



# Smallholder Innovation Series

A BRIEF ON HOW TO SUCCEED AS A SMALLHOLDER FARMER

## Smallholder Irrigation



### What is Smallholder Irrigation?

Smallholder farmers rely heavily on rainfall for their crops. In sub-Saharan Africa, where droughts are frequent, rainfall is inconsistent, and water is unevenly distributed, smallholder farmers are the most vulnerable. Inadequate water supply is the leading cause of yield loss. In 2015, over 15 million people in countries across sub-Saharan Africa were affected by drought. Research shows that by 2050, climate change will result in unpredictable weather patterns that will affect farmers' ability to plan their growing seasons.<sup>1</sup>

Climate change poses a severe threat to food security and income generation for farming families who rely on staple crops that are subject to weather fluctuations as inconsistent weather patterns can result in yield loss. Thus, there is an urgent need to prioritize water management strategies. Most smallholders do not have access to modern irrigation technologies but are finding alternative ways to cope. An increasing number of smallholders around the world are adopting a variety of different irrigation schemes that are cost-effective and water efficient. These techniques enable smallholders to cultivate more reliable farms that can promote rural food security and sustainable livelihoods.

## Benefits of Smallholder Irrigation

Smallholder irrigation farming can be transformative to poor farming communities who have minimal access to modern irrigation techniques. Some benefits of smallholder irrigation schemes include:

- *Crop diversification* as farmers do not have to rely on rainfall and can plant a variety of crops throughout the year. This promotes food security and can increase profits for farmers as they can take advantage of seasonal price fluctuations.
- *Environmental sustainability* as agriculture accounts for 70% of the world's freshwater resources. Adopting efficient irrigation technologies allows farmers to maximize their water usage which minimizes smallholders' vulnerability to water scarcity.<sup>2</sup>
- *Minimal yield loss* as irrigation all year round will result in decreased soil salinity and fewer pests and diseases. Irrigation techniques can improve soil quality as nutrients are consistently flowing through crops and suppressing weeds.
- *Reduced labor* as a regular flow of water will decrease the amount of time needed to manually water each crop. Irrigation schemes can also reduce time spent weeding and applying fertilizer.



### Surface irrigation for smallholders in Mauritania

Boghé, Mauritania is a sub-Saharan town located in West Africa and home to 40,341 people. 65% of its population rely on traditional agriculture which is heavily dependent on the rainy season. The region is prone to periodic droughts, leaving the majority of the population vulnerable to food insecurity. In 2010, the Mauritanian Red Crescent, a humanitarian volunteer organization, implemented an irrigation project along the Senegalese River basin in the Brakna region. Access to steady irrigation succeeded to increase crop yield, which improved food security for smallholders. The project consisted of installing a motor pump to the river basin to deliver water to all crops. Previously, smallholders relied on inconsistent rainfall to water their crops, but with irrigated fields they were able to grow a greater range of produce to support their livelihood. A participant of the project explained, "Before the project was implemented, I depended on the rain to grow crops. This year, thanks to the water pump, I won't be so affected by the drought."

## Methods

### ***Drip Irrigation***

Drip irrigation is a pressurized micro-irrigation system that involves dripping water and nutrients into the soil at slow rates using a network of small diameter plastic pipes called drippers, emitting water between 2-20 liters per hour either from the soil surface or below the root of the crop. This is a water-efficient technique as water is only distributed to the root, minimizing evaporation and run-off, unlike sprinkler irrigation where the entire soil bed is irrigated. Drip irrigation systems are primarily used for row crops such as soybean, maize, potato, canola, and sunflower. It can be adaptable to most slopes and suitable for a variety of soil conditions. Thanks to drip irrigation, farmers can produce high-quality yields with minimal water usage.<sup>3</sup>

### ***Practicing drip irrigation on your farm***

To start a drip irrigation scheme, you'll need a water pump or pressurized water system to deliver water to your crops along with an electric power source. Attach a control valve to the pump, which will release the water and connect a pressure regulator to control the water pressure. You'll also need a backwater prevention device that will prevent unwanted materials, such as dirt and polluted water, to flow back into the system. Set up a network of pipes across your rows and attach emitters to release water droplets. Turn the system on and allow the water to drip drip drip!



### ***Gravity-fed Irrigation***

For smallholders who do not have the capital to start a pressurized drip irrigation system, gravity-fed irrigation or surface irrigation is a cost-effective alternative that provides the same benefits as a drip irrigation system. Gravity irrigation requires no electricity and can be installed anywhere. This method requires a water reservoir set up on a slight slope (at least 4 ft above desired irrigation area) to create water pressure. Water can be sourced from rainfall or a nearby river or stream. Unlike drip irrigation, gravity-fed irrigation



does not require a pump; therefore, it relies on the natural gravitational path of least resistance to deliver water and nutrients to the crop root.<sup>4</sup>

### **Practicing gravity-fed irrigation on your farm**

You can turn your farm or garden into a gravity-fed irrigation system with just a few simple materials. You can use recycled water bottles for individual plants or a large bucket or barrel for rows of plants. Create a small hole on the side of the bottle or barrel and attach a PVC line connector with adhesive. Next, attach an inline valve which will control the flow of water. Then connect your tubing to the valve and lay the pipes next to the root of the plant. Open the valve and allow gravity to do the work!

## Things to Consider

- **Water Blockage.** Ensure the water is free of sediments to avoid blockage as the drippers have tiny waterways. If sediments reside, the drippers will be unable to water the soil. Consider implementing a filtration device to prevent blockages.
- **Inputs.** Access to inputs is the main obstacle for smallholders seeking to adopt irrigation schemes. Though irrigation schemes can improve farmers' yield by 40% to 110%, the installation cost can be high depending on the type of irrigation system. Initial inputs include equipment such as pipes and valves, fertilizers, electricity, and motor pumps.<sup>6</sup>
- **Knowledge.** The adoption of irrigation schemes is dependent on smallholders' awareness and ability to apply it to their farm. Managing an irrigation system requires technical skills. This includes farmers' knowledge of their land, crops, and correct maintenance.

### References

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