

# Optimizing Crop Production with Drip Irrigation



**A** major challenge in increasing the income of resource-poor and smallholder producers is to transform them into commercially competitive farmer-entrepreneurs. This requires improvement in quantity and quality of farm yields if they are to pursue market opportunities. A key constraint here is regular availability of water for crop production, especially at times when extended

dry seasons are experienced. Entering into market contracts, which require regular and timely delivery of produce, becomes problematic when water is limited. Improving on-farm water productivity to maximize yield quality, quantity and profitability is therefore important. Drip irrigation, which reduces water use by as much as 45%, shows promise in this respect. Figure 1 shows a drip irrigation setup.

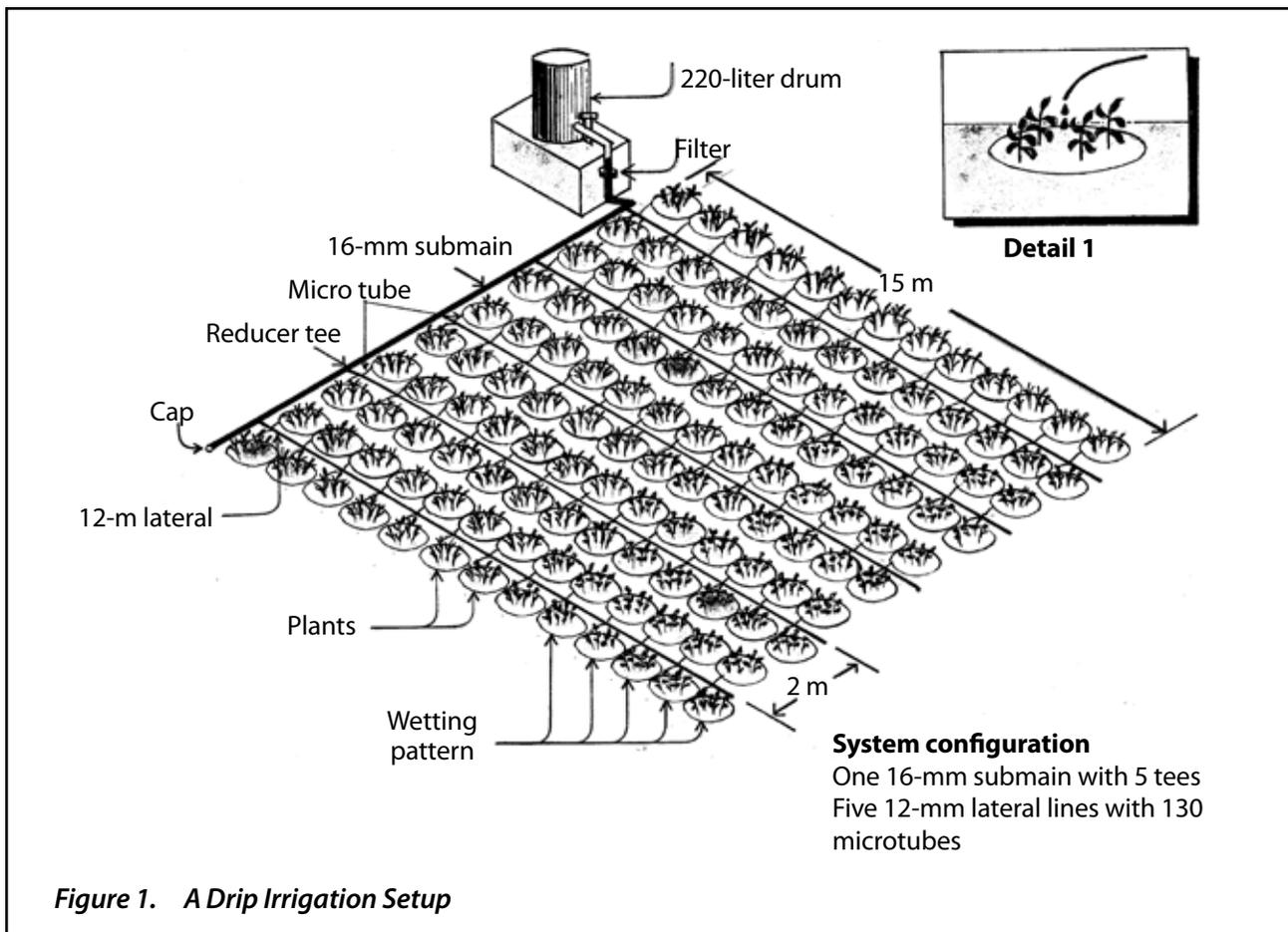


Figure 1. A Drip Irrigation Setup

## Applying farmer economics to promote drip irrigation

Before the support and involvement of the CGIAR Challenge Program on Water and Food (through the Innovative Market-based Strategies project), it was assumed that the lack of reliable water was preventing farmers in Cambodia from becoming commercial producers. It was therefore believed that, by demonstrating how drip irrigation reduces water use by 45%, farmers would be willing to buy and install the system on their farms. Unexpectedly, during the actual introduction and trials, farmers valued drip irrigation more for its labor-saving benefit than for its water-saving

benefit. To the farmers, the savings in labor translate into more time available for other income-generating opportunities, like having additional vegetable gardens for extra income. However, other constraints, such as low soil fertility, low market prices and a lack of technical skills, have to be addressed before farmers can invest in drip irrigation and enjoy these benefits.

**Farmers place more importance on the labor-saving benefit of drip irrigation than on its water-saving benefit.**

## Adapting PRISM

A useful approach to ensure water productivity in smallholder farm systems is PRISM (Poverty Reduction through Irrigation and Smallholder Markets).

This is a non-prescriptive, participatory approach to help farmers adapt to the specific challenges and circumstances that they face. The approach is undertaken in five phases (see Figure 2).

1. Situational assessment of the environment where smallholder markets will be developed.
2. Assessment of agricultural markets to identify promising opportunities and constraints to smallholders and enterprises.
3. Design of interventions that will strengthen the capacity of supply and trading enterprises to
4. Implementation of approved interventions, where necessary technologies, farm inputs, agricultural knowledge and market linkages are promoted.
5. Monitoring and evaluation for feedback and adjustments in interventions as market opportunities are realized.

deliver affordable and profitable technologies and services.

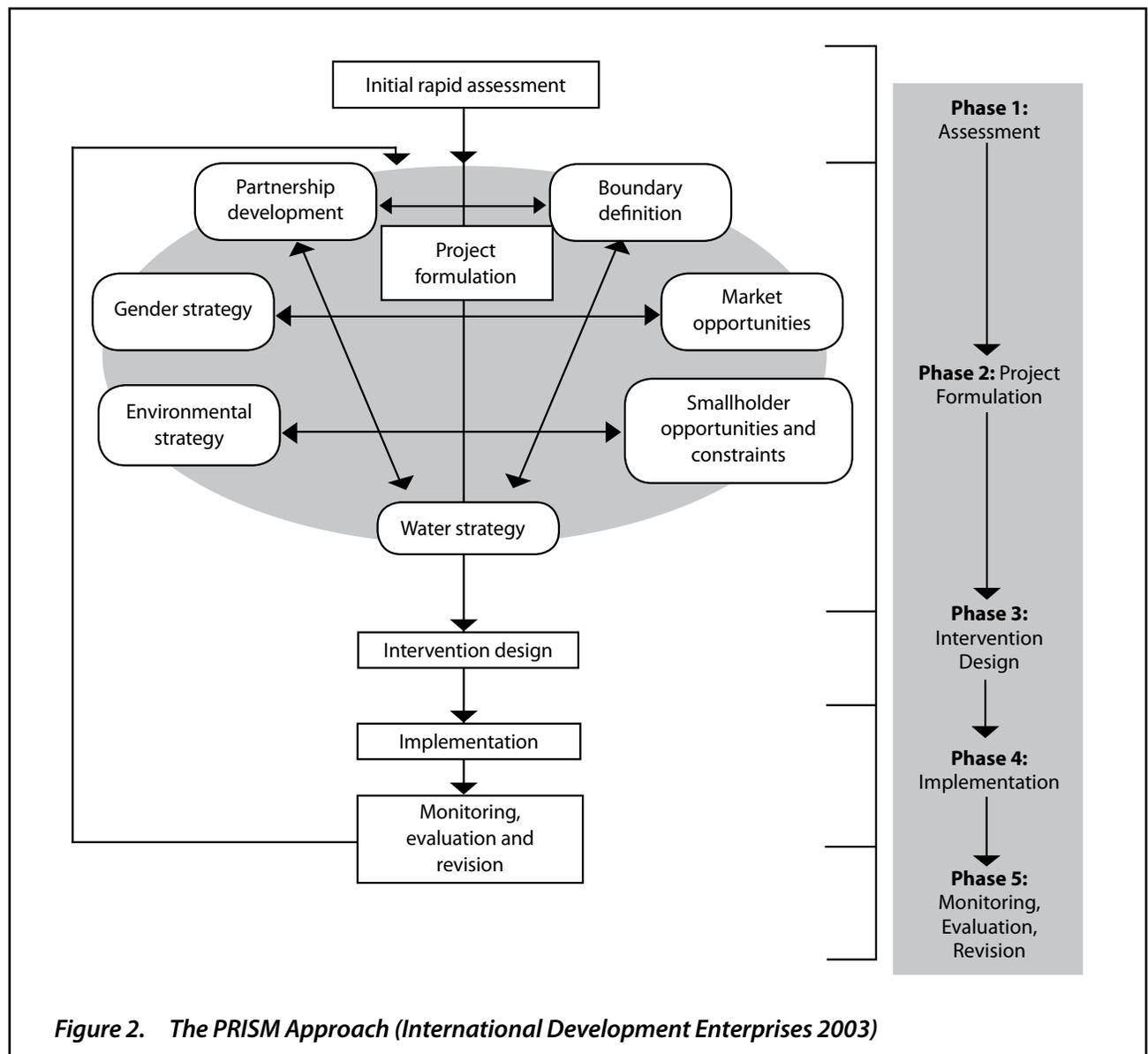
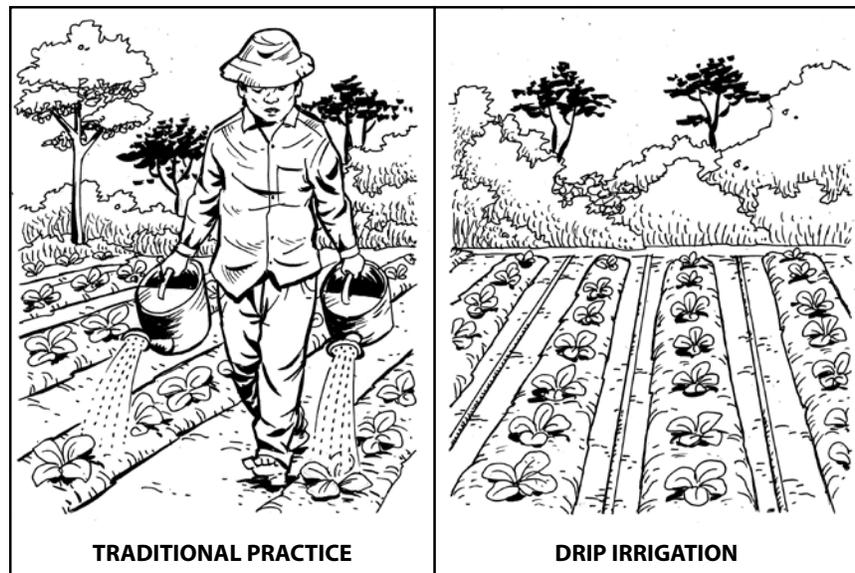


Figure 2. The PRISM Approach (International Development Enterprises 2003)

Important elements or activities of PRISM, which were adapted in the introduction and adoption of drip irrigation among vegetable growers, were:

- ◆ Selection of market clusters or geographical areas suited to production of the identified marketable crop mixes and high-value crops. This allows for crop diversification and cultivation of adequate production volumes that can be aggregated for transport to markets.
- ◆ Selection and training of farmers who will be private extension agents (PEAs). (Please refer to other articles in this sourcebook which deal with this topic in greater detail.)
- ◆ Establishment of field demonstration trials to promote and assess the ability of each intervention (i.e., drip irrigation, fertilizer deep placement [FDP], high-value crops, PEA support) to improve farmers' access to markets.
- ◆ Facilitation of business relationships among technology manufacturers, horticultural input suppliers, marketplace retailers and PEAs.
- ◆ Strengthening of the private sectors' ability to deliver the introduced technologies and services.

labor and water as the three major advantages of using drip irrigation. Other advantages expressed by farmers were better soil moisture and aeration, fewer weeds, easier irrigation, healthier crops, higher yields and higher net income. Farmers who tried drip irrigation on their current crops and planting systems reported a 3% increase in net income. On the other hand, those who used drip irrigation in combination with planting of high-value crops and deep placement of fertilizers experienced a 33% increase in net income over current irrigation practices.



In separate trials, deep placement of fertilizers increased yields by 20% without improved water techniques. When combined with drip irrigation, yields increased by 73% over traditional farmer watering and fertilizer practices. However, most farmers said that they also need to have special horticultural/technical skills and knowledge on the planting and making of rows or beds when using drip irrigation systems.

## What farmers say

In field trials by farmer-cooperators in Cambodia, more than 70% of them claimed savings in time,

### Drip irrigated plot trials showed

- ◆ 43% less water used,
- ◆ 15% higher yield, and
- ◆ 38% less labor for irrigation used.

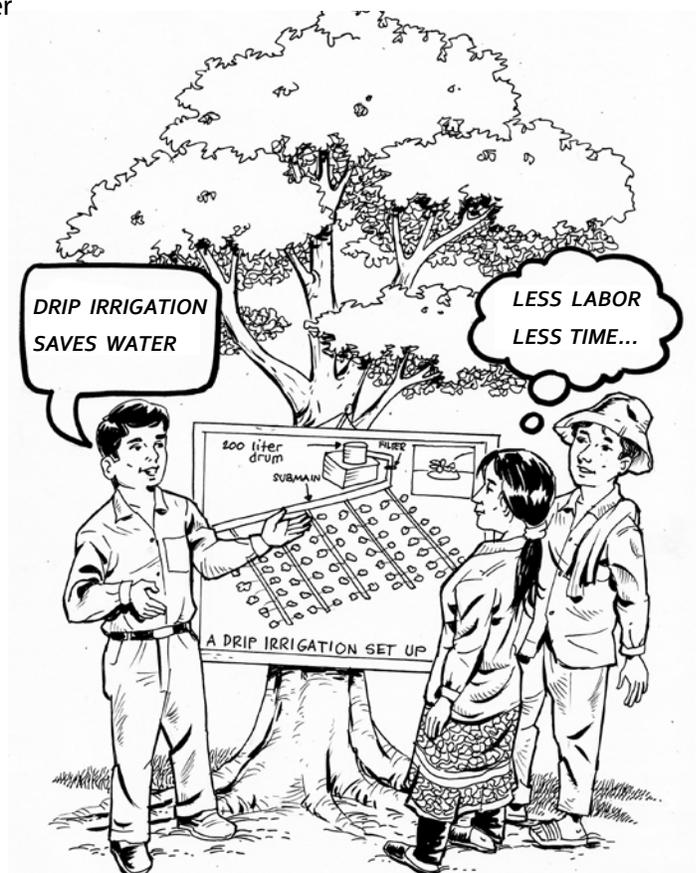
# Lessons learned

- ◆ Smallholder farmers value the labor- and time-saving aspect of drip irrigation more than the reduction in water use because it allows them to engage in other income-generating activities.
- ◆ Limited water availability, soil fertility constraints, low market prices for traditionally grown vegetables and lack of horticultural skills are major limitations to commercial vegetable production.
- ◆ A market-based strategy requires that farmers invest in soil fertility technologies, obtain up-to-date market information, have training in horticultural production, and know water control devices such as drip irrigation.
- ◆ Farmers need to be convinced that, by investing in drip irrigation, they will have higher net incomes.
- ◆ The introduction of high-value crops may be one approach to improve net income. These crops can be identified through market assessments.

Farmers need assurance that they will achieve higher net incomes, not just improved water productivity by investing in drip irrigation. To accomplish this, poor soil fertility, low market prices and lack of horticultural skills should be addressed alongside drip irrigation.

## Conclusion

Drip irrigation, in combination with appropriate crop management practices, improves water use efficiency and productivity. This may be the key to increasing farmer participation in market-oriented farming. In promoting the adoption of drip irrigation, more emphasis should be placed on its labor- and time-saving elements, along with improved access to inputs and information.



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### Partner Organizations

Canadian International Development Agency  
International Center for Soil Fertility and Agricultural Development  
International Development Enterprises  
Provincial Department of Agriculture, Cambodia  
The World Vegetable Center

### Key Reference

Roberts, M. 2008. *Demonstration and documentation of innovative market-based strategies to realize agricultural income through increased on-farm water productivity and market integration*. CPWF Small Grants Final Report. Colombo, Sri Lanka: CGIAR Challenge Program on Water and Food.

*Tags: SG502; Innovative Market-based Strategies*

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