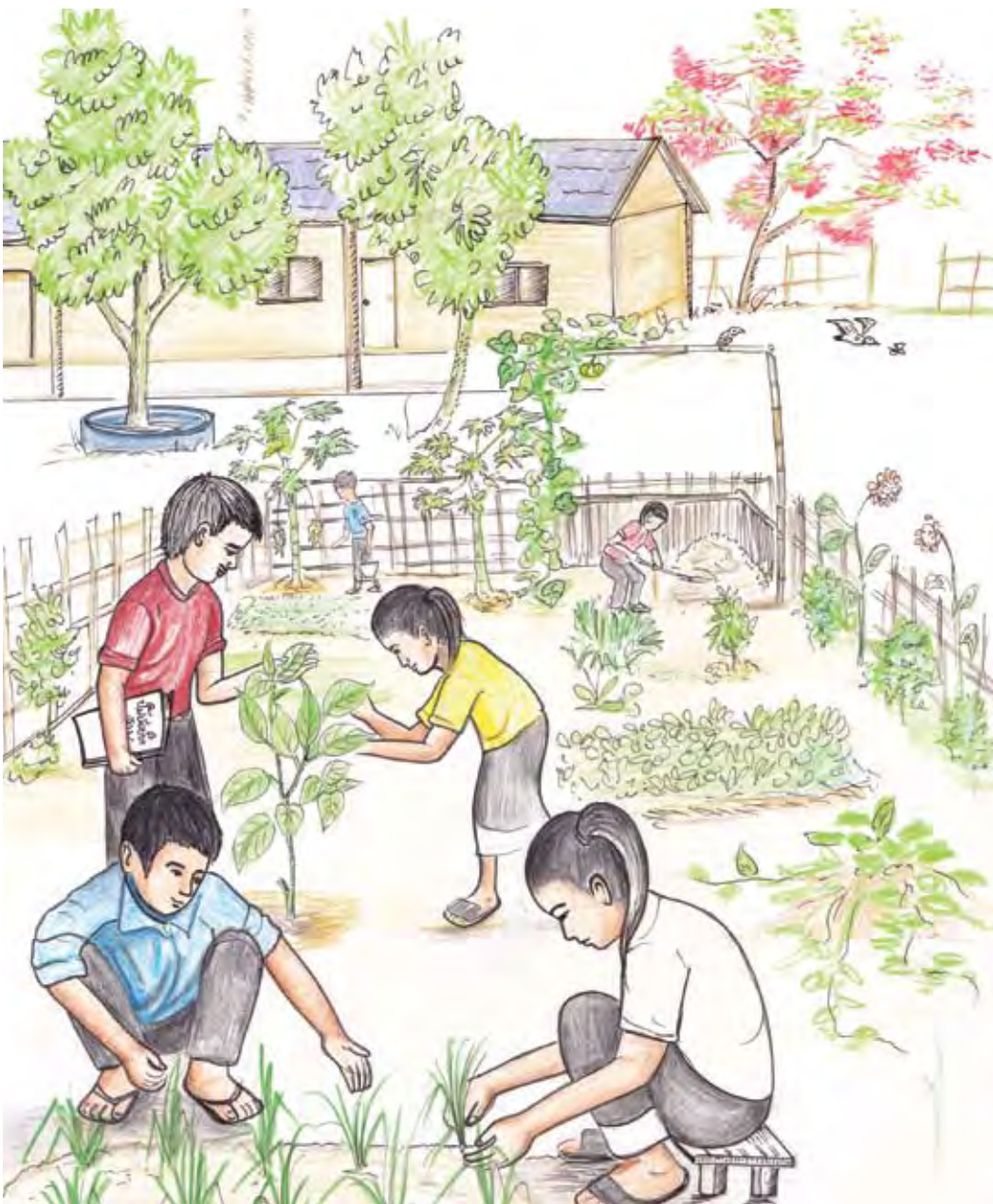


Teacher's Manual Primary School Garden

Mary Oakley Strasser, Florian Obermeier & Pasith Seng Amphone
Illustrations by: Kongngern Sengdee

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FOREWORD

The Lao People's Democratic Republic has a very young demographic structure with almost thirty-seven percent of the population under the age of 15, according to the CIA's World Fact Book. A country's future hinges on its children, especially their health and education. Unbalanced nutrition leads to decreased physical activity, reduced cognitive development and reduced resistance to infections. A school garden can help to improve both health and education by providing an active learning environment and nutrition supplements.

The school gardens also feature various medicinal plants to help sustain traditional medicinal knowledge. Lao people, including many different ethnic groups, still have a broad knowledge of the medicinal benefits of their natural environment. This natural medicine is often very accessible and frequently offers opportunities for effective cures without spending money on pharmaceuticals. By growing medicinal plants in a school garden, children can learn about the value of nature, preserve parts of their cultural heritage, and improve their health.

Through working in the school garden, students will learn how easy it is to grow organic vegetables, how to improve basic nutrition, and how to understand and respect their place in the environment. The physical activity in the garden will stimulate children's bodies and minds. Gardening can also be a great source of pleasure, recreation and character development. Taking responsibility for the development of plants, watching their growth, watching the flowers, observing the insects and enjoying the tasty harvest is fun, and it instills a sense of pride and self-confidence.

This manual is designed to encourage schools to create educational gardens of moderate size, with a variety of nutritious fruits and vegetables, which can be easily managed by students, teachers and parents. The goal of this manual is to present basic information that is easy to understand so that the gardens may be replicated by students and parents for their homes in both rural and urban areas.

School gardens are a unifying concept. Students learn how to grow, maintain and harvest nutritious produce. The experience will promote the environmental and social well-being of the school community, will foster a better understanding how nature sustains us and teach the children to approach the nature of Laos in a respectful, sustainable way. Involving parents and encouraging home gardens reinforces this concept and enables an exchange of knowledge and experience in the community.

We hope that this manual will prove a useful tool for all those who wish to start and improve a school garden to help children grow in both mind and body.

HOW TO USE THIS MANUAL

This manual is for the principal and teachers of primary schools. It explains how to maintain a garden, how to organize the work, motivate the students, and how to use the garden as an extension of the classroom. There is a section of lesson plans that explains how to make and maintain the garden and a separate appendix with information on each type of plant.



IDEAS FOR GROWING THE GARDEN

We have developed this school garden for a minimum size of 30 square meter but if you have the space and want to make the garden larger here are some things you can consider:

What are your goals for the garden ?

Do you want to grow enough food to provide regular snacks for the students ?

Do you want to grow extra food to sell at the market ?

	What will the school do ?	What will the students learn ?
Basic Gardening	Create a sustainable garden using organic methods. Provide a model of a mixed kitchen garden for the community.	How to grow things in a safe and sustainable way. How to enjoy gardening and have a positive attitude to agriculture.
Nutrition	Produce food for the school. Improve students' diets with garden produce. Improve students' eating habits.	How to improve their diets and prepare healthy meals. How to appreciate healthy foods and change their eating habits.
Marketing	Sell garden produce to get income for the school.	How to do basic finance and run a business.
Environment	Improve the school environment with trees, grass, flowers, etc. Encourage good insects and prevent erosion.	How to respect the environment and nature.
School Subjects	Reinforce some lessons, such as science and math.	How to understand a particular lesson through active, hands-on learning.

STARTING THE GARDEN

What do we need

You will learn as you go what tools are most useful for your students, but to start, we recommend:

- o Watering cans
- o Garden Hoes
- o Shovels
- o Trowels

These items can be expensive, so there are a couple ideas to keep costs down. For example, you may ask students to bring these items from home on the specific days that they will be working in the garden. Many of these tools can also be made using recycled materials. Scrap metal and bamboo can be shaped into hoes, shovels and rakes, and used plastic containers can become trowels and watering cans.



Here is a watering can made from a plastic bottle.

You could use large plastic bottles or other similarly sized containers. First of all the bottle must be cleaned to remove any residuals from the previous contents. Punch one hole in the cap and many small holes in the bottom. To fill the bottle, unscrew the cap, immerse it in a water barrel, screw the cap on again and put a thumb on the hole. Then you can lift the bottle out of the barrel. To water the plants just lift your thumb from the hole in the cap. To stop the water flow, put your thumb on the hole again.

Simple trowels can be made from bamboo.



Making Compost

Compost is natural and very cheap ! Using compost is an easy and important way to keep the garden healthy. It provides important nutrients for plants, and it improves the soil by retaining water and air in the soil. This helps the plant roots can breath and bacteria work. The best way of adding compost is to mix it with the top 20-30cm of the plant bed soil. But you can also use it as mulch. Mulch is a layer of dry organic material of at least 5cm on top of the soil to keep it moist and prevent weeds from growing.

Ingredients:

50% Green Waste:

- o Grass and weeds
- o Vegetable Waste from the kitchen
- o Chicken and buffalo manure
- o Coffee grinds

50% Brown Waste:

- o Paper and Cardboard
- o Wood chips
- o Straw and Rice Husks
- o Dead leaves, Soil

Be careful not to put anything in the compost that you do not want in the garden.

Do NOT add cooked food (meat, fish), large bits of wood, plastic, metal, glass etc.

How to make compost:

- Make 20-30cm high layers of each type (one layer of brown, one layer of soil with chicken/buffalo dung, one layer of green and repeat).
- Add Bio-Extract to speed up the break down of compost. Add 10 cc of Bio-Extract (see next page) with 10 liters of water. Add every two weeks.
- Keep it in a dry sheltered area. For example, keep in a contained space made from bamboo fence and shelter it with a roof.
- Turn the compost pile twice a month, and add some water when you turn. Compost should be moist, but not wet. Healthy compost does not smell bad. If it smells it is too wet and should be turned more often.
- It normally takes about three months for compost to be ready.
- Only use ripe compost ! Ripe compost has a consistent texture and a good, earthy smell, and seeds from wild plants start to germinate in it.

The school garden compost:

- The compost box in your school garden can be built with bamboo or wood and should be 2m long, about 1m deep and about 1m high. Keep the front sides open, so it is accessible and easy to turn.
- Divide the structure into two separated boxes.
- To shade the compost, build a bamboo-frame from the sides over the compost boxes and let climbers like beans or pumpkins grow on the frame.
- After installing the garden, you should try to gather as much green, organic waste as possible. Ask around in your village. Often there are unused sources of organic waste.

- Try to fill the first box within the first days to get your first ripe compost in 3 months.
- Once the box is full, do not put any more material in there; start filling the second box. If you keep adding fresh material to the first box you will never get ripe compost.
- Once the compost in the first box is ripe, you can use it. Keep about a 5-10cm thick compost layer at the bottom of the box. And again start filling the box with organic matter and stop feeding the second box.
- Often people feel a little disgusted by compost. It is dirty, moldy, smelly, and it has many small creatures, such as bacteria, mites, worms. But compost and the composting process is a wonderful, fascinating biological process that is happening everywhere on earth. Observe and admire the process of decomposition, the basis for all living beings. And once you have ripe compost, handle it, smell it, press it together, crumble it again and be happy to have very easily produced such a valuable material.

How to use the compost:

- **Mulch:** Put around plants a 1cm layer to keep moisture in the soil
- **Potting:** Mix one part compost with two parts topsoil to get good potting soil.
- **Soil Improver:** Add compost to plant bed to improve the soil quality.

Making Bio-Extract (Fertilizer)

Bio-Extract is a homemade fertilizer used to feed plants. It is an easy fertilizer to make at home or at school. Fertilizers give plants nutrients that they need to help them grow healthy.

Ingredients:

- Any vegetables or fruit (make sure they are clean)
- Molasses or normal sugar

Instructions:

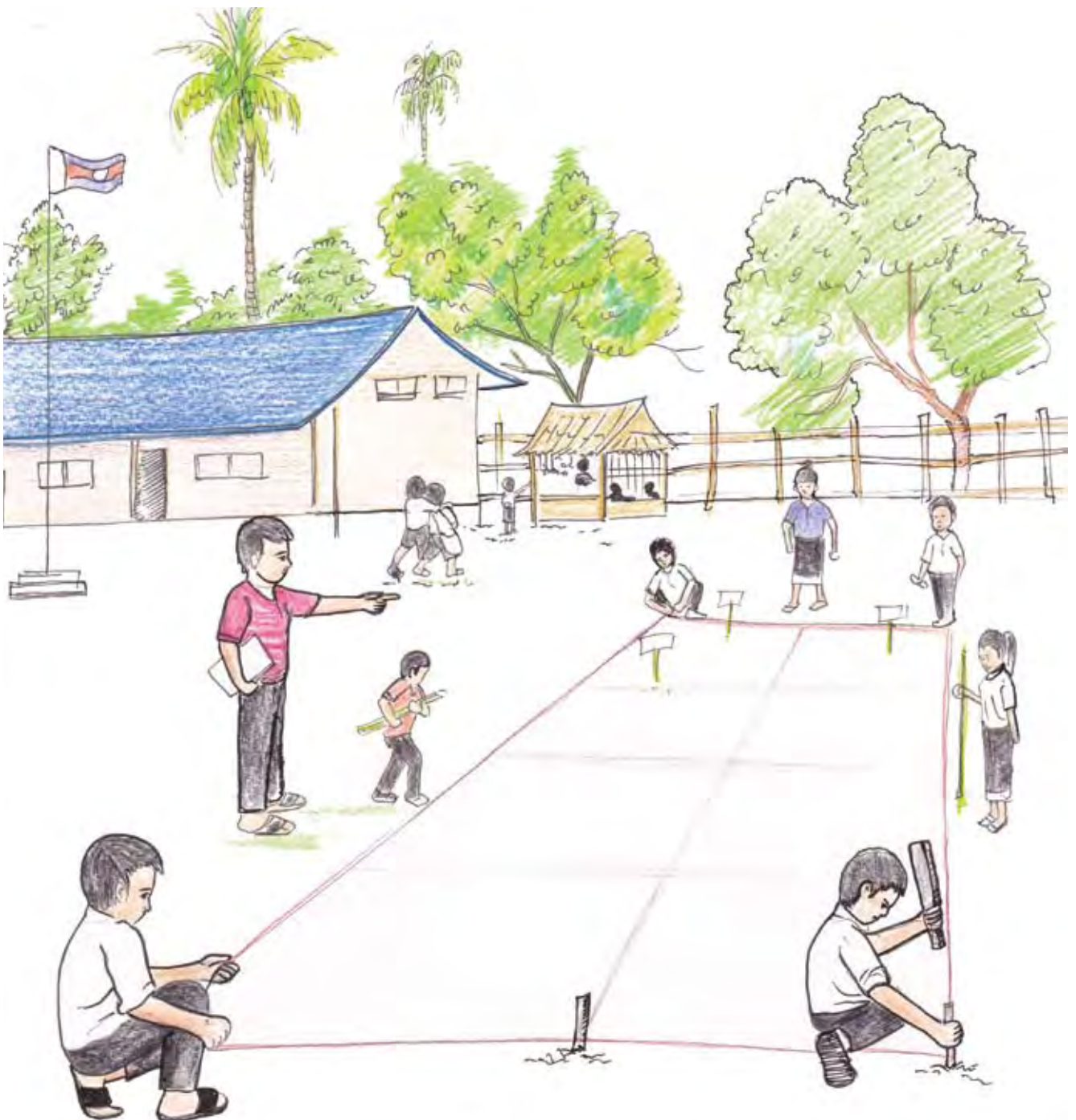
- Chop up the vegetables or fruits into small pieces and mix them together in a plastic bucket/container with an airtight lid.
- Add one part molasses/sugar to three parts of vegetable-fruit-mix and mix.
- Seal the container and be sure no air gets inside. Leave it like this for 5 to 7 days.
- When you see white bits rise to the surface, it is ready.
- Strain the mixture through a cloth to collect the liquid. The remaining solid organic matter can be added to your compost.
- The Bio-Extract can be stored 6 months in a glass container (old jar) with a lid.
- To use the Bio-Extract, add two or three spoons of Bio-Extract to ten liters of water. You can spray the Bio-Extract over the plants or just water your plants with it; you can use it every time you water your plants and should at least use it once a week.
- The Bio-Extract can be extended by diluting one part of Bio-Extract and one part of sugar to ten parts of water, leave it for three days.

Preparing the Soil

Before you do any planting, you need to decide where you will make the garden. The area should have full sunlight, at least 80 to 100 percent. The ground should not be too wet and should have good drainage. The better the soil, the healthier the plants !

How to prepare the ground:

- Clean the area and use tools to remove all weeds.
- Measure the garden.
- Use sticks and strings to lay out the length and width of the beds and paths, referring to the garden design (see page 30).



How to make the beds:

- Use hoes and shovels to turn the soil to a depth of 30 - 40 centimeters. This raises the surface of the soil, adds air and loosens the structure, so the fragile roots of young plants can easily grow.
- If you already have a source of compost, dig down 40cm, place the soil beside your beds, put a 30cm high layer of compost at the bottom of the beds and cover it again with the topsoil. In this the compost does not have to be totally ripe.
- Break the soil surface into small pieces and remove old roots. This allows even more air into the soil and gives good drainage.
- With this technique you build raised beds, with a good nutrient supply and drainage.
- Add 250g lime to your plant beds (200g lime per square meter) to lower the acid level in the soil. This takes time to activate, so wait five to seven days before planting.



Making a Fence

If the garden is near the school and already part of a contained yard, then it only needs to be surrounded by a small bamboo fence to separate the plots. If it is in a separate area, a larger bamboo fence will be needed to protect the plants from animals. The fences, gates and compost bin can all be made from bamboo or with wood sticks.



Sowing the Seeds

There are two techniques for sowing the seeds, protected and direct.

Protected Sowing Techniques:

It is best to start some seeds in pots, trays or nursery beds before transplanting the seedlings into their final place. Small seeds, for example from herbs, can be broadcast or spread thinly over compost soil. Larger seeds, such as sunflowers and papayas, should be placed in rows with spaces between or planted separated in pots.

- **Seed trays:** Lay paper in the bottom of the tray. Fill it with 2 parts soil, 1 part sand, 1 part rice husks and press it down gently with a piece of cardboard to make a flat surface. Leave a 2cm gap at the top, so when you water the tray the soil does not get swashed out. Water gently. Sow seed and again press down gently so the seeds are in close contact with the soil. Cover the seeds with a 3mm (not more) layer of fine soil, rice husk, compost or sand. Place the trays in a protected area. The following days the soil should stay moist (not wet !). Check the soil every 1-2 days and if necessary water carefully in the morning.



- **Nursery Beds:** A nursery bed is a small area of soil that has been well prepared with an even surface and no big clumps of soil. The seeds are then spread evenly over the area and allowed to germinate. After about thirty days, when the plants have developed three or four leaves, they can be transplanted to their final locations in the garden.

How to transplant seedlings:

- Seedlings are ready to be planted when they are 25-30 days old or when they have three or four leaves.
- Water the seedlings five minutes before transplanting. This prevents the roots from breaking when you lift the seedlings out of the tray or bed.
- Make small holes for the seedlings. Plant the seedlings carefully in holes and gently press the soil with your fingers from the side to the plant roots, so they have close contact with the soil.
- For information about each kind of seedlings, read the plant information. These include the specific distances for planting seedlings.



Direct Sowing Techniques:

The seeds of herbs can be sown directly in the plant beds. Bulbs and tubers can be directly planted in their final position and do not need to be transplanted.

How to direct seed sow:

- The technique for direct sowing is the same as for seed trays. The only difference is that after germination and 3-4 weeks of growth, these plants do not have to be transplanted. If the plants are too crowded, they should be thinned out.
- Before sowing, flatten the plant bed and water the soil.
- Spread the seeds evenly over the ground and press down gently with a piece of cardboard or a wooden slat so the seeds are in close contact with the soil.
- Water again carefully. Take care that you does not wash all the seeds into one spot.

How to plant a bulb:

- Water the soil before planting.
- For onion and garlic, cut the tip of the bulb and soak the bulb in water 12-24 hours.
- Bury half the bulb in the soil, half above ground.
- See the plant sheets for more information.

How to plant a tuber (for example sweet potato):

- Water soil before planting.
- Plant 5cm deep.

Tips: *It is best to plant in the evening when it is cool to protect young plants from the sun.*

Companion Planting

Planting particular plants together can attract beneficial insects and drive away pests (more about these later). In general, mixed crops and strong smells (for example, aloe vera, artemisia, basil, catnip, chili, garlic, ginger, lemon grass, marigold and onions) repel garden enemies, while flowers (for example, flowers of carrots, celery, coriander, dill, citrus, and mint) attract beneficial insects. Allowing some of your plants to develop flowers is a natural way to attract beneficial insects and to protect your plants. Garlic can also kill some fungi in the soil, and marigold kills nematodes (a tiny worm attacking plants).

Combination ideas:

- Basil repels tomato hornworms
- Nasturtiums get rid of squash bugs
- Marigolds and mint, drive away cabbage moths
- Beans and Cabbage planted together confuse each others pests.

Interplanting

Interplanting is when you grow different crops near each other to make the best use of space and to protect the soil structure and the plants. An example in these gardens is planting papaya with basil and planting marigolds all around the garden boundary to repel nematodes from the garden soil.

Putting plants with different needs together reduces competition. Here are some ideas for you to grow in the garden:

- Tall plants next to small ones (corn with cabbage, broccoli with spinach/lettuce, fruit trees next to vegetables)
- Deep-rooted plants next to shallow-rooted plants (deep rooting papaya with shallow rooting basil)
- Climbing plants next to ground plants (beans or corn with lettuce, onions)
- Broad leaves next to narrow leaves (cabbage with carrots)



Interplanting; to make the best use of space and to protect the soil structure and the plants

TAKING CARE OF THE GARDEN

Once the plants are in the soil, you have to take care of them almost every day. There are many routine jobs that should be carried out regularly. It is good for boys and girls to learn to take responsibility, to check and observe the plants' needs and development every day. How does your garden develop ? Are there already any nice flowers, insects ?

Every time you spend time on your plants, you get more familiar with them and build a relationship with them. And there is always something new to discover ! Do not rush through your garden. After getting a first impression, take a seat between your beds and relax. Enjoy your garden, watch the plants, their flowers and the many insects hosted by them, and gradually you will start to observe more details.

Growth	How are the plants developing ? What stage are they at ?
Soil & Water	Is the soil dry ? Which plants or beds need water ? Is anything too wet ?
Health	Are the plants looking healthy and strong ? Are there fallen leaves, eaten leaves, yellow leaves or fungi ? Are there signs of pests or diseases ? Are any plants wilting or stunted ?
Hygiene	Is there infected material that needs to be burned ? Are there many weeds growing, competing or even covering your plants ?
Garden Creatures	What insects / worms / animals are around ? Are there any pest infestations ? And are there beneficial creatures ?
Support	Does anything need training up, tying up, spreading out or cut back ?
Space	Is anything too crowded and needs to be thinned out ?
Weeds	Are there weeds growing in the plant beds ?
Compost	How good are your supplies of compost and do you have ripe compost ? When did you turn it last time ? Is the compost too dry or too wet and stinks ?

Daily Garden Care Check-List

Growth:

- When you enter your garden, the most obvious thing to recognize is plant growth. Strong, growing plants are the daily feedback you should receive from your garden.
- Take a close look at each plant and every day you will discover some change in your garden, such as new leaves, sprouts, or flowers appearing, or fruits getting ripe.

Watering:

- Water is essential for plants. But not all plants need the same amount of water. Keeping the soil too wet can be even worse than letting it dry out occasionally. Wet soil quickly attracts fungi, which infects the roots of plants. It is almost impossible to discover this fungi early enough to save the plants. A clear sign of this problem is when the plants wilt even when the soil is moist. In this case, clear the bed, burn the plants, add lime to the soil and replant with a different plant family.
- When plants are very young they have not developed many roots yet and have to be watered twice a day - morning and evening.
- Small plants need less water than big plants.
- Deep rooting plants (papaya) need much less water than shallow rooting plants.
- Water the soil and not the plants. Especially if watering in the evening, be careful that leaves do not get too wet because then they will be wet for several hours.
- Do not water at noontime. The water drops are like lenses and can, combined with sun, burn your plants.
- There is no specific amount of water a plant needs. Every plant is different, every soil is different, every day is different (for example, temperature, sun, clouds, and rain).
- To give the right amount of water, you have to develop a certain feeling for your plants. If your plants show wilting at noon you may have not given enough water in the morning. If the soil is still wet after a couple of days, you may have watered too much.

Soil:

- Every 2 weeks, add compost to the soil surface, and then turn the first 5cm of soil. But be careful not to destroy the plant's roots. This way you mix in the compost, maintain a loose soil structure, a good drainage and healthy soil conditions. This is also a good time for weeding. After turning the soil, most weeds will die already because their roots lose contact with the soil.

Weeding:

- Some weeds survive after turning the soil, so one week after turning, look for the weeds again, and pull them out. Try to pull them out with their roots to be sure they will not grow again. If there are not many weeds, you can just leave them on the beds (they will die in the sun). If there are many weeds, just put them in your compost.

Health and Hygiene:

- Hygiene is very important to prevent infections with many viruses, bacteria and fungi!
- If you discover any broken leaves, sprouts or branches, cut them with a sharp tool and put them on your compost. If this material shows signs of any diseases, burn it !
- Weeds attract diseases and pests. Do not let too many weeds conquer your garden.
- When the color of your plants changes from green to yellow, they are not getting enough nitrogen. Add more extra compost around those plants and use more Bio-Extract.

Garden Creatures:

- In every garden, you will find animals, most of them insects.
- Many insects are not easy to recognize because they are very, very small (such as thrips and mites), they live underneath the leaves (mites and whiteflies), inside buds (thrips) or hide during daytime (weevils and snails / slugs). You will need some practice and experience to detect a pest infestation.
- But do not worry. Having an infestation in an early stage in your organic garden is no reason to panic or to treat your plants with chemicals right away. First of all, look again to see if there are already beneficial insects fighting those pests. If you cannot find any, wait another 2-3 days and if after those you again cannot find any beneficial insects, spray your plants with an organic insecticide (see recipes in *Natural Pesticides* section).
- If you find beneficial insects, you have two choices:
 1. Let the beneficial insects do their job. (This is the most sustainable method. It might reduce your first yields but the beneficial insects will enjoy hunting the pests, increase their population, and effectively prevent further serious infestations !)
 2. Spray a natural insecticide to save your yield. But be aware that the insecticide kills both pests and beneficial insects.

Space:

- In the plant sheets you will find information about the spacing for each plant.
- Plants growing in a space that is too narrow will cause several problems. The competition for nutrients, water, space for leaves and roots will weaken your plant, and after watering, it takes much more time until the leaves are dry again. Weak plants attract more pests, and wet leaves easily get infected with fungi and bacteria.
- After direct sowing, plants are often growing too close together. So after 3-4 weeks of growing you have to thin them out.

Compost:

- Turn your compost every 2 weeks to loosen it and bring air in. After turning the compost, water it.
- When it is very hot and/or the compost is not sheltered with a roof you might have to water your compost more than every 2 weeks.

Harvesting

Harvesting is fun as you reap what you sowed and what you took care of in the last weeks and months. And even more fun is to enjoy the delicious meals you can prepare with your own tasty vegetables and herbs ! It is important to know and recognize when each crop is ready to be harvested, so you can collect it at the right time. Some crops must ripen on the plant and some can ripen off the plant. See the fact sheets for this information.

Harvesting should be done gently so that the crops are not damaged. Only produce in perfect condition should be stored. Any damaged or imperfect food should be used immediately, added to your compost or processed to make Bio Extract. At the end of the school year, during school-break you can keep all plants that you do not want to harvest in the plant beds. They will protect your soil from heavy rainfall and full sun. Burn sick plants to avoid spreading diseases.



The best time to harvest is the early morning when it is cool. Fruits and vegetables harvested during cool temperatures can be stored longer than harvested ones in hot conditions. Make sure the plants are checked regularly so your produce is harvested in time and does not get over ripe.

It is very important to get seeds for your next schoolyear so do not harvest all plants !

Keep 2-3 strong and healthy plants in your beds, and let them grow until they flower and produce seeds. After flowering, the seedpods first appear green in color and are very soft. For your seed harvesting, you have to wait until the seedpods change to a brown color and get harder. Harvest the seeds in the afternoon when it is dry to avoid your seeds getting moldy in storage.

Storing the Seeds

It is important to store the seeds in a dry and cool place. If they are stored in a moist place they will become moldy, and if they are stored in a too warm place, they will dehydrate and die. Best is to keep them in a cloth bags or paper envelopes. Make sure to label them with the name of the plant and the date you collected the seeds. Otherwise you may not remember what is in your storage.

Crop Rotation

Crop rotation is important for your garden's health and quite easy to implement. Every different crop takes out different nutrients from the soil and attracts specific pests and diseases. By planting your crops in a different plant bed in the following year / season, you prevent re-infection with the same pests or diseases and retain strong plant development. Avoid planting crops of the same plant family in the same bed again.

The main crop families to be rotated are:

Acanthaceae	La sa bee
Amaranthaceae	Dok saam pi
Amaryllidaceae	Garlic, Onions
Apiaceae	Coriander, Dill
Brassicaceae	Chinese Cabbage
Caricaceae	Papaya
Compositae	Dok ta ven, Lettuce, Marigold, Zinnia
Convolvulaceae	Sweet Potato
Cucurbitaceae	Pumpkin
Iridaceae	Van jod
Lamiaceae	Basil, Mint
Leguminosae	Beans
Plantaginaceae	Yar en yeud
Solanaceae	Chili, Eggplant, Mak dith, Tomatoes

During summer school break, do not leave your bed's soil uncovered. The full sun and rain exposure will reduce soil health. Therefore, grow mixed temporary crops like beans, peanuts, marigolds, sweet potatoes or herbs. With these, it is not a problem if there are weeds. At the beginning of the new season you can use all this green material to make compost. After clearing the beds add your remaining compost from the previous season to your beds, turn the soil 20-30cm and remove the sweet potatoes.

If it is not possible to grow crops during summer break, cover the beds with compost or any organic material.

Diseases

Plants can become sick, just like humans. There are many different kinds of plant diseases. They can be infected with bacteria, viruses or fungi. Those problems mainly occur when the plants are weak, for example after germination, after transplanting, or when it is too wet, shady or hot. These diseases are spread through water, soil or compost, insects and the gardener's tools. To prevent spreading infections, burn infected plants (do not put them on the compost !), clean your tools with strong alcohol (lao lao works well), use fresh water when watering your plants, add lime to the soil diseased plants were growing in and rotate the location of your crops each season.



Plant infected with fungi
Plant infected with bacteria



Plant infected with viruses



Insects in the Garden

Plants attract many different kinds of insects. Some are pests that eat your plants or suck the plant's sap. Some even transfer plant diseases or spread infections. But not all insects are pests ! There are also many beneficial insects that help pollinate flowers and others that hunt and eat pests.

Finding some pests in your plants does not mean you have to be worried. Those pests will also attract beneficial insects. In an organic garden, try to avoid using insecticides. It is best to maintain a balance between pests and beneficial insects. Often in the early days of a garden, pests develop more quickly than their predators, beneficial insects. They then can become a serious infestation and you may have to fight them with natural pesticides. In case you find both pests and beneficial insects in your plants at the same time, it is best to let the predators do their job. This is more ecological and less work for you ! Just keep observing your plants and insects and make sure there is a balance between pests and predators.

The following two chapters give you an overview about common garden pests and beneficial insects.

Common Pests



Slugs and Snails

Both have slimy, soft bodies. Snails have a shell, slugs have not. They favor seedlings and soft leaf plants. Since they are most common at night, their movements can be tracked by the silvery slimy track they leave behind. The best methods to deal with these pests are organic control. For example, snails and slugs love beer ! If you set out small dishes with 2cm beer in the morning, you can collect many slugs from the dishes.



Caterpillars

Caterpillars are the larvae, baby forms, of butterflies and moths. Most of them make “loops” or little arches as they crawl. Often caterpillars are found on cabbage, chewing the leaves. Caterpillars can be easily collected by hand and returned to nature, somewhere apart the garden. Be careful, there are some hairy caterpillars that are poisonous, so try to use a tool and not to touch them directly.



Weevils

Weevils have a characteristic long curved nose. They are about 1cm long and grey brown. The larvae, baby forms, are slug-shaped. They chew holes in leaves, root vegetables and plant tops. The weevil works at night and sleeps in the soil during the day. Weevil and caterpillar damage is similar. Weevils are hard to fight. One way is to place a pot filled with organic matter and soil upside-down. This way the weevils can be attracted to stay there during daytime and it's easy to collect them.



Aphids

Aphids can be green, black, brown, and even orange and are about 2-5mm long. They multiply rapidly in warm, dry weather. The cast of the aphids contains sugar, which attracts fungi to grow on the leaf. Ants also like this sugar cast. The ants then protect the aphids from beneficial insects and carry the aphids to other plants. A small aphid infestation you spray with warm water or wash the infected areas of the plant by immersing it in a solution of soapwater.



Whiteflies

Whiteflies are tiny white insects that are only found on the undersides of leaves. They fly out in clouds if disturbed. The easiest way to detect them is to softly shake you plants and watch if any whiteflies fly out. Wipe the insects with your fingers and check the plants regularly every 3-4 days. The baby whiteflies are so small you cannot see them with your eyes. After 3-4 days they will have grown to a recognizable size and you can fight them again.



Scale Insects

There are many varieties of scale insects. They move a lot when they are young, and then the adult scale insects rest on leaves and branches, either alone or in groups. They are basically sap-sucking insects that leave yellow patches on leaves. They also cast sugar, which attracts fungi and ants. Use a soft brush, soap and water to remove scale insects. Be careful not to damage leaves. You can also use a solution of one-part water to one-part lao lao. With a serious infestation you might have to repeat the treatment.



Mealy bugs

Mealy bugs are a common pest, little oval shaped, grey-white fluffy-looking, wooly insects, and are 2-5mm long. They are often found on the underside of leaves and new growth. Like aphids, they also secrete honeydew. Use a cotton swab and clean the infected areas of the plant with soap to remove the adult mealy bugs in case of minor infestations. With serious infestation you might have to repeat the treatment.



Red Spider Mites

Red spider mites are hardly visible to the human eye (0,5-1mm), but you can spot them by the web-like film on the underside of leaves and the yellow to white leaf surfaces. They are sap-sucking insects and destroy leaf cells. This results in the leaves yellowing and dying. Spider Mites need dry air with a low humidity to breed. In the morning time mist the tops and undersides of leaves regularly in dry-season to prevent infestations.



Thrips

Thrips are very tiny winged insects (0,2-1mm long) and grey-ish in color. They usually settle on the underside of leaves. They scrape the leaf surface for sap, which causes silvery zones with tiny black spots on the leaf. Use organic insecticide like garlic-solution to fight them.



Rats and Mice

Rats and mice can be very destructive as they enjoy eating plants, fruits and seeds. Don't put any meat or fish on your compost, which attracts rats and mice. Cover and protect your compost so they cannot reach it. If you have problems with rodents, use traps to catch them. Avoid using rat poisons, because these are harmful to plants and to humans!

Beneficial Insects

Adult



Larva



Ladybugs

Ladybugs are about 5mm long. They are small and beautiful bugs. There are many different kinds of ladybugs. They vary from yellow, to orange, to red, to black. They eat aphids or scale insects. The ladybug larvae are especially effective at getting rid of these pests. When you find larvae on your plants do not use any insecticides, because the ladybugs will do the job for you.



Lacewing Flies

Lacewing flies become about 1,5cm long, are green and have filigree wings. The larvae are like miniature monsters. Both adults and larvae hunt scale insects, aphids, mites, mealy bugs, thrips and whiteflies. The larvae are very hungry and can eat up to 60 pests per hour.



Hoverflies

Hoverflies are a large beneficial insect family. Some are fat and look like bees. Others have a narrow waist and look like wasps. The adult flies hover in the air and eat pollen or nectar. Their larvae very effectively prey on aphids. One larva can eat about 900 aphids before becoming adult.



Small wasps, so called Ichneumonidae

here are many different kinds of these wasps. They can range in size from 1,5mm to 50mm, though most are tiny. Their color is often black to brown. The wasps are slender, have a pinched waist and clear wings. They can be parasites to aphids and caterpillar by laying their eggs in the bodies of the pests. When they hatch, the larvae feed on the pests.



Assassin Bugs

Assassin bugs grow up to 12mm long. They are black, brown or green, have large eyes on a narrow head, and have large front legs with spines for grabbing prey. They prey on aphids, caterpillars, beetles, leafhoppers, and other insects.



Pirate Bugs

Pirate bugs are very small, about 3mm long beetles. Both adults and larvae prey on thrips, aphids, mites and caterpillars. They prefer thrips, and each adult can eat 5 to 20 thrip larvae per day.



Ground beetles

There are many different kinds of ground beetles. Adults are up to 2,5cm long, fast moving, and an iridescent bluish-black color. They hide under rocks and other objects during the day. They are mostly carnivorous, especially hunting caterpillars and snails, and they prey on aphids, springtails and mites.

Natural Pesticides

Natural pesticides are an organic, cheap and effective way of controlling pests.

They can be made from a variety of different ingredients that are easy to get.

Not using chemicals is better for the environment, for the pocket, for the gardener and for the people eating the harvest. When spraying your plants, take care to spray the bottom of the leaves. Many pests hide there.

Chili / Garlic Spray

Pests it affects / controls: Caterpillars, thrips, red spider mites, whiteflies, grasshoppers, ants and termites.

This spray is the best for all insects apart from aphids (use soap for them) !

How to make: Mash 1 kg chili, 1 kg garlic and 1-2 tobacco leaves. Add 1 liter lao laao and leave for 1 week. Now gain the liquid by filtering it with a piece of cloth. If you don't have tobacco leaves you can also use 2 cigarettes.

Soap Spray

Pests it affects / controls: Aphids, Thrips, Red Spider Mites, Whiteflies

How to make: Mix 30 ml liquid soap, 30 ml lao laao with 1 liter water. This mixture you can use right away. Shake well before using it.

Lao Lao Spray

Pests it affects / controls: Slugs and snails, worms, red spider mites

How to make: Mix 1 liter of lao laao with 0,5 liter lime juice (5%), 0,5 liter Bio-extract and 0,5 liter of sugar water. Leave for 1 day and store up to 6 month at a dark, cool place. To spray add 10 ml (1-2 tablespoons) to 10 liter water.

WHAT IS IN YOUR GARDEN

Your school garden can have a combination of food plants, medicinal plants and decorative plants. Therefore, you, the teacher and the students, have a lot of choices ! In the chart below you can see all the recommended plants. In the appendix are the plant information sheets for each of these with information about nutrition, caring for the plant, harvesting, propagating, recipes and other uses.

Medicinal Plants

In nature there are many different plants for medicinal use, and there are many traditional ways to use each. Ordinary diseases such as diarrhea, colds, and insect bites may easily and effectively be treated. It is important to preserve the knowledge of these plants and their unique uses in Laos, and in the school garden, the children may be inspired to pursue a deeper understanding of this particular aspect of their culture.

Flowers and Insects

A garden is not only for work and health of course ! It also offers a place of beauty and recreation. Flowers in your garden attract beautiful insects like butterflies and bees. Cut flowers can be used to decorate classrooms, can be made into necklaces, can be handed as a bouquet to a beloved teacher or parent, and can be used for merit making, including Marigold, Gomphrena globosa and Zinnia.

Vegetables, Herbs and Fruits

A variety of vegetables, herbs and fruits ensure a well balanced diet for children. When the school garden is not very big, you may be able to provide snacks, but will not be able to provide the full amount for each child's diet. However, the garden can give children and their parents ideas for increasing the variety of cooking ingredients and striving for a balanced diet. Examples are: Papaya, Tomato, Basil, Coriander, Dill, Garlic, Spring Onion, Chinese Cabbage, Lettuce, Sweet Potato, Long Bean and Pumpkin.

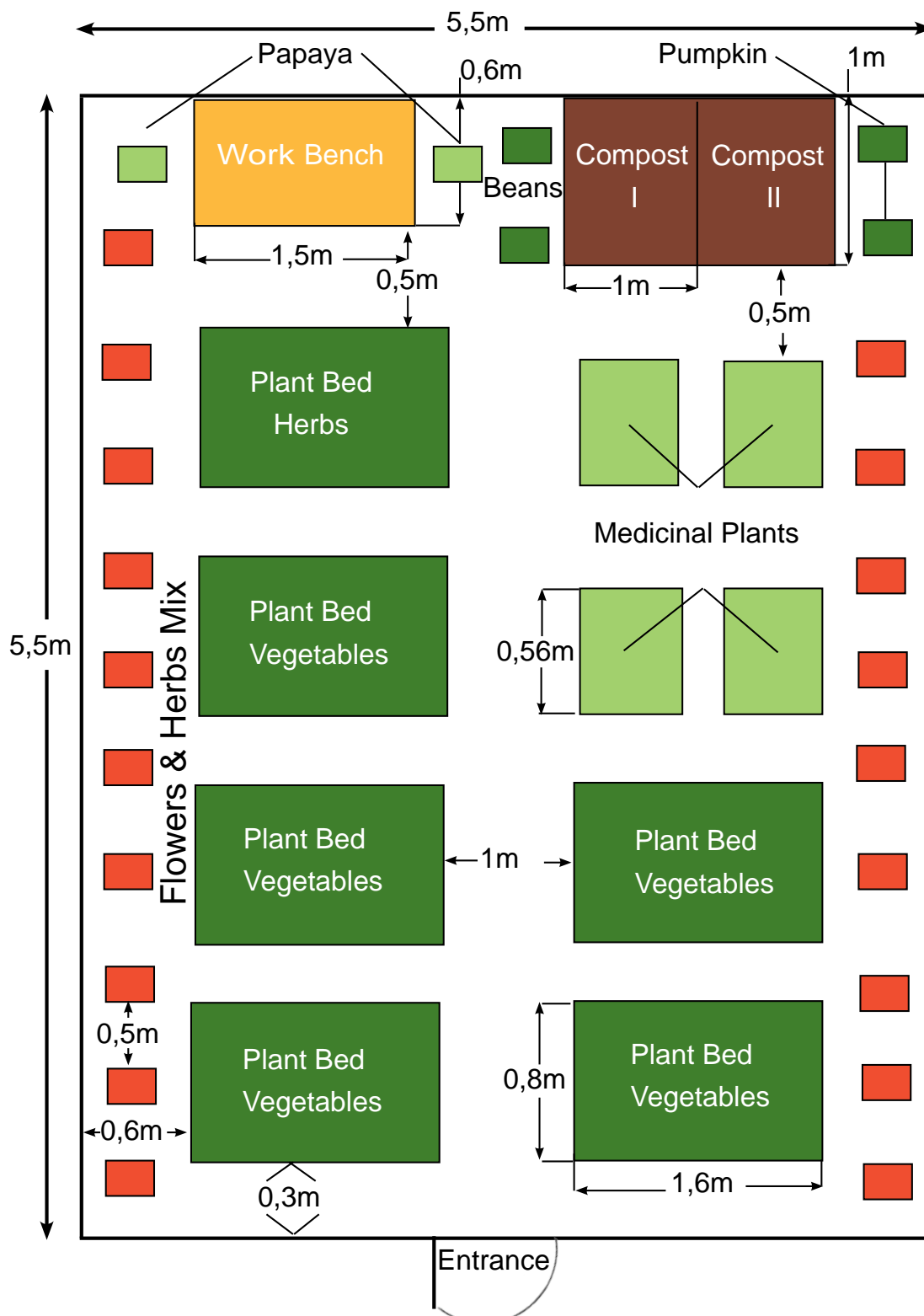
Medicinal Plants

Name	Medicinal properties	How to make remedy
ຫວ້ານຈອດ (Van jod) <i>Plantago major</i> Yahuar piripiri	Helps stomach ache, diarrhea, heals wounds, promotes the appetite, strengthens the blood, nourishment	Stomach ache / diarrhea: Use bulb (if dried 3g, if fresh 25g). Boil in water. Drink two times a day, morning and evening. Wounds: smash fresh bulb and smear directly on skin. Boil in water. Promote Appetite: pickle with alcohol.
ດອກຕາເວັນ (Dok ta wen) <i>Helianthus annuus</i> Sunflower	Cough, bleeding wound, stomach ache and urine problems	Treating a cough - use the seeds, fry them until they get brown and then put them in a cup of hot water and drink it like tea. Bleeding wounds: use the axle inside the stem, pound it and then cover the wound with it. Stomach ache and stimulate urination: use the roots, chew a fresh root or boil it in water and drink until you get better. Warning: not for use by pregnant women !
ຫຍ້າເອັນຍືດ (Yar en yeud) <i>Eleutherine bulbosa</i> Greater plantain	Stops itching from insect bites, and keeps ligaments and muscles free from stiffness, urine problems, blood pressure, ulcers	Insect bites, ulcers: Rub leaf juice, and leaf directly on the skin. Others: use whole plant. If dried 3g, if fresh 25g. Boil in water. Drink two times a day, morning and evening.
ໝາກດິດ (Mark dit) <i>Solanum spirale</i>	Addresses symptoms of food poisoning, sore throat and malaria	Combine root and lemongrass, mix with cold water and keep it for about 15 minutes before drinking. Sore throat: chew leaves or boil them in water and drink like a tea. Symptoms of malaria: use the whole dry plant. Cut in small pieces and dry in the sun, then boil in water (3 grams per 1 liter of water) and drink as much as you want.

Vegetables, Herbs and Fruits

On this page you find a plan how to make your garden on a size of 30 square meters, if you have more space and time you can make it bigger of course, but make sure all the different elements find their proper place.

All the information on how to take care of the Vegetables, Herbs, Fruits and Flowers can be found on the separate plant sheets at the end of this manual.



Nutrition - Healthy Diet for School Children

As the students work on their garden and learn about growing things, they should also think about their own growth. It is important that they understand why they need to eat healthy food.

First, they need to understand that good food makes them grow taller and stronger, and that their brains also need good food to become smarter. They can see that feeding the plants in the garden makes the plants bigger and stronger as well. Measuring the growth of both plants and students can help them to understand this.

More comparisons can be made between healthy plants and healthy children. As the students learn about the pests and diseases that can harm plants, they should also be learning that a strong healthy body will not get sick as often and that some illnesses can be prevented by eating good food.

A good exercise will be to compare the results between two groups of plants, one grown with bio feed and compost and the other group grown without. The underfed plants will be less green, have more pests and diseases, be smaller and produce less.

Children can make comparisons about how they feel if they try to play sport or do work when they have not had enough to eat. They also find it difficult to concentrate in school and so they perform badly and often drop out of school early because they feel discouraged.

Poorly nourished children are more likely to become sick, develop slowly and fail to achieve their potential, so it is very important that nutrition is not forgotten and that children get the best start in life to help Lao become stronger.

The teacher can organize activities to teach children about nutrition, based on the following information about foods, the nutrients they contain and the benefits for their health. Talking about what nutrition does for the body and how it works is easier when we compare growing bodies with growing plants. Some plant nutrients help make leaves darker and green, some help increase the production of fruit. Schoolchildren can make lists of the foods they eat and what those foods do for their bodies.

Calcium is good for bone growth. Iron-rich foods are important in preventing anaemia. Teenage girls and childbearing women need extra amounts of iron and folate. Iron from plants is better absorbed if eaten with Vitamin C. For healthy eyes and good vision, growing children need Vitamin A. This vitamin is also good for the skin and for fighting infections. Oil must be included in the diet to be sure that the Vitamin A is easily absorbed. Many children do not eat enough foods that are rich in zinc, like meat and fish. Zinc is necessary for the body to function properly.

Children need more vitamins and minerals than adults because they are active and they are growing - not only their bodies, but their minds as well.

Using the above information and the lists of foods and the nutrients they contain, students can create posters for the classroom featuring the foods, the nutrients they contain and the benefits they have for health and then create ideal diet plans. This way they can see the direct benefits of the food they eat and the garden they are creating. Children should have three meals every day and occasional healthy snacks for energy. Breakfast is particularly important if the children have a long walk to school or have to help with housework in the mornings. Rice, noodles and sweet potatoes are all good breakfast foods. Eggs, starches and vegetables are good lunch foods, and foods from the school garden can add fresh nutrition. The evening meal is usually the biggest meal of the day and should be a good mix of different foods, including starches, meat or fish and vegetables.

It's important to know that hungry children are healthy children and they should eat for their strength and not scolded for being greedy if they want to eat a lot.

Of course, fat children are not healthy children, so while it is important to eat, the point must be stressed that children should eat the right foods. Eating very sweet, salty and fatty foods is bad because there is little nutrition in these foods and they are fattening, promote tooth decay and provide only empty calories and potential health problems.

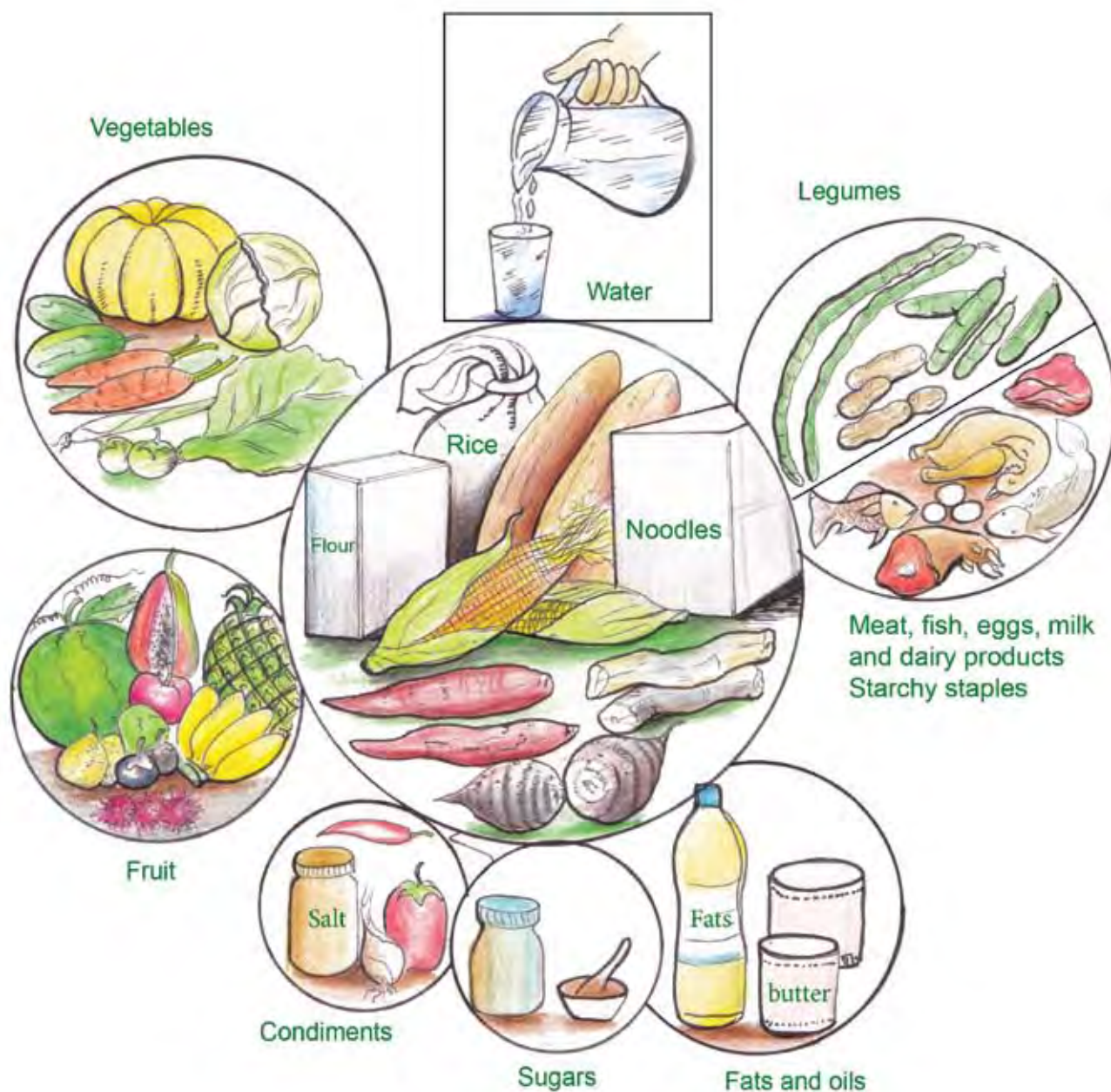
Which nutrients we get from our garden and which ones from other sources?

Having a garden to grow food provides a good opportunity to teach about basic nutrition and which foods make our bodies healthier. Knowing about which nutrients are found in which foods will help students make better food choices.

There are five main groups of nutrients including carbohydrates, fats, proteins, minerals. Some give our bodies energy, some are good to help prevent disease and some are good for helping young bodies to grow. Sometimes it is necessary to eat different nutrients at the same time to make it easier for the body to use the nutrients. And some foods fill our stomachs to make us feel full, but don't have many nutrients.

The first group, carbohydrates, is one of these. It includes starches like rice, beans, bananas and potatoes, sugars like honey, sweetened foods and sweet fruits and, thirdly, fibre, as in beans, vegetables and whole grains (unrefined). They are good for filling the stomach and for providing energy. Fibre helps to keep our systems working well and processing what we eat. But if we do not exercise enough, and eat them with other nutrients, these foods can make people fat and tired.

Fats often make food taste better but can also make people fat if they eat too much and are bad for the heart. Some are healthier than others. Good fats include vegetable oils, oil from whole grains, nuts and seeds, and fatty fish. People should not eat as many of these fats: butter, coconut and meat.



For longer lasting energy and building growing bodies, students should eat proteins. Often these are expensive, like buffalo and pork, but there is also plenty of protein in birds (chicken and duck), fish, eggs, beans, peas, nuts, soybeans and there is also a small amount in grains like rice. These foods also provide zinc, and this nutrient is found in insects, too, so these foods are extra good for you.

A lesson in eating the right foods together is provided by the mineral iron. It is easy for the body to absorb iron from liver, blood, red meat and breast milk. However, it is more difficult for the body to get enough iron from grains, beans and dark green leafy vegetables unless they are eaten together with meat, liver, chicken, fish or foods that have a lot of vitamin C, like oranges, lemons and tomatoes. Combining different types of

foods makes the nutrients easier for the body to use.

Colour can be important in identifying good sources of vitamins, like vitamin A. It is found in yellow and orange sweet potatoes, carrots and pumpkins, yellow corn and bananas (if we eat a lot of them) and also in dark and medium green leafy vegetables like spinach and morning glory. If the leaf is very dark, there will be more vitamin A, very light green like cabbage and there will be less vitamin A. This vitamin is also found in dark meat like liver and kidneys, egg yolks, and whole dried fish.

Vitamin C is the vitamin we all need to keep immune systems working and the key to this nutrient is that the sources must be fresh and uncooked. Vitamin C will disappear quickly so students need to understand that fresh fruits like oranges, guava, lemon, and pomelo are better than fruits from a can or in juice. Fresh green leafy vegetable, tomatoes and sweet peppers are also good for vitamin C but only if they are not cooked. Vitamin C is also found in fresh milk and breast milk.

Folate is another important nutrient that can be found in products from the garden. Beans and peanuts, dark green leafy vegetables are good sources along with liver, kidneys, eggs and breast milk. This is an important nutrient for pregnant women and helps their babies develop in a healthy way.

LESSON PLANS & GAMES

In this final section, you will find a variety of lesson plans. You can follow these exact plans, adapt them to your class, or create your own ! These are simply different ideas for using the garden as an extension of the classroom and another place for learning.

The garden can be used to help teach many subjects, from environmental subjects to math and writing lessons.

WRITING AND DRAWING

Parts of the Plant

Describing Taste

Senses in the Garden

MATH AND SCIENCE

Comparing Carrots (or another root vegetable, such as sweet potato)

The Importance of Topsoil

Why Do We Weed ?

Estimating Garden Measurements

GAMES AND ACTIVITIES

Garden Tag

"I Can Compost !" Game

"Yes, No, Maybe" Compost Game

Parts of the Plant

Objective: To understand the great variety of different parts of the plants we eat

Procedure:

1. Have students draw a basic diagram of a plant such as the bean plant below:
2. Label the following on the plant: seed, stem, root, leaf, flower, fruit.
3. Discuss with the class different plants that we eat and place them into the categories:
Foods we eat that are roots
Foods we eat that are stems, leaves, flowers, fruit, etc.



Below are some possible answers:

- a. Roots: Onion, carrot, potato, radish, sweet potato, beet, turnip
 - b. Stems: asparagus, bamboo shoots, bok choy, broccoli, celery
 - c. Leaves: Parsley, cabbage, spinach, lettuce, watercress
 - d. Flowers: Broccoli, cauliflower
 - e. Seeds: Lima beans, kidney beans, pumpkin seeds, sunflower seeds, peas, corn
 - f. Fruit: Apple, grapes, cucumber, banana, pumpkin, squash, pepper, berries, eggplant, mango, papaya, tomato
4. Have students discuss and write about their favorite part of the plant to eat.
Do they like roots the best ? Leaves ? Fruits ? Why ?

Describing Taste

Objective: To get students to try new / healthy foods, to work together and to trust each other. To practice writing and describing foods.

Materials: Sliced up fruits, vegetables and herbs

Procedure:

1. Harvest a variety of foods from the garden. You can also include samples of foods that are not grown in the garden to see if the students can tell.
2. Split the students into pairs or small groups and blindfold one child.
3. Have the seeing student feed samples to the blindfolded student. The blindfolded student has to try to guess what they are eating.
4. Switch after a few minutes.
5. When both partners have tasted, have the students try to find what they tasted in the garden.
6. Ask the students to pick a sample of food that they liked the best and to write and describe why they liked it:
What did it taste like ?
Why did they like it ?
When might they want to eat it again ?
What dish might be delicious with this food ?
What might make this food healthy for you ?
7. Students may also wish to draw a picture of their chosen food sample.

Senses in the Garden

Objective: To have students explore the garden and exercise all their senses

Procedure:

1. Have students list or draw three things in the garden that they
 - a. See
 - b. Hear
 - c. Touch
 - d. Smell
 - e. Taste (if appropriate)
2. After students have had plenty of time to explore, have them discuss or write about what did they like best ? What will they remember from this visit ? How is it important to use all of these senses when taking care of the garden ?
For example: some diseases might be easier to identify through smell or touch than simply through sight.



Comparing Carrots (or another root vegetable, such as sweet potato)

Objective: To practice measuring techniques and to practice critical thinking.

Materials: Carrots with the leaves still on, rulers, string

Procedure:

1. Harvest some carrots. Try to get a variety of leaf length in the samples you collect.
2. Using the ruler, measure the carrot and use the table below to record your findings.
3. Measure the lengths of the leaves and then the lengths of the carrots.
4. Measure the diameter of the carrots by wrapping the string around the top (leaf end) of the carrot and then measuring how much string it takes to go around. Then measure around the bottom.
5. Have students discuss if there is a relationship between the different measurements. For example, if it has long leaves, what might we guess about the length of the carrot ? If the diameter is large, what can we guess about leaf length ?
6. You could also try making a graph or chart that shows the relationship between leaf and carrot length.

Leaf Length	Carrot Length	Top Diameter	Bottom Diameter

The Importance of Topsoil

Objective: To teach students the importance of topsoil, the amount of topsoil we have and why we should care for it.

Materials: Apple, sharp knife

Procedure:

- Start by explaining: *“All around the world, topsoil is being swept away every year by erosion. Topsoil is the top layer of soil that has important nutrients. Erosion is when water and wind wear away soil. Topsoil is essential because we need it to grow crops and plants to eat. Erosion takes away the topsoil that we need.”*
- Ask students to discuss: *What else do you know about soil ? What is it ? Why do plants need it ? How does it help humans ?*

Apple Demonstration:

Show students the apple, explain: *“Let’s say this apple is the Earth.”*

1. Cut the apple into quarters and set three quarters aside.
“Three quarters of this apple represent all the oceans on Earth. The remaining quarter represents all the land on Earth.”
2. Cut the remaining quarter in half and set one piece aside.
“One half of the land is unfit for humans; it is either too hot, like a desert, or too cold, like the north and south poles.”
3. Cut the remaining piece into quarters and set three of them aside.
“Of the land that humans can live on, only this small piece is land that we can grow food on. The rest is too rocky, or there isn’t enough sun for plants to grow.”
4. Peel the remaining piece.
“This thin peel represents the thickness of the soil in which we grow our food. It is only about three feet deep. This tiny portion is the only area out of the whole Earth where all the right conditions exist to grow food. Enough food has to be produced on this small bit of land to feed ALL the people on Earth.”

Have students discuss or write about the following questions:

1. Why is topsoil important in our world ? (Possible answers: We use topsoil to grow food and plants; plants convert carbon dioxide into oxygen for us to breath.)
2. How does healthy topsoil affect our lives ? (Possible answers: Without healthy topsoil we would not be able to grow food to eat.)
3. With so little soil in the world, what should people be doing to take care of it ? (Possible answers: Plant cover crops to minimize erosion; make sure the soil stays moist but not muddy; dry and dusty soil will blow away.)

Why do we weed ?

Objective: To understand how weeds affect plant survival by taking water and nutrients from the soil that the plants need to grow.

Procedure:

1. Have students brainstorm what are weeds and why weeds might be bad for the garden and list ideas on the blackboard.
2. Explain:
"Weeds are plants that grow where they are not wanted. Weeds take nutrients and water from the soil that other plants need to survive. Think about your favorite snack sitting in front of you, and you are so excited to eat it, and then, oh no ! Someone else takes your snack away before you can eat it. Weeds do the same thing. They grow near plants so they take the water and nutrients from the soil before the plants get to it. As weeds grow and their roots extend deeper into the soil, they take more and more of water and nutrients that plants need to survive."
3. Take students out to the garden and demonstrate weeding. Point out that the weeds have roots and leaves just like the other plants and that they use the roots the same way - to get water and nutrients to grow and survive.
4. If possible, observe the plants around the weeds and compare them to plants in places of the garden where there are no weeds.
5. Have students discuss / write / draw a weed. What does it look like ?
How does it affect plants? What might happen to the plants around weeds as the weeds get bigger ?

Estimating Garden Measurements

Objective: To reinforce the concepts of centimeter and meter by measuring objects in the garden; to interest students in the fruits, herbs and vegetables growing in the garden.

Materials: Centimeter / meter sticks made from bamboo, pencils and paper

Procedure:

- Use sticks made from bamboo that measure about one meter and about 1-10 centimeters long. Explain to students that they will use the sticks to measure objects of different lengths. Students may brainstorm about things they'll find that are short and small (1-10 centimeters) and longer and larger (1 meter).
- Find at least three objects in the garden that are about 1 to 10 centimeters long. First, guess what you think the length is. Then record the real length. Do the same for at least three objects that are about one meter long.

Object	Estimated Length	Actual Length

Challenge:

- Find a very tall plant in the garden. What is the name of the plant ?
- Write three words to describe it. (Color, shape of leaves, flowers...)
- Without using a measuring stick, estimate its height in meters and centimeters.
- With measuring stick, record the plant's height in meters and centimeters.

“I Can Compost !” Game

Objective: To review what items can be put in compost.

Materials: A ball or other object to toss.

Procedure:

1. On the blackboard or in journals, students list as many items as possible to compost.
2. To star the game, everyone stands in a circle outdoors.
3. A person calls out something that can be composted and the person’s name who the ball is being tossed to.
4. Once students practice throwing the ball, calling out something that can be composted and another student’s name, then place someone in the middle of the circle. This person’s goal is to tag the person with the ball before it is tossed. If tagged, that student changes places with the one in the middle.
5. To make sure all students get a turn, students can sit down after they have named something they can compost and tossed the ball to another student.



“Yes, No, Maybe” Compost Game

Objective: To review what items can be put in compost.

Materials: Three paper signs (Yes, No, Maybe), Scrap paper

Procedure:

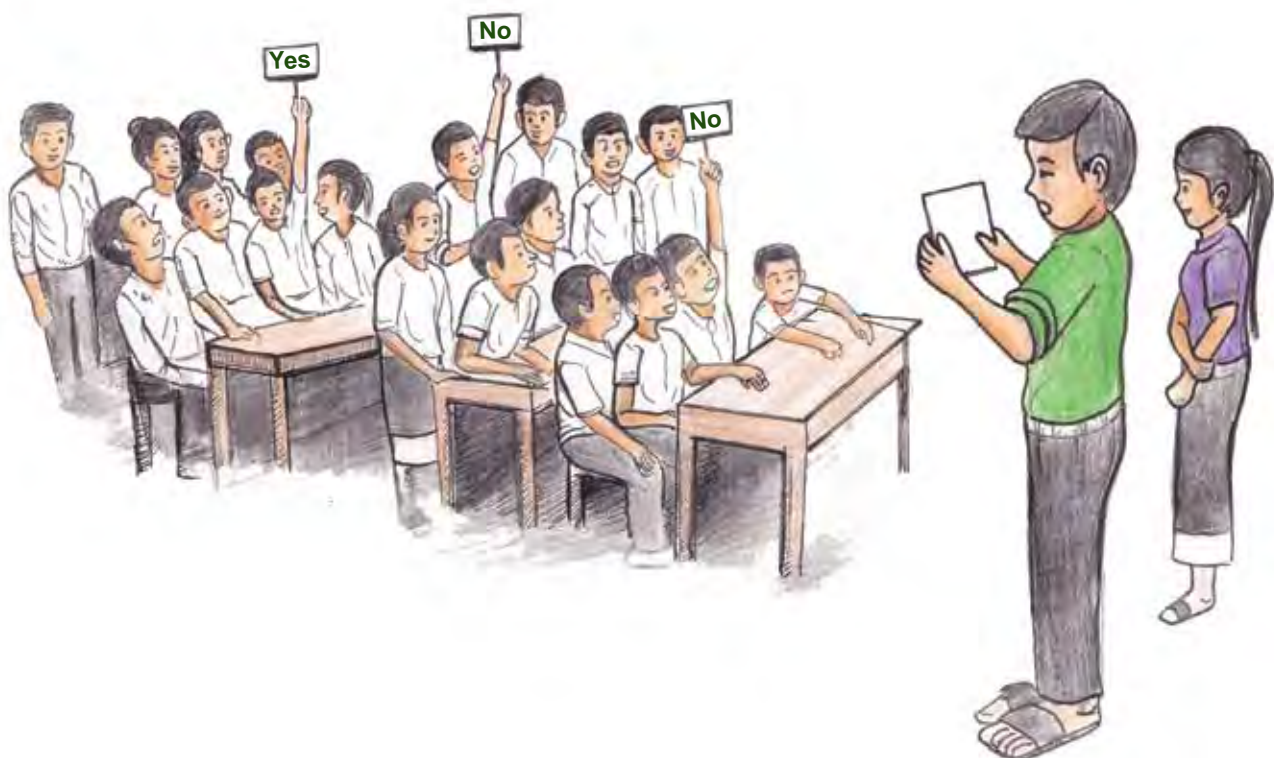
1. Have students think individually about what types of waste you can put into a compost bin. Write or draw one item per piece of scrap paper.
2. In groups, discuss what types of waste can be composted or not and why
3. As a class, place each piece of paper under the appropriate heading card (Yes, No, or Maybe) and discuss why.
4. Can combine with a practical demonstration of adding waste to compost bin.

Samples:

Yes: Grass and weeds, chicken and buffalo manure, feathers, coffee grinds, vegetable waste from the kitchen, paper, cardboard, wood chips, straw and rice husks, dead leaves, cotton cloth, soil

No: Cooked meat and fish, large bits of wood, plastic metal, glass, wire, nylon, synthetic fabrics, coal ash, seeding grass, tough weeds, dairy products

Maybe: Cloth (depends on the kind), wood (depends on the size), weeds



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Teacher's Manual

Primary School Garden

Plant Information

Ya en yeurd
Plantago major
Greater Plantain



Nutritional Value:

Plantains are rich in beta carotene, vitamin B, and vitamin C, which all nourish the body and help fight illness.

How to Make Remedies:

For insect bites and ulcers, use fresh leaf juice or mash fresh leaf directly onto the skin. For ligament and muscle pain, gonorrhea, urine problems, and blood pressure issues, use the whole plant. Boil 3 grams of dry leaves or 25 grams of fresh leaves in water. Drink two times a day, morning and evening. For bleeding gums, rub leaves and press them on the wound.

Time Frame:

Plantains are perennial plants. If grown under good conditions, including adequate humidity, it will flower and produce many seedlings on its own. Under poor conditions, the plant will not flower and will die after about 10-12 months.

How to Take Care of It:

Plantains are easy to cultivate. They can grow in full sun or shade, and they grow quite quickly. Water the plants once a day. Turn the soil and add compost once a month.

Harvesting:

It takes 2-3 months until young leaves can be harvested, and seeds may be harvested after 3-4 months. Harvest seeds at noon when it is dry.

Propagation Instructions:

Greater plantains are very easy to cultivate. They like high air humidity and can be propagated using seeds.

Other Uses:

You can eat the fresh young leaves with chili sauce or in laap.

Varn jord
Eleutherine bulbosa
Yahuar Piri Piri



How to Make Remedies:

For stomachaches, diarrhea and urine problems, use the bulb. Boil 3 grams of dry bulb or 25 grams of fresh bulb in 1 liter water. Drink this tea twice a day, morning and evening. For wounds, smash a fresh bulb and put it directly on the skin. This treatment shrinks and quickly dries the wound. To maintain good blood flow and increase the appetite, pickle the whole plant with alcohol.

Time Frame:

Yahuar piri piri take 1-4 months to grow. After four months, the leaves of the plant diminish and the plant enters a phase when it stops growing. This is a good time to harvest the bulbs.

How to Take Care of It:

Yahuar piri piri likes loose sandy soil with good drainage. Water each morning and each evening. Weed and add compost every 10-15 days to give sufficient nutrients and help the tubers grow.

Harvesting:

About 3 months after planting, you will see dry leaves. Take the bulbs out of the soil, wash them, and dry them. You can store them in cool place for about one year.

Propagation Instructions:

Propagate by dividing a tuber and replanting.

Sunflower
Helianthus annuus
Sunflower



Nutritional Value:

Sunflower seeds are excellent source of calories, essential fatty acids, vitamins, and minerals. The seeds are mainly used to make the edible oil sold all over the world. Humans and birds eat the seeds as delicious snacks alike!

How to Make Remedies:

For treating a cough, use the seeds. Fry them until they get brown, and then put them in a cup of hot water and drink as a tea. For bleeding wounds, use the axle inside the stem. Pound it and then cover the wound with it. For stomachaches and urine problems, use the roots. Chew a fresh root or boil it in water and drink until you feel better. Warning: Pregnant women should not use these remedies!

Time Frame:

After planting, it takes 2-3 months to bloom. After 3 months, you can start collecting seeds.

How to Take Care of It:

Sunflowers grow quickly, and they like good drained soil and full sun. They do not like soil that is too moist, so just water one time per day. Sunflowers need a lot of nutrients to produce flowers and seeds, so twice per month mulch with compost. This adds nutrients and controls weeds at the same time.

Harvesting:

When the sunflowers are three months old, the flowers will change to a brown color. This is a very good time to do the seed harvest. Lay the seeds in the sun to dry them for 2-3 days, and then keep them in a cool and protected place to prevent insects and rats from eating the seeds.

Propagation Instructions:

Sunflowers can only be propagated using seeds. The seeds germinate quickly and easily. You can propagate in trays, pots or nursery beds. After 10-12 days, you should transplant the seedlings. The end of rainy season is good time to grow them (August to September) and in summer, from November to December.

Other Uses:

Sunflowers are a decorative plant, so a lot of people like to plant them. Sunflowers are used to decorate houses, rooms, or tables and are used at wedding parties.

Mark Dit
Solanum spirale



Nutritional Value:

Mark dit leaves contain many antioxidant essential oils with significant antibacterial properties and cytotoxic properties that may fight cancer cells.

How to Make Remedies:

To treat food poisoning symptoms, rub roots and lemongrass, add cold water and keep it for about 15 minutes before drinking. For sore throats, gum leaves or boil them in water and drink like a tea. To treat symptoms of malaria, use the whole dry plant. Cut in small pieces and dry in the sun, then boil in water (3 grams per 1 liter of water) and drink as much as you want.

Time Frame:

Mark dit is a perennial plant, so you can let it grow for many years. Weed and add compost regularly. Prune it to get a bushy shape and water regularly so it will produce more leaves and fruits.

How to Take Care of It:

Weed, prune, turn the soil and add compost every two weeks. Water regularly.

Harvesting:

Two to three months after planting, there will be many young leaves. You can start pruning whole branches or collect single leaves.

Propagation Instructions:

You can propagate *Mark dit* in two different ways, by sowing or by using cuttings. For cuttings, choose a stem that is not too young and not too old with many buds, and cut it about 20cm long. Then place the cutting in a pot with compost soil. Keep the soil wet and place the pot in a shady area for about three weeks.

If you propagate using seeds, choose the healthy and ripe fruits, wash the pulp off the seeds. Lay the seeds in the sun to dry (you can keep the seeds for one year). It takes 25 to 30 days for germination. After another two weeks, start transplanting the seedlings.

Other Uses:

Young leaves can be used in chicken soup to add flavor, but it is a bit bitter. You can eat fresh young leaves in laap, and the fruits can also be eaten.

What Might Go Wrong:

Mark dit is bitter so most of the pests do not like it. However, be careful when you collect young leaves to keep at least 4 or 5 of the top leaves on the plant for fruit production.

Papaya

Nutritional Value:

Papaya is very good for you! Half a slice of ripe papaya has nearly 200% of vitamin C needed by a child each day. Ripe papaya has the most vitamins. It is easy to digest and soothes the stomach. Green papaya has the most protein.



Ideas for How to Eat It:

Eat dried papaya slices as a snack or prepare as papaya salad, the national Lao dish. Press through a wire strainer or clean cloth and add cooled clean water to make juice.

Propagation Instructions:

The plants will grow rapidly to 3-6 meters, so plant at least one meter from trees or buildings. Don't plant in wet soil. Take a ripe fruit and wash the pulp off the seeds and you have to sow the seeds the same day (you can not keep them longer than one day). Sow seeds in very good soil, rich in nutrients. Dig a hole half a meter across and fill with a mix of good compost and soil. Sprinkle about one dozen seeds per bed. Cover lightly with more compost. As they start to grow, pull out smaller seedlings and only keep the best.

How to Take Care of It:

Place mulch around the tree from the stem and out about half a meter. Add animal manure if possible. Water well during the growing months but do not swamp the soil. Trees over three years old can be cut down to about one meter to make harvesting easier.

What Might Go Wrong?

Pests, such as mites, bugs, moths and scale insects, are most likely to attack the fruit when it is nearly ripe; you can tie a bag over each fruit to keep off pests, or pick the fruit when mature and let it ripen indoors away from pests.

Harvesting:

When the fruit starts to turn from green to yellow, it is ready to harvest. Cut the stem close to the tree trunk so that the sharp end of the stalk will not hurt the other fruits. Green papaya can be harvested when the fruit is nearly full size, but its flesh is still hard and white. Off or on the tree, the fruit will ripen quickly, getting more yellow and soft.

Time Frame and Yield:

Sow papaya right away when you start the garden in September, as it takes quite long until the first fruit will be ready to harvest in about 6-8 months. An adult tree will produce about 15 to 30 fruits per year and lasts about 5-8 years.

Other Uses:

Rubbing the juice of green papaya will take away the pain of insect stings. For indigestion or intestinal worms, mix three/four teaspoons of the milky juice of green papaya with the same amount of honey, stir in a cup of hot water and drink.

September	October	November	December	January	February	March	April	May
Growth							Harvest	

Tomato

Nutritional Value:

Tomato has valuable minerals and vitamins A and C, which are all needed by children each day. Ripe tomato has the most vitamins.



Ideas for How to Eat It:

Put fresh or dried tomatoes in salads or with rice for a snack, for example jaew mak len. Cook tomato with fish, meat or beans, in curry, stew, soup, or as a sauce.

Propagation Instructions:

Take a ripe fruit and wash the pulp off the seeds. Dry them and you can keep them for one year. Sow seeds about 2 centimeters apart in a nursery bed. When seedlings are about 2 centimeters high and the base of the stem is purple, transplant them into garden beds about 50 centimeters apart. you can keep the seeds upto one year.

How to Take Care of It:

Tomatoes grow best if branches with heavy fruit are held up off the ground. Tie them loosely to a 2-meter stake. Remove some shoots so that leaves and fruit do not get crowded. Lay mulch around the tree from the stem out about half a meter. Add compost or animal manure to the mulch. Water regularly, but not too much. Tomatoes are susceptible to fungus and bacteria infections. Take care to water the soil and not the plant leaves.

What Might Go Wrong?

Avoid diseases, use clean soil, remove weeds and use mulch on the soil so it doesn't get too hot. Remove and destroy infected plants or fruits to avoid spreading infection.

Harvesting:

Pick the fruit when most of the green color has changed to red or orange. Fruit off the plant will continue to ripe. Fresh fruit can be stored in a cool, airy place for up to 3 weeks.

Time Frame and Yield:

Tomato fruit are ready to harvest 2-3 months after planting. The need warmth to grow, but must have cool nights to set fruit, so the cool season is a good time of year. A plant will produce 10-30 kilograms of tomatoes, and will produce tomatoes for about 2-3 months. Tomato plants easily get sick when they are exposed to rain. So it is best to start planting beginning of December.

Other Uses:

Tomato leaves are poisonous and should not be eaten. Wash your hands after touching the leaves. They can be used for mulch to distract snails and slugs.

September	October	November	December	January	February	March	April	Mai
			Growth			Harvest		

Herbs

Basil, Coriander, Dill, Mint



Nutritional Value:

Leaves of all herbs are rich in vitamins A, B and C and minerals, iron and calcium, especially important for children and mothers.

Ideas for How to Eat It:

Herbs can be added to salads, soups, stews, curries, and other dishes that go with the staple food (such as rice or potato). They add flavor as well as nutrients.

Propagation Instructions:

Dig in animal manure or compost before planting. It is easiest to grow from seeds (Basil, Dill, Coriander), though some herbs can be easily grown from cuttings or runners (Mint).

Therefore, put cuttings into moist soil, place in a shady area for 2-3 weeks and water often.

How to Take Care of It:

Plant them in a sunny, sheltered corner of the garden in raised beds.

Herbs can be planted as companions amongst other garden plants to keep away pests.

Place mulch around herbs to keep the weeds down and keep the soil moist.

What Might Go Wrong?

Herbs are fairly free of pests and diseases. In fact, the flavor and fragrance of most herbs keep away insects, so it is good to have some in any garden.

Harvesting:

To harvest the whole plant, cut the stem at soil level and wash off any dirt. Otherwise, cut or pick leaves or shoot tips.

Time Frame and Yield:

You can plant and harvest herbs all year round, and you can start picking leaves after about four weeks. Ten plants will produce a small bunch of kitchen herbs every day. After some time of collecting the leaves the plants get weak and it is best to sow new plants again. Do not harvest all herbs planted in February, let some flower and develop seeds. Those you can harvest to gain seeds for the next school year. During harvest time you can gain about 100g leaves per week and plant of Basil, Coriander and Dill. Mint grows more quickly, and you can harvest about the double amount - 200 g per week and plant.

Other Uses:

Waste stalks can be used to feed animals, put on the compost, make Bio Extract and spread around vegetable seedlings to keep away pests.

September	October	November	December	January	February	March	April	May
			Growth	Harvest	Growth	Harvest	Growth	Harvest

Chinese Cabbage



Nutritional Value:

Chinese cabbage is high in Vitamin A and Vitamin C. It is also high in fiber, which helps make digestion faster.

Ideas for How to Eat It:

Chinese cabbage can be served raw in salads. It can be added to soups or stir-fried in a small amount of oil.

Propagation Instructions:

You can sow from seeds or plant seedlings. It is easiest to sow from seeds. You can purchase seeds or collect from dried seedpods.

How to Take Care of It:

Plant seeds about 1 cm deep and about 15 cm apart. Water and weed regularly. Use bio-extract and manure when plants are half grown.

What Might Go Wrong:

Insects and fungus can be a problem. Use natural pesticides for insect problems, and treat the soil with lime before planting to prevent fungus.

Harvesting:

Plants will re-sprout several times after harvesting the leaves. Remove the leaves but leave the stump, which will produce more, smaller plants.

Time Frame and Yield:

Chinese cabbage develops best during cool weather. It is fast growing and can be harvested in six to seven weeks. Plants will re-sprout several times. Each plant yields about 300g leaves.

Other Uses:

All parts of the plant can be used for animal feed, to make compost or Bio Extract.

September	October	November	December	January	February	March	April	May
		Growth	Harvest	Growth	Harvest			

Lettuce

Nutritional Value:

Lettuce, especially dark green lettuce, is full of important vitamins and minerals, especially vitamins A, C and K.

Ideas for How to Eat It:

Best is to eat lettuce raw in salads. You can also add it to soups or stir-fry it, but the heat destroys most of its vitamins !



Propagation Instructions:

Lettuce is best to be sown protected in trays as snails and slugs love young lettuce. The seeds need light to germinate, so just cover it with a very thin layer of compost. After germination leave the young plants in the trays for about 2-3 weeks until transplanting them to the beds. On the beds the plant rows and the plants within the row should be at least 30 cm apart.

How to Take Care of It:

Water lettuce regularly. When its water supply is insufficient, lettuce will very quick develop flowers and will get a bitter taste. Snails and slugs are attracted to lettuce, so take care to remove weeds as soon as they appear. Regularly look underneath the lettuce leaves, because the pests tend to hide in the shadows during daytime. You may need to thin out the plants as they grow.

What Might Go Wrong:

Small birds like to eat lettuce. If this is a problem, you can protect them with chicken wire. Use natural pesticides to protect from insects. When it is too hot and the plants do not get watered daily lettuce will very quick develop flowers.

Harvesting:

Lettuce is ready to cut when a firm center has formed. Harvest lettuces by cutting rather than pulling. After the lettuce has flowered, seeds will be ripe in about two weeks. Store seeds in a cool, dry place. But lettuce is pollinated by different plants and the new generation propagated from these seeds can be unsatisfying it is better you buy new seeds for the next season.

Time Frame:

Lettuce should be planted in the beginning of the cool season. It will be ready for harvest in about 45 to 50 days. And can be planted several times per season. Per plant you can yield about 300g.

Other Uses:

All parts of the plant can be used for animal feed, to make compost or to make Bio Extract.

September	October	November	December	January	February	March	April	May
		Growth	Harvest	Growth	Harvest			

Sweet Potato



Nutritional Value:

Sweet Potato tubers are a good source of carbohydrates and are rich in vitamin A. The shoots are a good supply of iron. They are easy to digest, so good for young children and sick people.

Ideas for How to Eat It:

Sweet Potatoes can be eaten as a cooked vegetable, roasted, steamed or boiled. They can be the basis of a meal, or eaten as a snack. Cook pieces of the potato in a stir-fry, curry, stew or soup.

Propagation Instructions:

Prepare 30-40 cm high mounds about 1 m apart in moist soil and mix in green plant material or compost. The quickest and easiest way to grow sweet potatoes is to use cuttings. Cut a piece of a runner, about 30 cm in length. Remove all the leaves except for the tiny leaves at the very tip. Plant the cutting by covering the whole length with soil. Only the leaves of the tip should stick out of the ground. You can also start growing sweet potatoes by planting the tubers. Cut 3-4 cm pieces off the tops of tubers. Put them into damp soil till they sprout and then plant in prepared mounds.

How to Take Care of It:

Mulch and feed the plants with compost every month. Lift the vines occasionally to stop roots growing into the soil. In hot weather give small amounts of water regularly.

What Might Go Wrong?

The sweet potato weevil is one of the worst pests. Sprinkle ash around the plant to keep them away.

Harvesting:

Light harvest of shoots can be done regularly.

Dig tubers when they are big enough. If left growing too long they get fibrous and tough. The cleaned tubers can be stored wrapped in newspaper in a cool dry place for 3-5 months.

Time Frame and Yield:

Sweet potatoes are ready for harvest four to six months after planting. Leafy shoots can be picked after 6-8 weeks. They prefer warm and sunny conditions so do not plant in rainy season. Sweet potatoes like growing in sandy soils, lots of sun and a reasonable amount of water and nutrients. They love heat. The hotter it is the faster they grow. Leaves will yield about 350g per week. The tubers will yield about 2 kg per plant.

Other Uses:

All parts of the plant can be used for animal feed, to make compost or to make Bio Extract.

September	October	November	December	January	February	March	April	May
		Growth		Leaf-Harvest			Tuber-Harvest	

Green Onions and Garlic



Nutritional Value:

Green onions and garlic have valuable amounts of vitamins A and C, and they have an anti-inflammatory effect in gastrointestinal tract.

Ideas for How to Eat It:

Put fresh sliced onion leaves in salads, soups or noodles. Cook onions and/or garlic with rice and vegetable, soups, laab, curries and stews.

Propagation Instructions:

Green onions seeds can be directly sown in the plant beds. Sow about 50 seeds per square meter. Cover the seeds lightly with compost soil, and water carefully after sowing. If necessary, thin out seedlings after germination to about 7 cm apart.

To propagate garlic, break up a clump of bulbs and plant the small bulbs directly into the bed 10 cm apart. They will grow a clump of bulbs from the one bulb you planted.

How to Take Care of It:

Green onions and garlic are low maintenance crops. Water every 2-3 days and do some weeding from time to time.

What Might Go Wrong?

Onions and garlic are fairly free of pests and diseases. If there is too much rain or watering and the soil gets swamped, roots, stem and bulb may rot. Therefore do not put a thick mulch layer around the onions.

Harvesting:

The leaves of green onions can be harvested after about 6 weeks. Waiting 8 to 12 weeks increases the harvest and you get thicker bulbs. Cut lower leaves weekly and leave a few leaves to keep the plant growing. Garlic needs a much longer growth period. It is ready for harvest after 4-6 months. After about 3 weeks stop watering the garlic plants so the leaves get yellow and the bulb grows. Before harvest, loosen the soil a little and pull out the bulbs, but be careful not to damage them. After harvest dry the garlic in the sun.

Time Frame and Yield:

The early harvest of the green onions will yield about 800 grams per square meter; the late harvest will yield about 1200 grams per square meter. Garlic will yield about 1000 clumps per square meter.

September	October	November	December	January	February	March	April	May
Garlic		Growth					Harvest	
Green Onions		Growth		H	Growth		Harvest	

Pumpkin

Nutritional Value:

Pumpkins have a lot of vitamin A and energy. The leafy shoots have valuable protein, iron, vitamins C and A. The seeds are rich in essential oils and protein. Pumpkin flesh is easy to digest and is good for babies, children and sick people.



Ideas for How to Eat It:

Eat pumpkin flesh as cooked vegetable, roasted, steamed or boiled. Cook in soup, stir-fry, curry or stew. Toss flowers into a stir-fry. Leafy shoots can be steamed after peeling off any stringy skin from the stem. Seeds can be dried or roasted.

Propagation Instructions:

Pumpkins need to grow 1-2 m apart. They seeds can be sown directly, so transplanting is not necessary. Plant 2-3 seeds together and after 2-3 weeks of growth thin out, leaving 1-2 in each place.

How to Take Care of It:

The common tropical Asian pumpkin can be grown up a trellis or over a thatched roof. The trellis can be constructed next to the compost area so the roof is 1-1.5 m above the compost and shades it. Most are also happy spreading over the ground. When the vines have many flowers the shoots can be harvested to help set and ripen the fruit. Water regularly. Pumpkin needs a good supply of nutrients, so feed the roots with compost or animal manure each month.

What Might Go Wrong?

Snails, slugs, aphids and some beetles attack the seedlings, but older plants are quite hardy. Mildew attacks the leaves if there is too much rain, shade or cold. Remove old wilted flowers to prevent the fruits start to rot.

Harvesting:

Pick small squash when the fruit is about 10 cm across. Cut or snap the stalk off the vine. Soft squash can be harvested about every 3 days. They dry and wilt fast, so eat them within a few days. Hard pumpkins are harvested when the vine has died off and can be stored in a shaded cool place for up to 4 months.

Time Frame and Yield:

After planting, the first harvest can take place in 2-4 months. It can be planted any time of the year but avoid planting in heavy monsoon season. Soft pumpkins yield a harvest of about 200g every 3 days. Hard pumpkins yield a single harvest of about 8kg per plant.

Other Uses:

A high dose of pumpkin seeds will expel intestinal worms.

September	October	November	December	January	February	March	April	May
		Growth			Harvest			

Long Bean

Nutritional Value:

Long beans are a good source of protein. They contain high amounts of vitamin A and vitamin C and important minerals. They are a great addition to meals!



Ideas for How to Eat It:

The beans can be eaten fresh or cooked. Eat raw as a snack, or add to soups, stir fries and omelets.

Propagation Instructions:

Soak the seeds for an hour, and then plant directly into the beds about 5 centimeters apart in a single row under a trellis. They usually germinate in one to two weeks.

How to Take Care of It:

Beans do not need much compost. They have special roots that collect nitrogen from the air, which other plants have to get from manure or compost. Weed around plants. Water regularly in hot weather, once or twice a week. Since it is a climbing bean, you need a trellis about two meters high.

What Might Go Wrong?

Planting seeds too deeply, dried out or compacted soil and over-watering can prevent the beans from growing. Diseases can build up in the soil from old plants, so do not plant beans in the same place next year. If you have infected plants, destroy them.

Harvesting:

Long beans are best if picked before they reach full maturity. Dry, older beans can be used like dry beans in soup. When harvesting, it is important not to pick the buds that are above the beans because the plant will create many more beans on the same stem. Often, you need to harvest beans every day.

Time Frame:

Beans will start to appear about two months after planting. One plant will yield about 100 grams of beans per week.

Other Uses:

Beans and peas are an essential part of the crop rotation cycle. They put nitrogen back in the soil.

September	October	November	December	January	February	March	April	May
		Growth		Harvest				
				Growth		Harvest		

Chili and Green Pepper

Nutritional Value:

Capsicum contains high concentrations of vitamin C. In the traditional medicine they are used for toothaches, osteoarthritis, rheumatic pains and migraines. Too much chili can cause problems with the bladder and stomach.



Ideas for How to Eat It:

Chili is a very common spice in Laos and can be added to almost any food. Green pepper is good for barbecues, salads, and jaews and can be used in curries and stews.

Propagation Instructions:

Protected sowing in seed trays or pots is best. Sow the seeds 5 mm deep. After 1-2 weeks the seeds germinate. The plants need high temperatures and full sun to develop fully. Transplant them after 2-3 weeks when the plants have developed their second adult leaf pairs. Plant them with a distance of 40-50 cm of each other.

How to Take Care of It:

Capsicum is a very hungry plant. Support it with enough compost soil and water regularly with Bio Extract. Once established, it does not need very much watering.

What Might Go Wrong?

Aphids are easily attracted. Protect your plants from pests by spraying them with an organic insecticide.

Harvesting:

Chili and green pepper can be harvested unripe when they are green or ripe when they become red. They need quite long (about 70 days) from pollination to ripeness. Harvest in the morning. After harvesting chilies, store them in a dry, cool place or directly dry them for a couple of days in the sun. Dried chilies can be stored for several months. The yield per plant varies considerably by type of pepper. Chili will yield between 100 - 400 g per plant, and green pepper between 400g - 2000g. Green pepper cannot be dried and therefore should be eaten within a couple of days, because they quickly get moldy.

Time Frame:

Capsicum is a perennial plant, it grows and produces fruits for several years. But often the plants get tired or serious infections, so it is advisable to propagate new plants each year.

Other Uses:

Many animals do not like chili. With ripe red chili you can produce a natural insecticide to fight caterpillars, thrips, red spider mites, whiteflies, grasshoppers, ants and termites. But do not put the peppers in your compost, because earthworms also do not like chili.

September	October	November	December	January	February	March	April	May
	Growth					Harvest		

Lao-Eggplant



Nutritional Value:

Eggplants are fairly high in fiber and low in calories. The skin of the eggplant has strong antioxidant properties, some may even help with the control of diabetes and hypertension.

Ideas for How to Eat It:

Lao eggplants are used in curry dishes, jaews, and orlam, and they are served raw with traditional Lao dishes like laab and papaya salad.

Propagation Instructions:

Protected sowing in seed trays or pots is best. Sow the seeds 5-10 mm deep. After 1-2 weeks the seeds germinate. The plants need high temperatures and full sun to develop fully. Transplant them after 6-8 weeks. Plant them in full sun with a distance of 40-50 cm between each. At the seedling stage, make sure not to over-water. Nothing can damage a young eggplant like too much water.

How to Take Care of It:

Eggplants do not need much care. Water sporadically, leaving the soil dry for a few days before watering again. But eggplants are very hungry plants, so support them with sufficient compost and use Bio Extract every other time you water.

What Might Go Wrong?

The plant roots can easily get infected with fungi through over-watering.

Harvesting:

Eggplants can be harvested 3 months after seedlings are transplanted to beds. Under favorable conditions, flowering and fruit production is continuous. For best edible quality, eggplants should be eaten while immature and before seeds have enlarged. They can be stored in a cool place for up to 10 days. Eggplant yield varies by strain and can be between 2-4 kg per square meter.

Other Uses:

The root can be used to treat coughs, asthma, colic fever, loss of appetite and chest pain.

September	October	November	December	January	February	March	April	May
			Growth			Harvest		

Carrot



Nutritional Value:

Carrots are very good for you! They have a lot of vitamin A and other vitamins and minerals that are important for good eyesight, skin, hair and brain development. They are also high in natural sugar.

Ideas for How to Eat It:

Carrots are most nutritious eaten raw, either alone or added to salads, such as papaya salad. Carrots can also be boiled, steamed and stir-fried. Wash them well and scrape away the skin with a knife if it is dirty.

Propagation Instructions:

Leave a plant to flower in the second year (carrots grow the root one year and the seeds the next). Sow seed 1-2 cm deep directly into garden beds in rows 40-50 cm apart. After 2-3 weeks, thin to 5 cm apart. Eat the thinnings if they are big enough.

How to Take Care of It:

Carrots grow slowly in the beginning. Place animal manure or compost on the plants every few weeks and water regularly. Carrots like hot weather, so they do not need too much water.

What Might Go Wrong?

Aphids and grasshoppers sometimes attack leaves and can give plants a disease that makes the leaves yellow and twisted. Spray with soapy water. Grubs also may burrow into the roots. To prevent them from hatching, dig the soil over well and practice good crop rotation.

Harvesting:

Harvest carrots when they are about enough to eat. Each square meter will yield about 3 kg of carrots. Carefully loosen the soil on either side of a row of carrots and pull them out by the leafy tops. Wash and brush them clean. Store in a cool, dark place to keep them from drying out. They will last for one to two months.

Time Frame:

Carrots will be ready to eat about 12-16 weeks after planting.

Other Uses:

Feed the waste stalks and leaves to animals.

September	October	November	December	January	February	March	April	May
	Growth			Harvest	Growth			Harvest

Lemongrass



Nutritional Value:

Lemongrass herb has numerous essential oils, minerals (including potassium, zinc, calcium, and iron) and vitamins that have anti-oxidant and disease preventing properties.

Ideas for How to Eat It:

Lemongrass's long fragrant leaves are a popular flavoring, for example as a tea infusion. The more aromatic leaf bases are used to add a powerful sweet lemon flavor to dishes.

Propagation Instructions:

Plant lemongrass by using slips, which can be obtained by dividing full-grown clumps. The tops of clumps should be cut off within 20 to 25 cm of the root and the lower brown sheath should be removed to expose young roots. The slips should be planted deeply enough to cover the roots, and the soil should be firmed around the plant to remove trapped air pockets. Choose a bed in full sun and plant rows 40 cm apart and plants 20 cm apart within rows. Instead of growing in plant beds you can also plant individually as borders for the garden.

How to Take Care of It:

Lemongrass is a hungry plant, so add compost and water with Bio Extract regularly. It likes to be watered but allow the soil to dry between waterings to prevent diseases.

What Might Go Wrong?

The high levels of essential oils in lemongrass protect it from most pests and diseases. Snails sometimes hide in the tightly folded inner leaves of mature plants; carefully search for these if your plants look chewed. A stem-boring caterpillar is the most common pest for lemongrass. The caterpillar is white with a black head and black spots on the body. It bores into the stem and remains there, feeding on the shoot. Pull out the affected shoots and burn them.

Harvesting:

The first harvest can take place from 6 to 9 months after planting the slips. The grass can then be harvested frequently during the active growing season, up to once every month. Frequent cutting stimulates growth and oil production. The grass should be harvested early in the morning. Cut it 10 to 15 cm above soil level. Do not cut too low because it will delay re-growth. You may harvest up to three times in the first year and between 5 to 10 times during each of the succeeding years.

Other Uses:

Lemongrass can be used to make Bio Extract, natural pesticides and anti-mosquito spray.

September	October	November	December	January	February	March	April	May
	Growth						Harvest	

Marigold

Value:

Even though you cannot eat those flowers, they have a great value. Flowers are beautiful and they attract insects, including bees, butterflies and other beneficial insects. The more insects you attract to your garden the better the balance between pests and predators there will be.



Ideas for How to use them:

Enjoy their beauty in the garden or around school buildings. You may cut flowers to decorate classrooms, make necklaces, make a bouquet to present to your favorite teacher, or use them for merit-making.

Propagation Instructions:

These three plants all need light for germination. It is best to propagate them in seed-trays. Cover the seeds with a thin layer of soil, compost, rice husks or sand. They will germinate after 1-2 weeks and can be transplanted 3-5 weeks after sowing. Direct sowing is possible, but you have to thin them out after 3-5 weeks.

How to Take Care of It:

To keep your plants flowering for long time and develop flowers again and again, you have to cut out the old flowers so the plant's energy is spent on growth and not on producing seeds.

What Might Go Wrong?

Pests may attack these ornamental flower plants. Luckily, you will not lose yield. You can fight pests, but it is even better let flowers attract and feed beneficial insects and gain a balance between pests and their predators.

Harvesting:

The best time to cut flowers is in the early morning when it's cool. Use a sharp cutter, quickly put them in water and keep them in a shaded area. The cooler the place, the longer the cut flowers look beautiful. After some time the plants will get tired, and the flowers they develop become smaller and smaller. So do not cut them all. Keep 1-2 healthy, big and color-intense flowers of the first flush, let them produce seeds, and sow again to get young vital strong plants that you can re-plant.

Time Frame:

3-5 weeks after sowing transplant. First flowers appear after 10-12 weeks.

Other Uses:

The old flowers you cut can be added to the compost or be used to make Bio Extract.

September	October	November	December	January	February	March	April	May
	Growth		Flowering					
				Growth			Flowering	



*The World is like
a big library,
if you stay
only at home
that means
you have read
only a
few books.*

Pha Tad Ke Botanical Garden

Pha Tad Ke Botanical Garden is located on the Mekong River in Luang Prabang and as the first Botanical Garden in Laos our goal is to collect and show the flora of Laos, and to educate the general public on the importance of ecology and biodiversity conservation.