were established by the Rift Valley in 2011, all located near Lake Ziway and they pump groundwater from a depth of 20 to 23 meters.

2.3 Study Limitations

While this study addresses a breadth of issues, it does have some limitations. While the short and long form survey contained questions about different experiences for men and women, the study did not provide and in-depth analysis or investigation of gender dynamics. We did not explore gender enough adequately in the interviews, in the analysis, findings or recommendations. The study looks at some issues of governance and social sustainability of WUAs, but does not explore decision-making processes, equity of WUA benefits across socioeconomic status, or how WUA leadership currently (and might better) represent member interests in in farmer cooperative unions or with other actors in the market. Finally, it is important to note that the report is biased towards the Oromia area since the improvement of the research tools took place following the research in Tigray. Given the limited funds, a decision was made to concentrate on Oromia since Oxfam America has more extensive partnerships and involvement there.

3. Findings: Examining Threats to Sustainability

At each of these eight associations we asked farmers to consider the questions we had prepared in our long-form instrument, pertaining to the five categories of sustainability indicators: Technical Capacity, Financial Management, Governance, Farm Profitability, and Land and Water Resources. We summarize the information we obtained for each category by describing our observations, discussing the inherent threats to sustainability, and providing recommendations regarding measures for minimizing those threats and enhancing the likelihood of sustaining the benefits made possible through investments in small-scale irrigation.

3.1 Technical Capacity

3.1.1 Observations

In water user associations or irrigation cooperatives that had been established for some time, the farmers had developed a successful program of operating and maintaining their motors, pumps, and pipelines. Several associations had appointed and trained two or three “motorists” who are primarily responsible for operating the water extraction or diversion device, and attending to maintenance and repairs. Most of the motorists are farmers in the association who have received training from a supporting NGO or government agency.

An irrigation pump house constructed for a 12-member WUA, near the town of Meki, Ethiopia

Delivering water in the small associations requires the same technical expertise as in a large association regarding motors, pumps, and distribution, but the challenge of coordinating irrigation schedules and rotating water deliveries among members is comparatively straightforward. This is particularly true when most or all members are producing the same crop on a similar production schedule. For example, if all 12 members are producing tomatoes in spring and onions in summer, all 12 members will require irrigations of similar timing and duration. The schedules and irrigation requirements will vary somewhat, with differences in planting dates and crop development, but the planted areas are sufficiently small that coordination should not be difficult.

In larger associations, coordination is more challenging, but all of the farmers we visited expressed satisfaction with the operation of their WUA. We were not made aware of any persistent problems involving the technical capacity of an association or any problems of inadequate or untimely water deliveries.

3.1.2 Threats to sustainability

Members of the smaller WUAs were notably concerned about their reliance on a single motor and pumping station. During the dry season the motors and pumps must operate from 16 to 24 hours per day to keep pace with irrigation demands. Any breakdown can cause a disruption in the irrigation schedule, thus placing crops at risk of not receiving adequate water at critical growth stages. This concern is particularly apparent in associations in which farmers are producing vegetables. The input costs for tomatoes, onions, and peppers are substantial, and any reduction in crop yield or a crop failure could leave farmers in a very difficult financial situation.

We are not aware of any crop failures or sharp reductions in crop yields since the farmers in our study area began producing irrigated vegetables. Yet such risk is inherent in the nature of vegetable production. The farmers likely choose to produce tomatoes, onions, and peppers because seeds and other inputs are available locally and they perceive a viable market in which they can sell their produce at a profit. They also wish to maximize the revenue generated on their

small plots of irrigated land by choosing to produce highly valued crops. Lacking experience in irrigated vegetable production, farmers likely also lack a complete understanding of the inherent risks. Over time, with experience, farmers might select crops that generate smaller - but more stable - financial returns.

The potential inability to obtain the timely repair or replacement of a pump or motor also is a notable threat to sustainability. Some associations report that they have established a small savings account that can be used for this purpose, but the amounts reported are likely insufficient (20,000 to 30,000 ETB, for example). Other associations suggest they will collect funds from members on the occasion of a breakdown in the pump or motor. None of the smaller associations we visited had yet had the experience of needing to replace its pump or motor, and thus none had needed to collect funds for that purpose. The associations might consider implementing an annual assessment of 500 to 800 ETB per member, to build a repair and replacement fund at the rate of 6,000 to 9,600 ETB per year.

Farmers in one association have replaced their motor four times in seven years. The association hires a motorist to operate and maintain the motor, and it is not clear why the motor fails with such frequency. Nonetheless, we were told that several farmers had chosen to discontinue their membership in the association, as they could no longer afford the too-frequent assessments for a new motor. The reduction in membership, from 34 to 24, has made it more difficult for the remaining members to continue paying for new motors, as there are fewer contributing members.

3.1.3 Recommendations

The larger and smaller WUAs should be encouraged to establish a financial account for machinery repair and replacement. Funds should be collected and deposited on a regular basis, such that farmers will view this activity as a normal part of doing business. A target balance could be specified and the required payments into the fund could be suspended while the balance is in place. Yet the notion of establishing a fund in advance of the need for repairs and replacement should be encouraged throughout the region.

Donor organizations could spur the development of such funds by modifying their investment strategies. Rather than requiring repayment of the purchase price for new motors and pumps, the donors might require WUAs to establish repair and replacement funds, and to begin paying into those funds through member assessments at the end of the first production season. The donors could establish an investment trajectory for each WUA, in light of its potential expenditures on repairs and replacements, over time.

The larger and smaller associations should be encouraged to collect funds for the purchase of a second motor and pump station, to serve as a back-up for the primary station in the event of a breakdown. If affordable loans are available, the associations might even consider borrowing the funds required to purchase the second station, so that the risk of crop failure due to a breakdown is minimized. The smallholder farmers and their associations are at substantial risk of failure as long as they rely on a single pump station for irrigating vegetables in the dry season.

NGOs operating in the region should promote the development of a vibrant, local market in the repair of pumps and motors. One might envision the private sector taking up the challenge of establishing pump and motor repair shops, perhaps with financial assistance from the diaspora. A market in replacement rentals also would be a helpful development, as it would enable associations to rent a pump or motor while theirs is being repaired. Although the association would incur a cost for renting the equipment, they would be able to maintain irrigation deliveries, thus preventing very costly crop losses.

3.2 Financial Management

3.2.1 Observations

Some of the associations we visited have a plan for collecting fees from members and establishing a savings account, while others do not. Some associations impose an initial membership fee in the range of 100 to 150 ETB.[3] An older association assesses an initial fee of 150 ETB, but 100 ETB of that amount is allocated to the purchase of one share in the irrigation cooperative. The remaining 50 ETB is used to pay for administrative expenses.

Two older associations have established savings accounts over time by collecting fees from farmers each year. One asks each member to contribute from 10% to 30% of their annual profit, while another asks farmers to contribute 1,500 ETB each year to pay for water service and the salary of the person operating the motor and pump station. Both have established significant savings accounts over the years, and they have drawn the accounts down, as needed, when repairing or purchasing the motors and pump stations.

Newer associations, formed with assistance from the Rift Valley, have much less experience in managing their finances. Some assess an initial membership fee, while others do not. The notion of establishing a savings account is viewed positively, yet some of the 15 Rift Valley associations have not yet opened such accounts. In some cases, the associations require members to provide their own diesel fuel for operating the motor during irrigation events. This approach minimizes the number of cash transactions between the association and its members, yet it does not enable the association to assess charges for depreciation or replacement of the motor and pump.

Many of the 15 new WUAs are receiving financial support from the Rift Valley Children and Women's Development Organization in the form of a revolving fund facility that enables the association to purchase agricultural inputs on behalf of the members. Essentially, the Rift Valley has established lines of credit, against which each association can borrow funds. As loans are repaid, the line of credit is restored, thus enabling additional lending.

We understand also that the cost of purchasing and installing the motors and pumps, and digging the wells, must be repaid by each association to the Rift Valley, over time. In a sense, the Rift Valley has loaned the associations the money required to establish their access to groundwater.

[3] $5.88 to $8.82, given 1 USD = 17 ETB in June 2012

The Rift Valley also is serving as a lender, assisting the members in obtaining the inputs they need each season. We are not yet aware of the success with which the WUAs or their members are reimbursing the Rift Valley for the loans they have initiated.

We asked representatives of each of the new associations we visited the following question: "When do you expect you will no longer need financial assistance from the government or from an NGO?" Most of the respondents suggested they would need between 2 and 4 years to become financially independent, provided that crop prices were favorable, and farmers obtained good yields during those years. It is good to see explicit acknowledgment of the link between farm-level net revenues and the financial success of a WUA. Indeed, the revenue required to operate and maintain the water delivery system should come from the net returns generated through irrigated crop production.

3.2.2 Threats to Sustainability

The older WUAs have been operating for several years and they have established a sustainable financial management program. They collect fees from members and they pay for repairs and replacement of equipment needed to provide water delivery service. That said, there is some concern that the cost of repairing and replacing equipment might not be affordable.

We understand that ten members of one WUA have decided to end their membership because they could no longer afford the cost of replacing the motor and pump used to lift water from the Meki River. As the number of members decreases, the average cost to each remaining member increases, thus threatening the financial sustainability of the WUA. In this example, the annual budget for maintaining the motor and paying the motorist is 12,000 ETB. When the membership declined from 34 to 24 members, the annual assessment per member was increased from 350 to 500 ETB (43%) to maintain the annual budget.

We are somewhat concerned about the financial viability of the 15 small WUAs established by the Rift Valley. Initially, the associations are benefitting from the loans and revolving fund accounts provided by the Rift Valley. Yet that support might be creating a false sense of security regarding the costs involved in producing high-quality, irrigated vegetables for sale in retail markets. The farmers and their WUAs likely will face higher costs when the support is no longer available. In addition, it is not clear that the farmers or their WUAs will have sufficient time to establish the savings or reserve accounts needed to ensure financial security, before the support from the Rift Valley is no longer available.

3.2.3 Recommendations

We recommend that training be provided to WUAs on the topic of financial management and business planning. Both the older and newer associations might gain substantial benefit through learning how to plan for the scheduled maintenance, repair, and replacement of fixed assets. They could use training also on the best ways to generate revenue to pay for those costs, over time. At present, many associations seem to operate with the assumption that when funds are required to pay for an unexpected repair or replacement, the association will simply ask

members to contribute. That approach involves quite a bit of uncertainty for everyone involved. All parties would benefit from a more rigorous financial planning program in which expected costs are arrayed over time and a plan is implemented for collecting funds to cover those costs through regular, affordable payments on the part of members.

Oxfam America and the Rift Valley might also consider revising the program of loaning funds to WUAs for the installation of well, pumps, and motors. Rather than requiring repayment of those loans, the donors might provide those funds as grants, while requiring the associations to establish accounts to cover repairs and replacement. Farmers might perceive a greater incentive to establish such funds, particularly if that activity supplants the requirement to repay the loans for installation. Such a program might have a notable impact on sustainability of the irrigation investments.

We recommend also that farmers and their associations address the revolving fund issue directly, and in advance of the termination of the revolving fund program. That program allows WUAs to borrow funds from their supporting NGOs, while not paying market rates of interest. It is not clear that farmers or their associations will have access to affordable loans from private vendors when the revolving fund program is ended, as the terms of credit offered by microfinance institutions is not often aligned agricultural cycles and the unique risks involved. A more viable option might be to promote the establishment of credit and savings cooperatives (SACCOs) which could join bigger SACCO unions. It is better to develop an expressed plan for transitioning away from the revolving fund program, rather than waiting for that transition to evolve with no plan.

Consistent with efforts to improve financial management at the farm level and in the associations, we recommend also that Oxfam America and NGO partners advocate for crop and livestock insurance programs made accessible to smallholder households. Many small-scale farmers are investing large sums in the production of high-value vegetables, with substantial risk of crop loss or price declines that risk severe financial hardship. Lacking adequate savings accounts, the farmers would be wise to pay for insurance, protecting them from significant downside risks. WUAs could benefit from similar insurance programs designed to insure against the untimely loss of an irrigation motor or pump.

3.3 Governance

3.3.1 Observations

Most of the associations we visited operate according to both traditional and modern bylaws. The associations have formed committees to address standard issues of governance, and the committees meet on a regular schedule. The older associations conduct elections every three years, while the newer associations have been operating for less than two years. Thus, the older WUAs have gained substantial experience in conducting elections and replacing committee members, while the newer associations have not yet reached the end of their first election cycle. Most members participate in elections and we understand that women have the same opportunities as men. During the course of our visits and interviews, we met several women who serve as vice-chairs of a WUA, but we did not meet any women serving as chairperson.

All of the associations in the Meki-Ziway area reported very few conflicts among users regarding water allocations or irrigation scheduling. Only in one association did we discover a non-trivial conflict involving several members of a WUA. Certain members have stopped paying the monthly membership fee of 10 ETB per month, yet they continue to divert water from the community canal into their crop fields and they extend their diversions beyond the time normally allotted for irrigation turns. Senior members of the Shasha water user association have expressed concern about this situation, but they have not yet developed a solution strategy.

3.3.2 Threats to Sustainability

Within the category of governance, we perceive both threats and opportunities. One potential threat is the lack of secure land tenure in areas where irrigation is being developed. In addition to investments on the part of NGOs, farmers also are investing in the construction of irrigation wells and water delivery structures. They are also purchasing durable assets, such as spray rigs and the poles required for trellising tomatoes. Those investments would have little or no salvage value if farmers were to lose their access to the land for irrigated crop production.

Tomato plants, staked for high-quality production

Legal status for WUAs would also be a helpful enhancement in governance, as it would allow the associations to engage in a full range of financial and market transactions on behalf of the members. Smallholders would gain substantial benefits if their WUAs could borrow money to upgrade irrigation delivery systems and transact on their behalf in markets for inputs and outputs. Unions of WUAs also could be helpful in obtaining larger discounts when purchasing inputs and securing higher prices when negotiating with fruit and vegetable brokers on behalf of association members.

3.3.3 Recommendations

We understand that legislation establishing legal status for WUAs in Ethiopia is pending. Oxfam America and NGO partners might wish to support such legislation.

3.4 Farm Profitability

3.4.1 Observations

Most of the farmers we visited in Tigray and the Central Rift Valley were pleased to have gained access to irrigation, as it enabled them to produce marketable yields of vegetables in two or three crop cycles each year. In the Meki-Ziway area, many of the farmers using irrigation produced vegetables such as tomatoes, peppers, onions, local and head cabbage, and potatoes. Farmers reported that when output prices are high, they can earn substantial profits. Yet when market prices are low, they can fail to earn enough revenue to offset their costs of production.

Farmers in the Meki-Ziway area purchase inputs from several sources. Many purchase vegetable seeds from the Meki-Batu Cooperative Union, while some farmers produce their own tomato seed by preserving the seeds of selected, high quality tomatoes (Legese and Hassena, 2012).

We observed many farmers using fertilizer and pesticides to produce high-quality crops for sale in retail markets. Farmers have observed rising input prices in recent years, but continue applying fertilizer and pesticides to increase the potential value of their output. This is particularly important for smallholders irrigating only 0.25 or 0.50 hectares of land. Many of the plots we observed were free of weeds, the plants appeared to be healthy, and the rows were largely filled with plants of uniform height and vigor. Farmers purchase fertilizer and pesticides from cooperative unions and retail shops. We did not investigate whether farmers were applying the minimum fertilizer and insecticide needed for high quality results. There is concern that some farmers apply pesticides more frequently than necessary, copying the practices of other farmers, rather than assessing pest pressure in their fields (Legese and Hassena, 2012). High frequency pesticide application can substantially increase the cost of producing vegetables, while not necessarily providing incremental improvements in the quality of farm produce. Better access to good extension for irrigated crops could improve savings for WUAs, and favor environmental sustainability.

When farmers receive high prices, their efforts are nicely rewarded. Yet many farmers suggested that output prices are not always attractive. While not providing specific examples or describing trends over time, many farmers stated that on more than one occasion they were required to sell crops to middlemen at low prices, as they had no other market available. They often are unable to obtain good prices for their vegetables, for one of two reasons:

1. If many farmers produce a perishable crop, such as tomatoes, on a similar production schedule, the local market can become over-supplied at the time of harvest.

2. Farmers are largely unable to sell their vegetables directly in end markets. Rather, they must sell their output at spot prices offered by middlemen (or brokers) who then re-sell the vegetables to another broker for sale in a retail market.

Most farmers in the Meki-Ziway area operate independently when making decisions regarding crop production and marketing. Some WUAs attempt to coordinate cropping patterns to facilitate easy scheduling of water deliveries, while others do not. In either case, farmers producing

perishable vegetables are at risk of harvesting their crops at the same time that many other farmers also are harvesting vegetables, thus placing downward pressure on market prices. Middlemen or brokers can take advantage of a situation of moderate over-supply by offering unusually low prices to farmers selling their crops into such a market. Some of the farmers we interviewed told us of situations in which they or their neighbors chose not to harvest their crops, rather than sell their produce to middlemen at the very low prices they were offering.

The emergence of powerful brokers in the Central Rift Valley is a recent phenomenon that has accompanied the rapid increase in irrigated vegetable production (Legese and Hassena, 2012). Brokers generally provide a helpful service in bringing together smallholder farmers with vegetable traders who interact with wholesale or retail buyers. In theory, brokers can reduce the transaction costs for both buyers and sellers, and thus they deserve a fair return for their efforts. Yet when interacting with smallholder farmers, brokers can gain asymmetric advantage because they have much better knowledge of market actors and market conditions than the farmers. The potential implications of that advantage become troublesome when farmers produce perishable crops and they have little or no storage capacity. In such situations, brokers can offer low prices and impose transaction fees that substantially reduce the returns earned by farmers.

Legese and Hassena (2012) provide an instructive example of the way in which smallholder farmers lose revenue through interactions with vegetable brokers. During price negotiations, a broker might argue that the farmer's tomatoes or onions are not of high quality, and the broker might thus impose a quality adjustment charge of 0.2 to 0.4 ETB per kg. The farmer, lacking market alternatives, will be obliged to agree. The broker will also extract a commission of 0.3 to 0.5 ETB per kg, depending on market conditions.

There are several ways in which brokers can adjust the weight of vegetables sold by farmers in a manner that reduces farmer revenue. For example, some brokers will deduct the weight of 10 kg for each box of vegetables loaded on a truck, while the actual weight of each box is from 5 to 6 kg (Legese and Hassena, 2012). Other brokers will over-fill each box, thus obtaining the equivalent of 15 free boxes per truckload of vegetables. Others will load trucks at night, when it is more difficult for farmers to observe the precise number of boxes delivered. Legese and Hassena (2012) suggest that farmers can lose an average of 600 kg of onions or 15 boxes of tomatoes, per truckload, as a result of such cheating mechanisms.

Suppose a farmer sells five tons of onions through a broker, at a negotiated price of 8 ETB per kg. Suppose also that the price is adjusted downward for quality (0.3 ETB per kg) and the broker extracts a commission of 0.3 ETB per kg (Legese and Hassena, 2012). The net price to the farmer becomes 7.4 ETB per kg. The broker pays for five tons of onions, yet he has actually loaded 5.6 tons of onions on the truck. Thus, the farmer loses revenue in three ways: 1) dishonest accounting of the weight loaded, 2) inappropriate quality adjustment, and 3) the broker's commission. Rather than receiving revenue of 44,800 ETB (5.6 tons at 8 ETB per kg) for the onions, the farmer receives only 37,000 ETB (5.0 tons at 7.4 ETB per kg). The difference of 7,800 ETB, which is essentially transferred from the farmer to the broker, represents a 17% reduction in the farmer's revenue.

Some observers might suggest that the commission charge of 0.3 ETB per kg is a fair price for the broker's services. If one adjusts the example to account only for the quality adjustment and the deceptive weight, the revenue differential would be 6,120 ETB per truckload, or 14% of the 43,120 ETB the farmer should have received (5.6 tons at 7.7 ETB per kg). Clearly, the measures taken to misrepresent the weight of onions loaded on the truck result in the largest portion of the reduction in revenue received by the farmer.

3.4.2 Threats to Sustainability

Farm-level profitability is an essential component of the sustainability of interventions to provide access to irrigation water. Profits also provide the revenue needed to support the successful operation of a WUA. Thus it is critical that farmers are able to obtain agricultural inputs at affordable prices and in a timely fashion, while also having access to viable output markets.

Most of the smallholder farmers who have recently gained access to irrigation in Tigray and the Central Rift Valley have little or no savings accounts that might enable them to sustain one or two seasons of unprofitable crop production. Rather, they likely live from one season to the next, generating small to moderate amounts of net revenue that eventually will enable them to begin accumulating savings and investing in new assets for their households and their farming operations. Prior to accumulating a savings account, smallholder farmers have very little capacity to sustain shortfalls in revenue brought about by low prices or low yields.

Farmers engaged in vegetable production must purchase high-quality seeds, fertilizer, pesticides, and other inputs at the start of each crop cycle. Tomato farmers must also invest in the stakes and twine required to lift the plants above the ground, in support of high-quality production. Thus, all smallholder farmers producing vegetables undertake substantial risk in each crop cycle, as they have invested large sums on agricultural inputs, with no guarantee of the price they will receive at harvest, or the yields they will achieve.

The perishability of many vegetable crops is another source of risk for smallholder farmers, as many lack access to a refrigeration or storage facility. Most smallholders must sell their crops as they mature, regardless of the prevailing market price. In regions where many farmers produce the same crop according to a similar crop calendar, local prices can drop sharply during harvest. Smallholder farmers with no market power and no ability to modify the time at which they bring their crops to market face the prospect each season of receiving prices that are lower than their average cost of production.

When farmers lose money in one crop cycle, they might be unwilling or unable to pay for irrigation services in the subsequent cycle. They might also be unable to pay for the highest quality seeds or to purchase optimal amounts of fertilizer and pesticides. As a result, crop yields might be smaller and crop quality might be less than desirable in one or more subsequent cycles. It is easy to envision a downward spiral of low crop prices leading to smaller yields and lower quality, which then lead to even smaller revenues. Most smallholders would not be able to sustain irrigated crop production along such a downward path.

3.4.3 Recommendations

We recommend that Oxfam America and NGO partners advocate for policy changes and investments that will enhance smallholder access to the following:

1. Affordable agricultural inputs
2. Financial credit
3. Viable output markets
4. Agricultural insurance products
5. Safe and reliable financial institutions

Access to affordable inputs can be enhanced, in part, through efforts to legalize WUAs, so they may serve as bulk purchasers of inputs at wholesale prices. Those inputs could include seeds, fertilizer, pesticides, and fuel. The securing of bulk delivery contracts could reduce substantially the per-unit cost of farm inputs for smallholders. Promotion of effective agricultural cooperatives also would be helpful in providing smallholders with affordable access to the range of inputs required in vegetable production. While some cooperatives exist, it is not clear smallholders have adequate access to cooperatives that can assist them in gaining better access to input and output markets.

Financial credit is a critical input in irrigated agriculture. Credit can be viewed as any other input, for which farmers must pay a price, and through which farmers enhance crop yields and net revenue. Financial credit at the start of a crop cycle enables farmers to purchase needed inputs, such as seeds, fertilizer, and pesticides. Without sufficient credit at affordable interest rates, input applications will not be sufficient to generate profitable crop yields.

Smallholder farmers in Tigray and the Central Rift Valley need better connections with their output markets. At present, much of the net revenue that could flow to smallholder farmers is taken, instead, by middlemen who offer prices that are substantially lower than prices in retail markets. Smallholders selling perishable vegetable products have little ability to negotiate higher prices, particularly when they lack storage facilities and when they are unable to transport their products directly to market.

In many market settings, middlemen serve an important transactional role in bringing buyers and sellers together. When operating in a competitive fashion, middlemen contribute to the efficient functioning of a market system. However, when middlemen collude and they agree to offer smallholders the lowest possible prices, the middlemen capture an inordinate amount of the potential net returns from crop production. In a sense, they tax smallholder farmers heavily, rather than assisting them in obtaining a fair share of the market value of their produce. If the rate of fees charged by middlemen are sufficiently severe, smallholder farmers will not earn a profit and they will eventually be forced to abandon irrigated crop production.

In a non-collusive setting, middlemen will compete for the business of smallholder farmers, just as the buyers of any good or service must compete in other open markets. A competitive market

environment would bring farmers higher prices, while still enabling middlemen to earn a fair wage for their services.

We understand that middlemen have gained a substantial market presence in some areas, over the years. We have been told that the Meki-Batu Cooperative Union discontinued its role as a market maker for vegetable farmers in the region, in part, because they could not break into markets controlled by middlemen. If true, it would seem that policy intervention might be needed to open the market process to enable participation by new and existing cooperative unions. One can envision a competitive marketplace in which unions and middlemen offer services to large and small-scale farmers, and all parties are free to choose how and where they market their agricultural products.

Agricultural insurance products would be helpful in reducing the potential financial harm to smallholder famers from low-to-medium probability events, such as crop losses due to pests, weather, and unforeseen events. Given the potentially devastating impacts of crop losses when farmers have little or no savings, many farmers should be willing to pay for insurance. Among the insurable events, one might include the failure of a WUA to deliver irrigation water in a timely fashion, if the delay is due to a failed pump or motor.

Smallholder farmers need access also to safe, reliable financial institutions. In particular, they need institutions in which they can invest their savings at interest, and from which they can obtain short-term loans to support crop production. Upon establishing a savings account, it should be possible for smallholders to open lines of credit at affordable rates of interest. WUAs can gain similar savings and loan benefits by establishing relationships with financial institutions over time.

3.5 Land and Water Resources

3.5.1 Observations

Many of the farmers we visited in the Lake Ziway region expressed a concern about the long-term availability of irrigation water. Farmers diverting water from the Meki River, which flows into Lake Ziway, reported that irrigation developments upstream have diminished the flow of water in the Meki River, particularly during the dry season. Farmers who divert water directly from Lake Ziway report that the surface of the Lake has receded somewhat in recent years. We visited also with many farmers who withdraw groundwater from depths of 20 to 30 meters on land within view of Lake Ziway. Given that the aquifer likely is linked hydrologically to the Lake, many farmers are concerned that groundwater levels will decline over time, as demands on the Lake increase. Farmers diverting water from the Bulbula River, which drains Lake Ziway, report a similar concern regarding their long-term access to irrigation water. They fear that increases in groundwater pumping and diversions from the Lake will reduce water flows in the Bulbula River.

Irrigated area has increased substantially in the Lake Ziway region in recent years, coincident with steady increases in population and the number of livestock owned throughout the Central Rift Valley (Scholten, 2007; Meshesha et al., 2012). Much of the increase in irrigation demand has

been generated by investments in smallholder fruit and vegetable production on small plots. Many of the smallholders participate in community irrigation schemes involving fewer than 100 ha, on which individual farmers cultivate vegetables on plots of just 0.25 or 0.50 ha (Van Halsema et al., 2011). Open field cultivation of fruit and vegetables by smallholders accounts for an estimated 162 million m^3 of water diversions, or about 90% of all the water diverted by smallholder, private, and state farms for production of fruit, vegetables, and flowers in the region (Scholten, 2007). Thus, smallholder irrigation accounts for a substantial share of irrigation demand in the Lake Ziway region.

A few of the farmers we visited in the Lake Ziway region expressed a concern about soil and water salinity. Farmers irrigating with groundwater in one of the 15 small WUAs suggested that their water source is more salty than water in the Lake. They reported seeing salt accumulate on irrigated furrows, thus giving rise to their concern regarding soil salinity. The farmers had not collected any data describing the salinity of their irrigation water, and they had not yet tested their soils for salt content. Thus, it is not possible to know if the farmer reports high salt levels are accurate.

3.5.2 Threats to Sustainability

Several analysts who have studied land and water management in Ethiopia's Central Rift Valley have expressed concern regarding the sustainability of irrigated agriculture in the Lake Ziway region. Jansen et al. (2007) report that the expansion of irrigated area along lower reaches of the Meki and Katar Rivers, and on the shores of Lake Ziway, have contributed to a 0.5 m decline in the surface level of the Lake between 2002 and 2007. The outflow from Lake Ziway to the Bulbula River also has declined over time, from an average of more than 200 million m^3 per year in average years, to less than 50 million m^3 in some years. The reduced outflow has contributed to the decline in the size of Lake Abyata, which receives its inflow from the Bulbula River (Ayenew and Legesse, 2007; Jansen et al., 2007).

Further declines in the average level of Lake Ziway, and any substantial increase in salinity, would have potentially severe impacts on farmers, herders, and many other residents of the Central Rift Valley. Many smallholders rely on Lake Ziway as their primary source of municipal drinking water and also as their source for watering livestock. If the Lake becomes saline, due to higher evaporation rates and diminished outflows to the Bulbula River, many livelihoods will be notably impaired. Reductions in the average level of Lake Ziway will increase the cost of pumping groundwater and diverting water from the Lake for irrigation. Many smallholder farmers likely will be unable to afford higher costs of irrigation.

The threat of increasing salinity in Lake Ziway is made more pressing by the construction of a dam at the point where the Lake discharges to the Bulbula River. We understand that the Government of Ethiopia is building the dam to increase the average water level in Lake Ziway. Yet restricting the outflow of water from the Lake into the Bulbula River can have several deleterious outcomes (Jansen, 2009):

1. There would be less water flowing to Lake Abyata

2. There would be less water available for irrigation by farmers who currently divert water from the Bulbula River
3. The salinity of Lake Ziway would increase, and
4. There would be increased evaporation losses from the Lake, as the surface area expands.

The likely social impacts of these outcomes would include increasing competition for scarce water supplies in the region, particularly along the Bulbula River, declining water quality of the public drinking water supply for Ziway Town, and lower revenues from fishing in the Lake (Jansen, 2009). In addition, the livelihood activities of many farmers and their households would be greatly impaired if fresh water were no longer available in Lake Ziway.

3.5.3 Recommendations

We support the recommendations put forth by others regarding actions needed urgently to prevent further degradation of land and water resources in the Lake Ziway regions. Those recommendations include active participation in the Central Rift Valley Working Group, which has been established to provide a forum for public dialogue regarding resource management in the region (Jansen et al., 2007). It would be helpful also to conduct a regional study of water demands and supplies, water quality issues, and the likely impacts of the dam being constructed at the discharge point of Lake Ziway (Jansen et al., 2007).

Jansen (2009) recommends suspending construction of the dam until there is greater consensus regarding the potential hydrological and environmental impacts. We agree also with the recommendation that a moratorium be placed on further development of new smallholder irrigation systems, until the completion of a rigorous analysis of the water demands and supplies in the region, with the goal of determining how much irrigation can be supported in a sustainable manner (Jansen et al., 2007). It seems unwise to continue promoting investments in smallholder irrigation systems until it is clear that sufficient water will be available, over time, and that the additional demand pressure can be absorbed within the region's natural endowment of renewable water resources.

We propose also that Oxfam America and partner NGOs implement water volume, water pumping, and water quality data collection practices on the smallholder irrigation schemes established in recent years. Parameters of interest include depth to groundwater, discharge rates at the primary pump station, volumes of water pumped each day, average irrigation depths, and the electrical conductivity of water deliveries. Many of these variables can be recorded by the operators of pump stations, following a small amount of training with affordable measuring devices. The cumulative record will be helpful in assessing the pace of any changes in depths to groundwater and in gaining an understanding of whether or not water salinity is an issue of concern.

We support also with the recommendation to establish a regional network of river monitoring stations to collect information describing relationships involving river flows, irrigation diversions, the level and quality of water in Lake Ziway, and the volume discharged to the Bulbula River (Legesse and Ayenew, 2006). We would include also a set of groundwater monitoring wells at

selected locations to assess seasonal and long-term changes in groundwater levels. Such a program would enable public officials to gain a better understanding of the impacts of irrigation and other water use activities on river flows, Lake levels, groundwater depths, and water quality in the region.

4. Examining Risks and Strategies – Results of Short Form Survey

4.1 Insuring Against Risks to Sustainability

During our second field trip to the Meki-Ziway areas in Oromia, we asked the members of five water user associations to assess and rank ten potential risks to sustainability, and to consider the possibility of insuring against one or more of those risks (short-form surveys). In particular, we asked the members to allocate the sum of 10,000 ETB across the ten risks, as if they were purchasing insurance against each item. The members could allocate any amount to any item, provided that the sum of insurance payments did not exceed 10,000 ETB. The results of this exercise demonstrate the perceived importance of pumps and motors in gaining access to irrigation water, and the high level of concern among farmers regarding input and output prices (Figs. 1 to 5 in Annex).

Members from four of the five water user associations chose the risk of a breakdown in their irrigation pump or motor as the most important risk they face. Of the four associations, two lift groundwater using diesel engines to power their pumps. Two other associations divert water either from Lake Ziway or the Meki River, which flows into Lake Ziway from the north. Farmers in the latter association are concerned about their dependence on a single diesel engine and pump they use to lift water from the Meki River. Irrigable area for the fifth association is limited by the capacity of the two pumps they own at present, to lift water from the earthen channel that brings water by gravity from the lake to their pump station. Farmers in the fifth association placed less emphasis on their water diversion structure when completing the instrument, perhaps because they already own one electric motor and one diesel motor for lifting water from the Bulbula River. They normally operate the electric motor for most water deliveries, while using the diesel engine only as a backup.

Farmers in all five WUAs placed the risk associated with increasing input prices within their top four choices. The risk of inadequate access to profitable markets was placed in the top four choices by four of the five associations. Soil salinity appears in the top four choices of the two associations using groundwater, while appearing to be of less importance in the associations using river water. It is possible that the groundwater irrigators are observing higher levels of salinity in their water supply, but lacking water quality data, it is not possible to know whether or not salinity is a valid concern.

Farmers in the fifth association (WUA 6 in Table 1) appear to be most concerned about the long-term availability of irrigation water. They are also concerned that their land might be appropriated for other purposes. This is the only association we visited that withdraws irrigation water downstream from Lake Ziway, from the Bulbula River. It is possible that farmers perceive the risk they face from irrigation developments around the Lake more clearly than farmers who

use groundwater or divert surface water from the Lake. The response might also reflect the longer time during which these farmers have been practicing irrigation and observing water levels in the Lake and River. The association was formed in 2001, while two others were formed in 2011. Farmers in the association formed in 1996 also place concern regarding long-term water supply within their top four choices of risk considerations.

4.2 Investing in Risk Reducing Assets

We asked the farmers in five WUAs to consider also the possibility of investing in selected assets to reduce the risk of failure of their WUA. In particular, we asked the farmers first to rank a set of ten investment options and then allocate a sum of 100,000 ETB across those options. Participants could allocate any amount to any investment option, provided that the sum of investments did not exceed 100,000 ETB. The results we observed are largely consistent with the results we obtained when asking farmers to rank several risks and then allocate funds to purchase insurance (see Annex: Figures 1 through 5).

Farmers in all five associations allocated the largest portion of their 100,000 ETB to the purchase of a new or additional pump or motor. The farmers in WUA 5 allocated 80,000 ETB to that item, reflecting the concern they expressed regarding reliance on a single motor and pump to lift water from the Meki River. Farmers in the two associations using groundwater also allocated substantial portions of the 100,000 ETB to the purchase of a new or additional pump or motor (WUA 2: 60,000 ETB; WUA 3: 40,000 ETB). WUA 7 farmers allocated 30,000 ETB to a pump or motor, while farmers in WUA 6 allocated 19,000 ETB.

Farmers in three of the five associations allocated their second largest sum to the purchase of irrigation pipes and surface tubing. This might reflect one of two phenomena. When visiting with farmers in WUA 2, we learned that they were not pleased with the performance of the lay-flat tubing they had been using since their inception in 2011. Within a relatively short time, the tubing had begun cracking and leaking, thus complicating efforts to manage water carefully. In two other associations, farmers might be considering that an additional pump and motor would enable them to irrigate a larger area, thus generating the need for additional irrigation pipes and surface tubing to distribute water from the pump stations.

4.3 Engaging in Additional WUA Activities

We asked farmers also to consider the possibility of having their WUAs engage in new activities that assist farmers in ways that go beyond providing irrigation water. Some of choices include assisting farmers in selling their output, purchasing inputs, learning about new production or irrigation methods, and serving as a savings and loan institution. We asked farmers to imagine they had been given a substantial sum of money for investment in such activities. We asked them to rank the selected activities and then assign a proportion of the large sum to each one. The farmers could apply any proportion to any activity, provided that the sum of proportions did not exceed one.

The results observed in this exercise are somewhat mixed (Figs. 10 to 15). Farmers in four of the five associations placed providing access to credit for purchasing inputs within their top four choices. Only in WUA 6 did this activity receive a low ranking. Farmers there operate larger areas of irrigated land (0.75 ha) than other farmers in our study area (0.25 ha), and they have been producing irrigated crops for many years. Thus, they might have developed individual lines of credit for purchasing inputs or they might be self-financed to some degree.

Farmers in WUA 6 are more interested in having the association provide assistance in marketing their crops. The famers allocated 40% of their hypothetical sum of money to that activity. They allocated 20% of their funds to the activity of lobbying the regional and federal government on behalf of the members. Farmers in WUA 5 also selected assistance with output sales as their highest priority. They gave this activity equal funding with assisting farmers in learning new crop production methods. In our discussions with these farmers, we learned that membership in the association had declined in recent years, as some farmers were having difficulty paying their fees. That situation might partly explain the attention given to assisting farmers with output sales and with the purchase of inputs and gaining access to affordable credit.

5. Conclusions

5.1 Primary Challenges

The sum of information we have received from smallholder farmers, NGO staff members, and representatives of government ministries leads us to conclude there are three primary challenges to the institutional sustainability of Oxfam America's water intervention program in Ethiopia. The first of these pertains to the near-term access to irrigation water and operational challenges regarding water extraction and delivery. Farmers expressed a keen concern regarding the operation and maintenance of their water lifting or diversion devices. Farmers operating in the Meki-Ziway region are particularly concerned about relying on a single pump and well for obtaining irrigation water. They worry that a breakdown in a diesel engine during the peak irrigation period could cause substantial crop losses. Some of the WUAs have a plan to obtain timely service and repairs, while others suggest a major repair might require many days or weeks, depending on the availability of spare parts in local towns.

The second challenge to sustainability pertains to long-term water availability. Many of the farmers we visited perceive increasing demand pressure on regional water resources. In the Meki-Ziway area, many farmers are aware that private investors and the government are implementing new irrigation projects in the region. Some farmers seem to understand the likely hydrologic interaction between groundwater and surface water sources in the area of Lake Ziway, while others seem less concerned. It might be that farmers operating within sight of the lake understand more easily that the level of water in their wells is linked hydrologically to the level of water in the lake. Farmers operating further from the lake might not perceive that hydrologic interaction.

Farmers diverting water from the Meki River, which flows into the lake, and from the BulBula River, which flows out from the lake, seem particularly concerned about the sustainability of their

irrigation supply. Perhaps those farmers observe reductions in river flows, in response to increasing demands, more easily than farmers lifting groundwater from wells at some distance from the lake. It is well known among farmers that irrigation development is increasing along the Meki River, above Lake Ziway. That development adds to the concern of farmers diverting water from the river just before it enters the lake.

The third important challenge to sustainability is that of interacting successfully in input and output markets when producing high-value horticultural crops. Most of the farmers we visited in the Central Rift Valley are producing two or three irrigated crops per year, thus greatly increasing their income potential. Realizing that potential requires affordable access to input and output markets, and the ability to borrow operational funds at reasonable rates of interest. Technical assistance also is essential, as most farmers have no experience producing vegetables before gaining access to irrigation water.

The farmers we interviewed generally have received good technical training in the production of tomatoes, onions, peppers, green beans, and cabbage, and they generate good yields per hectare. Examples include 0.8 tons of teff, 2.0 tons of wheat, 24 tons of onions, and 80 tons of tomatoes. Yet vegetable crops are largely perishable and they must be brought to market soon after harvest. Lacking cold storage and operating without forward contracts, most farmers have little room for bargaining over price when their crops mature. They are largely at the mercy of middlemen who offer low prices that might or might not cover the total cost of production. Most smallholder farmers will not be able to sustain subsequent seasons in which they lose money, and many might conclude that irrigated crop production is not a viable enterprise.

Many farmers also report challenges in obtaining farm inputs at reasonable prices. Several farmers and other key informants have suggested that input prices have been increasing sharply in recent years, while some farmers also lack access to affordable credit for the purchase of inputs at the start of each season. We understand that one or more NGOs might be providing some farmers with crop production loans through revolving credit mechanisms, but it is not clear that such an approach is widespread or sustainable. In a region where many farmers cultivate only 0.25 ha of irrigated land, it seems sensible to consider some form of cooperation in which groups of farmers join together in the purchase of inputs and the marketing of crop products.

5.2 *Recommended Strategies*

The three primary challenges to the sustainability are: 1) reliance on a single motor or pump station for diverting water from rivers or withdrawing groundwater, 2) reliance on a regional water resource that is likely over-subscribed at present, and will face even stronger demand in future, and 3) the inability to interact effectively in input and output markets. These challenges are surmountable, provided that appropriate policy measures are implemented soon.

With regard to pumps and motors, WUAs should consider investing in back-up systems, either individually, or in collaboration with other associations through sharing a back-up system. The associations might also consider purchasing insurance to cover the losses incurred when their pump or motor fails, although such an insurance product might not yet be available.

The increasing pressure on regional water resources can be abated only through active engagement by public officials committed to ensuring sustainability of the livelihood activities dependent on those resources. It is likely that the water system involving the Meki and Katar Rivers, Lake Ziway, the Bulbula River, and regional groundwater is already over-stressed. A thorough, dynamic assessment of water supply and demands is needed urgently to prevent substantial increases in groundwater pumping depths and long-term degradation of water quality in Lake Ziway. If the regional water resource is not managed in sustainable fashion, there might be little need in addressing other sustainability issues.

Sustainability depends also on affordable access to competitive input and output markets. Currently, many smallholders are unable to obtain financial credit and other inputs at affordable prices, and they must sell their products to middlemen who extract much of their potential profit. The farmers incur substantial risk when producing irrigated vegetables without crop insurance or forward contracts. Most of the smallholders have little or no savings accounts that might enable them to sustain several cycles of low prices or low yields. It is essential that farmers are able to receive good returns in years of high prices and good yields. To this end, middlemen must operate in a competitive setting in which all parties earn a fair wage, while not extracting undue rents from smallholders. Policy interventions that ensure competitive markets for inputs and outputs, and investments in roads and cold storage, would be very helpful in ensuring that smallholder farmers have the opportunity to earn attractive returns and sustain their productive enterprise.

5.3 Moving Forward

Oxfam America can enhance the sustainability of its investments in water for productive use by giving additional attention to the issues of finance, market access, and hydrology. Providing access to irrigation water is a notably helpful intervention in efforts to increase food production and improve farm incomes. Yet access alone is not sufficient. Smallholder households need access to affordable credit, and to competitive input and output markets. They need also to know that their own investments in irrigated farming will not be undone by the sudden loss of access to water, due either to the loss of a right to use land or water, or to the declining volume of water available in a river or declining levels of groundwater in an over-pumped aquifer. Indeed, there is much to consider beyond the usual calculations of expected costs and returns, when evaluating interventions that provide access to irrigation water.

Perhaps the first issue to examine is whether or not the water supply is sustainable. Analysts need to evaluate both the current and future demands for water in the region, and to assess those demands in light of the available water supply. It is not sufficient to evaluate only the current depth to groundwater in a location where a WUA might be formed. It is critical also to assess the demands for water along the Meki and Katar Rivers that flow into the lake, and to understand also the pace at which irrigation is expanding in the region. The hydrologic linkages involving groundwater and surface water must be understood quite well, as those linkages can determine the fluctuation and long-term trends of groundwater availability at the farm level.

Oxfam America should encourage its implementing partners to conduct an extensive review of water supply and demand outlook before investing in new wells and pumping stations.

Farm-level access to affordable credit is equally critical. Farmers gaining access to irrigation will endeavor to produce highly valued vegetables, in pursuit of large net returns per hectare. Such crops require expensive inputs including high-quality seeds, fertilizer, pesticides, and–in the case of tomatoes–poles and strings for trellising the plants. Most smallholder households gaining access to irrigation for the first time will not have savings accounts from which to pay for those inputs. Rather, the farmers will need to obtain seasonal crop production loans at reasonable rates of interest. They must also have access to crop insurance, so that a crop failure due to weather or pest infestation will not cause long-lasting financial harm. Oxfam America can advocate for the development of accessible credit markets at both the national and regional level. Implementing partners might also be helpful in working with banks and other credit institutions to make production loans available for smallholder households.

The issue regarding affordable access to input and output markets likely will require action at both the national and regional levels. Oxfam America might advocate for legislation that prevents brokers and middlemen from manipulating markets in their favor. Implementing partners might also consider forming or supporting the formation of marketing cooperatives that would operate specifically for the benefit of smallholder farmers. For example, several NGOs with an interest in agricultural development might jointly form a marketing cooperative that focuses on purchasing inputs in bulk and making those inputs available to farmers at affordable prices. The cooperative could also market crops for smallholder farmers, thus enabling them to obtain better prices than they receive when working with middlemen.

None of these recommendations will be easy to implement, yet each will contribute substantially to the sustainability of irrigation investments. Addressing all three areas of concern–finance, market access, and hydrology–could brighten the future prospects for thousands of smallholder farmers striving to improve their livelihoods by taking on the risk of producing irrigated crops for sale in local and regional markets. Indeed, there is quite a bit of risk in such an activity, particularly for farmers with no previous experience in irrigation, little or no savings, and limited knowledge of market interactions involving middlemen. To the best extent possible, we should endeavor to help reduce the risks associated with finance, market access, and hydrology. The farmers will still have plenty of risk to assess and accommodate, in the form of weather, pests, and market prices.

---

6. References

Ayenew, T., Legesse, D. 2007. The changing face of the Ethiopian rift lakes and their environs: call of the time. *Lakes & Reservoirs: Research and Management* 12(3): 149-165.

Jansen, H. 2009. Implications of the dam in the Bulbula River for Lake Ziway. Unpublished policy brief. Wageningen, Alterra.

Jansen, H., Hengsdijk, H., Legesse, D., Ayenew, T., Hellegers, P., Spliethoff, P. 2007. Land and water resources assessment in the Ethiopian Central Rift Valley; Project: ecosystems for water, food and economic development in the Ethiopian Central Rift Valley. Wageningen, Alterra, Alterra- rapport 1587.

Legese, G., Hassena, M., 2012. Assessment of vegetables value chain in Central Rift Valley, Ethiopia. Report prepared for Oxfam America, Horn of Africa Regional Office, Addis Ababa, 69 pages.

Legesse, D., Ayenew, T., 2006. Effect of improper water and land resource utilization on the central Main Ethiopian Rift lakes. *Quarternary International* 148(1): 8-18.

Meshesha, D.T., Tsunekawa, A., Tsubo, M. 2012. Continuing land degradation: cause-effect in Ethiopia's Central Rift Valley. *Land Degradation & Development* 23(3): 130-143.

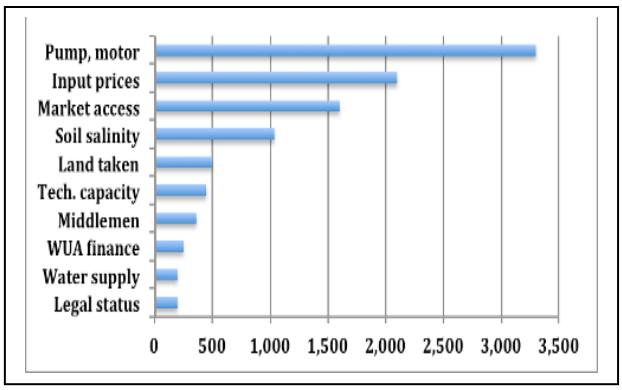
Scholten, W. 2007. Agricultural development and water use in the Central Rift Valley of Ethiopia: A rapid appraisal. Internship Report, University of Twente, The Netherlands.

Van Halsema, G.E., Lencha, B.K., Assefa, M., Hengsdijk, H., Wesseler, J. 2011. Performance assessment of smallholder irrigation in the Central Rift Valley of Ethiopia. *Irrigation and Drainage* 60(5): 622-634.

Annex: Figures for Short-Form Survey Results

Figure 1. Results of short-form surveys in WUA 2 (Meki-Ziway area, established 2011 drawing groundwater, with 12 members)

WAU 2: Allocation of 10,000 ETB in insurance against risks to sustainability



WAU 2: Investing 100,000 to reduce risks to sustainability

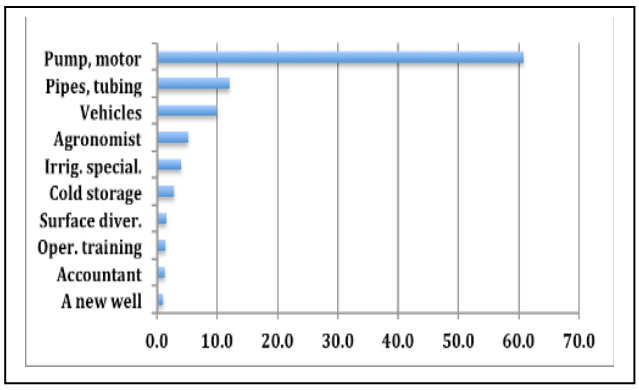
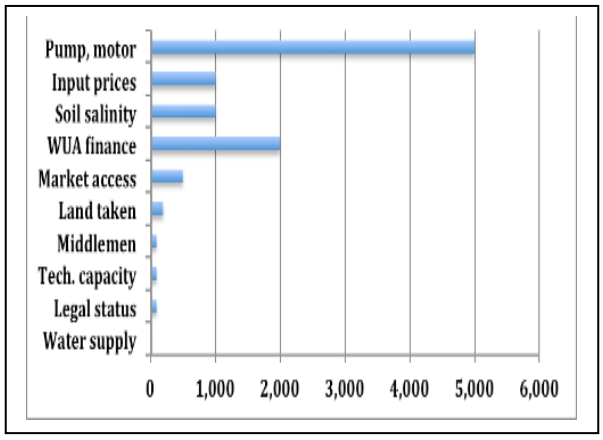


Figure 2. Results of short-form surveys in WUA 3 (Meki-Ziway area, established 2011, drawing groundwater with 12 members)

WAU 3 : Allocation of 10,000 ETB in insurance



WAU 3: Investing 100,000 to reduce risks to sustainability

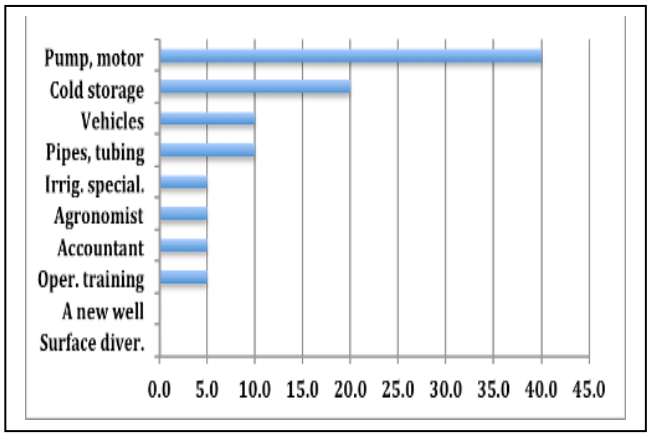
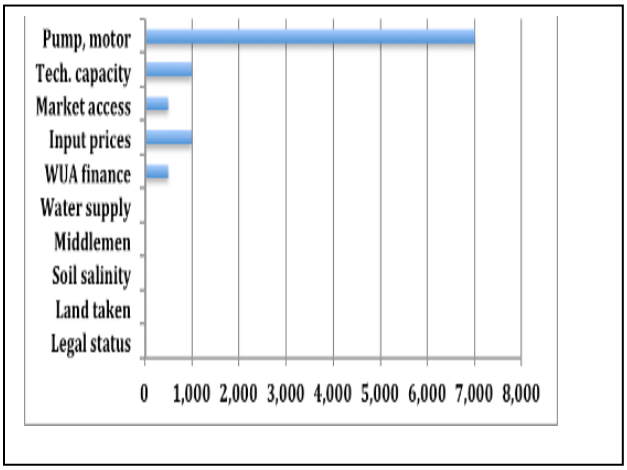


Figure 3. Results of short-form surveys in WUA 5 (Meki-Ziway area, established 2004, diverting from Meki River which flows into Lake Ziway from the north, with 29 members)

WAU 5: Allocation of 10,000 ETB in insurance



WAU 5: Investing 100,000 to reduce risks to sustainability

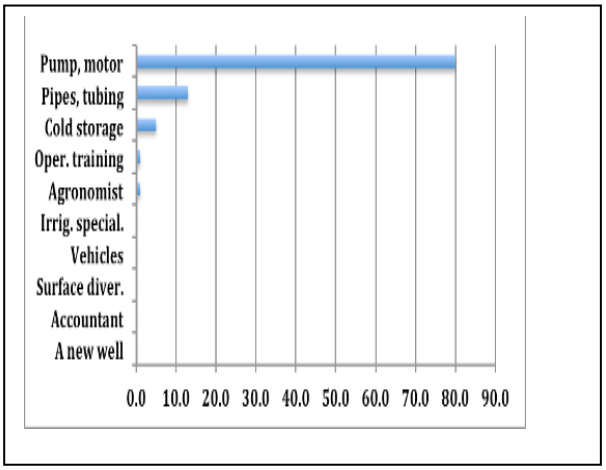
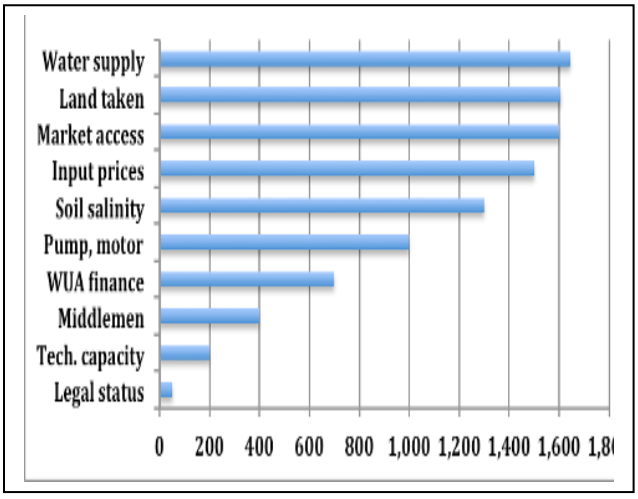


Figure 4. Results of short-form surveys in WUA 6 (Meki-Ziway area, established 2001, diverting from Bulbula River which exits Lake Ziway to the south , with 98 members)

WAU 6: Allocation of 10,000 ETB in insurance



WAU 6: Investing 100,000 to reduce risks to sustainability

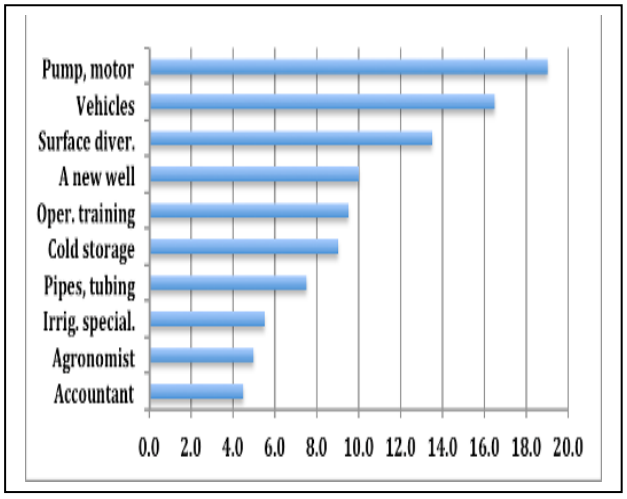
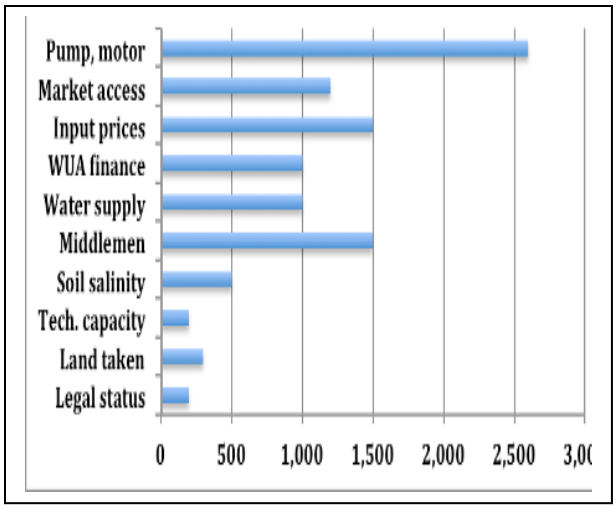


Figure 5. Results of short-form surveys in WUA 7 (Meki-Ziway area, established 1996, diverting directly from Lake Ziway, 74 members)

WAU 7: Allocation of 10,000 ETB in insurance



WAU 7: Investing 100,000 to reduce risks to sustainability