Improved irrigation efficiency

Challenge: Too little water **Adaptation response:** Water efficiency and demand management

Description

Improving irrigation efficiency aims at minimizing water use within the agricultural sector while continuing to maintain optimal crop productivity rates. Water (and energy) efficient irrigation also provides a number of environmental and socio-economic benefits. High irrigation efficiency is becoming increasingly important due to the current decrease in available water resources and growing populations that drive expansion of agricultural activities.

Technological advances for improved irrigation include more efficient irrigation systems where water release can be controlled so that crops receive only the amount needed (e.g. pressurized irrigation systems such as drip irrigation). Other modern irrigation systems are self-propelled and include wireless sensors and GPS technology to improve site-specific and volumetric precision of water applications to match the needs of the soil and crops. Irrigation efficiency can also be improved through altering farming practices, such as crop rotation (plant crops according to seasons and soil conditions) and conservation tillage (leaving a previous year's crop residue on the field to reduce soil erosion and runoff) that help improve soil moisture conservation.

Regularly monitoring equipment and repairing damages/leakages in irrigation systems are also important in improving water use efficiency for crops. Improving access to information in regards to these measures, for example through farmer education programs, can help create incentive and influence the behaviour of farmers toward greater water-efficient management of irrigation systems. In addition, operational and legislative changes, for example the implementation of new water-rights laws, or creating incentives for efficient use, may also be effective in promoting irrigation efficiency.

Implementation

The first step is to evaluate the current levels and costs of water and energy use related to irrigation, and pinpoint where water and energy can be saved. Soil type, target crop types and water availability should then be assessed to calculate minimum water requirements and establish where it can be obtained. This should be carried out by an agronomist. Irrigation efficiency measures are often implemented as part of a plan to improve water efficiency on a broader scale, so a wide range of stakeholders are involved in planning. Educating farmers about the benefits and goals is an important step in development of an irrigation efficiency plan. These include decreased consumption, reduced costs, reduced energy requirements, maintained productivity, etc. Changes in irrigation methods may require changes to legislation. Implementing the changes is the next step and these may include installation of a new irrigation system and equipment, equipment repair, land levelling, water conservation techniques, on-site water recycling facilities, etc. Finally, a plan to monitor, maintain and evaluate the changes should be implemented to ensure high efficiency is sustained.

Environmental Benefits

- Reduces the amount of water extracted for irrigation purposes, and the amount of water lost (in surface runoff in the fields and evapotranspiration). Energy requirements for pumping and conveying

are subsequently reduced, minimizing the carbon footprint.
- Minimizes nutrient leaching and pollution of local watersheds due to decreased agricultural runoff.

Socioeconomic Benefits
- Reduces costs related to extraction and transport for irrigation.
- Contributes to food security and income generation (cash crops) due to high crop productivity.
- Increases water availability for other uses, especially during dry periods.

Opportunities and Barriers
Opportunities:

- Can improve agricultural production in dry areas with limited access to freshwater resources
- Extended environmental and economic benefits, including cost savings and reduced risks of water source degradation
- Climate change adaptation and mitigation benefits, including increased community resilience to changing water availability
- Understanding of the importance of water conservation in farming is likely to increase the chances of improving water efficiency in other sectors.

Barriers:

- Change in irrigation practices may change soil-water balance and reduce groundwater recharge
- Agricultural water costs are heavily subsidized in many countries, providing little incentive to change from conventional (high water consuming) farming methods

Implementation considerations*

Technological maturity:	3-5
Initial investment:	2-4
Operational costs:	1-2
Implementation timeframe:	2-4

* This adaptation technology brief includes a general assessment of four dimensions relating to implementation of the technology. It represents an indicative assessment scale of 1-5 as follows:
Technological maturity: 1 - in early stages of research and development, to 5 – fully mature and widely used
Initial investment: 1 – very low cost, to 5 – very high cost investment needed to implement technology
Operational costs: 1 – very low/no cost, to 5 – very high costs of operation and maintenance
Implementation timeframe: 1 – very quick to implement and reach desired capacity, to 5 – significant time investments needed to establish and/or reach full capacity
This assessment is to be used as an indication only and is to be seen as relative to the other technologies included in this guide. More specific costs and timelines are to be identified as relevant for the specific technology and geography.

Sources and further information

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