FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

Measuring the water level at Ajuri River, Ethiopia
Photo: Maheder Haileselassie/IWMI

WATER RESOURCES

Feed the Future Innovation Lab for Small Scale Irrigation (ILSSI)

Availability of water resources is one of the most basic requirements for expanding farmer led irrigation (FLI). That's why a significant part of ILSSI's efforts are focused on supporting decision-makers to understand where and how water can be sustainably used for irrigation, using state of the art techniques. These efforts include co-designing, employing and strengthening capacity for tools that can reveal competing demands, risks of water insecurity and threats to water quality. ILSSI also trials improved irrigated farming practices that can help safeguard water resources and enable farmers to sustainably increase irrigation.

Identifying water availability and use in a basin to expand irrigation sustainably

Water resources in Ethiopia, Ghana, Tanzania, and in areas of Mali, are sufficient to allow farmers to sustainably expand irrigation, which would result in improved incomes and livelihoods for millions. In most areas, surface and groundwater resources -need to be used conjunctively and with good tools and practices for on-farm water management. Treating rainfall and groundwater as one -interconnected system supports a sustainable expansion of small scale irrigation. Competing water demands, for domestic and productive uses, can be identified and better managed through the use of -Water Accounting+. Water Accounting+ is an internationally recognized and standardized framework for allocating available water resources across uses and sectors. Tools such as Water Accounting+ can be central to irrigation planning, enabling identification of potential water insecurity risks under current and future climatic conditions.

Modelling tools, such as ILSSI's -integrated decision support system (IDSS), is used to assess the impacts of FLI at the watershed and field-scale levels. This can help inform plans for expansion of small scale irrigation. ILSSI also works with institutions at multiple levels to build modelling skills in order to evaluate the impacts of FLI on water resource risks, agricultural production, environmental sustainability, household income and nutrition.

Understanding shallow groundwater dynamics and enhancing recharge

Shallow groundwater represents a valuable resource to smallholders, but must be well managed at the plot level, as well as at watershed and community levels. Farmers can tap into shallow groundwater using manual, diesel or solar-powered pumps. This allows them to irrigate during the dry season and complement rainfed production for one or two seasons (depending on the location).

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Solar powered irrigation combined with conservation agriculture, Ethiopia
Photo: Mulugeta Ayene/WLE

Spatial information on groundwater depth and aquifer productivity can help in identifying irrigated land potential under -current, or -climate change, conditions. Such information can also aid in assessing -suitability for irrigation technologies such as solar. When planning for small scale irrigation it is important to know how much water is available after the rainy season as this would influence crop and irrigation investment choices. In the Ethiopian Highlands, for example, water levels in shallow wells fluctuate by 2 - 15 meters, as the dry season advances, depending on where they are located in the watershed. The majority of these wells can only provide significant irrigation inputs during the -first three months of the eight month-long dry season unless they are located at the bottom of a valley.

Facilitating groundwater recharge, through suitable water and soil management in the watershed, is key to increasing the availability of water for irrigation during the following dry season. For example, employing a newly developed plow - -the berken plow - can help farmers break up the hard crust formed below the surface of some soils in the Ethiopian Highlands. This results in reduced rainwater runoff, limits soil disturbance and can lead to increased soil moisture.

Prioritising water quality while intensifying agricultural production

Intensification of agricultural practices is often associated with expansion of FLI. Increased use of agrochemicals poses a potential risk of water pollution. Institutions should be strengthened alongside irrigation expansion to protect water resources. As agriculture intensifies, national, basin and watershed level institutions should be supported in ways that enable them to identify suitable areas for irrigation development. It is crucial that they are well placed to assess any -potential water pollution impacts from agro-chemicals resulting from -agricultural intensification facilitated by the irrigation. In some cases, new guidance needs to be created to set allowable levels of chemicals in water bodies.

Greater yields and less water use through conservation agriculture

Conservation agriculture practices contribute to a range of farmer benefits, while also improving soil health and reducing negative environmental impacts. Benefits include: increased crop yields, reduced yield variability, increased profit from agricultural activities, and enhanced nutritional outcomes. For example, in one test site in Ethiopia, onion production through conservation agriculture achieved -35% higher yields compared to conventional agriculture. The application of soil cover on onion plots reduced soil evaporation by 26% compared to conventional tillage, while it also added organic matter to the soil. Conservation agriculture with drip irrigation in Ethiopia and Ghana has been found to reduce water use by between -18-45%, depending on the crop type, resulting in a range of crop yield increases (in some cases almost double), compared to conventional tillage. Soil moisture after irrigation was also higher under conservation agriculture.

Adapting irrigation practices through irrigation learning tools

Irrigation learning tools, such as -wetting front detector systems, enable farmers to achieve higher water productivity, increased yields, and improvements in the quality of produce. For example, in Dangishta, Ethiopia, these tools resulted in a -doubling of onion yields when farmers used manual water lifting devices. In cases where motorized pumps were used, irrigation learning tools helped farmers achieve crop yield increases of up to 21%, while reducing water use by up to 44%.

Community governance of shared resources for adaptability and resilience

At the community level, participant games can improve local understanding of groundwater-related interdependences, for strengthened management of shared resources. In addition, ILSSI examines the use of pumped water for multiple purposes. This emphasizes the need for adaptive community and watershed level governance of conjunctive water use.

Exploring community water governance, Burkina Faso
Photo: IWMI

-The Feed the Future Innovation Lab for Small-Scale Irrigation (ILSSI) is a research-for-development project that aims to expand farmer-led, small scale irrigation in Ethiopia, Ghana, Mali, and Tanzania. Now in its second phase (2019-2023), ILSSI is working to identify the best ways to expand the use of small scale irrigation within environmentally sustainable limits. ILSSI is a part of the -U.S. Government's Feed the Future Initiative.

- Links to these publications, and other resources, can be found here: http://ilssi.tamu.edu/knowledge/water-resources/

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