NUTRITION AND SCHOOL GARDENING

TRAINING MANUAL

FOR SCHOOL TEACHERS

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INTRODUCTION

Some of today's biggest challenges for developing nations are nutrition, the environment, livelihoods and education. In all of these areas, school gardens are making a proven contribution to children's wellbeing, understanding and life prospects. The "Nutrition and School Gardening" manual helps schools to establish gardens and to make them successful.

School gardens are primarily a platform for learning – learning how to grow food for a healthy diet, improve the soil, protect the environment, enjoy garden food and, not least, advocate it to others. School gardens can also help to generate income for school funds.

About This Training Manual

Agriculture, being the mainstay of Ethiopia's economy, renders food, employment and income to the vast majority of the population. Since agriculture is the primary source of food which provides nutrients that the body needs for the proper functioning of various organs, agriculture has a direct link to nutrition.

The lack of knowledge about diversified production and consequent utilization can lead to malnutrition and undernutrition. A food-based approach is feasible and sustainable to address the malnutrition concerns that exist among many smallholder farmers in rural communities of developing nations. Imparting appropriate technology, knowledge and skills in diversified agriculture, particularly the production and utilization of vegetables and fruits, will be critical areas of intervention for nutrition oriented projects.

School gardens are ideal methods to demonstrate, promote and disseminate nutrition sensitive messages and agriculture technologies to the school and the wider community. It is possible to address and effect students, teachers, Parent Teacher Associations (PTAs) and the local communities with various interventions run in school gardens. Setting up and running school gardens encourages active involvement of students and teachers thereby increasing their day to day interaction. It helps to ensure smooth coordination and collaboration among the different local participants and it demands a well-coordinated effort among the bureaus of education, agriculture and health in the process of implementation. With the appropriate approach and conditions, school gardens can help demonstrate nutrition-sensitive agricultural technologies to students, their families and communities through the learning by doing approach.

ENGINE, through its livelihood and nutrition component, has committed its resources to school gardening interventions to obtain demonstrable results among the targeted rural communities. ENGINE has also set criteria to select schools to work with to ensure its objectives, such as access to water supply for irrigation. The prime focus of ENGINE in school gardens is the production and demonstration of nutrient dense vegetables and fruit, supported by cooking demonstrations for students, teachers and local communities to attend and replicate at home. The planned activities to ensure smooth implementation of school gardening include training of school teachers (preferably those who teach agriculture related subjects or environmental science), school principals and woreda experts, organizing experience sharing visits and conducting agronomic and cooking demonstration events.

This manual has been developed to train school teachers and pertinent figures who will be directly involved in the guidance and daily management of ENGINE supported school gardening activities. It is illustrative and informative to support the teaching learning process and contains relevant theoretical and practical sessions for the trainees to internalize and exercise. The training will take three days and will be instrumental in ensuring the proper implementation of the gardening activities in the schools selected.

There are 11 sets of outline lessons. Each set relates to a different part of the manual. The manual is comprised of basic nutrition sessions with a sequence of gardening activities that enable the trainees to acquire practical skills that are easy to implement and transfer to others. To facilitate effective delivery of the information, the training should only be conducted in schools targeted for ENGINE support to carry out school gardening.

Training Method

Different training methods appropriate for adult learning are suggested for use during this training. Detailed instructions on how to carry out each session using the methodologies suggested below are included in the activity description sections throughout the training manual. The training methodologies used in this training manual include the following:

- Group work
- Actual field work
- Demonstrations
- Brainstorming sessions
- Interactive plenary presentations

Training Materials

The materials needed for each session of the training such as markers, flip charts, masking tape, cards, training manual, etc. are included in each session.

Training Evaluation Method

In this training, different training evaluation methods are used including:

- Pre- and post-tests
- Participants' feedback
- Daily evaluation at the end of each day and recap
- Final training evaluation checklist

Overall Training Purpose

At the end of this nutrition and school gardening training, trainees will be able to:

1. Understand the importance of nutrition in decreasing morbidity and mortality; improving productivity and educational performance and its contribution to the national economy;
2. Explain the role of school gardening for healthy eating and dietary diversity;
3. Establish a school garden and cultivate nutritionally dense vegetables and fruit through the learning by doing method;
4. Explain the multi-faceted importance of school gardening activities: nutrition education, good diet, income generation and livelihood skills;
5. Conduct agronomic practices and cooking demonstrations in their school gardens involving students, parents and the wider communities to promote production practices and nutrition education;
6. Explain how to keep food safe by practicing safe handling, preparation and preservation techniques;
7. Describe the type of interventions that promote nutrition through school gardening activities whereby the students will gain knowledge, skills and attitudinal changes on dietary intake and assist their families in addressing problem of malnutrition.

TRAINING SESSIONS AND SCHEDULE

DAY 1	DAY 2	DAY 3
DAILY SESSION		
Set-1: Welcome, introductions, pre-assessment (30 min) **Set-2:** Why nutrition matters? (45 min)	**Recap of Day 1** (10 min) **Set-7:** Growing food (45 min) **Set-8:** Growing plants (250 min)	**Recap of Day 2** (10 min) **Set-10:** Marketing and income from sales (35 min) **Set-11:** Garden planning, demonstration and evaluation (225 min)
TEA BREAK		
Set-3: Dietary diversity - what it means and why it is important? (35 min) **Set-4:** Thinking gardening (55 min)	**Set-8:** Growing plants (continued)	**Set-11:** Garden planning, demonstration and evaluation (continued)
LUNCH BREAK		
Set-5: Compost preparation (30 min) **Set-6:** Land preparation (220 min)	**Set-8:** Growing plants (continued)	**Set-11:** Garden planning, demonstration and evaluation (continued) Post-test, evaluation and closing (60 min)
TEA BREAK		
Set-6: Land preparation (continued)	**Set-9:** Preparing food (90min)	

SET 1: WELCOME, INTRODUCTIONS AND PRE-ASSESSMENT

Learning objectives
1. To get to know participants and their expectations.
2. To assess participants' knowledge.

Resources needed

- Flip chart, markers

Preparation

- Read the session carefully.
- Prepare all necessary flip chart papers and write the training objectives on flip chart.
- Copies of: Guide 1.1: Assessment of Knowledge (Pre-test)

Duration: 30 minutes

Activity 1: Welcome and workshop objectives

1. Welcome participants to the workshop.

2. Ask participants to group in pairs to introduce one another. One will introduce the other including name, position, where he/she comes from and one expectation from the training. Write participants' expectations on flip chart.

3. After all of the participants have been introduced, summarize and comment on the expectations.

4. Present the training objectives below to the participants (should be written ahead of time on a flip chart). Ask a volunteer from the participants to read them aloud.

Training objectives

- Understand the importance of nutrition in decreasing morbidity and mortality; improving productivity and educational performance and its contribution to the national economy;
- Explain the role of school gardening for healthy eating and dietary diversity;

- Establish a school garden and cultivate nutritionally dense vegetables and fruit through the learning by doing method;
- Explain the multi-faceted importance of school gardening activities: nutrition education, good diet, income generation and livelihood skills;
- Conduct agronomic practices and cooking demonstrations in their school gardens involving students, parents and the wider communities to promote production practices and nutrition education;
- Explain how to keep food safe by practicing safe handling, preparation and preservation techniques;
- Describe the type of interventions that promote nutrition through school gardening activities whereby the students will gain knowledge, skills and attitudinal changes on dietary intake and assist their families in addressing problem of malnutrition.

5. Compare participants' expectations to the workshop objectives and discuss any discrepancies.

Activity 2: Pre-test

1. Prepare numbers on a piece of paper for each participant to serve as a code for pre- and post-tests. Each participant should randomly select from the different numbers and remember his/her code but it should remain confidential.

2. Distribute the pre-test to participants and allow them to finish within 10 minutes. Remind them to write their code on the pre-test.

3. Inform participants that they can ask questions if anything is not clear to them.

4. Collect the pre-test after 10 minutes. Make sure that participants have written their code on the pre-test.

Guide 1.1: Assessment of Knowledge (Pre/Post-Test)

Key		Statement	Yes	No	Don't know
False	1	By increasing agricultural production, we can fully address the problem of malnutrition.			
True	2	Malnutrition can affect the learning capacity and understanding of students.			
False	3	Absence or presence of leafy vegetables and fruits in our diet doesn't have any effect on our health and body conditions.			
True	4	School gardening could contribute to better nutritional outcomes.			
False	5	The school community doesn't have any role to play in improving the nutritional status of households.			
False	6	Direct consumption of raw vegetables and fruits from the field has no negative consequence.			
False	7	Malnutrition is not a problem for students who are able to eat three times a day.			
False	8	When a child is born, his/her IQ/intelligence quotient and how well the child will do in school are already determined.			
False	9	Cooking and proper storage has nothing to do with the nutritional content of agricultural products.			
False	10	It is recommended to use artificial fertilizers and pesticides rather than organic compost and integrated pest management practices to grow vegetables and fruits.			

PART I: NUTRITION

SET 2: WHY NUTRITION MATTERS

Learning objectives
1. To describe the impact of malnutrition on mortality and morbidity, productivity, economic development and education.

Resources needed

- Flip chart with stand, markers, tape/sticky putty

Preparation

- Read the session carefully.
- Prepare all necessary flip chart papers.
- Make copies of printed Guide 2a.
- Draw headings of Guide 2b on a flip chart.

Duration: 45 minutes

Activity 1: Group work

1. Explain to the participants that the next session will be on the impact of malnutrition.
2. Ask participants: "What do we mean by malnutrition?" Write responses on a flip chart. Explain to the participants that malnutrition includes both overnutrition and undernutrition but because undernutrition is the major problem in poor countries like Ethiopia, we will focus on it.
3. Ask participants what they think are the major causes of undernutrition? Write responses on a flip chart. Explain to the trainees that inadequate food/diet and poor health are the immediate causes of undernutrition. Inadequate food/diet can be caused by household food insecurity and poor care of mother and child including poor or suboptimal feeding practices. Similarly, poor health can be caused by poor access to health care, poor feeding practices, poor hygiene and sanitation and other health conditions.
4. Ask participants: If these are the causes of undernutrition/malnutrition, what could

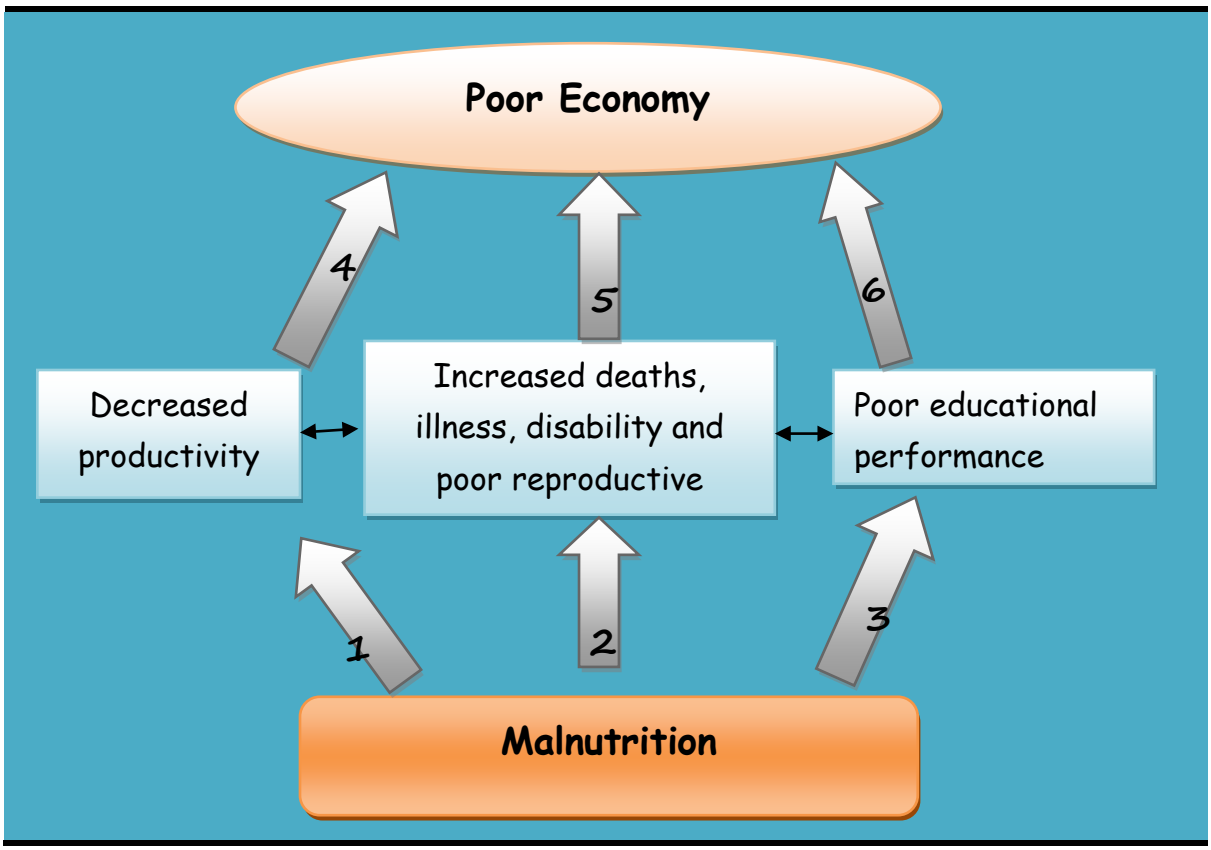
be the impact or consequences of undernutrition?" Write responses on a flip chart. Show the chart from Guide 2a.

5. Draw the chart from Guide 2a on a flip chart and explain to the participants that malnutrition could cause decreased productivity, increased deaths and illnesses and poor educational performance. Eventually these all cause poor economic development (don't explain the "How" part as this will be done as group work).
6. Explain to the participants that the next activity will be group work. Use Guide 2a.
7. Each group will identify the causes as per the number indicated in each arrow.
8. Divide participants into 6 groups (from 1 to 6 as per the arrows indicated in the Guide 2b) and give them a card. They need to write the causes in a short phrase/word on the small cards.

- **Group-1**: How does malnutrition decrease productivity?
- **Group-2**: How does malnutrition cause increased deaths and illnesses?
- **Group-3**: How does malnutrition cause poor educational performance?
- **Group-4**: How does decreased productivity cause a poor economy?
- **Group-5**: How do increased deaths and illnesses cause a poor economy?
- **Group-6:** How does poor educational performance cause a poor economy?

9. Give each group 15 minutes to discuss and write the causes on the cards.
10. After 10 minutes, ask representatives of each group to post the causes on the chart (draw the chart on a flip chart ahead of time). Cards should be posted at the arrows.
11. When each group finishes posting the cards on the chart, ask others if they have questions and address them accordingly. Use the key information below to complement participants' suggestions.
12. When all of the groups finish posting the cards, explain to the participants that decreased productivity, increased deaths and illnesses and poor educational performance are also interlinked to each other (e.g., increased illness makes less productivity and increased school drop-out rate).
13. Ask participants if they have questions and summarize the session.

Guide 2a: Impact of Malnutrition



Arrow-1: How does malnutrition decrease productivity? (Group-1)

Arrow-2: How does malnutrition cause increased deaths and illness, disability and poor reproductive performance? (Group-2)

Arrow-3: How does malnutrition cause poor educational performance? (Group-3)

Arrow-4: How does decreased productivity cause a poor economy? (Group-4)

Arrow-5: How does increased deaths and illness cause a poor economy? (Group-5)

Arrow-6: How does poor educational performance cause a poor economy? (Group-6)

Guide 2b: Key Information

Arrow-1: How malnutrition decreases productivity	**Arrow-2: How malnutrition increases deaths and illness**	**Arrow-3: How malnutrition causes poor educational performance**
- When malnourished individuals are sick, they can't perform their daily work (e.g., sick farmer) - Individuals with iron deficiency anemia (particularly women) become tired and can't perform their day-to-day activities - Shortage of iodine decreases IQ and causes a productivity loss - Stunting also causes less productivity	- Malnutrition weakens immunity and predisposes individuals to different infections - More than half of infant deaths are associated with malnutrition - Suboptimal breastfeeding is accountable for 24% of infant mortality and vitamin A deficiency for 17% of deaths - Marasmus and kwashiorkor and finally death are caused by severe malnutrition - Goiter due to iodine deficiency - Night blindness to complete blindness from vitamin A deficiency - Anemia from iron deficiency - Diseases from deficiency of vitamins (scurvy, pellagra, etc.)	- Iron deficiency anemia lowers IQ by 9 points, mild iodine deficiency by 10 points, sever stunting by 5-10 points, and low birth weight by 5 points - High absence and drop-out rates from school due to malnutrition associated illness
Arrow-4: How decreased productivity causes poor economy	**Arrow-5: How increased deaths and illnesses cause poor economy**	**Arrow-6: How poor educational performance causes poor economy**
- Less productive citizens will have lower income and this creates a poorer society - Productivity loss due to iodine deficiency is estimated at 1,347 million birr each year and this has negative economic impact - Productivity loss due to stunting (low height for age) is estimated at 2,992 million birr per year and this has negative economic impact - Increased dependency due to less productive citizens causes poor economy	- High number of ill individuals will become less productive and have low income - Low number of productive citizens (due to high number of deaths) can't produce adequate income - High dependency due to low number of productive citizens (as a result of high deaths)	- Illiterate farmers will follow traditional agricultural practices and this will cause poor agricultural productivity - Illiterate society will have poor access to modern health care and this will increase deaths and illness and finally create poor productivity and economy - Illiterate society will have less innovation and creativity and this will decrease productivity and cause poor economy - Illiterate mothers will follow poor feeding practices and this will eventually lead to increased deaths and illness and finally to decreased productivity and poor economy

SET 3: DIETARY DIVERSITY - What it means and why it's important?

Learning objectives
1. **To understand the six main food groups and why eating a variety of foods is important.**

Resources needed

- Small pieces of paper to write names of foods
- Prepared flip chart papers with six food groups labeled

Preparation

- Read through the session and familiarize yourself with the process and activities
- Prepare photocopies of Guide 3: The six key food groups

Duration: 35 minutes

Activity 1: Food groups game

1. Ask each participant to write the names of three different foods on small pieces of paper, one on each piece. Explain that this can be any type of food—animal source, vegetable, fruit, etc. Each should be a separate food item, not a mixed food that has more than one ingredient.

2. Put all of the papers in a basket and mix them up. Then lay out the prepared flip chart papers on the floor with the six foods group categories—one category on each piece of paper. Ask each participant to pick three slips of paper from the basket and to put the foods listed on the corresponding flip chart paper—into the food category to which it corresponds.

3. Check with the group to ensure that the foods are put in the correct category.

Activity 2: Presentation and review on dietary diversity

1. Using Guide 3: The six food groups and the flip charts from the first activity, review the six food groups and the importance of eating a variety of foods at every meal.
2. Ask if there are any questions and summarize.

Guide 3: The six key food groups

1. Staples

Foods in this group include cereal grains such as sorghum, millet, maize, barley, oats, wheat, teff, rice, and starchy roots (cassava, sweet potato, false banana and potato). They are good sources of energy.

2. Legumes and Nuts

This group includes ground nuts, soya beans, beans, peas, chick peas, broad beans, kidney beans, lentils. They provide mainly protein and are important for growth, repair and body building.

3. Animal Foods

All of the foods in this group are of animal origin such as meat, poultry, eggs, milk products and fish. They provide protein, fats, vitamins and minerals. They help the child to grow, have strong bones and be healthy.

4. Vegetables

Include green leaf and yellow vegetables such as cabbage, kale, spinach, cauliflower, lettuce, carrot, celery, cucumber, eggplant, green pepper, broccoli, pumpkin, onions, tomato and others such as mushroom. They provide mostly vitamins, minerals and water. Vegetables also contain fiber that is necessary for proper digestion.

5. Fruits

They include citrus fruits (oranges, lemons and mandarins), banana, apple, avocado, cherry, grapes, pineapple, papaya, mango, peach, guava, watermelon, sweet melon and many others. Fruits provide mostly carbohydrates, vitamins and water. They help to protect from illness.

6. Fats

This group includes oil seeds (soybean, sesame, linseed and groundnut), avocado, cooking oil, milk and milk products such as butter, margarine, yoghurt, meat, fish and poultry. They mainly provide fat (additional energy).

Make the following note

Animal-source foods

Animal-source foods are a good source of readily digested protein and are rich in energy. Animal-source foods are easily absorbable and an efficient source of micronutrients (calcium and B_{12} from milk, iron, zinc and vitamin A). Animal products are exclusive sources of dietary vitamin B_{12}, and a good source of preformed vitamin A, particularly in milk which protects children from diseases.

Legumes

Encourage the use of legumes. Legumes are a good source of protein which is essential for the body, as well as important minerals such as calcium, zinc, iron and folate, a mineral that is important for brain function, mental and emotional health.

Vitamin A

Fruits and vegetables are good for the body to protect you from disease. Encourage the use vitamin A-rich foods such as yellow colored fruits/vegetables (papaya, mango, oranges, carrots, pumpkins, orange-fleshed sweet potatoes), dark green vegetables, organs (liver), animal source (eggs, milk, butter, cheese and vitamin A-fortified foods).

Make sure the child gets vitamin A supplementation from 6-59 months of age twice a year.

Iron

Iron is one of the necessary micronutrients which the human body needs. Plant sources of iron include beans, peas, lentils and spinach. Eating foods rich in vitamin C with or soon after a meal increases the absorption of iron. Drinking tea and coffee with a meal reduces the absorption of iron.

Iodine

Iodine increases brain growth which will help the child perform better in school and be more productive in farming activities. Use iodized salt for cooking.

Part II: SCHOOL GARDENING

SET 4: THINKING SCHOOL GARDENING

This session starts with general gardening questions, basic information and principles. It aims to find out what learners know, think and want, and it introduces learners to the idea of consulting gardeners in the community.

4.1. SHALL WE HAVE A GARDEN?

This brainstorming sessions help to find out what the participants know, what they can do and how they think and feel about gardening. Most of the information in this lesson comes from the participants.

LEARNING OBJECTIVES

Participants

- become aware of the various uses of gardens
- recognize their own potential ("I can do it too")
- appreciate some positive aspects of gardening
- discuss reasons for having a school garden
- feel motivated to start.

RESOURCES NEEDED

- Flip charts, markers

- **DURATION:** 25 minutes

ACTIVITIES

Ask participants to:

- List different types of vegetables and fruits that are grown in the school garden, if they have it, and if not, in home gardens in their locality.
- Consider what happens to each crop (e.g., sold, eaten, burned as fuel, used for medicine or for making things, kept for decoration, etc.).
- Find out what tasks have to be done in a garden (e.g., digging, planting, watering, weeding, harvesting).
- Find out about the times of year when different tasks have to be done.
- Decide if they are interested in establishing a school garden and what they would like to do with it.

4.2. STARTING WITH SOIL

A feel for soil is the beginning of good gardening. Hands-on experience is the best way to learn. This needs a double lesson.

LEARNING OBJECTIVES

Participants

- recognize topsoil and subsoil
- recognize good soil by feel and sight
- become aware of all the components of soil.

RESOURCES NEEDED

- Samples of good and poor soil, spade, hoe, pick ax and water

PREPARATION

Prepare soil samples in plastic bags. Sample 1: good soil (lots of humus). Sample 2: - poor soil (plain sand or clay). If soil is very dry, moisten it before the session.

Duration: 30 minutes

ACTIVITIES

1. **Cross-section** - Take the class outside. Ask: What will we see if we dig a hole? Is the soil the same all the way down? Dig a hole in good soil to show participants the difference between topsoil and subsoil. Ask them to describe all the things they see in the soil.

2. **Feeling** – Ask each participant to pick up a handful of soil, smell it and feel it with their fingers. Ask: Is it damp? Is it dark? Is it crumbly? Is it full of life (bits of plant and animals)? If so, it's good soil. Then let them feel a sample of poor soil, describe it and conclude that it is not as good.

   Let them use the samples to compare with the soil they dig out. Use guide 4.2a and 4.2b below to further explain the soil characteristics and structures.

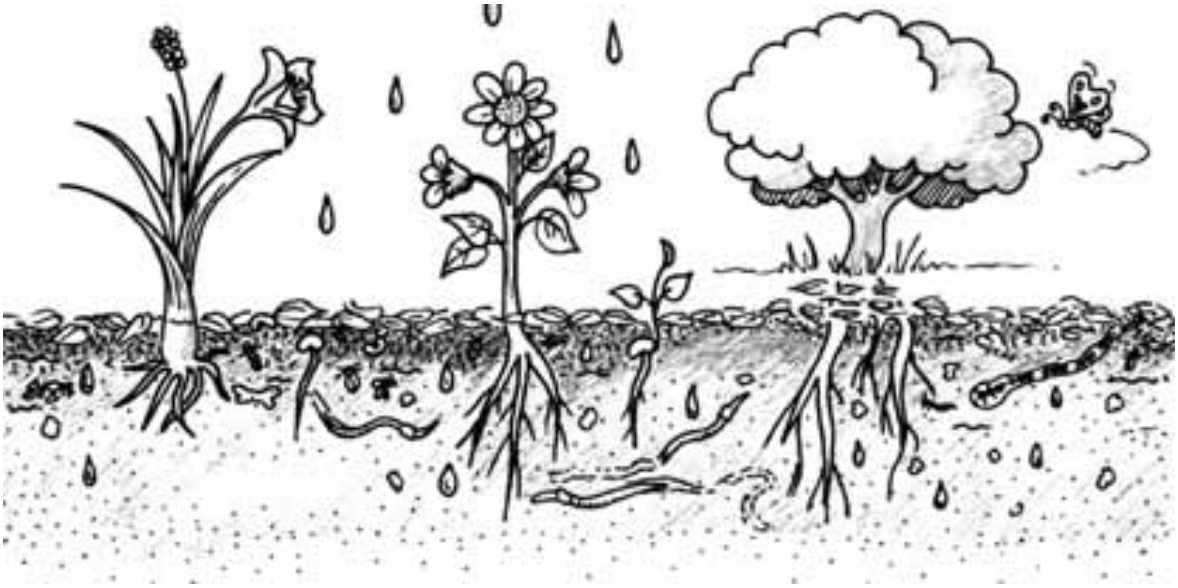
Guide 4.2a: GOOD SOIL IS ALIVE AND ACTIVE

Plants grow and take nutrients from the soil.

Plants die where they grow. They drop leaves, fruits, and seeds.

Dead plants are eaten by ants, worms and bacteria. The nutrients go back into the soil.

New plants grow in the rich soil.



GOOD SOIL HAS

Air

Water

Organic material

Living things

!

GOOD SOIL IS

Damp

Dark

Crumbly

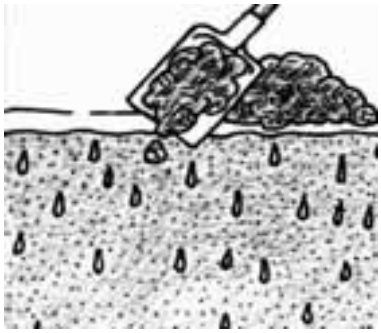
Full of life

Guide 4.2b: SOIL IS SAND, SILT OR CLAY

Sand has large grains.

Water drains fast.

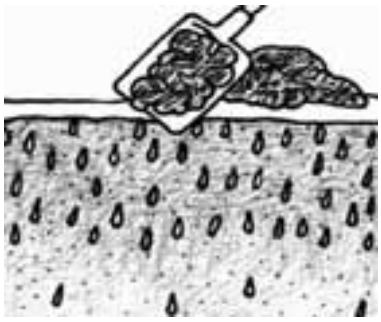
Add compost and anthill materials



Silt has medium grains.

Water drains more slowly.

Add Compost.



Clay has fine Particles.

Water drains very slowly.

Add Compost.

SET 5: COMPOST PREPARATION

The aim of this session is to raise participants' environmental awareness and introduce them to composting and waste recycling. Compost, "brown gold", is at the heart of good gardening. Catch the students' interest and form the compost habit when they are young! Do this session in the garden before you start the compost heap.

LEARNING OBJECTIVES

Participants

- recognize compost
- appreciate the value of compost
- know how to use compost.

RESOURCES NEEDED

- Some samples of matured compost in a plastic bag

PREPARATION

The trainer should collect samples of matured compost for demonstration.

Duration: 30 minutes

ACTIVITY

1. **Brown gold:** Ask participants what their favorite foods are and get a few replies. Hold up a bag of compost and say, "This is plants' favorite food. Can they guess what it is?" Distribute handfuls of compost to small groups. Ask them to:

   a) Look and tell (brown and crumbly)

   b) Smell and tell (like earth, damp)

   c) Feel and tell (damp and light)

   d) Squeeze and tell (makes a ball but falls apart again). Tell the class that this is compost or "brown gold" which is plants' favorite food.

2. **Compost making:** Explain how compost is prepared using different ingredients, keeping it damp and airy, then it will get warm and slowly turn into compost. Use Guide 5.1a and 5.1b.

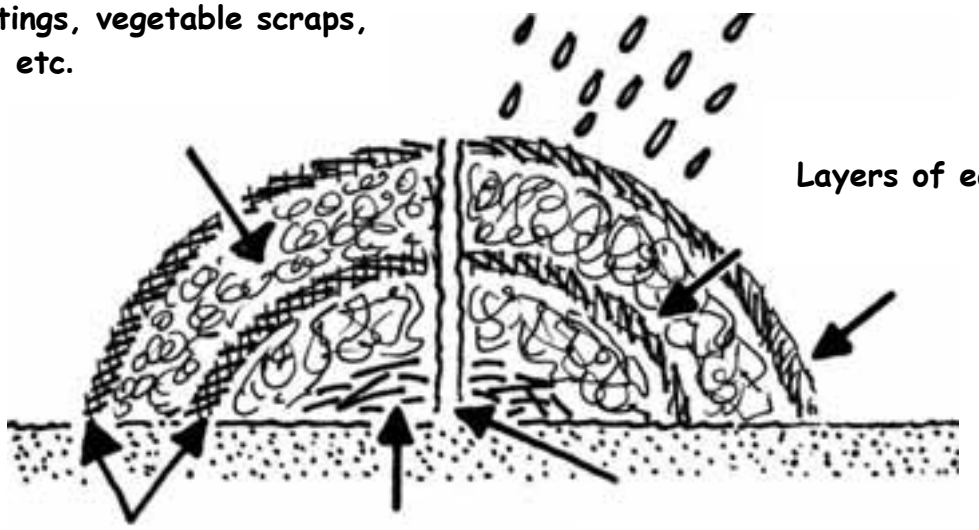
3. **Using compost:** Ask participants when we should use compost. – For example:

   - Use it in the early evening, when it is cool. Do not let it dry out.
   - Spread compost before planting.
   - Put compost in when potting.
   - Put compost around growing plants every two weeks.
   - Mulch to keep it damp.

Guide 5.1a: INGREDIENTS OF COMPOST

YES!	NO!
Straw, cut grass, organic waste from kitchen, weeds, plants, leaves, green manure, animal manure, wood ash, animal and fish bones, soil	Cooked food large pieces of wood, tough weeds, seeding grass, plastic, nylon, synthetic fabrics, metal, wire glass, crockery Coal ash

Guide 5.1b: HOW TO MAKE COMPOST



SET 6: LAND PREPARATION

These lessons enable learners to take stock. Learners may not do the heavier work of preparing the site (e.g., ploughing, laying pipes, fencing), but they should help if they can. Session 6.1 is a preliminary check on learners' knowledge of garden tools and how to care for them. Session 6.2 to 6.5 help them to understand what is going on through observation, enquiry and activity, and to take part in decisions.

There is plenty for learners to do before planting begins. Compost-making should be continuing. Site clearing is a good time to start collecting mulching material - dry grass, weeds, straw, and leaves – which will be needed throughout the gardening season.

6.1. TOOLS AND EQUIPMENT

Learners can quickly pick up the use of garden tools by imitation and demonstration. It is good to make sure that everyone uses the same tool names and that learners develop good routines for caring for and storing equipment.

LEARNING OBJECTIVES

Participants

- recognize common gardening tools and understand how to use them
- care for tools properly, take safety precautions and can tell others what to do
- decide how to implement garden rules

RESOURCES NEEDED

- Garden tools and equipment (if possible), or the pictures in **Guide 6.1**

PREPARATION

- Gardening tools/equipment or picture of Guide 6.1

Duration: 20 minutes

ACTIVITY

1. Ask participants to name what tools and equipment they have found at home and agree on what they are called. If necessary, use **Guide 6.1** to identify the items.

a) What is it used for?
b) How should we leave it so it won't be dangerous? (e.g., Leave hoes/rakes with "head in air".) Show us what could happen if you don't do this! (Stage some fake accidents.)

c) How do you prevent tools from getting rusty? (Keep tools out of the rain, in a shed or under the house; trowels/forks in a bucket of sand; barrows/buckets upside down so they don't collect water.)
d) What do you do when you have finished using it? (Clean it, and then put it back.)
e) Where does it go? (Establish a designated "home" for every item.)

Guide 6.1: THE GARDEN AT WORK

Find and name all the tools and equipment.

6.2. WATER MANAGEMENT

This session is for areas where water is a problem. The school has to identify the source of supply while the students should understand the need to conserve water, how it can be done and create some ideas for school gardening.

LEARNING OBJECTIVES

Participants

- know various sources of gardening water
- appreciate the need to conserve water and have some ideas about how to do it
- can assess some irrigation systems for lower cost, labor-saving and effectiveness.

PREPARATION

- The trainer has to figure out the source of water for the schools targeted for ENGINE support and inspect the equipment (e.g., taps, pumps, pipes, tanks, well, oil drum with rainwater).

Duration: 35 minutes

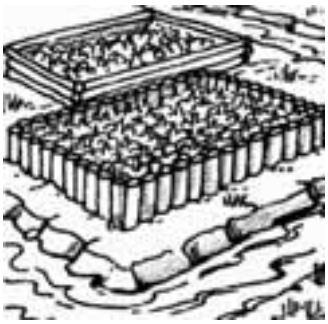
Activity

1. Ask participates how many different ways there are of getting water to plants. Allow participants to brainstorm the following points through questioning and answering.

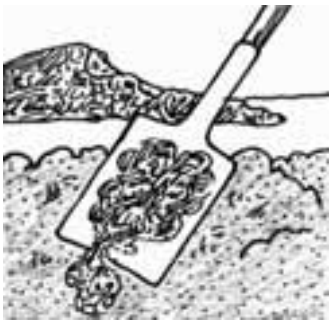
   - Where does our school garden water come from? How does it get to the school? (What equipment is used?) Is the supply reliable? Does the equipment need maintaining? Who maintains it? What does maintenance cost?
   - Could we get water from anywhere else? (Can we get more water if we need it?) Participants should be aware of the possibilities of rain water harvesting, making ponds and finding alternative sources of water.
   - How much water do we need for our garden every day? Will we have enough for the year? A garden of 25m^2 needs about 40 liters a day. The teachers can work out what their own garden needs. Schools are advised to grow vegetables in the dry season so that the students will participate in the gardening activities. How can we use less water? Some ideas are mulching, composting, drip irrigation – see Guide 6.2b. Participants can explain how these methods save water (e.g., by trapping water, preventing evaporation, keeping water in the soil).
   - How will we get the water to the plants? Participants can suggest the most obvious ways (hosepipe, watering can and bucket). They can also share what they have found out about local irrigation systems. Discuss which ways are cheapest, most labor-saving and most effective in conserving water (e.g., sprinkler systems are very wasteful).

Guide 6.2a: WATER WISDOM

Do we have a lot of water? Then we should try some of these:



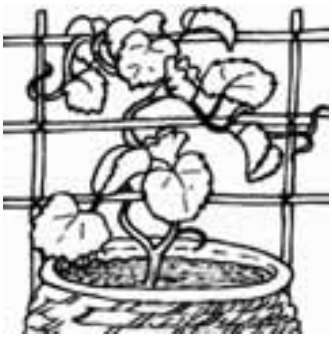
Dig holes and canals to drain water.



Add compost to drain clay soil.

Grow plants that love water.

Protect young plants from heavy rain.



Grow plants on trellises and use containers.

Don't mulch too much.

Guide 6.2b: NOT ENOUGH WATER

Use “grey water” from washing

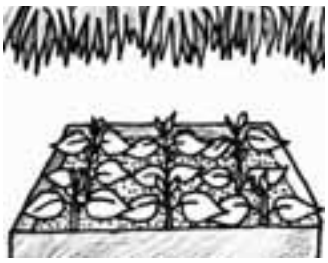
Harvesting rainwater

Grow crops near the water

Prevent run-off;
Put beds across slopes
And build up edges.

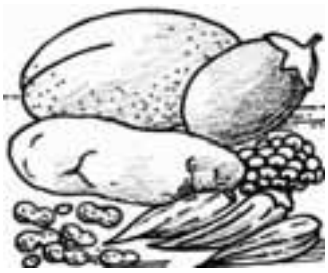
Water conservatively;
DON’T use sprinklers

Use a lot of compost and mulch



Provide shade for young plants.

Remove competitive weeds,
which steal water.



Grow dry-climate crops,
e.g. eggplant, sweet-potato,
mango, mung bean, groundnut,
okra.

6.3. PREPARING THE SITE

Participants may not be able to carry out major site preparation operations (e.g., uprooting trees, clearing rocks, laying pipes, ploughing), but they should understand what is being done and why, and be able to explain it to others.

LEARNING OBJECTIVES

Participants

- have a clear picture of the garden site
- recognize what the garden site needs (e.g., clearance, soil, water, protection)
- can interpret site preparation activities

RESOURCES NEEDED

- Camera and measuring tape

PREPARATION

The trainer needs to identify and observe the garden site selected, including:

- the main features (buildings, rocks, bushes)
- the plants, contours (bushes, slopes, bumps)
- the facilities (tap, tank, shed)

Duration: 45 minutes

ACTIVITY

1. Walk around the garden site. Take the measurements of the garden plot. Participants should point out and describe what they have observed. They may also take a photo of the site.

2. What needs doing? Discuss the questions below, recalling previous lessons on soil, water, compost and what plants like.

Is there any rubbish? What should we do with it? If it is organic, put it on the compost heap. If not, think how it can be used. If it is useless, bury it or throw it away.

What do we do about bumps/hollows/slopes? Turn a dip into a pond or ditch; level out bumps when ploughing; make a terrace; grow trees on slopes.

Do we need fences/hedges/walls? Where? What for? How many meters?

Are there any trees? What do we do with them? Keep some for shade, fuel, stakes, improving the soil; use for studying, eating, hanging a swing, sheltering compost.

Are there any bushes? Can we use them? If not, what do we do? Cut them back or root them out; keep some for hedges, for flowers and as homes for good insects.

What about grass/weeds? They are competition but they hold the earth in place and provide a home for insects. Cut long grass, pull weeds, dig them in, use for compost. Leave some patches of grass and weeds for good insects.

Is there a good water supply?

Note about efficient water management.
Are there rocks, stones or anthills? What do we do with them?

Use stones for borders and paths; leave some large rocks to sit on or play on; anthills make good topsoil.

Guide 6.3a: PREPARING THE SITE

KEEP RECORDS

Draw, measure, take photos, and make maps.

ANALYSE SOIL

Take three samples of topsoil and subsoil

CLEAR THE SITE

Use grass and weeds for compost.

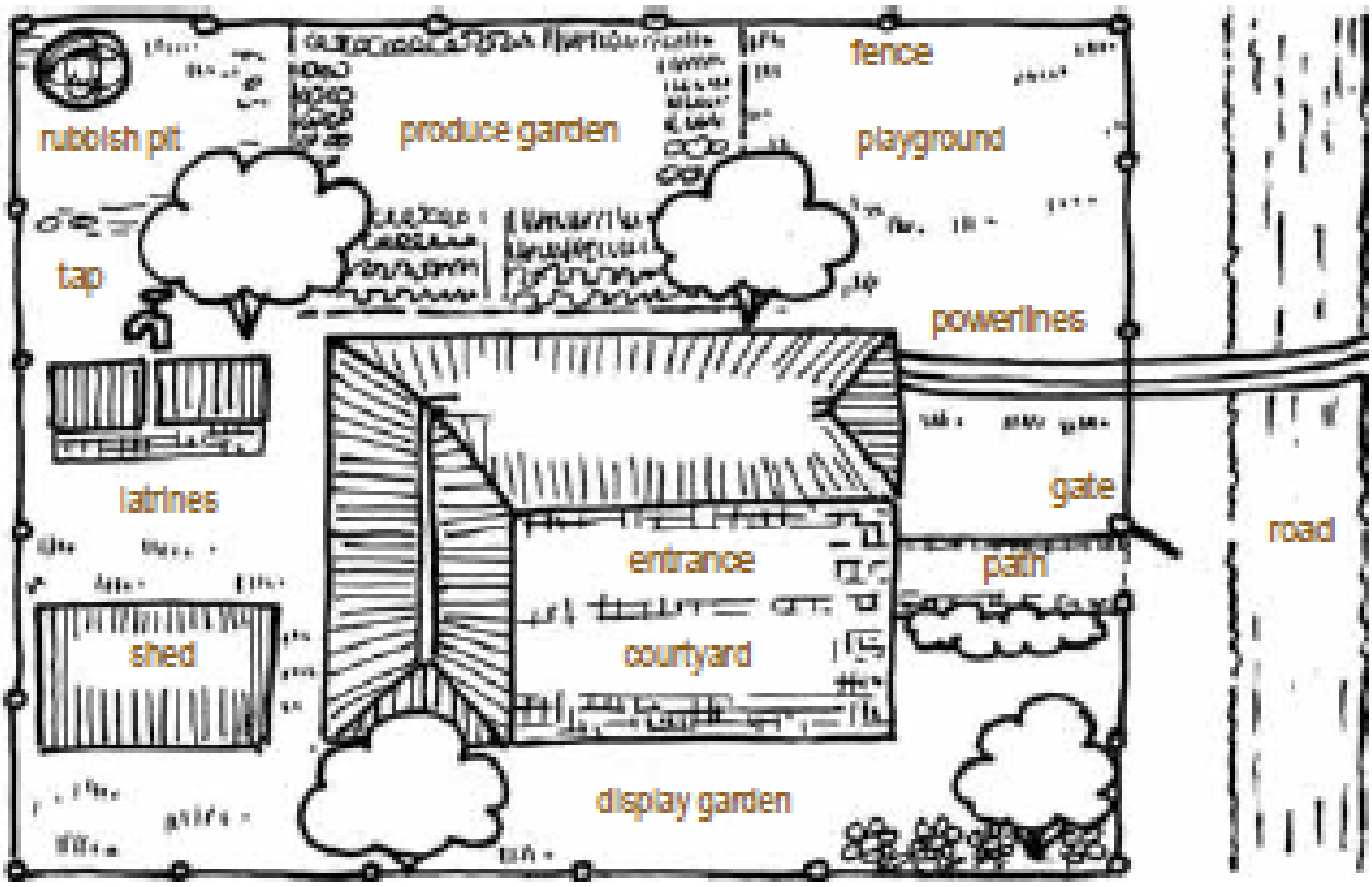
DIG DEEPLY

Dig once only, when soil is not too wet or dry

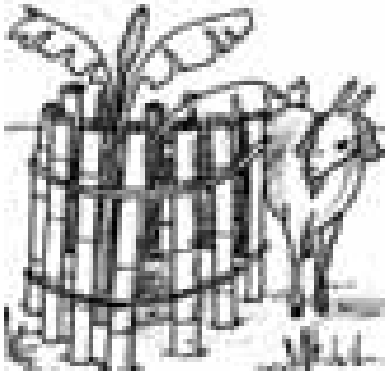
ADD COMPOST

Work compost into the top 25cm.
Water well
Add lime for acid soil.

Guide 6.3b: A SITE MAP



6.4. PROTECTING THE GARDEN



Protecting the garden against animal predators is an exciting area of action, if it is presented as a battle of wits against cunning opponents. Students can usually help with making fences and hedges and can protect plants in many small ways. Local knowledge and practice should be gathered and valued.

LEARNING OBJECTIVES

Participants

- recognize the main predators
- know some ways of protecting the garden against them

PREPARATION

The trainer will prepare by listing some of the common predators and ways of protecting the garden.

Duration: 25 minutes

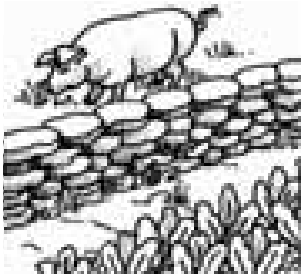
ACTIVITY

1. Ask participants to list local animals that eat garden plants.
2. Discuss and decide how to protect the garden as a whole (e.g., with fences, walls, hedges). Refer to **Guide 6.4**.
3. Pest patrol while the plants are growing; checking for predators should be part of the pest patrol.

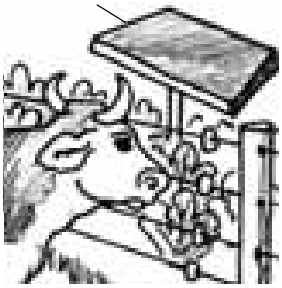
Guide 6.4: PROTECTING THE GARDEN

WALLS

A lot of work, but strong and permanent
Need maintenance
Brick, concrete, stone, rammed earth



Solar Plane



FENCES

Effective but often expensive
Brushwood, wattle, bamboo, wire and electric fences
Some keep out chickens, some keep out burrowers,
Some keep out big animals.

HEDGES AND LMNG FENCES

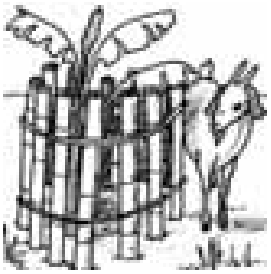
Slow to grow cheap. Prevent erosion.
Big dense hedge keep out big animals.
Food hedgerows give food and fodder as well.

NETS AND SCARERS

Nets protect plants from birds and insects.
Scarecrows keep away birds and are fun to make.
Shiny things or plastic strips also scare birds away

AT THE GRAS ROOTS

Mini-fences protect single plants.
Earth blocks stop diggers.
Coverings keep chickens away.



6.5. GARDEN LAYOUT

This lesson opens up the range of possibilities for the garden and involves participants in planning paths and garden beds.

LEARNING OBJECTIVES

Participants- recognize the range of possible garden activities
- recognize essential elements of the garden layout (e.g., paths, beds, shed, compost, signs)
- contribute to garden layout planning

RESOURCES NEEDED

- Flip charts, ruler and markers

PREPARATION

. None

Duration: 45 minutes

Activity

1. Divide the participants into groups and ask them to draw a garden layout of the school on site. Let each group come up with its own garden layout and present it accordingly. The participants should discuss which things they would like to have in their garden (e.g., plots, paths, signposts, flowers, plant nursery). They can make a list of desirable features as well.

Discuss relevant questions – for example:

a) Beds

How many beds are needed? (e.g, one for each group/class?)

Is there a slope? (Beds should go *across* a steep slope, so they collect rain and *down* a slight slope in order to drain off water).

How big should a bed be? (A bed should be wide enough to reach the center without stepping on it.

b) Paths

Where should paths be? (Paths should be around the beds.)

How wide? (Paths should be wide enough for a wheelbarrow or for carrying buckets.)

Guide 6.5a: SCHOOL GARDEN LAYOUTS

What have these gardens got? What are people doing there?
How are they different? Are there any things here that you would like in your school garden?

GARDEN A

GARDEN B

Guide 6.5b: GARDEN SIGNS

Some garden signs and labels which are cheap, weatherproof and durable

Poker work – bum writing into wood or horn with blowtorch or hot poker

Tie sticks together to make letters.

Use oil paint on flat stones, horn and bone, aluminum, plastic, wood, gourds and calabashes.

Dip them in paraffin to keep off insects.

Cloth is good for banners.

String and rope also make letters.

Small stones with individual letters can be used again.

6.6. GARDEN BEDS

Participants may not make the actual school garden beds themselves, but they have to guide the students in preparing the beds. They should know what kind of beds the school garden has and why, and how to treat them. This exercise concentrates on permanent raised beds. It is done in the garden, but on a very small scale.

LEARNING OBJECTIVES

Participants

- understand how garden beds provide what plants need
- can describe/explain the kind of beds adopted by the school and how they are made
- learn why you don't walk on raised beds

RESOURCES NEEDED

- a small patch of ground for demonstration (about 50cm x 25cm)
- compost
- water
- string, pegs, spade or trowel, rake
- a few small live plants with roots, preferably in their own soil

PREPARATION

The trainer will explain the various types of seed beds (flat, sunken, raised and ridged). Refer to Guide 6.6c

Duration: 50 minutes

ACTIVITY

1. Divide the participants into groups to prepare the raised bed and plant the seedling based on the guides below.
2. Let them discuss the garden bed they have prepared.

Guide 6.6a:

DEMONSTRATION

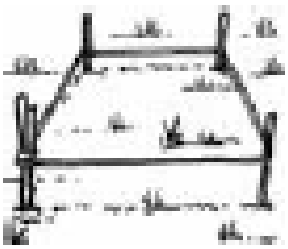
MAKING A RAISED GARDEN BED

Learners should have ready the compost, water and the small plants. Explain that we are going to make a "baby bed", just for demonstration. Agree on the size. As you show how to make the bed, call on learners to help, observe and interpret.

1. With learners' help, mark out the new "bed" (about 50 cm x 25 cm) and the paths around it with sticks and string.
2. Lift the topsoil off the "bed". Learners describe the topsoil (soft, crumbly, full of life) and the subsoil (hard and dense).
3. Dig over the "bed" about 40 cm deep. Explain that this lets in air and water. It should only be done once.
4. Learners add compost to the bed and water it, explaining why this is good.
5. Put back the topsoil. Discuss where we can get more topsoil – e.g. from the paths.
6. Add the topsoil from the paths to the bed, so the bed is now raised.
7. Learners flatten the bed with a rake.
8. Ask: Do we need to dig the paths? (No, paths are for walking, not for growing)
   Why is this bed good for plants? (Rich, damp, full of life, room to grow)
   Why is a raised bed good? (Water drains out, easy to work with)
9. Prepare the ground for the small plants.
10. Learners plant the small plants and water them.
11. Discuss why one should not walk or lean on the bed (it makes the earth hard for the roots and for the animals in the soil; it squeezes the air out).
12. Arrange who will look after the plants and monitor their growth.

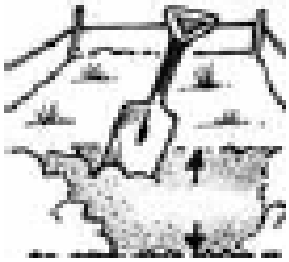
Guide 6.6b: HOW TO MAKE RAISED BEDS

1



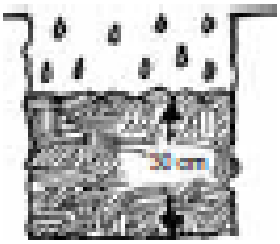
Mark out beds.

2



Dig over beds only.

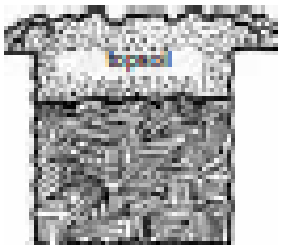
3



Add compost /manure/ organic material (30cm).

Water and put back soil.

4



Add topsoil from the paths.

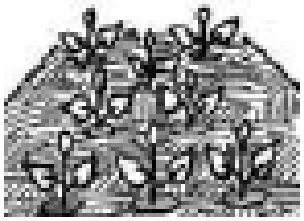
5

Flatten the top of the bed.

6

Don't or kneel on it and squash the soil.

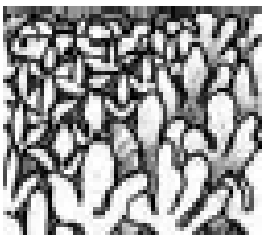
7



"Minimum tillage"

Protect soil structure.
Add compost and mulch
but never dig again

8



Plant densely.

Keeps down weeds.
Conserves moisture.

Guide 6.6c: TYPES OF SEED BEDS

Picture of: Flat, raised, sunken and ridged seedbed (from left to right respectively)

SET 7: GROWING FOOD (WHAT SHALL WE GROW TO EAT AND DEMONSTRATE?)

School teachers as garden managers may make the final decision on what to grow, but they should be encouraged to think of the underlying motive of the project and the end result expected to be achieved. The foods that are planted and grown in school gardens need to diversify production and ensure the nutrition agenda of the ENGINE project.

LEARNING OBJECTIVES

Participants

- will be informed and must agree on what food crops are to be planted and grown at school gardens based on nutritional value
- learn the different criteria to be considered when selecting the food crops to plant. This enables the teachers to grow food crops not listed in the ENGINE package but proven to have substantial nutritious value
- will be informed on the core interest of ENGINE at school gardens. Demonstrations and nutrition education as prime focus with income generation and profit making as complementary and subsidiary importance.

RESOURCES NEEDED

- cards, markers, flip chart

Duration: 45 minutes

ACTIVITY

1. Provide a card to each participant.
2. Ask them to write the names of five locally grown vegetables and fruits that they would like to grow in the school gardens. Ask them how they selected the vegetables and fruits?
3. The trainer will list on the flip chart the types of vegetables and fruits recommended by ENGINE to grow at households, FTC and school gardens depending on their agro ecological settings. These include kale, Swiss chard, head cabbage, carrot, Irish potato, pumpkin, orange-fleshed sweet potato (OFSP), green beans, avocado, apple, mango and papaya (refer to the photos below). (Guide 7a)
4. Check if there are other nutritional vegetables and fruits mentioned which are not included in the ENGINE production package. Apply the selection criteria below (Guide 7.1b use sample fact sheet for kale for further explanation Guide 7c).
5. The facilitator lists on the flip chart the diversified food crops that should be grown in the school gardens.
6. Make sure that the selected crops are nutritionally sound and enable the promotion of the nutrition education and demonstration process.

Guide 7a: VEGETABLES AND FRUIT CROPS FOR ENGINE INTEREST

Figure 1: Head cabbage, Swiss chard, kale, carrot, Irish potato, sweet potato, green beans and pumpkin

Figure 2: Avocado, papaya, mango and apple (trees and fruits)

Guide 7b: CROP FACT SHEET

	SELECTING CRITERIA	NAME OF CROP .....
INFORMATION NEEDED	QUESTIONS TO ASK	INFORMATION
The crop	Is it grown a lot locally? Where? What for? (cash or food) Are there different varieties?	
Nutritional value	Is it good for us? What is its food value?	
Local status and attitude	Do people like it? Do they value it (e.g. as food, medicine)?	
Dishes, snacks, combinations	How do we cook it and eat it? What do we eat it with? What is the best way to cook it and eat it?	
Easy to grow	Is it easy to grow?	
Time frame	How long does it take to grow? Will the project fit into the school year? How long does it go on producing? When should we plant it and harvest it?	
Planting instructions	How do we plant it and where? Does it need thinning/transplanting? How much space does it need?	
Care and cultivation	How should we look after it? Does it need a lot of water or shade? Does it need staking or trellising?	
Pests and diseases	What attacks it? What can we do about it?	
Harvesting and storing	How much does it produce? How do we harvest the crop and store it?	
Preserving, processing, packaging	Will it need preserving or processing? How should this be done? What packaging/labeling will it need?	
Other uses	Are there any by-products we can sell[1]?	

[1]E.g. groundnut shells can be compressed for fuel; sunflower oil is good for lamps or as lubricant; pigeon pea stems make good fuel; bottle gourds can be turned into containers; bananas leaves are used for baskets and wrapping food; pawpaw leaves tenderize meat; pineapple fiber from young leaves makes fabric; coconut shells are used for bowls.

Guide 7c: CROP FACT SHEET QUESTIONNAIRE COMPLETED FOR KALE

INFORMATION NEEDED	QUESTIONS TO ASK	ANSWERS
The crop	What food is this? Is it grown a lot in our area? Where? What for? (sale? home eating?) Are there different varieties?	*Kale* *It grows in the hills, in small fields.* *It is mostly grown as a cash crop.* *There are two main varieties here.*
Nutritional value	Is it good for us? What is its food value?	*It is very rich in vitamin A and vitamin C.*
Local status and attitude	Do people like it? Do they value it as a food? Are they right?	*They think it has a pleasant flavor,* *but they do not value it much.* *They should value it more.*
Price	How much does it cost to buy? Is it expensive for families to buy?	*It is quite cheap, about 3k a kilo, but* *it is cheaper to grow at home.*
Dishes, snacks, combinations	How do we cook it? How do we eat it? What do we eat it with? What is the best way to eat it? How should it be prepared for full food value?	*It is eaten as a relish with cassava* *or fish, cooked with tomato, onion* *and oil. It is good in soups and stews,* *with groundnut paste or fish or* *scrambled eggs, or boiled in coconut* *milk. Eat it with a little oil or fatty food* *to help the vitamin A.*
Easy to grow	Is it easy to grow here?	*It is quite easy to grow, but it has to* *be started in a nursery bed.*
Time frame	How long does it take to grow? How long does it go on producing? When should we plant it and harvest it?	*It takes 60-85 days (2 to 3 months).* *It goes on producing a long time.* *We should plant in May and June* *so we can eat it July to September.*
Planting instructions	How do we plant it and where? Does it need thinning? Does it need transplanting? How much space does it need?	*Sow seeds in trays or in a seedbed.* *Thin when they have 4 (real) leaves.* *Transplant when 10-15 cm high,* *40 cms apart in rows 60-85 cm apart.*
Care and cultivation	How should we look after it? Does it need a lot of water or shade? Does it need staking or trellising?	*Weed regularly. Water well; give* *shade in the afternoon. Keep the* *soil firm so plants do not fall over.* *No staking.*
Pests & diseases	What attacks it? What can we do about it?	*Not much attacks kale.* *Protect the seedlings from slugs.*
Harvesting and storing	How do we harvest it? How do we store it?	*Pick young leaves from the top,* *and side shoots. Cut with a knife.* *Stand in cold water.* *Eat the same day – don't store.*
Preserving, processing, packaging	Can we preserve it? How? Does it need curing or processing? What packaging does it need?	*Dry the leaves in a solar drier.* *It does not need special processing.* *Keep leaves in airtight plastic bags.*
Other uses	What else can we do with it?	*Put it on the compost if not used.*
Promotion	Does it need promoting? If so, how?	*Tell people what a good food it is.* *Give a demonstration of solar drying.*

Adapted from Burgess et al. (1998)

SET 8: GROWING PLANTS

This set of session deals directly with gardening activities and helps to set up routines such as regular watering, weeding and daily patrols of the garden. There is no need to buy fertilizers, but you will need a good supply of compost (enriched with animal manure if possible), mulch and sufficient water. Adequate pesticides can also be homemade (see Homemade sprays in *Setting up and running a school garden*).

8.1. SOWING SEEDS

This session is about sowing seeds directly in the garden. Sowing is done after the beds are prepared and you are ready to plant. The whole lesson should take place in the garden.

LEARNING OBJECTIVES

Participants

- obtain local advice on planting seeds
- learn sowing practices of selected vegetable seeds and fruit seedlings
- understand the proper care for seeds and seedlings

RESOURCES NEEDED

- Flip chart, markers
- Seed packets (of selected vegetables)

PREPARATION

The trainer prepares a flip chart that describes the seeding rate, spacing requirements between plants and rows and planting depth for the selected vegetable and fruit crops (head cabbage, Swiss chard, kale, carrot, Irish potato, orange-flesh sweet potato, green beans, pumpkin, mango, avocado, apple and papaya). Be prepared to explain the instructions on the seed packets.

Duration: 30 minutes

ACTIVITY

1. Allow the participants to brainstorm on the sowing practices they know for the vegetables and fruits mentioned above.
2. Use the following information to lead a discussion on spacing and depth measurements for planting.

- Ask participants: How deep should you plant the seeds? How far apart? (The instructions on the seed packets provide guidance on the spacing and depth of planting.)

- Measuring the height and width of fully grown fruit trees will assist in determining the spacing between plants.

- Measuring or estimating the seeds' diameter and multiplying by three gives a rough planting depth.

3. Lead a discussion on sowing practices using the following questions.
   (Refer to Guide 8.1a and 8.1b)

   - What should we do first? (Rake the soil, make it fine.)

   - Do we want rows? Circles? Patterns? How will we mark them? (Pegs, string, etc.)

   - How do we measure between seeds and rows? (With measuring sticks)

   - How do we make the holes? (With a stick)

   - What do we do next? (Put in a little compost.)

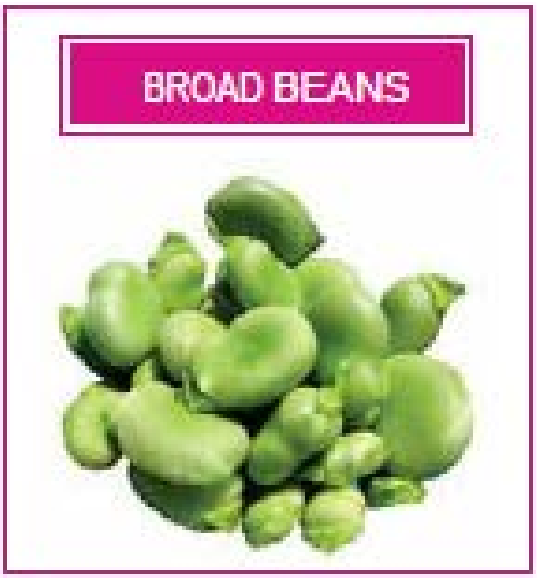
   - And then? (Drop the seeds in.)

   - And then? (Cover with soil and press in the seeds, water GENTLY.)

   - How will we protect the plants? Refer back to the risks and suggest solutions (e.g., thorns to keep off chickens, branches for shade and rain protection, gentle watering).

Guide 8.1a: PLANTING INSTRUCTIONS AND LOCAL KNOWLEDGE

Seed packets give general planting instructions. They should be adapted to local conditions.



Cropping	71 days
Height	80 cms
Description	This is the fastest maturing variety of broad bean and very high yielding: up to 34 pods per plant!
Sowing instructions	Sow the seed any time, 5cm deep and 23cm apart in double rows 23cm.
Growing instructions	When they flower, take off the top shoots to induce earlier and bigger crops. Surprise your friends and neighbours!

Adapted from Thompson and Morgan (2004)

CAN YOU FIND THE ANSWER?

We are high up, so we plant a few weeks later than people in the valleys.

When should we plant?

How deep?

How far apart?

Guide 8.1b: **SOWING SEEDS**

1

Make a good bed with fine soil.

2

Space out the rows.

3

Sow three seeds deep.
Add a little compost

4

Cover the seeds and press down.

5

Water gently and keep damp.

Guide 8.1c: General Agronomic Information on Vegetable Production

(Source: MOA, Ethiopia: Vegetables & root crops extension package, Amharic.)

No	Vegetable Crop	Suitable conditions for growth & development			Seed Rate/ha	Spacing/Distance		Irrigation Intervals	Additional Information
		Temperature (Centigrade)	Altitude (MASL)	Rainfall (millimeters)		Between Rows	Between Plants		
1	Cabbage ጥቅል ጎመን	24	Above 2000	400-500	0.4 Kg	50 cm	50 cm	5-8 days	Seeds are generally sown in nursery beds & transplanted when the plant is 10-15 cm tall.
2	Carrot ካሮት	16-24	1000-2000	700-800	4.5-5 kg	20 cm	10 cm	3-7 days	Seeds are sown in nursery beds and thinned out 10 cm apart when the plant height reaches 5-8 cm.
3	Swiss Chard ቆሥጣ	13-40	1000 – 2200	400 – 500	15 kg	50 cm	20 cm	4- 7 days	Seeds are sown directly in beds and thinned out 20 cm apart when the height of the plant is about 8 cm.
4	Pumpkin ዱባ	18-25	1200 -2000	600	2 seeds/hole and thinning to one after emergence	2.5 meters	90 cm	5-7 days	Seeds are sown in the main garden and thinned out. Harvesting should be carried out when the skin of pumpkin is hard and not easily scratched with a finger nail.
5	Irish Potato ድንች	16 -30	1500-2500	750-1000	20 quintals	75 cm	30 cm	7 -10 days	Direct planting on well prepared seed bed maintaining the space between plants/seeds at 30 cm.
6	Sweet potato ስኳር ድንች	25-29	1500-1800	600-700	56,000 pieces of cuttings.	60 cm	30 cm	7-14 days	2/3 of the cutting (seed vine) should be covered with soil. Cutting should have 2 to 3 buds or should be 30 to 35 cm long.
7	Kale ጎመን	15 -20	1000-2200	600-700	0.5-1kg for transplanting and 4-5 kg for thinning	60 cm	40 cm	Every 4- 7 days	Seeds are sown directly in nursery beds and thinned out or transplanted when the seedlings reach a height of about 10-15 cm.
8	Green Beans ፋሶሊያ	16- 21	1000 - 1800	400 – 500	80 -120 kg depending on germination rate	50 cm	10 cm	4- 7 days	Seeds are sown directly and thinned out. There are two types. Bush and runner types. Harvesting is advised to be carried out early in the morning when the weather is cool. For fresh market pods need to be harvested when they are green.

8.2. PLANTING AND TRANSPLANTING

Small seeds are generally started in a seedbed and then transplanted or thinned out.

LEARNING OBJECTIVES

Participants

- understand the overall process of planting and transplanting
- gain exposure to seeds of the selected type of vegetables and fruit crops
- plan the process and carry it out in the garden

RESOURCES NEEDED

- Samples of seeds of ENGINE selected vegetable and fruit crops
- Flip chart and markers

PREPARATION

- Bring a seed catalog of ENGINE selected vegetables and fruits for demonstration.
- Prepare key information presented in Guide 8.1c to respond to the questions listed below in Guide 8.2a.

Duration: 45 minutes

ACTIVITY

1. Show the seed catalog and ask which seeds need more care and protection (the small ones). Explain that we have to treat them like babies!
2. Divide the participants into three groups and ask them to discuss and work on the questions listed in the guide below for Swiss chard, kale and carrot. Let each group present their findings, then have a group discussion. The trainer will then present the key information prepared for this exercise (Guide 8.2b)

Hardening off transplants/seedlings is a process of gradually exposing transplants/seedlings that have been grown in a protective shelter to the outdoor climatic conditions to which they will be transferred. This process reduces the stress of transplanting seedlings to the field/garden and should be started 8 to 10 days before transplanting outside. Follow these procedures:

- Harden off gradually in order for seedlings to adapt to strong sunlight, cooler conditions and/or less frequent watering for about 10 days.
- Increase exposure to sunlight a few hours at a time and gradually reduce frequency of watering, but do not allow seedlings to wilt.
- Finally expose the seedlings to the full weather conditions outside.

Guide 8.2a: PLANTING AND TRANSPLANTING

STAGE	QUESTIONS	ANSWERS
Sowing	When do we sow the seed? How do we sow the seed? How deep? How far apart should the rows be?	
Growing **Thinning** **Hardening off**	How long do they take to germinate? Do we thin out the seedlings? When? When should we harden them off?	
Transplanting	When do we transplant them? How far apart?	
Growing plants	How do we look after the plants?	
Harvesting	How long until they are fully grown? How/when do we harvest the crop?	
Storing	How do we store the crop?	

Guide 8.2b: GROWING SCHEDULE FOR DIFFERENT VEGETABLES

GROWING SCHEDULE FOR CARROTS

INSTRUCTIONS	MONTH 1	MONTH 2	MONTH 3	DETAILS
SOW	x			1 cm deep and 20 cm apart between rows.
GERMINATION	x			Takes 7 to 10 days to emerge.
THIN OUT	x			10 cm apart between seedlings when the plant height is about 8 to 10 cm.
HARDEN OFF				No need
TRANSPLANT				No need
HARVEST			X	70 to 90 days depending on the variety or when they attain a diameter of at least 2 cm.
WATER	X	X	X	Water every day in the morning and late afternoon for about one month. After thinning out water regularly with an interval of 5 to 7 days depending on the soil type and weather conditions of the area.

GROWING SCHEDULE FOR SWISS CHARD

INSTRUCTIONS	MONTH 1	MONTH 2	MONTH3	DETAILS/Remarks
SOW	X			1-1.5 cm deep. Seed can be sown direct or can also be transplanted.
GERMINATION	X			Requires 7 to 10 days to germinate.
THIN OUT	x			20 to 25 days after sowing or when the seedlings reach about 8 to 10 cm high.
HARDEN OFF	x			For about 10 days before transplanting to allow seedlings familiarize to the field conditions.
TRANSPLANT	x	x		20 cm apart between plants and 50 cm apart between rows when seedlings are about 10 cm tall.
HARVEST			X	50 to 60 days after transplanting.
WATER	X	X	X	Water in the morning and late afternoon for about one month and then continue with one week interval as long as the plant produces sufficient leaves to harvest.

GROWING SCHEDULE FOR KALE

INSTRUCTIONS	MONTH 1	MONTH 2	MONTH 3	DETAILS
SOW	X			1.5 cm deep and 30cm apart between rows. Can be sown direct or transplanted.
GERMINATION	X			Needs about 7 to 10 days to emerge.
THIN OUT	x			20 cm apart between plants when the height of seedlings reach about 10 to 15 cm.
HARDEN OFF	x			When the seedlings attain a height of about 10 cm. for about 10 days before transplanting.
TRANPLANT	x	X		60 cm apart between rows and 40 cm apart between plants.
HARVEST		X	X	Leaves can be ready for picking in 30 to 40 days after transplanting and continue to produce leaves for picking for about 4 to 6 weeks.
WATER	X	X	X	Water in the morning and late afternoon for about one month and then continue with an interval of about 10 days so long as the plant produces sufficient leaves for picking.

Guide 8.2c: THE STAGES

SOWING

1. Make a seed bed with fine rich soil.

No lumps, sticks or stones.

2. Weed well.

Get the roots out.

3. Flatten it neatly.

Use a board.

4. Protect seeds.

Make shade.
Keep away pests.

5. Mix seeds with fine soil or sand.

Keep the packets.

.

6. Draw lines.

A few cm deep, about 15cm apart.

7. Sprinkle seeds

Label the rows.

8. Cover lightly.

Press down gently.

9. Water well.

Don't flood!

10. Mulch.

Keep cool and damp.
Stop competition!

GROWING, HARDENING OFF AND THINNING

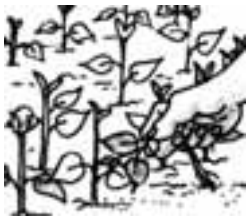
1. Water twice a day.

Morning and evening

2. Keep mulching.

Mulch keeps plants cool and damp and stops the competition.

3. When they have true leaves, thin them.



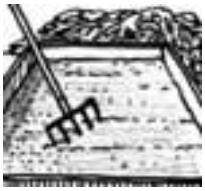
About 5 cm apart

4. 6-8 weeks after germination, harden them off gradually.

Give them more sun and weather every day.

TRANSPLANTING AND PLANTING

1. Prepare good raised beds.



Use lots of compost and topsoil.

2. Transplant when it's cool.

A cloudy day, morning, evening.

3. Mark lines and holes.

Read instructions on seed packets.

4. Dig holes.

Put in a little compost.

5. Choose strong healthy seedlings.

Healthy plants make good food.

6. Scoop up plants.

Take some soil with the roots.

7. Transplant them.

Handle roots delicately.

8. Fill with soil.

Press down lightly.

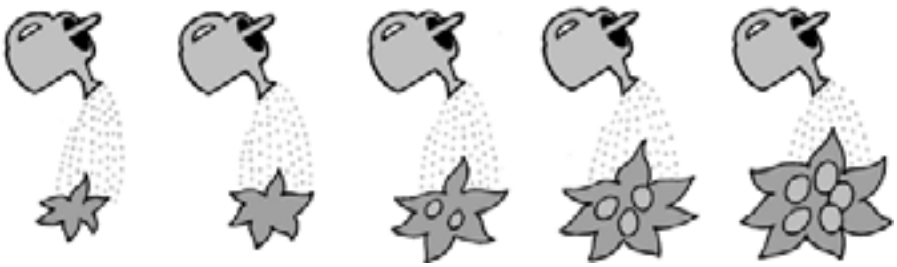
9. Water right away.

Water ground, not plant.

10. Mulch around.

Keep water in. Keep away weeds.

11. Water regularly for good growth.



If plants get too dry, they will wilt and not grow.

8.3. MULCHING: THE SOIL BLANKET

Mulching is a protective covering of the soil using hay or straw around plants to prevent erosion, retain moisture, and sometimes enrich the soil.

LEARNING OBJECTIVES

Participants

- recognize the value of mulching
- know how to mulch and when

RESOURCES NEEDED

- Flip chart and markers

PREPARATION

The trainer needs to be prepared to address issues such as what mulch is, how it is made, how it is applied and why it is used.

Duration: 25 minutes

ACTIVITY

1. Ask participants what mulch is, how it is used and its importance.
2. Explain mulching to the participants based on the information provided in Guide 8.3 below.

Guide 8.3: MULCHING: WHAT AND WHY?

Is your soil poor? Do you have a hot climate? Do you have very little water?

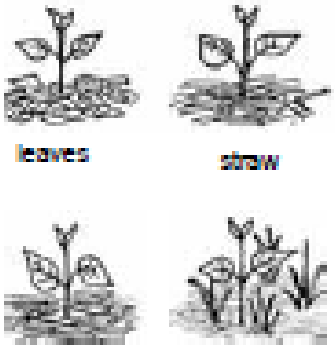
THEN YOU NEED TO MULCH!

WHAT TO DO

Mulch covers the ground round plants so other plants can't grow.

Make it thick - about 6 cm.

You can use:



Light-coloured mulch reflects away light and heat.

WHY MULCH?

It keeps moisture in.
Water gets in but can't get out.

It prevents weeds.
Nothing grows in the dark.

It keeps soil cool and soft.
Diseases don't like cool soil.

It improves the soil.
It turns into compost.

8.4. WATERING

Watering deals with application of water on the soil for the plants' use.

LEARNING OBJECTIVES

Participants

- appreciate plants' needs for water
- know when and how to water plants

RESOURCES NEEDED

- Markers and cards of paper

PREPARATION

The trainer has to write the following questions (not the answers) and the Seven Golden Rules for Good Watering listed in Guide 8.4b on separate cards.

- Where is there water/moisture in the garden? **(mostly in the soil and in the plants)**
- Where is the water in plants? **(all through the plant)**
- Where do plants get water from? **(from the soil)**
- How does the water get into the plant? **(Sucks it up through the roots – not through the leaves.)**
- How much of a plant is water? **(90% - almost all of the plant. A plant is just a bag of water.)**
- Can plants have too much water? **(N o)**
- Can plants have too little water? **(No)**
- What amount of water do plants need? **(the right amount – see Guide 8.4a)**

(Note that the phrases in the parentheses with bold font are the answers to the questions.)

Duration: 45 minutes

ACTIVITY

1. Stick or pin up the prepared question cards one by one for discussion.
2. Randomly select seven participants to hold up the Seven Golden Rules for Good Watering one by one, read each one out loud and explain why it is important. At the end, the trainer will collect the rules, turn them face down and ask one of the participants to repeat them all. As s/he calls them out, stick them up again.
3. Ask participants to brainstorm on different ways of plant watering. Use Guide 8.4c.

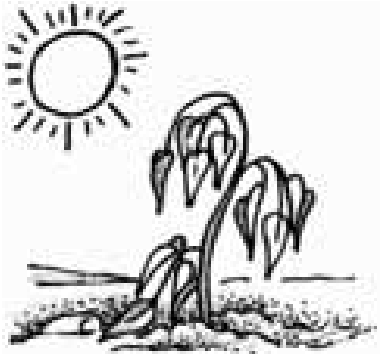
Guide 8.4a: HOW MUCH WATER DO PLANTS NEED?

PLANTS ARE LIKE PEOPLE

THEY CAN HAVE

TOO LITTLE WATER

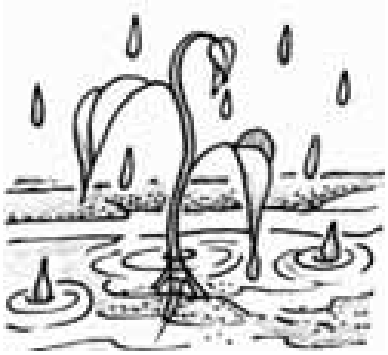
=



OR THEY CAN HAVE

TOO MUCH WATER

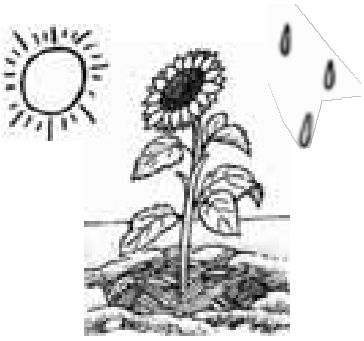
=



OR THEY CAN HAVE

JUST THE RIGHT AMOUNT

=



Guide 8.4b: SEVEN GOLDEN RULES FOR GOOD WATERING

1 **MEASURE MOISTURE EACH DAY**

The top 25 cm of soil should be damp. If the top 3 cm is dry, it's time to water. Make a stick to measure

2 **WATER IN THE EVENING OR MORNING**

Don't let the water evaporate in the heat of the day.

3 **WATER SOIL NOT PLANTS**

Water on leaves can hurt the plant and may not reach the roots. Water between plants and around them.

4 **BE GENTLE**

In particular, water seeds and seedlings frequently and gently.

5 **DON'T OVERWATER OR FLOOD**

Plants can drown, just like people. If they need a lot of water, give it in stages.

6 **DEEP ROOTS DON'T NEED MORE WATER**

Let them dry out between watering to encourage roots to grow.

7 **MULCH! MULCH! MULCH!**

Mulching keeps the water in.

Guide 8.4c: WAYS OF WATERING PLANTS

1 Flood the bed

Make sunken beds in dry places to keep water in.

2 Drip irrigation

Use a drip hose or soaker hose.

3 Water by hand

Use a watering can or a plastic bottle.

4 Make water traps

Keep the water round the plant.

5 Individual watering

Use tins and plastic bags.

MAKE EVERY DROP COUNT

GET THE WATER TO THE ROOTS

8.5. WEEDING

The spirit of battle is the best approach to weeds. But participants need to know how to prevent them as well as how to get rid of them, and also that not all weeds are harmful to crops. A weed is a plant in the wrong place!

LEARNING OBJECTIVES

Participants

- recognize common local weeds and their characteristics
- find out how to deal with them
- know how to control weeds easily, cheaply and ecologically

RESOURCES NEEDED

- Flip charts and markers

PREPARATION

The trainer needs to print the assessment questions listed below and make copies for group discussion.

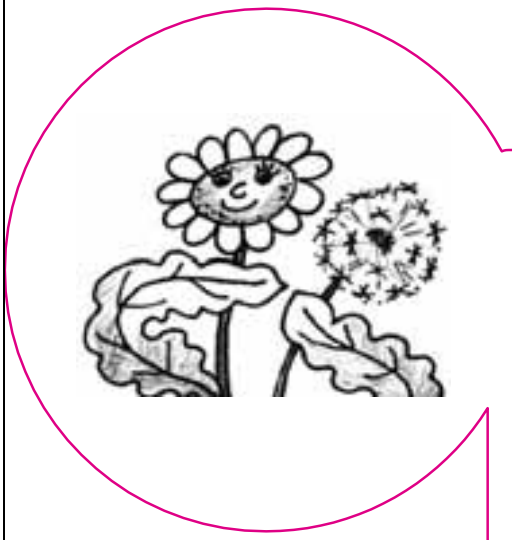
- How many different kinds of weed can you find in your localities? Do you know their names?
- Which is the most common? Explain its nature, effects and the local control measures practiced by the farmers?
- Are all weeds bad for crops? If the answer is no, then what are the benefits they would have for crops?

Duration: 30 minutes

ACTIVITY

1. Split the participants into groups and provide them with the printed questions to discuss. Let each group present their findings. After the discussion, brief them on the nature of weeds (using Guide 8.5a) and weed control measures as illustrated in Guide 8.5b below.

Guide 8.5a: WEEDS: FRIENDS OR ENEMIES?



SOME WEEDS ARE GOOD FOR THE GARDEN

They attract good insects

Bees and butterflies are friends. They pollinate flowers.

They make the soil rich.

Legumes give nitrogen to the soil.

SOME WEEDS ARE BAD FOR THE GARDEN

Some pests like to live on tough weeds

They are too close for comfort! They can move from weeds into crops.

Weeds can starve crops.

They take the light, water and food for themselves.

Guide 8.5b: WEED CONTROL

PREVENT WEEDS

Fill up the space.

Lay mulch 6 cm deep.
No weed seeds!

Cover the ground.

Plant quick-growing vine plants.

Create shade.

Grow crops in layers.

Dig or pull weeds when ground is damp.

Catch them small!
Don't let them go to seed.

Don't use weed killer.

It can kill good insects.
It can kill good plants.
It poisons the soil.
It can kill YOU.

Use weeds for compost.

Use weeds for mulch –
but not if full of seeds!

8.6. KEEPING THE GARDEN HEALTHY

Participants need to realize that heavy indiscriminate spraying with pesticides is not a good answer to the dangers of pests. Instead they should emphasize prevention more than cure, giving priority to the health of the plants and the whole environment.

LEARNING OBJECTIVES

Participants

- practice healthy gardening as a basis for integrated pest management (IPM)
- know how to encourage beneficial insects
- make a rough diagnosis of a plant problem
- choose a suitable remedial action and carry it out
- monitor the effects

RESOURCES NEEDED

- Flip chart and markers
- Plant specimens affected by pests, disease and nutrient deficiency

PREPARATION

- The trainer needs to write down the following questions on a flip chart:
  - How do we look after our plants to make them healthy?
  - How can we keep the garden clean and tidy?
  - Do we think that all insects are enemies of garden plants?
  - What are the pros and cons of Integrated Pest Management (IPM) and chemical pesticides?
- The trainer needs to prepare the specified plant specimens for demonstration in Activity 2.

Duration: 45 minutes

ACTIVITY

1. Ask the participants to discuss the questions above and take notes of the discussion on the flip chart. Use Guides 8.6a and 8.6b to summarize the discussion.
2. Present the plant specimens affected by pests, disease and nutrient deficiency to the participants and ask them to identify the problems. Use Guide 8.6c to summarize the discussion.

Guide 8.6a: A HEALTHY GARDEN

Integrated Pest Management (IPM) is the most effective route to healthy plants. It aims to prevent pests and diseases as much as to cure them. It uses many ways of producing healthy plants and a healthy environment.

1. HOW DO WE LOOK AFTER OUR PLANTS?

Grow plants where it suits them.

Some plants need sunlight.
Some like shade.

Make the soil rich by
adding mulch and compost.

Feed your crops and they will
feed you!

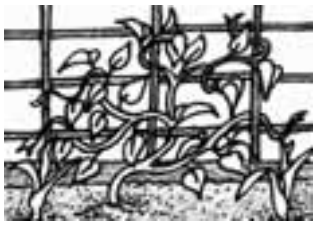
Provide shelter and protection.

Use hedges against predators.
Use trees to break the wind.

Water regularly …

… but not too much!

Give plants space.



Reduce competition by weeding,
mulching, training up.

Know the dangers for each plant.

What might attack your plants?

2. WHO DO WE WANT TO LIVE HERE?

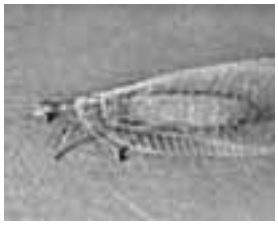
MAKE THE GARDEN A GOOD HOME FOR GARDEN FRIENDS!

Have plants of all kinds and sizes, and flowers all the year.

Leave some bugs for the beneficial insects to eat.

Have plants which attract the good guys ...

Be friends with the Pest Police, e.g. frogs, lizards, ladybirds.



Bring in lacewings and ladybugs.

A few caterpillars or aphids for breakfast!

… and which keep the bad guys away.

Invite ducks and hens in to make a meal.

PESTICIDES KILL YOUR FRIENDS AS WELL AS YOUR ENEMIES!!

3. WHAT DO WE GROW AND WHERE?

Plant local varieties.

They are often stronger.

Use clean up-to-date seeds.

It's safest to buy them.

Grow several crops together.

It confuses pests.

Rotate crops.

It cheats diseases and pests and saves the soil.

4. HOW CAN WE KEEP THE GARDEN CLEAN AND TIDY?

Burn diseased plants and take away plant rubbish ...

… to protect other plants.

Keep down weeds.

Pests live there.

Keep the compost heap away from the vegetable patch.

That way diseases can't spread.

Guide 8.6b: BENEFICIAL GARDEN CREATURES

Ladybird

Ground beetles

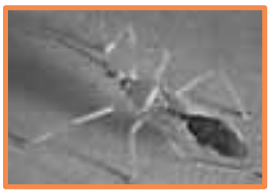
Soldier beetles

Spiders

Lacewing fly

Hoverfly

Centipedes



Assassin bugs

Bees

Praying mantis

Photos: Ken Gray, © Oregon State University, www.govlink.org

Guide 8.6c: DANGEROUS PESTS

Whitefly

Ground beetles

Slugs

Mealybugs

Caterpillars

Aphids

Leafhopper

Shield bugs

Guide8.6d: WHAT'S WRONG WITH MY PLANT?

1

DISEASE: IS MY PLANT SICK?

Are the leaves covered in powder?
Is the plant wilting or drying up?
Are there black patches with yellow edges?
Are there spots?
Are the leaves rolled up?
Are there red and yellow marks on the leaves?
Are there strange patterns on the leaves?

DESTROY IT!
AND START AGAIN

- Use clean seeds.
- Plant it in a different place.
- Let the bed dry out before re-planting.

2

DIET: IS IT GETTING THE WRONG FOOD?

Does it have yellow leaf veins?
Is it too small?
Are the leaves pale?
Do other plants around look the same?
Perhaps it needs nitrogen.
Do the edges of the leaves look burnt?
Are there brown patches on the leaves?
Perhaps it needs potassium.
Are the stems or leaves purple?
Perhaps it needs phosphorus.

FEED IT!

For all problems, give compost and mulch and rotate crops.

For nitrogen, dig in legumes (green manure).

For potassium, give wood ash or wood bark.

For phosphorus, add chicken manure or animal bones to your compost.

3

DEPREDATION: HAS IT GOT PESTS?

Are there insects on the plant?
Are the leaves or stems sticky?
Is there sooty mold on the leaves?
Are the leaves or fruit pale, brown or speckled?
Perhaps it has sucking insects.
Do the leaves have holes or jagged edges?
Is the plant wilting or falling over?
Perhaps it has chewing insects.

GET RID OF THEM!

PICK OFF by hand.

WIPE OFF whitefly, scale or mealybug by hand.

TRAP whitefly with "sticky traps". Smear yellow cardboard with petroleum jelly.

TRAP slugs under citrus or potato skins or in a slug trap (e.g. a half-buried can of beer or milk). Spread ash or sawdust around plants.

SPRAY with natural pesticides, or dust with wood ash or flour. Spray under the leaves too!

PEST POLICE Encourage ducks and hens, frogs and lizards, ladybugs and lacewing.

8.7. HARVESTING

Harvesting is to gather a matured crop from the field for use and/or sale. Consult Food Fact Sheets, seed packets and local experts for advice on harvesting and storing particular crops.

LEARNING OBJECTIVES

Participants

- know which food crops decay rapidly
- appreciate the need for careful harvesting, rapid transport and good packaging, and act accordingly
- know what to do with plant debris

RESOURCES NEEDED

- Flip chart and markers
- Unripe, ripe, over ripe, dried and damaged fruit or vegetable samples for demonstration purposes

PREPARATION

The trainer needs to print the following assessment questions and make copies for group discussion.

a) Why do foods dry out? (too much sun, exposure, wind, thin skins)

b) Why do they rot? (Rotting is caused by bacteria/fungi in the air or enzymes in the food.)

c) When do they rot? (when they are overripe, cut, bruised, wet or warm)

d) Which foods rot quickly and why? sunflower seeds? bananas? tomatoes? sweet potatoes? spinach? ("Rapid rotters" are usually ripe, soft and full of water.)

e) What are some of the key considerations during harvesting? (Refer to Guide 8.7 below)

Duration: 30 minutes

ACTIVITY

1. Display the vegetable/fruit samples collected for demonstration purposes and ask the participants to analyze and discuss their condition.
2. Form participants into groups and provide them with the printed assessment questions listed above. Let the participants discuss the questions and present a group report.

Guide 8.7: FRESH AND UNDAMAGED

All crops mature on the plant.
Some can ripen off the plant.

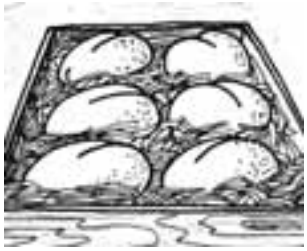
Find out the best way to
harvest each crop.

Harvest in the cool of the day.

Be gentle! They are fragile!

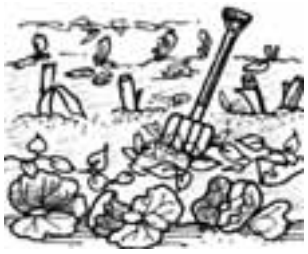
Use up damaged foods
quickly before they rot.

Only store perfect foods.



… so it won't get hurt.

This will ruin your crop.



They are good compost.

SET 9: PREPARING FOOD

Food hygiene practices are based on an understanding of the dangers of "invisible dirt" (i.e., bacteria). This set of lessons focuses on ways to eat raw food (*as long as it is washed with clean water*), ways to conserve food value, on cooking and eating as social activities and the culmination of gardening work.

9.1. KEEPING FOOD and PREPARATION

This lesson introduces the general principles of food handling and maximizing the nutritional value of your homegrown foods. It stresses light cooking and conserving the cooking water.

THE ROT RACE

LEARNING OBJECTIVES

Participants

- share knowledge of how to keep foods fresh
- recognize the causes of food decay
- describe local methods of cooking and food preparation
- understand how to cook to conserve food value
- try out new cooking methods.

RESOURCES NEEDED

- Flip chart and markers
- Raw carrots for cooking
- Stove, steamer
- Two cooking pots with lids
- Water
- Two glass bottles (jam bottles)
- Knife

PREPARATION

The trainer needs to write the following questions on a flip chart.

- How do we keep food fresh?
- What happens to fresh foods if we leave them?
- Why do we wash our hands with soap and running water and wash fresh vegetables and fruits with clean water?

Duration: 60 minutes

ACTIVITY

1. Ask the participants to reflect on the questions.
2. Divide the participants into groups and have them discuss different ways of keeping

food fresh and cooking vegetables without affecting their nutritional value. Have the groups present their findings for further discussion. Ask the participants to draw conclusions about the effects of different cooking methods. Refer to Guides 9.1a – 9.1c

3. Different methods of cooking vegetables are: (See Guide 9.1c)
   a) B*oiling*. Put vegetables in water in a pot and boil them. *What happens to the vitamins in the vegetables?* (Some escape into the water.) *What happens if we throw the water away?* (We lose the vitamins in the water.) *How can we save the vitamins?* (Use less water; make a sauce with the water.)
   b) S*teaming*. *Is this better than boiling?* (Yes, because the vitamins remain in the vegetables.)
   c) *One-pot cooking* (cooking meat with vegetables together) *Is this a good way to cook?* (Yes, because nothing escapes – we eat all the food and vitamins.)
   d) G*rilling*. *Is this good?* (Yes, because nothing escapes.)
   e) S*tir-frying*. *Is this a good way to cook?* (Yes, because it is light cooking and many of the vitamins stay in the food.)
4. Demonstrate cooking carrots for the class following the instructions in Guide 9.1d.

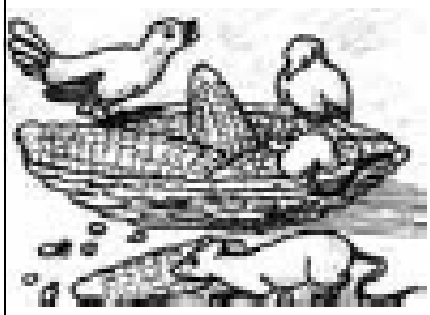
Guide 9.1a: KEEPING FOOD FRESH

MICE

RATS

BIRDS

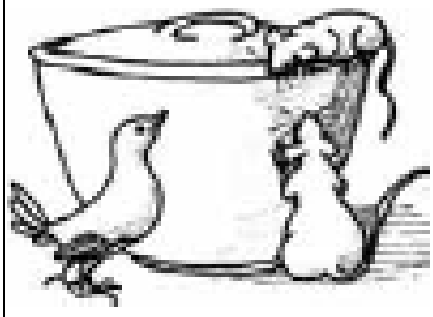
INSECTS



They eat our food. They carry our food away. They make it dirty.

SO...

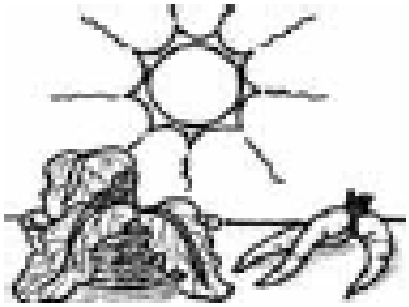
Keep food in containers.
Keep animals away.



THE SUN

DRY AIR

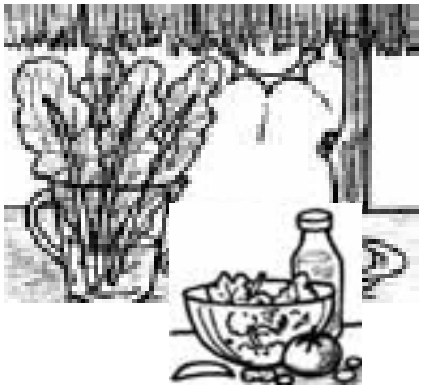
THE HEAT



They take out the water.
They dry up the food.

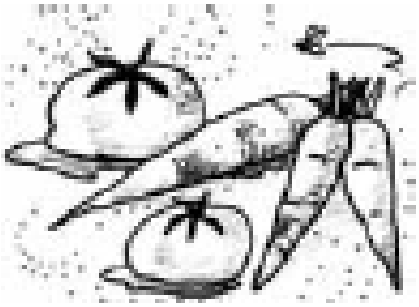
SO...

Keep food cool.
Keep it out of the sun.



BACTERIA

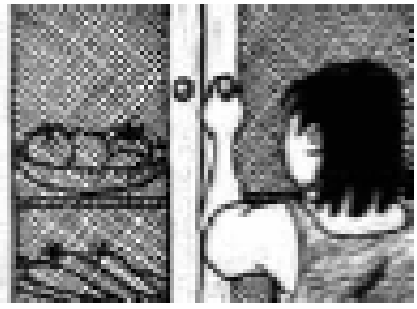
FUNGI IN THE AIR



They make food mouldy.
They make food rot.
They like it warm, wet and light.

SO...

Don't keep damaged food.
Keep food cool and dry.
Keep it in the dark.



Guide 9.1b: HOW DO WE EAT RAW FRUIT AND VEGETABLES?

WHOLE

For example: salad, celery, tomatoes, nuts, young peas

WHOLE WITH DRESSING

For example: pawpaws, avocadoes, grapefruit

PEELED

For example: bananas, oranges, grapefruit, passion fruit

WASH THEM ALL WITH CLEAN WATER!

CUT UP

For example: sweet peppers, cucumber, melon, celery

GRATED

For example: carrot, apple, cabbage

JUICED

For example: grapefruit, passion fruit, tomato, carrot

WHAT FOODS DO YOU EAT RAW?

HOW DO YOU EAT THEM?

Guide 9.1c: **HOW DO WE COOK OUR FOOD?**

Don't kill nutrients with overcooking

Don't throw nutrients out with the water.

KEEP THE NUTRIENTS

IN!

STEAMING

More nutrients stay in the food.

"CONSERVATIVE" COOKING

Use very little water. Keep the water for soups.

ONE-POT COOKING

Make dishes which include the cooking water.

STIR FRYING

Cut food very small and cook very quickly in a small amount of hot fat.

BAKING AND GRILLING

Cook thin slices over the fire or in the oven.

Guide 9.1d: COOKING CARROTS

PURPOSE: to determine what cooking method preserves the most vitamins

MATERIALS: carrots, stove, steamer, two pots, clear glasses or glass bottles

PROCEDURE:

1

Slice up the carrots. Divide them into three heaps.

2

Boil one third of the carrots. Steam one third of them. Keep one third raw.

3

When they are cooked, pour the water from the boiled carrots into a clear glass or bottle, and the water from the steamed carrots into another.

RESULTS:

The orange color of the water is the vitamins that have come out of the carrots.

The more orange the water, the more vitamins have escaped from the carrots.

Which water is darker?

Which cooking method has taken more vitamins out of the carrots?

Which carrots now contain more vitamins – the boiled ones or the steamed ones?

What about the raw ones?

Which cooking method preserves more vitamins?

Adapted from Kiefer and Kemple (1998)

Note: This experiment can also be done with spinach or squash.

Guide 9.1e: CONVENTIONAL COOKING METHODS IN RURAL SETTINGS

OPEN FIRE

Not very economical or efficient: a lot of heat is lost

More efficient but still uses a lot of fuel

9.2. CONSERVING AND PRESERVING

Preserving food may be essential to maintaining a good diet throughout the year. Preserving processes can be practiced in the school setting, repeated at home and promoted by taking samples home, inviting visitors to try them, or selling the products in the community.

LEARNING OBJECTIVES

Participants

- understand the principles of food conservation (protection against pests, bacteria and fungi)
- can give examples of local food conservation practices
- participate in preserving foods and can explain the process

RESOURCES NEEDED

- Flip chart and markers

PREPARATION

The trainer needs to print the following questions (only the questions, not the phrase or words in the brackets) and make copies for the participants to use.

1. What foods are stored at home?
2. How are they stored/preserved?
3. Why don't they go bad?
4. What can get into our food? (flies, birds, weevils, insects, ants, rats and mice)
5. How do we stop them? (using containers, neem tree leaves, rat baffles, mouse traps)
6. How do foods go bad? (black bananas, moldy oranges, fuzzy tomatoes)
7. Why do they go bad? (Bacteria/fungi cause decay - tiny invisible living things which love damp, light and warmth.)
8. How do we stop it? (Kill bacteria by drying, boiling, cooking, keeping cool.)

Duration: 30 minutes

ACTIVITY

1. Divide the participants into groups. Give the printed questions to the groups and allow them to brainstorm. Ask the groups to report their findings, and then discuss them as a whole. Present the different types of preservation methods illustrated below in Guides 9.2a and 9.2b.

Guide 9.2a: HOW WE PRESERVE FOOD

KILL BACTERIA AND FUNGI. STOP THEM GROWING

Use good containers

Always put a label on, with the date

Keep dry

Bacteria need water: a little toasted white rice keeps foods dry.

Keep cool

Most bacteria don't like the cold and dark.

Add preservatives

Sugar and salt can stop food going bad.

Boil and cook

Boiling kills bacteria, but it also destroys some vitamins.

Dry and cure

Don't dry in direct sunlight.

Freeze and can

Freezing kills some bacteria and stops others.

Pickle

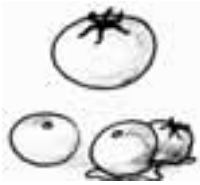
Salt and vinegar kill bacteria.

Make flour

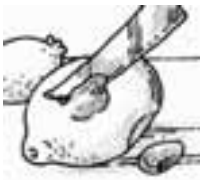
Keep flour airtight and dry.

GENERAL RULES FOR PROCESSING FOODS

Harvest in the cool of the evening.



Choose ripe, undamaged items.



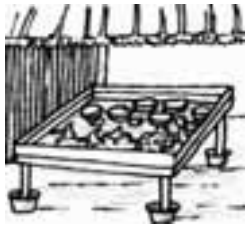
Cut out bad spots.

Sterilize equipment.

Guide9.2b: TEN SIMPLE FOOD-PRESERVING PROJECTS

HANG UP strings of onions, garlic, chilies, herbs, bunches of cherry tomatoes, in a cool shady airy place.

CURE SWEET POTATOES, YAMS, PUMPKINS by leaving them in a warm shady airy place for a week after harvesting. The skin will thicken and they will keep better. Then store in a dark cool dry place.



DRY FRUIT AND VEGETABLES in an airy open-sided shed. Put slices of food on a rack/mat/tray well off the ground with the legs in water to prevent climbing insects. Turn every day until dry (vegetables) or leathery (fruit). Thin foods (e.g. green leaves) can be dried whole. Dry legumes and oil seeds on the plants. Store in a cool, dry, protected place.

SOLAR DRYING is faster and preserves nutrients better. A solar drier is basically a box or frame with a plastic cover and is not difficult to construct. Fruit/vegetable strips and slices take about three days, green leaves about two days. Store dried food in airtight containers with labels.

FLOUR can be made from pumpkin, banana, sweet potato, breadfruit, cowpeas and cereals. Use in cakes, biscuits, pancakes and complementary feeding. Dry the food, then pound, sieve and store in an airtight container. For banana flour, pick bananas when three-quarters ripe. Heat, peel and slice them, then dry the slices. Pound into flour, sieve, store and label.

FRUIT LEATHERS are made by cooking fruit, pulping it, then drying it. For pumpkin leather, wash, peel, cut up and cook the pumpkin, purée, strain, add honey and spices, spread on an oiled tray and dry in a solar drier. Cut the leather into squares, wrap in cellophane and label.

PICKLED CUCUMBER Wash 3 kilos of firm, fresh, medium-size cucumbers and put in a deep bowl. Mix salt and water enough to cover the cucumbers. Let stand for two days. Drain, rinse and slice. Put 10 cups of sugar, 10 cups of white vinegar and some pickling spice in a pot and bring slowly to the boil to dissolve the sugar. Add sliced cucumbers to the hot syrup for a few seconds, then pack into clean hot jars. Fill jars with hot vinegar-sugar solution, seal and label.

Cooks Com (2004)

PICKLING SPICE is made of a lot of different spices, such as cinnamon, mustard seed, bay leaves, allspice, dill, cloves, ginger, peppercorns, coriander, juniper, mace, cardamom, chilli. Use whatever you have.

KANJI PICKLED CARROT DRINK This is popular in India. Wash a kilo of carrots and grate them into a jar/bottle. Add 7 liters of clean water, 200g salt and some hot spices (e.g. chili, mustard seed). Close tightly, leaving a tiny hole for gases to escape. Ferment for 7-10 days. Strain. Consume within 3-4 days.

Battcock and Azam-Ali (1998)

BOTTLED TOMATOES Use plum tomatoes, ripe but hard. Wash well and remove bad bits. Dip in boiling water for 30 seconds, cool in water, then peel. Fill jars with tomatoes. Add a small spoon of lemon juice/vinegar to each. Seal while hot. Cover jars with water in a deep pan, with straw to stop rattling. Boil for 30 minutes (small jars) or 50 minutes (big jars). Let cool and label.

FAO Rural Processing & Preserving (1985)

GUAVA JUICE Choose firm ripe guavas. Wash, cut off the ends and slice. Cover with water in a large pot. Boil until very soft (15-20 minutes). Pour into a bag of rough cloth and let the juice drip through. Drink it right away. To bottle it, sterilize bottles and lids, boil the juice again, pour into hot bottles, seal and label.

SET 10: MARKETING AND INCOME FROM SALES

Marketing deals with the disposal of products, goods and services either directly to the end user or through different market intermediaries. Some of the foods that are produced at school gardens can be used for demonstration or educational purposes, but the remaining amounts need to be sold to generate income to sustain the gardening activities. This session deals with the importance of marketing the vegetables and fruits produced in school gardens and proper utilization of income earned to sustain the gardening activities.

LEARNING OBJECTIVES

Participants

- identify feasible marketing strategies and market outlets
- propose how they will manage the income from sales of the produce
- recognize the basics of market research

RESOURCE NEEDED

- Flip charts (2), markers

PREPARATION

Trainer should print and make copies of the following case statement to better understand how participants would undertake marketing and utilize the income gained from sales of garden produce. It also provides key resource information from a practical perspective.

The case statement

Save the Children through ENGINE project is going to undertake school gardening activities in the school where you come from to promote its nutritional objectives among the school community and wider population as well. Since its primary concern lies with promoting nutrition education, ENGINE identified a list of nutritious crops to be produced in the school garden. These will include different kinds of vegetables and fruits such kale, Swiss chard, head cabbage, potato, carrot, OFSP, pumpkin, green beans, apple, mango, avocado and papaya. You are requested to grow some of these crops based on your agro ecological setting and demand of your locality. The project will also provide some support such as seeds, hand tools and equipment for you to start and undertake the

gardening activities. Once you are able to sustain the intended demonstrations to aid in the teaching process, you will be selling some of the harvested produce to generate income for the school. Keeping this statement in view:

1) What marketing strategies will you employ to dispose of the harvested crops? Justify the reason why you chose this strategy? Try to analyze your approach from a practical point of view.
2) Who (can be individuals or committees) do you think should be involved in the selling process?
3) How will you manage the income generated from sales of the produce? List how the income will be utilized in order of importance.

Duration: 35 minutes

ACTIVITY

Group exercise to learn how participants (schools) will sell what they produced and how they will manage the income from sales of the produce.

Steps to be taken

1. Divide the participants into two groups and label them as staff of School A and B.
2. Provide each of them the case statement and the brainstorming questions to discuss and come up with their respective marketing strategies and how they plan to utilize their proceeds from the sales of the produce.
3. Ask each group to report their findings through presentation on a flip chart.
4. Provide possible options from a practical point of view using Guides 10a and 10b. Explain that to research the market we need to ask five important questions:
   a) What will be special about our product?
   b) Who will buy it and where?
   c) Which markets are best?
   d) What will customers pay?
   e) When is the best time to sell?

Guide 10a: MARKET OUTLETS

WHERE CAN YOU SELL SCHOOL GARDEN PRODUCE?

- at special school events
- in school snack stalls
- for school meals

- in shops
- in the market
- at the roadside

- at church socials
- to youth clubs
- to local restaurants
- to cafés and snack bars
- to people at home

Guide 10b: DO YOUR MARKET RESEARCH!

QUESTIONS	OUR MINT DRINK
What will be special about our product? **What is its "added value" or selling point?** Why should people want to buy ours instead of another one? For example: high quality? cheap? attractive? delicious? highly nutritious? organic? available out of season available when needed produced by the school convenient (e.g. delivered home)	**Answer:** It will be there when people are thirsty. It's cool and delicious.
Who will buy it and where? Local people: local shops, markets, roadside stalls, bars and restaurants People at school: in snack stalls, through vendors, in class Families: through learners, or at school events The school meals service	**Answer:** People at school People at sports events People at the market
Which markets are best? Why do we prefer these markets? Are they the most profitable? Are they easy to get to?	**Answer:** The school is easiest.
What will customers pay? What is the normal price range for this product?	**Answer:** 5 per glass (less than in shops)
When is the best time to sell? Are there seasonal price differences? Are there special times when this product will sell well? (e.g. in hot weather)	**Answer:** All year round, but especially when hot

SET 11: GARDEN PLANNING, DEMONSTRATION AND EVALUATION

These sessions are important for raising awareness among students, families, the cluster of schools and the wider community. The gardening **plan** sums up gardening activities, schedules, inputs required and gives a framework for organizing the work. It should be done in advance so that the implementation will fall within the school year in order to secure the participation of the students. Demonstration events for the wider community should take place twice within the cropping season. The first one should be held when the crops are in good standing to demonstrate the agronomic practices and the second one when most of the crops have matured to demonstrate food preparation. Both demonstrations should be planned with enough time for students to get involved in some type of useful publicity before the end of the school year. Evaluation should take place near the end of the cropping season, in time to make outline plans for the next cropping season.

11.1. GARDEN PLANNING

After the decision has been made to establish the school garden, the first step should be garden planning. This planning exercise offers guidance for smooth and timely implementation of gardening activities by clearing up misunderstandings, laying a basis for later evaluation and preparing the school for demonstrating gardening techniques to the community.

LEARNING OBJECTIVES

Participants

- make their objectives and expectations explicit
- prepare proposals to access support

RESOURCES NEEDED

- Flip charts, markers
- Printed questionnaire (Guide 11.1a) and calendar (Guide 11.1d)

PREPARATION

The trainer needs to print the Project Summary Questionnaire (Guide 11.1a) and Crop Calendar (Guide 11.1d) and make copies for the participants.

Duration: 2 hours

ACTIVITY

1. Divide the participants into groups. Give each group the Project Summary Questionnaire and Crop Calendar and allow time for discussion and drafting. Each group should appoint a secretary to record their ideas.
2. Allow each group to present their project plan. Encourage participants to listen to each other's ideas and suggest changes or improvements.

Note: Based on this planning exercise, each school targeted for ENGINE support is expected to develop a detailed proposal and submit it to the Save the Children respective field offices in order to access the intended support and to establish and run the gardens accordingly.

Guide 11.1a: PROJECT SUMMARY QUESTIONNAIRE

	QUESTION	ANSWER
Project	***What is our project? What is its name?***	
Aims	***What are our general aims?***	
Objectives/targets	***What exa***ctly do we want to produce? What exactly do we want to learn?	
Activities	What will we plant, how much and where? What will we need to do in the garden? How will we organize it? Who will help, and how? Apart from growing plants, what else will we do? How will we maintain and improve the garden?	
Inputs	How much time will be required? What inputs will we need? (seeds, tools, etc.) Where will we get them?	
Time frame	What is the schedule of activities?	
Monitoring	What do we need to keep track of? What kind of records will we keep?	
Information	Who will we keep informed? And how?	
Publicity	How will we demonstrate garden activities and create positive attitudes for our project?	
Evaluation	How will we evaluate our project? And when?	

Guide 11.1b: PROJECT SUMMARY QUESTIONNAIRE – CHECKLIST OF POINTS

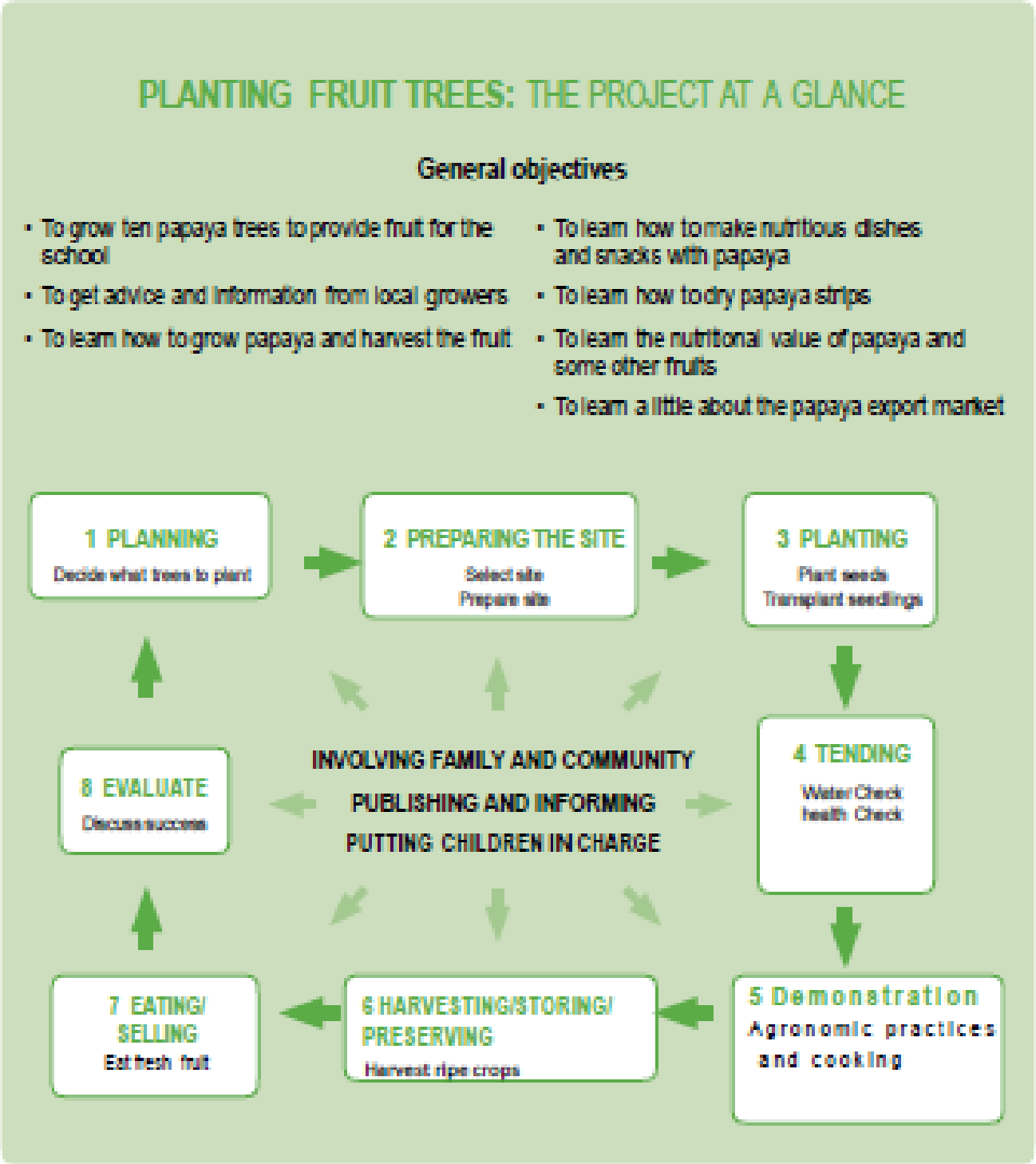
	QUESTION	ANSWER
Project	What is our project? What is its name?	
Aims	What are our general aims?	E.g. better eating, better health; learning gardening; improving the school environment; making money
Objectives/ targets	What exactly do we want to produce?	E.g. a certain amount of a particular crop; some aspect of garden infrastructure (paths, hedges); a number of flowering plants; x square meters of herbs for sale
	What exactly do we want to learn?	How to grow particular plants; particular garden activities (e.g. pruning, potting, making compost); how to sell vegetables successfully; how to manage a project; which insects are beneficial)
Activities	What will we plant, how much and where?	E.g. the number of plants, number of square meters, garden plan showing locations
	What will we need to do in the garden?	Outline of activities (e.g. sowing seeds, transplanting, watering, weeding, harvesting; making compost)
	How will we organize it?	E.g. time per week, teams or groups
	Who will help, and how?	E.g. parents, visitors, sponsors, teachers
	What else will we do?	E.g. cooking, preserving, packaging, studying insects
	How will we maintain and improve the garden?	E.g. enriching the soil, putting up fences, making a bird bath, creating amenities, garden art

(Continued)

	QUESTION	ANSWER
Inputs	How much time is needed?	Estimate of hours per week per person
	What inputs will we need?	E.g. seeds, tools, water, buckets, seed trays, packages, pots, fuel for cooking, knapsack spray
	Where will they come from?	E.g. bought, borrowed, found, lent
Time frame	What is the schedule of activities?	Outline of what will happen each week/month, including planting, harvest, processing, garden events, sales, evaluation, celebration
Monitoring	What do we need to keep track of?	E.g. money, plant growth, weather, production, pests, work done, time spent, control experiments, visitors
	What kind of records will we keep?	E.g. garden diary/log, accounts, photos, drawings/plans/maps/diagrams, booklets, garden file, letters
Information	Who will we keep informed? And how?	E.g. the school, the PTA, parents, sponsors, the local community, the local newspaper
Publicity	How will we demonstrate garden activities and create positive attitudes to our project?	E.g. letters, talks and presentations, articles, Open Days, stalls and sales, take-home products, free gifts, talking to families
Evaluation	How will we evaluate our project? And when?	E.g. by looking back at our objectives and aims, halfway through the project and at the end

Guide 11.1c: FLOW DIAGRAM

A flow-diagram shows the project activities at a glance. Here the objectives come first. The main stages are in the boxes of the diagram. Inside the diagram are ongoing activities (e.g. informing) and some of the important conditions (e.g. involving family and community).



Guide 11.1d: CROP CALENDAR

A calendar makes it possible to see the whole project at a glance, to look back at what you have done and to plan for the future. Spread the calendar across a whole wall, giving plenty of space to each month. You will then be able to add items under each month – e.g. visits and events, cooking and processing activities, sales, lessons, work schedules, garden diary, pictures, photos, displays.

Activity	Month 1	Month 2	Month 3	Month 4	Month 5	Month 6	Month 7	Month 8	Month 9
Compost 1	Start heap	Turn	Turn	Use	Use			Start new compost heaps	
Compost 2		Start heap	Turn	Turn	Use	Use			
Compost 3			Start heap	Turn	Turn	Use	Use		
Carrots			Sow seed	Sow seed Thin out	Thin out	Harvest	Harvest	Harvest	Harvest
Cabbage	Sow seed	Transplant Sow seed	Transplant Sow seed	Transplant	Harvest	Harvest	Harvest		
Cowpeas					Sow seed	Sow seed		Harvest	Harvest and dry
Yucca fence	Plant cuttings	Check fence	Check fence						
Help needed	Finding cuttings	Turning compost	Turning compost	Turning compost	Turning compost				Digging in cowpea plants

11.2 Demonstration of Agronomic Practices and Food Preparation

Telling farmers about the garden and showing them what you are doing ties the school closer to the community, inspires farmers to adapt the same practices in their own gardens, brings in expert technical advice and helps the students to learn by talking, doing and developing their confidence. The information that is communicated is not as important as the enthusiasm and interest aroused. Involving students in this "garden demonstration" makes them aware of and take pride in what they are doing. The demonstrations consist of agronomic practices and food preparation which will be carried out at different times.

LEARNING OBJECTIVES

Participants

- think who to tell, why, and what, and decide how to do it.

RESOURCES NEEDED

- Flip chart and markers

PREPARATION

The trainer needs to print and make copies of the demonstration Guides 11.2a, 11.2b, and 11.2c

Duration: 1 hour

ACTIVITY

1. Divide the participants into two groups. Provide each group with the printed demonstration guides to brainstorm.
2. Ask one group to prepare a plan to demonstrate agronomic practices carried out in the school garden (such as compost making, seed bed preparation, seeding, transplanting, watering, weeding, etc.) and the other group to plan a demonstration of food preparation using the crops grown in the school garden. Some food preparation ideas are: (i) cooked head cabbage and carrot salad; (ii) fried beans and carrots; (iii) steamed Swiss chard; (iv)mashed potatoes or pumpkin for children; etc. Refer Guide 11.2c for safe handling of foods.
3. Instruct the group to focus on:

   a) Selection of the audience or who to invite (teachers, students, farmers, neighboring

schools, woreda officials, etc.)

b) What to demonstrate?

c) How to demonstrate?

d) Who should be assigned as demonstrators? (teachers, students, nutrition clubs, health and agriculture extension workers, ENGINE staff)

e) Identify the role of the Parent and Teacher Association (PTA) in the demonstration.

Guide 11.2a: SHOWING AND TELLING: WHO, WHY, WHAT, HOW?

To whom shall we demonstrate?

The general public/Farmers witin Kebele and neighboring Kebeles

Other schools

Parents and families

Local organizations (church/mosque/youth groups/women associations

) Woreda Government Offices & kebele administration

The local radio

The local newspaper

Why?

To promote dietary diversity

To spread gardening practices

To get feedback for improvement

To Transfer knowledge and skill

To get help (technical, financial, etc…)

To find markets

To show them what we are doing

What shall we tell them / show them?

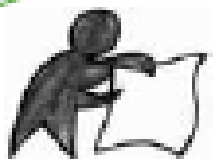
Our garden

Agronomic practices of our products

Food preparation of our crops

Achievements (what we've done)

Our activities (what we're doing) and events



How?

Guided garden tours and visits Picture and photo display

Talks/presentations

Fund themometer

Exhibitions, displays, panoramas

, , drawings

Showing and telling at home

Play or dramatization

Posters, notices, fliers

Interview on radio/TV)

Special events – e.g. Open Day,

party, show, food tasting, Bring and Buy, auction

For special people

Tell them what you are going to do

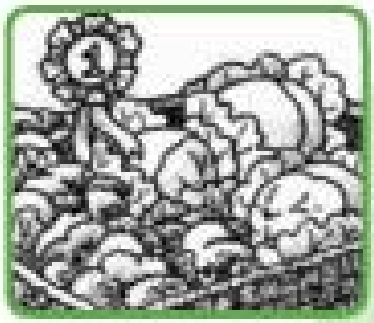
Tell them that you are doing it

Tell them that you have done it.

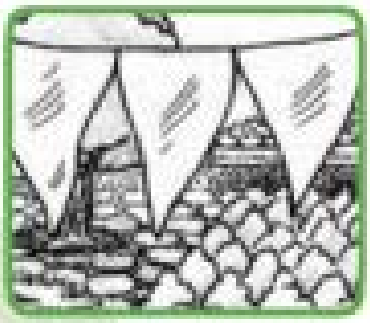
Then invite them to the demonstration event

Guide 11.2b: WAYS TO DEMONSTRATE

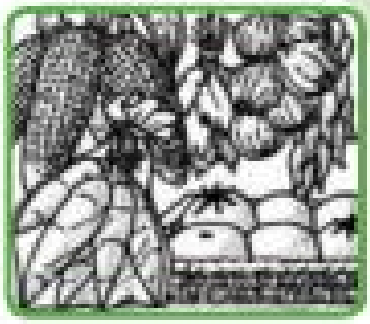
Make a photocopy of this guide and circulate to participants for group discussion.



COMPETITIONS



FLAGS



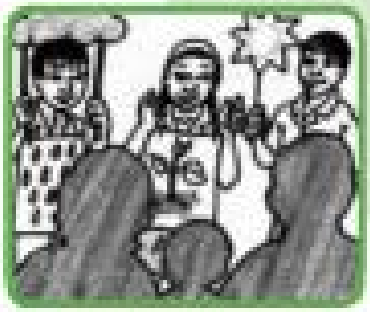
DECORATIONS

GIFT-WRAPPED PRODUCE

DEMONSTRATIONS

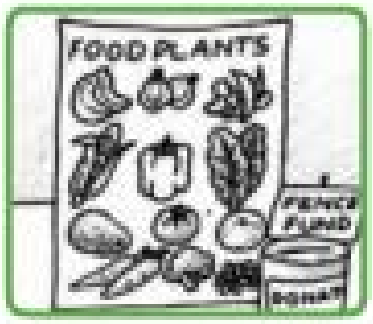
GUIDED TOUR
AND EXPLANATIONS

DISPLAYS/EXHIBITIONS



PERFORMANCES

(continued)



POSTERS

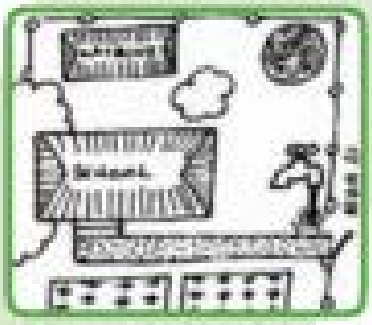
SPECIAL DISHES AND TASTING SESSIONS

PRESENTATIONS

STORY-TELLING

REFRESHMENTS

MAPS AND SIGNS



SONGS AND DANCES

PRIZE-GIVING

Guide 11.2c

CONSIDERATION DURING COOKING DEMONSTRATION (CLEAN, COLD, COVERED):

TEN STEPS TO SAFE FOOD HANDELING

1. Use clean water and cleaning equipment.
2. Keep away flies and insects.
3. Clean hands thoroughly (including nails) before preparing food – use soap and clean running water.
4. Separate raw and cooked food.
5. Check that everything is clean - work surfaces and utensils (pots, pans, knives etc.).
6. Cook food thoroughly, especially meat, poultry, eggs and seafood.
7. Wash fresh food in clean water.
8. Cover or wrap cooked leftover food.
9. Do not leave cooked food at room temperature for more than 2 hours; reheat leftover food.
10. Clean everything after preparing food

11.3 EVALUATION

The first question to ask in an evaluation is: *What happened?* The standard evaluation question is: *Did we do what we set out to do?* This leads to better planning for the future. A year's gardening may have a wide range of outcomes and warrants additional evaluation options. Other important questions to ask are: *What did we learn? Did we enjoy it? Were other people interested?* and (most revealing) *What shall we do next time?*

LEARNING OBJECTIVES

Participants

- Understand the essence of evaluation and points to be considered

RESOURCES NEEDED

- Flip charts, markers

PREPARATION

Duration: 45 minutes

ACTIVITY

1. Divide the participants into groups and have them discuss the importance of the evaluation process. Then ask them to brainstorm about how they should evaluate the gardening performance at the end of the cropping season. Have each group present their findings to the rest of the participants and ask for comments.
2. Make note of the objectives of evaluations and the questions that should be addressed in the evaluation process as indicated below.

   a) Evaluation objectives are:
   - recall the year's gardening exercises and its ups and downs
   - reflect on the year's gardening nutritionally, horticultural, educationally and as a general experience
   - acknowledge the help of others
   - make plans for the coming year
   - congratulate the participants

   b) Questions to be addressed in the process of evaluation
   - What did we manage to do?
   - What did we not manage?
   - What went well? What went wrong?
   - What did we learn?
   - Have we achieved our objectives?
   - What will we do next year?