# Kitchen Garden

**CENTRE FOR ENVIRONMENTAL STUDIES**
Forest, Environment & Climate Change Department
Government of Odisha, Bhubaneswar

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# PREFACE

Kitchen gardening is an age-old practice that not only ensures a steady supply of fresh, nutritious food but also promotes sustainability and self-sufficiency. In an era of rapid urbanization and shrinking green spaces, kitchen gardens serve as a crucial means to reconnect with nature, enhance food security, and contribute to environmental conservation.

Kitchen gardening promotes sustainability, self-sufficiency, and reconnects us with nature. This booklet, "Kitchen Garden," provides a comprehensive guide to establishing and maintaining a home garden, emphasizing sustainable agriculture and resource optimization.

It covers site selection, soil preparation, crop planning, water management, and harvesting techniques. Special emphasis is given to sustainable resource use, crop rotation, composting, and organic fertilizers. Compiled by the Centre for Environmental Studies (CES) with expert insights from Dr. Sasanka Lenka, this booklet is an essential guide for households, schools, and community groups. By adopting these principles, individuals can contribute to a greener, healthier, and more sustainable future.

I would like to thank Ministry of Environment, Forest & Climate Change (MoEF&CC), Govt. of India for giving opportunity to compile this book under Environment Education Programme (EEP).

**(Dr. K. Murugesan)**

# CONTENT

# KITCHEN GARDEN

## 1.0 Backdrop

The early history of gardening is largely entangled with the history of agriculture, with gardens that were mainly vegetables or ornamental generally the preserve of the elite until quite recent times. Smaller gardens generally had to be a kitchen garden as their priority, as is still often the case. Antonia Achache and Jérémie Sabbagh are the proud founders of Suzette and Kitchen Garden, a chain of restaurants in Mumbai. Appropriate size and shape will depend on the family size. It is better to have a small size well-maintained garden than a poorly maintained large one.

It is the art of growing vegetables on a small piece of land in a planned way in the vicinity of a living /residential house to meet the needs of the family with fresh produce all year around regularly. Successful vegetable gardening is not accidental. It is the result of planning, constant care and the will to grow healthy vegetables. There are many reasons for having a Kitchen garden but one of the simplest reasons for having a kitchen garden is that it can make you "Healthy Wealthy and Wise".

A garden is a planned space, usually outdoors, set aside for the display, cultivation, and enjoyment of plants and other forms of nature. The garden can incorporate both natural and man-made materials. The most common form is known as a kitchen garden. A kitchen garden is a space to grow herbs, leafy greens/vegetables, root crops, Tuber crops, legumes, cucurbits, crucifers, species, seasonal crops and fruiting plants


(including lemon, papaya, banana, guava, amla, drumstick, etc) for everyday use inside the kitchen, plus some beautiful (and oftentimes edible) flowers for the pollinators. The creepers can also be grown in *trellis systems* (intersecting pieces of wood or bamboo). Similarly, vegetables like brinjal, tomato, beans, cowpea, lady's finger(okra), chilli, cabbage, cauliflower, radish, carrot, coriander, pea and greens like amaranthus, and spinach can be grown in the kitchen garden. Nutritional well-being requires access to enough nutritious and safe food to meet the dietary needs of all school children throughout the year. Attaining better food supplies and nutritional well-being is more than just producing enough food locally. It also requires sufficient resources (such as land and labour), tools, skills, and knowledge to establish a nutrition garden in the residential school premises. Kitchen garden also known as nutitional garden or nutri garden. Kitchen gardens are based on a different model as per suitability, which is a structured garden with multiple crops having diverse cropping patterns.

## 2.0 Objectives

1. To grow fresh vegetables rich in nutrients to supply the farmer the whole year round

2. To ensure proper utilization of land in the vicinity of the house
3. To confirm the best utilisation of time of the farmers in a pleasure way exercising efficient and effective training to the children
4. To utilise the kitchen water and waste
5. To economise the food cost and food value
6. To ensure the useful for utilising the spare time in a profitable way

## 3.0 Principles of Kitchen Gardening

For developing a kitchen garden proper planning is required. The basic principles to be considered while planning are as follows :

- In a new construction, it is wise to plan a kitchen garden.
- Appropriate size and shape will depend on the family size. It is better to have a small size well-maintained garden than a poorly maintained large one.
- Location is the fundamental principle and it should be close to the house.
- Suitable and convenient layout.
- Open and sunny sites as sunlight is very important for the proper growth of plants.
- The site should be free from shade trees, etc.
- Ä Close to a well, water tap natural and any other source of irrigation including kitchen water which can be profitably utilized.

- The ideal kitchen garden is established in a fairly highly level area preferably on the southern side of the house, which can be protected by a live fence from stray animals.
- Suitable and effective rotations should be followed to make the best use of the available land.

## 4.0 Planning Criteria

- A 200 sq. metres size plot will be sufficient to meet the demand for vegetables for an average family of 5-6 members.
- Preparation of a clear sketch plan of a planned kitchen garden on a notebook before planting.
- The plan should indicate the layout of plots, paths channels, perennial plants permanent spots, etc.
- The size and shape of plots will depend on the slope of the land.
- The selection of vegetables to be grown in the kitchen garden will depend on the season, region, area available, nutritive value/importance, choice of individual's taste and preference of family members.
- The sowing/planting of vegetables should be systematically planned.
- Vegetables required in small quantities like lettuce, mint and coriander should be adjusted on ridges, along the path and water channels.
- Vegetables required in large quantities like potatoes, onion, garden peas, dwarf beans etc should be allowed to occupy more space.

- Temperate vegetables like radish, carrot, turnip, etc required for salad should be accommodated on ridges and sown continuously at intervals to make available daily.
- Pole-type vegetables like cucurbits and French beans during the summer/rainy season and garden peas in winter be planted along the fence on the three sides along the boundary wall so that maximum space be provided for their optimum spread.
- Taking into consideration the direction of sunlight, tall vegetable varieties should always follow medium and then dwarf ones so that every plot gets maximum sunlight.
- Perennial vegetables like asparagus, cho-cho etc should always be planted in one corner so that they do not interfere with the preparation of land, or annual beds, more so to avoid shade.
- Follow principles of crop rotation.
- Several sowings or succession of planting of one particular vegetable at short intervals should be done to ensure a regular supply of fresh vegetables, using a continuous crop pattern in the form of succession and companion cropping.
- Leguminous vegetables like French beans, peas etc should be included in rotation to maintain soil fertility.
- Ridges should always be used to grow root vegetables and side paths be used for growing tomatoes, or other leafy vegetables like celery etc.

- Early maturing varieties should be planted together in continuous rows so that the area may be available at once for planting late varieties.
- In the interspace of vegetables that are slow growing and take a long duration to mature like cabbage, brinjal cauliflower, broccoli etc must be used for quick growing vegetables like coriander, radish spinach lettuce etc.
- Vegetables that are easily grown with less effort, and less expensive be included.
- A small pit in a corner of the kitchen garden may be dug so that kitchen/house waste and plant refuse, etc be put for preparation of organic manure. This helps in providing manure for a kitchen garden.

## 5.0 Knowing the Ecosystem

It is required to know the pre-existing nature garden before taking up the kitchen garden because if we do not analyze the ecosystem of that area, we cannot plan for a good garden or pre-intervention interventions required for the establishment of the garden. The following points should be taken into consideration before finalizing the garden place.

a) Hand-drawn sketch of the backyard with existing resources like home, approach roads, trees, boundary walls, existing garden, land suitable for garden and its size and water source.

b) Study the ecosystem and record the names of different plants, insects, and birds present in the backyard. Imagine and write how the students could lead a life if they were born an insect, a bird or any garden citizen.

c) Draw the sketch layout of the kitchen garden in the backyard or any suitable place with or without an existing garden and check its size, water source and maintain a proper record.

d) Debate if more than one site is feasible for a kitchen garden.

## 6.0 Selection of the Garden Site

Site selection is an important part of the establishment of an ideal kitchen garden. So during the transect walk inside the backyard for the selection of a final site suitable for the establishment of an ideal garden, the following points should be considered.

- More shady areas should be avoided, because for proper crop growth adequate amount of sunlight is required which will enhance photosynthesis and better photosynthesis helps plants prepare more food for themselves, so it is required to select a site where ample sunlight is available.
- Branches of big shade-giving trees should be removed from near the garden site to avail the adequate amount of sunlight to the garden site.
- Vegetables are sensitive to water logging conditions, so during the site selection process, the possibility of water logging at sites should be avoided. Preferably high and medium lands may be selected.
- If possible, select the site near a water source, for easy crop production round the year.

- During selection of site, soil type should be taken into consideration, because fertile soil helps better crop production.
- A protective site is mandatory for preventing crops from grazing.
- Since the establishment of the garden aims to grow crops round the year, it is required to ensure perennial water sources near the garden site, like water pump, overhead water tank etc.

## 7.0 Whom to Involve in the Kitchen Garden?

All members of the house or the women farmers of the house may be involved during the initial preparatory stages and selection processes of the garden in a participatory manner to select an ideal garden site. The trainer will facilitate the process.

The facilitator or service provider along with farmers of the individual household will visit the entire backyard and select multiple areas. Then after a thorough discussion, the final garden site will be selected. The leader of the family will prepare a map of the whole area using a drawing sheet, pencil and colour sketch. The facilitator will facilitate the entire process.

## 8.0 Land Preparation

After the final selection of the site, land preparation is the next important step for establishing a garden, because crop growth and production depend upon proper preparation of the land. During the preparation of land, the following points should be taken into consideration.

- Before going for ploughing, it is required to clean the garden site by removing stones, bushes, weeds, plant debris and other unwanted materials from the field.
- 2-3 times of deep ploughing using bullock drawn plough or power-tiller or tractor-drawn plough followed by soil pulverizing and levelling of land is required before giving layout and preparation of bed.
- During ploughing fully decomposed FYM (@ one tractor load per acre) should be mixed with the soil to improve the soil fertility because crop growth and production mainly depend upon the soil fertility.
- Before land preparation, soil testing may be done to know the nutrient status of that land and on that basis soil-enriching nutrients/fertilizers (organic) may be added during or after land preparation.

## 9.0 Garden Lay-out and Preparation of Raised Beds

After thorough tillage of land, the next step is to prepare beds as per garden design/sketch prepared based on pre-determined dimensions. The following steps are to be followed for preparation of raised beds.

- Keep all the required garden tools and other materials required for giving layout and bed preparation at the garden site such as a pickaxe, measuring tape, plastic ropes, lime, small wooden sticks, spade etc.
- Keep the pre-prepared garden sketch at the garden site and discuss thoroughly again among the participants to refresh the interventions to be followed during bed preparation.

- Explain to the participants about the sketch. Keep the sketch on a surface and ask each participant to concentrate. Explain why and how the sizes/ dimensions of plots, sub-plots i.e. beds for row crops, strips for creepers and fruit trees (pits) are to be demarcated with pathways in between.
- Give measurements using the measuring tape and put sticks at corner/cross points.
- Tie the plastic ropes with the sticks to make separate beds, then put the lime along the rope line for marking of beds.
- Prepare raised beds, and make drainage lines using a spade and other earth digging materials.
- Prepare separate beds for separate groups of crops. main beds for row crops, creeper beds for creeping

crops, Separate beds for Green Leafy Vegetables, and separate beds for low canopy fruit plants at two sides.

- The height of the bed may vary from 10-12 inches. The purpose of making raised beds is to protect the crops from water logging during heavy rain and proper root and crop growth.
- Prepare drainage channels for better drainage of excess rainwater and make a pathway for proper movement inside the field to monitor crops without damaging crops.

## 10.0 Involvement and Roles of Farmers in Garden Establishment

Since training farmers is another important objective of the kitchen garden, so involvement of women and family members of the farmer in risky as well as light labour-intensive activities is essential to upgrade their practical knowledge of gardening and agricultural practices. We can involve family members in the following activities.

- Studying and mapping the site.
- Preparing garden sketches in consultation with family members.
- Studying and giving garden Layout.
- Observing and recording garden works.
- Staking and tying ropes.

Along with the preprepared garden sketch, the facilitator will first arrange a preliminary discussion with family members about the sketch, design, and preparation methods of different beds. Then with the help of the farmer and family members, he will demonstrate the entire bed preparation process.

Members may be involved in putting the sticks in a proper place, tying the ropes with sticks, and marking the subplots with lime to divide the plots into different subplots. Then labourers along with members will prepare the subplots using different earth-digging equipment.

The kitchen garden may not fulfil the entire requirement of a family's diet, but the garden can have a strong influence on what members should eat in their daily diets so that their nutrition index and health will improve. From a health and nutrition point of view variety of vegetables can be grown in the field to supply a balanced diet to family members.

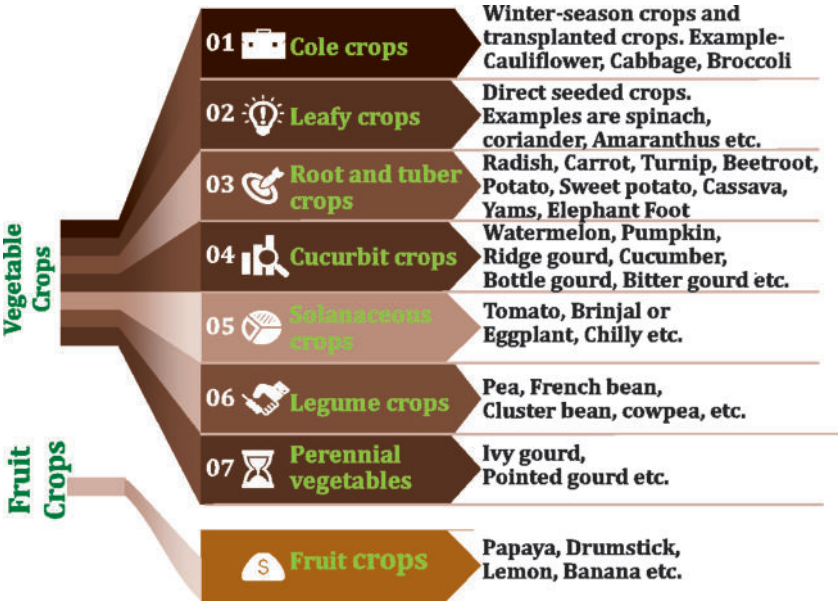
## 11.0 Types of Crops (Vegetables and fruits) to be grown in a Kitchen Garden

Since we are focusing on improving the family nutrition index, it is very much essential to grow diversified crops that are rich in micronutrients and vitamins to supplement multiple

nutrients in family members's food. So, it is required to grow different crops (Vegetables and Fruits) in the garden. Examples of some crops which we can take in the garden are given below.

### I. Vegetable Crops:

Vegetables are grouped into different families based on their cultural characteristics. They are-

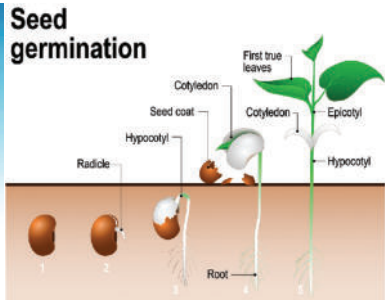



### II. Fruit Crops:

Since we are establishing a garden in a small area, so fruit crops having a lower canopy with high nutritional value and those can be utilised in the kitchen may be grown in the garden are Papaya, Drumstick, Lemon, Banana etc.

## 12.0 How do we grow seedlings in a nursery?

Growing crops is a vital part of a garden activity because the ultimate objective of establishing a school nutrition garden is




to produce vegetables and fruits. Some crops are sown directly in the main field and some are grown in a nursery before transplanting in the main bed. Before taking up seedling raising in a nursery, the following steps should be followed:

### 1) Sourcing of good vegetable Seeds/Fruit Saplings, Graft and Gooties

Selection of seeds of a good variety is an important part of crop production because a healthy, disease-free and good variety can yield more, which can be sourced from seeds retail shops in the market, local haats and own seeds preserved by the farmers or growers. Seeds from reputed firms should be used for proper germination, healthy plant growth and better production. For fruit crops saplings/grafts/gooties may be raised in the nursery or may be purchased from a reputed nursery. Varieties may be selected as per the local climate and ecology of that area.

### 2) Preparation of Nursery for raising seedlings

Nursery is a place where seedlings are grown before transplanting them in the main plots. Seedling raising in the nursery can be done in two methods i.e., in an open bed or under a shadenet and polytunnel. The seedlings are prepared

in protrays inside the poly-tunnels in the rainy and winter season and under shade-net in the summer season. They can be raised in an open bed also, but the use of a Protray, green shade net and polytunnel structure is more beneficial than an open nursery. For raising seedlings, a partial shady and high or medium high land is more suitable than very low land, because high land protects the seedlings from damage by draining out excess rainwater. Raised beds are advisable for open nurseries because raised beds are more fruitful for proper root and crop growth than flat beds.

## Nursery Raising using Pro-tray under Shade net structure and Poly tunnel structure

Raising seedlings under a shade net and polytunnel structure using pro-tray is a new scientific method, where one can grow seedlings in a controlled manner round the year. Shade net structures are mainly useful in summer seasons for protecting seedlings from extreme heat by controlling excess

Nursery under Shade net

Nursery under Poly tunnel

sunlight inside. It gives adequate protection from harmful insects and pests. The function of a polytunnel is almost the same as a shade net. structure, but it is more useful during heavy rains by protecting crops from damage. Besides this polytunnel is also useful during extreme cold by maintaining inner temperature and helps in proper germination of seeds during the winter season. The benefit of a protray nursery includes the production of pest-free quality seedlings, having an independent area for each seed, improved seed germination, better root development, minimized seedling mortality and damping off disease and also uniform, healthy and early maturity, easy handling and cheaper transportation. In the case of raising seedlings in a protray, we need to prepare a soil mixture using fertile loam/clay loam soil, FYM, vermicompost, coco peat and Trichoderma viride etc. If we are going to prepare a small amount of mixture, then take approximately 12-15 kg loose fertile soil (loam or clay loam), 6-8 kg dry FYM, 2 kg vermicompost, 300-400 g cocopeat and 100 g Trichoderma viride. Trichoderma viride is a fungus that enhances plant growth and suppresses the growth of plant pathogens. It also acts as a fungicide. First, mix the Trichoderma with FYM and keep it in the shade for 3-4 days so that the fungus population will increase. Mix all other ingredients (soil, vermicompost, coco peat etc.) with it. Fill the mixture in the pots of Portray. Put the seeds (1-2 seeds per pot) as per standard specification. Put the tray under the shadenet/ polytunnel structure and follow the other processes as in the case of an open-bed nursery. Place the structures in a high land, so that the chances of waterlogging due to high rainfall could be avoided.

## 13.0 Soil required for Kitchen Garden

For growing plants Soil is the most important component because the growth of the plant depends upon food, food intake process, root growth and spreading, Soil is used in agriculture, where it serves as the anchor and primary nutrient base for plants. The types of soil and available moisture determine the species of plants that can be cultivated. The composition of soil is minerals, organic matter, water and air. The typical soil consists of approximately 45% mineral, 5% organic matter, 20-30% water, and 20-30% air.

Generally, for formation of soil takes millions of years to form 1 inch of soil. The five factors that are responsible for soil formation are (a) parent material such as sand and rock, (b) weathering processes such as heating and cooling, wetting and drying, (c) time (d) living organisms such as earthworms, human, plants, microorganisms, such as bacteria or fungi, burrowing insects, animals etc. (e) topography. Soil is broadly classified into four types. 1. Sandy soil 2. Silt Soil 3. Clay Soil and 4. Loamy Soil.

### Sandy Soil:

Sandy soils are pale yellowish to yellowish brown in colour and are one of the poorest types of soil. Sandy soil is also grouped as one of the soils composed of the largest particles that prevent it from retaining water. As

such, sandy soils lose water content very fast which makes it very difficult for plant roots to establish.

Thus, plants do not get an opportunity to use the nutrients and water in sandy soil more efficiently as they are speedily carried away by runoff.

### Silty Soil

Silt is known to have much smaller particles compared to sandy soil and is made up of clay, rock and other mineral particles. It is the smooth and fine quality of the soil that holds water better than sandy soil. The silty soil is fairly fertile compared to the other three types of soil. Therefore, it is also used in agricultural practices to improve soil fertility.

### Clay Soil

Clay soil contains the smallest particles among the other two types of soil. The particles in this soil are tightly packed together with each other with very little or no airspace. This soil has very good water-

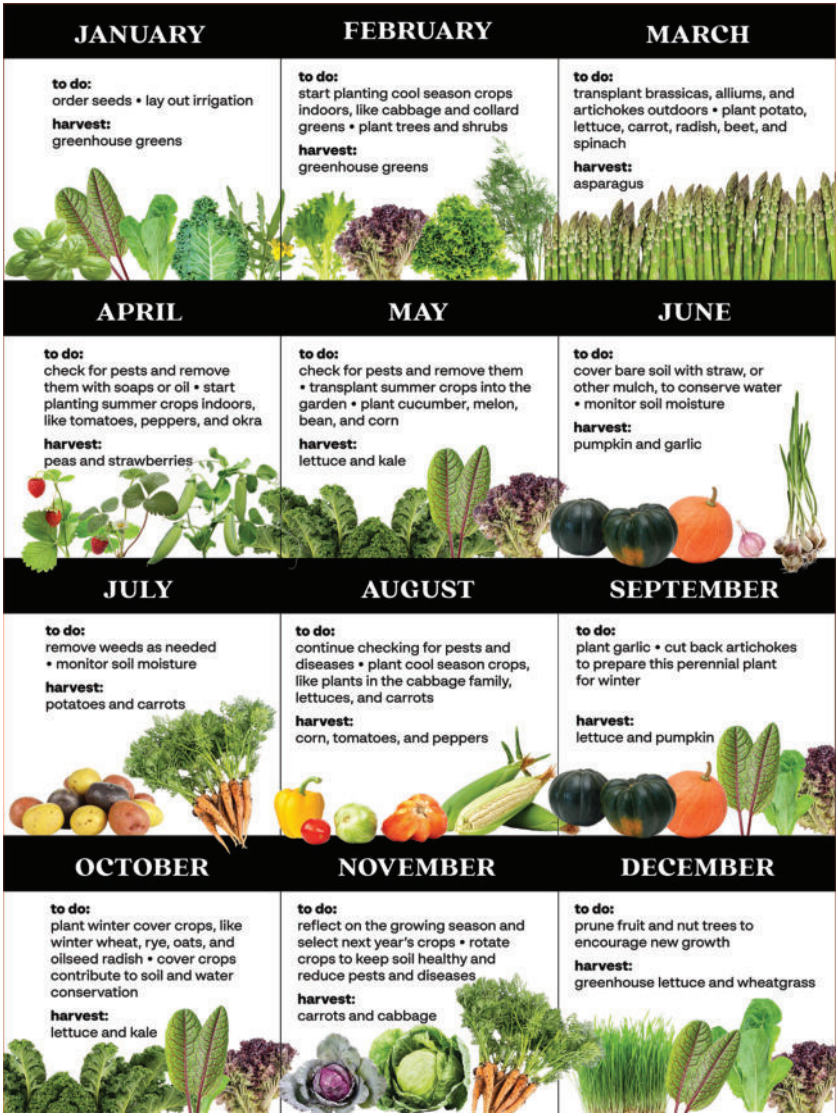
holding quality and makes it hard for moisture and air to penetrate it. Due to this characteristic, it retains most of the nutrients and water. It is very sticky to the touch when wet, but smooth when dried It is mainly dark or brown in colour. Clay is the densest and heaviest type of soil which does not drain well or provide space for plant roots to flourish.

### Loamy Soil

Loam is the fourth type of soil. It is one of the richest soil types because of its good composition. It is a combination of sand, silt, clay and decaying organic materials (humus) so that the beneficial properties of each are included. It can retain moisture and nutrients; hence, it is more suitable for farming. This soil is also referred to as agricultural soil as it includes an equilibrium of all three types of soil materials sandy, clay, and silt and it also has humus.

## 14.0 Selection of Crop Species

Selection of varieties is important because a good variety will give a good yield. Healthy, disease-free and high-yielding varieties that suit a particular locality may be preferred. Local varieties having good yield potential may be selected, because of their good adaptability in a particular locality. Besides these, certified seeds of a good company/brand may be used.




Some vegetable/fruit seeds are sown directly in the field, and some are grown in the nursery before sowing in the main fields. The species that are sown directly in the main field and those grown in the nursery are given below.

**Direct sown vegetable species:** Okra, Cucumber, Bitter gourd, Bottle gourd, Ridge gourd, Pointed gourd, Snake gourd, Radish, Carrot, Beetroot, Knolkhol, Green leafy vegetables etc.

**Nursery-raised vegetable species:** Brinjal, Tomato, Chilli, Cauliflower, Cabbage etc.

The service provider/trainer will demonstrate different types of vegetable seeds and their specifications with sowing methods to family members so that participants will be able to choose seeds and varieties in future easily. The trainer will explain in detail the specifications of different crops. Since we are focusing on local, open-pollinated high-yielding varieties for better health and environmental outcomes, it is advised that the trainer showcases to the members a few locally available good-performing varieties based on the farmer's perception.

## 15.0 Seed sowing and Seedling transplanting

The time and method of planting seeds and plants of a particular vegetable influence the success or failure of the crop. Important factors include the depth of planting, the rate of planting, and the spacing both between rows and between plants within a row. Standard spacing for seed sowing and transplanting of nursery-raised seedlings is given below.

| Sl. No. | Variety | Row to Row spacing (cm) | Plant to Plant spacing (cm) | Depth of seed sowing (cm) |
|---|---|---|---|---|
| 1 | Ladyfinger | 45 | 30 | 1-1.5 |
| 2 | Cauliflower | 45 | 45 | 0.5 |
| 3 | Cabbage | 45 | 45 | 0.5 |
| 4 | Brinjal | 60 | 45 | 0.5 |
| 5 | Tomato | 45 | 45 | 0.5 |
| 6 | Chilli | 45 | 30 | 0.5 |
| 7 | Cucumber | 75 | 75 | 1.5-2 |
| 8 | Ridge gourd | 75 | 75 | 1.5-2 |
| 9 | Bitter gourd | 75 | 75 | 1.5-2 |
| 10 | Bottle gourd | 150 | 150 | 1.5-2 |
| 11 | Pointed gourd | 150 | 100 | 3-5 cm |
| 12 | Cowpea | 60 | 30 | 2-2.5 |
| 13 | Snake gourd | 150 | 100 | 2 |
| 14 | Radish | 15 | 10 | 1-2 |
| 15 | Carrot | 15 | 10 | 1-2 |
| 16 | Beet root | 20 | 20 | 1.5-2 |
| 17 | French bean | 20 | 15 | 2-2.5 |
| 18 | Green pea | 20 | 15 | 2 |

Since different types of beds are prepared separately, so the choice of crops should be separate for different beds.

**Crops for main beds:** In the main beds mainly standing and row crops are planted like Ladyfinger, Cauliflower, Cabbage, Tomato, Chilli, Brinjal, Radish, Carrot, Beetroot, Peas, Cowpea (Bushy type), Knolkhol etc.

**Crops for Creeper beds:**

In these beds, only creeper crops are planted like Cucumber, Ridge gourd, Bitter gourd, Bottle gourd, Pointed gourd, Snake gourd, Cowpea etc.

**Crops for green leafy:**

In these beds, only green leafy vegetables are grown like Spinach, Lettuce, Asparagus,

**vegetable (GLV) beds:**

Khosla etc.

**Fruit plants:**

Fruit plants are planted separately prepared in two opposite sides of the plot beside the creeper. Since we are growing crops in a small patch of land, so low canopy nutritious fruits are recommended to grow like, Papaya, Drumstick, Lemon, Banana etc.

The trainer will do some practical demonstrations by sowing seeds and seedlings in specified beds. He will show the farmers, how to sow seeds or seedlings in main beds with proper spacing like row-to-row spacing, plant-to-plant spacing, depth of seed sowing and seedling transplanting as mentioned in the above table. He will also do the demonstration on pit

digging specifications (1ft x 1ft x 1ft) for planting fruit saplings in designated areas. farmers should do practical demonstrations on the above-mentioned activities with the proper guidance of the trainer to gain more practical knowledge on it.

## 16.0 Different Structure for Kitchen Garden

Different types of Fabricated and structural are required while establishing a Kitchen garden. The following are some important hardware components that are used in a garden.

### 1. Shadenet Structure:

This is mainly required for raising vegetable seedlings and fruit saplings in a controlled manner around the year. This is useful to maintain appropriate sunlight, temperature and humidity required for the germination of seeds and the growth of seedlings inside the structure. This structure is mainly prepared by using iron bars and covered with a green net having a 50-75% shade factor which is suitable for proper germination of seeds. Since for a school nutrition garden, a small patch of land is utilized for crop production practices, a small make-shift shade net structure is sufficient to grow seedlings for that small patch of garden.

### 2. Poly-tunnel Structure:

This structure is mainly made by using Iron bars (MS iron square bars) and is covered with a 200-micron UV

polyethene sheet. Like the green-shade net structure, the polytunnel structure is also meant for raising seedlings in a controlled manner. This is useful during extreme rain to protect seeds/seedlings from damage. Besides this is also useful during extreme cold periods by maintaining temperature and helping seeds to germinate avoiding too low temperature affects the germination of seeds.

### 3. Trellibars:

Trellis bars are mainly required for growing creeper crops. Iron angle (Ms angles) bars of 15-20 mm thick and of height 6-7 feet may be installed on the designated places of creeper beds to provide support for the effective growth of creeper crops. The gap between two angle bars put on the creeper bed should be 3-4 feet or as per the field situation. Since it is a permanent bed and crops will be grown continuously year after year, Iron bars are suitable to avoid damage to the structure after some years. For easy creeping

and vertical growth of crop nets or plastic, wires are tied tightly in crossed manners between two bars.

The trainer will conduct a practical demonstration on the use of shadenet/polytunnel structures, proper covering of green nets upon shadenet structure and white polythene upon polytunnel structure. He will also demonstrate how to put protrays under the structures for raising seedlings, the installation process of trellibars in designated places for creeper crops, tying of ropes, wires, or nets in trellibars for proper creeping of creeper crops. Between this, he will facilitate and guide the participants to do the same.

## 17.0 Weeding and Intercultural Operations

Weeding is the process of removing weeds or grasses from the field to keep the field clean and weed-free. Weeding is necessary because weeds compete with main crop plants for different factors such as water, sunlight, nutrients and space and hence affect plant growth. Weeding can be done in different methods like Hand weeding, weeding by using weeders, and weeding by using different types of herbicides. Besides weeding intercultural operations are essential for proper growth of crops. Intercultural operations include all the lighter and finer operations like weeding, thinning, earthing up, mulching, hoeing, training and pruning in fruit crops like citrus, Guava, Drumstick etc. carried out between sowing to harvesting of crops.

The trainer will show practical demonstrations on weeding to be done looking at present field conditions using Khurpi, hoe, weeder, spade etc. He will also do practical demonstrations on different intercultural operations like loosening of soil, earthing of soil around the plant, mulching

around the plants etc. Besides this, he will also do demonstrations on pruning, and training of fruit plants by removing dead, disease and pest-affected stems and leaves and unnecessary branches. Staking of some plants such as tomatoes, beans, etc. needs to be shown when fruits are already set. After that, he will also facilitate and encourage farmers/ family members to do the same.

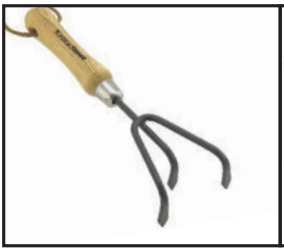
For proper maintenance of a vegetable garden, different types of tools are required for several activities such as weeding, intercultural operations, growing of seedlings in pro trays, easy uprooting of seedlings from the nursery bed, watering, spraying of pesticides in the nursery, cutting of dead branches and disease affected branches etc. Examples of some garden tools with their utility are given below.

1. **Three-Prong Hand Cultivator:** It is mainly required for loosening soil and weeding in the field.
2. **Transplanting Trowel:** It is mainly required for easy and safe up-rooting of seedlings from the nursery bed without damaging the root
3. **Khurpi:** It is mainly used for weeding and loosening of soil.
4. **Garden Rake with Handle:** It is mainly used for cleaning up dead leaves plant materials and other debris in garden beds.
5. **Hand pressure sprayer:** It is mainly useful for watering nursery beds and spraying pesticides and liquid minerals in nursery beds.
6. **Pruning Secateur:** It is mainly used for cutting stems of plants and removing dead stems from a healthy plant.

7. **Rose Cane:** It is mainly used for watering seedlings in nursery beds and small plants.

8. **Pro tray:** It is used for growing seedlings and to save place. The blocks of plastic tray are in cone shape which helps in the proper growth and development of the roots.

The garden tools that are used in preparing and maintaining the garden are as follows:



Three Prong Hand Cultivator

Transplanting Trowel

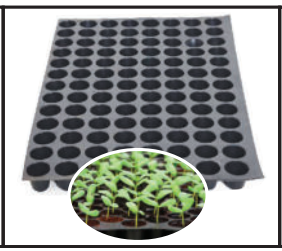
Khurpi

Rose Cane

Hand Pressure Sprayer

Garden Rake with Handle

Pruning Secateur



Pro Tray

Spade

## 18.0 Nutrient Management

Nutrient management is the process of addition of manures and chemical fertilizers to improve soil quality and fertility. A balanced application of nutrients in the soil is essential to improve the crop yield and its quality without affecting the soil health. Two sources are most widely used for nutrient management source, generally, called 'manure', and chemical or inorganic sources called 'fertilizer'. in view of the farmer's health, enough quantity of organic manures should be applied in the soil during ploughing and different stages of crop growth.

The trainer will do the practical demonstration on application methods of different fertilizers/manures in crops. He will show how, and how much quantity of manures and fertilizers will be given in a crop. S/he will facilitate and guide the farmers and family members to do the same to gain practical experience on it.

Since here we are focusing on farmer's health and environment, it is very much essential to apply different types of organic manures as much as possible avoiding the use of chemical fertilizers. Some examples of organic manures and their preparation methods are given below. Besides FYM, some other organic manures prepared can be applied in the crop by using natural and locally available products. Some examples are given below

### 1. NADEP Compost

The NADEP composting method was developed by Narayan Deotao Pandharipande, a farmer in Maharashtra. This

**NADEP Compost Pit**

composting method uses a wide range of organic materials such as crop residues, weeds, forest litter, and kitchen waste with an end-product of a fertilizer that serves as a good alternative to farmyard manure.

## NADEP Method of Composting

- Compost can be prepared from a wide range of organic materials including dead plant parts such as crop residues, weeds, forest litter, and kitchen wastes.
- Compost-making is an efficient way of converting all kinds of biomass into high-value fertilizer that serves as a good alternative to farmyard manure, especially for farmers without livestock and poultry.

### Description

- This method of compost-making entails the construction of a simple, rectangular brick tank with pore spaces maintained between the bricks for necessary aeration (aerobic decomposition).

- The recommended size of the tank is 8.5 ft (length) x 4.5 ft (breadth) x 3.5 ft (height).
- All four walls of the NADEP tank are provided with 6-inch vents by removing every alternate brick after a height of 1 ft. from the bottom for aeration.
- Tank can be constructed in mud mortar or cement mortar.

## Establishment Process

### Raw materials required for filling the NADEP tank

- Agricultural wastes (dry & green): 1350 - 1400 kgs.
- Cattle dung or biogas slurry: 98 -100 kgs.
- Fine sieved soil: 1500 kgs.
- Water: 1300-1400 litres.

The important technique in the preparation of NADEP compost is that the entire tank should be filled in gradually in a layered manner

### Before filling:

the tank is plastered by dilute cattle dung slurry to facilitate bacterial activity from all four sides. It is also filled in definite layers each layer consisting of the following sub-layers.

### Sub-layer 1

4 to 6 inch thick layer of fine sticks, stems, (To facilitate aeration) followed by 4 to 6 inch layer of dry and green biomass.

### Sub-layer 2

4 kg cow dung is mixed with 100 liters of water and sprinkled thoroughly on the agricultural waste to facilitate microbial activity.

### Sub-layer 3

60 kg of fine dry soil is spread uniformly over the soaked biomass for moisture retention and acts as a buffer during biodegradation. Thus, the proportion of organic materials for each layer is 100 kg.

### Organic biomass:

4 kg cow dung + 100 litres water + 60 kg soil. In this way, approximately 10-12 layers are filled in each tank. After filling the tank, biomass is covered with a 3-inch thick layer of soil and sealed with cow dung and mud plaster.

### Maintenance

i. After 15-30 days of filling the organic biomass, the tank gets automatically pressed down to 2 ft.

ii. The tank is refilled by giving 2-3 layers over it and is resealed.

iii. After this filling the tank is not disturbed for 3 months except that it is moistened at intervals of every 10-15 days.

iv. The entire tank is covered with a thatched roof to prevent excessive evaporation of moisture.

v. Under no circumstances should any cracks be allowed to develop. If they do, they should be promptly filled up with slurry.

### 2. Vermi Compost:

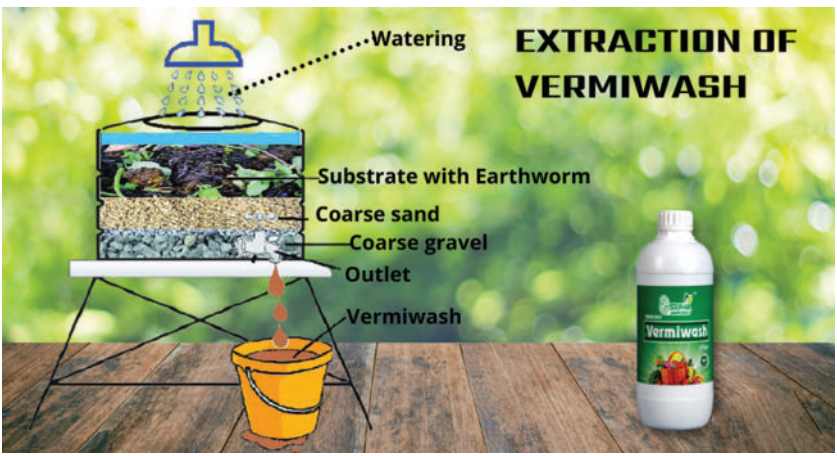
Vermicompost contains water-soluble nutrients and is an excellent nutrient-rich organic fertilizer and soil conditioner.

It is used in small-scale organic farming. Vermicomposting is the process by which earthworms are used to convert organic materials to compost known as vermicompost.

Vermi Compost Pit

### 3. Vermiwash:

To obtain Vermiwash, suspend a small bucket or a plastic bottle connected to a single hole on the edge of the vermicompost pit (tank). Place cotton wicks or bamboo sticks in the holes so the water trickles down. The water gradually percolates to the bottom through the compost carrying with it nutrients through the filter unit. This wash is mixed with water and sprayed over the plants for better growth.



## 19.0 Water Management

Water management is the process of irrigating crops in different stages. Irrigation after transplanting can significantly increase the plant survival rate, especially when soil moisture is marginal and the evapotranspiration rate is high. Irrigation can also increase the uniformity of emergence and final stand of crops.

### Where does water come from and how to use it optimally for gardening?

1) The source of water is generally groundwater and obtained by lifting through bore wells fitted with submersible pumps.
2) The rainwater harvesting structures like ponds can also be a good source. The used water from washing and cooking can also be used during scarcity.
3) Mulching with dry leaves, debris and black plastic sheets helps less evaporation of soil water by avoiding direct sunlight on the soil.
4) Irrigate the field considering the moisture content of the soil, type of soil and need of the crop. Excess water may

cause damping off of crops. So, irrigate the field considering the field situation.

5) A general thumb rule for applying irrigation water to crops is "irrigate before drying of soils/wilting of plants till a point when water does not stand on the soil surface".

6) For light texture (sandy loam) soils frequent and light irrigation is recommended.

## Use of Micro Irrigation System

As a part of innovation and modern technology, a micro irrigation system is a great technology for efficient use of water and reduction of water wastage. It supplies water exactly as much water as a crop requires without wastage of water. Broadly it is divided into two parts i.e., Drip and Sprinkler irrigation systems.

### Drip Irrigation:

Drip irrigation is a type of micro-irrigation system that has the potential to save water and nutrients by allowing water

to drip slowly to the roots of plants, either from above the soil surface or buried below the surface. The purpose is to place water directly into the root zone and minimize evaporation. Drip irrigation systems distribute water through a network of valves, pipes, tubing and emitters.

### Benefits of drip Irrigation

- Increase in yield up to 230 %.
- Saves water up to 70% in comparison to flood irrigation.
- Irrigation can be done in a controlled manner as per the need of the crop.
- More land can be irrigated with the water thus saved.
- The crop grows consistently is healthier and matures fast. Uniform crop growth is ensured.
- Early maturity results in higher and faster returns on investment.

## Sprinkler Irrigation

A sprinkler irrigation system allows the application of water under high pressure with the help of a pump. It releases water similar to rainfall through a small diameter nozzle placed in the pipes. Water is distributed through a system of pipes, sprayed into the air and irrigated in most of the soil types due to the wide range of discharge capacity.

### Benefits of sprinkler irrigation

- Discharges water in a sprinkling manner like natural rainfall
- Suitable in all types of soil except heavy clay.
- Water saving up to 30% - 50%.
- Suitable for irrigation where the plant population per unit area is very high.
- Helps to increase yield.

The trainer will show a practical demonstration of how to irrigate the crop and different types of irrigation methods. As we are focusing on micro irrigation systems, the trainer will give more emphasis on micro irrigation systems (drip and sprinkler systems) installed in the field beforehand. He will explain and demonstrate the whole operation systems and maintenance methods of micro irrigation systems. S/he will also explain and demonstrate the types of micro irrigation systems used for different crops, like an inline dripper for vegetables, an on-line dripper for fruit plants since it requires more water than vegetables and a sprinkler for leafy vegetables. The trainer will facilitate the participants to do the same as a process of learning by doing. The trainer will also show the functionalities of various hardware components such as screen/disc filter declogging of drippers and sprinkler nozzles, releasing air bubbles from pipes, valve/pressure control etc.

## 20.0 Pest and Disease Management

Minimizing pesticide usage in the garden is a great way to protect ourselves from chemical exposure, while also protecting the environment and surface water resources. But pest control - insects, diseases and weeds are challenging for the home organic vegetable farmers/gardeners. Advice to use biopesticides and biological measures to control pests and diseases.

Regular pest surveillance should be conducted for timely control of pests and diseases in the field. Some insects are beneficial for plants, and some are harmful. Butterflies and bees help in pollination and fruit setting, therefore, they are friends of the plants.

The use of chemical pesticides kills all kinds of insects including the beneficial insects as well as insects, which are harmful to the plants. Hand-picking the larvae, adults and destroying them at the egg stage will help limit the insects in the garden. Marigold during flowering looks good and attracts beneficial insects which in turn kills the harmful insects and protects the crop.

## Management of pests and diseases in crops

By preventing the use of chemical pesticides, one can control pests and diseases by following non-chemical methods.

1) The use of bio-pesticides can be promoted instead of chemical pesticides. Insect traps like yellow sticky traps, light traps, pheromone traps can be used to trap adult insects and reduce their population in the vegetable garden.
2) Pest and disease management through cultural practices like summer ploughing, and maintaining a clean field.
3) The use of disease-free seeds and seedlings can be promoted.
4) Pest control can be done through the use of bio-pesticides like Neem oil, Jibamrut, Bijamrut, Brahmastra, Neemastra, Agnyastra, etc.
5) Adoption of crop rotation that minimizes pest and disease infestation.
6) Use of Pheromone traps and yellow sticky trap sheets can be adopted to control flying insects.
7) Yellow sticky traps are used for controlling tiny flies and bugs.


**Pheromone Trap** **Yellow Sticky Trap Sheet**

1) The trainer will demonstrate different methods (except chemical methods) of pest management like using a Pheromone trap, putting yellow sticky trap sheets with sticks in different places of the field, hand collections of insects and using different organic pesticides etc. S/he will also prepare some organic pesticides on the spot to let the students/CCAs know how to prepare and use the pesticides. The trainer will facilitate the students/CCAs to do the same. This activity will be conducted when there are crops in the field.

2) The participants (especially students) are encouraged to visit the garden and observe each of the plants minutely. Come back to the facilitator with the leaves/fruits/plant parts that seem affected by pests/diseases or even discoloured ones.

3) The facilitator identifies the cause or possible causes of abnormality and informs the participants along with remedial measures (both preventive as well as curative).

## Lists of different Crop Pests, Diseases and their control measures:

| Name of the Pests & Diseases | Control measures |
|---|---|
| **Termite** | ➢ Apply Neem cake 15 kg/2500 sq.ft. at the time of bed preparation<br>➢ Castor cake can be incorporated into the soil to control termites.<br>➢ 5-7 kg of Calotropis gigantia (Arakha) are soaked in water for at least 2hr and then boiled for 30 min. and then applied in the bed. |
| **Aphids** | ➢ Spray garlic extract (100gm crushed and mix 50 litres of water) and apply once a week.<br>➢ Apply manure preparation using Adhatodavasica (Basanga) and wooden ash.<br>➢ Apply 1:20 Handikhata once a week or Neemastra in 10 litres of water. |
| **Shoot fly** | ➢ Managed effectively by keeping fish meal trap@ 5nos/2500 sq.ft. Crush the scale of fish, crab and bind them in a cloth and kept inside a mud pot for a week. Then separate this paste into small amounts and bind it in clothes and put it inside the field with a stick. |

| | |
|---|---|
| | ➢ So that the flies are attracted towards the pungent smell of the paste. |
| | ➢ Install a Pheromone trap and light trap. |
| **Stem borer/leaf folder insects** | ➢ Summer ploughing, Apply Neem cake @ 15-20 kg /2500 sq.ft. as basal manure or Neem oil (3ml/lit)<br>➢ Install pheromone Traps.<br>➢ Apply 1:20 Handikhata once a week or 200 ml Neemastra in 10 litres of water.<br>➢ Spray Bacillus thuriginesis @0.25 kg/ 2500 sq.ft. |
| **Bacterial wilt disease** | ➢ Use certified seeds.<br>➢ Adopt crop rotation. |
| **Powdery mildew disease** | ➢ Plant resistant varieties<br>➢ Planting in the full sunlight and following good cultural practices.<br>➢ Use 2-3 tablespoons of common apple cider vinegar mixed with a gallon of water and spray. |
| **Yellow vein mosaic disease** | ➢ Grow resistant variety.<br>➢ Summer ploughing<br>➢ Remove weeds.<br>➢ Treat the seeds with Beejamrut.<br>➢ Spray Spodopetra NPV/Heliothis NPV in the evening time always. |

**Late blight/ early blight disease**

- Summer ploughing.
- Remove weeds from the field.
- Treat the seeds with Beejamrut.
- Make Tulsi leaf paste and mix with 10 lit water and spray once a week

**Root rot disease**

- Summer ploughing.
- Remove weeds from the field.
- Treat the seeds with Beejamrut.
- Mix 200gm mint leaf paste and mix with 1-litre water, soaked for 24hrs and spray once a week.

### 1. Brahmastra:

- Crush 3 kg green Neem leaves in 10 lit. cow urine.
- Crush 2 kg custard Apple leaves, 2 kg Papaya leaves, 2 kg Pomegranate leaves and 2 kg Guava leaves in water.
- Mix the 2 ingredients and boil 5 times at some intervals till it becomes half.
- Keep it for 24 hrs, then filter, and squeeze the extract. This can be stored in a bottle for 6 months.

- Useful against sucking pests, pod/fruit borers.
- Dilute 50 millilitres of this extract to 15 litres of water for 2500 sq.ft. area.

**2. Neemastra:**

- Crush 5 kg green Neem leaves in 5 litres of water.
- Add 5 lit. cow urine and 2 kg cow dung.
- Ferment it for 24 hrs with intermittent stirring.
- Filter, squeeze the extract and dilute with 100 litres. of water.
- Use foliar spray over one acre.
- Useful against sucking pests and mealy bugs.

### 3. Beejamruta:

- Take 20 lit. water, 5 kg local cow dung 5 lit local cow urine, 50 g lime and a handful of soil (white ant soil).
- Take 5 kg of local cow dung in a cloth and bind it with tape.
- Put this cow dung in 20 litres. of water up to 12 hrs.
- Take 1 lit. water add 50 g lime in it, and let it be stable for a night.
- It is used for seed /root treatment.
- It helps in protecting young roots from fungus, as well as from soil-borne diseases.
- The seeds soaked with Beejamruta control the seed-borne diseases and increase seed germination.

### 4. Agneyastra:

- Collect 10 liters of Deshi cow urine, 200-250g tobacco leaves, 200-250g green chilli, 200-250g Garlic, 2-3 kg green Neem leaves and 2-3 kg green Karanja leaves.
- Crushed thoroughly the Tobacco leaves, green Chilli, Garlic, Neem leaves and Karanj leaves separately.
- Take a mud pot. Pour 4-5 litres of water in it. Add all the crushed materials in it and stir slowly with a stick. Then boil it for around 30 minutes.
- After boiling put it for some time to cool.
- Add the required amount of cow urine and stir it thoroughly, then keep it in the shade for around 48

hours. After it pour it in a cotton cloth and squeeze thoroughly. Collect the liquid in a plastic or glass bottle and put the cap tightly.

- Mix 30 ml of Agneyastra in 1 litre of water and spray it on crops.
- It is very effective for stem borers and pod borers

All the formulations should be prepared by the trainer one by one in different sessions in the presence of students / CCAs and teachers. Before this, the school authorities will arrange the raw materials required for preparing a specific pesticide. He will also facilitate and encourage the participants to do the same.

## 21.0 Harvesting of Crops

Harvesting of crops is the last stage of crop production. Harvesting should be done when crops are fully mature. If vegetables are allowed to grow to full maturity and are not harvested, the plant will stop producing. Besides this, the quality and taste are reduced if the vegetables are left up to the full maturity stage. Some crops are harvested once, like Cauliflower, Cabbage, Radish, Carrot and other root crops.

The trainer will conduct a practical demonstration on methods of harvesting different crops (fruits and vegetables). Matured fruits/vegetables should be plucked first. He will explain and show the maturity stages of different fruits and vegetables for harvesting and the different tools used for plucking fruits and vegetables. The trainer will facilitate the farmers and family members to do the same so that the participants will gain proper knowledge on harvesting

processes and stages of harvesting different fruits and vegetables. After harvesting the trainer will facilitate measuring the quantity harvested by using weighing machines so that it will be recorded properly in registers for assessment of production at the end of the month or season.

## 22.0 Daily Needs of Calories for Children

In general, the idea of how many calories a child needs per day based on his or her age range, gender, and physical activity level is specified below.

| Age (Years) | Gender | Sedentary (Not Active) | Moderately Active | Active |
|---|---|---|---|---|
| 2-3 | Male or female | 1,000 | 1,000 | 1,000 |
| 4-8 | Male<br>Female | 1,200 – 1,400<br>1,200 – 1,400 | 1,400 – 1,600<br>1,400 – 1,600 | 1,600 – 2,000<br>1,400 – 1,800 |
| 9-13 | Male<br>Female | 1,600 – 2,000<br>1,400 – 1,600 | 1,800 – 2,200<br>1,600 – 2,000 | 2,000 – 2,600<br>1,800 – 2,200 |
| 14-18 | Male<br>Female | 2,000 – 2,400<br>1,800 | 2,400 – 2,800<br>2,000 | 2,800 – 3,200<br>2,400 |
| 19-30 | Male<br>Female | 2,400 – 2,600<br>1,800 – 2,000 | 2,600 – 2,800<br>2,000 – 2,200 | 3,000<br>2,400 |
| 31-50 | Male<br>Female | 2,200 – 2,400<br>1,800 | 2,400 – 2,600<br>2,000 | 2,800 – 3,000<br>2,200 |
| 51 and older | Male<br>Female | 2,000 – 2,200<br>1,600 | 2,200 – 2,400<br>1,800 | 2,400 – 2,800<br>2,000 – 2,200 |

| Recommended Dietary for Men | | | | | |
|---|---|---|---|---|---|
| Age | 11-14 | 15 -18 | 19-24 | 25 -50 | + 51 |
| Calories (kCal) | 25OO | 3000 | 2900 | 2900 | 3000 |
| Protein (g) | 45 | 59 | 58 | 63 | 63 |
| Vitamin A (ug) | 1000 | 1000 | 1000 | 1000 | 1000 |
| Vitamin D (ug) | 10 | 10 | 10 | 5 | 5 |
| Vitamin E(mg) | 10 | 10 | 10 | 10 | 10 |
| Vitamin K (ug) | 45 | 65 | 70 | 80 | 80 |
| Vitamin C (mg) | 50 | 60 | 60 | 60 | 60 |
| Thlamln (mg) | 1.3 | 1.5 | 1.5 | 1.5 | 1.2 |
| Riboflavin (mg) | 1.5 | 1.8 | 1.7 | 1.7 | 1.4 |
| N iacin (mg) | 17 | 20 | 19 | 19 | 15 |
| Vitamin 86 (ug) | 1.7 | 2 | 2 | 2 | 2 |
| Folate (ug) | 150 | 200 | 200 | 200 | 200 |
| Vitamin BIZ (mg) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Calcium (mg) | 1200 | 1200 | 1200 | 800 | 800 |
| Phosphorous (mg) | 1200 | 1200 | 1200 | 800 | 800 |
| Magnesium (mg) | 270 | 400 | 3SO | 3SO | 3SO |
| Iron (mg) | 12 | 12 | 10 | 10 | 10 |
| Zinc (ug) | 15 | 15-18 | 15 | 15 | 15 |
| Iodine (ug) | 150 | 150 | 150 | 150 | 150 |
| Selenlum (ug) | 40 | so | 70 | 70 | 70 |


| Recommended Dietary for Women | | | | | |
|---|---|---|---|---|---|
| Age | 11-14 | 15-18 | 19-24 | 25-50 | +51 |
| Calories (kCal) | 2200 | 2200 | 2200 | 2200 | 1900 |
| Protein (g) | 46 | 44 | 46 | 50 | 50 |
| Vitamin A (ug) | 800 | 800 | 800 | 800 | 800 |
| Vitamin D (ug) | 10 | 10 | 10 | 5 | 5 |
| Vitamin E(mg) | 8 | 8 | 8 | 8 | 8 |
| Vitamin K (ug) | 45 | 55 | 60 | 60 | 60 |
| Vitamin C (mg) | 50 | 60 | 60 | 60 | 60 |
| Thlamln (mg) | 1.1 | 1.1 | 1.1 | 1.1 | 1 |
| Riboflavin (mg) | 1.3 | 1.3 | 1.3 | 1.3 | 1.2 |
| N iacin (mg) | 15 | 15-18 | 15 | 15 | 13 |
| Vitamin 86 (ug) | 1.4 | 1.5 | 1.6 | 1.6 | 1.6 |
| Folate (ug) | 150 | 180 | 180 | 180 | 180 |
| Vitamin BIZ (mg) | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Calcium (mg) | 1200 | 1200 | 1200 | 800 | 800 |
| Phosphorous (mg) | 1200 | 1200 | 1200 | 800 | 800 |
| Magnesium (mg) | 280 | 300 | 280 | 280 | 280 |
| Iron (mg) | 15 | 15 | 15 | 15 | 10 |
| Zinc (ug) | 12 | 12 | 12 | 12 | 12 |
| Iodine (ug) | 150 | 150 | 150 | 150 | 150 |
| Selenlum (ug) | 45 | 50 | 55 | 55 | 55 |

## 23.0 Role of Farmers in Garden Maintenance

Besides garden establishment, operation and maintenance of the garden is an important part. So, it is the collective responsibility of farmers to maintain the garden properly in different stages. For proper maintenance, farmers could help in different low-risk and light labour-intensive activities.

- Observation of crop status on a day-to-day basis in leisure time and recording it in their notes.

- Observe different pests and diseases affecting the crops.
- Collectively harvest crops.

- Undertake weeding, intercultural activities, and operate micro irrigation systems that are fairly low labour intensive.
- Besides these farmers could involve themselves under the supervision of teachers.

## 24.0 Conclusion

Kitchen gardens should be part of home and hobby irrespective of the fact whether it is developed in plains of a villages or cities. The idea of a kitchen garden should be spread so that it can contribute substantially to the health, happiness and economy of each family. Everybody should know how it makes us healthy and wealthy.

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