INTEGRATED PEST MANAGEMENT

Training tools for Pacific Island communities

Roselyn Kabu Maemouri

Training Tools for
Pacific Island Communities

Integrated Pest Management

Kastom Gaden Association
SOLOMON ISLANDS

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Contributors...

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...Roselyn Kabu Maemouri

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Contents

Preface

This book has been written for community extension workers, government field officers and non-government organisations.

The Integrated Pest Management (IPM) for North Malaita Project and this book, which represents one of its outputs, aimed to teach people about old and new knowledge regarding ways to manage insect pests in food gardens on North Malaita.

Combining old and new methods and sharing knowledge and skills may lead to truly sustainable ways of managing the insects which reduce crop productivity.

This may also help farmers avoid the use of synthetic pesticides which destroy the balance of nature and which are so expensive that farmers often cannot afford to buy them.

Natural pest management presents a cheaper solution and does not damage the soil and natural environment.

I have worked with the Kastom Garden Program since 1995 and started to develop the integrated pest management project in 1998.

Local farmers have trialed methods of integrated pest management and have helped with the workshops that have formed part of the participatory process of the project.

...Roselyn Kabu Maemouri

Author Roselyn Kabu, seen here with her son Andrew, has worked with the Kastom Garden program since 1995.

Roselyn currently manages the program's North Malaita projects in the Solomon Islands.

The IPM manual—background:

This section provides background on the IPM project.

- Local food for a changing Pacific
- The Integrated Pest Management project
- The Integrated Pest Management manual:
  - purpose
  - structure
  - innovative approaches
- Planning your training program

Local food for a changing Pacific

The diets of Pacific Island communities are changing,
and not always for the better.

Imported, processed and packaged foods are increasing in availability and in many places they now compete with the foods used in traditional Pacific Island diets. The result has been that many families no longer eat a balanced diet and their health has become poorer.

Processed foods often contain a lot of fats, sugars and salt. Overuse of these foods has brought an increase in medical disorders such as diabetes and obesity.

A longer term consequence of increased reliance on processed foods is that traditional knowledge of collecting, processing and cooking foods from the forest is lost.

Encouraging families to eat a balanced diet, one with a mix of carbohydrates for energy and proteins, vitamins and minerals for body building can maintain the health of communities. Even when imported and processed foods continue to form a part of family diets, locally grown vegetables and grain as well as fresh fish can maintain a balanced diet and family health.

The need to reduce insect damage

The availability of a balanced diet based on locally-grown foods requires farmer's to produce a reliable supply of food from their gardens. This means that the amount of food crop lost to insect pest attack has to be reduced.

There are other reasons to reduce the amount of crop lost to insect pests. When natural disasters such as drought or cyclone strike, local foods can reduce the need for the supply of emergency food. And with political trouble and conflict having affected a number of Pacific islands, the availability of local food means people do not go hungry if the supply of imported food is cut.

If agricultural extension staff and community workers are to popularise locally grown foods, then training farmers to reduce the loss of their crops to insect pests has to become part of their work. Insect pests are responsible for a great deal of crop loss in many developing countries but their control can increase the amount and quality of fresh foods available to village communities.

The easy way to control pest insects is to use synthetic chemical insecticides. But problems with these products have become apparent over the years. The most alarming of these problems is the poisoning of farmers who use too much insecticide and who do not wear protective clothing when using it. This is a real problem where farmers cannot read the labels on insecticide containers which explain how to use them properly.

Relying on synthetic insecticides also increases the reliance of farmers on imported products and consumes money that could be better spent on other needs. If farmers understood how to make their own insecticides from local materials and other ways to control insect pests that eat their crops they would save their money and be more self-reliant.

The work of the Integrated Pest Management Project in the Solomon Islands has shown the value of documenting the traditional knowledge of pest control held by farmers and combining it with scientific knowledge to produce an approach to insect pest management that can be used and controlled by village farmers.

The Integrated Pest Management project

This book is based on the experiences of the Kastom Garden Program, an activity of the Australian non-government organization, APACE (Appropriate Technology for Community and Environment).

Farmers involved in the program on North Malaita, Solomon Islands, identified serious pest problems affecting their shifting cultivation fields. The fields are used for family food production and local marketing.

Farmers abandon crops, resort to pesticides

Some farmers]abandoned nutritionally important crops at certain times of the year and an increasing number were resorting to the use of synthetic pesticides, especially for market crops. There has been numerous reports of misuse of these pesticides, with many farmers poorly informed on how to use them.

Incidents reported during the project period included:

- farmers poisoning themselves, with some ending up in hospital
- the poisoning of a village water supply when a pesticide container was washed out in the water catchment
- numerous stories of local consumers feeling poisoning effects after consuming produce grown with excessive pesticide use, including indiscriminate use of DDT left over from old malaria control programs.

We were fearful that farmers were about to embark on a spiral of increasing pesticide use with the resultant destruction of natural insect pest-enemies, ecosystem balance and increasing negative health and environmental effects such as have been experienced in many other parts of the world.

Participatory approaches to pest management

Between 1998 to 2000, APACE decided to try a participatory approach to solving some of these problems:

- field workers based at the Mana'abu Training Centre in North Malaita, Solomon Islands, worked with local farmers to identify individuals who had been successful at managing pest problems in their gardens
- these farmers were invited to a series of workshops where they were given the opportunity to share their experiences with other farmers and the group was introduced to the general principals and practice of integrated pest management
- a series of rather informal farmer field trials were then established where other farmers were invited to test the experiences of the innovative farmers
- field visits to the innovative farmers gardens were arranged to observe what they were doing in the field.

Farmers adopt successful methods

In general it was found that the successful farmers had already adopted and developed their own methods of IPM. Usually, these combined traditional knowledge with their own careful observation and experiences.

Adopted methods involved:

- good garden hygiene
- careful observation of insect life cycles
- careful understanding of seasons
- soils and soil fertility
- the use of some botanical insecticides and repellents as a last resort.

The field trials were visited by our project field workers and the results discussed with farmers. Generally, the feeling was positive that farmers could make a significant improvement to managing pest problems that would not damage the environment or their health by using improved information and local resources .

PTD proves successful

The process of sharing these farmer's experiences was modelled on the process of Participatory Technology Development (PTD).

This book is based on the experiences of these farmers and the PTD process in North Malaita, Solomon Islands. It represents only the start of what must be an ongoing process to improve farmers pest management practices in the face of rapid agricultural change.

Today, fallow periods are declining, new pests have been introduced and new crops often displace old in a period of agricultural intensification being experienced throughout much of the Pacific.

This book demonstrates the reliability of the basic principles of IPM and demonstrates the rich local knowledge that farmers in any location have. This is knowledge that should be used as a building block to solve local pest problems.

Tony Jansen
advisor, Kastom Gaden Association
Solomon Islands Planting Material Network

PTD approach to field assessment and training

identify project stakeholders who will be involved

↓

identify agricultural problems

↓

identify solutions through field trials

↓

share knowledge of successful field trials

The Integrated Pest Management manual

Purpose

The purpose of this manual is to assist agricultural extension workers from both government and non-government organisations to introduce methods of ecologically sustainable agriculture to Pacific Island communities.

The *Integrated Pest Management* manual specifically addresses:

- reducing crop damage by insect pests by managing the number of insects, not eliminating the insects completely
- developing an understanding of the role of insects (pests and predators) in the agricultural environment
- educating farmers in the application of safe methods of pest management.

The contents of the manual have been gleaned from the experience of the Kastom Garden Program (KGP) and the work of its successor, the Kastom Gaden Association (KGA), which have operated in the Solomon Islands since 1995. All of the methods described have been tested in the field by KGA staff.

Structure

The *Integrated Pest Management* manual consists of three sections—an introduction, a guide to assist trainers in their work, outlines of the training sessions including student handouts and attachments consisting of graphics for photocopying and enlarging for use as flip charts.

Introduction

This section provides an introduction to the manual, notes on the KGP approach to the planning of training programs and background reading on the importance to health of village-based food production.

Guide for trainers:

This section is about the training process and preparation for training:

1. Planning the workshop
2. Introductory session
3. Participants define expectations.

Integrated Pest Management for North Malaita regional project coordinator, Roselyn Kabu (right) leads a process to collect information about crops grown at Takwa village

Training session outline:

In this section of the *Integrated Pest Management* manual you will find lesson outlines that will assist you to organise workshops and to set up farmer field trials.

It will also help you to teach the skills of safe pest management. The sessions include:

4. Introduce safe insect pest management
5. Identify pests
6. Explain the lifecycle of insects
7. Identify existing management methods
8. Organic controls
9. Identify predators
10. Methods to encourage predators
11. Botanical sprays
12. Farmer field trials
13. Assessing the experiments
14. Post-workshop activity.

A five stage process

There are five stages to introducing safe insect pest management to village farming communities:

1. **Introducing safe insect pest management to farmers**
   a) Introduce safe insect pest management (session 4)
   b) Identify pests occurring in the farmer's gardens (session 5)
   c) Explain the lifecycle of insects (session 6)
2. **Alternative ways to manage plant pest and diseases**:
   In this section we explore pest management methods that do not rely on buying and using synthetic pesticides, such as the production of botanical sprays (made from plants such as chilli). Some natural pest control methods also reduce the spread of plant disease.
   a) Organic controls
      - identify existing management methods (session 7)
      - organic controls (session 8)
   b) Biological pest management
      Biological pest management involves the suppression of pest populations by living organisms such as predators, parasites and pathogens.
      Growing a variety of flowering plants (especially those of the Asteraceae, Apiaceae and Lamiaceae family) will attract insect predators into the garden. These beneficial insects feed on the pest insects, keeping the pest population at a low level.
      These training session will explore:
      - identify predators occurring in the farmer's gardens (session 9)
      - methods to encourage predators (session 10)
   c) Botanical sprays (made from plants) (session 11).
3. **Farmer field trials** (session 12)
4. **Assessing the experiments** (session 13)
5. **Post-workshop activity** (session 14)

These stages can be the focus of a series of workshops with farming communities.

The workshops involve:

- **meetings** where discussion takes place and where methods of insect pest management are described and demonstrated
- **visits** to farmer's gardens to identify insect pests and to see pest management techniques in use.

Attachments (flip chart graphics):

1. What is safe pest management?
2. Identifying insects in the garden
   a) Caterpillars
   b) Grasshoppers
   c) Bean fly
   d) Birds
3. Insect life cycle
4. Organic controls:
   a) Why use mulch?
   b) Clean the garden
   c) Hand pick insect pests
   d) Clean planting material
   e) Plant strong smelling plants
   f) Crop rotation
   g) Mixed cropping
   h) Remove weeds
   i) Leave trees standing in the garden
5. Encourage predators
6. Botanical sprays
   a) Benefits of botanic sprays
   b) Plants used to make botanical sprays for pest management
   c) Making chilli sprays
   d) Making Mala'alakwa spray
   e) Making tobacco spray
   f) Making wood ash
   g) Using botanic sprays.

Innovative approaches

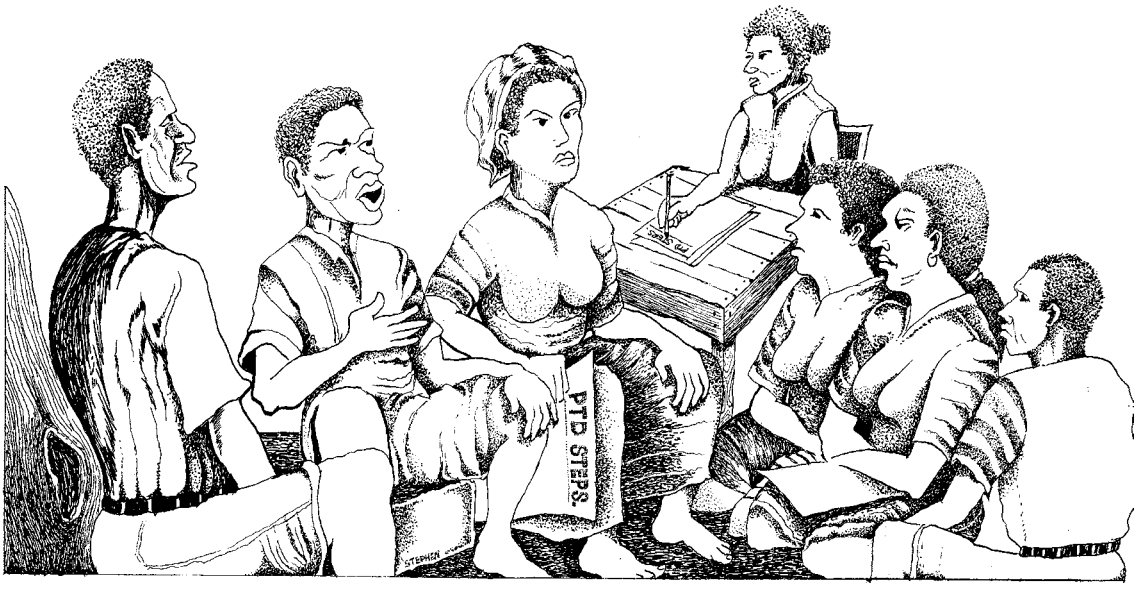
In the training of village farmers and community groups, the KGP and, since 2001, the KGA have made use of a variety of approaches.

These include:

- Participatory Rural Appraisal (PRA)
- Participatory Technology Development with farmers (PTD)
- community food security assessment.

The methods featured in the manual are drawn from the practice of low-external-input sustainable agriculture which encourages farmer and regional self-reliance through:

- substitution of externally sourced agricultural inputs by locally produced inputs, as far as practical
- farmer innovation
- the use of relevant traditional knowledge.



Planning your training program

The Participatory Technology Development (PTD) methodology we use was modelled on the experience of farmer groups in Africa and other countries.

It has been reported in the reference journal *LEISA* (*Low External Input Sustainable Agriculture*) and in the book *Developing Technology With Farmers—A Trainer's Guide for Participatory Learning* (1997; van Veldhuizen and others; ETC Netherlands: Zed Books, London).

1. Planning the training workshops

Here we plan the workshops through which the farmers will acquire skills.

Scheduling the workshops is done with the farmers so training does not conflict with times of intensified farming activity or cultural obligation.

2. Training program implementation and monitoring

Help farmers find solutions

To use the PTD process, we encourage farmers to try out some of the potential solutions and techniques in their fields.

We help farmers find solutions to their problems. We don't come up with the answers ourselves, instead we try to help farmers solve their own problems or find alternatives.

3. Farmer field trials

The farmer field trials allow farmers to assess potential solutions for themselves. On the basis of their experience during the field trials, they can decide for themselves whether they want to adopt the techniques and new ideas in their own gardens.

The farmer field trials can continue for some time. When the trainers return for follow-up visits, they organise a tour of the farmer field trials so the group learns how the trials went, what problems were encountered and what solutions were tried.

Innovative farmers are encouraged to discover their own solutions and then share their experience with others.

4. Monitor progress

While the program of workshops and field visits are being implemented, we **monitor** them so we gain some idea of how they are progressing and if there is a need to modify the program.

If necessary, the program can be evaluated after it has ended so we can improve on our work in future.

5. Sharing results

After all of the trials have been concluded, we organise workshops for the farmers where they share their findings. This way, we develop a group conclusion to the experimentation and assessment.

A series of workshops can be held in the local language and we can ask some of the experienced, innovative farmers to become involved in facilitation and to share their knowledge.

Farmers are encouraged to talk about their experiences with other farmers.

Sustaining innovation

Led by the innovative farmers and promising future leaders, the PTD process can be expanded into other villages. This is done through farmer tours and exchanges where groups of farmers visit each other's gardens to see the innovations being made there.

In this way, an expanding network is developed. This leads to the spread of innovation because the farmers become empowered to analyse, understand and find their own solutions to their own problems.

Guide for trainers:

This section is about the training process and preparation for training.

1. Planning the workshop
2. Introductory session
3. Participants define expectations

NOTES:

1. Planning the workshop

Training should be practical

Kastom Gaden Association trainers have developed a three stage training approach that emphasises practical activities:

- **talk about it**—explain the technique and the benefits of using it
- **see it**—demonstrate the technique or skill so the trainees see it being done
- **do it**—assist the trainees to acquire the technique by doing it for themselves, under the supervision of the trainer.

Explaining and demonstrating a technique helps participants in workshops comprehend it and how it fits into the farming cycle. Then, when they practice what has been explained and demonstrated, they acquire the skills to make use of the technique in their own gardens.

Organising training sessions

A well planned training session is more likely to be successful, but no matter how well a training session is planned there are times when you will have to change from your plan to compensate for something unexpected. Your planning should allow for this flexibility.

Here are some things to think about in planning your training session...

List the key areas

Make a list of the key areas you want to cover.

How are they relevant to the people who will attend the training session?

Choose your outcomes

Work out the outcomes you want from the session. What will students be able to do at the end of the session?

Knowing the outcomes you want brings focus to your training and helps you decide what to include and what to leave out.

Keeping to the teaching principle of providing information in small, easy-to-comprehend blocks helps achieve our learning outcomes.

Achieving your outcomes

How will you achieve your learning outcomes?

Through:

- presentation of information
- games
- small group activity
- garden visits
- practicals
- some other technique.

How will you present the information and build on each step? You can use demonstration, practice and analysis of what has been taught.

Time your activities

When you have chosen the activities that will make up your training session, give them an estimated timing.

Try to keep as close as possible to this timing so your training session does not run overtime.

If you run overtime you might have to leave something else out later.

Summary and closing

At the end of each part of your training session, summarise the main points of what you have taught to help participants remember them.

When the session finishes for the day, summarise the main points of what you have covered over the whole day.

Use questioning to help the participants feed back what they remember — ask them what they remember about what was covered.

This is an important part of the day's training, so allow enough time to do it. Then, if training is to continue the next day, briefly preview that day's material.

After the first day, it is a good idea to do some revision exercises each morning. This refreshes people's memory of what was covered the day before.

Watch participant energy and motivation

To keep students interested and to maintain their energy, plan to use a variety of teaching methods such as:

- **presentations** with flip charts on brown (or white) paper (using diagrams and pictures as well as written words where literacy skills are low)
- **participatory activities** such as making maps and tables of information on the ground
- **questioning** to engage the participants in thinking and sharing their ideas and knowledge
- **role play** to illustrate an important point
- **site visits** to see and explain something and to learn about other people's experience
- **small group activities** in which the participants are divided into groups to work on something, then share their findings when the group comes back together
- **practicals**: always apply all of the methods you have talked about or explored; if people then go and practice the methods they are more likely to use them in their own gardens.

Throughout the session, monitor participant energy levels and, if they are becoming tired, change to a more participatory and active mode of teaching.

Plan breaks to divide up the day.

Whenever the group appears tired you can choose an 'energiser' activity that involves movement.

Prepare materials

Obtain and prepare any materials **before the training session**.

Flip charts should be drawn up after the lesson has been planned but before it starts and other materials gathered. Take extra flip chart paper and marker pens for participants to use.

When a person is facilitating a session, the other trainers should assist in preparing materials for the following session.

Meet to assess activities

The facilitation team should **meet in the evening after the day's activities** or in the morning before activities start to monitor how the training is going.

This is the time to allocate responsibilities for the next sessions and to ensure that materials are ready.

Sample training timetable

Following is a sample training timetable for a day.

The timetable you draw up will take into account:

- the time available to participants
- their other daily responsibilities such as family meal preparation, social activities and work commitments.

8.00am:	group introductions—who people are and what they hope to get from the day + introduction of the learning objectives
8.30am:	group activity, information collection, needs identification, problem identification etc + report back to main group
9.00am:	demonstration of some part of the training
10.30am:	break
11.00am:	presentation
12–1.30pm:	lunch break
1.30–2.30pm:	field visit or practical
3–3.30pm:	discussion about what was seen during field visit or learned during the practical
3.30pm:	summary of key points covered during the day
4pm:	conclusion; ask each person to tell the group one thing they have learned during the day.

The trainer

Trainers are very special people because they:

- are motivated to help others achieve their basic needs
- have enthusiasm for their work
- are patient
- continually seek out new information to pass onto participants in their programs—they are continually learning
- have an extensive knowledge of what they teach
- are good communicators, passing on knowledge in easy-to-manage pieces and in language that participants can understand easily
- are problem solvers
- practice what they teach and experiment with new ideas in their own gardens
- learn from the participants in their workshops
- seek feedback about their teaching from staff members, program participants and colleagues
- understand the limitations and opportunities of village life
- are good organisers of people, events and resources
- have a warm and friendly personality to create a relaxed learning environment
- network with their colleagues and contacts
- have skills in working with and organising people and have good group dynamics skills
- have skills in conflict resolution.

Checklist for trainers

Organising the training

- what negotiations/ arrangements are necessary with village decision makers to organise the training?
- will a translator be needed to translate into local language?
- has an appropriate time been chosen for the training— is the time free of work or cultural obligations?
- has an appropriately sized training venue been organised and has workshop space been selected?
- is it necessary to plan follow-up workshops?
- has a place been chosen to make a sup-sup garden?
- who will look after the garden following the workshop?

Planning the training

- how many participants are expected and who are they?
- what seating arrangements would be suitable?
- has time been allocated for the different sessions and workshops?
- have resources been gathered for each session or workshop? (flip charts/ blackboard/ colour marker pens/ string/ materials for PRA and practical sessions)
- what do you know about the food/ nutrition/ health and other circumstances of the community?
- what process will be used—small group activities/ lecturing/ case studies/ brainstorming/ role play/ garden visits/ practical workshop in the garden?
- what are the key issues to address?
- how will the material be brought together in a summary?
- who will make a written record of the workshop if needed?
- who will produce a written report?
- what are the key questions to ask to find out if the participants have understood the material?
- how will you obtain participant feedback?
- how will you identify your own learnings from the training?
- how will you make sure that women are free to express themselves and fully participate?
- who are the local experts or innovative farmers who will be resource people during the workshop and whose gardens can be used for visits?

Logistics

- what garden sites are available for field visits and workshops?
- what are the food arrangements for participants?
- are you using local food for catering?
- what are the arrangements for field worker accommodation and food if staying in the village?
- what transport arrangement are necessary?

2. Introductory session

Outcome

At the end of this session, workshop participants will have been introduced to each other and to the facilitators.

Key messages

Participants work together better when they know each other.

Approach

After the official opening, participants introduce themselves.

Facilitators introduce themselves after the participants.

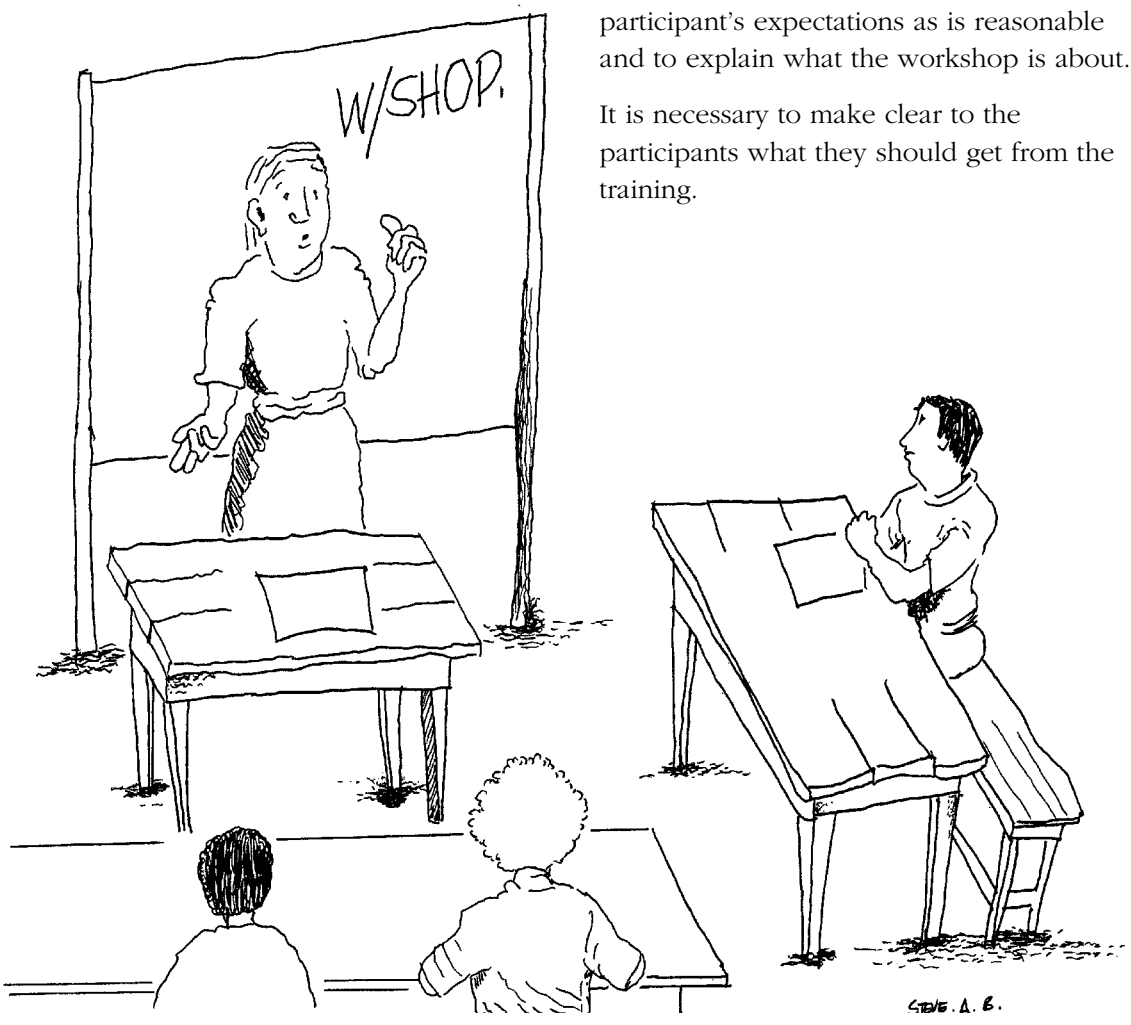
Procedure

1. Break the group into pairs
2. The pairs get to know each other—10 minutes
3. Each person introduces their partner and what they learned during the getting-to-know period.

The first day of a training workshop is a time when participants get to know each other (if they do not do so already) and the trainers and to clarify what they hope to get from the training.

For the trainer, it is a time to listen carefully, plan to accommodate as many of the participant's expectations as is reasonable and to explain what the workshop is about.

It is necessary to make clear to the participants what they should get from the training.



3. Participants define expectations

Outcome

At the end of this session, workshop participants will have made a list of their expectations for the workshops.

Key messages

Participant expectations are most likely to be met when they have been clarified and explained.

Approach

Participants identify, clarify and discuss their expectations of the workshop.

Procedure

1. **Facilitator explains** to participants that:
   - the workshop will be adjusted to accommodate as many of their expectations as possible within time and resource limits
   - it may not be possible to cover some expectations in the workshop
2. **Hand out** three to five cards to each participant and asks them to write or draw a picture of one of their expectations on each card
3. **Participants explain** the expectations on their cards to the group
4. **Facilitator sticks cards on a board**, trying to group them according to common expectations
5. **Facilitator summarises** the expectations presented
6. **The workshop then takes a break**. During the break the facilitators:
   - select the groups of expectations they can cover in the workshop
   - allocate time to each on a workshop timetable; any remaining time is used to cover standard improved household gardening topics. Refer to other manuals in this series, such as *Improved Home Gardening Skills* and seed saving manuals, if these come up as expectations of the participants
   - each group of expectations is assigned to a separate day.

Training session outline:

This section contains lesson outlines to assist you to organise workshops and set up farmer field trials.

4. Introduce safe insect pest management
5. Identify pests
6. Explain the lifecycle of insects
7. Identify existing management methods
8. Organic controls
9. Identify predators
10. Methods to encourage predators
11. Botanical sprays (made from plants)
12. Farmer field trials
13. Assessing the experiments
14. Post-workshop activity

NOTES:

4. Introducing safe insect pest management to farmers

Outcomes

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

- explain the importance of safe pest management in the garden
- explain the benefits of natural pest management and the problems that may occur with pest management based on the use of synthetic chemicals.

Key messages

- safe pest management is important to the management of insect pests and plant diseases
- look at the whole garden system including soils and plants
- some insects found in the garden are beneficial; these are called predators because they eat the insects that damage our plants.

Approach

...discuss

- brainstorm—what is a garden pest?
- break into small groups to discuss techniques the participants have used to control pests
- what is safe pest management?
- break into small groups to discuss insects and the plants they eat; groups report back to workshop what they learn.

Materials

...for discussion

- flip chart to use in discussing safe and unsafe pest management (Attachment 1)
- marker pens and paper for small group work.

Procedure

1. **The trainer introduces** the subject by describing the difference between natural pest management and pest management based on the use of synthetic chemicals.
2. **Ask the participants** if they have experienced any health problems after using synthetic chemicals or if they know of any health problems that others have experienced.
3. **Describe** the dangers to health and the environment caused by the misuse of synthetic pest management chemicals.
4. **Explain** that, often, the over-application of pest control chemicals and illness is because farmers are unable to read labels on agricultural chemical containers.
5. **Explain** how synthetic pest management chemicals can:
   - kill wildlife
   - get into streams and pollute the water, making it unsafe for drinking or fishing
   - remain on the plant and cause health problems for families eating the plant.
6. **Describe** the benefits of natural pest management:
   - it is safer and less likely to affect the farmer's health
   - it is less likely to pollute streams
   - care still has to be taken to use only the right amount of natural pesticide
   - farmers can save money by making their own natural pesticides and by using natural pest management.

Safe pest management

Problems with synthetic insecticides

Using synthetic pesticides on crops appears to offer an easy solution to the management of insect pests, however a number of problems have been noticed:

- pesticides are sometimes overused on food crops and can cause sickness among farmers using the pesticide and in those eating the food
- when too much insecticide is used, rain washes the excess pesticide into streams, polluting the water.

These things have occurred because some farmers cannot read very well. They do not read the instructions on the pesticide container and misuse the pesticide. Sometimes, the instructions on the pesticide container are in a language the farmer does not speak or read.

A solution is to use plant-based insecticides such as those made from chilli or tobacco.

These can be made by farmers who can grow the plants themselves. Because they produce the natural pesticides themselves, they understand how to safely use them. This avoids farmers getting sick, as happens with store-bought pesticides.

A cautionary story

A woman named Lucy from Takwa village, North Malaita, used a chemical spray on melon.

One day, she left for her garden and put a bottle of chemical insecticide in her basket. She did not close the lid well. The chemical leaked onto her betel nuts.

When it was time for a rest, she started to chew on the betel nut. She fell to the ground.

Luckily, a man saw her and brought her a tin of milk and sugar to treat her. Soon, she could talk again.

Chemicals can be a problem

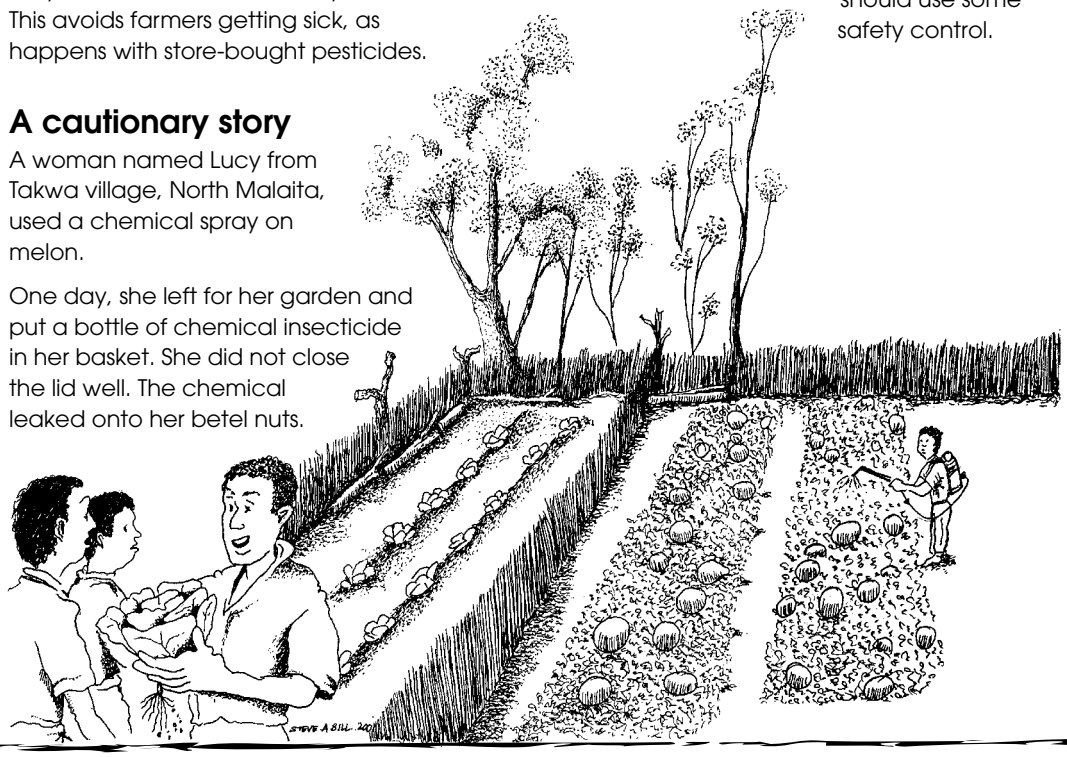
On some farms, the effect of chemicals is a problem. One woman said that after spraying with Orthen she became sick. She said that the smell of Orthen was very bad and made her sick for a week.

Melon farmers at Takwa (Malaita Province, Solomon Islands) have been using a lot of chemical pesticides.

When I interviewed one woman I read the label on the container and asked her what she used when applying the chemical to her plants. She said that she used nothing.

I explained that the chemical was poisonous when breathed in while spraying. She said that was true because, after using the chemical, she became sick.

I advised her to be careful when using the chemical and that when applying it she should use some safety control.



5. Identify insect pests

Outcomes

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

- describe a number of insect pests occurring in the garden.

Key messages

- some insects found in the garden are beneficial.

Approach

...discuss

- ask the group about the types of insects that are pests in their gardens. Ask for:
  - the names of the insects
  - what plants they eat
  - what part of the plant they attack (leaf, stem, roots)
  - what times of the year they are found
  - what they look like (ask participants to draw a picture of the insect on the board or on flip chart paper or to draw a picture on the ground; ask them to show how long the insect is).

...practice

- walk through a garden to collect insect specimens
- break into small groups to discuss the insects and the plants they eat; groups report back to workshop what they know.

Materials

- small, sealable plastic bags into which collected insects are placed during the field visit
- pest identification sketches or books
- flip chart paper for participants to use
- see Attachment 2: Identifying insects in the garden:
  a) Caterpillars
  b) Grasshoppers
  c) Bean fly
  d) Birds
- paper and pen for making notes to produce a report.

Procedure

1. **Review** what a pest is.
2. **Discuss** what pests participants know of in their gardens.
3. **Field visit:**
   This is important to making the information clear and to providing practical examples.

Participants in a Mana'Abu Rural Training Centre pest management workshop collect insect pests from a farmer's field

Process

a) Take the group for a walk through a number of farmer's fields and identify as many of the insects as possible; this makes sure everyone knows the insects and what they look like.
b) Point out, or have the participants point out any damage to leaves, stems or roots caused by the insects; identify which insects have caused the damage.
c) Walk across the field, collecting insects as you go and making notes for identification.

The field visit allows the trainer to cross-check the identification of the insects and the damage they cause.

Only insects in the fields at the time of year the workshop is held will be found in the fields.

If the trainer has access to camera with a 'macro' lens, pictures of small insects can be made for use in a manual that can be produced at the end of the workshop series.

Alternatively, a notetaker who is good at drawing can make a sketch of the insects.

4 Identify insects found

Identify the collect insects that are brought back from the field visit. Pass specimens around and name them to make sure the participants can identify them.

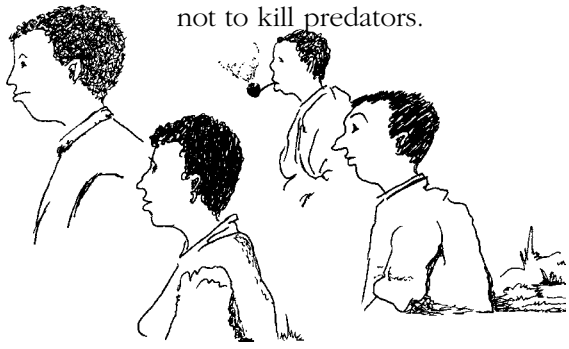
5. Make an insect occurrence matrix:

Draw a matrix on the ground. A matrix is a row of columns in which information is recorded. This activity will help identify insects in the participants fields.

Process

a) Draw a matrix.
b) Ask the group to name the insect pests they find in their fields; write or draw these across the top horizontal axis.
c) Write the months of the year down the vertical axis on the left side of the matrix.
d) Ask what times of the year the insects appear; mark this information in the same column as the insect's name against the month marked on the vertical axis.
e) Ask about the crop plants these insects attack; write or draw these on the bottom horizontal axis at the bottom of the matrix in the column under the insect name.
e) Ask participants what part of the plant the insects attack (leaf, stem or roots); write or draw this below the names of the plants the insects attack.
f) Ask participants to draw the insects and indicate how long they are (this shows whether they are crawling, walking or flying insects and whether they are large or small; this information will help in any later identification of the insects using scientific names).

6. Summarise why it is important to be able to identify insect pests so as not to kill predators.



Identify insect pests

Identifying insects in the garden
Walk a transect through the garden to collect and identify insects

Some insect pests

Caterpillars
Caterpillars chew holes in the leaves.
Look for their droppings.
Remove by hand.

Some insect pests

Grasshoppers

Grasshoppers chew the leaves of plants such as taro and chinese cabbage.

Remove by hand; encourage birds and chickens to feed on them.

Mulch plants.

A tobacco spray can be used.

Bean fly

Larvae tunnels in and damages the lower stem.

Young plants can wilt, turn yellow and die. Older plants may be damaged less than young plants.

Encourage wasps and small birds that can feed on the bean fly.

Mulch plants to improve the soil.

Plant bean seeds that are resistant to bean fly if you can find the seed supply.

Birds

Insect eating birds eat insect pests in the garden.

Some other birds eat our food plants.

Use a screen to protect plants from birds when plants are fruiting.

6 Explain the lifecycle of insects

Outcomes

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

- describe the life cycle of insects.

Key message

- know at what stage of the insects lifecycle they become a pest to our food plants.

Approach

...discuss

- discuss the stage of the insects lifecycle at which they become a pest.

Materials

- flip chart illustration of insect lifecycle (see Attachment 3)
- flip chart paper and pens for participants to use
- paper for making notes to produce a report.

Procedure

1. **Review** insect identification session.
2. **Using a flip chart** with pictures of insect pests at different stages of their lifecycle, describe how insects pass through their lifecycle and the stages at which they damage plants.
3. **Split into small groups**; participants discuss what pests cause damage in their fields and at what stage of their life they are a pest eg. larvae stage, mature stage.
4. **Summarise** the importance of knowing about the insect lifecycle; it helps to identify when the insect is likely to cause damage to food plants.

Lifecycle of insects

Insects change appearance

It is hard to believe that a caterpillar and a moth are the same creature. The moth, however, is the adult form and the caterpillar (or larvae) is the juvenile form.

Adults

In the adult stage, insect bodies are divided into three parts and have six legs. Most have wings and are related to spiders.

Nearly all adult insects live in the air or on land but many of their young live in fresh water.

Laying eggs

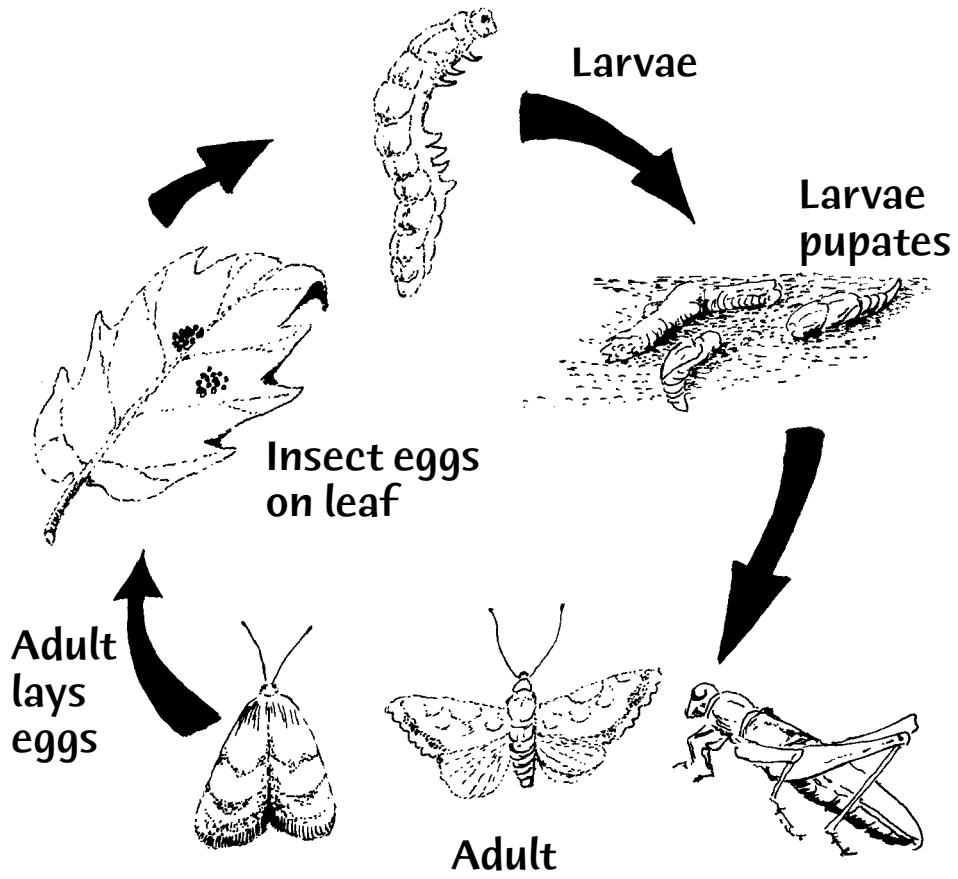
The females of most insects lay eggs after mating. The eggs hatch into a wormlike larvae called a grub or caterpillar. This is sexual reproduction.

Some insects, after mating, bear offspring that resemble the adult but have undeveloped wings. These are nymphs.

A few insects lay fertile eggs or bear nymphs without mating. Aphids reproduce this way.

Larvae stage

When larvae are ready to develop into the adult form of the insect they enter a resting phase inside a protective case called a pupa. The larvae develop into adults inside the case.



Insect life cycle
Insects take a variety of forms from egg to adult.

Training session outline

7. Identify existing management methods

Outcomes

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

- list traditional approaches to insect pest management.

Key messages

- pest management is important to reducing the amount of crops lost to insect pests
- look at the whole garden system including soils and plants
- some insects found in the garden are beneficial.

Approach

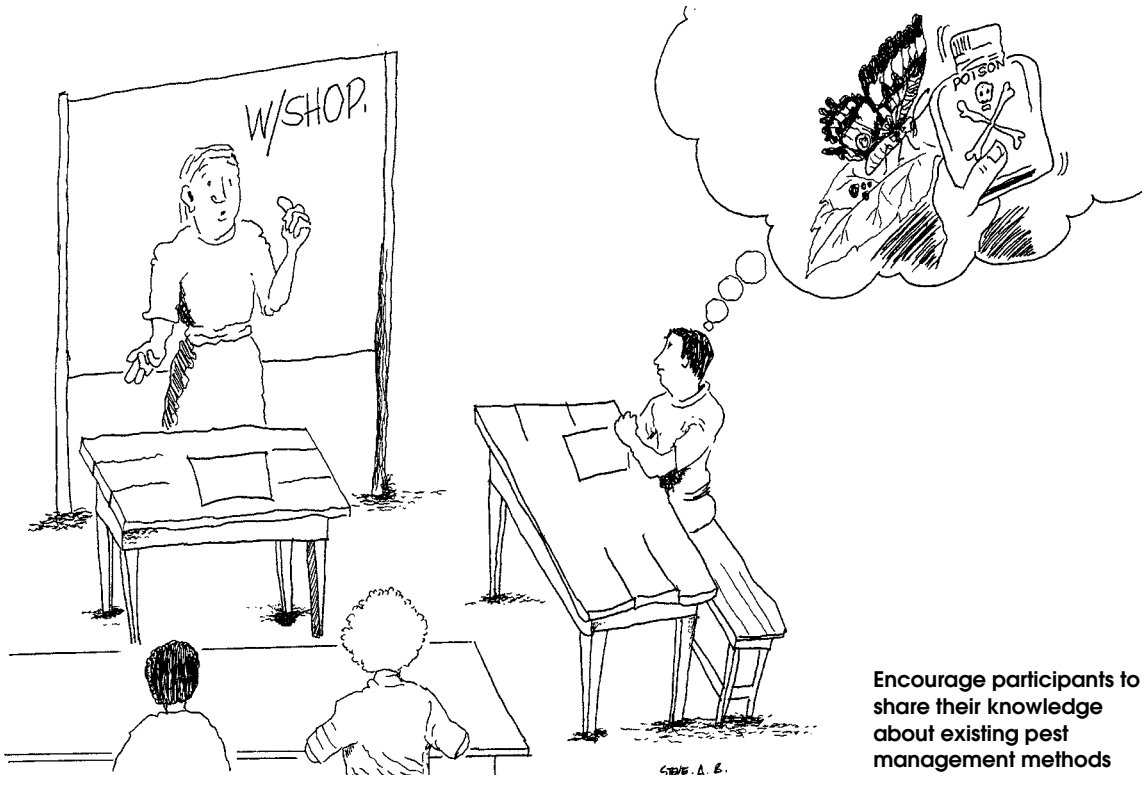
...discuss

- effective methods of pest management that participants use

Materials

...for discussion

- flip chart paper for listing farmer pest management techniques
- marker pens and paper for small group work.



Encourage participants to share their knowledge about existing pest management methods

Procedure

1. **Review** the identification of pests session
2 **Participants list** what management methods they now use for insects; these might include:
   - hand removal (picking the insects off plants)
   - natural sprays (these are also called botanical sprays because they are made from parts of plants)
3. **Participants discuss** how effective they judge the different methods to be.

Process

A two-column table is a useful graphic means to record this information.

- draw a two-column table on the ground, flip chart page or blackboard
- across the horizontal axis at the top, write the heading 'insect pests'
- down the vertical axis on the left side of the table, write the heading 'management method'
- against the names of the insect pests write the management methods found to be most effective.

4. **Summarise** most effective methods participants have found to work.

8. Organic controls

Organic controls depend on day-to-day decisions about managing the garden. As well as new methods, they include a number of traditional methods from the Solomon Islands that have withstood the test of time.

The primary objective is the prevention of insect pest damage rather than the destruction of existing pest populations.

Outcomes

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

- describe a number of organic control methods.

Key messages

The importance of traditional methods of organic control:

- long fallow results in less insect damage than short fallow
- gardens should be far from each other
- mixed planting is very important.

Approach

...discuss

- brainstorm the organic controls that people have used to manage insect pests
- make a list of the methods.

...practice

- visit a garden in the bush:
  - where the fallow is long
  - where the fallow is short
  - where different organic control techniques are used.
- compare what you saw:
  - the number of insect pests
  - the health of the crops.

Planting a number of different plants in the garden reduces damage from insect pests and makes food available for mixed meals

Materials

- flip chart showing cultural control methods
- markers and paper for small groups
- flip chart illustration
  Attachment 4
  Organic controls:
  a) Why use mulch?
  b) Clean the garden
  c) Hand pick insect pests
  d) Clean planting material
  e) Plant strong smelling plants
  f) Crop rotation
  g) Mixed cropping
  h) Remove weeds
  i) Leave trees standing in the garden.

Procedure

1. **Review** what a pest is
2. **Describe** what organic control methods of pest and disease are.
3. **Visit** a garden where traditional and organic control techniques have been used.
4. **Participants make a list** of what organic control methods they now use for pests and disease management. These might include:
   - hand removal (picking the insects off plants)
   - soil improvement—mulching
   - cleaning up the garden of dead and diseased material
   - bird screens
   - interplanting
   - crop rotation
   - mixed cropping.
5. **Participants discuss** how effective they judge the different methods to be.
6. **Discuss** the benefits or using organic control methods.
7. **Summarise** the different organic control methods.

In this mulched garden, marigolds have been interplanted with other crops to help repel insect pests

Organic controls

Look after the soil

1. Soil preparation

A healthy soil mean that plants will grow to be healthy and will be more resistant to pests.

A soil rich in humus, which comes from using mulch, discourages plant diseases.

2. Mulching

Mulching the garden helps:

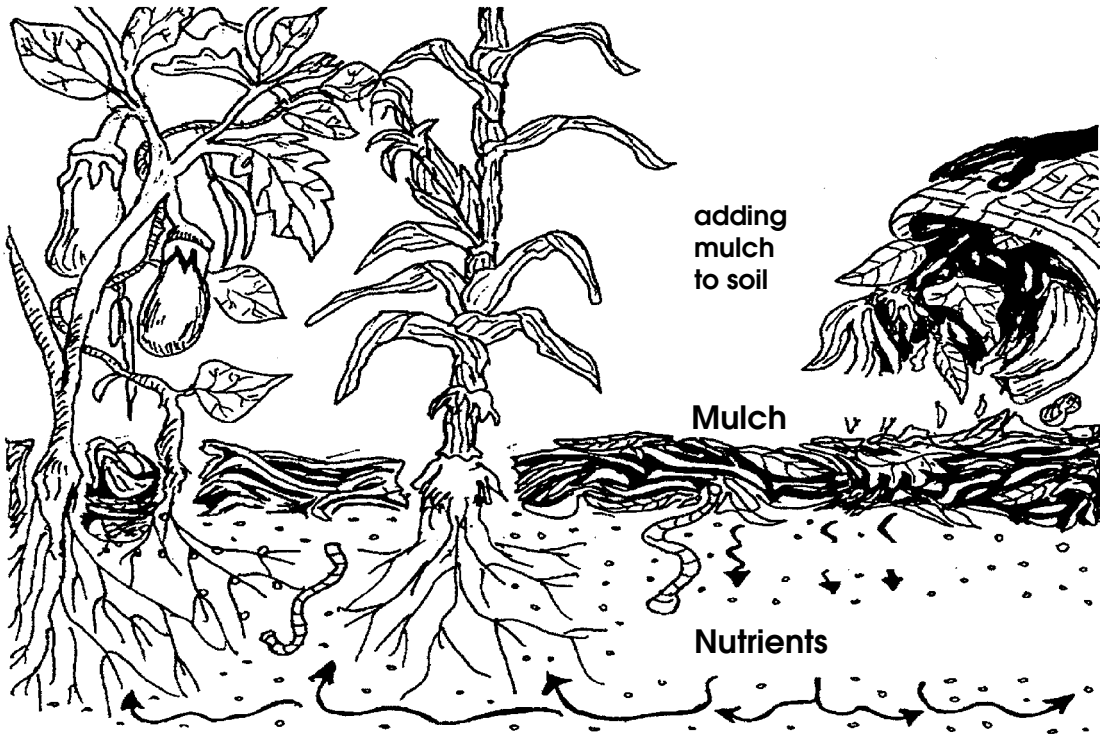
- plants grow stronger as the mulch breaks down to become food (nutrients) for our plants
- to stop the hot sun drying out our soil
- to provides more food for plants than slash and burn farming.

3. Organic manures

These are materials added to the garden soil.

Organic manures increase life in the soil and reduce plant diseases. They help to make more food available to your plants.

Lime and mineral ash are said to be useful organic manures that control certain diseases. Care must be taken not to add too much lime because it can make the soil alkaline and make some plants grow poorly.



Why use mulch?

- **it help plants grow strong**
- **strong plants are more resistant to pest and disease attack**

Keeping the garden clean

4. Clean up the garden

- remove plants once they have been harvested
- clean up rotten fruit
- remove diseased weeds or seedlings that might infect other plants; burn them
- clean garden tools after use to help stop the spread of plant disease.

5. Hand picking

Hand pick pests when you see them in the garden.

Chickens are good at feeding on pests.

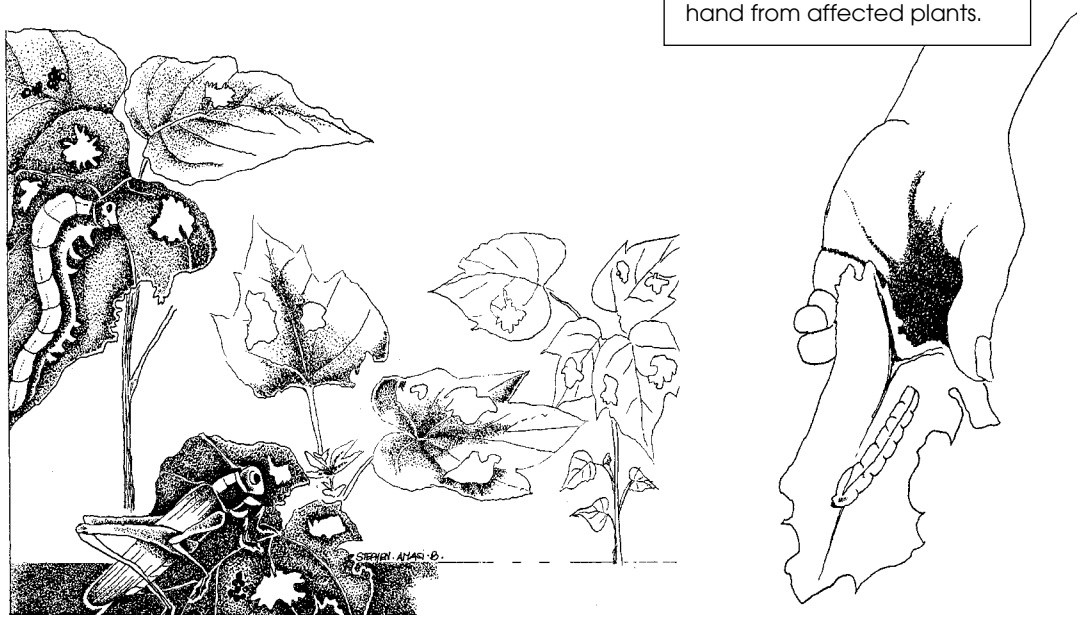
Example of hand picking:

Farmer: Salome Hailifu

Target species: green worm

Diseases controlled: leaf wilt

Procedure: Remove insects by hand from affected plants.



Using plants

6. Resistant varieties

Some plants are more resistant to insect pests and diseases. They are less damaged. Plant these in your garden.

Save their seeds and grow new plants from their tubers and by taking cuttings from them. This way, you will always have pest and disease resistant plants in your garden.

Clean planting material
Plant varieties of vegetable plants known to be resistant to insects and diseases.

7. Intercropping with aromatic herbs

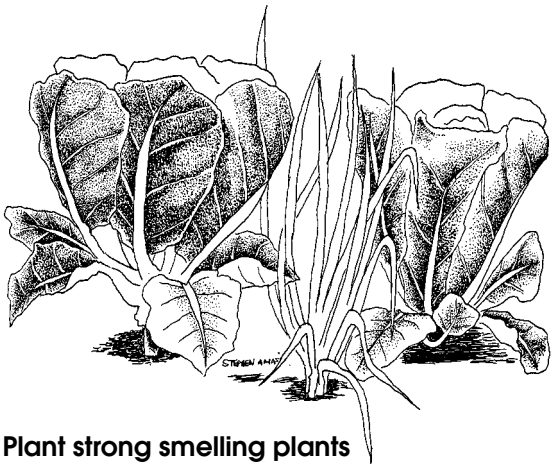
Grow plants with a strong smell near your vegetables to repel insect pests.

Suitable plants include:

- onion—*Allium cepa*
- leek—*Allium odorum*
- garlic—*Allium sativum*
- mint—*Mentha cordifolia*
- sweet basil—*Ocimum basilicum*
- sacred basil—*Ocimum sanctum*
- wormwood—*Artemesia spp*
- oregano—*Coleus ambonicus*
- marigold—*Tagetes spp.*

In the Solomon Islands we also make use of these plants:

- coleus
- ginger
- tumeric
- chilli.



Plant strong smelling plants
...to keep insects away

Example of interplanting with coleus and marigold

Farmer: Mary Suea

Target species: caterpillar worm

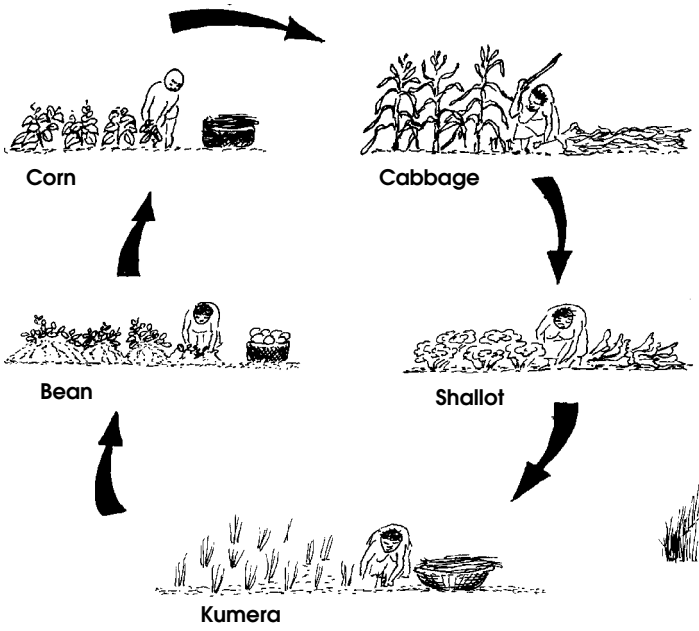
Diseases controlled: powdery mildrew

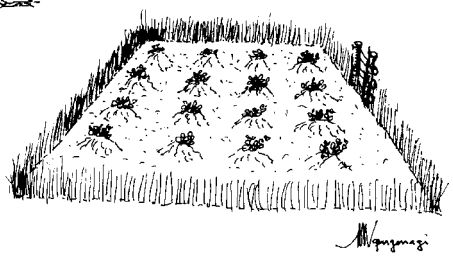
Procedure: You need enough coleus and marigold flowers to plant between your chinese cabbage.

8. Crop rotation

Planting different crops in the garden breaks the cycle of insect pests that live in the soil. Crop rotation avoids using up all the nutrients in the soil.

Growing different crops in the same place in the garden at different times discourages plant diseases.

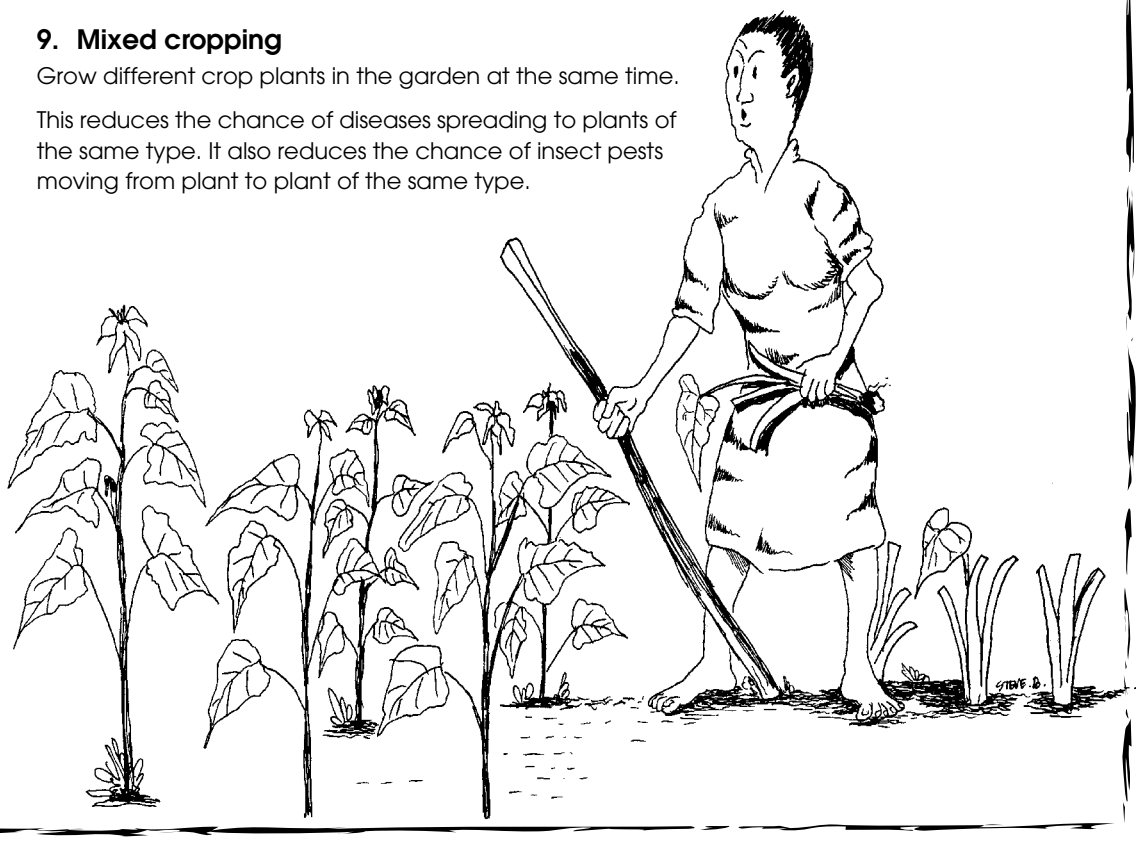




9. Mixed cropping

Grow different crop plants in the garden at the same time.

This reduces the chance of diseases spreading to plants of the same type. It also reduces the chance of insect pests moving from plant to plant of the same type.



Other methods

10. Screens

Screens stop insect pests getting to plants.

A nylon net or fine mesh screen placed over the plants during their first 30 to 40 days can keep insects away and reduce damage.

The net also:

- shades plants from the hot sun
- reduces damage from heavy rain.
- protects fruit from bird and insect damage.

11. Encouraging pest predators

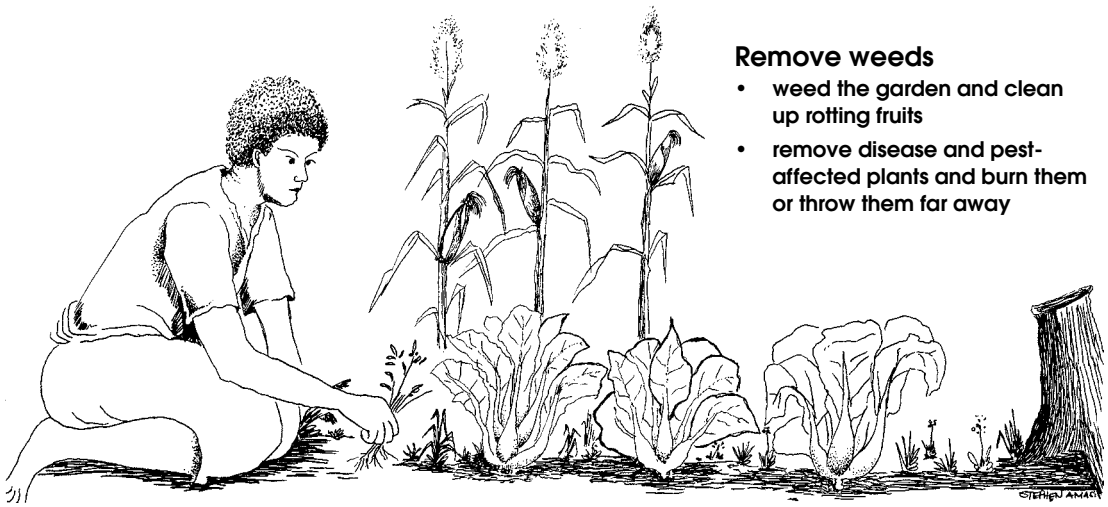
Pests can be controlled by their natural enemies.

Growing a variety of flowering plants—like marigold—will attract insect predators into the garden. These beneficial insects feed on the pest insects.

Making a garden

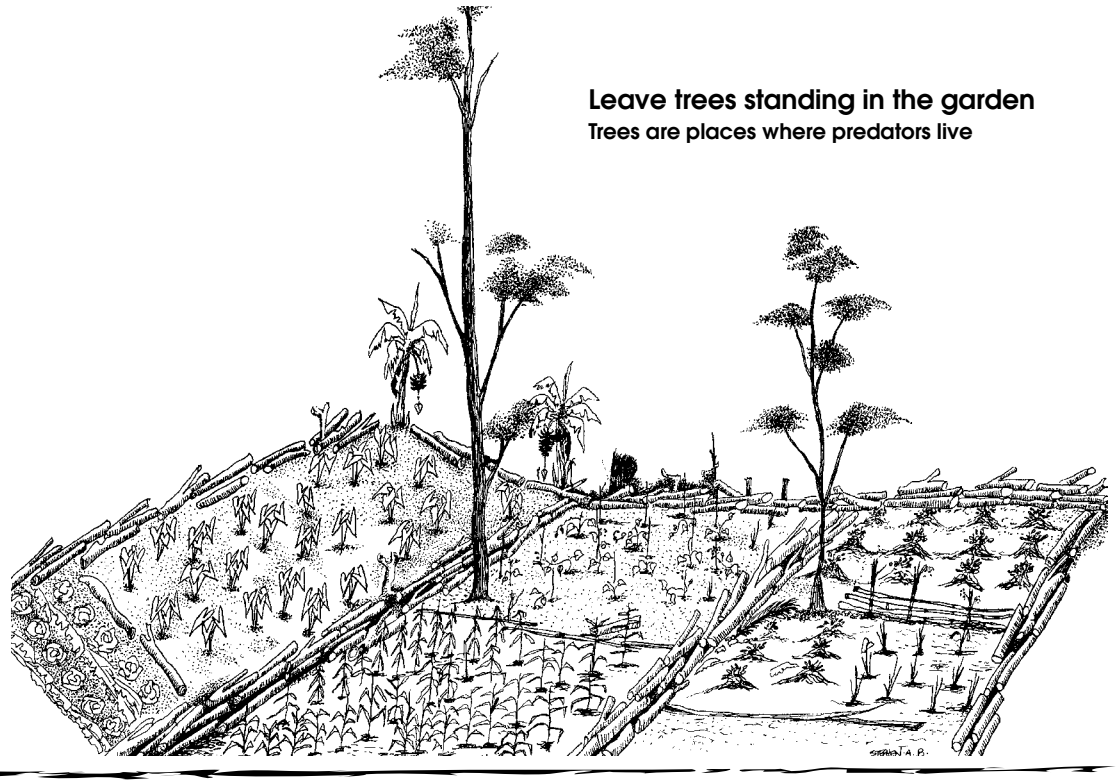
Here are some things we should consider before making a garden:

- look for healthy soil (kwene)—healthy soil produces healthy plants
- leave some trees standing in the garden to keep the soil cool
- use healthy pest and disease-free planting materials
- plant in the correct season and planting time
- plant strong-smelling plants in the garden
- weed the garden and clean up rotting fruits; remove disease and pest-affected plants and burn them or throw them far away
- encourage pest predators in the garden and provide plant food, such as flowering plants, for the insects
- practice crop rotation with different plants in the garden.



Remove weeds

- **weed the garden and clean up rotting fruits**
- **remove disease and pest-affected plants and burn them or throw them far away**



Leave trees standing in the garden

Trees are places where predators live

9. Identify predators

Outcomes

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

- identify a number of insect predators occurring in the garden.

Key messages

- some insects found in the garden are beneficial
- a predator is an insect, bird or animal that eats pest insects in our garden
- it is important to identify the difference between a pest and a predator.

Approach

...discuss

- ask the group about the types of insects that are predators in their gardens. Ask for:
  - the names of the insects
  - what pests they eat
  - what times of the year they are found
  - what they look like (ask participants to draw a picture of the insect on the board or on flip chart paper or to draw a picture on the ground; ask them to show how long the insect is).

...practice

- walk through a garden to collect insect specimens
- break into small groups to discuss the insects and the plants they eat; groups report back to workshop what they learn.

Materials

- small, sealable plastic bags into which collected insects are placed during the field visit
- predator identification sketches or books
- flip chart paper for participants to use
- paper for making notes to produce a report.

Participants look for insect predators in a farmer's field

Procedure

1. **Review** what a predator is.
2. **Discuss** what predators participants know of in their gardens.
3. **Field visit:**

   This is important to making the information clear and to providing practical examples.

   ### Process

   a) Take the group for a walk through a number of farmer's fields and identify as many of the insects predators as possible; this makes sure everyone knows the insects and what they look like.

   c) Walk across the field, collecting insects as you go and making notes for identification.

   The field visit allows the trainer to cross-check the identification of insect predators.

   Only insects in the fields at the time of year the workshop is held will be found in the fields.

   If the trainer has access to camera with a 'macro' lens, pictures of small insects can be made for use in a manual to be produced at the end of the workshop series.

   Alternatively, a notetaker who is good at drawing can make a sketch of the insects.

4. **Identify insects found**

   Identify the collect insects that are brought back from the field visit. Pass specimens around and name them to make sure the participants can identify them.

10. Methods to encourage predators

Outcomes

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

- describe a number of methods to encourage predators in the garden
- describe how to set out the garden to create habitat (living space and food) for predators.

Key messages

- look at the whole garden system including soils and plants
- predators are beneficial insects in the garden because they eat insect pests.

Approach

...discuss

- the methods people use to encourage predators
- the methods people use to create habitat for predators in the garden.

...practice

- go to gardens where methods to encourage predators are used.

Materials

- writing materials and pens to record the session and to produce a written report for use by the project team and villagers
- flip chart graphic, Attachment 5. Encourage predators.

Procedure

1. **Review** what a predator is.
2. **Discuss** what predators participants know of in their gardens.
3. **Field visit:**

   This is important to making the information clear and to providing practical examples.

   Process

   a) Take the group for a walk through a number of farmer's fields to explore techniques that are used to encourage predators

   c) Show how to make predator habitat in the garden.

4 **List methods used to encourage predators:**

   - encourage birds by providing water and flowering plants that provide nectar
   - encourage lizards, spiders and other predators by leaving logs and rocks round the edge of the garden for them to hide in.

5. **Summarise**

Methods to encourage predators

1. Encouraging predators

Most insects are either beneficial or harmless.

Encourage predators in our gardens to manage pest numbers.

There are a number of things we can do to encourage predators into our gardens.

2. Create habitat

Flowering shrubs and trees grown in our garden will attract a range of insect predators.

Plants such as marigold can be used to attract the natural enemies of insect pests.

3. Provide alternative hosts for pests

To ensure a supply of food for the beneficial insects, grow alternative host plants along fence lines and between cultivated crops. The natural enemy populations attracted to these alternative plants will control pests attacking the cultivated crops.

4. Attract frogs, reptiles, birds

Logs, rocks with cavities and mulch provide nesting sites for snakes, lizards, frogs, rove and carabid beetles which feed on insects.

Small trees and shrubs in or around the edge of the garden provide nesting, shelter and refuge for birds which eat insects.

5. Increase humidity

Increasing humidity in your garden by constructing small ponds provides habitat for frogs, birds and reptiles.

Many predatory insects live on or near water. Well-vegetated small dams and pools scattered through the garden will create conditions for the buildup of the natural enemies of pests.

Take care where you place ponds — keep them away from the house because they can provide breeding sites for malarial mosquitoes.

6. Reduce dust build up in crops

Dust inhibits the function of the natural enemies of insect pests.

Grow well-designed windbreaks and groundcovers like centrosema and lablab bean to reduce dust build up.

11. Insect sprays made from plants

The use of natural sprays follows after you have tried organic and biological controls. We emphasise that it is very important to make sure you have the other methods correct before you move on to using sprays.

For example, if you apply sprays but the season or the variety is wrong you will still have problems.

Outcomes

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

- make botanical sprays from plants.

Key messages

- natural insect sprays are insecticides made from plants such as chilli and tobacco
- natural insect sprays made from natural ingredients such as plants are safer than chemical sprays if used properly
- although natural pesticides are usually safer than those made of synthetic chemicals, they still must be used carefully to avoid overuse
- the use of natural insect sprays comes after you have tried other methods such as hand picking
- natural insect sprays can kill predators as well as the pests.

Approach

...discuss

- explain why you would use natural sprays as a pest management strategy
- explain any safety precautions necessary for preparing and handling natural insect sprays (such as avoiding contact with the eyes when preparing and using chilli spray)
- talk about the sprays participants have used.

...practice

- have knowledgable farmers demonstrate the production of different natural insect sprays
- produce natural insect sprays that you can treat pests with in the garden at that time of year
- go into the garden and demonstrate how the sprays are applied safely and any other methods that could be used.

During this workshop, the trainer may introduce pest management methods unknown to the farmers.

Insect pests can be managed in bush gardens through the use of plant-based insecticides. These insecticides are easy to prepare and do not affect the health of gardeners if used carefully

Materials

- flip chart paper and pens/ blackboard
- flip chart graphics in Attachment 6. Botanical sprays
  a) Benefits of natural insect sprays
  b) Plants used to make natural insect sprays for pest management
  c) Making chilli sprays
  d) Making mala'alakwa spray
  e) Making tobacco spray
  f) Making wood ash
  g) Using natural insect sprays
- plants from which natural insect sprays are made
- containers for mixing sprays.

Procedure

1. **Review** the difference between a pest and a predator.
2. **Explain** why you would use natural insect sprays as a pest management strategy.
3. **Explain** any safety precautions necessary for preparing and handling natural insect sprays (such as avoiding contact with the eyes when preparing and using chilli spray).
4. **Discuss** what sprays participants have used.
5. **Have knowledgable farmers demonstrate** the production of different natural insect sprays.
6. **Produce** natural insect sprays that you can treat pests with in the garden at that time
7. **Go into the garden and demonstrate** how the sprays are applied safely and any other methods that could be used.
8. **Make a list** of natural insect sprays and the pest and/or disease it can treat.
9. **Summarise** when you would use and natural insect spray and the safety precautions you would use.

Innovative farmers and their findings

This is a summary of innovative North Malaita farmers and their findings with botanic sprays.

Farmer	Plant used on	Insect used for
Spray: Chilli fruit		
Basilisa Roko	slippery cabbage chinese cabbage	cutworm small black beetle
Felix Lauski	slippery cabbage	small black beetle
Dick	slippery cabbage	small black beetle
Mary Leoa	slippery cabbage	small black beetle cutworm
Freda Suita	slippery cabbage	small black beetle
Elsy Siale	slippery cabbage	small black beetle
Corina Elson	slippery cabbage	small black beetle
Spray: Mala'alakwa leaves		
Basalisa Roko	slippery cabbage pak choi	cutworm small black beetle
Spray: Ashes		
Basalisa Roko	bean	
Lawrence Gaota	chinese cabbage	cutworm
Mary Leoa	slippery cabbage	cutworm
Elsy Siale	slippery cabbage bean	small black beetle
Elson Iro and Albert	slippery cabbage	small black beetle

Using natural insect sprays

Pest management methods: natural insect sprays

Plants used to make botanical sprays for pest management

Tobacco **Ginger** **Chilli** **Marigold**

NOTE: some people are allergic to Marigold.

Making natural insect sprays

Using natural insect sprays

Take care when using natural insect sprays.

Do not breath the spray if possible and do not spray it on yourself.

Wash your hands when you have finished spraying.

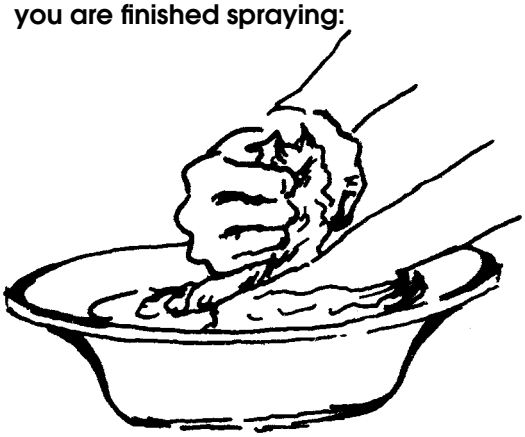
Benefits of natural insect sprays

Use natural insect sprays carefully and only when insect pests are in large numbers.

The careful use of natural insect sprays reduces insect pest damage and leaves more food plants for you.

Crop that was sprayed **Crop that was NOT sprayed**

Wash your hands when you are finished spraying:



Examples of natural insect sprays:

Sea weed

Use for: fungal and bacteria problems such as brown rot, black spot and curly leaf; spray on foliage at any time of year.

You need: 1 bucket of sea weed, bucket and water.

Procedure:

1. Collect sea weed
2. Cover the bucket of seaweed with water and leave till the water turns pale brown; usually for about 2 weeks.
3. Strain water out of bucket to use for spraying diseased plants leaves.
4. Seaweed left over in the bucket can be used as a mulch.

Recipe

Farmer: Luciano Sika'ae
Target species: cutworm

You need: 1 or 2 bags of sea weed depending on area to cover

Procedure:

1. Collect sea weed.
2. Spread on ground before planting.
3. Spread around plants.

Chilli spray

Caution:

- use a stick to mix this spray
- do not mix with your hand
- chilli spray can **cause severe pain to your eyes**.

Use for: hot chilli acts as a stomach poison and is used against caterpillars

Recipe 1

Farmer: Mary Leoa

Use for: stem borer; small black beetle

Diseases controlled: leaf wilt

You need: 1 coconut shell full of chilli fruit, soap mixed in a bucket of water.

Procedure

1. Mash chilli.
2. Dissolve soap in water.
3. Mix in mashed chilli fruit.
4. Leave overnight.
5. Spray on crops.

Recipe 2

Farmer: Felix Laukasi

You need: one coconut shell of chilli fruit/ five litres water/ liquid soap

Procedure

1. Mash chilli fruit in a bag.
2. Mix with water.
3. Strain.
4. Spray in the morning when insects are feeding on plants.

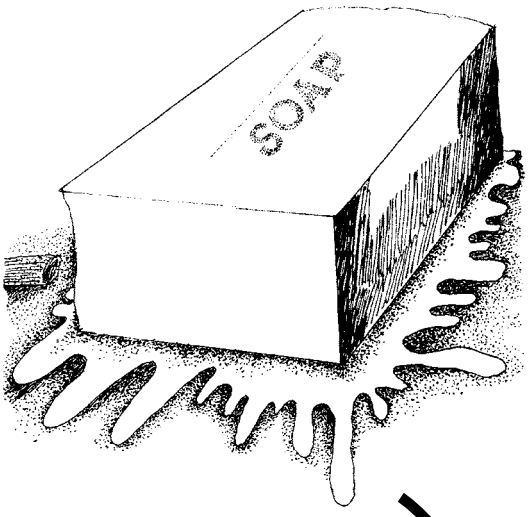
Recipe 3

Farmer: Selina Afuna

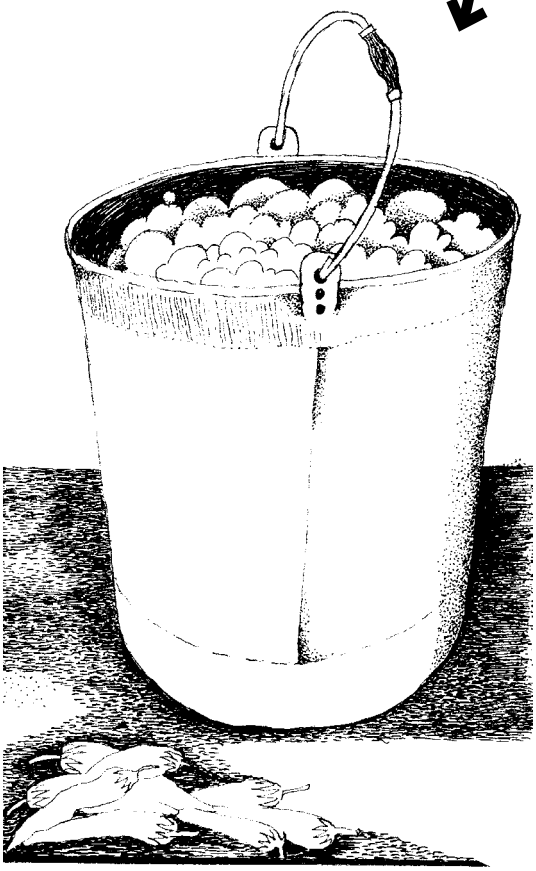
You need: one coconut shell of chilli fruit/ washing soap liquid/ water

Procedure

1. Mash chilli fruit in a bag.
2. Mix with water.
3. Leave overnight.
4. Spray on crops.



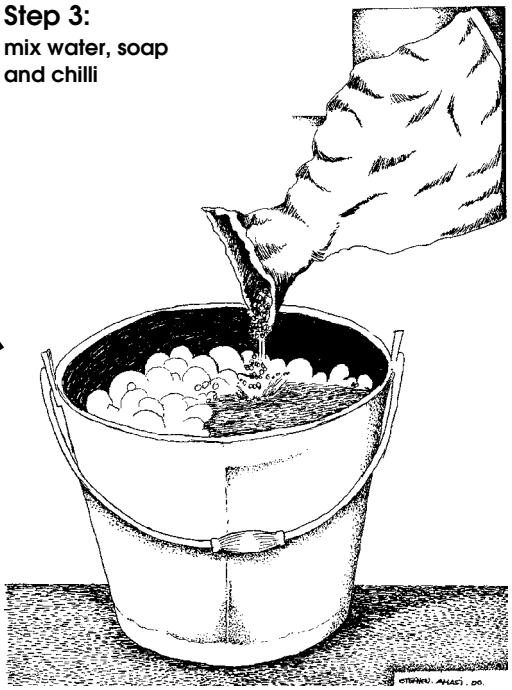
Step 1:
add soap to a bucket of water

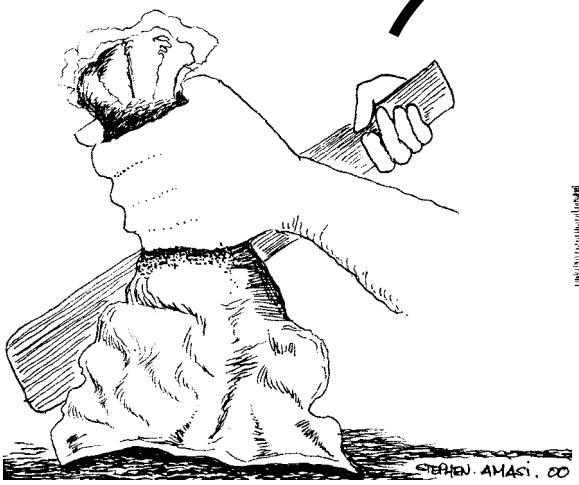


Chilli spray (cont.)

Step 2:
pick chillies and put into a plastic bag and smash

Step 3:
mix water, soap and chilli

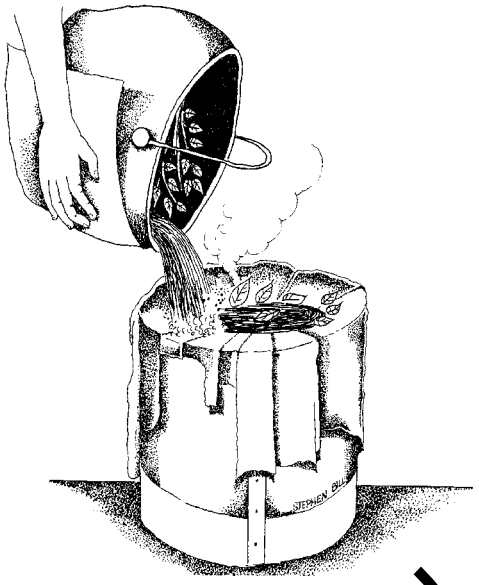




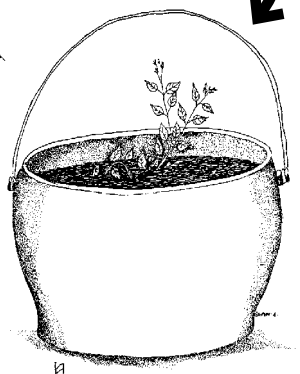
Step 4:
spray on insect damaged plant

Mala'alakwa spray

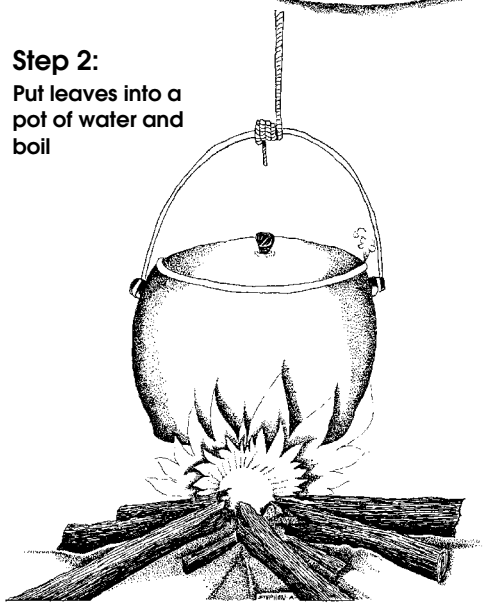
Use for: cutworm and small black beetle



Step 1:
Collect leaves and water



Step 2:
Put leaves into a pot of water and boil



Step 3:
Strain to separate leaves from spray.
Use leaves as mulch.

Step 4:
Spray the liquid on insect damaged plant

Tobacco spray

Caution: don't spray on tomatoes, eggplants and peppers as you risk spreading viruses. Leave food plants for at least 48 hours after spraying before eating the food.

Used for: many insect pests such as caterpillars, beetles, aphids and thrips; it acts as a stomach poison. It can be watered into soil to control cutworm, root maggots and ground beetle.

Recipe 1

Farmer: Felix Laukasi

Used for: many insect pests; it acts as a stomach poison

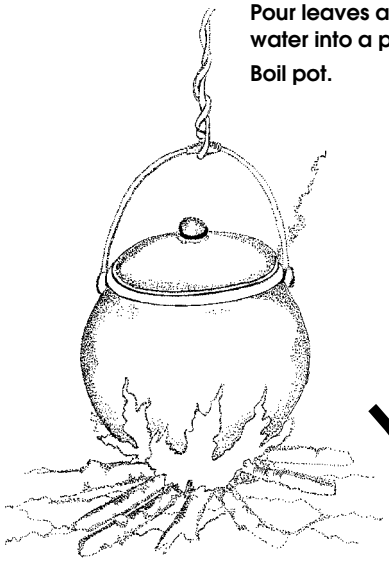
Diseases controlled: banana fruit caterpillar

You need: a handful of tobacco leaves and three litres of water.

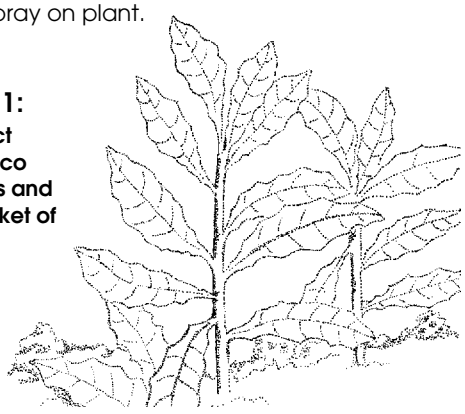
Procedure

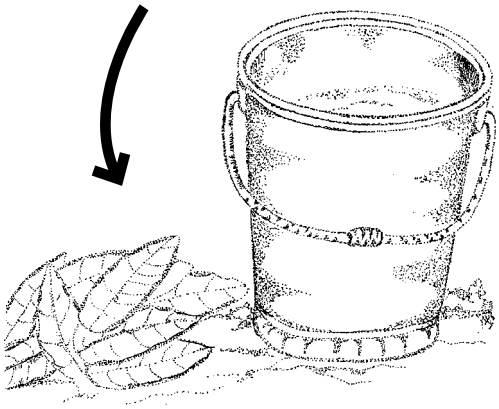
1. Boil tobacco leaves with water.
2. Strain mixture into a container.
3. Leave to cool.
4. Spray on plant.

Step 2:
Pour leaves and water into a pot.
Boil pot.

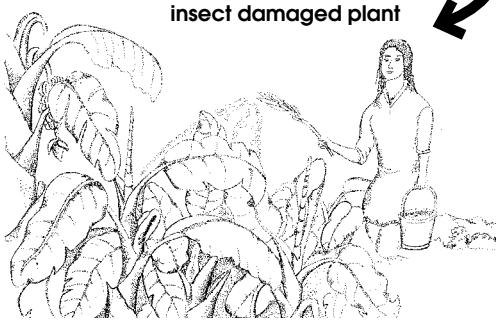


Step 1:
Collect tobacco leaves and a bucket of water





Step 4:
Spray the liquid on insect damaged plant



Wood ash

Caution: ashes should be cool before using. Do not use on young plants or place close to the stems of plants.

Use for: dehydrating soft bodied insect such as caterpillars, grasshoppers, cutworms, weevils and aphids; also used for fungal disease such as mildew and club root.

Procedure: dust ash evenly onto vegetables or spread thickly around plants to deter soil pests such as cutworms and club root.

Recipe 1

Farmer: Merlyn Avasi

Made from: burned wood

Use for: small black beetle

Diseases controlled: leaf spot and holes

You need: 4 to 5 coconut shells of ash

Procedure: Apply to plants when insects noticed.

Recipe 2

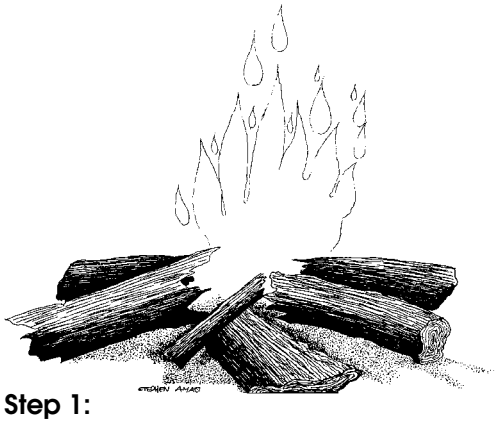
Farmer: Mary Lily

Use for: white worm; grasshopper

Diseases controlled: leaf spot and holes

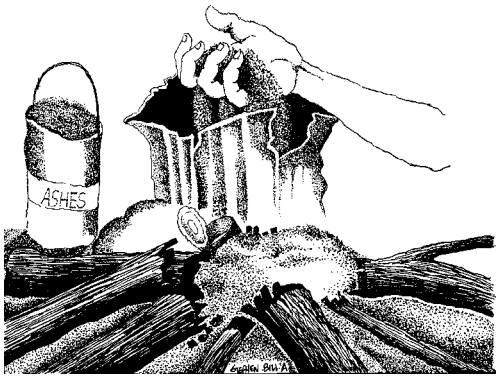
You need: 4 to 5 coconut shells of wood ash.

Procedure: Apply to plants when insects start to cause damage.



Step 1:
Burn some wood

Step 2:
Ashes from the fire are ready to be collected when cool



Step 3:
Ashes collected and ready for use

Step 4:
Ash is spread on bean

12. Farmer field trials

Outcomes

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

- set up field trials to identify the most effective control methods for use against particular insects.

Approach

...discuss

Summarise the most effective methods discussed during the pest management workshop.

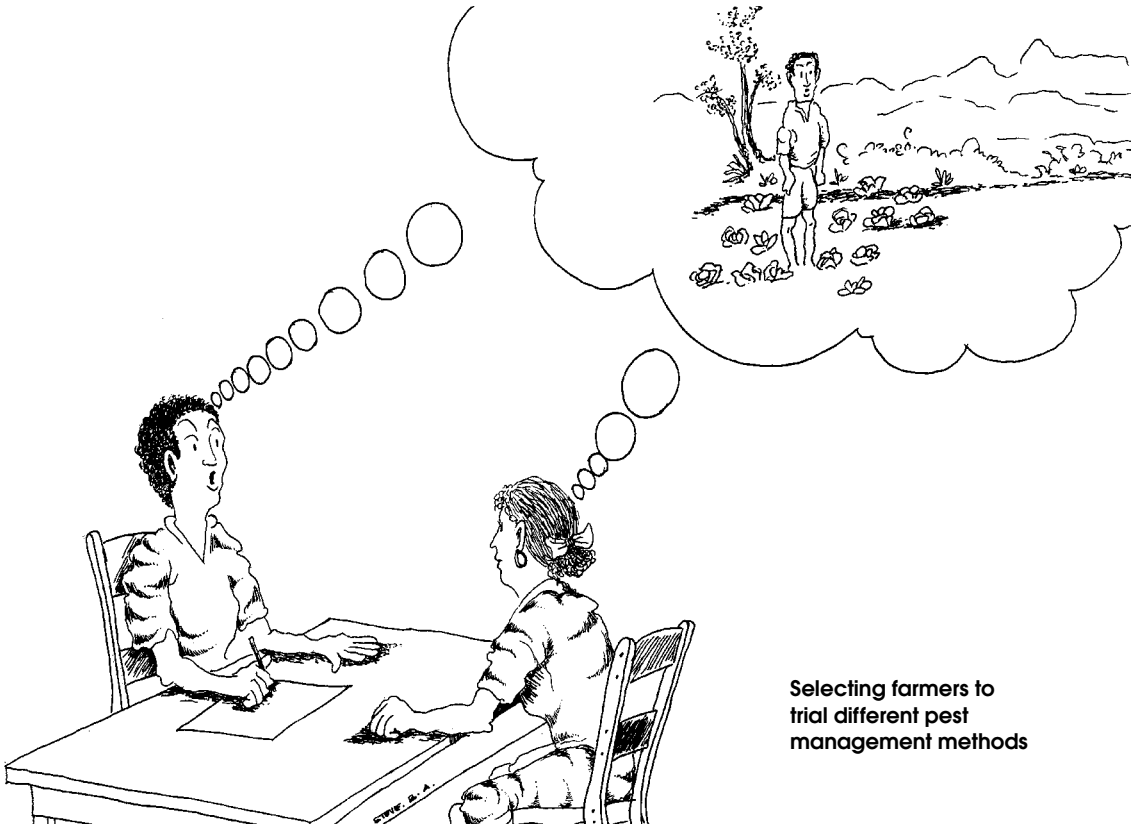
...practice

At the workshop, the trainer and farmer participants coordinate the field experiments by:

- selecting farmers to trial different management methods, such as hand picking of insects and the use of different botanical sprays
- developing ways to observe the effects on insect populations and of recording this over an agreed-upon period
- setting a date for a follow-up meeting to assess the methods trialed.

Informal follow up visits

If the trainer visits the village over the period of the farmer field trials they should informally monitor the experiments, help solve problems which may have emerged and encourage participation in the trials.



Selecting farmers to trial different pest management methods

Planning farmer field trials

Trainers work out with participants what workshops are needed

PLAN		
NAMES	EXPERIMENT	DATE
ENRIQA	CHILLIE	
ROKO	CHILLIE ASH MALAALAKWA	
FELIX		
AFUNA	CHILLIE	
LAURENCE	CHILLIE ASHES	
SELTI	CHILLIE	
ELSIE	CHILLIE	

Flip chart page showing who is to participate in farmer field trials

Trialing botanical sprays in farmer's gardens

Trainers monitor farmer field trials during follow-up visits

13. Assessing the experiments

Outcomes

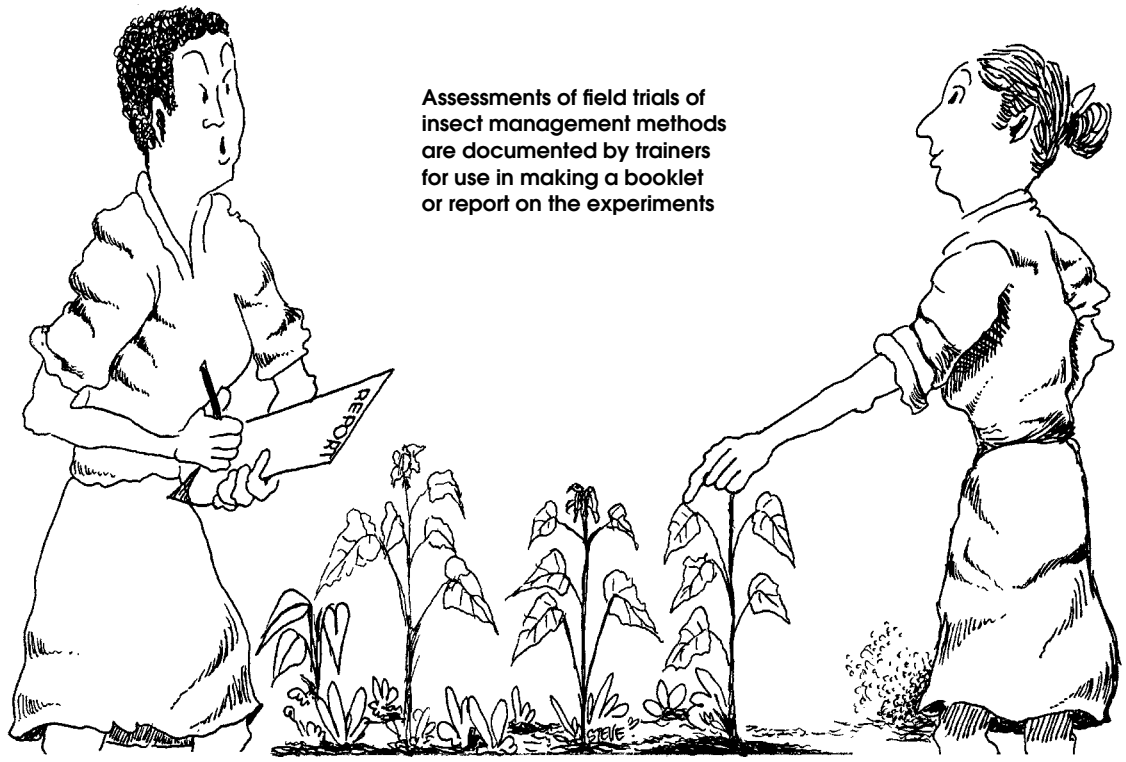
By the end of this session, participants will be able to:

- describe the shared experiences of the farmers who participated in the field trials
- list the most effective pest management methods that were trialed.

Approach

...discuss

- ask farmers to share the results of field trials (small groups: make summary on flip chart paper)
- ask farmers which methods they think worked best and why they think they worked well (refer to flip chart paper and circle effective methods)
- make a list of botanical sprays that where found effective as well as other methods of pest management found useful
- ask about providing follow-up training if required.



Assessments of field trials of insect management methods are documented by trainers for use in making a booklet or report on the experiments

14. Post-workshop activity

End to the workshop series

At the end of the workshop series participants have:

- identified the most effective insect pest management methods
- been trained in the production of botanical sprays
- been trained in other organic pest management methods.

Keeping a record—develop a pest management manual

Organisers are encouraged to make a record of the workshop series by producing a manual that:

- identifies the most effective insect pest management techniques
- provides instructions on how to make botanical sprays
- describes the use of other pest management methods identified during the workshop series.

The manual should be reproduced and distributed to:

- participating farmer communities
- relevant government agricultural extension services
- non-government organisations working in agricultural development with farmers.

Bring together information produced during the workshops and farmer field trials into an Integrated Pest Management (IPM) manual

Attachments:

Flip chart graphics:

1. What is safe pest management?
2. Identifying insects in the garden
    a) Caterpillars
    b) Grasshoppers
    c) Bean fly
    d) Birds
3. Insect life cycle
4. Organic controls:
    a) Why use mulch?
    b) Clean the garden
    c) Hand pick insect pests
    d) Clean planting material
    e) Plant strong smelling plants
    f) Crop rotation
    g) Mixed cropping
    h) Remove weeds
    i) Leave trees standing in the garden
5. Encourage predators
6. Botanical sprays
    a) Benefits of botanic sprays
    b) Plants used to make botanical sprays for pest management
    c) Making chilli sprays
    d) Making mala'alakwa spray
    e) Making tobacco spray
    f) Making wood ash
    g) Using botanic sprays

Background to the project

NOTES:

1. What is safe pest management?

2. Identifying insects in the garden

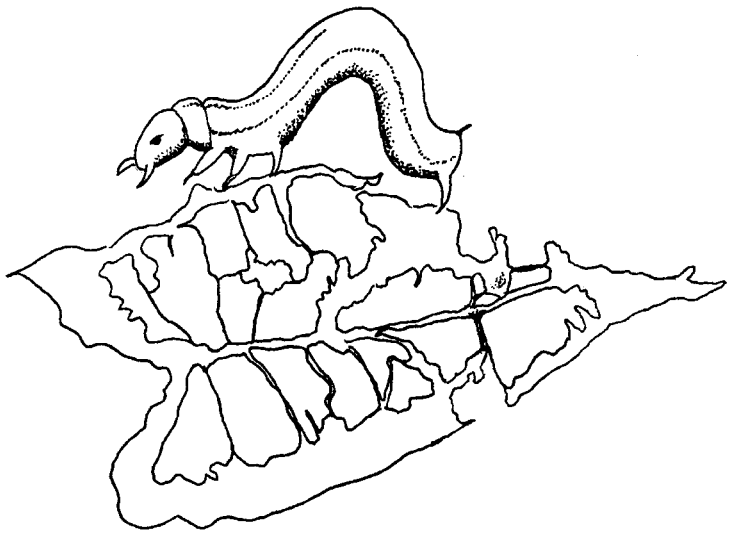
Walk a transect through the garden to collect and identify insects

Caterpillars

Caterpillars chew holes in the leaves.

Look for their droppings.

Remove by hand.



Grasshoppers

Grasshoppers chew the leaves of plants such as taro and chinese cabbage.

Remove by hand, encourage birds and chicken to feed on them.

Mulch plants. A tobacco spray can be used.

Bean fly

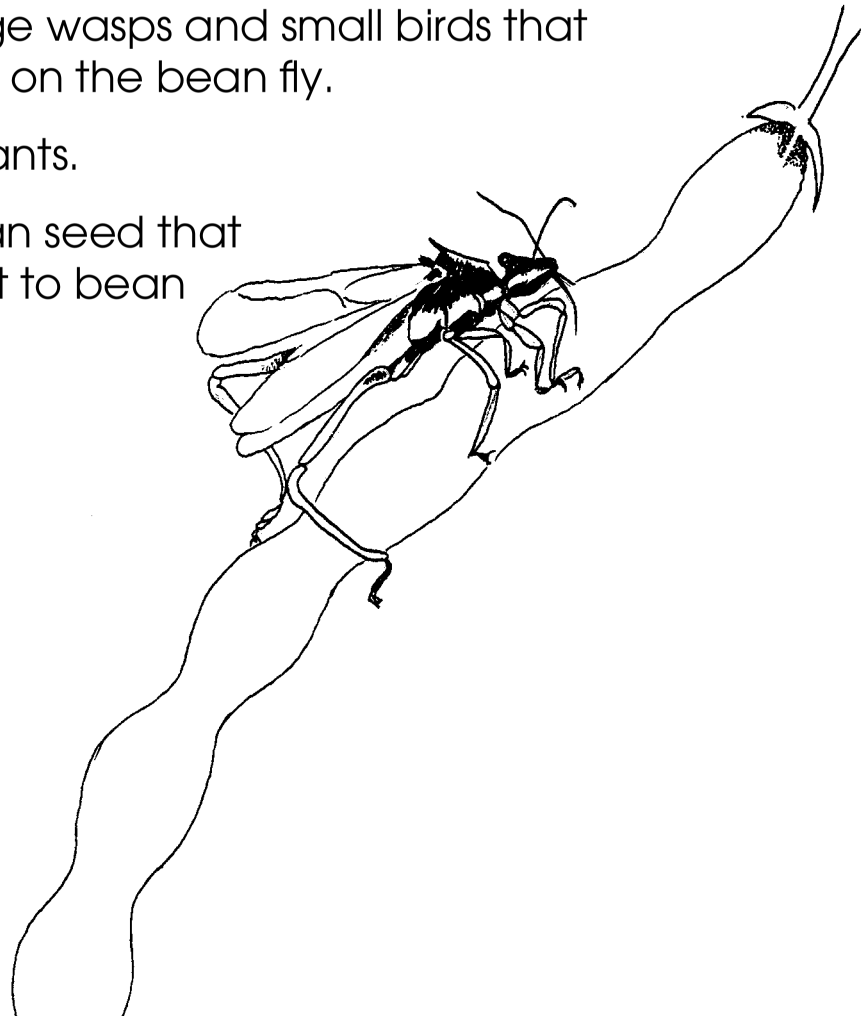
Bean fly larvae tunnel and damage the lower stem.

Young plants can wilt, turn yellow and die.

Encourage wasps and small birds that can feed on the bean fly.

Mulch plants.

Plant bean seed that is resistant to bean fly.



Birds

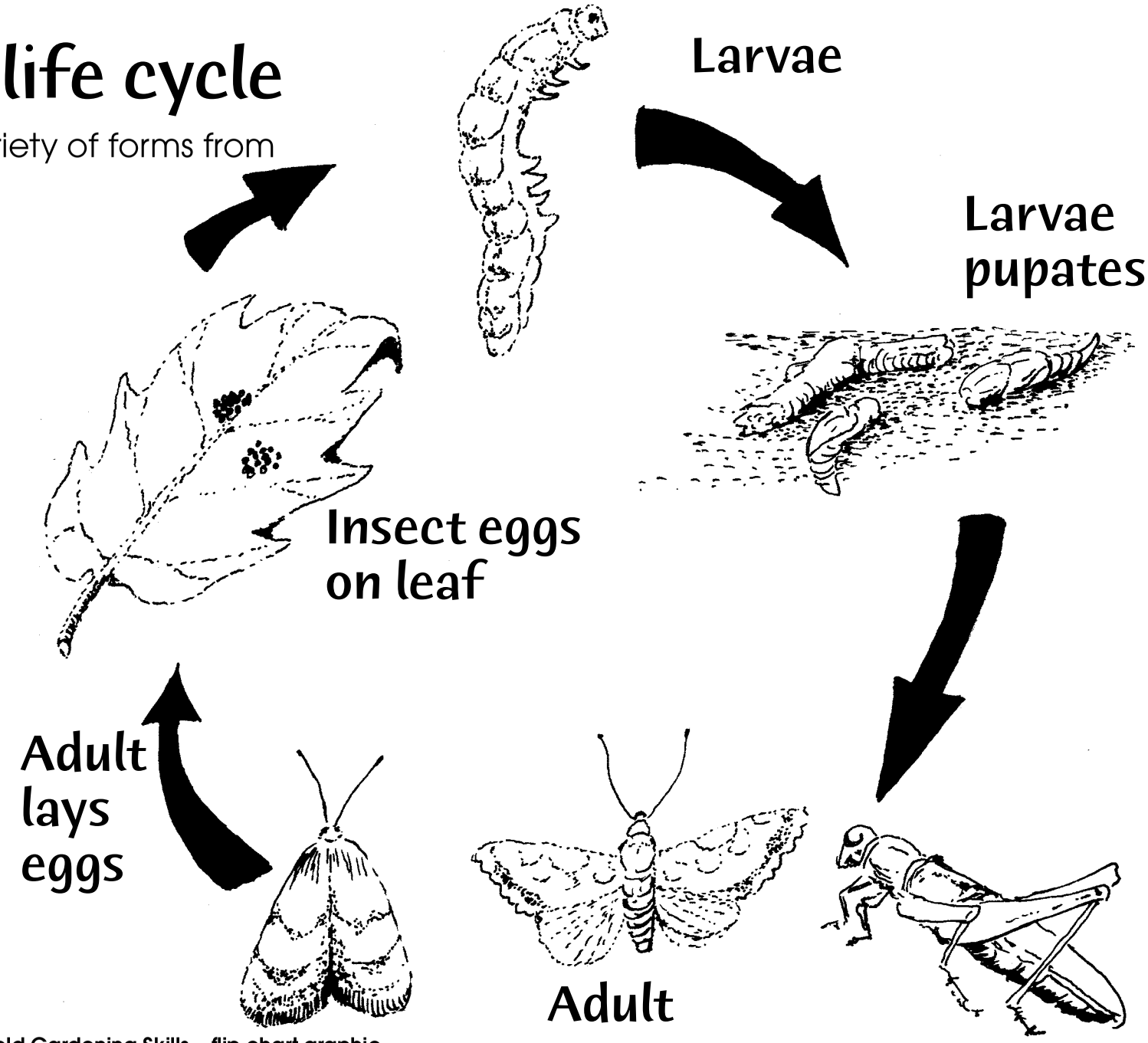
Insect eating birds eat insect pests in the garden.

Some other birds eat our food plants.

Use screen when plants are fruiting to keep the birds away.

3. Insect life cycle

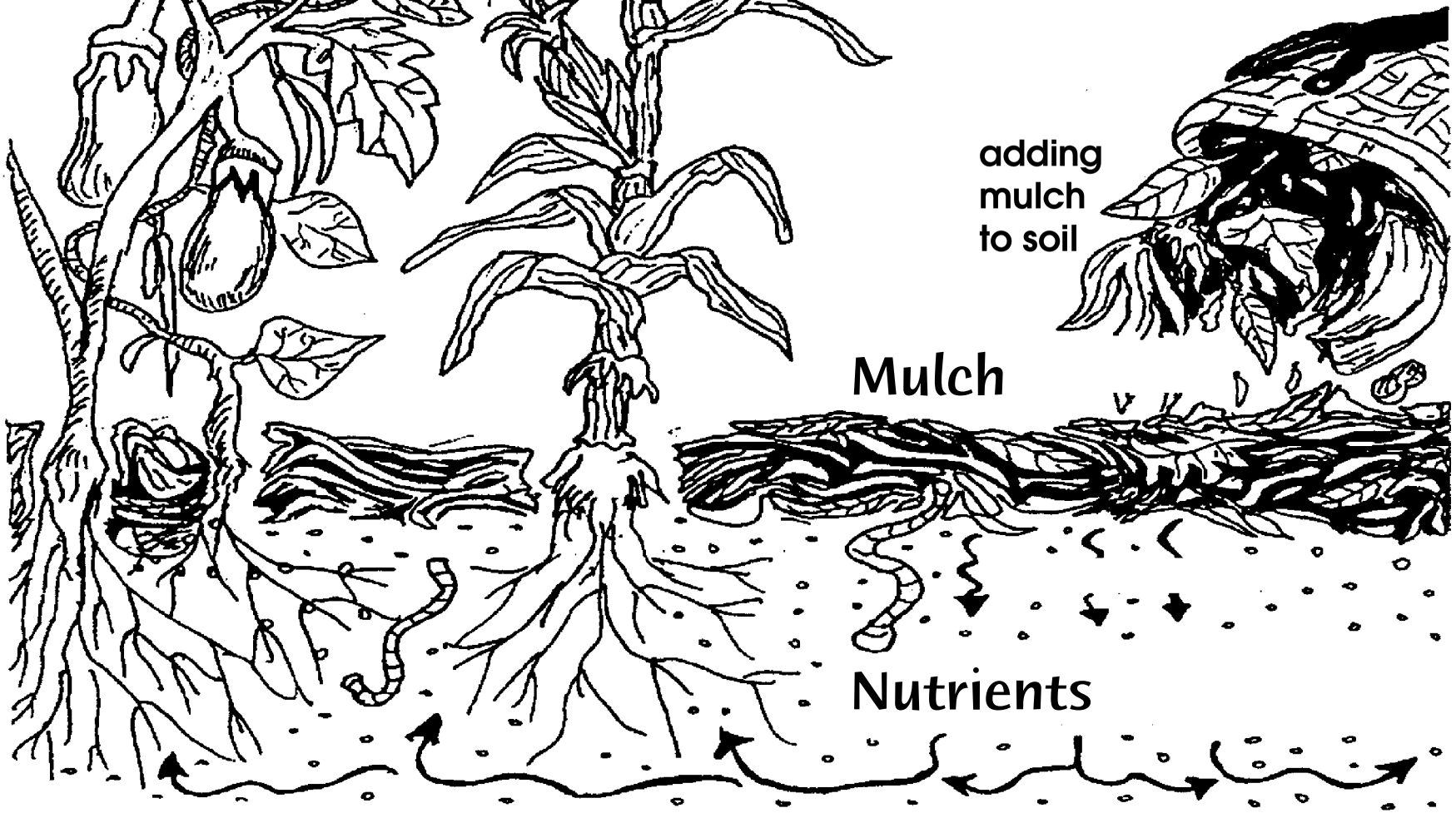
Insects take a variety of forms from egg to adult.



4. Organic controls

Why use mulch?

- mulch helps plants grow strong
- strong plants are more resistant to pest and disease attack

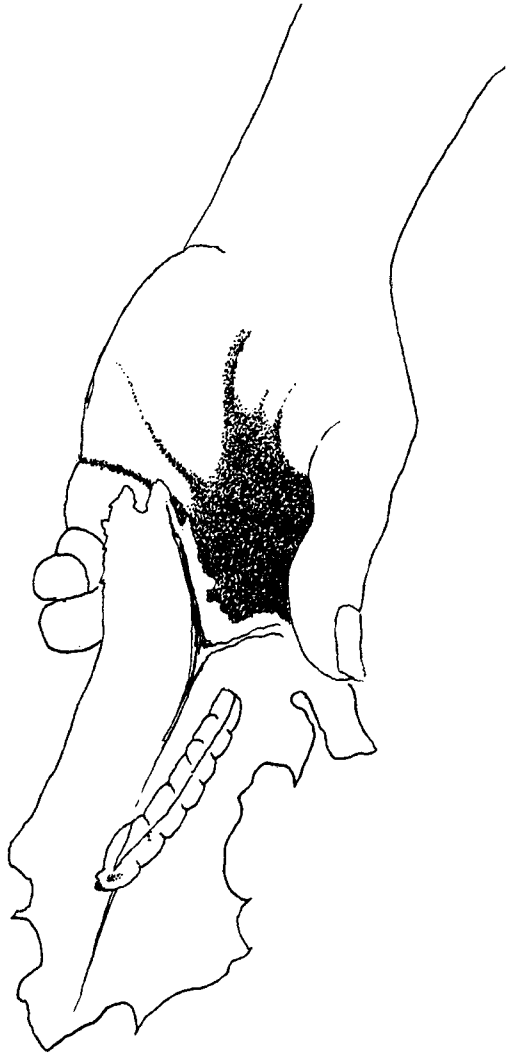


Clean the garden

Removing dead and damaged plants helps keep our gardens free of disease

Hand pick insect pests

Look for insect pests in your garden. Pick them off your plants when you see them

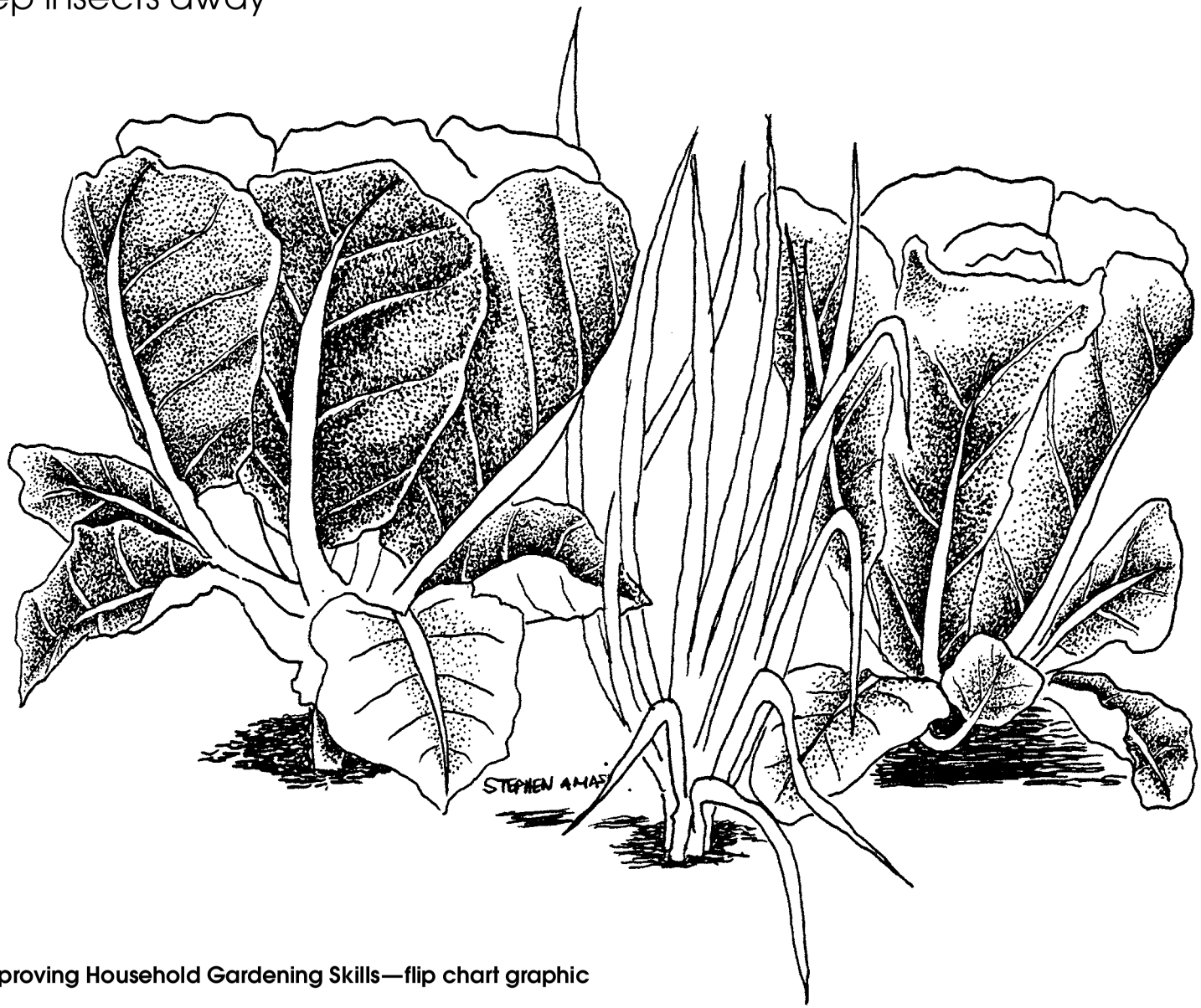


Clean planting material

Plant varieties of vegetable plants known to be resistant to insects and diseases

Plant strong smelling plants

...to keep insects away



Mixed cropping

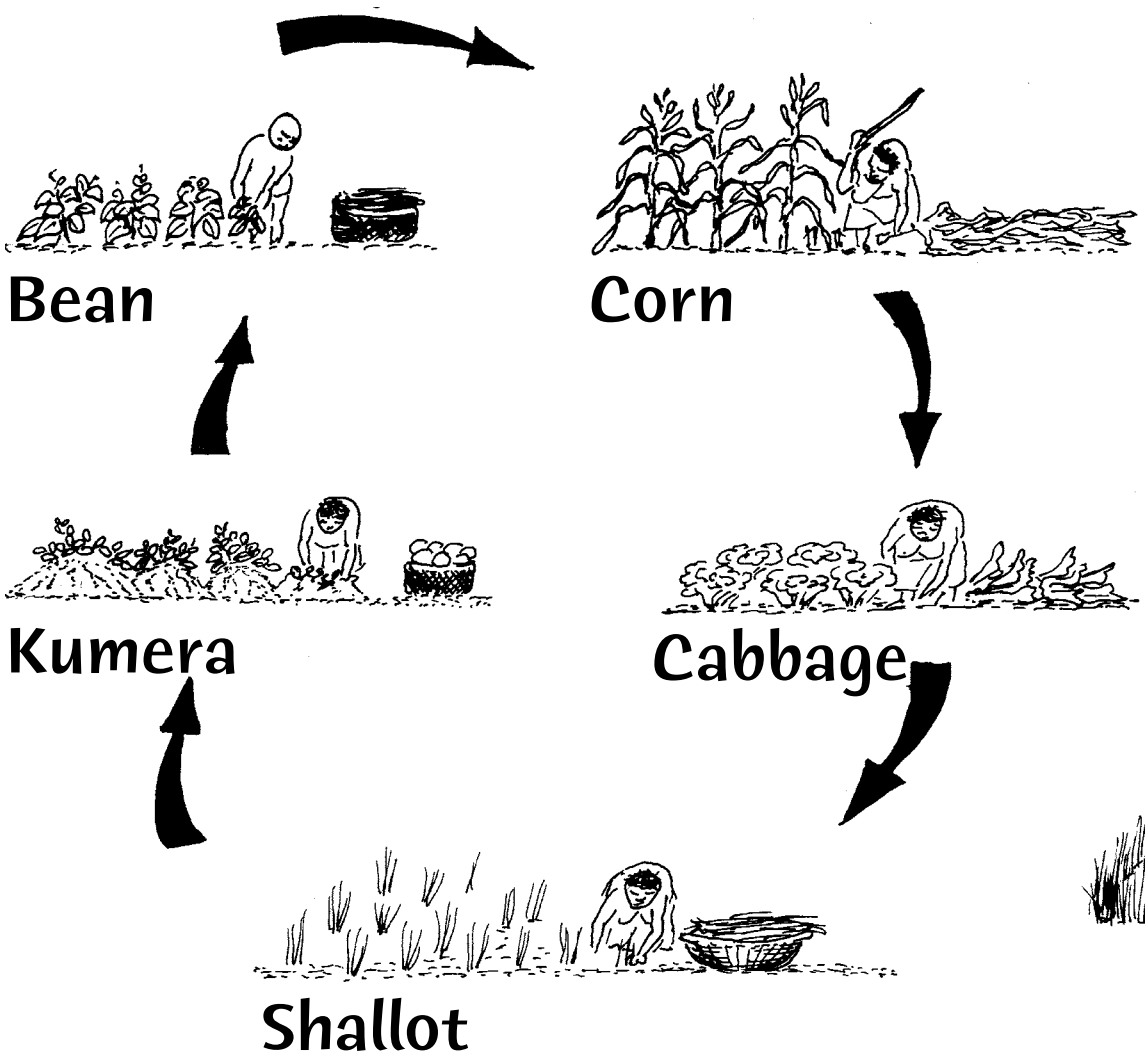
Plant different plants in the garden at the same time.

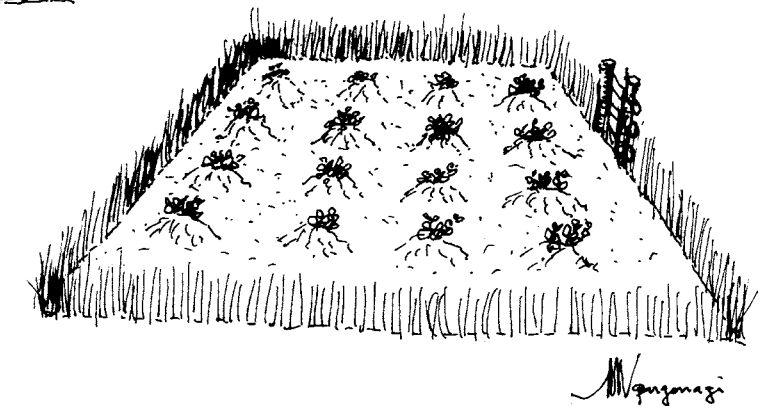
Mixed cropping reduces damage from insect pests and diseases.

Crop rotation

Plant different crops in the garden at different times to break the cycle of insect pests that might live in the soil.

Crop rotation avoids depleting the soil of nutrients.





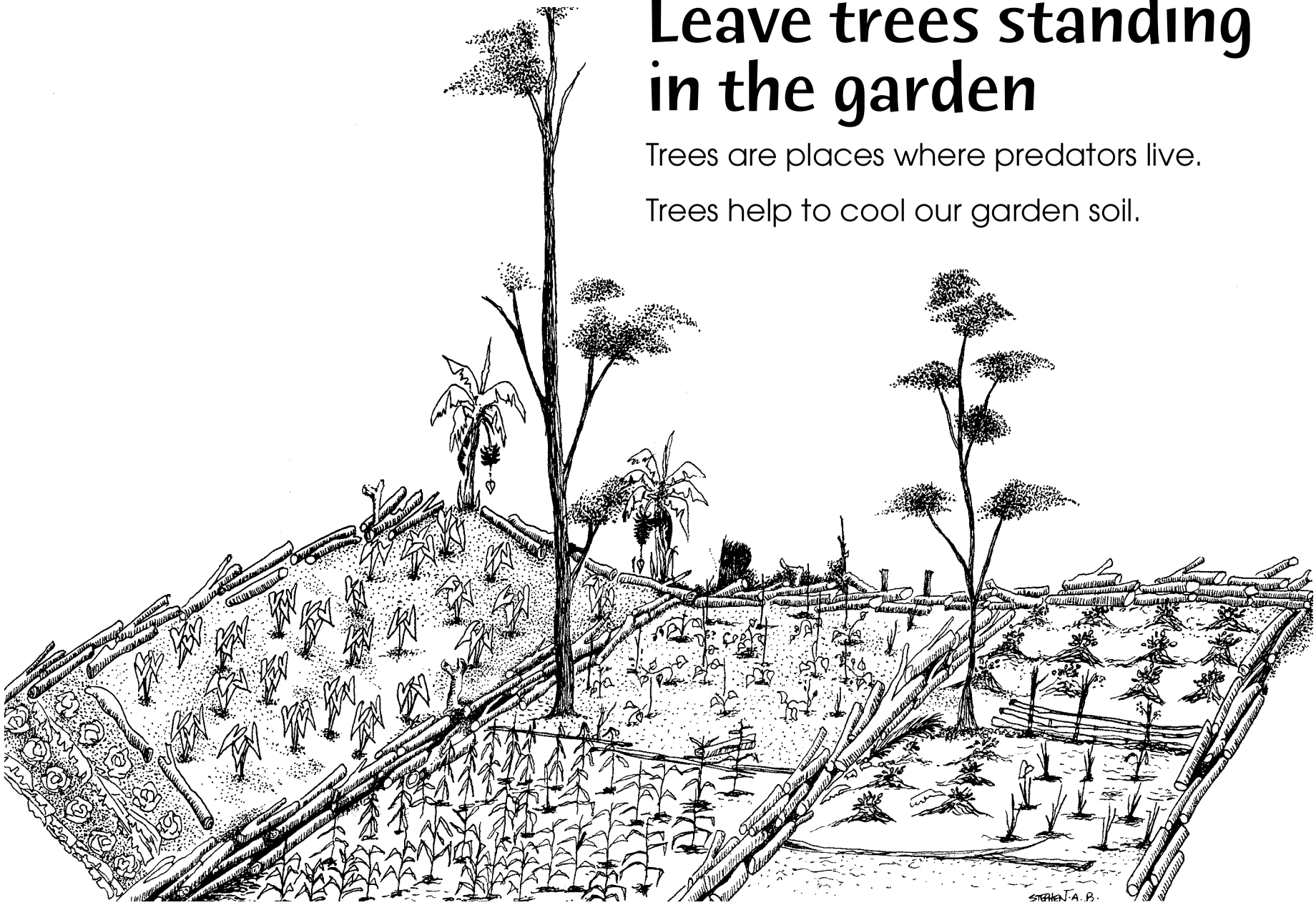
Remove weeds

- weed the garden and clean up rotting fruits
- remove disease and pest-affected plants and burn them or throw them far away

Leave trees standing in the garden

Trees are places where predators live.

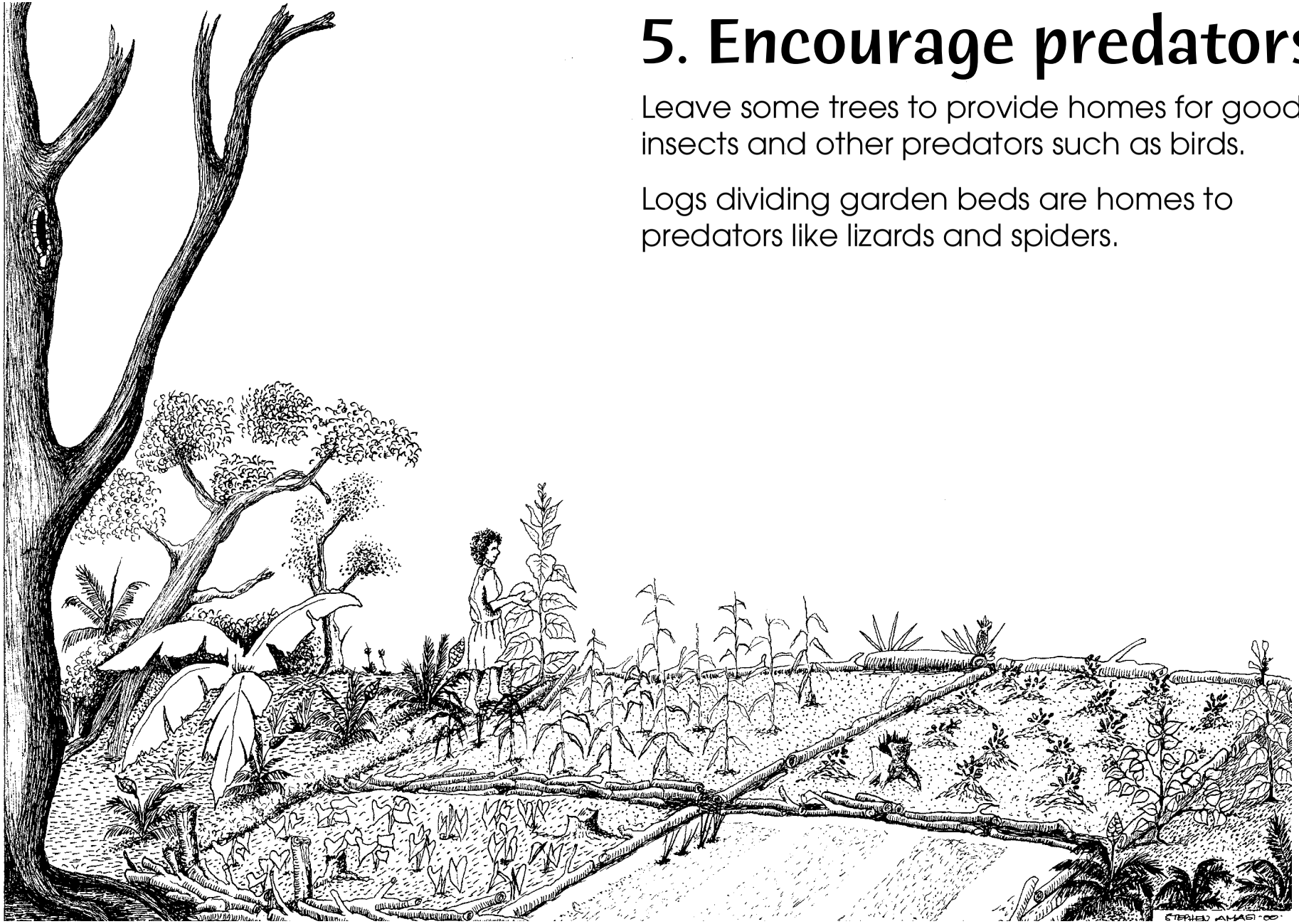
Trees help to cool our garden soil.



5. Encourage predators

Leave some trees to provide homes for good insects and other predators such as birds.

Logs dividing garden beds are homes to predators like lizards and spiders.



6. Botanic sprays

Benefits of botanic sprays

Use botanic sprays carefully and only when insect pests are in large numbers.

The careful use of botanic sprays reduces insect pest damage and leaves more food plants for you.

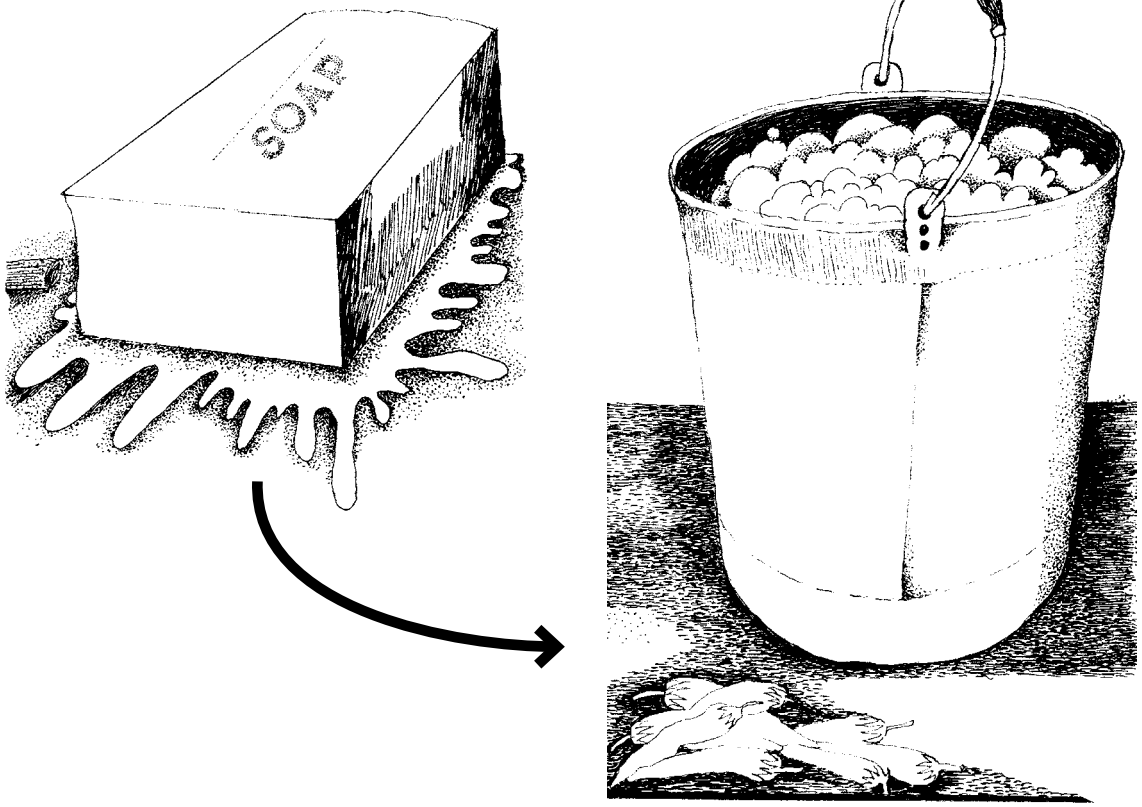
Botanical spray used

No botanical spray used

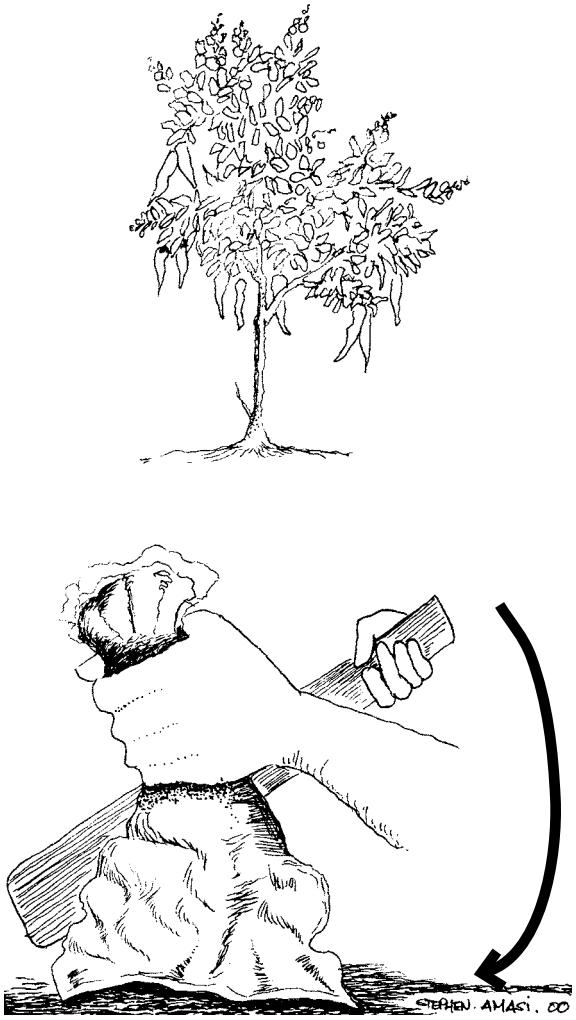
Plants used to make sprays for pest management

Tobacco Ginger Chilli Marigold

Making chilli spray 1



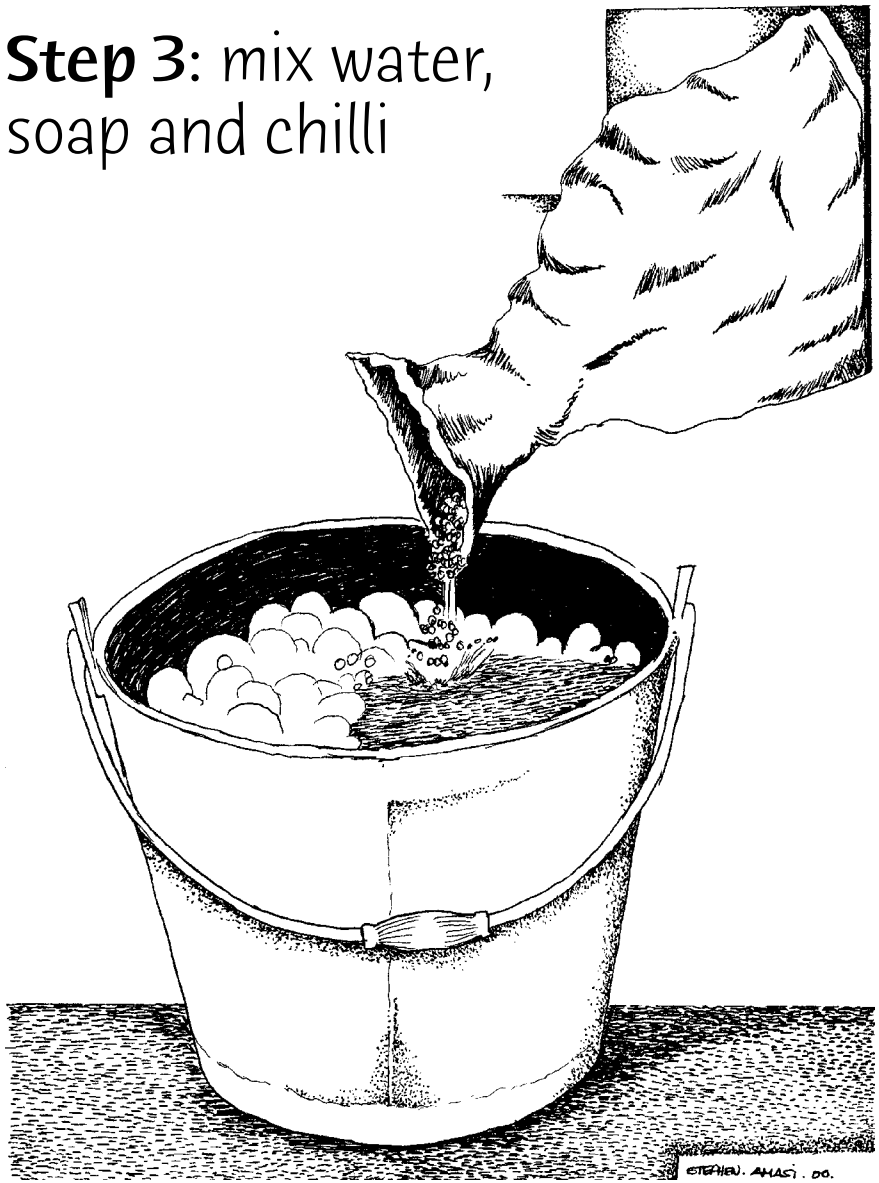
Step 1: add soap to a bucket of water



Step 2: pick chillies and put into a plastic bag and smash

Making chilli spray 2

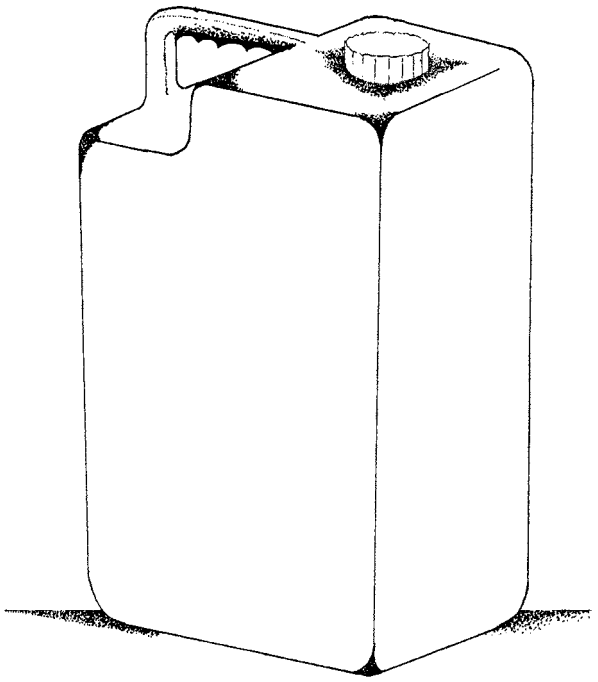
Step 3: mix water, soap and chilli



Step 4: **spray on** insect damaged plant

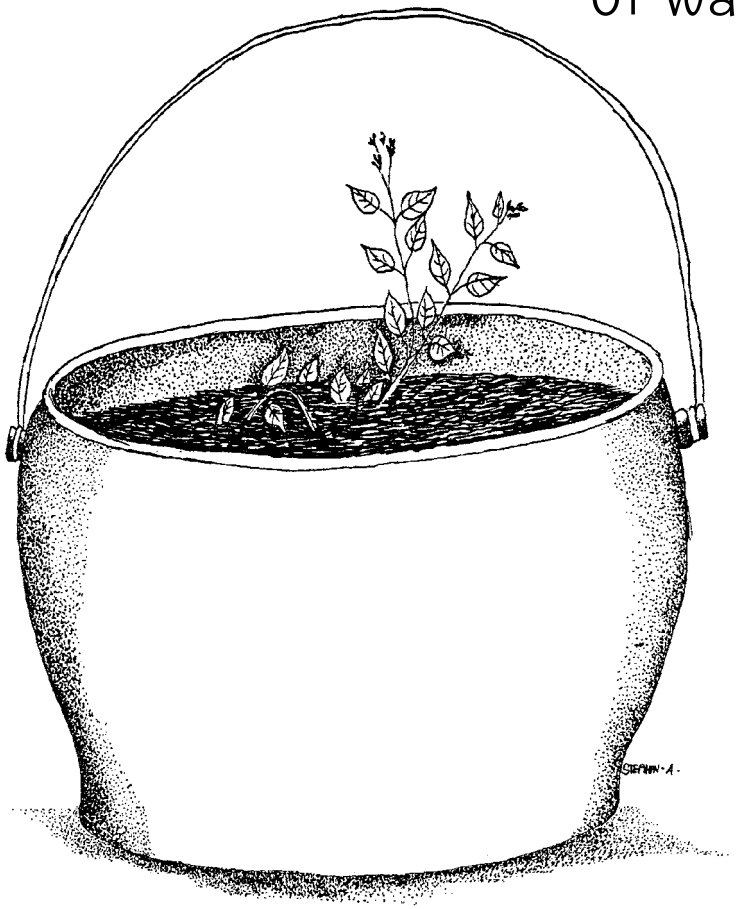
Making mala'alakwa spray 1

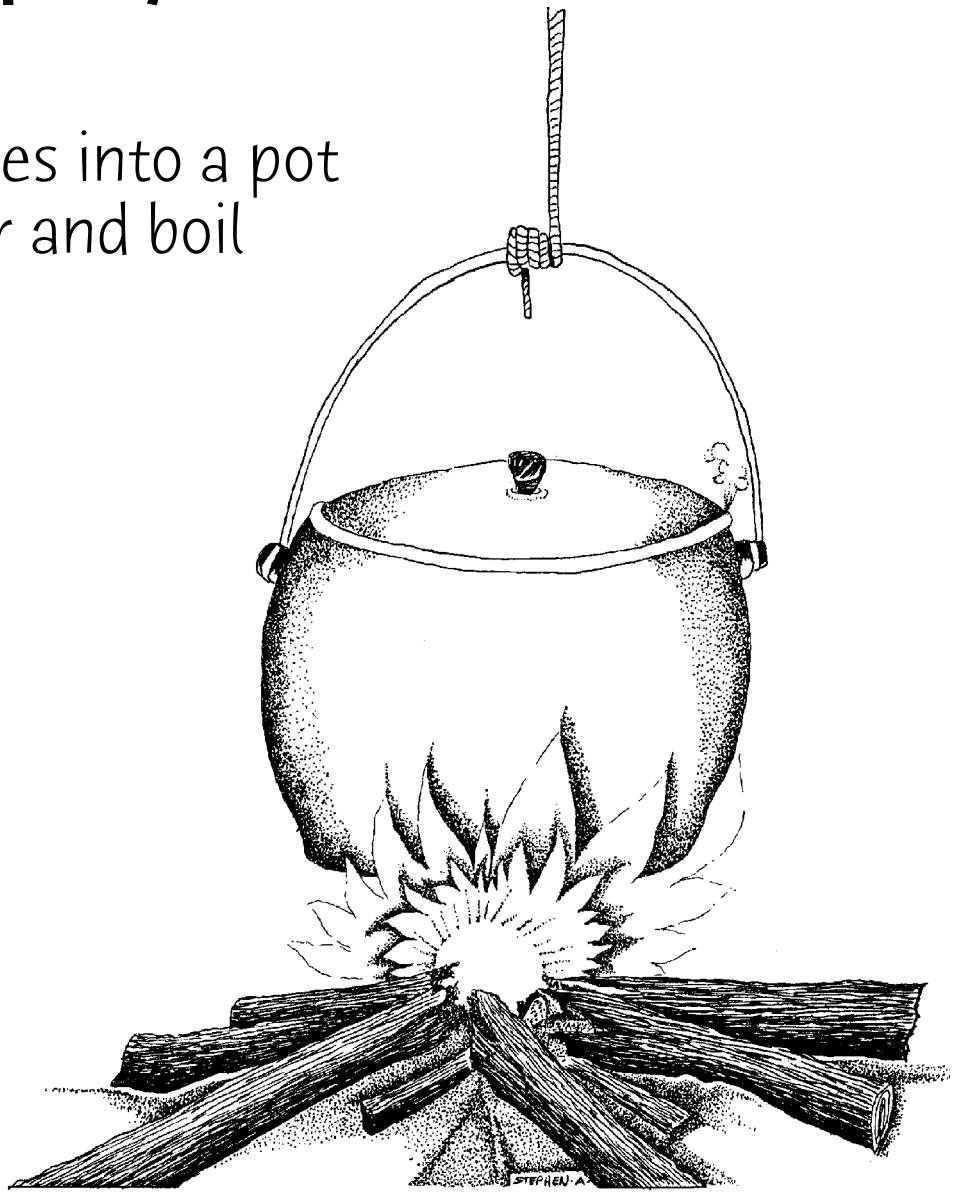
Step 1:
Collect leaves and water



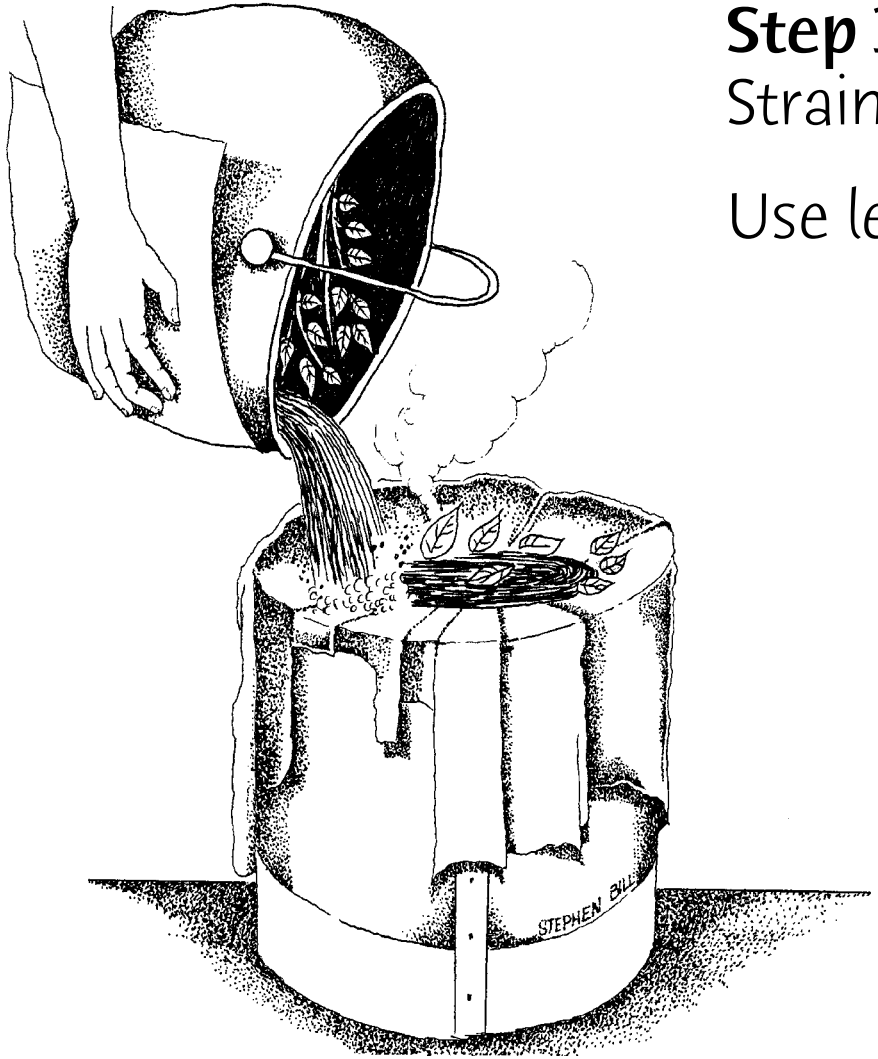
Making mala'alakwa spray 2

Step 2:
Put leaves into a pot
of water and boil





Making mala'alakwa spray 3



Step 3:
Strain to separate leaves from spray.

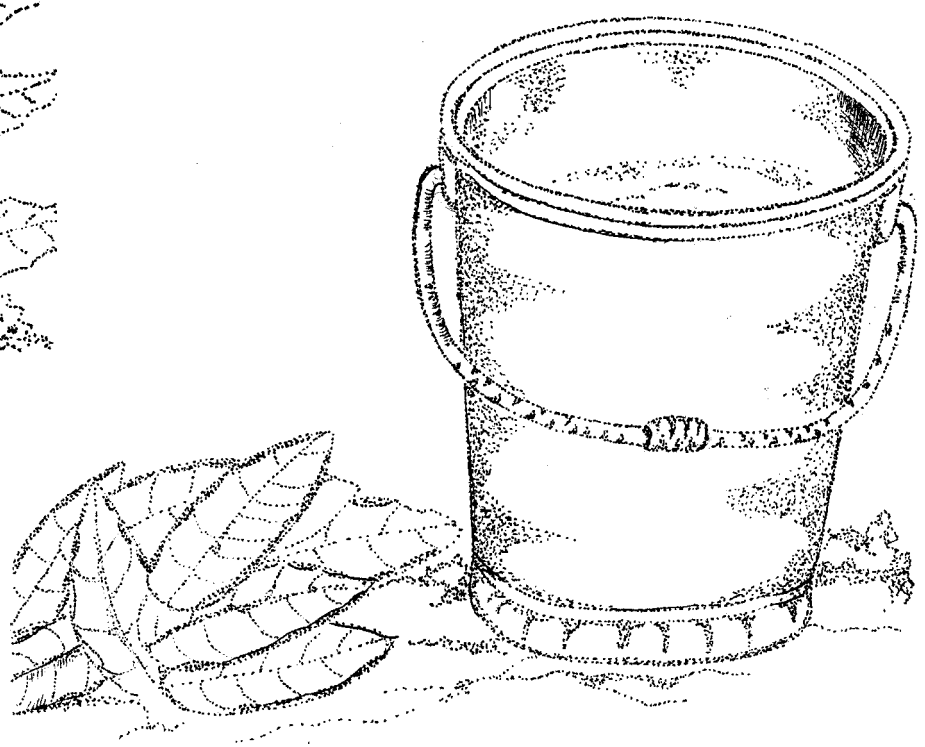
Use leaves as mulch.

Making mala'alakwa spray 4

Step 4:
Spray the liquid on insect damaged plant

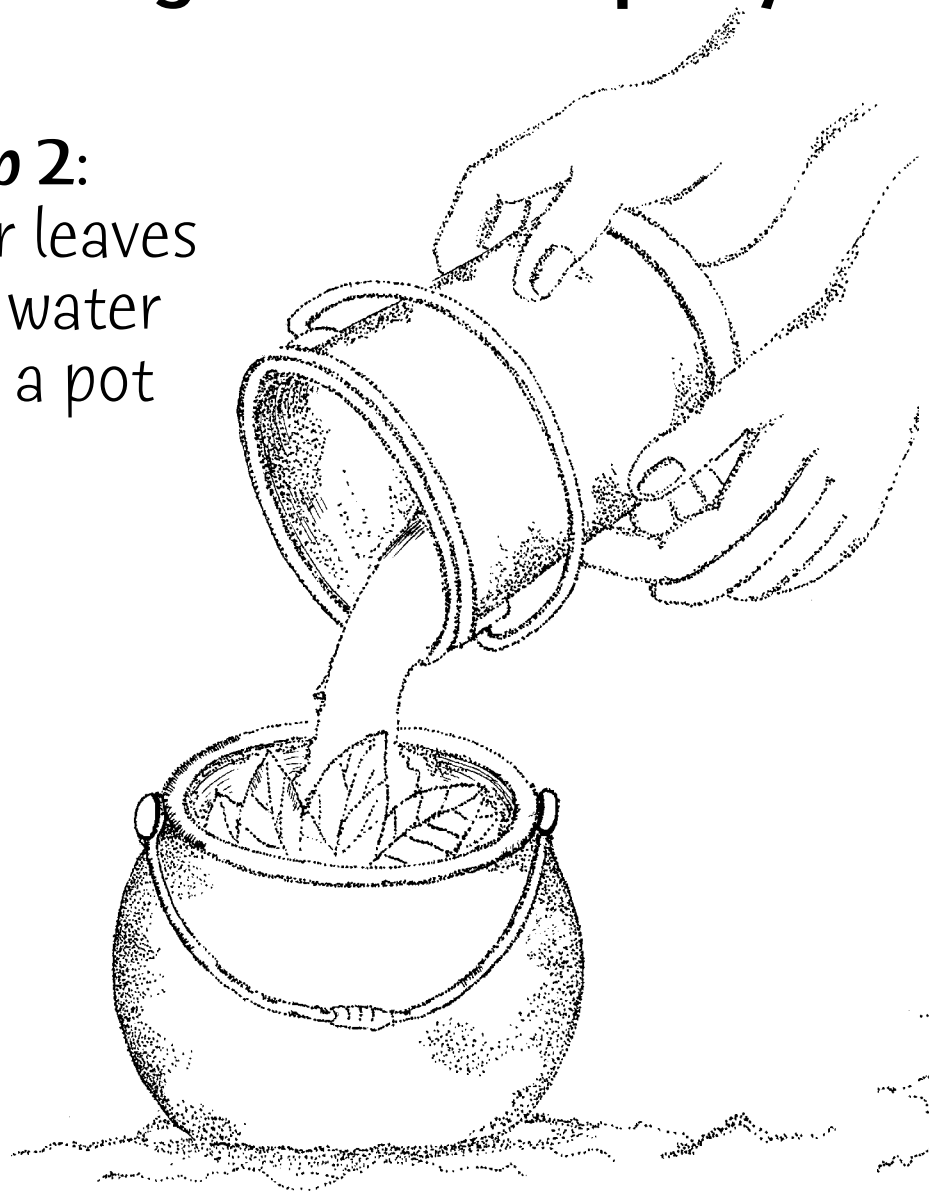
Making tobacco spray 1

Step 1:
Collect tobacco leaves and a bucket of water

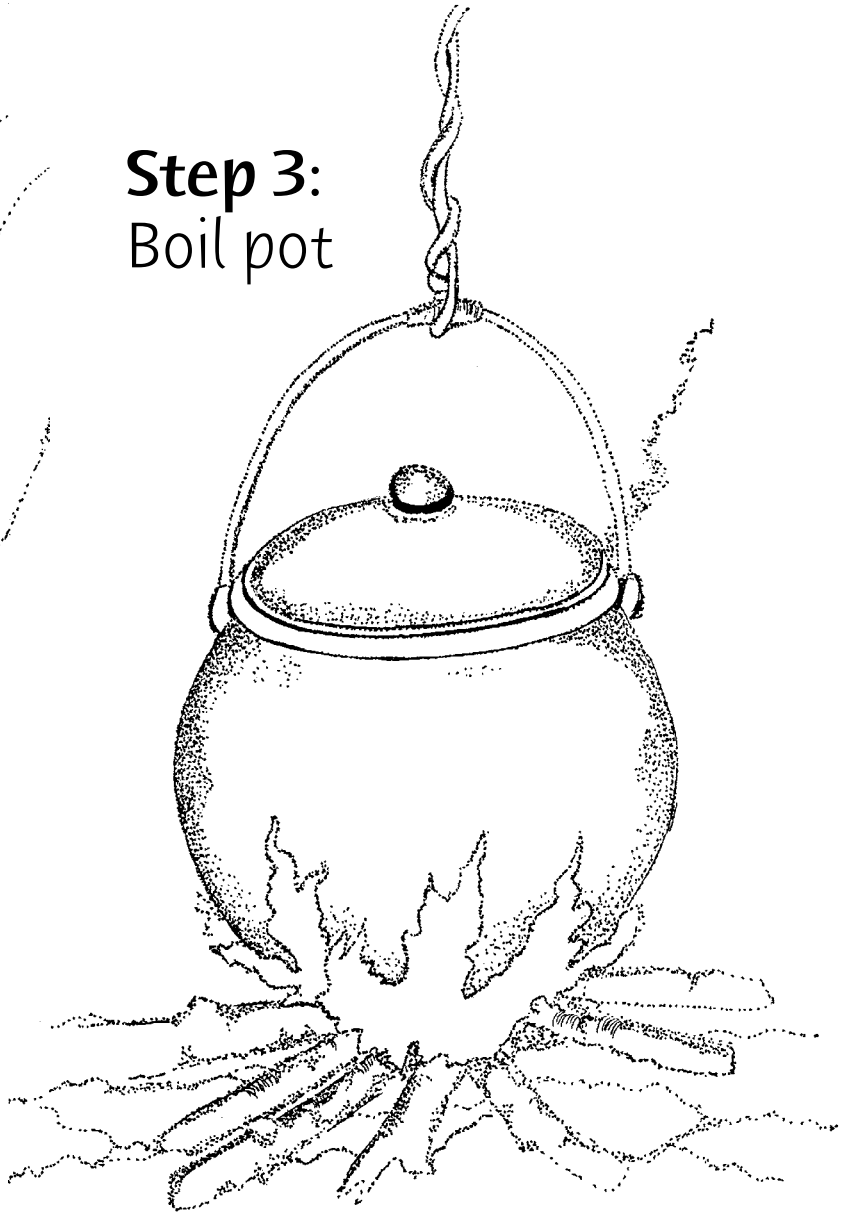


Making tobacco spray 2

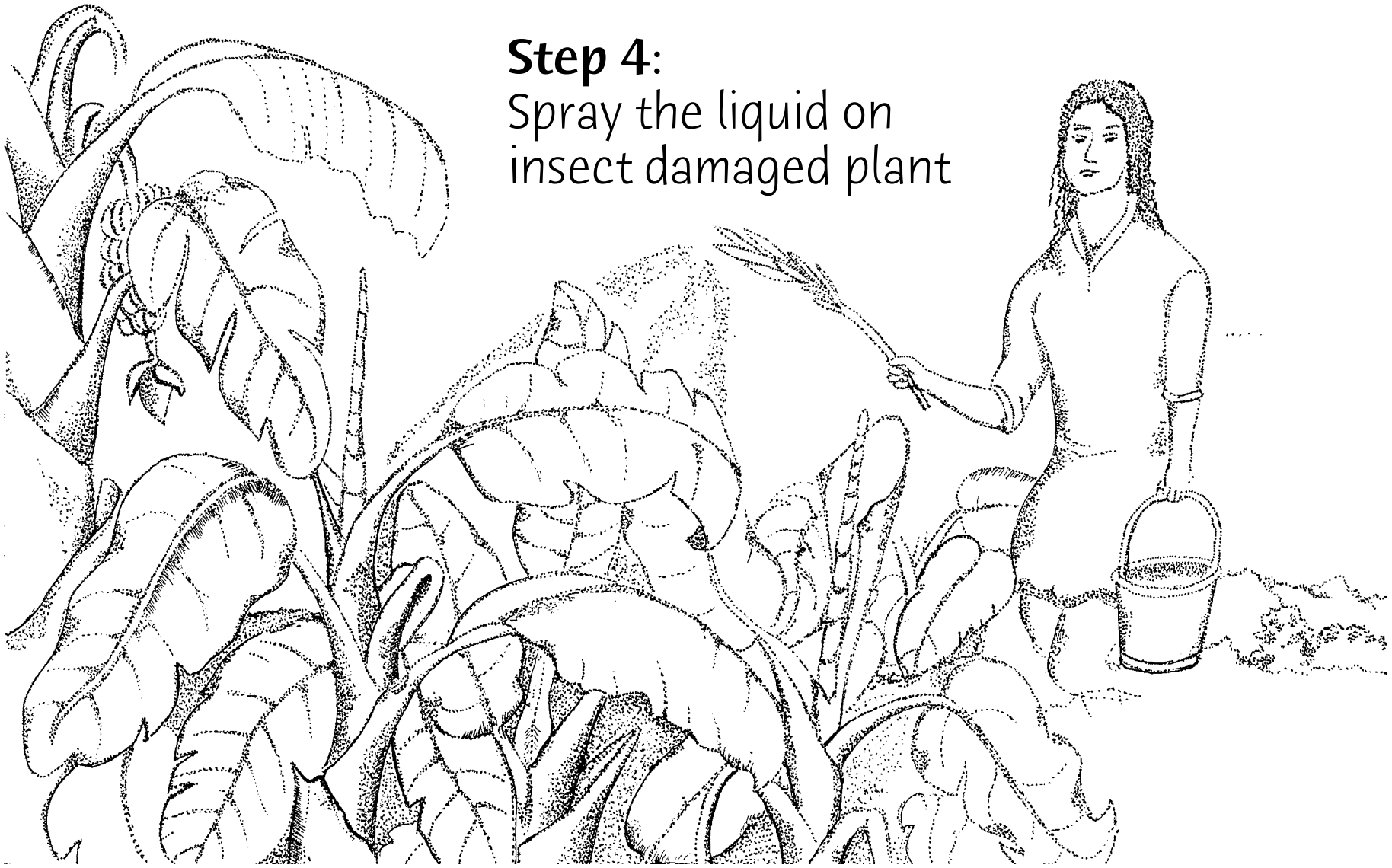
Step 2:
Pour leaves and water into a pot



Step 3:
Boil pot



Making tobacco spray 3



Making wood ash 1

Step 1:
Burn some wood

Step 2:
Ashes from the fire are ready to be collected when cool

Making wood ash 2

Step 3:
Ashes collected and are ready for use

Step 4:
Ashes are spread on bean

Using botanic sprays

Take care when using botanical sprays.

Do not breath the spray if possible and do not spray it on yourself.

Wash your hands when you have finished spraying.

Wash your hands when you are finished spraying

Background to the project

Australian involvement

In 1995, the Australian NGO (non-government organisation) APACE (Appropriate Technology for Community and Environment) started the Kastom Garden Program to provide training and assistance in redressing emerging agricultural problems in the Solomon Islands.

The programme, funded by AusAID (the Australian Agency for International Development, a unit of the Department of Foreign Affairs which administers the aid budget), sought to introduce alternative cultivation methods and to improve soil management by educating village farmers.

In 1995, Australian development adviser, Tony Jansen — who had moved to Honiara to set up the program — was joined by the author of this manual, Roselyn Kabu, a resident of Man'abu village, North Malaita.

Together, Tony and Roselyn developed the education program and established the successful seed saving and distribution organisation, the Solomon Islands Planting Material Network. The program expanded as new staff joined, first into Guadalcanal Province, then to North Malaita and Choiseul Province.

The Integrated Pest Management for North Malaita Project grew out of the earlier successful agricultural training program in the province.

With the ending of APACE support in 2001, the Solomon Islands NGO, Kastom Gaden Association ('gaden' is the Solomon Islands Pijin word for 'garden') was set up to continue its work.

The North Malaita situation

The project was initiated in North Malaita because it is one of the most highly populated regions in the Solomons.

In most villages, 50% of the population is under 14 years of age (Ministry of Finance 1997).

Setting up the project

To set up the integrated pest management project, the KGP identified a number of innovative farmers who had developed promising solutions to the insect pests of the two main crops — slippery kabis and kumera.

A Participatory Technology Development (PTD) process was then initiated to trial and disseminate information about the successful methods developed by these farmers through an informal farmer network.

Participating farmers — the majority of whom are women and are associated with the Mana'abu Training Centre (MTC) — have been sharing the methods and have tried them in their own gardens.

Tony Jansen

The importance of agriculture

The Solomon Island's high rate of population growth — around 3.4% a year — is putting pressure on the farming lands around villages on North Malaita.

These pressures include the loss of topsoil due to erosion on the increasingly-steep lands now being cultivated and the loss of organic matter and nutrients due to a cultivation cycle which, in many cases, is too short.

Subsistence agriculture

Subsistence slash and burn farming is practised throughout North Malaita. Swidden is the dominant farming method throughout the Solomon Islands.

Characteristically, swidden farming takes the form of the cyclic use of family fields in an extensive area surrounding permanent villages.

In the traditional form, fields are cleared of forest and burned by the men of the family. Burning of the slashed vegetation creates a mineral and nutrient rich layer on top of the soil into which cuttings and corms of sweet potato, taro, cassava and yam are planted by the women.

Usually, the rest of the cultivation cycle remains the work of village women. Men's responsibility in family food production is primarily in hunting and fishing, important sources of dietary protein.

Depending on soil and forest regrowth conditions, the field may be cultivated for a number of years before being abandoned to the encroaching jungle. Traditionally, after 15 to 20 years, the farmers return and repeat the farming cycle.

The increase in population following World War Two is believed to be behind the expansion of cultivation and to changes in farming practices. Population increase is also blamed for the encroachment of farming onto marginal lands, such as steep slopes. The high rainfall erodes the unstable soils of the steeper slopes, and, over time, reduces the productivity of farmer's fields.

Also contributing to reduced farm productivity is the accelerated cultivation cycle in which the 15 to 20 year fallow period, during which soils regain the nutrients removed by farming, has been reduced to what farmer's groups estimate to be between six months and four years.

This is too short a time for the returning forest to deposit a sufficient reserve of nutrients in the soil to sustain high productivity in the next cultivation cycle.

Declining land availability

Because of the shortened fallow period, farmer's groups say that in as little as 20 years there will be insufficient arable land to produce food for an increasing population using shifting agriculture.

If this is true, it is likely to result in increasing dependence on imported food, such as rice and white flour. This could contribute to a decline in health due to poor nutrition.

At the present time, the Solomon Islands suffers an economic imbalance due to food imports while health problems are increasing because of changing diets. Dietary change is associated with an increase in the incidence of non-communicable diseases such as obesity, diabetes and infant undernourishment.

Insects attack increases

Village farmers on North Malaita are facing increasing crop loss due to insect pests. Important food crops such as slippery kabis (slippery cabbage — *Hibiscus manihot*) and kumera (sweet potato — *Ipomea batastas*) are affected.

In the worse cases, damage caused by insect pests has led to families abandoning production of these crops — particularly slippery kabis. This has contributed to nutritional problems because slippery kabis is a traditional staple vegetable in Solomon Island diets.

Many factors have contributed to the increasing insect pest problem. Most can be traced to increasing pressure on the traditional shifting cultivation.

...Roselyn Kabu Maemouri, Tony Jansen, Russ Grayson