CHAPTER 15: Low-cost family drip irrigation systems

INTRODUCTION

The drip irrigation is the most efficient method of water use for crop production. Yet millions of small farmers in the third world countries cannot adopt this technique, due to:

a) The high initial capital cost of the system installation and
b) The relatively sophisticated level of management.

To address these two critical constraints in water scarce areas a number of international NGOs (International Development Enterprises [IDE], Swiss Development Co-operation [SDC], UK Department for International Development [DFID] introduced a variety of low-cost non-surface technologies with the same technical advantages – water savings, increased yield – as conventional installations. The aim was to enable small-scale and poor farmers to utilize efficiently marginal quantities of water and to cultivate home gardens and other land for the production of food needed for the family and some trade.

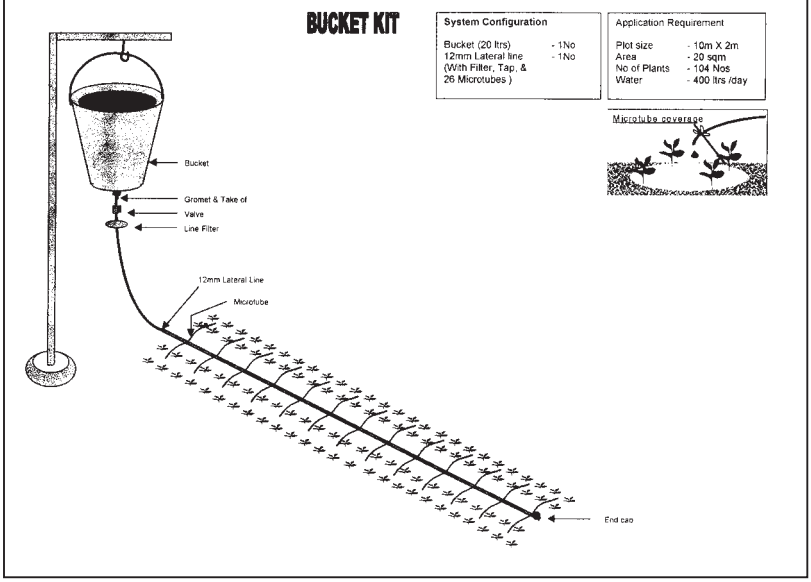
THE AFFORDABLE MICRO-IRRIGATION TECHNIQUES (AMIT)

The various new techniques promoted, named affordable micro-irrigation technologies (AMIT), are predominantly simplified drip and other micro-irrigation techniques for small land areas ranging from 100–500 m^2. Most of them (see Systems Configuration) – the shiftable dripper line, pitchers (ceramic pots) irrigation, the spaghetti micro-tubes, the bucket and drum kits, the PE hose with plain holes (perforated) at frequent spacing and the multi-exit drippers – had been tried in many countries long ago. All these techniques minimize the initial capital cost at the expense of available cheap labour. The concept is very promising and can be critical for poverty alleviation in many areas of the world.

Many efforts have been made since the early nineties to promote the application of these systems in poor areas in the Indian continent and in the Sub-Saharan Africa. Field trials and research projects were implemented to give answers to key questions on the suitability and profitability of these techniques on a sustainable commercial basis for the millions of poor small farmers around the world. No matter the efforts made, the grants and the subsidies given the customised AMIT systems have not generated any sound

interest among the farmers. It must be noted that the Government extension agencies were not in any approach to technology transfer (Figure 15.1).

FIGURE 15.1 - AMIT Configuration of the typical Bucket kit with one 12 mm lateral and spaghetti micro-tubes fitted on either side. Area covered 20 m² (by IDE).



More AMIT configuration are given at the end of the chapter.

Nevertheless, the AMIT systems have drawn the attention of the drip irrigation commercial enterprises. A leading commercial manufacturer in the field of modern irrigation developed the so-called family drip system (FDS). It is an improvement of the Drum kit. Other big companies have also included this type of system in their range of products under various names, e.g. “Easy Drip” etc.

THE FAMILY DRIP SYSTEM

This system is a complete drip irrigation unit; it operates by water gravity from a tank placed at 1–1.5 meters high. It is a closed piped gravity system, localized method, and solid seasonal installation, for growing vegetables, flowers and other horticultural crops on flat or minor slope land. It does not necessarily need any external power for normal operation. The average

system flow is around 1 m^3/h. Developed especially for family farming as a single production unit, the typical system sizes range from 500–1000 m^2. It is ideal for rural conditions and small-scale agricultural production in rural areas with water shortage and limited supply. It can be installed in greenhouses, low-tunnels and in the open and in the back yard of village houses.

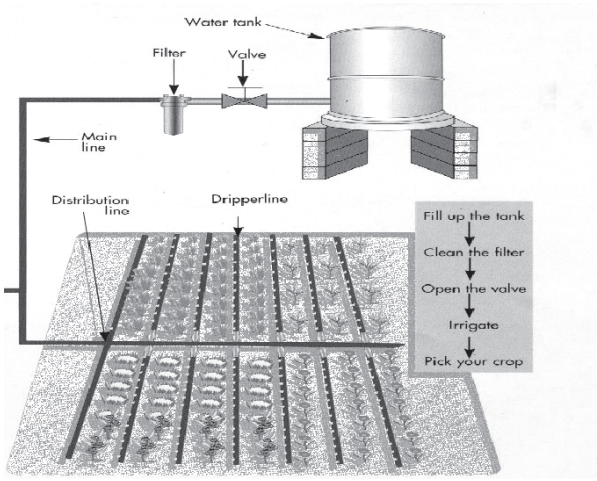
What is New in the Family Drip Systems?

- The pressure of the system is very low (0.1–0.2 Bar). No external power, electricity or other, is needed.
- The System Control Head is very simple and inexpensive. It consists only of a shut off (control) valve and a small screen or disk filter.
- The management of the Family kit systems is very easy. No skilfulness and/or expertise are needed.

SYSTEM LAYOUT AND COMPONENTS

The system layout is almost the same as in all closed pipes pressurized irrigation systems. A complete Family drip kit consists of four component parts - a "water delivery tank", "a simple control head", "the water distribution pipelines" and "the irrigation dripper lines". All component parts of the Family drip system are supplied in one case as a complete kit. Yet in many cases the farmers provide their own Water Tanks. This reduces the initial capital investment (Figure 15.2). The following description refers to the standard kit of the Family drip systems for approx. 500 m^2 land area.

FIGURE 15.2 - The Family Drip System.



The water tank

The water tank is of 300–3000 liters capacity. It can be a plastic barrel, one, two r more, an iron drum, a self-made with concrete or any other suitable tank. It is always placed 1–1.5 m above ground level, so that the system will have enough gravity for water pressure. Filling the tank method depends on the particular situation, by buckets, by a hand pump or a treadle pump or by a small diesel pump. The source of the water can be canals, or ditches, shallow wells, rivers and boreholes. The tank is always covered, to protect the water from the various impurities and the sunlight and prevent algae development. It has a drain tap at the bottom for frequent flush out and cleaning from suspended solid particles. A plastic tank outlet 1 inch threaded male is fixed on the tank at least 5 cm above the bottom. This fitting is necessary to be included in the system's parts, with the tank or separately (Figure 15.3).

FIGURE 15.3 - Locally made Tank for FDS.