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Introduction to basic crop production, post-harvest and financial management practices:

a training manual for smallholder vegetable farmers in western Pacific island nations



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a training manual for smallholder vegetable farmers in western Pacific island nations

P. Seta-Waken, R. Malie, P. Utama and G. Palaniappan

Editors: C.J. Birch and B.E. Chambers



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Seta-Waken P., Malie R., Utama P. and Palaniappan G. 2016. Introduction to basic crop production, post-harvest and financial management practices: a training manual for smallholder vegetable farmers in western Pacific island nations (ed. by C.J. Birch and B.E. Chambers). Australian Centre for International Agricultural Research: Canberra, ACT.

ACIAR Monograph no. MN176

ACIAR Monographs – ISSN 1031-8194 (print), ISSN 1447-090X (online)

ISBN 978 1 925436 20 4 (print)

ISBN 978 1 925436 21 1(PDF)

Design by Peter Nolan, Canberra

Cover: [top] Tapini women making a bani compos from natural materials; [middle] Philmah Seta Waken (NARI) demonstrating to Tapini women drip irrigation for tomatoes; [bottom] Poela Utama (FPDA) demonstrating post-harvest methods to Tapini women at their training on 16 August 2013. Photos: Barbara Chambers.

Foreword

Vegetable production on small farms in Pacific countries improves the nutritional status and security of these communities and enhances income opportunities for farming families. Most Pacific island countries are not self-sufficient in access to fresh produce to meet the needs of people in towns and cities, and fresh produce represents one of the few sources of cash income for many poor rural households in the region. There are substantial opportunities to improve supply to meet the existing demand, to the benefit of rural and urban people alike. This situation was identified in the ACIAR project SMCN/2008/008 'Increasing vegetable production in Central Province, Papua New Guinea, to supply Port Moresby markets', led by Dr Colin Birch of the University of Tasmania, and also applies to other areas of Papua New Guinea (PNG) as well as countries such as Solomon Islands, Vanuatu, Fiji and Kiribati.

While vegetable production and marketing are becoming increasingly rewarding for smallholder farmers, they are also increasingly complex, requiring an understanding of production, post-harvest and business management. Training is an essential ingredient for empowering farmers to manage their farming businesses, and good training requires good resources.

This manual was originally developed as a project tool to assist vegetable farmers in PNG, and now incorporates elements of many ACIAR-funded projects in PNG, Solomon Islands, Vanuatu and Fiji. I hope that it will be of great assistance to trainers and extension personnel as they endeavour to improve incomes and nutrition in Pacific communities. Sadly, Dr Birch passed away during the final stages of preparing this manual.



Dr Nick Austin

Chief Executive Officer

Australian Centre for International Agricultural Research

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Project identification

SMCN/2008/008 Increasing vegetable production in Central Province, Papua New Guinea, to supply Port Moresby markets

Acknowledgments

This manual is derived from the Training Needs Analysis Workshops designed by the social research team in 2011, 2012 and 2013 for farmers in Rigo/Koiari, Hiri, Sogeri and Tapini districts of Central Province, Papua New Guinea. Workshops were conducted and analysed by staff of National Agricultural Research Institute (NARI), Fresh Produce Development Agency (FPDA) and Pacific Advent University (PAU); and Australian Centre for International Agricultural Research (ACIAR) project team members from Australia. The contribution of the many participants in those workshops is acknowledged. We would particularly like to sincerely thank the Central Province women, men and youth for their generous sharing of traditional knowledge and skills in the training workshops.

The financial assistance of ACIAR for the production of this manual is also gratefully acknowledged.

Background

This manual arises from a series of training workshops conducted as part of the ACIAR-funded project SMCN/2008/008 'Increasing vegetable production in Central Province, Papua New Guinea, to supply Port Moresby markets', and also draws on findings and outcomes from other ACIAR-funded projects in Papua New Guinea (PNG), Solomon Islands, Vanuatu and Fiji.

In the PNG work, women and men smallholders from low-, medium- and high-altitude regions in Central Province participated in joint and gender-separated workshops conducted from 2011 to 2013. The first was a Training Needs Analysis Workshop and the second a Training Development Workshop on aspects of the value chain that were identified by smallholders as problematic to them. In the first set of workshops, participants were shown a series of photographs from a typical value-chain (from soil preparation and planting to harvest and sales) and first asked in small village-based groups to talk about them in terms of their own competencies and capacities to undertake such activities. These responses were then shared with the whole group, and women, men and youth then ranked them in order of priority of their training needs by village. In the second set of workshops, men and women were then separately recalled in district groups for the training that had been requested. The training needs identified by active engagement with the smallholders were categorised as farm production (soil management, crop protection and irrigation), post-harvest (product readiness, postharvest treatment and negotiating price) and business skills (banking and bookkeeping). The National Agricultural Research Institute Southern Region Centre (NARI SRC) at Laloki provided the training on farm production activities, and the Fresh Produce Development Agency (FPDA) Southern Region provided the training in post-harvest and business skills.

Because of the similarity of the production systems and economic realities in other parts of PNG and the island countries of the Pacific, the training material prepared following the workshops referred to above is presented here in a form that can also be used in other areas. The material in this publication provides basic information and is meant to be used in conjunction with the trainer's own experience and knowledge of local conditions, practices and culture, and is sufficiently flexible to allow delivery of the specific items needed by particular groups of farmers.

SECTION 1

Basic Farm Production Training

Introduction

Basic Farm Production Training is the first of a series of training activities presented in this publication. The first three topics provide information on farm production activities, in particular basic soil management and an introduction to irrigation and irrigation practices, including drip irrigation systems and crop protection. The notes provide foundation material, leaving the details of local adaptation and expansion of content to the trainer, who can bring local experience and knowledge to bear in the training sessions.

Learning objectives

By the end of this training, participants will be able to:

- ▶ identify soil management practices and appreciate the importance of soil management;
- ▶ understand some new irrigation technologies and how they can adopt them in their current farming practices;
- ▶ identify common weeds, pests and diseases of vegetables and understand some management practices;
- ▶ understand how to make their own plant-derived pesticides and appreciate the resources in their surroundings that are available to use; and
- ▶ understand the importance of safety when using chemicals for application on their farms.

TOPIC 1

Basic Soil Management Practices

Objectives

By the end of this topic, you should be able to:

- ▶ describe soil management and how it is implemented;
- ▶ describe ways to properly manage soil; and
- ▶ understand soil management practices that contribute to the maintenance of soil fertility.

Introduction

To maintain their capacity to support plant growth and high crop yields, soils need to be managed properly. Losses to capacity can result from landslides, flooding and erosion. Soil management is designed to minimise the impact of these processes, and means using soils wisely so that they can continue to support plant growth over the long term.

Soil Management Practices

Soil management practices include mulching, crop rotation, cover cropping and land fallowing.

Mulching

What is mulching?

Mulching is covering the surface of a bed prepared for planting vegetables with dry grass, leaves, sawdust or food peelings.



Mulching materials (L to R)—sawdust, food peelings, leaves and a grass mulched crop

Why is mulching good?

Mulching helps to:

- ▶ hold back water and keep crops cool during the dry season
- ▶ minimise weed growth
- ▶ prevent soil erosion by reducing the impact of both raindrops on the soil surface and run-off
- ▶ improve soil fertility and structure.



Mulching (L to R) holds back water and controls weeds and soil erosion

Types of mulches

Mulches can be divided into two types:

1. **Organic mulches**—the most common ingredients are dry grass, leaves, sawdust and crop by-products such as peanut shells, coffee hulls, rice hulls, coconut husks and corn cobs.



Types of organic mulches

2. **Artificial mulches**—include polyethylene plastics, fibreglass, aluminium foil, sand, stones and gravel.



Types of artificial mulches (L to R)—light-coloured plastic, black plastic

Crop rotation

What is crop rotation?

Crop rotation is the process whereby a first crop (e.g. peanuts) planted on the land is followed by a different crop (e.g. cabbage) on the same land after harvesting the first crop. Figure 1.1 shows an example of crop rotation. Non-legume crops (e.g. corn, aibika and cabbage) will use up nitrogen in the soil, and legume crops (e.g. peanut and snake bean) will add nitrogen to the soil. After harvesting, the non-legume crops will be rotated, as shown by the arrows, and the cycle will continue.

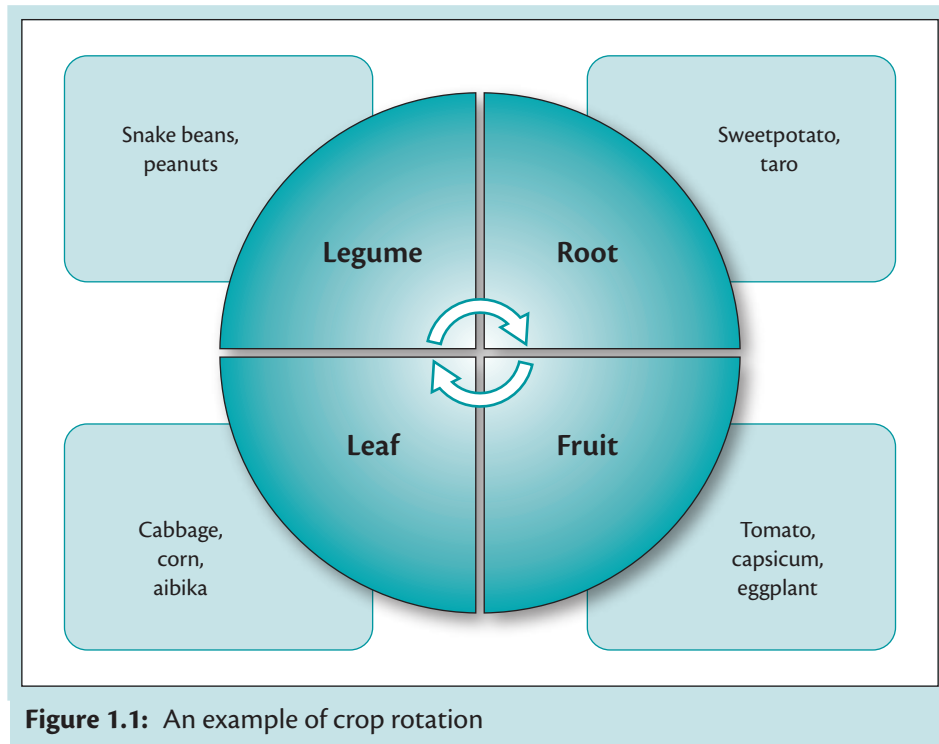


Figure 1.1: An example of crop rotation

Why is crop rotation good?

Crop rotation is good because:

- ▶ It avoids disease attack on crops in the previous plot.
- ▶ It adds nitrogen in the soil by growing legume crops.
- ▶ It prevents soil erosion by growing dense (foliated or vined) crops such as snake beans.
- ▶ Varieties of crops are grown for the farmer's use.



Examples of crops able to be grown in rotation

Cover cropping

What is cover cropping?

Cover cropping is when the soil surface is protected by a cover of plants, usually certain legumes that also contribute nitrogen to the soil. An example is growing legumes such as *Pueraria* or *Centrosema* in a plantation of coconut, cocoa, oil palm or rubber.

Why is cover cropping good?

Like green manuring, cover crops help to:

- ▶ reduce weed growth
- ▶ conserve soil moisture
- ▶ add nitrogen to the soil
- ▶ improve soil organic matter content and soil structure
- ▶ prevent soil erosion.



Pueraria sp.—legume plants



Centrosema sp.—legume plants

Land fallowing

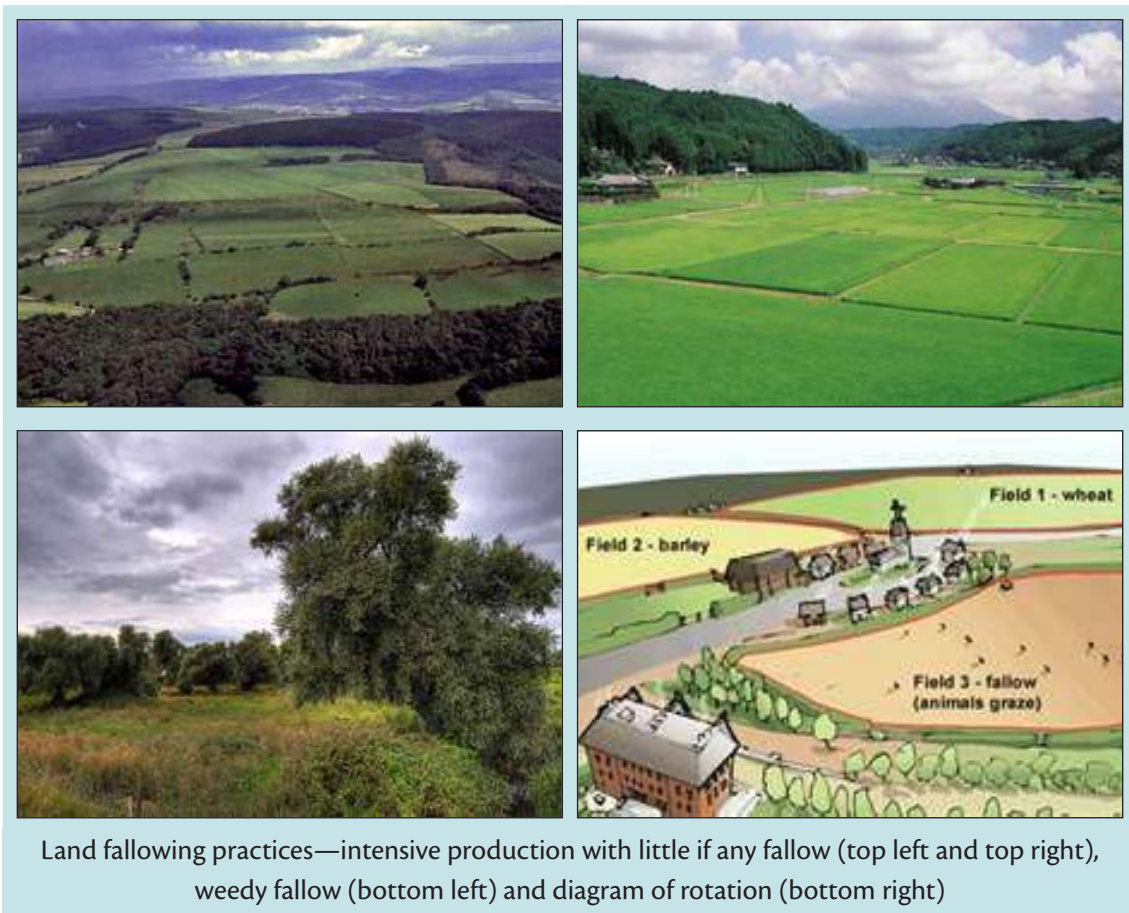
What is land fallowing?

Land fallowing is when the land is rested from cropping for a certain period of time. In the past the fallow period was 10–25 years, but today these periods in some areas are only 3–5 years as a result of land pressures due to increases in population.

Why is land fallowing good?

Land fallowing helps to:

- ▶ restore the organic matter content of the soil
- ▶ restore soil fertility
- ▶ restore soil structure
- ▶ reduce or prevent soil erosion.



Methods of Fertiliser Application

There are four methods of applying fertilisers to crops: broadcasting, controlled placement, foliar (leaf) application and fertigation.

Broadcasting

The fertiliser is held by hand or machine and distributed over the soil surface and then mixed into the soil layer. This method is easy to use; however, the crops may not utilise the fertiliser as it may be out of reach of the crop roots or may be distributed unevenly. Also, the fertiliser is usually applied before the crop is planted and if it rains heavily some loss of fertiliser may occur due to leaching.



Broadcasting fertiliser in the field

Controlled placement of fertiliser

The fertiliser is placed as a band to the side of the seedlings, about 10 cm from vegetables such as cabbages, tomatoes and capsicum. If seeds are planted the fertiliser is placed in the planting holes then covered with some soil before the seeds are added. Coverage of the fertiliser with soil is essential to prevent 'fertiliser burn' because of the high concentration present in contact with the seeds or seedling roots. The placement method is effective because the fertiliser is provided directly to individual plants. However, it requires more time and excess (i.e. too much applied) fertiliser may kill the crops due to severe fertiliser burn.



Placement of fertiliser to plants

Foliar (leaf) application

Some fertilisers can be mixed in water and sprayed with machinery (either manual or motorised sprayers) onto the leaves of growing crops. This has to be done carefully as too much fertiliser will injure the plants.



Foliar application

Fertigation

In this method the fertiliser is mixed in a tank and a motorised pump is used to apply it via an irrigation pipe or fixed irrigation sprayers/sprinklers onto the soil at the base of the crop. Fertiliser can also be mixed in a bucket with water and applied using a watering can but, again, care is needed to avoid placing too much in contact with the plants, resulting in fertiliser burn.



Fertigation methods—by watering can (L) and in trickle irrigation (R)

When can fertiliser be applied?

Fertilisers can be applied:

- ▶ before planting (*pre-planting* or *pre-emergence*);
- ▶ at planting; or
- ▶ during the growth of a crop (*post-planting* or *post-emergence*).

The timing depends on the types of crops and fertilisers.

Activity 2

► Think back to your village garden/farm. Do you use fertilisers? Fill in the table.

Name of crop	Is fertiliser applied?	What type of fertiliser is used?

► When (time) do you apply fertiliser?

.....

.....

.....

.....

.....

.....

► What method do you use to apply fertiliser?

.....

.....

.....

.....

.....

.....

Manuring Techniques

What is manure?

Manure is waste materials from animals or plants that are added to soil to improve its fertility. Manure is used as an organic fertiliser that contributes to soil fertility by adding organic matter and nutrients.

Advantages and disadvantages of manuring

There are advantages (desirable or 'good' effects) and also disadvantages (undesirable or 'bad' effects) of using manure. Table 1.1 summarises the advantages and disadvantages of manuring.

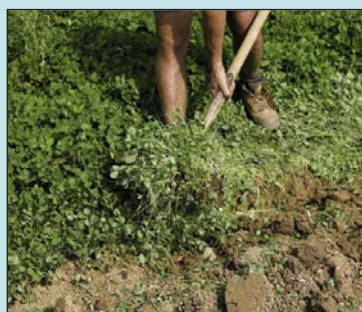
Table 1.1: Advantages and disadvantages of manuring

Advantages 😊	Disadvantages ☹️
<ul style="list-style-type: none"> Increases the content of soil organic matter and nutrients Improves plant nutrition Improves soil structure Increases crop yield 	<ul style="list-style-type: none"> Labour intensive Longer time to see the result Has an odour/smell Heat generated can harm plants

Types of manure

There are three main types of manure that are commonly used:

1. green or plant manure
2. farmyard or animal manure
3. 'tea' or liquid manure.



Green manure



Animal manure



'Tea' or Liquid manure

Green or plant manure

What is a green or plant manure?

Green manuring is the process of growing legume plants such as mucuna or mungbean in well-prepared soil until they are leafy. They are ploughed into the soil 2 months after sowing (at 20–30 cm tall) because their tissues are very soft when they are very young, and they rot and decay very fast.

Green manure plays a similar role to a cover crop but has a shorter preparation time. Most green manure crops are legumes such as mucuna, pueraria and mungbean.

Why is green manuring good?

Green manuring:

- ▶ improves the soil organic matter content, fertility and structure;
- ▶ minimises or prevents erosion; and
- ▶ conserves soil moisture.



Green manuring

Farmyard or animal manure

What is animal manure?

Animal manure refers to waste such as dung and urine from animals. Most common manures used are from poultry droppings, and pig or cattle dung, and are used in the form of solid manure directly applied to the soil about 2 weeks before planting.

Note that manure must not be applied fresh to the base of your crop because as it decomposes it produces heat that may burn and harm your crop.

Animal manure is very useful for improving soil fertility. Most animal manures contain nutrients, so they can also be referred to as solid fertiliser. The rate of decomposition of the manure depends entirely on the type of animal waste or dung used.

The effectiveness of the manure depends on the timing and application methods, and of course the type of manure, used. Uniform application of manure must be done 2 weeks prior to planting as it will be in a solid form. However, if planting is delayed for more than 2 weeks after application, the soil is likely to lose nutrients through erosion or leaching. To avoid losing nutrients if planting is delayed, legumes may be planted as a cover crop, as the nutrients will be absorbed by the legumes.

Note that one of the main disadvantages of using animal manure is the contamination of water through leaching or run-off from the soil surface.



Chicken manure

Cattle dung

Goat manure

'Tea' or liquid manure

What is 'tea' or liquid manure?

'Tea' or liquid manure is derived from the two main manure sources (i.e. plant and animal). Depending on the source used (Table 1.2), 'tea' or liquid manure is labelled differently—if you use animal or farmyard manure it is called **animal 'tea' manure**; and if you use plant manure it is referred to as **plant 'tea' manure**.

Steps in preparing 'tea' manure

The steps in preparing either animal or plant 'tea' manure are the same (Table 1.3; Figure 1.2, Figure 1.3). However, there are slight differences in the storage period; animal 'tea' manure will last longer than plant 'tea' manure.

Materials and steps needed for animal and plant ‘tea’ manure

Table 1.2: Materials for animal and plant ‘tea’

Animal manure	Plant manure
1. Pig, chicken, goat, sheep, cow dung etc.	1. Green leaves—soft, hairy and leguminous
2. Sack or stock feed bag (50 kg)	2. Wood ash
3. Clean water	3. Sack or empty stock feed bag (50 kg)
4. 200-L (44-gallon) drum, plastic containers or buckets (10-L/15-L)	4. Clean water
5. A stick or wooden timber	5. 200-L (44-gallon) drum, plastic containers or buckets (10-L/15-L)
6. Large stone for weight	6. A stick or wooden timber
	7. Large stone for weight

Table 1.3: Steps in making animal and plant ‘tea’

Animal manure	Plant manure
1. Collect or gather dried animal manure.	1. Gather three types of green leaves: <ul style="list-style-type: none"> – soft, e.g. cassava – hairy, e.g. pumpkin – leguminous, e.g. gliricidia shade tree, leucaena.
2. Fill the sack or stock feed bag with the manure.	2. Chop the leaves into fine pieces.
3. Place the large stone into the bag filled with manure to prevent the bag from floating.	3. Fill the bag with the chopped leaves.
4. Make a hole at the top of the bag and insert a stick or timber to hold the bag upright when placed into the drum.	4. Add wood ash for minerals and also as a pest repellent, and shake thoroughly.
5. Fill the drum or plastic container halfway with water.	5. Add the stone as a weight to prevent the bag from floating.
6. Lift the bag filled with manure and place into the drum filled with water and cover with a lid, cloth or flywire.	6. Make a hole at the top of the bag and insert a stick or timber to hold the bag upright when placed into the drum.
7. Using a stick, stir the ‘tea’ daily.	7. Fill the drum/container halfway with clean water.
8. The ‘tea’ should be ready for application after 7 days.	8. Place the bag of manure into the drum filled with water and cover the drum/container with a lid, cloth or flywire.
	9. Stir every morning using a stick.
	10. The ‘tea’ should be ready for application after 7 days.

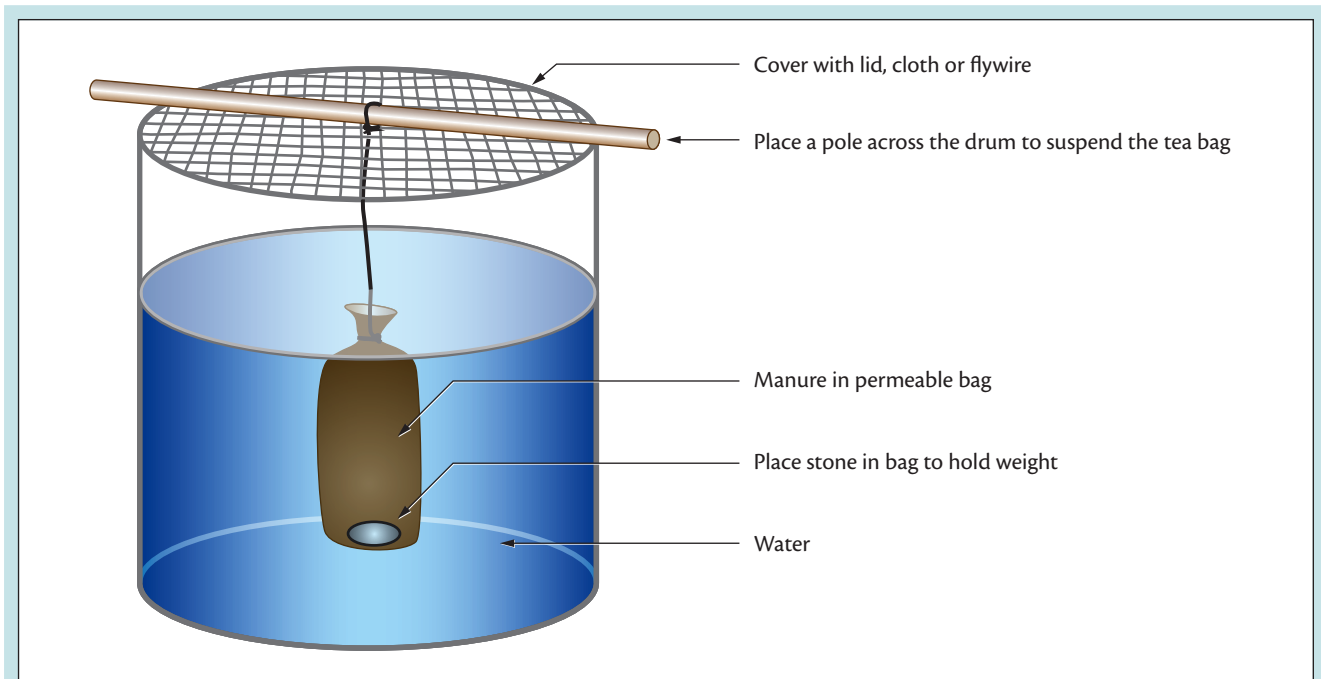


Figure 1.2: Making animal or plant 'tea' manure

How to make: Plant 'Tea'

Plant 'tea' is a food for plants made from green leaves and water.

Ready In 7 Days

Plant tea is easy to make and makes crops strong and improves yields. *Christine, Pallisa*

- 1. Soft leaves**
For example
Wandering Jew
Tithonia
Cassava
- 2. Hairy leaves**
For example
Pumpkin
Elephant grass
Lab lab
- 3. Leguminous tree leaves**
For example
Acacia
Albizia
Moringa

The leaves contain **food** that goes in the water and makes the tea.

Wood ash contains **minerals** and repels pests.

Plant tea is **free, easy to make and increases yields**

Materials
• Green leaves that will rot
• Wood ash
• Container
• Water

Step by Step

- 1 Collect leaves**
Collect the 3 different types of leaves. Get only green leaves that will rot. Chop the leaves. Find a container like a bucket, jerry can or pot.
- 2 Fill container**
Almost fill the container with leaves. Add some wood ash.
- 3 Add water**
Fill the container with water.
- 4 Cover**
Cover the container and leave the tea. Stir the tea every morning. After one week the tea will be ready.
- 5 Plant tea**
Remove the leaves and use as mulch. Dilute the tea. For each tampeco of plant tea add 2 tampecos of water.
- 6 Apply**
Apply one tampeco of the diluted tea to each plant before flowering. Use the plant tea within 14 days.

Logos: FAO, apopa, HEIFER INTERNATIONAL, caritas uganda, SEND A COW UGANDA LIVESTOCK FOR LIFE

Figure 1.3: Making plant 'tea' (source: Forthway, UK (2010))

Application of liquid manure

Application is done by diluting the manure with an equal amount of water and applying it using a watering can or small tins at the side of the plant. Avoiding application during the rainy season minimises or prevents losses by leaching.

Advantages and disadvantages of plant manure

Table 1.4: Advantages and disadvantages of plant manure

Advantages 😊	Disadvantages ☹️
1. Supplies major and minor nutrients	1. Labour intensive
2. Is taken up quickly as it is a liquid	2. Not to be applied during rainy season
3. Can be stored for a longer period	3. Can burn plants if applied directly on the surface of the leaves
4. Cheap	4. Can only be stored for a shorter period
5. Takes a shorter time to be ready	

Composting

What is compost?

Compost is a mixture of organic matter that has decomposed and is used as an organic fertiliser. It is very rich in the major and minor nutrients needed by plants for healthy growth.

Organic matter includes dry leaves, green grass clippings or food peelings, and animal manure. Dry leaves produce carbon for heat energy; and green clippings, food peelings and animal manure provide nitrogen and microorganisms to help break down the organic matter (the decaying process). Compost acts as a soil conditioner and fertiliser, and adds humus. In some circumstances it can also act as a pesticide. Composting also requires water and oxygen for the living organisms that help in the decomposition process (Figure 1.4).

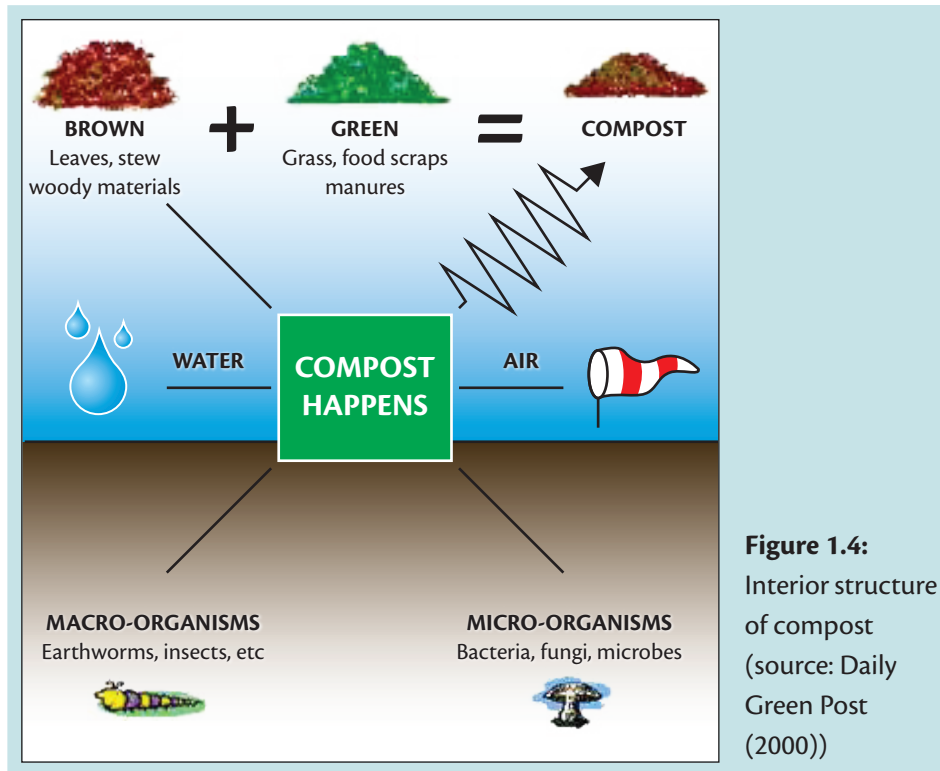


Figure 1.4: Interior structure of compost (source: Daily Green Post (2000))

Advantages and disadvantages of using compost

Table 1.5: Advantages and disadvantages of composting

Advantages 😊	Disadvantages ☹️
<ol style="list-style-type: none"> 1. Waste products are made use of properly and recycled 2. Adds nutrients, reconditions the soil and improves soil structure 3. Cheap 4. Helps to clean up contaminated soil 5. Kills plant diseases and pests in the soil 	<ol style="list-style-type: none"> 1. Produces odour/smell 2. Attracts pests such as rodents and other insects 3. Labour intensive 4. Time consuming

Types of compost

There are two compost types that farmers may prefer to make and use:

1. 18–30-days compost (Table 1.6 and Table 1.7)
2. 3-months compost (Table 1.8 and Table 1.9)

18–30-days compost

Table 1.6: Materials needed to make 18–30-days compost

1. Sticks or bamboo to build a stockade with its shelter
2. Kunai grass, sago leaves or plastic sheet for the roof
3. Dry leaves, green grass clippings and fresh animal manure
4. Sack bags or banana leaves to cover the compost
5. Ropes or tie wire for tying edges of the stockade

Table 1.7: Steps in making 18–30-days compost

1. Build a 1m (length) × 1m (width) × 1m (height) stockade and allow for a similar sized area to turn the manure.
2. Chop dry leaves and green leaves together.
3. Thoroughly mix the chopped leaves with fresh animal manure.
4. Combine the mixture and pile to make a heap up to 1 m high.
5. Cover the heap with the sack bag or banana leaves.
6. After 3 or 4 days turn the heap and continue to turn after every 2 days.
7. In 18–30 days the compost should be ready for use.

3-months compost

Table 1.8: Materials needed to make 3-months compost

1. Sticks or bamboo to build a stockade with its shelter
2. Kunai grass, sago leaves or plastic sheet for the roof
3. Dry leaves, green grass clippings and fresh animal manure
4. Sack bags or dry banana leaves to cover the compost
5. Ropes or tie wire for tying edges of the stockade
6. Green manures such as legumes
7. Topsoil

Table 1.9: Steps in making 3-months compost

<p>First stage: Making a heap</p> <ol style="list-style-type: none"> 1. Build a 2.5m (length) × 2m (width) × 1.5m (height) stockade and allow for a similar sized area to turn the manure. 2. Chop dry leaves and green leaves together and make a layer about 15 cm thick. 3. Sprinkle a thin layer of animal manure about 2 cm on top of the first layer. 4. Add a second layer of plant materials, preferably green manure. 5. Sprinkle wood ash or charcoal dust on top of the green manure. 6. Each layer should be 30 cm thick. 7. If the weather is dry, sprinkle 4 L of water to make the layer damp. 8. Repeat the above steps until you have a heap about 1.5 m high. 9. Cover the heap with 10 cm of topsoil to minimise nutrient loss.
<p>Second stage: Turning the compost</p> <ol style="list-style-type: none"> 1. Turn the heap using a fork after 1 month. 2. Move the materials from the top and sides of the heap to the middle of the new heap. 3. Turn the heap every 2 weeks until the compost becomes dark grey in colour.
<p>Third stage: Monitoring progress</p> <ol style="list-style-type: none"> 1. From 8 days onwards, push a stick into the middle of the heap and pull it out. If it feels hot this is a good sign that decomposition is occurring. 2. The compost will be ready for use when it becomes hot and greyish in colour. This takes 3 months.

Note: The only significant difference between these two compost methods is the time frame for the manure to be ready for use.

How to apply compost

Compost can be used in the following ways:

- ▶ broadcasting—scatter compost onto the soil surface prepared for planting
- ▶ incorporating—dig or plough compost into the soil before planting
- ▶ side dressing—make a hole at the side of your plant, place manure into the soil and mix, and then cover the hole.

Note that if you are not ready to use the compost immediately, it can be stored in the shade or covered with 10 cm of topsoil to minimise nutrient loss.

Summary

Appropriate soil management practices should be used where possible to maintain high soil organic matter content, which will:

- ▶ protect the soil from erosion;

- ▶ provide nutrients to your plants using different manuring and composting techniques;
- ▶ improve the soil properties and structure; and
- ▶ improve crop growth and bring better yield.

Good soil management practices are:

- ▶ mulching
- ▶ crop rotation
- ▶ cover cropping
- ▶ land fallowing
- ▶ manuring
- ▶ fertiliser application
- ▶ compost making and application.



Compost constructed using local bush materials

References

- Animal manuring: http://en.wikipedia.org/wiki/Animal_manuring
Compost components: <http://www.dailygreenpost.com/how-to-compost/html>
Compost: <http://en.wikipedia.org/wiki/Compost>
Cover cropping: http://en.wikipedia.org/wiki/Cover_cropping
Fertiliser application: http://en.wikipedia.org/wiki/Fertilizer_application
Green manuring: http://en.wikipedia.org/wiki/Green_manuring
Land fallowing: http://en.wikipedia.org/wiki/Land_fallow
Making plant tea: <http://www.fourthway.co.uk/posters/pages/planttea.html>
Mulch: <http://en.wikipedia.org/wiki/Mulch>
Mulching: <http://www.hort.purdue.edu/ext/mulch.html>
University of Papua New Guinea Open College. 2010. Principles of crop production: Study Guide. Life Skills Series. University of Papua New Guinea Press: PNG.
Soil management: http://soilquality.org/management/soil_management_practices.html

TOPIC 2

Simple Irrigation Techniques

Objectives

By the end of this topic you should be able to:

- ▶ identify different types of irrigation techniques;
- ▶ identify and describe drip irrigation; and
- ▶ appreciate and use the drip irrigation method in your various farm settings.

Introduction

Like people and animals, plants also need water for healthy and normal growth. Many farmers rely only on rainfall to water their crops, but water for irrigation is very important to successfully grow vegetables all year round, especially in dry periods without rain. Some vegetables require more-abundant and more-frequent watering than others. For example, cabbages require more water than tomatoes, and capsicums and watermelons grow well with somewhat less water. Irrigation is a must to successfully grow vegetables, especially in drier periods when there is little or no rain.

Types of Irrigation

The type of irrigation system depends on the size of the farm, the source of water (from a water-well, dam or river) and how much the farmer can afford to spend on irrigation. Four types of irrigation are illustrated below, and drip irrigation is described in further detail.

1. Manual—the simplest but least efficient system is watering by hand using buckets and watering cans for irrigation. Water is fetched and applied to plants by hand.

2. Canal or furrow—water is pumped (using a manual or motorised water pump) and stored in a reservoir or tank, and is then directed to flow into the open field in furrows between beds or ridges. A pump may be needed to draw water from a water-well or river.
3. Drip—water is pumped into a tank (a reservoir) and then delivered as drips to each plant's base through small and narrow tubes, using gravity to pressurise the tubes and transport the water. This system is effective when the tubes are not blocked by dirt or build-up of salts from the water.
4. Overhead sprinklers—this system requires sufficient pressure from a water pump to force water to shoot out of the upright sprinklers as spray as they rotate.



Using watering cans to manually water food crop gardens



Water canals and furrows



Simple drip irrigation system in the field



Overhead sprinklers

Drip Irrigation

What is drip irrigation?

Drip irrigation or micro-irrigation is a method that allows a farmer to control the application of water (and fertiliser dissolved in it) by allowing it to drip slowly near the plant's roots through a network of valves, pipes, tubing and emitters. However, drip irrigation is not suitable for all farms.



Drip emitter on a crop

Table 2.1: Advantages and disadvantages of drip irrigation

Advantages 😊	Disadvantages ☹️
<ul style="list-style-type: none"> • Less water is used. • A lower operating pressure means a low cost for fuel/petrol for pumping. • Water is used efficiently because plants can be supplied individually with water. • Water is applied directly to the plant root zone. • There is reduced weed growth and thus less weeding. • Pests/disease infestation is less. • Soil erosion is reduced. • Less labour is required. 	<ul style="list-style-type: none"> • There is higher initial investment. • It requires regular maintenance and high-quality water. • The tubes may be lifted or moved by wind.



Advantages of drip irrigation

Materials needed for drip irrigation

1. Water source—the water for irrigation can come from wells, streams, ponds, tanks, rain and recycled water from wastewater treatment plants or other sources.
2. Tap
3. Filter
4. Tank connection
5. Valve
6. Submain
7. Laterals
8. Micro-drip and connectors/elbows
9. Stoppers

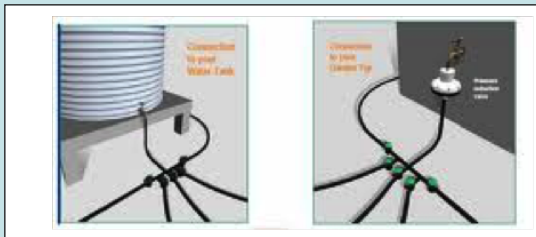
Parts and fittings for a simple drip irrigation system



1. Water source



2. Tap
3. Filter



4. Tank connection



5. Valve



6. Submain (19mm)



7. Laterals (16mm)



8. Micro-drip and connectors/elbows



9. Stoppers

Components of a drip irrigation system

A typical drip irrigation system has eight major components (Figure 2.1).

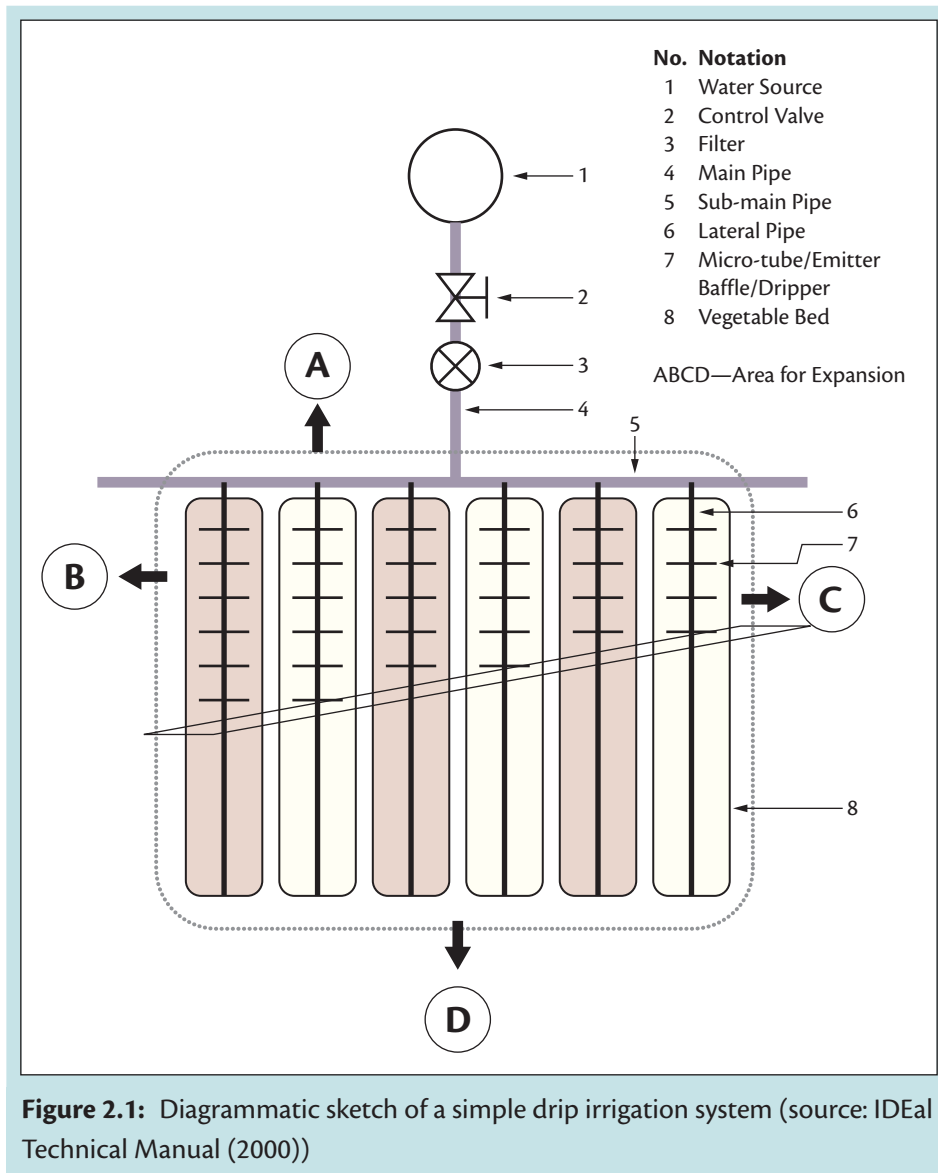


Figure 2.1: Diagrammatic sketch of a simple drip irrigation system (source: IDEal Technical Manual (2000))

Simple drip irrigation systems

Simple, affordable low-cost drip irrigation systems for smallholder vegetable growers have been developed, including:

- ▶ bucket kit
- ▶ family nutrition kit
- ▶ drum kit
- ▶ customised system
- ▶ combo kit.

Features of the bucket kit (Figure 2.2) are:

- ▶ It is a pre-assembled kit to irrigate vegetables in home gardens.
- ▶ It has a 20-L bucket with one or two rows of lateral drip lines 5–10 m in length, depending on the space available.
- ▶ It can irrigate an area up to 20 square meters (m²).
- ▶ The bucket can be hung from a tree or pole 1 m high.

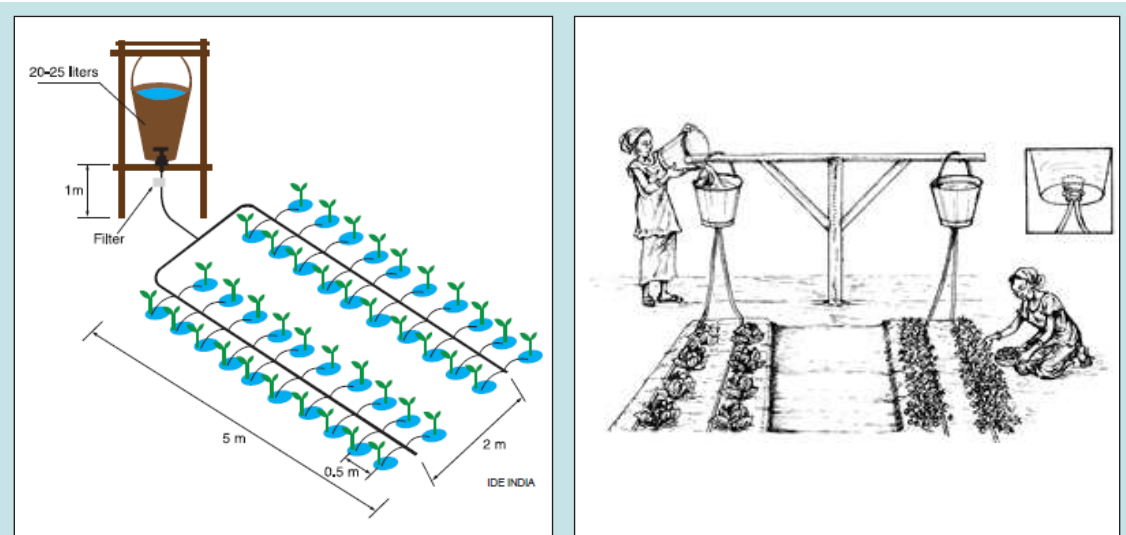


Figure 2.2: A simple bucket kit for irrigating a small vegetable garden plot of approximately 20 m²

The images below show drip irrigation from a water tank. This works by gravity feed in that the water tank has to be on a platform above ground level.



Simple drip kit off tank for irrigating a small vegetable garden plot

Activity 1

1. We will now construct a simple micro-drip irrigation system in the demonstration site.
2. Try to think back to materials available in your area such as bamboos, and the sizes that can be used, and try to utilise those and make a simple irrigation kit system using the examples given in this topic.

Summary

Apart from proper soil management and crop protection practices, water is a very important factor for plant growth and yield. There are a number of ways in which water is applied to crops in the field. There are various simple irrigation techniques that can be used in the farm. The types of irrigation systems depend on the size of the farm, the source of water and how much the farmer can afford.

Drip irrigation is a simple easy-to-use system that allows a farmer to control the application of water, and fertiliser dissolved in it, by allowing water to drip slowly near the plant roots through a network of valves, pipes, tubing and emitters.

Simple drip irrigation kits such as bucket kits can be purchased from agricultural suppliers.

References

- Drip irrigation: http://en.wikipedia.org/wiki/Drip_irrigation
- International Development Enterprise. 2000. Technical manual for IDEal micro-irrigation systems. Kathmandu, Nepal.
- Keller J., Adhikari D.L., Petersen M.R. and Suryawanshi S. 2001. Engineering low-cost micro-irrigation for small plots. Report No. 5. Journal of International Development Enterprises: Longmont, Colorado, USA. http://www.siminet.org/fs_start.htm
- Keller J. and Bliesner R.D. 1990. Sprinkle and trickle irrigation. Van Nostrand Reinhold: New York, NY, USA.
- Polak N. and Adhikari D.L. 1997. A low-cost drip system for small farmers in developing countries. Journal of Water Resources, 4–7.
- The World Vegetable Center (AVRDC). More crop per drop. 2011. AVRDC Publications: Taiwan.

TOPIC 3

Basic Crop Protection

Objectives

By the end of this topic you should be able to:

- ▶ describe why plants are called weeds;
- ▶ identify and describe ways to control and manage weeds;
- ▶ describe what an insect pest is;
- ▶ recognise which insects are pests to a particular crop;
- ▶ describe ways to control and manage insect pests;
- ▶ outline some techniques to prepare plant-derived pesticides (PDPs);
- ▶ define plant disease;
- ▶ describe the general symptoms of plant disease;
- ▶ describe ways to control and manage plant diseases; and
- ▶ outline the importance of safety when using agricultural chemicals.

Introduction

Crop protection deals with the pests and weeds that cause crop losses and how they are managed to minimise these losses. There are three main agents that cause damage to crops: weeds, insects and plant diseases.

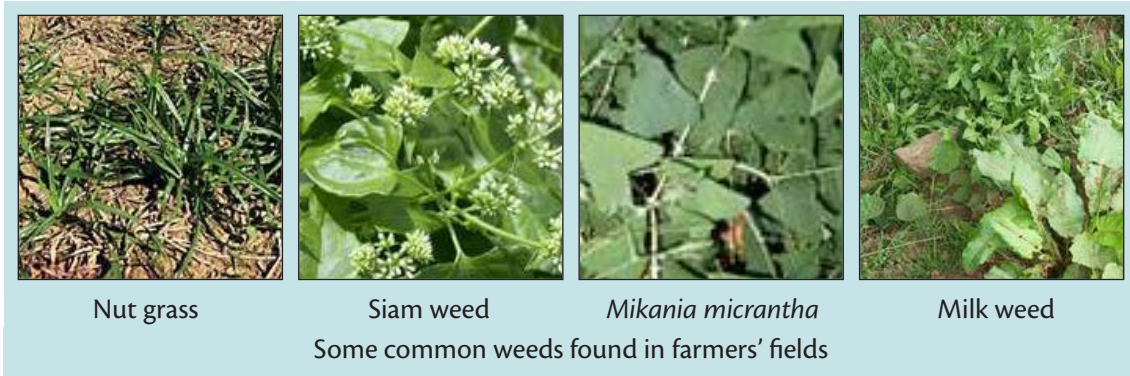
Weeds

What are weeds?

A weed is a plant that is growing in the wrong place.

For example, volunteer tomatoes or beans become weeds if they grow in ground that has been planted with a crop of sweetpotatoes. Weeds can interfere with

cropping or grazing activities; block waterways; or compete for nutrients, water, space and light, resulting in low crop yields. Some examples of introduced weeds of economic importance to PNG and Pacific island countries are shown below, and some of these are also widespread in other parts of the world.



The effects of weeds on crops

Harmful effects of weeds: Weeds directly compete with crops for light, space, nutrients and water, causing reduced crop yields. Some weeds can also act as hosts for insect pests and disease agents.



Beneficial effects of weeds: However, in abandoned land, weeds can also act as cover crops, helping to reduce soil erosion and adding organic matter to the soil when they decompose. Some may also act as a source of food and may have medicinal properties.



Ways to control weeds

Physical control

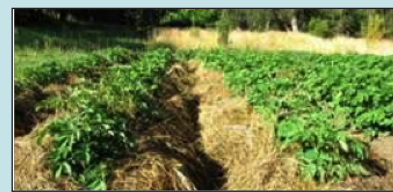
- ▶ hand weeding
- ▶ hoeing and cultivation
- ▶ mowing and slashing.



Physical control

Cultural control

- ▶ mulching
- ▶ cover cropping, especially using leguminous crops; cover crops also help to improve soil fertility.



Cultural control

Chemical control

- ▶ Chemicals that control weeds are called herbicides.
- ▶ Herbicides are expensive and can be dangerous to use without proper equipment and training.
- ▶ Some herbicides that kill the plant by contact with the plant surface are called contact herbicides.
- ▶ Others can be applied to one part of the plant and are then absorbed and distributed through the plant's vascular system to the whole plant—these (e.g. glyphosate or Roundup®) are called translocated herbicides. However, care must be taken as these can also kill crop plants.
- ▶ Manufacturers give comprehensive instructions on the label of the containers on how and when a particular herbicide can be applied, as well as its potential danger to humans, animals and crops.
- ▶ Although chemicals do result in a quick kill of weeds, they may only be economic if used in large plantation crops such as cocoa, coffee and oil palm.



Using chemicals to control weeds

Insect Pests

What are insect pests?

Pests refer mostly to the 'bad' insects and their larvae, which feed and damage food crops. They include:

- ▶ sucking insects such as aphids, stink bugs, plant hoppers and thrips;
- ▶ chewing insects such as grasshoppers, caterpillars and beetles;
- ▶ leaf rollers such as aibika leaf roller and banana skippers; and
- ▶ burrowing insects such as taro beetles, sweetpotato weevils and red banded caterpillars.



Symptoms of sucking insects



Chewing insects—caterpillar

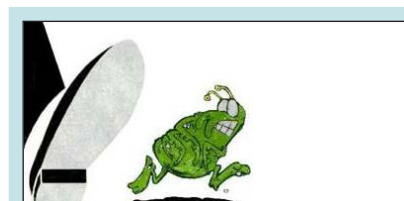


Burrowing insects—weevils

Ways to control insect pests

Physical control

Physical control is by hand removal and killing them. It is possible only in a small garden, and the best time to hand-pick insects is early in the morning on a weekly basis.



Physical control

Cultural control

- ▶ crop rotation
- ▶ planting of repellent crops in the vegetable garden
- ▶ planting of resistant crop varieties.



Cultural control

Biological control

Biological control encourages the use of other natural living organisms (e.g. insects, birds) to control/kill other 'bad' insects. The 'good insects', called parasites/parasitoids or predators, include praying mantis, ladybird beetles and spiders (although these are not insects) that feed on other 'bad' insects that damage or destroy crops.



Biological control

Chemical control

Chemical control uses natural or synthetic pesticides to kill the insect pests attacking crops.



Chemical control

Organic control

Natural pesticides

Natural pesticides are made from plants such as:

- ▶ derris (poison roots)
- ▶ tobacco leaf and stalk
- ▶ neem leaves, bark and seeds
- ▶ marigold leaves and stem
- ▶ chilli fruits
- ▶ pawpaw leaves.



Organic control

Note: Refer to the PDP section on using chilli and neem seeds by NARI.

Synthetic pesticides

- ▶ These are pesticides that are produced using chemicals. They are very effective but can be harmful to the environment and are very costly. There are strict safety measures to follow to avoid poisoning yourself or others and polluting the environment.
- ▶ It is best not to use synthetic pesticides in home gardens unless you are sure that you know how to safely handle the chemicals and correctly mix and apply them. This is because they are usually poisonous to humans. However, they are useful in commercial-scale farming. Examples of insecticides sold in agricultural supply stores and their uses are listed in Table 3.1.

Table 3.1: Insecticides and their uses

Chemicals	How to use			
	Plant	Pest	Rate	How to apply
Confidor	Capsicum	Green peach aphid	Mix 1 sachet in 5 L of water	Spray thoroughly at first sign of pests. Ensure that undersides of leaves are sprayed.
	Tomato			
	Zucchini			
	Melon			
	Eggplant			
Karate	Capsicum	<i>Helicoverpa (=Heliiothis) armigera</i>	400–500 mL/ha or 10 mL in 10 L of water	
	Tomato	<i>Earias vitella</i>		
	Zucchini	<i>Spodoptera</i> spp.		
	Melon	<i>Sylepta derogata</i>		
	Eggplant	Tubermoth, aphids		

Note: Application of these chemicals requires knapsack sprayers and safety equipment. The application rates differ from chemical to chemical. On every chemical container there should be labels and instruction guides given on the rate for mixing and (e.g. 10 mL into 10 L water) and how to apply them.

Other Pests

There are some other pests that attack crops or damage them in some other way. These include vertebrates (i.e. animals with backbones) such as cane toads, and birds or snails, including the giant African snail.

Activity 1

- ▶ Below are some photos of different pests. Do you see some of these pests in your crops? If yes, what crops do they attack?



Tomato hornworm



Corn earworm



Brown stink bug



Pumpkin beetles



Cane toad



Giant African snail



Capsicum maggots

Plant Diseases

What is a plant disease?

If a plant is not growing well or looks 'sick' compared with a normal healthy plant, it may be diseased. It is usually possible to see some of the symptoms that plants are not growing well.



Examples of symptoms of disease in plants and fruits

What causes plant disease?

Most plant diseases are caused by:

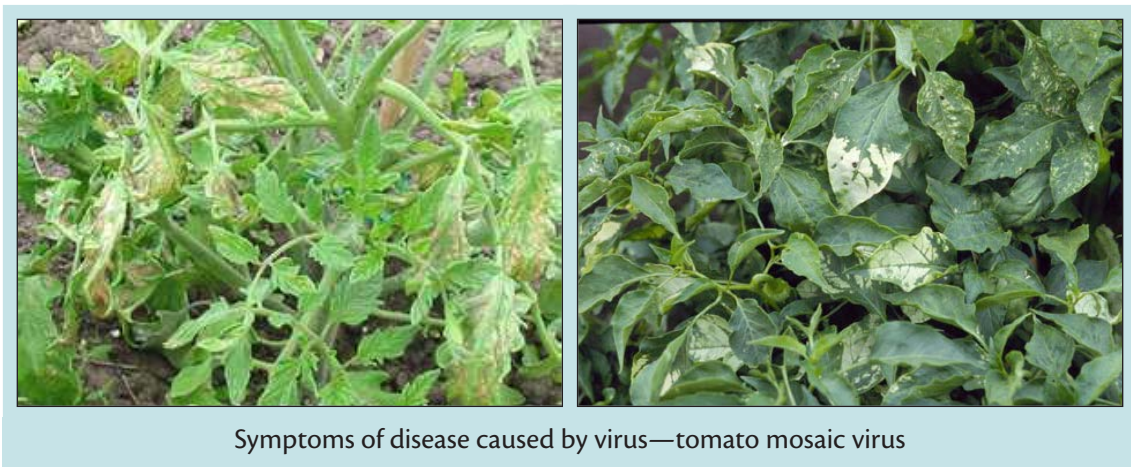
- ▶ **Fungi**, which cause plant tissue to rot, resulting in, for example, spots or blotches on the flowers, leaves and stem
- ▶ **Bacteria**, which have similar effects but often cause unpleasant to repulsive odours as well
- ▶ **Viruses**, in which the symptoms are very similar to some nutrient deficiencies.



Symptoms of diseases caused by fungi



Symptoms of diseases caused by bacteria



Symptoms of disease caused by virus—tomato mosaic virus

Common diseases in crops

Wilt diseases

The symptoms of wilting are shown by the leaves. The leaves are no longer erect but droop downwards and are limp. Wilt may be caused by not enough water in the plant, but the plant will recover as soon as water is applied to the soil and taken up by the roots. If the plant does not recover from wilting even though there is enough water given, it means that the wilting is caused by a disease.

We can test this further by slicing the plant stem to display the vascular tissue (which allows water to move from the roots to the leaves). If sliced along the stem length, the vascular tissue shows a brown streak along the stem; if the tissue is sliced across the stem, the vascular system appears as a brown ring. This browning shows that the wilt is due to a blockage of



Tobacco plant showing wilting symptom

the vascular system. The disease, known as vascular wilt disease, is usually caused by pathogenic fungi or bacteria.

Leaf blight

The symptoms of leaf blight start with the appearance of tiny brown spots of dead tissue on green leaves. These enlarge and merge together until the whole leaf is dead. Under good environmental conditions the disease can spread from one plant to another until the entire crop is affected. If the disease starts when the plants are young, it is called early leaf blight, but if it occurs later when the plants are flowering or producing fruit, it is called late blight. Leaf blight disease is common on tomatoes, capsicum, potatoes and taro, and is caused by pathogenic fungi.



Early and late symptoms of leaf blight on tomato (left) and pumpkin leaves (right)

Leaf spots

Sometimes there may be a number of different types of leaf spot on a plant. They may be regular, round and small; irregular; or show diseased brown dead tissue that drops off and leaves a hole. More than one disease caused by pathogenic fungi (or bacteria) may occur on the same plant.



Leaf spots on tomato leaves

Activity 2

1. Take a walk in the garden and see if any tomatoes are showing signs of wilt. Scrape the top layer of soil and test if the soil is moist or dry. If the soil is moist, remove a wilted plant and take a knife and cut open the stem, horizontally and longitudinally, and examine it to see if you see any signs of vascular browning.
2. Examine the leaves for brown spots. If the spots are brown with concentric rings that look like a target board of darts, it is called target spot and this is indicative of early blight disease.
3. Take a walk among some taro plants growing in the field. Examine both young and old leaves. Note whether the young leaves have any circular brown spots on them. Now examine the older leaves and see whether there are huge areas of brown spots or dead tissue due to the merging of a number of dead leaf spots. Examine the undersurface of the leaves and check whether there is a white ring around the border of the leaf spot. If so, this is taro leaf blight disease. It is best to observe this in the early morning.

Record your observations here:

a. Symptoms observed

b. Number of plants affected

Ways to control disease

There are three common controls that can be used.

1. Cultural control

- ▶ using disease-free planting materials, that is healthy seeds or cuttings obtained from a healthy crop
- ▶ good hygiene, that is removing and destroying infected material (e.g. burning cocoa pods with black pod disease), and destroying crop residues after the crop is harvested
- ▶ crop rotation, by planting different host crops after the first crop is harvested, for example beans after sweetpotato, and avoiding too-close spacing when planting corn, peanuts and taro
- ▶ planting cultivars that are resistant to disease, for example new taro and potato varieties with tolerance to leaf blight.

2. Physical control

- ▶ preventing excess watering, for example by using a glasshouse or drip irrigation
- ▶ farm quarantining, that is stopping unnecessary movement of people, animals and machines in and out of the farm.

3. Chemical control

- ▶ using fungicides—chemicals that can be used to control diseases caused by micro-organisms such as fungi, for example a copper-based fungicide or Mancozeb (Table 3.2); however, these are costly and require care in using the right chemical for the right disease. When using chemicals, care must be taken and the directions on the label must be followed
- ▶ managing insect pests such as aphids that transmit plant viruses.

Table 3.2: Example of recommendations for use of Mancozeb

Chemical	How to use			
	Plant	Disease	Rate	How to apply
Mancozeb	Tomato	Early blight Late blight Leaf mould Grey leaf spot Grey mould	40 g / 16 L knapsack or 50 g / 20 L knapsack	Spray at first appearance of the foliage disease. Spray at 7–10-day intervals. Continue into the picking season to obtain best results against leaf mould.

Activity 3

- ▶ Do you use any of these practices in your gardens/farms to control diseases? If so, describe what you do.

Safety Instructions for the Use of Chemicals¹

Selection of suitable pesticides and herbicides

- ▶ Use only those pesticides recommended by the Department of Primary Industry or NARI.
- ▶ Read the instructions on the label and follow the precautions exactly.
- ▶ Do not use more pesticide than is recommended. Do not mix more pesticide than you will use in 1 day.

Safe storage of chemicals

- ▶ Store chemicals in a safe place where they cannot be reached by children or domestic animals. **Do not** store chemicals in the same room as food or drink.
- ▶ **Always** keep the pesticide in the original container. Never use other containers such as beer or lolly-water (soft drink) bottles. Check the containers regularly to make sure that they are not leaking.
- ▶ Only buy as much pesticide as you will use in a few months, so that you do not need to store it for too long.
- ▶ Do not use empty insecticide containers for storing or carrying food or drink.

¹ Source: Crop Protection Team, The National Agricultural Research Institute, Papua New Guinea

Safety during spraying operations

- ▶ Make sure that the right protective clothing and equipment is available.
- ▶ When spraying, wear the appropriate protective clothing.
- ▶ When windy, do not spray near children or other people, animals or prepared food.
- ▶ **Never** suck or blow blocked nozzles with your mouth.
- ▶ Do not fill pesticide in knapsack sprayers over the full level mark.
- ▶ Do not eat, drink or smoke while handling or applying the pesticide.
- ▶ Do not eat, drink or smoke until you have washed and changed your clothes.
- ▶ After you have finished spraying, wash the sprayer and then yourself and your clothes.
- ▶ If you feel sick after using a pesticide, go and see a doctor immediately. Make sure to tell him/her the exact name of the chemical used.

Disposal of chemicals

- ▶ Do not empty spare chemicals or wash the sprayer near a drinking water supply.
- ▶ Destroy or dispose of all empty chemical containers safely.

Time of harvest

- ▶ Observe the recommended waiting period after the last spray—then you can harvest your crop.

Tok Lukaut Long Marasin Bilong Sprei Long Gaden^{2,3}

Makim ol gutpela marasin

- ▶ Usim ol marasin ol didman tokim yu long em tasol.
- ▶ Ridim gut ol toksave i stap long botol. Bihainim gut ol dispel toksave.
- ▶ Yu mas bihainim stret toksave bilong didiman long hamas marasin bilong usim. You mas mixim o skelim inap marasin long yusim long wanpela taim tasol.

Gutpela wei bilong karim na lukautim ol marasin

- ▶ Putim ol marasin long hap we'e ol pikinini, pik na dok ino inap long kisim. ***Yu no ken*** putim marasin long ples yu save putim kaikai.

2 Source: Crop Protection Team, The National Agricultural Research Institute, Papua New Guinea

3 This is the Tok Pisin version of the safety instructions for the use of chemicals.

- ▶ **Olgeta taim** tu mas lusim marasin istap long tin o botol bilong em yet. Yu noken usim ol narapela botol o tin na coke botol. Lukluk na sekim ol tin nogut ol lik na kapsait.
- ▶ Baim inap marasin long usim long sotpela taim tasol, olsem bai yu no inap putim long haus longpela taim.
- ▶ Ino ken kapsaitim ol pinis marasin botol o tin long kaikai o wara.

Gutpela wei blong spre

- ▶ Yu mas igat spre pam na ol samting bilong skelim marasin na karamapim skin bilong yu.
- ▶ Yu mas tingting gut na karamapim gut skin bilong yu taim yu laik holim na usim strongpela marasin stret long botol.
- ▶ Taim yu spre, yu mas putim ol samting long karamapim skin bilong yu.
- ▶ Noken spreim ol marasin klostu long ol pikinini o man na pig o dok o kaikai.
- ▶ **Yu no ken** winim maus bilong spre pam taim em i pas.
- ▶ Yu no ken pulumapim tumas spre pam.
- ▶ Yu no ken kaikai, simuk o dring long taim yu spreim marasin.
- ▶ Yu no ken kaikai, dring o simuk pastaim long yu waswas na senisim ol klos.
- ▶ Bihain yu pinis spre, yu mas wasim spre pam, klos bilong yu na yu yet.
- ▶ Sapos yu pilim sik bihain long yu usim marasin, go na lukim dokta hariap tru. Yu mas tokim em stret nem bilong dispela marasin yu bin usim.

Gutpela wei blong toromoi pipia marasin

- ▶ Ino ken kapsaitim hap marasin o wasim spre pam klostu long wara bilong dring.
- ▶ Bagarapim o brukim na planim long graun ol marasin botol i pinis long en.

Wanem emi gutpela taim bilong kamautim kaikai bihain long spreim marasin

- ▶ Yu no ken rausim ol kaikai long garden inap long taim ol i makim long toksave long botol marasin.

Safety Gear for Using Chemicals



Nose masks



Gloves



Safety glasses



Safety boots / gum boots



Overalls



Clean water and soap

How to Make Homemade Pesticides⁴

What are homemade pesticides?

There are a number of native and exotic plants that have substances in their leaves, roots or wood that protect them from being eaten by insects. Homemade pesticides can be produced from these plants without expensive equipment. We call them plant-derived pesticides or **PDPs**. Most PDPs are not as dangerous to people as commercial pesticides and can be used without expensive protective clothing.

Equipment and materials to make PDPs

Materials needed:

- ▶ 1 medium-sized plastic bucket (~10 L capacity)
- ▶ rubber gloves
- ▶ wooden hammer / strong stick
- ▶ plastic kitchen strainer
- ▶ stick for straining
- ▶ sprayer
- ▶ clean water (preferably rainwater)
- ▶ piece of soap
- ▶ chilli pods—350 g fresh or 70 g dry pods or 1 fish-tin of dry pods
- ▶ neem seeds—100 g of kernels or 120 dry seeds.



Ripe chilli pods



Ripe neem pods



Young neem pods

⁴ Source: Crop Protection Team, The National Agricultural Research Institute, Papua New Guinea

Making chilli PDP

Steps in making chilli PDP are:

1. Put chilli pods into bucket.
2. With a mallet or gloved hand pound or squeeze pods to a fine paste.
3. Add 1 L of water (3 soft drink cans 330 mL in size) and rub mixture of pods and water between gloved hands.
4. Add four teaspoons (20 g) of soap flakes.
5. Leave mixture in bucket overnight or for one day.
6. Pour liquid into sprayer through a strainer to remove dirt and large particles.
7. Add water to make up to the knapsack carrying capacity.
8. The liquid is now ready to spray the crops.

Making neem PDP

Steps in making neem seed kernel extract PDP:

1. Take 100 g / 120 neem seed kernels.
2. Grind or mesh the seeds to a fine paste.
3. Pour 1 L of water into a bucket and add the paste.
4. Stir the water and neem seed paste with gloved hands.
5. Cover and allow to settle overnight or for 12 hours.
6. Pour the liquid into a knapsack sprayer through a strainer to remove dirt and large particles.
7. Add four teaspoons (20 g) of soap flakes.
8. Add water to make up to carrying capacity of knapsack sprayer.
9. The liquid is now ready to spray crops.

Plants from which pesticides can be made are listed in Table 3.3.

Table 3.3: Plants from which pesticides can be made

PDPs	Scientific name	Region	Plant part used	Type of plant
Derris	<i>Derris elliptica</i>	Wet lowlands, below 600 m	Roots, squeezed	Climbing plant
Neem	<i>Azadirachta indica</i>	Dry lowlands, e.g. Markham Valley or Central Province	Seeds, ground	Big tree
Chilli	<i>Capsicum frutescens</i>	Lowlands and highlands	Fruits, mashed or powdered	Small cultivated
Pyrethrum	<i>Tanacetum cinerariifolium</i>	High altitudes, above 2,200 m, e.g. Enga, Western or Southern Highlands	Dried flowers	Cultivated

Photographs of selected plants from which PDPs can be made are presented below.



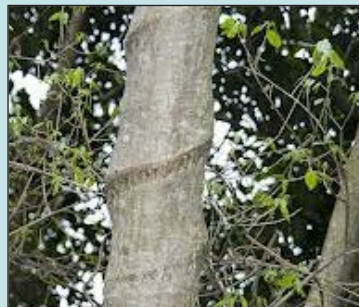
Neem flower and leaves



Pyrethrum flowers



Derris tree



Derris bark



Derris roots

Summary

Weeds grow in any environment. They are found in gardens, in pastures, in water, on trees and in all environments. Weeds compete with crops for water, nutrients and sunlight, resulting in loss of yield. Weeds can be controlled by physical, cultural, mechanical, chemical (herbicides) and biological methods.

Pests refer to mostly the 'bad' insects and their larvae that feed and damage vegetables. Insect pests can be controlled by physical, cultural and biological methods, and with organic and inorganic pesticides.

Plant diseases are hard to see or recognise at an early stage until the crop has been affected. Observing the visible symptoms indicates that there is a plant disease problem. Some methods to control crop diseases include good cultural practices, physical control and using chemicals.

Safety when using chemicals for any farm use is very important. Chemicals must be safely stored away to avoid children touching them. Wearing safety equipment is also very important when preparing to apply chemicals such as pesticides, herbicides or fungicides on crops. Being safe and taking note of safety regulations during chemical applications is also essential.

Plant-derived pesticide (PDP) use is economical and safe for the environment and farmer use. Farmers are able to use resources in their surroundings to make PDPs to use on their crops to control insect pests safely.

References

- <http://archive.bio.ed.ac.uk/jdeacon/microbes/panama.htm>
Crop pests images: http://en.wikipedia.org/wiki/crop_pests_images
Fusarium wilt: http://en.wikipedia.org/wiki/Fusarium_wilt
National Agricultural Research Institute (NARI). Making your own plant derived pesticides. Extension Series Booklet No. 1. NARI: Papua New Guinea.
National Agricultural Research Institute (NARI). Chemical safety instructions: Crop Protection Section handout. NARI, Southern Regional Centre, Laloki: Papua New Guinea.
Plant disease images: http://en.wikipedia.org/wiki/plant_disease_images
University of Papua New Guinea Open College. 2007. Principles of crop production: Study Guide. Life Skills Series for Agricultural Courses. University of Papua New Guinea Press: PNG.

SECTION 2

Post-harvest Training

Introduction

Section 2 focuses on post-harvest knowledge and skills. On many occasions a considerable proportion of the produce from a farm does not reach the consumer, causing significant loss to farmers. The topics in this section will cover the important aspects of postharvest practices that can minimise loss during the chain from farmer to consumer.

The topic illustrations simply show what postharvest management practices look like and what the level of maturity is for:

- ▶ commercial value and physiological value according to different market requirements
- ▶ indicators of maturity of fruits and vegetables
- ▶ time to harvest
- ▶ tools to use in harvesting of fruit, vegetable or root crops
- ▶ harvesting techniques depending on the type of crop and yield
- ▶ field handling, selection and grading, sorting and trimming
- ▶ packaging in waxed cartons or cane baskets
- ▶ storing of produce in the right place
- ▶ transportation.

TOPIC 4

Post-harvest Training

Objectives

By the end of this topic you should be able to understand how to:

- ▶ reduce losses between harvest and consumption;
- ▶ extend the storage life of fruits and vegetables; and
- ▶ retain quality in fruits and vegetables.

Introduction

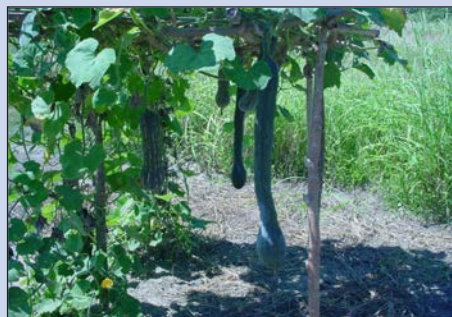
Post-harvest is the stage from harvesting of the produce to reaching the end consumer. In this stage the produce is harvested, washed, graded, packed and transported, and handled by many people, including the grower, transporter, wholesaler, retailer and consumer.

Harvesting of the produce at the right maturity stage is important for the optimum duration of shelf life. Harvesting immature fruits and vegetables affects the postharvest shelf life of the crop. To increase the shelf life, farmers need to harvest at the appropriate time, which will also reduce wastage and improve quality.

Harvesting can be done either manually or mechanically. Careful harvesting and transporting practices are essential as suboptimal methods will result in wounds, including bruises and cuts, on fruits and vegetables. The wounds provide entry for fungi and other organisms that cause further damage (e.g. rotting), which reduces quality and creates openings for greater water loss, particularly in leafy vegetables.



5-month-old bulb onions



Staked pumpkins ready for harvest

Activity 1

- ▶ Discuss in small groups the differences between supermarkets and wet markets.

Market Requirement for Maturity

There are two types of maturity that are relevant to market requirements.

1. Physiological maturity is the stage when the produce (e.g. fruit/flower/leaves) becomes fully developed—this may be later than desirable for harvest for human consumption. Examples include flowers forming on pak choi and cracking on tomatoes, as shown below.



Overgrown pak choi flowering, and overripe tomatoes cracking

Note: Retail shops and wholesalers will avoid handling produce at advanced maturity as the shelf life is short or the produce may be unacceptable to the consumer.

2. Commercial maturity is the stage when the produce is ready for market. This can occur before physiological maturity. Examples include English cabbage and tomatoes, as shown below.



English cabbage and tomato at commercial maturity, that is ready for the market

Activity 2

- ▶ Walk through crops and identify and differentiate between levels of immaturity and maturity, for example youngest to oldest crops. List the differences in a table.

Harvest Management Practices

For proper harvest management practices, attention must be paid to the maturity stage of produce, harvesting techniques, harvesting containers, harvesting tools, packaging and transport.

Maturity stage of produce

The right maturity stage of produce can be determined by indicators such as size, shape, colour, size of filled pods, appearance and texture.

Produce harvested early may not have flavour and may not ripen, whereas produce harvested late may be too ripe and be fibrous (Bautista and Mabesa 1977).

Examples of crops at the correct stage for harvest are shown in the photographs below.



Lettuce ready for harvest



Capsicum ready for harvest

Harvesting techniques

The five main harvesting practices are:

1. Harvest at the coolest part of the day—early hours of the morning or late in the afternoon are best.
2. Avoid harvesting produce that is wet from dew or rain, as wet produce will overheat when not ventilated and could be damaged.
3. Separate produce that is unfit for human consumption from high-quality produce.
4. Use clean equipment and containers.
5. Harvested produce must be put under shade or kept in cool rooms (if available) to keep it as cool as possible and protect it from excessive water loss until transport is available.

Harvesting tools for different crops

There are different harvesting techniques used for different types of crops:

1. Root and tuber crops including sweetpotato, yam and cassava — Digging sticks and forks can be used to remove the soil. When digging, the stick or fork should be placed far from the root to loosen the soil and lever the tuber out of the soil.



Using a fork to harvest sweetpotato

2. Vegetables including cabbages and broccoli — The use of short, sharp knives for cutting stems and trimming in the field should be encouraged. The outer layer of leaves should be kept to protect produce for the market.



Using a sharp knife to harvest cabbage

3. Fruit including mangoes and pawpaw — Depending on the fruit trees, picking poles may be needed, for example for mangoes and oranges. This kind of tool will prevent fruit falling to the ground.



Using picking poles for harvesting mangoes

4. Bulbs — Bulbs should be removed by hand from the soil.



Harvesting bulb onions by hand

Field handling

Field handling techniques include the following:

1. Trimming involves removing leaves, stems and other plant parts, whether damaged or not, that are not required by the market and that may reduce value.



Trimming cabbages ready for sale

2. Cleaning is done to remove dirt, dust, insects or visible damage by insects prior to being marketed.



Washing radishes to clean off dirt

3. Curing is a process where produce such as root tubers and bulbs is kept at high temperature and humidity to extend shelf life. Curing hardens the skin of the produce and is effective in reducing decay and water loss during storage or transit. Curing is done either in the field or in curing rooms.



Curing bulb onions

4. Sorting is done to remove and separate damaged, bruised, diseased, pest-infested and deformed produce from good produce to increase the value of the produce delivered to the market.



Sorting mangoes for the market

5. Grading involves sorting produce into uniform size, length, colour, shape and firmness for better market price.



Grading of vegetables for better market price

Packing

Packaging assembles the produce in convenient units for transportation, marketing and distribution (Hassan 2010). Packing must be done to protect the produce during handling and transport. Choosing the right packing materials for the produce is important to avoid bruising and damage due, for example, to an increase in humidity. Natural materials such as bamboo baskets and jute sacks can be used, as they are usually cost effective, but there can be disadvantages, for example a lack of rigidity during transport. Plastic crates can be used for rigid transport, but they can be expensive and additional packing may be needed to protect fruits and vegetables in them.

Packing the right quantity in bags or cartons to prevent mechanical damage is important. If produce is packed loosely, vibration may cause bruises. If produce is packed too tightly, bruising can occur due to compression (Grierson 1987).



Potatoes packed in bags



Capsicums packed in waxed cartons



Using plastic crates to pack corn

Pre-cooling

Between harvest and consumption, it is important to keep produce at a cool temperature to increase its shelf life, minimise loss of water that could lead to wilting and shrivelling, and slow other spoilage processes.

To keep the temperature low, harvest at early hours of the morning. Keep produce under shade or in cool rooms after harvest and during transport. If possible, transport in refrigerated vans.



Pre-cooling of vegetables

vStorage

Vegetables should be cooled as soon as possible after harvest and then stored at the appropriate temperature. Produce may be stored temporarily for reasons such as awaiting transport to markets. In order to maintain quality before sale and consumption, it must then be stored in a cool storeroom. The storage life of vegetables is greatly extended by maintaining low temperatures in the storage place.



Storage of vegetables for the market

Transportation

Several factors reduce the quality of produce during transportation:

- ▶ bruising, caused by the vibration of vegetables during transportation, and poor handling during loading and unloading
- ▶ repeated or rough handling

- ▶ high transit temperatures (especially in the field, if not cooled immediately)
- ▶ poor or no packaging
- ▶ bad roads.



Poor handling of round cabbage causes produce damage

Summary

To have quality produce, management should be maintained from harvesting to the consumer by following a series of postharvest practices:

- ▶ Harvest produce at the right maturity stage.
- ▶ Harvest produce using the correct equipment to minimise mechanical damage.
- ▶ Trim the produce to meet consumer needs.
- ▶ Clean the produce to remove dirt, dust and parts damaged by insect pests.
- ▶ Sort the produce and remove damaged, bruised, diseased, pest-infested and deformed produce for a better price.
- ▶ Pack the produce in the most suitable packing material and the right quantity for handling.
- ▶ Keep the produce under shade or at cooler temperature after harvest.
- ▶ Store the produce in a cool place.
- ▶ Transport the produce carefully to minimise damage due to temperature or bruising.

References

- Bautista O.K. and Mabesa R.C. (eds). 1977. Vegetable production. University of the Philippines at Los Banos.
- Grierson W. 1987. Postharvest handling manual: Commercialization of Alternative Crops Project. Belize Agribusiness Co. / Chemonics International Consulting Division / USAID.
- Haguluha V. and Natera E. 2007. Quality management of fresh produce from the highlands of Papua New Guinea: Postharvest manual. Ed. by J. Spriggs. ACIAR Monograph No. 128, Australian Centre for International Agricultural Research: Canberra.
- Hassan K. 2010. A guide to postharvest handling of fruits and vegetables. Bangladesh Agricultural University: Mymensingh, Bangladesh.

SECTION 3

Basic Financial Management Training

Introduction

Improving farmers' financial management is fundamental to the success of any rural household. This is possible through awareness and training on money management, and showing what money is, how to make money grow, how to save better for future circumstances and where to source credit for farm expansions. Credit is often necessary to have money for sound financial purposes such as starting a business or making money work for farming families, without unduly burdening them with debt. That is, careful management of the amount of credit and its repayment is necessary. The skills of money management can be practised when rural farming families are literate in finances.

Financial management is very important if farmers are going to be profitable and expand their business operations. Money is a key resource for any business and it has to be managed well for the betterment of the business owner, in this instance the farming household. Without proper money management it is possible that a business will fail.

The objectives of this section are to enhance farmers' capacity in money management. The section aims to increase farmers' knowledge on:

- ▶ Record keeping—this topic will show farmers the different types of records and the importance of keeping detailed records of all farm operations, both financial and physical.
- ▶ Budgeting—farmers will learn techniques on how to budget better and to follow their budget.
- ▶ Savings—farmers will learn why they should save, how to save and where to save.
- ▶ Loans—farmers should know why they need loans (i.e. credit) and how to make informed decisions if loans are necessary. They also need to know how they can access loans and what is involved in repayment.

These topics should guide farmers to making informed decisions so that they can better plan and manage their finances, thus improving farm business and their livelihoods.

TOPIC 5

Record Keeping

Objectives

By the end of this topic, you should know:

- ▶ the importance of keeping records;
- ▶ the different types of records used;
- ▶ how to keep records of income and expenses; and
- ▶ how to keep records of farm physical operations.

Introduction

Record keeping is very important, in both farm businesses and farming households. In farm business it is very important that proper records are kept as a basis of meeting legal requirements and for effective management decision. Financial and physical records of farm operations can also aid a farmer with loan applications.

Clear, adequate, accessible and relevant records provide the basis for both these functions. To stay in control of money, it is usually necessary to write down what has been received and spent. Memory is not good enough for proper analysis. A common problem for most rural households is to treat income as disposable when it may be needed to meet business needs. Others have problems controlling the sale of goods on credit—that is, when goods are delivered to a buyer and the buyer is to pay at a later date.

Keeping a cashbook to record income and costs (expenses) is helpful. A cashbook will easily inform the farmer of past income and expenses, and will be used to make informed decisions for the present and for cash flow budgeting for the future.

What sort of records should be kept?

Financial records include cash receipts and payments associated with all aspects of the farm business, including operating income and expenses, as well as non-operating items such as loans and payments of interest or tax. Capital contributions or withdrawals by owners will also be included.

Non-financial records will provide information that supports, explains and provides context for financial records. These could include a separate set of records for:

- ▶ suppliers
- ▶ customers
- ▶ labour
- ▶ staff time allocations to different activities
- ▶ records of environmental conditions, for example weather
- ▶ physical production activity records such as for use and maintenance of plant and equipment
- ▶ stock inventories
- ▶ volumes of production; and cropping records such as cultivation, planting dates, planting rates, fertiliser and chemical types and application rates, crop yields and crop quality.

Cash recording

Cash recording includes all cash transactions based on the use of a cashbook. All cash transactions fall into two categories, **Receipts** and **Payments**. You can have two separate books or one book with two sections:

- ▶ Receipts include cheques or money received in payment for the sale of goods, fruits and vegetables, or livestock.
- ▶ Payments include details of payments for goods and services encountered by the farming household.

Cashbook

Develop a cashbook to keep records of all cash income received from farm operations and all expenses paid to service providers and for goods.

The cashbook should include cash income and cash payments:

A. Cash income

Date: Record the date of income.

Particulars: Record details such as the source of income and its purpose, and the quantity of produce.

Amount received: Record the total amount received from the sale of goods. Table 5.1 shows an example of a record for cash income from sales of farm produce.

B. Cash payments

Date: Record the date the transactions occurred.

Particulars: Record details of who the payment was made to and for what purpose.

Amount paid: Every payment, whether by cash, cheque or deductions from bank accounts or sale proceeds, is recorded. Table 5.2 shows an example of records made for cash payments.

The recording of cash income and payments depends on an individual. It requires self-discipline and commitment to record regularly. Cash records are required for cash flow statements and budgets. All the cash records of receipts and payments in the cashbooks are then transferred to developing a cash flow statement or for budgeting on monthly, quarterly, half-yearly or annual bases for planning purposes.

Non-financial records

The third set of records that should be kept are non-financial records, such as production operations. Examples for a nursery and field operations are shown in Table 5.3 (A, B).

Table 5.1: An example of a household cash income record sheet

Note: This table uses PNG kina (K) as the currency; for use in other countries, local currencies and local values and costs should be substituted in the blank worksheet below.

Date	Details	Income sources and amount									
		Total (kina)	Vegetables (kina)	Yams	Fish	Poultry	Cooked food	Trade store	Others		
Month: July 2013											
1/7/13	Sale of 1 bag aibika	70	70								
5/7/13	Sale of 1 bag pumpkin	100	100								
8/7/13	Sale of cooked food (scone balls)	30					50				
9/7/13	Sale of cooked food (scone balls)	30					30				
12/7/13	1. Sale of 2 (50 kg) bags of pak choi 2. Sale of 1 bag yams	400 300	400	300							
14/7/13	1. Sale of 1 bag pak choi 2. Sale of 10 chickens @ K30 each	200 300	200			300					
15/7/13	1. Sale of 6 chickens @ K30 each	180				180					
16/7/13	1. Sale of 8 chickens @ K30 each 2. Sale of cooked food (scone balls)	240 46				240	46				
17/7/13	1. Sale of 12 chickens @ K30 each	360				360					
17/7/13	2. Gift from son in the city	200								200	
18/7/13	1. Sale of 4 chickens @ K30 each 2. Sale of 1 bag aibika	120 67	67			120					
20/7/13	1. Sale of cooked food	40					40				
25/7/13	1. Sale of 1 bag pak choi	200	200								
Total for month		2,683	1,037	300	0	1,200	166	0	200		
Previous total brought forward		860	540	0	0	0	120	0	0	0	0
Cumulative total carried forward		3,743	1,577	300	0	1,200	186	0	0	0	0

Table 5.1(a): Worksheet for inserting local activities, values and costs

Month:	July 2013	Income sources and amount									
		Date	Details	Total	Vegetables	Yams	Fish	Poultry	Cooked food	Trade store	Others
Total for month											
Previous total brought forward											
Cumulative total carried forward											

Table 5.2: An example of a household cash payments record sheet

Month	July 2013	Payments														
		Date	Particulars	Total	Production cost	Marketing cost	Food items	Hygiene accessories	Education	Clothes	Communications	Medical fees	Alcohol, cigaretttes	Customs	Wantok	Livestock
1/7/13		1. Transport costs and gate fee	10		10											
		2. Purchase of food items	50		50											
		3. School expenses	5				5									
		4. Flex cards	5					5								
2/7/13		1. Food	10		10											
		2. Education	5					5								
		3. Wantok	20											20		
		4. Customs	50										50			
4/7/13		1. Education	5					5								
7/7/13		1. Transport costs and gate fee	10		10											
		2. Food	30		30											
		3. Education	5					5								
		4. Flex cards	5							5						
		Total for month	210	0	20	90	0	20	0	10	0	0	0	50	20	
		Previous total brought down	350	50	40	130	20	40	50	20	0	0	0	0	0	
		Cumulative total carried forward	560	50	60	220	20	60	50	30	0	0	0	50	20	

Table 5.3: An example of a non-financial record table: (A) Nursery and (B) Field operations records
(A) Nursery operations for 1 year

Cropping code	Date seed sown / planted	No. of seeds or trays sown	Date seed germinated	No. of seeds or % germinated	Nursery medium used	Other comments and observations

(B) Field operations for 1 year

Crop planted	Area planted	Date of planting	No. of seedlings or trays planted	Fertiliser application date and rate	Fungicide application date and rate	Insecticide application date and rate	Other comments and observations

Summary

Key points to remember:

- ▶ Keep records of all farm operations, as both financial and physical records will provide guidance and insights for the farmer to use when making sound management decisions.
- ▶ Keep records of money received through sales of farm produce, and a separate record for payments made on a daily basis.
- ▶ Keep records of both household income and expenses and farm income and expenses.
- ▶ Physical records are equally as important as financial records.

References

Australian Training website: www.training.gov.au/budget

Cameron D. and Beasley S. 2009. *Business Management 1: learning guide*. University of Queensland, Australia.

Heney J. 2000. *Enhancing farmers' financial management skills*. Food and Agriculture Organization of the United Nations (FAO). No. 6.

TOPIC 6

Cash Account Budgeting

Objectives

By the end of this topic, you should be able to:

- ▶ understand a budget;
- ▶ appreciate the importance of a budget; and
- ▶ create your own budgets.

Introduction

Budgeting is a very fundamental function in finance and money management. This topic will show you what a budget is, why it is important to budget and how you can create your own budget. Budgets come with goals to achieve, which will help in good financial management.

What is budgeting?

Budgeting is planning income and expenses in a period, which acts as a guide for individuals, families and businesses to make better informed decisions about their finances. To change the way you handle money is to budget.

A good plan on how to use income will help you build wealth. A person who budgets will have control over his/her finances, which will allow them to make better financial decisions at the very beginning. When you budget well you will be able to reach your financial goals more quickly and avoid or minimise debt. Proper budgeting doesn't require that you spend less, but it will help you to make more-effective financial decisions.

Why is budgeting important?

Budgeting is important because it helps you control what your money will do for you. By assigning each kina to a category, for example a vegetable farm budget, you are controlling where your money goes and what it does. This will help you to begin to reach your financial goals.

Budgeting can be done in both business and personal settings.

Vegetable farm budget

In a vegetable farm budget, farmers plan how they will use their available finances for farming expenses. A good budgeting technique is doing a budget on the basis of individual crops that are suitable for the farmer's locality. This budgeting process is normally done at the end of the year for the next year, or the beginning of a crop production cycle, whichever period is suitable to the farmer.

There are two categories of cost in vegetable businesses that are critical to cash flow. These are growing and marketing costs. There are other costs (called overhead costs) such as depreciation (i.e. loss of value) of machinery, but these are not considered in this topic.

Growing costs are all the costs that are required in producing vegetables.

This includes the cost of seeds and planting materials, the labour cost in land preparation and transplanting or planting, and the costs of fertilisers, weeding, and pest and disease management. Central Province and other areas with similar climate are prone to drought during the dry season and irrigation is therefore very important, so vegetable farmers need to include the cost of irrigation.

The second part of the cost of a vegetable farm business is **marketing costs**, which cover all the costs involved in taking the produce from the farm site to the purchasers, which may be supermarkets, wholesalers or consumers. The cost of marketing vegetables to distant markets in cities such as Port Moresby includes harvesting and packaging, transport, communication, handling, market commissions, gate fees and spoilage costs.

Table 6.1: An example of a vegetable farm's income and expense budget

Note: This table uses PNG kina (K) as the currency; for use in other countries, local currencies and local values and costs should be substituted in the blank worksheet below.

Crop: Tomato (crop spacing is 90 cm x 50 cm) Area: 2,500 m ² ; 4,000 plants planted in this area.	
Revenue (6 tonnes or 6,000 kg @ K3/kg)	K18,000
Expenses	
Seeds (500 g)	K250
Nursery practices (soil sterilisation, composting, watering and general husbandry practices)	K150
Land preparation (slashing, ploughing, harrowing @ K0.5/m ² for 2,500m ²)	K1,250
Transplanting or planting (10 men for 30 hours @ K3/hour)	K900
Staking (10 men for 40 hours @ K3/hour)	K1,200
Weeding (10 men for 30 hours @ K3/hour)	K900
Pest and disease control	K180
Irrigation (hire of water pump and fuel)	K450
Harvesting (10 men for 20 hours @ K3/hour)	K600
Sorting, grading and packing (5 men for 20 hours @ K3/hour)	K300
Packing (300 boxes @ K5/box)	K1,500
Transport costs (300 boxes @ K5/box)	K1,500
Market fees and commissions	K700
Communication costs	K100
TOTAL COST	K9,980
Gross income: (Revenue – Expenses)	K8,020

Table 6.1(a) Worksheet for inserting local activities and costs for individual crops

Revenue (show crop, yield and expected sale price)	Value or cost in your local currency
Expenses	
Seeds (500g)	
Nursery practices (soil sterilisation, composting, watering and general husbandry practices)	
Land preparation (slashing, ploughing, harrowing @ /m ² for 2,500 m ²)	
Transplanting or planting (10 men for 30 hours @ /hour)	
Staking (men for hours @ /hour)	
Weeding (men for hours @ /hour)	
Pest and disease control	
Irrigation (hire of water pump and fuel)	
Harvesting (men for hours @ /hour)	
Sorting, grading and packing (men for hours @ /hour)	
Packing boxes (@ /box)	
Transport costs (boxes @ /box)	
Market fees and commissions	
Communication costs	
TOTAL COST	
Gross income: (Revenue – Expenses)	

Personal budget

In personal budgeting, individuals of each household who are the main money managers can make a plan of their income related to living expenses. A well-thought-out plan of income against all household expenses will enable a person to have control over where he or she spends the income. A good budget will guide the individual to spend within what he/she has planned, thus minimising debt to achieve his/her financial goals. The idea is to have a workable budget and to stick to it as much as possible.

Budgeting can be made easier if you list all expenses. This will help you keep track of the expenses and make you cut unnecessary expenses.



How do I create a budget?

The simple steps below will show you how you can create your own budget.

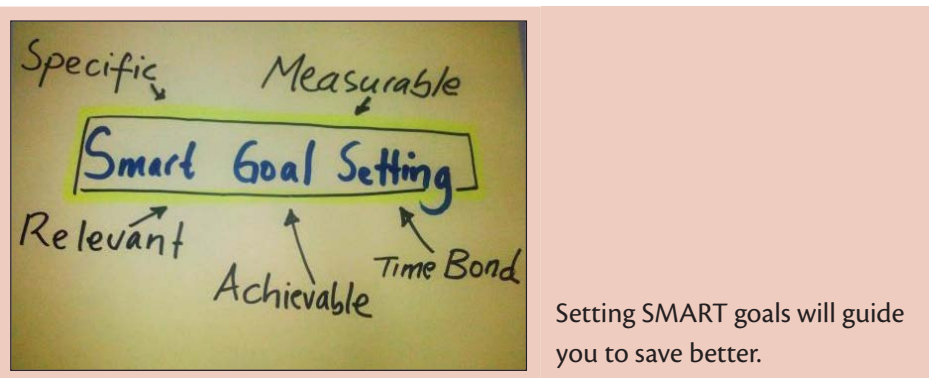
Identify your goal

What are your financial goals? Do you have debts you need to pay off in order to minimise your expenses? Are you dreaming of owning a car, sending your children to university or owning a business? This is the time you need to identify a goal. Without a goal, you will not achieve what you could in your future lives. Budgeting can be for the short, medium or long term. Short-term goals can range from 1 month to 1 year, medium-term from 1 year to 5 years, and long-term can be over 5 years.

SMART goals

You should set SMART goals.

- S:** Specific — Be specific about your goals.
- M:** Measurable — Is it measurable? Quantifying it is better than being vague.
- A:** Achievable — Set a goal that you will achieve given the strengths that you have.
- R:** Relevant — Be realistic and set real goals that you can achieve.
- T:** Time bound — Set a time frame for your goal so you work towards achieving it.



Budgeting can involve tough choices, but if you have set yourself SMART goals it will make budgeting a little less painful.

Examples of a farmer setting SMART goals would be:

- ▶ Short-term goal: By the end of this year, I will save K1,000 to visit my Dad.
- ▶ Medium-term goal: By 2017, I will save K6,000 to send my son to university.
- ▶ Long-term goal: By 2020, I will save K30,000 to buy a tractor.

Note: When setting goals it is important that you set the time in which you want to realise your goal, what it is that you want and the value of your goal, so that this will guide you to achieve your goals.

Where your money is going

Do you find yourself running out of money before you realise you have nothing left? Do you wonder how and where all your money went? If you have no idea how all your money disappeared, it is good to make a list of all your spending. Before you can manage your money, you have to know how you're spending it. Make a list of all expenses in a month to track what you are spending. Get into the habit of recording your expenditures once a day.

Separate the expenses into three categories:

1. Fixed needs—necessary expenses that stay the same from month to month, for example rent, phone bill, school fees.
2. Variable needs—necessary expenses that may vary from month to month, for example fuel, food.
3. Wants—non-essential expenses are items that are not very essential and ones that you can forgo, for example parties, eating out, electronic items, new clothes.

Expenses categorised in such a manner will make budgeting much easier, in that expenditure can be cut back in areas that are not necessary.

In the budget include a monthly savings goal as an expense. It is much easier to save money if you've planned for it in your budget. And it's important, too: if you run into unforeseen expenses, you'll want to be able to pay them without going into debt. And even if nothing goes wrong, having some savings will help you follow your dreams in the future.

Where your income is coming from

Income is money that you receive through various money-generating activities such as the sale of farm produce, fish, livestock or trade store goods, or from a salary if you are employed. Income may also include a loan or gifts from families. It is better to list all the activities that give good income. An example of a household's income and what it is used for is shown in Table 6.2. Table 6.3 shows an example of a budget, which puts a value on each income and expense item, and shows how much money can be saved.

Table 6.2: An example of a rural household's income and expenses

Money comes from (income)	Money is used for (expenses)
Income from sale of garden produce	Day-to-day household costs (e.g. food, clothes, ceremonies, school fees, gifts to church)
Income from sale of fish	Day-to-day farm costs (seeds, pesticides, labour etc.)
Income from customs (e.g. bride price)	Large one-off household costs (such as building or repairs to house, big ceremonies, school fees)
Income from loan	Buying a tractor
Gifts from families	Special treats or luxuries

Keeping track of your income will also help boost your morale, and you can look for opportunities in which income can be increased.

Activity 1

1. Make a list of all your expenses and income for a fortnight, month and year.
2. Create your own budget by using the budget format included, or you can create your own.
3. Set yourself smart goals that will help you to stick to your budget.

Table 6.3: An example of a budget from a village farmer

My budget:

Date:

Income (money in)

Description of Income	Fortnightly (kina)	Monthly (kina)	Yearly (kina)
Sale of garden produce	50.00	108.33	1,300.00
Sale of fish	150.00	325.00	3,900.00
Sale of livestock	50.00	108.33	1,300.00
Loan			
Gifts from wantok	20.00	43.33	520.00
Total income	270.00	585.00	7,020.00

Savings = Total income – Total expenditure

Fortnightly savings: K54.00

Monthly savings: K117.00

Yearly savings: K1,404.00

Expenditure (money out)

Item	Fortnightly (kina)	Monthly (kina)	Yearly (kina)
Food	80.00	173.33	2,080.00
Energy	5.00	10.83	130.00
Rent			
Clothes	5.00	10.83	130.00
Fuel			
Lunch	5.00	10.83	130.00
Bus fare (transport)	10.00	21.67	260.00
Phone/flex	5.00	10.83	130.00
Cost of farm inputs	40.00	86.67	1,040.00
Livestock			
Entertainment			
School lunch and cost	20.00	43.33	520.00
Wantok	5.00	10.83	130.00
Customs	10.00	21.67	260.00
Church	27.00	58.50	702.00
Unexpected costs			
Savings	54.00	117.00	1,404.00
Others	4.00	8.67	104.00
Total expenditure	270.00	585.00	7,020.00

Cash flow budget

A cash flow budget is a valuable tool that one can use to monitor the cash coming into the household and going out through payments for goods and services. A person who keeps track of his/her cash flow is able to predict problems and take avoidance actions. Table 6.4 shows an example of a cash flow for the first 3 months of a year.

Table 6.4: Household cash flow statement for January to March 2013

Name of family: Name of village:

	January	February	March	Total
Income (cash coming in) (kina)				
IGA 1: Vegetables	200	140	200	540
IGA 2: Fruits	500			500
IGA 3: Root crops	230		300	530
IGA 4: Chickens	800	800	800	2,400
IGA 5: Bananas	150			150
Other income: gift from wantok		300		300
(A) Total income	1,880	1,240	1,300	4,420
Deduct				
Expenses (money family used) (kina)				
1. Food	250	300	300	850
2. Soap and others	60	60	60	180
3. Electricity or kerosene	60	60	60	180
4. Transport costs	60	80	40	180
5. Clothes	20	200		220
6. School fees and other education costs	80	60	100	240
7. Beer, gambling, smoking and betel nut				
8. Other household goods	150			150
9. Building and renovating house				
10. Community obligations (bride price, funeral etc.)	200		50	250
11. Church work (10% of total income)	188	124	130	442
12. Wantok as gifts	50		50	100
13. Communication costs (flex cards and top-ups)	30	30	30	90
14. Loan repayments	200	200	200	600
15. Savings (20% of total income)	376	248	260	884
(B) Total expenses	1,724	1,362	1,280	4,366
(A – B) Money left (surplus/(deficit))	156	(122)	20	54
Opening balance	210	366	244	210
New closing balance	366	244	264	264

Summary

Key points to remember:

- ▶ Make it your habit to record all expenses and income on a daily basis. This will help you to keep track of your expenses and to budget for the future.
- ▶ Have a SMART goal that can be a motivator for your savings.
- ▶ Include savings as an expense in your budget.
- ▶ Always remember that a cash flow budget will allow you to project your expenses and income in a period of time, whether quarterly, half-yearly or yearly.
- ▶ Categorise your expenses into fixed needs, variable needs and wants. Budget for the fixed and variable and try to save on the wants.

References

Australian Training website: www.training.gov.au/budget

Cameron D. and Beasley S. 2009. Business Management 1: learning guide. University of Queensland, Australia.

Heney J. 2000. Enhancing farmers' financial management skills. Food and Agriculture Organization of the United Nations (FAO), No. 6.

Integrated Agriculture Training Program. 2004. Saving and credit: making money work. Lukautim moni na moni bai lukautim yu. Module 11.

TOPIC 7

Savings

Objectives

By the end of this topic, you should be able to:

- ▶ understand what saving is;
- ▶ know the importance of savings;
- ▶ know how to save better; and
- ▶ decide where to save your money.

Introduction

Rural farmers in the South Pacific region need skills to guide them to save to realise their dreams. When farmers understand the need for saving for future expenses, they will be able to make plans on how they will save and where exactly they are going to save. These are some of the areas that farmers will be shown in this topic, which will inform them about plans for saving for future expansions of their farm or other bigger costs that are unaffordable now.

What is Saving?

Saving is setting aside some percentage of your income for later use, especially for things you are unable to afford now, or putting aside money for future use, such as sending your children to university, buying a house or car, or even starting a business. In today's society you will hear people talk about savings but do they really save? Everyone knows it's smart to save money in the long run, but many of us still have difficulty doing it. Smart money-savers need to not only save but also consider how to spend the money they *do* have, as well as how to maximise their income.



Save a portion of your income each time and you will be surprised how your money will lead to your destination.

Why do You Need to Save Money?

For many, they say that life is short, so live for the day. That can be true; however, are you truly happy living for each day as it comes? Do you have enough money to send your children to school, buy your dream car, or for an unexpected thing such as an illness that requires money for treatment? These are times when you need the extra cash that you have tucked away. Saving a little each time will ease your anxiety and your stress level during 'rainy days' (i.e. days when things don't go to plan).

Activity 2

1. Write in your notebook some of the reasons why you need to save.

Reasons for saving

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How Can You be a Smart Saver?

As mentioned earlier, many people will say that they save money now for the future, but do they really practice what they say? The steps below will show you how you can save better. To start thinking about saving, you need to set realistic SMART goals and keep all spending in check.



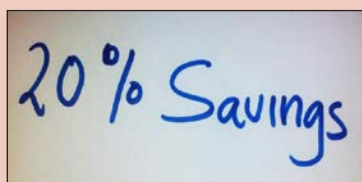
Savings can ease your burden of worrying about tomorrow.

Pay yourself first

Before you spend or do anything with your income, as soon as your cash is in your hands, the first thing you need to do is find a way to pay yourself. This means that you will save a percentage of your income first in your savings account where you can't get ready access to it. People who have paid jobs with a regular fortnightly income should open a separate savings account and arrange for a direct automatic transfer of the amount nominated. This will ease the temptation of using all of the money.

For village farmers and those who do not have a regular fortnightly income, it is wise to stick to your budget. The percentage nominated for savings should be set aside for depositing into a savings account. Decide on a specific cash amount to manually deposit into a savings account each month and stick to your goal. In order to help you save better, try following these simple rules and you will be surprised how easily they work:

1. **Save 20% of your income. This must be the first thing you do once you have cash in your hands.**
2. **10% of your income should be for church activities or other valued regular activities.**
3. **70% of your income should be used for other expenses.**



Open a savings account and save 20% of your income.

Where Can you Save?

There are two options for rural village farmers to save:



1. **informal saving:** that is, saving money in unregulated ways such as voluntarily saving at home in piggy banks, or carrying money around in bags, or hiding it at home in secret places where other people cannot steal it.
2. **formal saving:** that is, saving money in bank accounts or through savings and loan societies, which are regulated financial institutions.

Examples of each of these options are given, together with their advantages and disadvantages, in Tables 7.1 and 7.2.

Table 7.1: Some examples of formal and informal saving

Examples of formal saving	Examples of informal saving
<ul style="list-style-type: none"> • Savings account at a commercial bank • Savings account in a microbank • Savings in interest-bearing deposits 	<ul style="list-style-type: none"> • Penny box (piggy banks) at home • Carrying in billums and wallets • Hiding in the house under beds etc. or in secret places • Giving to relatives or trusted person to keep safe

Table 7.2: Advantages and disadvantages of formal and informal saving

	Formal saving (banks)	Informal saving
Advantages 	<ul style="list-style-type: none"> • Safe keeping • Accumulates interest • Easy access to loans against savings 	<ul style="list-style-type: none"> • Easy access when required • No account opening requirements
Disadvantages 	<ul style="list-style-type: none"> • Not easily accessible • Account opening requirements that are not friendly for village farmers • Limited access to the banks 	<ul style="list-style-type: none"> • Not safe to keep at home • No interest • No growth plan • No control over spending due to easy access

Where Can Savings be Made?

By analysing the advantages and disadvantages of formal and informal saving, you can see that it is better to save formally with banks. Savings in banks and other regulated financial institutions will give you the opportunity of earning interest on your money. Similarly, the money is kept safe in the banks compared with being at risk of theft and damage if kept at home.

Examples of some commercial banks in Papua New Guinea where savings can be made include the Bank of South Pacific (BSP), ANZ and Westpac. Microbanks include Nationwide Microbank, PNG Microfinance and Women's Micro Bank. You need to shop around to identify a bank that gives good interest for your savings. All banks are different and a thorough assessment will guide you to save your money in the best place. The Fiji Development Bank specifically targets agriculture as a crucial area of lending, providing small farmers and individuals with loans in the range FJ\$1,000–\$500,000.

Other places that you can save money include savings and loan societies. If you are a member of any of these societies, you can save. It is a good idea to thoroughly study their products and requirements and select the one that suits you most.

Some examples of financial institutions that farmers across the Pacific region use to either save or borrow money are shown below.



Bank of South Pacific (source: Bing image) and Fiji Development Bank provide loans for agriculture and small or medium enterprises (SME) that have been designed for individuals and farmers.



ANZ Bank has branches nationwide in major provincial centers (source: Bing image).

PNG National Development Bank provides loans to farmers and any other SME (source: Bing image).

Westpac Bank is found across the Pacific countries.



Nationwide Microbank has branches in all provincial centers (source: Bing image).

Activity 3

1. Do some research and identify a bank that best suits your savings requirements.
2. Open a new savings account.
3. Start saving money by depositing 20% of your total income each fortnight or month.
4. Remember to stick to your goal!

Summary

Key points to remember:

- ▶ Have a SMART goal to follow when saving.
- ▶ To achieve your savings goals, pay yourself first.
- ▶ 20% of your income should go to savings; 10% for church, for example; and 70% for other expenses.
- ▶ Make sure you shop around and identify saving options that best suit you.
- ▶ Remember to open a savings account and arrange for automatic deposits if you are receiving a regular income.
- ▶ If you are self-employed and receiving cash, make sure to stick to your goal and deposit into your savings account every month.

References

- Australian Training website: www.training.gov.au/budget
- Cameron D. and Beasley S. 2009. Business Management 1: learning guide. University of Queensland, Australia.
- Heney J. 2000. Enhancing farmers' financial management skills. Food and Agriculture Organization of the United Nations (FAO), No. 6.
- Integrated Agriculture Training Program. 2004. Saving and credit: making money work. Lukautim moni na moni bai lukautim yu. Module 11.

TOPIC 8

Loans

Objectives

By the end of this topic, you should be able to:

- ▶ understand the difference between formal and informal credit;
- ▶ understand the different language (words) used by formal lenders;
- ▶ understand well the requirements of getting a loan; and
- ▶ calculate the repayments for a loan.

Introduction

This topic will give information on how you can make informed decisions when it comes to getting a loan. A loan can be risky if you do not have plans on how it can be used and repaid. In this topic, farmers will be introduced to what credit is. A loan is not a grant or a gift; it comes with an obligation for repayment, which is tied with interest. Farmers who want to get loans should have plans on how to use the money, so that it does not become a burden but will generate income to finance the repayments. This topic will show farmers how to get a loan and where to get loans at interest rates that are lower. Loans can be obtained formally and informally.

What is a Loan?

A loan is money you receive from financial institutions or other people that you agree to pay back with interest at a later time, often consecutively until the repayments are complete. People borrow because they do not have enough money to afford the cost of goods and services they require at that time.

Why do You Need a Loan?

People get loans for various reasons. Some borrow to improve both their income and their livelihood, while others borrow for leisure or non-essentials goods—but that can make families worse off. Borrowing to improve farm outputs and income is a fair reason for borrowing because it is making families better off. Farmers who want to expand their farms but do not have sufficient money can obtain loans to finance their farm expansion.

Do you really need a loan?

Before you decide to get a loan, you should first make plans on you how you will use the money. Only borrow money if the borrowing is going to be used to fund expenses that will earn more money in the future. Loans are not handouts. They are accompanied with obligations and responsibilities.



Don't let a loan become a burden to you but use it to generate more income.

What are the Requirements of Getting a Loan?

Different banks and financial institutions have different loan requirements and loan products to suit different needs. Most commercial banks would require some form of security before they will approve your loan. Banks will not just lend you money instantly. They will require you to make plans on how you will use the loan. Some of the plans they will require are your business plan and marketing plan, including the cash flow projection of the farm project that you want to venture into. It is wise to research the various banks and financial institutions on the loan products they have and their requirements, and only get loans from the banks with which you are most comfortable. Ask people who have obtained similar loans as you are seeking about the experiences they have had. They might give you good information that can be helpful.

Requirements for a loan application

Here are some examples of information that lenders may ask for when you apply for a loan. Not all lenders require all these things.

- ▶ records to show what income you have had in the past
- ▶ records to show past expenditure (receipts)

- ▶ identification
- ▶ references of your character from an approved person
- ▶ a cash flow budget
- ▶ a business plan
- ▶ security (collateral) or a deposit or both
- ▶ approval from the appropriate authority to run your business (if necessary)
- ▶ a completed loan application form.

How to keep the records necessary for a loan application

Keep all the records of your past income in a folder to use if you need to show how much income you have received and how much you have spent. Savings records are also useful to show a good savings habit and regular payments.

Examples include:

- ▶ sales of produce to a store, supermarket or processor
- ▶ receipts for expenditure
- ▶ wages records
- ▶ a savings passbook
- ▶ bank statements.

Keeping a cashbook to record income and costs (expenses) is helpful. A cashbook lists what your income and costs have been in the past, and this can be helpful in estimating future income and costs for a cash flow budget.



Where Can You Get a Loan?

There are two credit options available to village farmers. Loans can be obtained formally or informally. Tables 8.1 and 8.2 distinguish between formal and informal loans and their advantages and disadvantages.

Table 8.1: Examples of loans from the formal and informal sectors

Examples of formal loans	Examples of informal loans
<ul style="list-style-type: none"> • Loan from a bank • Loan from a savings and loan society • Loans from a credit scheme (seed funding or district credit scheme) 	<ul style="list-style-type: none"> • Money lenders • Loans from wantok (family members) • Obligations • Buying things on credit

Table 8.2: Advantages and disadvantages of formal and informal loans

	Formal credit	Informal credit
Advantages 	<ul style="list-style-type: none"> • Interest rates are much lower than for informal credit • Gives higher loan amounts for bigger projects 	<ul style="list-style-type: none"> • Easy access, no requirements
Disadvantages 	<ul style="list-style-type: none"> • Strict loan application requirements that often discourage small farmers • Need collateral to obtain loans 	<ul style="list-style-type: none"> • Interest rates are often too high, over 40% on short-term loans • Do not give bigger loans, especially over K1,000

A **formal loan** is borrowing from banks and recognised financial institutions. The credit given is not a handout and repayments must be made at set time periods. Penalty fees and account maintenance fees apply, and the system will fail if you don't pay back the loans.

Only use credit if:

- ▶ you can repay the loan
- ▶ the loan will be used to improve your farm and livelihood
- ▶ you understand the terms and conditions of formal credit.

All microbanks and some commercial banks give credit to village farmers and people outside the formal employment or business sector. If you are thinking about getting a loan to expand your farm business, it is better to do some research and find out which of the various banks in your country that give loans at a competitive rate most suits your needs. In order to get a loan you need to first open a savings account with a financial institution that rewards you with a high savings interest rate plus a low interest rate for loans. The savings you have can be used as collateral against the loan.

Loan Repayment

The exercise example below on loan repayments will give you some understanding of how repayments are calculated on a flat interest rate.

For example:

A vegetable farmer wants to take a loan to expand his/her vegetable farm to supply to a new market. The cost of expanding the vegetable farm is projected at K3,000 as starting capital. Due to financial constraints, the farmer can't afford to expand, so he/she wants to get a loan to fund the expansion.

The farmer then approaches a rural bank that gives loans to similar small farmers with similar cash flow budgets, and provides the bank with a loan application for a loan of K3,000. The bank approves the loan and the farmer gets a K3,000 loan on

a flat interest rate of 10% per year. The term of the loan is 3 years. Repayment will start after 3 months when the farmer starts to sell the vegetables. The calculations below will show you how he/she repays the loan over 3 years.

What would be the repayment for this vegetable farmer?

- ▶ Principal amount = K3,000.00
- ▶ Term of the loan = 3 years = 36 months
- ▶ Flat interest per year = 10% of K3,000.00 = K300.00
- ▶ Flat interest for the term of the loan = K300 x 3 years = K900.00
- ▶ Total to repay = principal + flat interest = K3,000.00 + K900 = K3,900.00
- ▶ Loan repayment per month = K3,900.00 ÷ 36 months = K108.33/month

The farmer would repay **K108.33** per month for **3 years**.

Terms Used in Applying for Loans

Some terms or words used when applying for loans are summarised in Table 8.3.

Table 8.3: Terms used when applying for a loan

Terms used	Meaning
Interest	Extra amount paid on top of amount borrowed based on a % rate. Two types of interest are used in loans: <ol style="list-style-type: none"> 1. flat interest, which is paid on the total amount borrowed for the period of the loan 2. simple interest, which is paid only on the amount of the loan that is still owed, so the amount of interest reduces as the loan is repaid.
Interest rate	Interest is expressed as a percentage, usually per month or per year.
Principal	The principal is the amount of money you borrow at the beginning. As well as paying interest, you have to pay back the principal.
Loan repayments	Loan repayments are the total of interest and principal together. Repayments are usually divided into regular time periods.
Loan term	The loan term is the number of months or years that you take the loan for.
Fees	You will usually have to pay other charges for borrowing money, as well as interest. These other charges are called fees. There are different types of fees. Examples are loan fees, stamp duty, fees for using cheques, fees for withdrawing savings, and fees for late repayments.
Default penalties	You pay the lender more money if you don't make your repayments regularly. This is called a default penalty (or default fee).
Arrears	If you stop repaying the loan, you would be in arrears.
Collateral (security)	Security in terms of assets (e.g. savings, deposits, land, house or vehicle) is sometimes a requirement for a loan.
Grace period	Sometimes you don't have to start repaying the loan immediately after you take the principal. You might be allowed a 'grace period' until you have to start repaying.
Terms and conditions	The terms and conditions are the requirements you have to meet when borrowing the money from formal lenders.

Summary

Key points to remember:

- ▶ A loan is not a handout—it comes with obligations. Loans have to be repaid with interest.
- ▶ Only get a loan if you are going to expand your farm or improve your family's livelihood. Loans to fund entertainment and leisure can make families worse off.
- ▶ Farmers are encouraged to get loans from banks and regulated financial institutions that have a lower interest rate compared with informal loans.
- ▶ Get information on the various loan products from different financial institutions before you decide to get a loan.
- ▶ Formal banks would normally have requirements that you will have to meet before they approve your loan. Remember to submit all their requirements together with the loan application when applying for a loan.
- ▶ Keep necessary records such as savings records, receipts from the sale of produce etc. for the loan application.
- ▶ Make yourself familiar with the monthly repayment calculations and schedule.

References

- Heney J. 2000. Enhancing farmers' financial management skills. Food and Agriculture Organization of the United Nations (FAO), No. 6.
- Integrated Agriculture Training Program. 2004. Saving and credit: making money work. Lukautim moni na moni bai lukautim yu. Module 11.