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Simple Drip Irrigation System Manual

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SIMPLE DRIP IRRIGATION SYSTEM

Appropriate irrigation technology for smallholder farmers

Very Small (80m²)



Guidelines for Installation and Operation

SUPPLY CHAIN





1. INTRODUCTION

Drip irrigation is the most efficient method of irrigation because it applies water only to the plant root zone, where it is most beneficial. A simplified low-cost version of drip irrigation has been developed in Nepal and is called “Simple Drip Irrigation.” For the past several years this technology has been successfully used to irrigate both winter and spring vegetable crops by thousands of farmers in the hill region of Nepal.

However, despite its simple design, information is still required for correct installation of the system. Therefore, this booklet serves as a step by step installation guideline for a variety of layouts of a VERY SMALL sized system, which irrigates 90m also includes important operation and management techniques.

It is expected that these guidelines will be useful for lead farmers and field technicians to understand drip irrigation systems and enable them to assist farmers in correct installation and operation.

2. BENEFITS AND LIMITATIONS

Drip irrigation has number of advantages over other methods of irrigation. Even with a small volume of water ef is possible because water losses due to deep percolation and evaporation are very low. Unlike flood irrigation, with drip irrigation the entire plot is not wet, which drastically reduces weed growth. It is also possible to apply fertilizer with the irrigation water through the drip system. Because of these characteristics substantial water, labor and time are saved and

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crop yield is increased. The technology is easy to understand, install and operate, and if managed properly, system components last for more than five years. On average, the financial investment for the drip system can be recovered in less than a year with sales of high value crops.

Drip irrigation is useful for most land conditions, even regions with a scarce water supply and undulating land with porous soil where surface irrigation is unfeasible. It works best with crops grown in rows, and can be used in conjunction with other agricultural techniques, such as the use of plastic houses.

However, there are also some limitations of drip technology. It is not suitable for closely grown crops such as garlic, onion, and leafy vegetables. If filters are not properly maintained, the emitters can become clogged with solids. Similarly, if the system is not well attended there may be a chance of damage or theft of the components.

3. COMPONENTS OF THE SYSTEM



System components

| Component | Quantity | Sketch |
|------------------------------|------------------------|---|
| 50 Litre head tank | 1 | Ring Head tank |
| Tap outlet set | 1 set | Tap Level pipe Nut Washers |
| a) Tap | 1 | |
| b) Nut | 2 | |
| c) Washers | 1 | |
| d) Level pipe | 1 | |
| Filters | | Coarse filter Screen filter Fine filter |
| a) Coarse filter | 1 | |
| b) Fine filter | 1 | |
| c) Screen filter | 1 | |
| Main line set | 1 set | Main line "T" "L" |
| a) Main line, vertical (m) | 1 | |
| b) Main line, horizontal (m) | 6 | |
| c) Vertical "T" | 1 | |
| d) Horizontal "T" | 4 | |
| e) "L" | 2 | |
| Drip pipe set | 4 sets | Lateral drip lines Peg Baffle End plug |
| a) Lateral drip lines | 4 | |
| b) Pegs | 8 | |
| c) End plugs | 4 | |
| d) Baffles | 80 (20 per lateral) | |

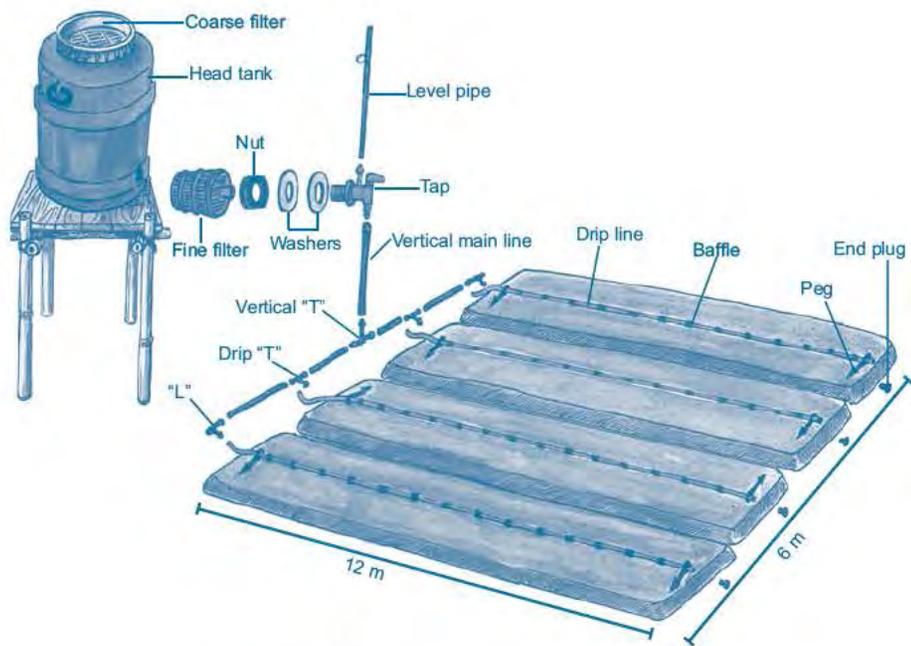


Diagram of the drip system components



4. INSTALLATION PROCEDURE

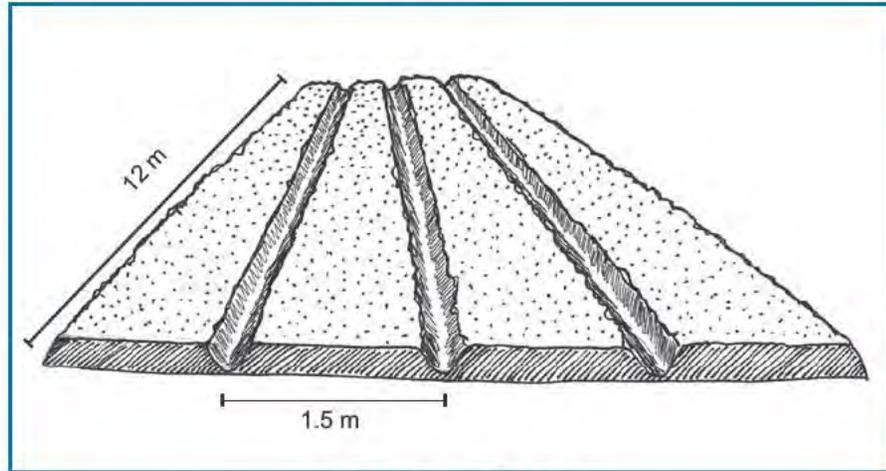
4.1 MATERIALS AND EQUIPMENT REQUIRED FOR INSTALLATION

| Component | |
|---|--|
| Drip system - 1 set | |
| Materials | |
| a) Bamboo or wood (2 metres long; 4 pieces) | |
| b) plank (60 cm long) | |
| c) rope | |
| Seed or seedlings (minimum 80) | |
| Clean water (Minimum 100 litres) | |
| Fertilizers | |
| Tools | |
| a) Spade | |
| b) Sickle | |
| c) Driller | |

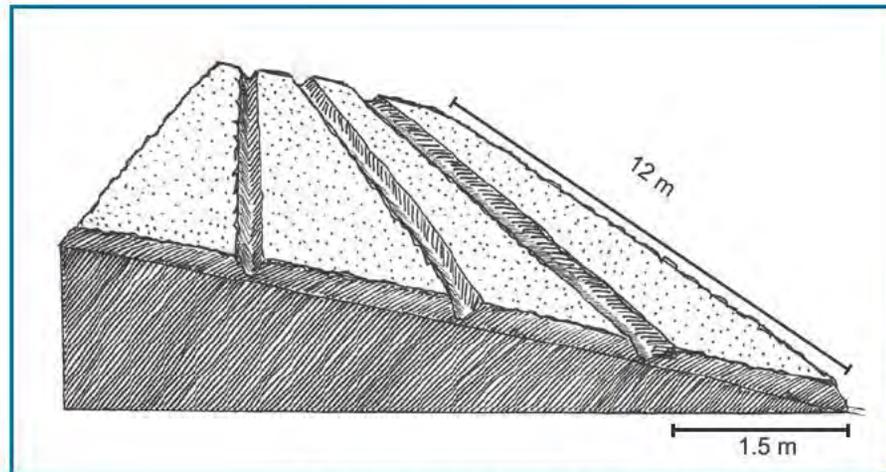
4.2 LAND SELECTION AND BASIC PREPARATION

Choose a land of dimensions 12 metres long and 7 metres wide. It is best to install the system on flat land. If flat land is not available, it is also possible to install drip system on sloped land.

Prepare four crop beds each 12 metres long and 1.5 metres wide as shown in the following diagram.

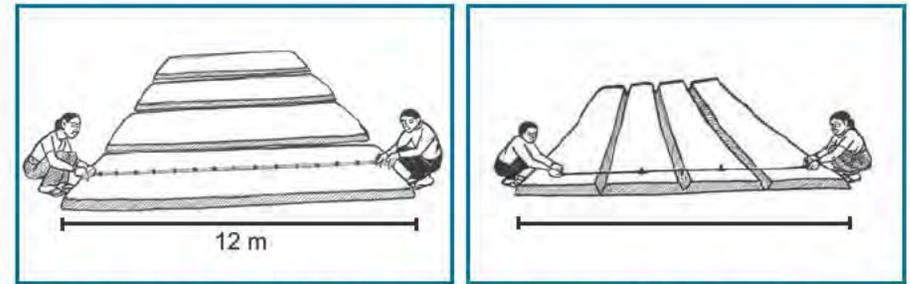


Crop beds on flat land



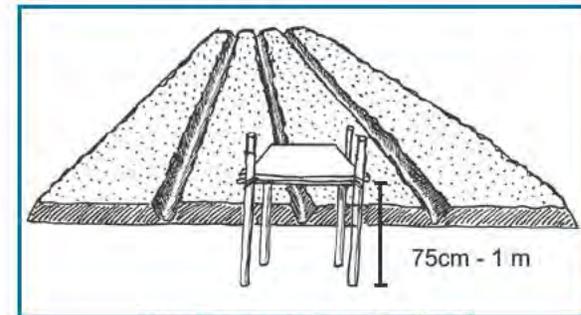
Crop beds on sloped land

Drip pipe and Mainline pipes can be used to measure the length and width of the plot.

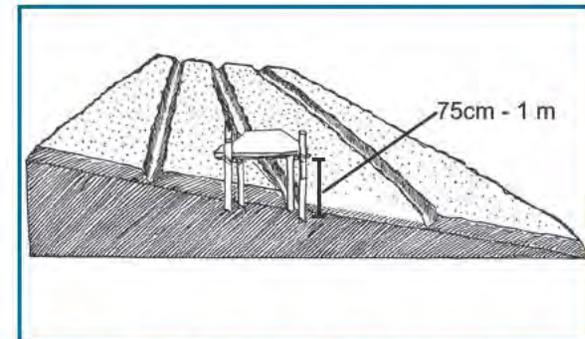


4.3 PREPARATION OF HEAD STRUCTURE

In order to ensure the required pressure to ef the drip system, a head structure has to be made to rest the head tank upon. This can be a simple table-like structure made with locally-available wood or bamboo. The most important feature of the head structure is its height. It must be between 75cm to 1 metre above the ground.



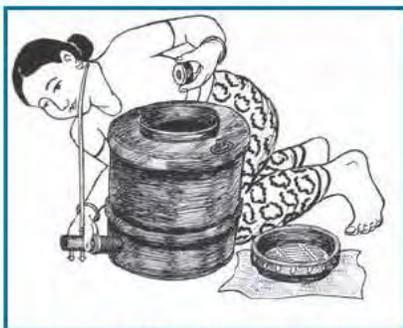
Head structure on flat land



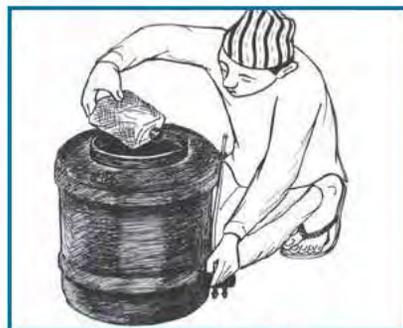
Head structure for sloped land

4.4 FIXING THE OUTLET TAP AND FINE FILTER

In order to fix the outlet tap, insert the threaded portion through the outlet hole of the tank. Put one washer over the threaded portion of the outlet tap from inside the tank. Then, holding the outlet tap with one hand, screw the nut clockwise onto the threaded portion of the outlet tap. From inside the tank, screw the fine filter onto the outlet tap. Keep the level pipe vertical by inserting on to the ring on the outside of the tank near the top (as shown in components table).



Fixing the outlet tap



Fixing the fine filter

4.5 FIXING THE TANK AND CONNECTING THE MAINLINE PIPES

Set the tank on the platform and cover the mouth with the net filter followed by the coarse filter. Attach the vertical mainline onto the outlet tap. Unroll the horizontal mainline. Attach one "L" to each end of the horizontal mainline, and one "T" to each of the remaining holes on the horizontal mainline. Lay the horizontal mainline on one edge of the plot such that the "Ts" and "Ls" are close to the middle of each bed.



Fixing the net filter and coarse filter



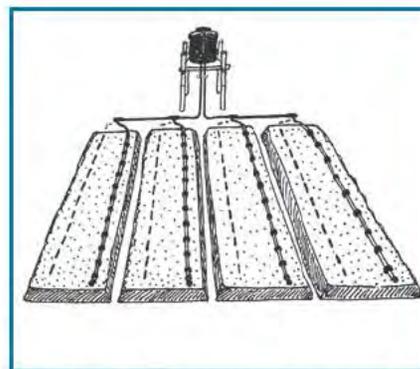
Connecting the mainline pipe

4.6 LAYING THE LATERAL DRIP

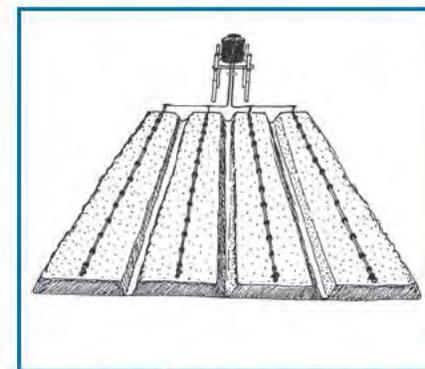
Unroll the drip lines and connect the open end of all 4 lateral drip lines with the previously attached "Ts" and "Ls." At this point in installation, two options for locating the position of the drip pipes are available, depending on the desired crop spacing. For crops such as cauliflower and cabbage, set up two lateral drip lines per bed (see Option 1.) For crops such as cucumber, eggplant, pumpkin, and gourds, use one lateral drip line per bed (see Option 2.) Now use the pegs to fix both ends of each lateral drip line, keeping the pipe straight.



Connecting the mainline pipe



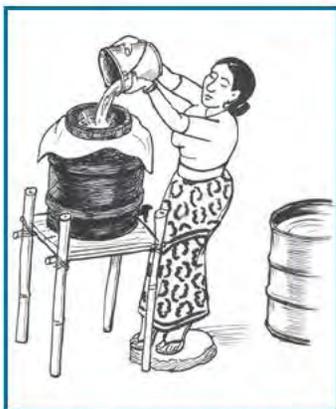
Option 1: Two crop rows per bed



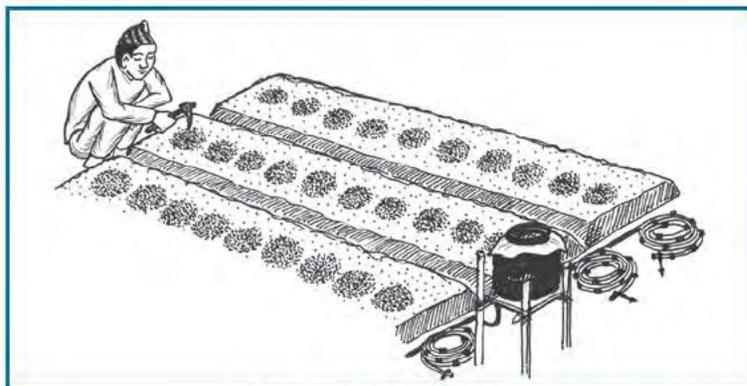
Option 2: One crop row per bed

4.7 LOCATING THE PLANTING SPOTS

With the gate valve closed, fill the tank with water to near full. Open the gate valve and check to see if the drippers are functioning. If any of the drip holes are creating spray along the lateral drip line, place a baffle over that drip hole. Allow the system to run for about 5 minutes. Close the gate valve and mark the wet spots. For "two crop row" (Option 1) installation, move the lateral drip line over to the next row of the same bed. Operate the system for 5 minutes once again to locate the planting spots in each second row per bed.



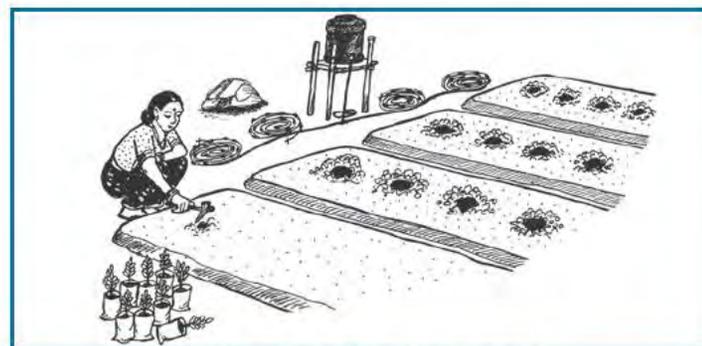
Filling the tank



Marking the wet spots

4.8 PREPARATION OF THE PLANTING

Using the wet marks created, dig the pits for planting and fertilizer according to typical agronomic practice. Operate the drip system and perform transplantation/seeding after the recommended 8-12 hour waiting period.



Preparing the planting pits

5. OPERATION OF DRIP SYSTEM

In order to properly operate the drip system, ensure the following:

- The drip pipes are correctly laid and the baffles are close to the plants
- There is no debris or dirt in the filters
- Fittings are tight enough to prevent leaking

With the gate valve closed, fill the tank with water near the top. Open the gate valve to irrigate.

Irrigation requirement during rainfall should be judged by observing the soil moisture. It is recommended to keep irrigate daily in the first month of the growing season. In later stages, the interval of irrigation can be extended up to 3 days.

The following table can be used as a reference for the daily irrigation requirements of both winter and spring crops in the middle hills of Nepal.

Schedule of irrigation

| Season | Months | Water (Ltr) | Volume (tanks) | Irrigation time |
|--------|-----------------|-------------|----------------|-----------------|
| WINTER | Oct | 100 | 2 | 30 minutes |
| | Planting: Oct | 150 | 3 | 45 minutes |
| | Harvesting: Jan | 200 | 4 | 1 hour |
| | Jan | 150 | 3 | 45 minutes |
| SPRING | Feb | 100 | 2 | 30 minutes |
| | Planting: Feb | 300 | 6 | 1.5 hour |
| | Harvesting: Apr | 250 | 5 | 1.25 hour |

6. MAINTENANCE AND STORAGE OF THE DRIP SYSTEM

For proper functioning of the drip system, the following maintenance is required.

6.1 CLEANING THE FILTERS

Depending on the turbidity of the water used, the coarse and net filters should be removed and cleaned at least once a week by rinsing with good quality water (for example, water used for domestic use).

6.2 FENCING THE CROP FIELD

It is recommended to put up a fence around the crop field where the drip system is in use in order to prevent damage or theft of the equipment and to keep animals from harming crops.



Cleaning the coarse filter

6.3 FLUSHING OF PIPES

If the filters are not maintained properly, the drippers can become clogged. To clean the clogged drippers, insert a pin through the drip hole. If several drippers are found to be blocked simultaneously, it is suggested to flush the pipe by opening all the ends of the pipeline until dirt from the pipes is completely removed.

6.4 PROTECTING THE TANK

During non-irrigation hours, it is recommended to cover the tank with a plastic sheet or old cloth to extend the life of the equipment.

6.5 STORAGE

Every component of the drip system should be stored in a safe place during the rainy season when irrigation is not required. However, drip systems in use under plastic houses may be used throughout the rainy season and do not require storage.

7. WHERE TO PURCHASE THE TECHNOLOGY

Currently, three companies are assembling and distributing the drip systems. These companies distribute the drip systems to local dealers in various regions of Nepal. In conjunction with partner organizations, IDE is assisting in market promotion and technical services of the drip system technology. In order to purchase a drip system, contact one of the companies listed below and they will provide information on the local dealer nearest to you.

THAPA MOLD AND DIES (TMD)

| | |
|----------------|----------------------|
| Business Type | Manufacturer |
| Location | Gwarkhu, Lalitpur |
| Telephone No | 01-5203688 |
| Contact person | Mr. Chandra B. Thapa |

JANASEWA AGRO INPUT CENTER

| | |
|----------------|------------------------------|
| Business Type | Assembler cum Distributor |
| Location | Chipledhunga, Pokhara, Kaski |
| Telephone No | 06-1533124 |
| Contact person | Mr. Narayan Gautam |

SITAL AGROVET TRADING CENTER

| | |
|----------------|---------------------------|
| Business Type | Assembler cum Distributor |
| Location | Birendranagar, Surkhet |
| Telephone No | 08-3520778 |
| Contact person | Mr. Dilli R. Pandey |



Using the drip kit for irrigating vegetables



Filling the head tank with water