IRRIGATION SYSTEMS FOR SMALLHOLDERS

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INTRODUCTION

In some areas of Papua New Guinea, especially those areas with a distinct dry season, many farmers are installing irrigation systems. This allows them to control the supply of water to their crops. They can then grow crops successfully throughout the year.

In order to help these farmers it is important that D.P.I. Extension Officers understand the basics of irrigation design and operation. With this knowledge they will be able to solve simple problems when they occur.

TYPES OF IRRIGATION USED IN PAPUA NEW GUINEA

1. Spray

Water is sprayed from nozzles. It falls like rain on the soil and crops.

Good points:

It is easy to control the amount of water.

The equipment is usually portable (can be moved).

It is cheap to operate.

The amount of water being sprayed is easy to see.

Bad points:

The equipment is damaged easily.

Water splash can spread disease.

Water may wash chemical sprays from plants.

2. Flood

Water is spread on the ground or controlled in furrows.

Good points:

The equipment is cheap.

It is usually portable.

It is cheap to operate.

There is no washing of leaves or fruit.

Bad points:

It is harder to control water application.

Land preparation, surveying and levelling are expensive.

It is more labour intensive.

3. Trickle or drip

Water is dripped into the ground from tubes usually underground.

Good points:

It is easy to operate.

Water can be dripped exactly where it is needed.

This system increases yields on high density crops.

It is cheap to operate.

Bad points:

The equipment is expensive.

It is practical for use on small areas only, or on high value crops, because the equipment is so expensive.

Equipment is damaged easily.

HOW TO DESIGN A SYSTEM

A good engineer should design the irrigation system that the farmer needs. To assist the engineer in designing an economic system, extension officers can help farmers supply the following information.

The land

- Is the land suitable for irrigation? For example is the soil type good for growing crops; is it close to water and is it fairly level?
- Draw a map of the proposed irrigation area showing all distances, size and shape of the fields and distance to the water supply.
- If possible show any changes in height or direction of slope of the land.

The water source

- Is it permanent?
- Is there enough water to irrigate from?
- Is there a water source deeper than 1.5 metres?
- Draw a plan of the river bank where the pump should be placed, showing the vertical distance from water level to the top of the bank. Show the highest flood level and the lowest water level recorded there.

The crop and the farmer

- What type of crops are to be grown?
- How much can the farmer afford to pay or what are his chances of a loan?

With this information the engineer should be able to design a system to suit the land and the farmer.

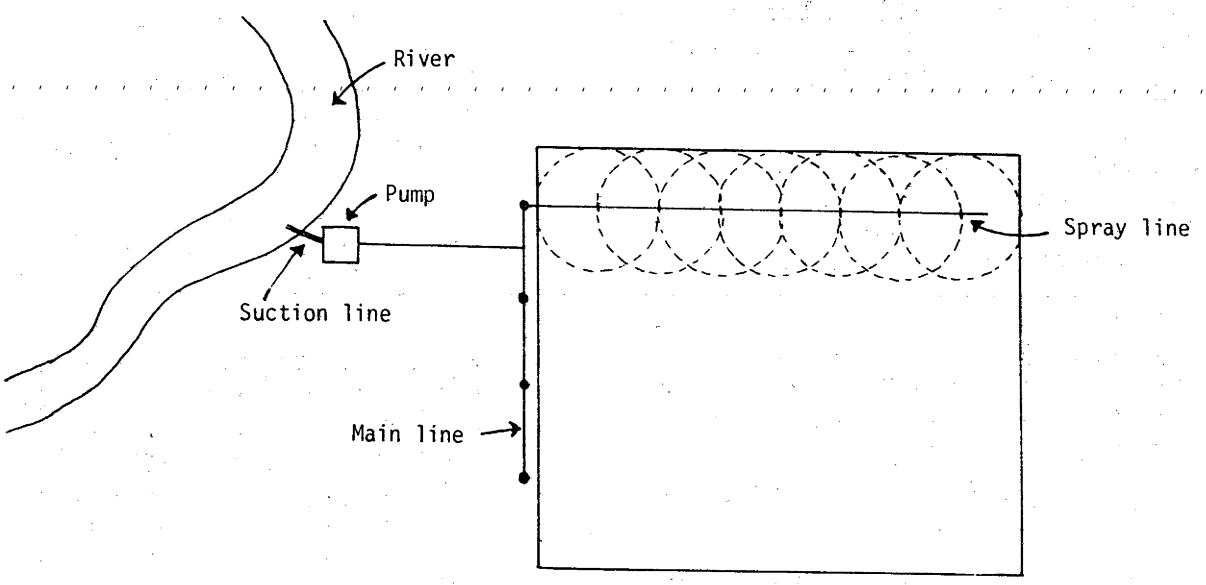
The irrigation system which is used most often in Papua New Guinea is the spray system. This system can be used on a range of different types of land, and it is the easiest system to install and operate. We will talk about the spray irrigation systems in a little more detail.

A SPRAY IRRIGATION SYSTEM

A spray irrigation system consists of a pump and motor which draws water from a river, forces it along delivery tubes and then through small nozzles which spray the water onto the field.

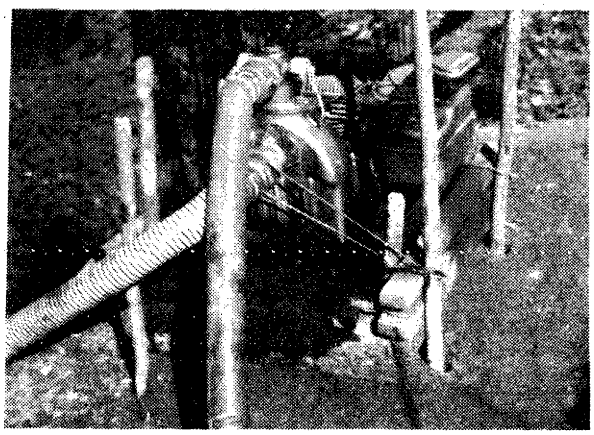
The motor is usually run using diesel fuel. The system operates with water at high pressure, and the nozzles usually rotate, spraying the water in a circle. This gives a more even water distribution.

Many types of spray irrigation systems are available. You should talk to your local supplier who will help you choose the best one for your situation.



Layout of a spray irrigation system

Irrigating seedling beds using the spray system



Pump used to run a spray irrigation system

Spray irrigating vegetables

In the lowlands the following assumptions can be made to allow enough water for the best vegetable growth.

(a) The time between each irrigation on one area of land should not exceed 5 days.

(b) The area should receive at least 30 mm of water every 5 days - i.e. 2-3 hours of irrigation.

(c) Application rates should be 12 mm per hour or less.

(d) Operating pressures should be above 280 kPa ('kPa' is a measure of pressure) at the sprinkler head.

Problems

If the pump does not work properly, stop the unit. In 90% of cases the problem is pump suction.

First check that the pump is fully primed, i.e. water is filled through the discharge tube of the pump until the suction line and pump are full of water.

Then check that all belts are tight and that the drive motor is operating at the correct speed.

The following are some more common problems and points to check when operating a sprinkler irrigation system:

1. The foot valve is not working. Check that the foot valve is not sitting in the mud or that the valve is not jammed open or closed (with a stick, for example). The valve may have worn out.

2. There is a leak in the suction line. Water pumps do not pump air. Any air that is sucked into the pump will stop it working. Check all joins in the suction line for air leaks. Treat the suction hose with care. It is expensive and is easily damaged.

3. The pump is too high above the water. The pump should not be more than 6 metres above the water. Move it lower.

4. There is an air lock in the suction line - the suction hose should always slope steadily downwards to the water and never loop over a tree or stump.

5. Check that the plug has been put in the end of the spray line.

6. Water is leaking from the pump drive shaft. If this happens, it is usually time to call in the pump dealer! Some pumps are meant to drip water and some not. If the pump is still not working after all other points have been checked, the mechanical seal may need replacing.

You should be able to cure most problems! REMEMBER:

. Air on the suction side is the enemy.

. Common sense is your friend.

. When all else fails, call the supplier.