

Organic Eggplant Production



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II. Gross Income**		400,000.00
Net Income		292,475.00
% Return on investment		272.0

*MAD - man-animal day; MD - man day

**With marketable yield of 20 t/ha at farm gate price of P20/kg.

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Table 2. Cost and return analysis of 1-ha organic eggplant production.

Items	Unit Cost (P)	Total (P)
I. Variable Costs		
A. Labor *		
Plowing (5 MAD)	600/MAD	3,000.00
Harrowing (3 MAD)	600/MAD	1,800.00
Furrowing/ Bedding (5 MAD)	600/MAD	3,000.00
Organic fertilizer application at bed preparation, basal and side dress application (10 MD)	300/MD	3,000.00
Seedling production (15 MD)	300/MD	4,500.00
Transplanting (10 MD)	300/MD	3,000.00
Spraying of fermented plant food supplement (FPFS) (10 MD)	300/MD	3,000.00
Irrigation (30 MD)	300/MD	9,000.00
Weeding (40 MD)	300/MD	12,000.00
Harvesting (50 MD)	300/MD	15,000.00
Miscellaneous (20 MD)	300/MD	6,000.00
Sub-total		63,300.00
B. Materials		
Seeds (100 g/ha)	1,100/50 g	2,200.00
Organic fertilizer (3 t)	5,000/t	15,000.00
FPFS		2,500.00
Biopesticides		500.00
Net bags, crates, and knives		5,000.00
Miscellaneous		5,000.00
Sub-total		30,200.00
Sub-total (A+B)		93,500.00
C. Contingencies (15%)		14,025.00
Grand Total Cost (A+B+C)		107,525.00

from the other varieties of at least 300 m should be maintained. Alternatively, select best plants in the lot and self the plants by wrapping flowers that will open the following day with aluminum foil or cotton. Tag selfed fruits and bulk these at harvest. Selected plants may also be caged in an insect-proof net to prevent cross pollination.

If the lot is relatively pure, simply remove the off-types at several stages from seedling stage to pre-flowering stage and at fruiting stage to prevent pollen and seed contamination.

Seed extraction may be done through the following:

1. Allow the yellowish ripe fruits to mature further by storing them at ambient temperatures for 3–7 days.
2. Beat the fruits with a stick to loosen the seeds from the flesh.
3. Cut open the beaten fruits and wash in water to separate the seeds from the flesh. Good seeds will sink. Discard the floaters.
4. Wash seeds in clean water and spread on cheese cloth or net to air dry. Sun-dry seeds only after air-drying. Stir the seeds 2–3 times a day, turning them over for uniform drying. Seeds that stick together should be separated. The seeds should be completely dry to about 8–10% moisture content.

To determine if the moisture content is acceptable, put around 100–200 g seeds inside a plastic bag or clear bottle and sun-dry. If condensation occurs after 30 minutes, continue to sun-dry the seeds. Pack the dry seeds in moisture-proof containers, label with the name of the variety and date then store in a cool, dry place. If properly stored, seeds can remain viable for up 2–3 years. Small quantities of seeds can be stored in the refrigerator.

Harvesting

Harvest mature fruits that are shiny and still soft. More frequent harvesting can reduce damage from fruit borers. Harvest all fruits including deformed and damaged ones to prevent spread of pests and diseases. Fruits can continuously be harvested up to six months. Several varieties can be grown for 1–2 years.



Postharvest Handling

Grade according to market standards. Pack in crates lined with banana leaves. Do not expose eggplants to high temperature. Do not mix with the harvest from conventional production. Washing the fruits in 2–5% alum solution or coconut water can improve shelf life.

Severely damaged fruits can either be included in the compost pile or used in preparing FPJ.

Seed Production

Seed production is best done during the dry season. Growing eggplant for seed production is similar to fresh fruit production.

The rates of natural cross pollination vary depending on genotype, location, and insect activity. It has been reported that the extent of natural outcrossing is from 2% to 48% in eggplant varieties in India and from 3% to 7% in China. At the World Vegetable Center (formerly known as Asian Vegetable Research and Development Center), 0–8.2% of natural outcrossing rates (with a mean of 2.7%) have been observed. To have relatively pure seeds, an isolation distance

	4. Spray early in the morning (around 6–8 a.m.) or late in the afternoon (around 4–6 p.m.) to avoid desiccation of the spores. • Grow sacrificial plants such as okra around the area or use biocontrol and oriental herbal nutrient (OHN).
Eggplant FSB (<i>Leuconoides orbonalis</i>)	• Grow repellant crops such as basil, onion, and marigold. • Clip off the affected shoots along with the larva inside. Use pheromone or <i>Trichogramma</i>. • Spray with <i>Bacillus thuringiensis</i> (Bt) or Nuclear Polyhedrosis Virus (NPV). Collect NPV-infected larvae and store in the freezer for later use. These can be macerated, then diluted at 2 infected larvae/L water. Spread earwigs to feed on pod borers.
Leaf miner	• Conserve natural enemies such as spiders, lacewings, and syrphid flies. Intercrop with okra, eggplant, tomato, or other suitable vegetables. • Maintain low weed population along alleys to minimize the pest.

Table 1b. Disease management options in eggplant.

Diseases	Recommendations
Bacterial wilt (<i>Ralstonia solanacearum</i>)	• Use resistant varieties such as 'Mistisa' and 'Mamburao.' • Avoid planting after other solanaceous crops such as tomato and pepper.
Phomopsis (<i>Phomopsis vexans</i>)	• Practice mulching. • Prune infected basal leaves and fruits. Infected fruits and stems appear to be burnt. • Use resistant varieties and compost fertilizers. • <i>Trichoderma</i> incorporated in the soil can help minimize the disease.

Introduction

Eggplant (*Solanum melongena* L.) is one of the most important vegetables in the Philippines. It belongs to the Solanaceae family similar to tomato, pepper, and potato. Native to India, where it is known as 'brinjal,' and internationally known as 'aubergine,' eggplant is called 'talong' (Tagalog), 'tarong' (Ilocano), or 'bringhinas' (Bisaya) in the Philippines. It is cultivated for its immature fruits, which can be roasted, fried, stuffed, pickled, or processed.

The varieties of eggplant vary widely in size, shape, and color. Size and shape range from oval or egg-shaped to long and club-shaped. Fruit color ranges from white, yellow, and green through degrees of purple pigmentation to almost black. In addition to the cultivated species, wild relatives are also consumed as vegetables especially in Thailand. Among these are *Solanum incanum* (*S. campylacanthum*) and *S. cumingii*.

Uses

Eggplant has chemicals that can upset the digestive system if eaten raw, so it is usually cooked. It can be grilled, stuffed, roasted, served in soups and stews and on kabobs, and used in curries and stir fries.

Eggplant is high in fiber, and provides additional nutrients such as potassium, magnesium, folic acid, and Vitamins B6 and A. Eggplant also contains important antioxidant phytonutrients. The phytonutrients include phenolic compounds such as caffeic and chlorogenic acid, and flavonoids, such as nasunin. Nasunin is a potent antioxidant and free radical scavenger that has been shown to protect cell membranes from damage.

Production Management

There is a common misconception that eggplant is difficult to grow organically. This is due to the conventional practice of using pesticides to control eggplant shoot and fruit borer. This process not only makes production expensive, but also poses serious hazards to the grower, the consumers, and the environment. The need for pesticides in eggplant is a result also of conventional farming practice of monocropping, clean culture, and use of susceptible varieties.

Organic eggplant production can be made easier with the use of varieties suited for organic conditions. There should also be preventive cultural practices such as intercropping, use of attractant plants and pest repellents, and sanitation measures such as pruning or detaching of infected leaves, flowers, or fruits. Mulching and proper weed management can also help minimize many of the pest problems.

Varieties

The most common type of eggplant in the Philippines is the long purple such as the Dumaguete Long Purple (open-pollinated variety) and Casino (F1). There are also regional preferences and variety types. In the North, apple green, round and long eggplant is grown. In Central Luzon, the round, green or purple cultivars are common. In Southern Tagalog, green or dark green cultivars that are round to tear-drop shaped are still in the market. In many provinces in southern Philippines, the long, shiny, and pointed cultivar with good shelf life is grown.

The most resistant variety for organic gardening is Mistisa. It has resistance to bacterial wilt and eggplant shoot and fruit borer. It is also drought-tolerant and can yield up to 20–30 tons (t)/hectare (ha).

Other open-pollinated varieties such as Mara, Concepcion, Mamburao and Cabiao can also be grown.

Mara and mamburao are long, purple types selected for resistance to bacterial wilt. Concepcion and Cabiao are green selections. Among the new potential varieties selected under the project "Variety Development, On-Farm Trials and Seed Production of Organic Vegetables in Southern Luzon," funded by PCAARRD, are long purple type, namely, 10138, 10437, 10152, 10154, and 10155. The round green types are 10441, 10442, and 10435.

Soil and Climate Requirements

Eggplant can be grown in low- to high-elevation areas throughout the year. The fruits of eggplant in the high elevation tend to be bigger, fleshier, and less seedy. Highest production could be achieved during the cool, dry months in sites at any elevation. It thrives best in sandy loam soil with pH 5.5–6.5.

Seedling Production

Seedlings are produced as follows:

- For a 1-ha farm, prepare five seedbeds measuring 1 meter (m) x 10 m each.
- Incorporate 1 kilogram (kg) fully decomposed chicken manure and 300 grams (g) carbonized rice hull per square meter.
- Wet the seedbeds and make shallow lines 5 inches (in) apart.
- Sow thinly 100–200 g of seeds and cover lightly with soil. A 50-g can of hybrid eggplant has approximately 11,000 seeds, enough for half hectare area. Mulch with rice hull or chopped rice straw. Provide partial shade during the dry season and rain shelter during the wet season.
- Water regularly and use vermi tea or compost tea once a week.

- Harden seedlings one week before transplanting by decreasing the frequency of watering and by exposing them fully to sunlight to minimize transplant shock.
- Transplant at four weeks after emergence.

Seedlings are also best grown in nursery trays or in 'lukong' (rolled banana leaves). This will ensure better survival at transplanting.

Land Preparation

Land is prepared through the following steps:

- Prepare land by plowing and harrowing twice. Make furrows 1 m apart.
- Spread fully decomposed animal manure, or ideally, vermicompost if available, along rows at 0.5–1.0 kg/linear meter.
- Drench the soil with indigenous microorganism (IMO) preparations to help improve soil quality.

If plastic mulch is used, roll it out with the film silver side up. At about 1 m before the plot ends, pull the film and fully stretch the plastic without further rolling it out. Cover the ends and the sides with soil. Make holes using heated tin cans 7–10 cm in diameter. The holes may be spaced at 50 cm x 50 cm. Allow the weeds to grow along the alleys for pest, soil, and mulch management.



Eggplant can also be grown using the no-till system of permaculture. This involves making beds of biodegradable materials such as Napier grass and leaves of legumes then transplanting the eggplant seedlings on the plot by boring holes through the biodegradable materials. Additional farm debris can be added as the materials decompose. This will make the nutrients slowly available to the eggplant and help conserve soil moisture as well as control weeds.

Transplanting and Maintenance

Transplanting and maintaining the area are done as follows:

- Irrigate the area before transplanting. Plant one seedling per hill at a distance of 0.5–1.0 m depending on variety. Provide 1 m-long stake to prevent lodging.
- Irrigate through the furrow every 7–14 days depending on the season and soil type. Side-dress with organic fertilizer monthly or as needed. Drench with fermented plant juice (FPJ) and tea manure every two weeks during the vegetative stage and with fermented fruit juice (FFJ) and calcium phosphate during the fruiting stage.
- Weed 2–3 times during the growing season, or as necessary.

Add mulch to minimize weed growth, lessen fruit and leaf diseases due to soil-borne microorganisms, and maintain uniform soil moisture.

Pruning and staking

Manage and allow branching of eggplant by clipping the shoot at 5–7 leaf stage. Allow only 3 major branches to grow for better plant form. At fruiting stage, leaves below the lowest fruits can be removed for better aeration and pest control. Stake the plants to prevent lodging.

Nutrient management

The fertilizer requirement depends on target yields, variety, soil fertility, climate, and season of planting. The general fertilizer recommendation per ha is 125–150 kg nitrogen (N), 100–250 kg phosphorus (P2O5), and 100–250 kg potassium (K). Generally, up to 2–5 t/ha of well-decomposed animal manure is mixed with the soil during plowing or in the hills before planting. Based on soil analysis, the balance can be applied as organic fertilizers split at 3–4 weeks interval depending on season and growth of the plants. Compost tea, tea manure and other natural farm inputs such as FPJ, FFJ, fish amino acid (FAA), and calcium phosphate from egg shells can also be used.

To prepare tea manure, soak ¼ sack of dried cow or horse manure in water filling ¾ of a 200-liter (L) capacity plastic drum. Soak for 5–7 days with frequent stirring.

To prepare FPJ, mix two parts chopped plant shoots or banana trunk with one part raw sugar or molasses. Ferment mixture for seven days.

The tea manure may be diluted at 1 part tea to 20–40 parts water, while FPJ may be diluted at a ratio of 2 tablespoons (tbsp) of the concentrate to 1 L of water and drenched on the plots or used as foliar fertilizer. Base the rate and frequency of fertilization on the vigor of the plants.

FFJ is prepared using overripe fruits and peelings. Mix two parts of fruits with one part raw sugar or molasses and ferment for seven days. FAA is prepared from fish wastes such as gills and is fermented with equal part molasses for around two weeks. Calcium phosphate is prepared from egg shells, fish bones, and animal bones by charring to the ideal brown color, grinding, and mixing with ten parts natural vinegar then letting stand for two weeks. Liquid organic fertilizer can also be prepared by soaking ½ sack of 'kakawate' leaves in 100 L of water. Stir every morning. The resulting tea can be used one week after.

Pest and Disease Management

To minimize pest incidence, avoid monocropping. Intercrop with other vegetables, cereals, and legumes. Grow aromatic crops such as marigold, ginger, basil, lemon grass, and alliums to repel insects and flowering plants such as sunflower, cosmos, and zinnia to attract beneficial insects.

Remove and burn fruits and shoots damaged by fruit and shoot borers (FSB). Gather and destroy egg masses of borers found on the underside of the leaves and flower petals. FSB moths are nocturnal insects, thus they visit the area from dusk to early evening.

Tables 1a and 1b provide insect pest and disease management measures.

Table 1a. Insect pest management options in eggplant.	
Insect Pests	Recommendations
Aphids	- Spray with hot pepper extract (made from 100 g macerated hot pepper mixed with 16 L water) and soap solution. - Use langkawas (<i>Alpinia pyramidata</i>) extract spray.
Leafhopper	- Avoid clean culture. Spray with soap solution or <i>Metarhizium</i>. - Prepare <i>Metarhizium</i> culture through the following steps: - Mix sterilized palay and conidial suspension thoroughly. Incubate mixture for 1–2 weeks. - Prepare conidial suspension for spraying by adding 200 mL of 0.05% soap solution (a mixture of 0.5 g all-purpose detergent and 1 L water) to each bag of palay substrate. - Place 1 L of the conidial suspension in the spray tank and bring the water level to 16 L. Five bags of 200 g palay substrate yield 1 L spore suspension.