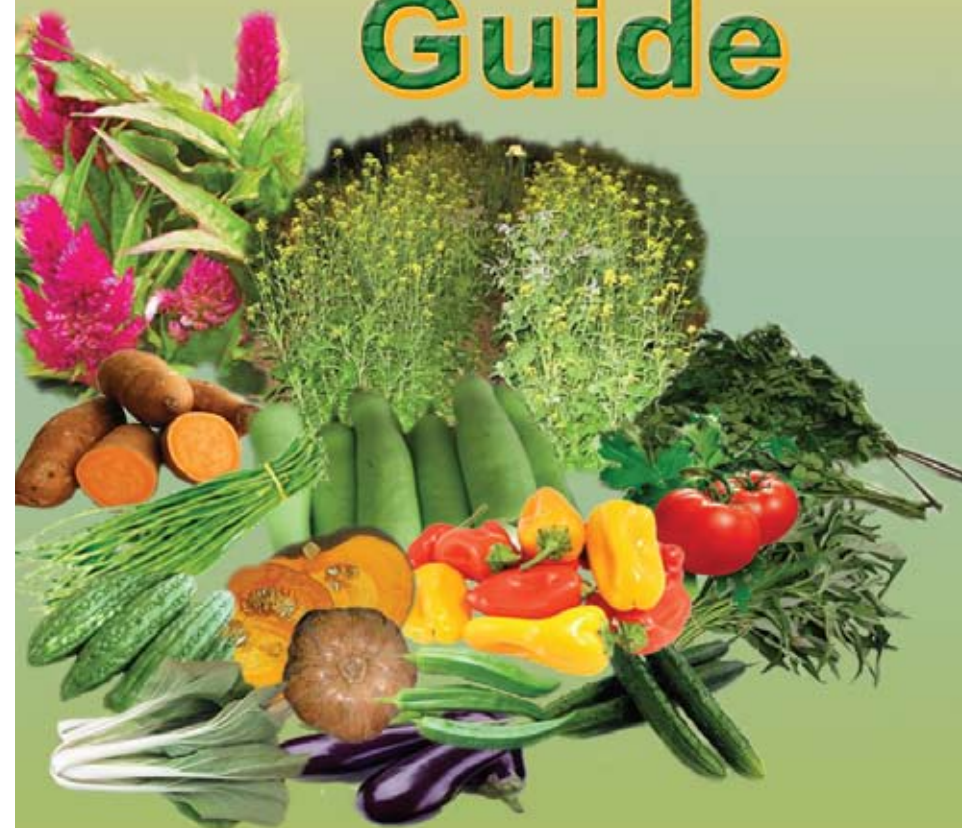


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# Vegetable Production Guide



*Produced by:*

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## PECHAY

### Description

Pechay, pitsay or petsay (*Brassica rapa* L. cv group Pak Choi) is one of the most popular vegetables in the Philippines and known as one of the oldest green vegetables in Asia. It is an erect, biennial herb of about 15-30 cm tall at vegetative stage and its spreading, spirally arranged green ovate leaves vary in length from 10 to 30 cm. They are mild flavored and less crisp compared to other cabbages. The petioles are enlarged and grow upright forming a subcylindrical bundle. Inflorescence is a raceme with pale yellow flowers. Seeds are 1 mm in diameter and are reddish to blackish brown in color.

### Soil and Climatic Requirements

Pechay grows best in a clay loam soil with high organic matter and a pH of 6.0 to 6.8. The climate must be cool, with occasional rainfall.

### Land Preparation

Plow and harrow the field once or twice. For small areas, use a hoe or bolo.

### Planting Method

#### Seed Sowing

Sow the seeds directly to the seedling tray at 2 pieces per hole.

#### Transplanting

After 12-15 days, transplant the seedlings at 20 cm x 20 cm distance.

#### Fertilizer Application

Apply organic fertilizer (preferably chicken manure) at one bag/20 sq.m. before planting. Inorganic fertilizers such as urea and 14-14-14 should also be applied during planting time at 4 kg and 1 kg per 20 sq.m., respectively.

#### Watering

Water the plants lightly after transplanting. Do it daily preferably in the morning to avoid fungal infection.

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**Pest and Disease Management**

**Diseases**

**Damping off**

- Properly prepare the field and the seedbed
- Irrigation should be well-managed
- Seedbed should not be over watered
- Soil must be sterilized and frequently sprayed with safe fungicide
- Use fungicide-treated seeds

**Bacterial Soft Rot**

- Use rice straw mulch to reduce soft rot incidence
- Spray recommended insecticides to control the stripped flea beetle
- Avoid sorting the leaves during cultivation
- Observe proper sanitation
- Allow crop residues to decompose before planting the second crop
- Practice crop rotation
- Drain the field well.

**General Preventive/Control Measures**

Uproot and burn disease-infected plants to prevent spread of diseases. Cultivation is also necessary to minimize weeds.

**Pests**

**Diamond Buck Moth**

- Use biological control agents such as the following:
  - Diadegma semi-elasmus for highland vegetables
  - Cotesia sp. and trichogramma chilonis for lowland vegetables
  - Bacillus thuringiensis
- Practice crop rotation.
- Intercrop repellant crops like mint or herbs.
- Collect infected plant parts and crop residue in the field and dispose them properly by burying or burning them

### Aphids

- Spray with hot pepper extract.
- Utilize bio-control agents like earwig, coccinellid beetles, etc.
- Practice mulching to enhance population of spiders
- Use recommended insecticides.

### General Preventive/Control Measures

When seedlings begin to wilt, reduce watering immediately. Also, use hot pepper extract to control these pests.

### Harvesting

Harvest pechay 35 days after sowing or 20-25 days after transplanting, preferably in the afternoon to minimize postharvest losses.

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### MUSTARD

#### Description

Mustard belongs to the genera Brassica and Sinapis whose small seeds are used as a spice and, by grinding and mixing them with water, vinegar or other liquids, they are turned into a condiment known as mustard. The seeds are also pressed to make mustard oil, and the edible leaves can be eaten as mustard greens.

*Note: Production procedure is similar to pechay*

## Fertilization

Before planting, apply 1 bag of chicken manure, 4 kg of complete fertilizer, 1 kg of urea and 30 g of furadan per 20 linear meters. After this, drench the plot with 16 liters of water at 150 ml per hill. Do this weekly, following the schedule and the recommended amount and kind of fertilizer below:

1st week	75 g	urea
2nd week	150 g	urea
3rd week	225 g	urea
4th week	75 g	complete
5th week	150 g	complete
6th week	225 g	complete
7th week	300 g	complete

Apply plant growth enhancer on the foliars using 4 caps per 16 liters of water every week.

## Pruning

Remove all the auxilliary buds, flowers and fruits below the fork and allow branches, flowers and fruits to develop above the fork.

## Trellis Construction

Use sticks as trellis.

## Maturity

Seventy (70) days after sowing, sweet pepper turns dark green to red, a sign of maturity. This can already be harvested with which average yield per hill may reach up to 15 kg.

## Planting Guide for the Establishment of a School Garden (10 m x 20 m)



## EGGPLANT

### Description

Eggplant (*Solanum melongena*), is a plant of the family Solanaceae. It is a popular vegetable crop grown in the subtropics and tropics. The name "eggplant" was derived from the shape of the fruit of some varieties, which are white and shaped similarly to chicken eggs. It grows 40 to 150 cm tall, with large coarsely lobed leaves that are 10 to 20 cm long and 5 to 10 cm broad. The stem is often spiny. The flowers are white to purple, with a five-lobed corolla and yellow stamens. The fruit is fleshy, less than 3 cm in diameter on wild plants, but much larger in cultivated forms. The fruit is botanically classified as a berry, and contains numerous small, soft seeds, which are edible.

### Climatic and Soil Requirements

Eggplant requires direct sunlight and thrives best in sandy loam to clay loam soils.

### Land Preparation

Prepare the land by alternately plowing and harrowing. Two weeks before transplanting, apply organic fertilizer such as chicken manure. For small scale production, use a hoe or bolo.

### Seedbed Preparation

Use a mixture of sand, compost and humus at a ratio of 1:1:1 and sterilize the seedbed by burning rice straws on top of it.

### Planting Method

#### Sowing and Seedling Care

Sow the seeds at approximately 5 pieces per linear meter and lightly cover them with soil. Five days after emergence, prick the seedlings in small pots using rolled banana leaves at one piece per pot.

### Planting Distance and Plant Management

Set the seedlings at 100 cm x 50 cm distance. Make sure that the soil is firmly yet slightly pressed in the roots. Water them and replant dead hills.

## **Fertilizer Application**

Apply 25 g of complete fertilizer per hill five days after transplanting and 7.5 g of urea 20 days after. Do the same after 30 days.

## **Watering**

Immediately water the plants after transplanting if rainfall is insufficient. Do as often as needed.

## **Weed Control**

Weeds are controlled either by physical methods or chemical control. Physical methods, such as hand weeding, cultivation, and mulching are quite common in small vegetable farms. Only shallow cultivation is necessary to avoid damage of superficial roots as plant pathogens may enter into the wounds. Mulching with black plastic mulch effectively controls weeds and reduces labor needs. Natural organic mulches, such as rice straw, will conserve moisture and add organic matter to the soil.

Chemical weed control is especially popular in places where labor is expensive. Suitable herbicides include Lasso, Enide, and Sencor.

## **Pest and Disease Management**

### **Insect Pests**

Numerous insects attack eggplant; only the most significant pests are mentioned here. With the exception of the Fruit and Shoot Borer, these insects are controlled by weekly applications of insecticides during periods of infestation.

### **Thrips**

They attack eggplant mostly during the dry season. They cause browning of leaves, especially on the lower leaf surface, and the scarring of fruit.

### **Leafhoppers**

They feed mainly on the underside of eggplant leaves, causing yellow patches on the foliage. Certain species also transmit mycoplasma-like diseases, such as little leaf disease. Fruit setting is adversely affected by the infestation.

## **Pest and Disease Management**

Amaranth is susceptible to foliar damage by insects such as leaf miners, leaf rollers, cutworms, aphids, leaf beetles, and mites. An effective method of controlling them is by covering the bed using a 32-meshed nylon net. Chemical pesticides should be used mainly as a corrective measure.

## **Harvesting**

Amaranth is ready for harvest 20-45 days after planting or sowing, and can be harvested once or several times thereafter. With multiple harvests, young leaves and tender shoots are picked at 2-3 weeks intervals.



## **SWEET PEPPER**

### **Description**

Sweet Pepper (*Capsicum annuum* L.) also known as capsicum, kampana, or lara is the most widely used condiment all over the world. It is consumed fresh, dried or processed.

### **Climatic Requirements**

Sweet pepper prefers a long, moderately cool night and a warm day with occasional rainfall having a high relative humidity.

### **Soil Requirements**

Soil should be well-drained, fertile sandy loam to clay loam with high organic matter, and a soil pH of 5.6 to 6.8.

### **Method of Planting**

#### **Sowing**

Directly sow the seeds to the seedling tray at 2 pieces per hole.

### **Field Layout and Spacing Ideal**

For patola are single plots at 1 meter wide to any convenient length with 60 cm wide pathways and 60-70 cm planting distance between hills of double rows in triangular orientation.

flower when day lengths are shorter than 12 hours.

It also thrives best in loam or silt loam soil with good water holding capacity. However, it can grow on a wide range of soil types and soil moisture levels and can tolerate a soil pH from 4.5 to 8.0.

### **Land Preparation**

Amaranth requires thorough land preparation and well-prepared bed for good growth.

### **Method of Planting**

It can be planted either by direct seeding or transplanting. Direct seeding is appropriate when there are plenty of seeds available. They are either broadcasted or sown uniformly in rows at 1 g per sq.m on a well-prepared seedbed. Since amaranth seeds are small, mix them with sand at a ratio of 1 g of seeds to 100 g of sand in order to obtain a uniform stand.

Transplanting, on the other hand, is preferred when there is a limited amount of seeds; labor is available; and during wet season when heavy rains can almost likely wash out the seeds. Seedlings grown in a seedbed or tray can be bare-root lifted (pulled with root ball still intact) and transplanted to a plot or bed.

### **Plant Spacing**

Beds should be raised at 20-30 cm high with bed tops of about 90 cm wide while rows should be spaced at 10-15 cm and 5-10 cm distance between plants.

### **Fertilization**

Amaranth is can grow in poor soils. However, yield can be improved if organic and inorganic fertilizers are applied.

### **Irrigation**

To ensure a good start, water the amaranth right after sowing or transplanting, preferably at noontime if wilting is observed.

### **Weed Control**

Amaranth is small seeded and slow in germination, therefore, weed control is necessary particularly in the early part of the season.

### **Aphids**

They feed on the juices within leaves and stems. Black sooty mold develops on the sugary excretions of the aphid. This sooty mold covers the plants, thereby reducing photosynthesis and weakening the plant. Aphids occur in the cool dry season.

*Note: For thrips, leafhoppers and aphids, use sticky yellow-colored trap. Spray with botanical pesticides. Apply mulch to enhance spider population*

### **Epilachna beetles**

They feed voraciously on the leaves and tender parts of eggplant. They cause serious damage during their larval stage and when they appear in large numbers. As a result of their feeding, skeletonized patches develop on leaves. Later, the leaves dry away.

Remove larvae/adults by handpicking every early morning. Practice clean culture. Apply wood ash. Use recommended insecticide.

### **Shoot and Fruit Borer**

Practice clean culture. Apply trichogramma. Use attractants/pheromones. Remove and collect infested shoots and fruits and bury them to kill the larvae. Use recommended insecticides.

### **Red Spider Mites**

Remove heavily infected leaf/burn. Use some predaceous mites.

### **28 Spotted Lady Beetle**

Remove larvae/adults by handpicking every early morning. Practice clean culture. Apply wood ash. Use recommended insecticides.

### **Common Cutworm**

Utilize biological control agents such as Nuclear Polyhedrosis Virus (NPV). Practice sanitation/clean culture. Remove alternate host. Use sex pheromone traps to monitor insect pest population. Use Nuclear Polyhedrosis Virus (NPV) and Bacillus Thuringiensis (Bt) spray based on damage levels and non-application of insecticide in the first 20 days after transplanting.

## Diseases

Several diseases attack eggplant. Few of which are Phomopsis blight, Damping off, Bacterial wilt, and Verticillium wilt.

### Phomopsis Blight

Practice crop rotation. Avoid use of contaminated manure. Spray the plants with fungicides

### Damping Off

*(See recommendation for damping off on pechay)*

### Bacterial Wilt

Plant bacterial wilt tolerant varieties like Dumaguete long purple. Practice crop rotation. Graft eggplants on disease-free and resistant stocks to minimize disease infection.

### Verticillium wilt

This causes stunting and wilting of plants. Leaves turn yellow along the margins, later turning brown and wilting. A lengthwise cut of the infected stem shows dark-brown discoloration in the vascular tissue. Soil sterilization and crop rotation with non-Solanaceous crops are recommended. Grafting eggplants on suitable rootstocks also minimizes the disease infestation. Use resistant varieties.

Plant Verticillium wilt tolerant varieties. Sterilize the soil and practice crop rotation.

Other diseases on eggplant include Southern blight, Alternaria and Cercospora leaf spot, and several viruses.

Practice crop rotation, clean culture and good water management. Apply fertilizer properly.

## Pruning

Remove excess and sickly branches.

## Harvesting

Harvest 60-80 days after transplanting and twice a week over a period of 3-6 months.

## Pruning

Prune the flowers, lateral vines and fruits up to 1 meter high or from the 12th to the 15th node since upo's fruiting zone is from the 16th node and above. After which, remove the "kolot" and do follow-up pruning.

## Trellis Construction

Trellis should be a box type.

## Pest and Disease Management

Pests that commonly attack upo are squash beetle, cucurbit bugs, fruit fly, thrips, leaf miner, mites, aphids, white flies, cutworm and root grub. Diseases, on the other hand, include damping-off, alternaria leaf spot, downy mildew, anthracnose, powder mildew, bacterial wilt, cercospora leaf spot, mosaic, fusarium wilt and root knot.

## Maturity

Fifty-five (55) days after sowing, upo can already be harvested. Average yield per hill may reach up to 15 kg.



## AMARANTH

### Description

Amaranthus, collectively known as amaranth or pigweed, is a cosmopolitan genus of herbs. Approximately 60 species are recognized, with inflorescences and foliage ranging from purple and red to gold. Members of this genus share many characteristics and uses with members of the closely related genus Celosia.

Although several species are often considered weeds, people around the world value amaranths as leaf vegetables, cereals, and ornamentals. The word comes from the Greek word amarantos, the "one that does not wither," or the never-fading (flower).

### Climate and Soil Requirements

Amaranth grows well in both humid and hot dry climates or in temperatures between 25-30° Celsius. It is photoperiod-sensitive, and most species will



## Soil Requirements

Upo thrives best in a well-drained, fertile sandy loam to clay loam with high organic matter, having a pH of 5.8 to 6.8.

## Climatic Requirement

Upo prefers a long day length and a warm, dry weather but with occasional rainfall having a high relative humidity.

## Method of Planting

### Sowing

Cut the tip of the seeds near the embryo and directly sow them to the seedling tray at 1 piece per hole with embryo facing downward.

### Transplanting Age

Transplant the seedlings 7 to 12 days after sowing.

## Field Layout & Spacing

In a double plot, preferably 1 meter wide to any convenient length, plant the seedlings in a single row with a crawling area of 6 meters, 60 cm pathways and a planting distance of 80 cm to 1 meter between hills.

## Fertilization

Before planting, apply 1 bag of chicken manure, 4 kg of complete fertilizer, 1 kg of urea and 30 g of furadan per 20 linear meters. After this, drench the plot with 16 liters of water at 150 ml per hill. Do this weekly, following the schedule and the recommended amount an kind of fertilizer below:

1st week	75 g	urea
2nd week	150 g	urea
3rd week	225 g	urea
4th week	75 g	complete
5th week	150 g	complete
6th week	225 g	complete
7th week	300 g	complete

Apply plant growth enhancer on the foliars using 4 caps per 16 liters of water.



## TOMATO

### Description

Tomato (*Solanum lycopersicum*, syn. *Lycopersicon lycopersicum* & *Lycopersicon esculentum*) is a herbaceous, usually sprawling plant in the Solanaceae or nightshade family. Savory in flavor (and accordingly termed a vegetable), the fruit of most varieties ripens to a distinctive red color. Tomato plants typically reach to 1–3 meters (3–10 ft) in height, and have a weak, woody stem that often vines over other plants. The leaves are 10–25 centimeters (4–10 in) long, odd pinnate, with 5–9 leaflets on petioles, each leaflet up to 8 centimeters (3 in) long, with a serrated margin; both the stem and leaves are densely glandular-hairy. The flowers are 1–2 centimeters (0.4–0.8 in) across, yellow, with five pointed lobes on the corolla; they are borne in a cyme of 3–12 together. It is a perennial, often grown outdoors in temperate climates.

### Soil and Climatic Requirements

Tomato grows in many types of soils, from sandy to heavy clay with a pH of 5.5 to 7.0. However, for a high production, it needs a well-drained loam soil and a warm weather with constant sunshine.

### Land Preparation

Avoid lands that had been planted with solanaceous crops in the previous season. Alternately plow and harrow the suitable area at least 2 times to improve its soil structure and remove the weeds.

### Method of Planting

### Seedbed Preparation

Prepare the seedbed by incorporating compost with soil and sterilize it by burning rice hull or straws on top a day before sowing the seeds.

### Seed Sowing and Seedling Care

Sow the seeds in rows of about 10 cm apart and 1 cm deep. Cover them with a very fine soil and spread a layer of rice straws on top. Water them everyday and remove the mulch as soon as the seeds germinate.

## Transplanting and Care

Three to four-week old seedlings can already be transplanted in furrows at 30-40 cm distance between hills. Firmly press the soil around the roots and water them using a sprinkler. Replant the missing hills.

## Fertilizer Application

A month before planting, apply 2-5 tons of manure as a substitute for chemical fertilizer. Use urea and muriate of potash as sidedress 30 and 60 days after transplanting.

## Irrigation

Tomatoes need about 25 mm of water every week. If rainfall is insufficient, water them at a regular interval of 7 days.

## Weed Control

Remove the weeds 14-21 days after transplanting

## Pest and Disease Management

### Diseases

#### Leaf Scald

Remove the first affected leaves. Improve air circulation by removing old basal leaves of non-infected plants. Use resistant variety.

#### Damping Off (*Pls see damping off control*)

#### Bacterial Wilt

Practice crop rotation

#### Fusarium Wilt

Plant resistant varieties

#### Southern Blight

Practice crop rotation, proper farm debris handling and proper soil management

disposing them by burning or burying them. Practice crop rotation. Use ripe fruits as attractant for trapping adult and larvae. Collect or spot spray them.

## Leaf-footed Bug

Despite the abundance of this insect, control measures are seldom required, but some insecticides are effective.

## Aphids, Whiteflies and Leafhoppers

To prevent these insects, plant okra to trap pests and plant ginger, marigold and lemongrass in strategic location to repel the pests. Use yellow sticky traps. Place light trap or a kerosene lamp inside a yellow colored basin with water and little detergent. Use fruit fly trap or fruit fly attractant.

## Leaf Miner

Practice deep cultivation to expose pupa to direct sunlight.

## Cutworms, Semi-looper and Caterpillars

Handpick early in the morning. Spray with botanical pesticides

## Maturity

Forty-five (45) days after sowing, patola reaches its desirable size which means it is already mature and ready for harvest. Average yield per hill may reach up to 10 kg.



## UPO

### Description

Upo (*Lagenaria siceraria*) or bottle gourd is a vegetable and is a relative of the pumpkin. From the wide-spreading vine, grows leaves, tendrils flowers, and fruits. The leaf is heart-shaped and has five lobes. The tendrils are coily and will attach the vine to some kind of support. The white flower has five petals and blossoms at night. The tiny flower is only about one-half inch in length. The young gourd fruit is soft and covered with downy hairs and is green or white. The fruit of the gourd can grow short and thick, or the fruit can grow long and thin. It can contain a white pulp with flat seeds.

## Fertilization

Before planting, apply 1 bag of chicken manure, 4 kg of complete fertilizer, 1 kg of urea and 30 g of furadan per 20 linear meters. After this, drench the plot with 16 liters of water at 150 ml per hill. Do this weekly, following the schedule and the recommended amount and kind of fertilizer below:

1st week	75 g	urea
2nd week	150 g	urea
3rd week	225 g	urea
4th week	75 g	complete
5th week	150 g	complete
6th week	225 g	complete
7th week	300 g	complete

Apply plant growth enhancer on the foliars using 4 caps per 16 liters of water every week.

### Pruning

Prune the flowers, lateral vines and fruits up to 1 meter high or from the 12th to the 15th node since fruiting zone is from the 16th node and above. After which, remove the "kolot" and do follow-up pruning.

## Pest and Disease Management

Insect pests that commonly attack patola are squash beetle, cucurbit bugs, fruit fly, thrips, leaf miner, mites, aphids, white flies, cutworm and root grub. Diseases, on the other hand, include damping-off, alternaria leaf spot, downy mildew, anthracnose, powdery mildew, bacterial wilt, cercospora leaf spot, mosaic, fusarium wilt and root knot.

### Pests

#### Cucurbit Leaf Beetle

Handpick the adults early in the morning or late afternoon. Remove debris after harvest if plant was previously infested.

#### Melon Fly

Bag the fruits using glossy paper, newsprint, telephone directory paper or plastic bags. Be sure to leave a small opening at the bottom for proper aeration/diffusion of rainwater. Use attractant such as methyl eugenol, zorgen, kalingag bark power, etc. Practice clean culture by collecting infested fruits and properly

## Bacterial Canler

Practice crop rotation. Eradicate weeds. Treat the seeds and spray them with copper fungicide.

## Tomato Mosaic Virus or TMV

Practice strict sanitation. Avoid excessive handling of seedlings. Wash hands with soap and water prior to plant handling

### Insect Pests

Aphids (see aphid control in pechay)

### Fruit worm

Apply trichogramma before fruit setting and spray with insecticides when fruits are already set.

## Harvesting

Tomatoes are harvested at several stages depending on how they are to be marketed or used.



## OKRA

### Description

Okra is a flowering plant in the mallow family, valued for its edible green fruits. Okra's scientific name is *Abelmoschus esculentus*; it is occasionally referred to as *Hibiscus esculentus* L.

This species grows up to 2 meters tall. The leaves are 10–20 cm long and broad, palmately lobed with 5-7 lobes. The flowers are 4-8 cm diameter, with five white to yellow petals, often with a red or purple spot at the base of each petal. The fruit is a capsule up to 18 cm long, containing numerous seeds.

## Soil and Climatic Requirements

Okra grows well in both wet and dry seasons. It tolerates a wide range of soil conditions provided that there is a good drainage. However, it is susceptible to nematodes frequently found in sandy soils. Short day stimulates its early flowering but reduces vegetative growth.

## Land Preparation

Plowing and harrowing can be done once or twice. Use hoe or bolo for small areas.

## Method of Planting

### Seed Soaking

To activate okra seeds, soak them with water in a shallow pan overnight.

### Transplanting

Plant 2-3 per hill and cover them with well-pulverized soil.

### Thinning

The first thinning of the seedlings should be done when the plants are already about 10 cm tall.

### Fertilizer Application

Apply organic fertilizer before planting while complete fertilizer can be applied during planting time at 12 g per plant.

Twenty days after emergence, sidedress with 15 g of urea per plant and another 15 g 25 days after the first sidedressing.

### Watering

Water the plants 7-10 days after emergence and do it weekly thereafter. Avoid water logging.



## PATOLA

### Description

Patola (*Cucumis acutangulus* Linn.) is a coarse, annual, herbaceous vine. The leaves are subrounded-ovate, 10 to 20 centimeters long, shallowly 5-lobed, and heart-shaped at the base. The female flowers are pedicelled, occurring singly in the axils of the leaves. The male flowers are yellow, 2 centimeters long, and borne in axillary racemes. The calyx-lobes are lanceolate and pointed. The fruit is oblong-oblongate, 20 to 25 centimeters long, about 5 centimeters in diameter, green, and characterized by 10, prominent, longitudinal, sharp angles. The seeds are numerous and close-packed.

Patola is a common vegetable sold in the markets. The fibrous network of the mature fruit, devoid of the pulp and cleaned, is used as a bath brush or sponge. Analyses of the unripe fruit show it is good source of calcium and iron and an excellent source of phosphorus, vitamin B.

### Soil Requirements

Soil should be well-drained, fertile sandy loam to clay loam with high organic matter, having a soil pH of 5.8 to 6.8.

### Climatic Requirements

Patola prefers a long or neutral day length and warm and dry weather but with occasional rainfall having a high relative humidity.

### Planting Method

#### Sowing

Cut the tip of the seeds near the embryo and directly sow them to the seedling tray at 1 piece per hole with embryo facing downward.

#### Transplanting Age

Transplant the seedlings seven to 12 days after sowing.

## **Pest and Disease Management**

Insect pests that commonly attack squash are squash beetle, cucurbit bugs, fruit fly, thrips, leaf miner, mites, aphids, white flies, cutworm and root grub. Diseases, on the other hand, include damping-off, alternaria leaf spot, downy mildew, anthracnose, powdery mildew, bacterial wilt, cercospora leaf spot, mosaic, fusarium wilt and root knot.

### **Pests**

Squash Beetle/Orange Leaf Beetle

Handpick adults early in the morning. Destroy the whole root system after harvest. Practice mulching using plastic mulch.

### **Aphids**

Spray insecticidal soaps or a strong stream of water. Utilize natural enemies like ladybird beetles.

### **Diseases**

Blossom end rot (affects the fruit)

Supply even moisture to the plant

### **Curly Top**

Destroy the infected plants. Avoid stressing the plants by watering evenly and providing adequate fertilizer. Clean up debris after harvest.

### **Powdery Mildew**

Use surface or underground watering methods to avoid wetting leaves. Practice crop rotation.

### **Maturity**

Sixty-five (65) days after sowing, when the fruits are already big and the leaves are dried, it means they are already mature and ready for harvest. Average yield per hill may reach up to 15 kg.

## **Pest Management**

### **Pests**

#### **Cotton Stainer**

Remove and destruct all standing cotton trees at a fixed date soon after the cotton has been picked and when they cease to bear profitable yield. Utilize soil dwelling predators. Use recommended insecticides.

#### **Melon Fly**

Bag the fruits when falling of fertilized flowers is observed. Use either glossy paper or plastic bags as bagging materials. Be sure to leave a small opening at the bottom for proper aeration/diffusion of rainwater. Use attractant such as Methyl eugenol, zoxgen, kalingag bark powder, etc. Practice clean culture by collecting infested fruits and dispose them properly by burning or burying them. Practice crop rotation. Ripe fruits can be used as attractants for trapping the adult and larvae. This can be collected or sprayed with insecticides (spot spraying)

#### **White Fly**

Practice intercropping using non-hosts to reduce numbers of white flies. Apply neem extract. Practice crop rotation and proper sanitation. Escape cropping.

#### **Harvesting**

First harvest should be done 42 days from plant emergence during dry season and 55 days during wet season. Fresh pods are harvested daily or every other day for prolonged and continuous fruiting. Number of harvesting can range from 27 to 31 times.



## **POLE/STRING BEAN**

### **Description**

Pole beans (*Phaseolus vulgaris*) are bushy or climbing tropical plant that clings to poles or trellises. It is widely cultivated for its narrow green edible pods. Their growth habit makes them very easy to harvest. These beans are also very easy to grow at home, as long as you live in a temperate to warm climate.

## Site Selection/Soil Type

String bean can grow on a wide range of soils and climate. However, for maximum growth and yield, it should be planted on a friable, fertile and well-drained soil. It also requires a sunny climate with adequate water and high relative humidity.

## Land Preparation

The area should be leveled and pulverized.

## Sowing

Sow 3-4 seeds per hill at 1 cm deep and 80 cm x 30 cm distance.

## Fertilization

A month before planting, apply 2-5 tons of manure as a substitute to chemical fertilizer.

## Thinning

Remove weak and diseased plants.

## Trellis/Pole

Post poles after thinning.

## Irrigation

Immediately water the hills after sowing. And if rainfall is insufficient, water the plants every week

## Weeding

Remove the weeds especially those around the plant base.

## Pest and Disease Management

### Pests

#### Aphids

Use formulations of fungal pathogens such as *Conidiobulus coronatus* and *Beauveria bassiana*. Apply recommended insecticides.

## Climatic Requirements

Squash prefers a long or neutral day length with long period of warm and dry weather, occasional rainfall, and high relative humidity.

## Method of Planting

### Sowing

Soak the seeds for 30 minutes to 1 hour and pinch their tips near the embryo. Directly sow them to the seedling tray at 1 piece per hole with embryo facing downward.

### Transplanting Age

Seven to 12 days after sowing, transplanting can be done.

## Field Layout and Spacing

In a double plot, planting should be in a single row with a crawling area/pathway of 5 meters wide and a planting distance of 80 cm to 1 meter between hills.

## Fertilization

Before planting, apply 1 bag of chicken manure, 4 kg of complete fertilizer, 1 kg of urea and 30 g of furadan per 20 linear meters. After this, drench the plot with 16 liters of water at 150 ml per hill. Do this weekly, following the schedule and the recommended amount and kind of fertilizer below:

1st week	75 g	urea
2nd week	150 g	urea
3rd week	225 g	urea
4th week	75 g	complete
5th week	150 g	complete
6th week	225 g	complete
7th week	300 g	complete

Apply plant growth enhancer on the foliars using 4 caps per 16 liters of water every week.

## Pruning

Prune the lateral vines, flowers and fruits up to the 5th node since the fruiting zone of squash starts on the 6th node and above.

### **Fruit Fly**

Practice clean culture by collecting infested fruits and dispose them by burning. Apply crop rotation and bugging. Use attractants (zorgen) or 1 kg brown sugar dissolved in 1 gallon water as attractant

### **Fruit Worm**

Remove larvae by handpicking and collect infested fruits. Do net bagging and use recommended insecticides

### **Bacterial Wilt**

Avoid using compost and manure contaminated with organism. Use healthy seedlings. Remove and burn diseased plants. Practice crop rotation.

Maturity  
Fifty (50) days after sowing, ampalaya can already be harvested. Average yield per hill may reach up to 5 kg.



## **SQUASH**

### **Description**

Squash or kalabasa is a viny, creeping and trailing crop producing fruits and considered to be one of the most delicious vegetables belonging to the family Cucurbitaceae of Gourd Family. Its prostrate herbaceous vine reaches a length of 4 meters or more and flowers throughout the year. Adventitious roots are also commonly formed at its nodes. The leaves are broadly rounded and heart shaped. Flowers are erect with lemon yellow to deep orange in color. The fruits are large and variable in shape, size, color and markings with peduncle that is large, soft and corky on the surface at maturity. Numerous seeds are embedded in the tissue of the placenta which lies at the center of the fruit.

It is the most commonly and regularly grown among the cucurbits due to its rich source of Vitamin A, phosphorous and calcium.

### **Soil Requirements**

Prefer well-drained, fertile sandy loam to clay loam soil with high organic matter, having a soil pH of 5.8 to 6.8.

### **Bean Pod Borer**

Practice field sanitation. Remove alternate host such as *Portulaca oleracea*. Practice IPM particularly on the use of resistant cultivars and adjustment of date where the most suitable options for residual soil moisture.

### **Bean Fly**

Practice intercropping. Use rice straw and other similar plant straw mulch. Apply commonly used systemic insecticides to the soil alongside the seeds to protect young seedlings when they are most vulnerable.

### **Common Cutworm**

Utilize biological control agents such as Nuclear Polyhedrosis Virus (NPV). Practice field sanitation/clean culture. Remove alternate host. Use sex pheromone traps to monitor pest population. Use Nuclear Polyhedrosis Virus (NPV) and *Bacillus thuringiensis* (BT) spray based on damage levels and non-application of insecticides in the first 20 days after transplanting.

### **Harvesting**

Normally, picking of green pods starts 45 days after emergence and about 7-10 days after flowering. Next harvest should be done every 2-4 days depending on the weather condition.



## **SWEET POTATO**

### **Description**

The Sweet Potato (*Ipomoea batatas*) is a dicotyledonous plant that belongs to the family Convolvulaceae. It is an herbaceous perennial vine, bearing medium-sized sympetalous flowers and alternate heart-shaped or palmately lobed leaves which are sometimes eaten as greens. Its long and tapered, edible, starchy, sweet tasting tuberous root are an important root vegetable, with a smooth skin whose color ranges between red, purple, brown and white. Its flesh ranges from white to yellow, orange, and purple.

### **Site Selection**

Sweet potato can adapt to a wide range of climatic condition. Planting it in a well-drained, sandy and silt loam or clay soil may result in growth of stems and

leaves but poor shape of tubers. They are sensitive to alkaline and saline condition.

### **Land Preparation**

Plow the field at least twice and harrow it once after plowing. The soil should be adequately prepared to ensure good contact between the soil and seed pieces/tops.

### **Plant Material Treatment**

The usual planting material for sweet potato is vine cutting, though tuber can be used. Gather cuttings of 25-30 cm long from healthy parent.

### **Planting Method**

Plant the cuttings in slanting position at 6-14 cm depth. The top of 2-3 leaves should be above the ground at a distance of 30 cm per hill.

### **Fertilization**

Poor soil has to be complemented with complete fertilizer during planting. Manure can also be applied at 5 tons per hectare as a substitute to inorganic fertilizer.

### **Irrigation**

Irrigate the field when the plant shows temporary wilting.

### **Pest Management**

#### **Sweet Potato Weevil**

Practice field sanitation by removing infested plant residues. Practice flooding to drown weevils in the field. Practice hilling up to prevent or fill soil cracks. Practice routine irrigation to prevent soil cracks. Practice mulching to keep the soil moist and prevent cracks, and provide more favorable place for natural enemies. Practice bio-control such as *Beauveria bassiana*/*Messiana anisopliae* by incorporating into the soil during planting. Use clean planting materials. Set up pheromone trap in the field to attract male weevils.

### **Field Layout**

In a double plot, preferably 1 meter wide to any convenient length, plant the seedlings in a single row with a crawling area of 6 meters wide, 60 cm wide pathways and a planting distance of 80 cm to 1 meter between hills.

### **Fertilization**

Before planting, apply 1 bag of chicken manure, 4 kg of complete fertilizer, 1 kg of urea and 30 g of furadan per 20 linear meters. After this, drench the plot with 16 liters of water at 150 ml per hill. Do this weekly, following the schedule and the recommended amount and kind of fertilizer below:

1st week	75 g	urea
2nd week	150 g	urea
3rd week	225 g	urea
4th week	75 g	complete
5th week	150 g	complete
6th week	225 g	complete
7th week	300 g	complete

Apply plant growth enhancer on the foliar using 4 caps per 16 liters of water every week.

### **Pruning**

Prune the flowers, lateral vines and fruits up to 1 meter high or from the 12th to the 15th node since fruiting zone is from the 16th node and above. After which, remove the "kolot" and do follow-up pruning.

### **Trellis Construction**

Trellis should be a box type.

### **Pest and Disease Management**

Insect pests that commonly attack ampalaya are squash beetle, cucurbit bugs, fruit fly, thrips, leaf miner, mites, aphids, white flies, cutworm and root grub. Diseases, on the other hand, include damping-off, alternaria leaf spot, downy mildew, anthracnose, powdery mildew, bacterial wilt, cercospora leaf spot, mosaic, fusarium wilt and root knot.



## Harvesting

Leaves can be harvested when the plant is already 1.5-2.0 m which usually takes one year. This can be done by snapping the leaf stem from branches. Flowers and pods, on the other hand, are normally produced during the 2nd year of growth. It is suggested that pods should be harvested when they are young, tender and green.



## AMPALAYA

Ampalaya (*Momordica charantia*) is a tropical and subtropical vine of the family Cucurbitaceae, widely grown for its edible fruit, which is among the most bitter of all vegetables. English names for the plant and its fruit include bitter melon or bitter gourd.

The original home of the species is not known, other than that it is a native of the tropics. It is widely grown in India and other parts of the Indian subcontinent, Southeast Asia, China, Africa, and the Caribbean.

## Soil Requirements

Soil should be well-drained, fertile sandy loam to clay loam with high organic matter, having a pH of 5.6 to 6.8.

## Climatic Requirements

Ampalaya prefers a long or neutral day length and warm, dry weather but with occasional rainfall having a high relative humidity.

## Method of Planting

### Sowing

Soak the seeds for 30 minutes to 1 hour then cut the tip near the embryo. Directly sow them to the seedling tray at 1 piece per hole with the embryo facing downward.

### Transplanting

Transplant the seedlings seven to 12 days after sowing.

## Leaf Miner

Cut the infested plant leaves. Plant insect-free propagation material. Use yellow-colored sticky traps/cards. Practice field sanitation. Flooding to soil followed by holing. Use recommended insecticide.

## Harvesting

If the crop is intended for tuber production, tubers can be harvested 110 days after planting. Dig the soil using a plow or bolo. Be careful not to harm the tubers. Pick and wash afterwards. If the intention is to use the tops as vegetables, harvesting can be done as early as 3-4 weeks after planting. Note that regular gathering of tops of the plant will result to non-production of tubers.



## KANGKONG

### Description

Kangkong (*Ipomoea aquatica*) is a semi-aquatic tropical plant grown as a leaf vegetable. It is known in English as water spinach, water morning glory, water convolvulus, or by the more ambiguous names "chinese spinach" and "swamp cabbage." It has many other names in other languages as it is found throughout the tropical and subtropical regions of the world.

*Ipomoea aquatica* grows in water or on moist soil. Its stems are 2–3 meters or more long, rooting at the nodes, and they are hollow and can float. The leaves vary from typically sagittate (arrow-head-shaped) to lanceolate, 5–15 centimeters long and 2–8 centimeters broad. The flowers are trumpet-shaped, 3–5 centimeters diameter, usually white in colour with a mauve centre.

### Climatic Requirements

Kangkong grows best in a moist climate with occasional rainfall, having a high relative humidity.

### Soil Requirements

Kangkong requires fertile, well-drained clay loam soil with high organic matter, having a pH of 6.0 to 6.8.

## Sowing and Plant Spacing

In a single plot with one meter width, directly sow 3 pieces of seeds per hole at 15-20 cm planting distance between hills.

## Fertilization

Apply 1 bag of chicken manure per 20 sq.m. as basal fertilizer. Urea and complete fertilizers can also be used.

## Pest and Disease Management

Observed insect pests in Kangkong are diamond backmoth, cutworms, cabbage looper, aphids, leafminers and flea beetle while diseases include damping-off, downy mildew, root knot, clubroot, bacterial soft rot, etc.

## White Rust

Practice crop rotation and field sanitation. Use adequate plant spacing using furrow rather than overhead irrigation

## Leaf Miner

Cover the bed with fine screen or fine mesh nylon net (32-mesh or finer)

## Harvesting

Start harvesting 30 days after sowing.



## MALUNGGAY OR MORINGA

### Description

Malunggay (*Moringa oleifera*), commonly referred to simply as "Moringa" is the most widely cultivated species of the genus *Moringa*, which is the only genus in the family Moringaceae. It is an exceptionally nutritious vegetable tree with a variety of potential uses.

The tree itself is rather slender, with drooping branches that grow to approximately 10 m in height. In cultivation, it is often cut back annually to 1 meter or less and allowed to regrow so that pods and leaves remain within arm's reach.

## Climate and Soil Requirements

Malunggay tolerates a wide range of environmental conditions. It grows best between 25-35° Celsius with 250-1500 mm of rain.

It thrives in a well-drained, sandy loam or loam soil, but is also tolerant in clay soil. It does not survive under prolonged flooding and poor drainage.

## Land Preparation

Malunggay requires a thorough land preparation.

## Planting Method

Malunggay can be planted either by direct seeding, transplanting or using hard stem cuttings. In the country, most popular is the use of stem cuttings from at least 1 year old tree since they grow faster. Use hardwood and avoid using young green stem. Cuttings can be dried in the shade for three days before planting in the nursery using plastic bags or directly in the field.

## Fertilization

Malunggay grows well in most soils without adding fertilizer. Once established, the extensive root system is efficient in mining nutrients from the soil. However, for optimum growth and yield, use compost or well-decomposed farm manure at 2 kg per tree.

## Irrigation

Water newly planted trees to promote early root development. Once established, the plants rarely need watering.

## Pest and Disease Management

Malunggay is generally resistant to most pests and diseases but outbreaks may occur under certain conditions. Diplodia root rot may appear in waterlogged soils causing wilting and death. Mite can also increase during dry and cool weather. Other insect pests include termites, aphids, leaf miners, white flies and caterpillars. Do chemical control when infestations become severe.

## Pruning

Malunggay should be trimmed to promote branching, increase its yield and facilitate harvesting.