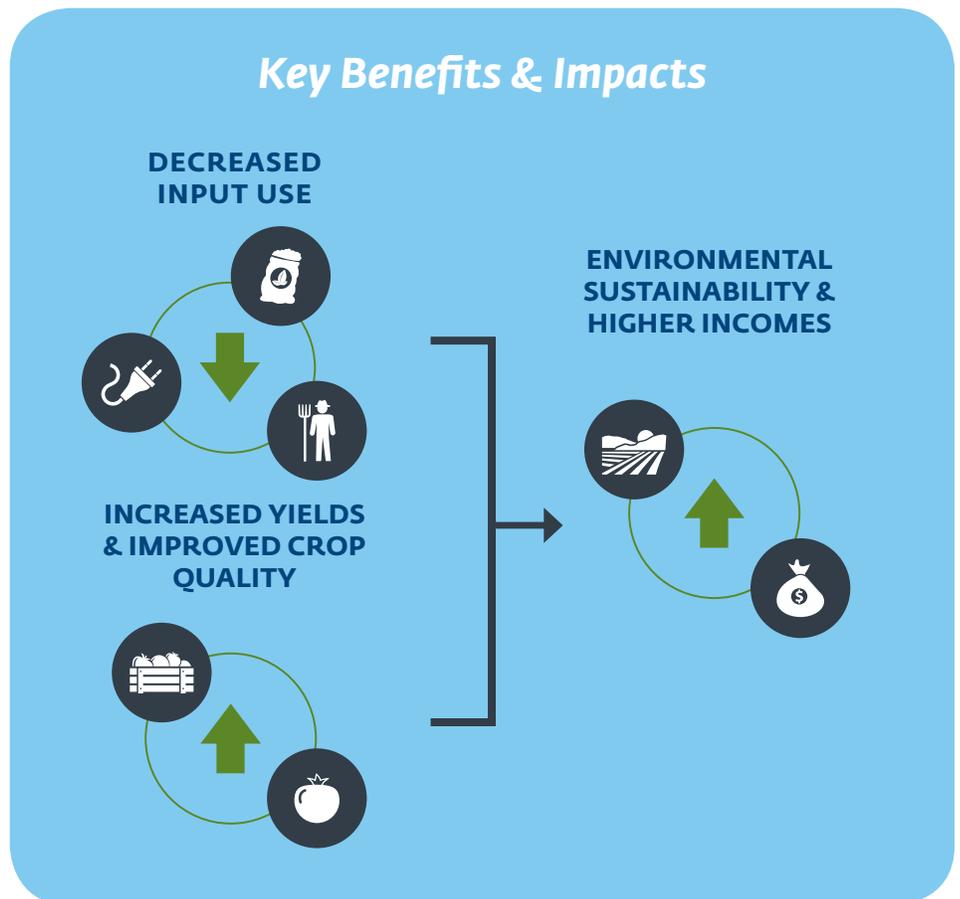
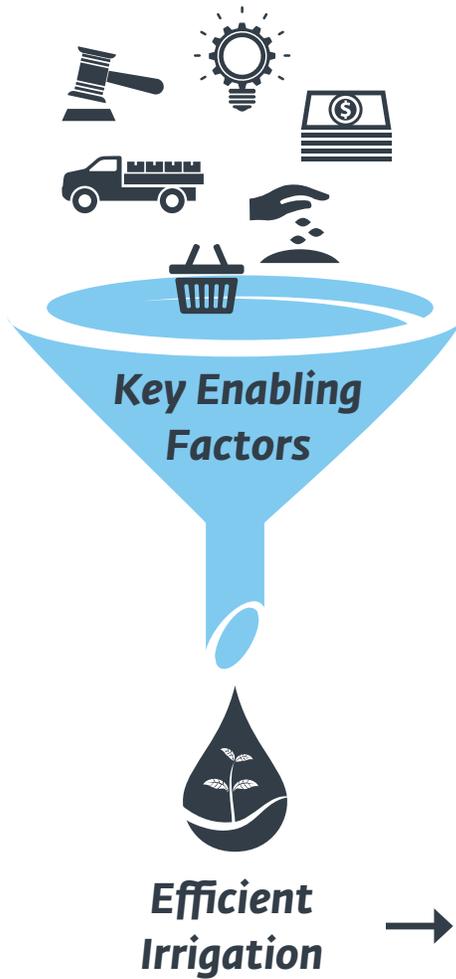


Impact of Efficient Irrigation Technology on Small Farmers



iDE

A growing population and changing food consumption patterns are estimated to require a doubling of food production in the developing countries by 2050. Eighty percent of this increase would need to come from higher crop yields and greater crop intensity given limited scope for agricultural land expansion. Expanding the use of efficient irrigation and agricultural water management technologies is a key part of the solution to increasing yields in a sustainable manner — currently only five percent of land in Africa for example is cultivated using irrigation. Investments in efficient irrigation can also lead to major improvements in the standards of living of small farmers who produce the majority of food in developing countries.



BENEFITS OF EFFICIENT IRRIGATION TECHNOLOGY

Efficient irrigation technologies help small farmers improve their livelihoods by allowing for a more efficient use of inputs, such as water and fertilizer, and by enhancing the yields and quality of the crops farmers grow. A more efficient use of the following inputs has several benefits:

WATER — Efficient irrigation allows farmers to (i) use less water to grow the same amount of crops; (ii) more productively farm larger areas of land by using the same amount of water; or (iii) use the same amount of water to grow higher value, more water-intensive crops.

FERTILIZER — Efficient irrigation reduces the amount of fertilizer needed per plant, as nutrients can be dissolved in the irrigation water for uniform application, reduced waste and lower labor input.

ENERGY — Efficient irrigation reduces energy use because less water is needed for a comparable area of irrigation, which in turn requires less energy for pumping this water. When automated, farmers are also able to easily and safely irrigate crops during times of fewer power disruptions (i.e., at night).

LABOR — Efficient irrigation decreases the amount of time required for providing water to a crop area due to the regulated flow of water in the irrigation operation. This indirectly reduces time spent on weeding and applying fertilizer.

The use of efficient irrigation technology improves crop yields and quality through direct impacts as well as indirect ones, such as decreased soil salinity, fewer attacks from pests and diseases, and less weed competition. In the presence of functioning markets and a favorable business environment, these changes in turn help generate higher incomes and better livelihoods for farmers.

Last but not least, through its effects on resource use efficiency (water and energy) and soil quality, efficient irrigation technology also promotes environmental sustainability. Agriculture accounts for about 70 percent of global freshwater use, greatly contributing to increasing global scarcity of freshwater. The use of efficient irrigation technology therefore helps farmers in vulnerable regions to adapt and strengthen their resilience to climate change.

International Finance Corporation (IFC) recently commissioned a series of studies to better understand the impact that adoption of efficient irrigation technology can have on smallholders' farming practices and livelihoods.² The studies also analyzed the main factors that enable the adoption of such technology, focusing in particular on assessing the financing solutions for smallholder investments in efficient irrigation. The highlights from these studies are presented below.



CGIAR Climate

Notes

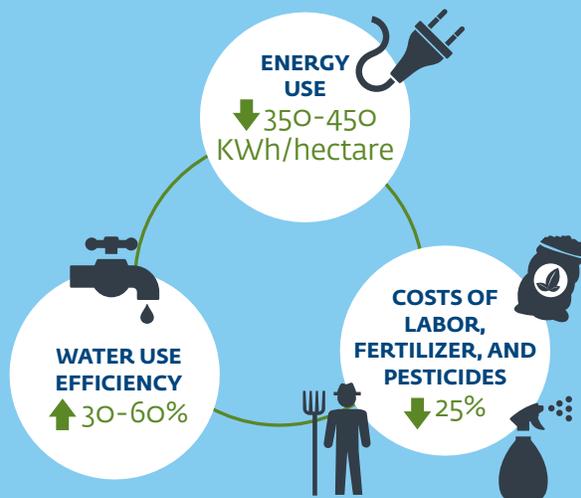
¹ Efficient irrigation technologies are a collection of irrigation solutions that promote water use efficiency by delivering water directly to the plant and enabling the farmer to control the time, location, and quantity of water application. Efficient irrigation technologies include, but are not limited to, drip irrigation, sprinklers, Californian and semi-Californian technologies.

² Cambridge Economic Policy Associates (CEPA) was appointed by IFC to carry out analysis that contributes to the World Bank Group's work to support smallholder farmers in target countries to access micro-irrigation technologies. Inclusive Business Study on Irrigation Technologies for Small Farmers entailed three reports (for India, Burkina Faso (in partnership with iDE Burkina Faso), and Zambia) and was completed during May-July 2014. In preparing the reports, CEPA carried out desk-based research, in-country data collection and verification, in-country consultations, and desk-based modelling and analysis.

Irrigation Technology in Action — The Case of India

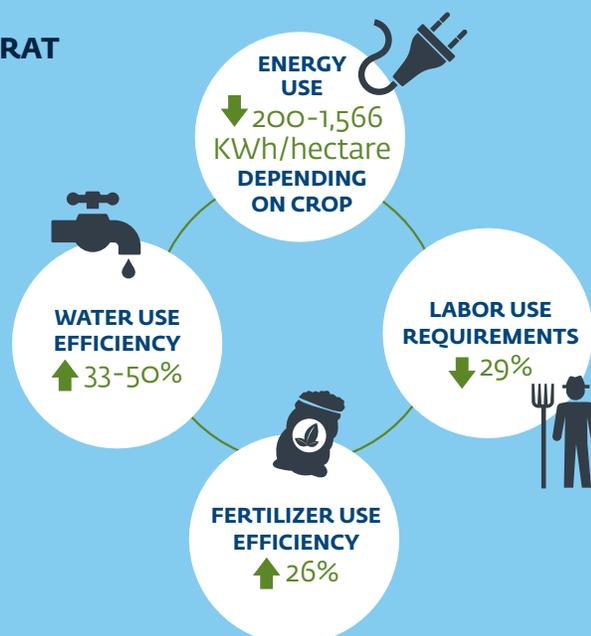
A quantitative assessment of the impact of improved access to efficient irrigation technology in the Indian states of Andhra Pradesh and Gujarat helps illustrate its benefits.

ANDHRA PRADESH



- ↑ **EFFICIENT IRRIGATION** also led to between **40-110% HIGHER YIELDS**,
- ↑ which in turn led to an **INCREASED INCOME** of **30-100%**.
- ↑ Farmers growing **SUGARCANE** experienced an average **INCOME INCREASE** of **over \$750/hectare** as a result of efficient irrigation, allowing them to **RECOVER THE COST** of the equipment in just **1.4 years**.

GUJARAT



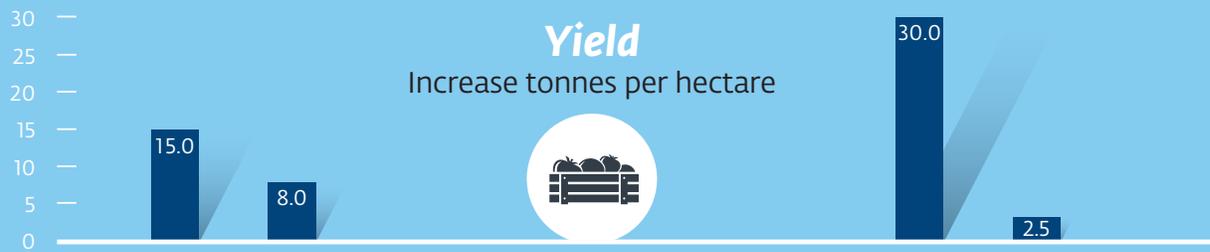
BANANA

POTATO

GUJARAT

SUGARCANE

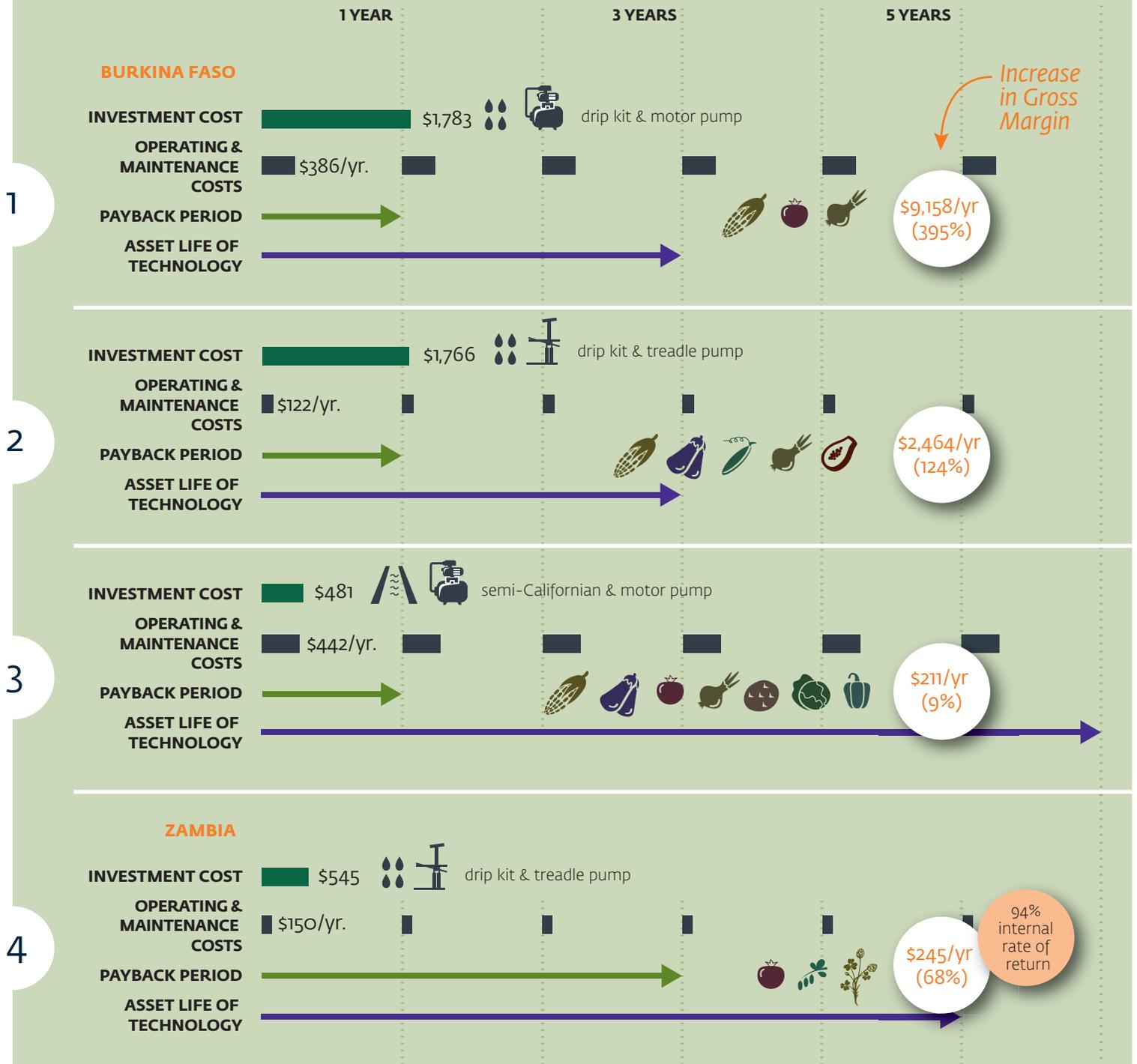
MANGO



In Gujarat, investing in efficient irrigation technology often makes financial sense even in the absence of government subsidies, which are widely utilized across India. The payback period of less than two years for efficient irrigation technology investment compares favorably with an average asset life of the technology of about five years.

Bringing Irrigation Technology to Africa — Burkina Faso and Zambia

Financial analysis in both Burkina Faso and Zambia confirmed that the adoption of efficient irrigation technology can be highly beneficial to small farmers.



Burkina Faso (scenario 1) covers maize, tomato, and onion cultivated on 0.25 hectares of land

Burkina Faso (scenario 2) covers maize, eggplant, green beans, onion, and papaya cultivated on 0.25 hectares of land

Burkina Faso (scenario 3) covers maize, eggplant, tomato, onion, potato, cabbage, and green pepper cultivated on 0.25 hectares of land

Californian irrigation systems involve transportation of water through pipelines from the water source directly to individual parcels of land. A variation of the Californian system is the semi-Californian irrigation system. In a semi-Californian system, water is distributed through a buried pipe to a network of pipes that run off the buried pipe and which have open channels distributing water into individual parcels of land. There are also small intermediate reservoirs to split evenly the incoming flow between laterals (or distribution branches).

Zambia (scenario 4) covers tomato, soya, and rapeseed cultivated on 0.2 hectares of land

KEY ENABLING FACTORS TO TECHNOLOGY ADOPTION

While the benefits of efficient irrigation technology are clear, a number of factors are necessary to unleash these positive impacts:



AWARENESS AND SKILLS — The adoption and effectiveness of efficient irrigation technology depends on farmers' initial awareness of it and their knowledge of its proper use. This includes the suitability of the farmers' land, their choice of crops, the level of intensity of cropping practices, and proper maintenance of the equipment. In this regard, the equipment manufacturers' willingness and ability to provide important technical support and after-sales services to the farmers play an important role.



INFRASTRUCTURE — Required infrastructure for ensuring that farmers reap the benefits of using efficient irrigation technology and enhancing crops includes access to water, the availability of reliable roads to transport crops to markets, and access to storage facilities. Both private and public sectors have important roles to play in easing these constraints.



REGULATORY ENVIRONMENT — On the regulatory side, the government has a role to play in ensuring that appropriate regulations are in place, which support smallholder agriculture (without crowding out the private sector) and ensure farmers' access to technology and markets. Investment climate is also an important factor in the efficient irrigation companies' decisions to launch operations in a particular market.



ACCESS TO INPUTS — The availability and quality of the other agricultural inputs used by the farmer, such as seeds, fertilizer, pesticides, and machinery, can influence or magnify the positive impacts of efficient irrigation technologies.



ACCESS TO MARKETS — The impact on smallholder incomes from using efficient irrigation technology depends on whether improved crop quality and higher yields translate into higher prices and increased market demand. The availability and reliability of off-takers, traders, and other buyers who purchase farmers' crops help reduce price fluctuations and put in place uniform food standards for the smallholders.



ACCESS TO FINANCE — Finally, the lack of access to finance to purchase efficient irrigation equipment is considered to be the main constraint to technology adoption. In Burkina Faso, for instance, only 5 percent of overall bank lending is devoted to agriculture due to high operating costs and high risk of the sector. An even smaller proportion supports efficient irrigation investments. These challenges are exacerbated for small farmers by their lack of credit history, collateral, and financial skills, as well as limited or no prior experience with efficient irrigation equipment. Government subsidies in India have facilitated the adoption of efficient irrigation technology by small farmers helping to generate the benefits shown in the Andhra Pradesh and Gujarat examples, which in turn benefited smallholders' livelihoods. Other sources of finance for farmers could include partnerships between private financial institutions and donors.

CONCLUSION

Investments in efficient irrigation play a key role in relieving the pressure on global agricultural systems as well as on the environment to meet the rising demand for food. They also generate marked improvements in farmers' incomes and standards of living, especially for small farmers who are the biggest contributors to agriculture in developing countries but typically are among the poorest and most vulnerable members of society. IFC is seeking to partner with financial institutions, donors, governments, farmers' groups, and equipment manufacturers to facilitate access to efficient irrigation technologies, aiming to transform the livelihoods of small farmers and promote highly productive yet climate-friendly agriculture.

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