

Tomato

Protected Cropping

Crop group: Solanaceae (sweet pepper, tomato, eggplant)

Crop Rotation

Follow this crop with cucurbits, leafy vegetables, brassicas or sweet corn. Avoid following with sweet pepper, tomato, eggplant.

Climate & Soil

Tomatoes are a temperate vegetable. The optimum temperature for fruit setting is 20–25°C. Fruit set is severely reduced at temperatures above 32°C and below 18°C at night.

These requirements mean that protected cropping structures used for growing tomatoes in the Philippines must be well ventilated to avoid heat build-up.

Tomatoes can grow in soils ranging from sandy loam to clay loam, which are rich in organic matter, ideally with a pH of 6.0–6.5.

Protected cropping structures

The most successful designs for the protected cropping production of tomatoes in the Philippines are house-type rain shelters. The structures can be covered in UV-stabilized plastic, which keeps all the rain out, or fine netting which reduces the impact of rain, but allows water to penetrate, reducing the need for irrigation.

Growing tomatoes under a house-type structure results in a significant increase in yield – typically more than double. The gross margin per m² is 51% higher than tomatoes produced in the open field. Typical yields from protected cropping structures in the Visayas are about 100kg per ha compared to about 35 kg per ha (or less) in the open field.

The main reasons for the extra yield under protected cropping is that the crop can keep producing fruit for longer because there is less disease and the growing conditions are better, especially during periods of heavy rain.

The structures can be made from locally sourced bamboo and have a life expectancy of 3–5 years.



For more detail on how to build structures for growing vegetables in the Philippines, refer to the separate fact sheet in this series.

Land preparation

Begin soil preparation 2–3 weeks before transplanting. If the soil is acidic (pH below 5.8), lime should be applied one month before transplanting at a rate of 250g per m².

Spread decomposed animal manure or compost over the cropping area at 1.5kg per m² and mix into the soil at least two weeks before planting.

Form 1m wide, 20–30 cm high beds spaced 0.5m apart. Irrigation and drainage canals should be prepared to prevent water logging during rains.

Cover the beds with organic mulch to minimize weeding, or use bare soil understructures. Trials in Leyte have shown a 25% increase in tomato yield using organic mulch compared to bare soil. The following mulch materials can be used: wedelia (*Sphagneticola trilobata*), hagonoy (*Chromolaena odorata*), chicken dung,

carbonized rice hull, cabbage waste (*Brassica oleracea* var. *capitata*) and wild sunflower (*Tithonia diversifolia*).

The mulch should be applied one week before transplanting, about 2.5cm thick. The wedelia, hagonoy, cabbage waste and wild sunflower can be applied fresh after shredding.

Transplanting

Mark out two rows per bed, 75cm apart, and on **each row** mark planting holes 50cm apart (26,000 plants per ha or 10,000 plants per acre).



Transplant seedlings so that the top of the root ball is level with the soil surface.

Install trickle irrigation (refer to table for more details).

Ensure seedlings are healthy, disease- and insect-free before transplanting. Always handle seedlings carefully to minimize injury to the roots. Under good conditions, seedlings will be ready to transplant after 4 weeks, and should have 4–5 true leaves.

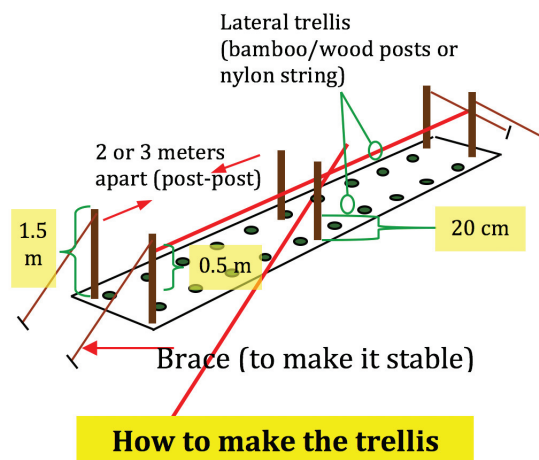
A drinking straw wrapped around the stem a day before transplanting, when the seedlings are still on the trays, can help reduce damage caused by crickets or other chewing insects.

Transplant late in the afternoon, or morning – if it's cloudy. Cover the hole with soil and gently press the soil around the plant base to avoid injury of the seedlings.

Water immediately to establish good root-soil contact. Drench around the plants with fungicide as needed.

Trellising

1. Trellis the plants two weeks after transplanting.
2. Construct the trellis using bamboo ipil-ipil poles or stakes on each side of the bed, 2–3m apart and 1.5m high.



3. Attach wires to the bamboo post horizontally at a height of 0.5m and tie stems to the wire using twine or blue string.
4. When the plants are fruiting, maintain all branches in an upright position to avoid overlapping that causes insect pests to hide. Tie all droopy branches especially those with many fruits to avoid breaking.


Pruning

Remove all lateral branches that emerge from between the leaf and the main stem. as these branches are not very productive. Avoid the use of pruning tools that may cause disease transfer, and prune regularly when the branches are still young and tender using a hand pinch. Regular pruning is twice a week.



Pinching of young lateral shoots in tomato.

Fertilizer, irrigation, pest and disease management

Tomato growth stages					
	Pre plant	Transplant / Establishment	Vegetative	Flowering/ fruit development	Maturity
					
Fertilizer	Before planting apply fertilizer into each planting hole and mix in with soil. During plant growth, apply fertilizer to each plant an inch away from the base of the plant. Ensure no fertilizer touches the leaf of the plant to avoid leaf burning. Additional application can be applied 2 weeks apart during fruit development and harvest. Use the following rates per plant.				
Timing	At transplanting	2 weeks after transplanting	4 weeks after transplanting	6 weeks after transplanting	Additional applications
Rate	1 tablespoon (10g) of 14:14:14 per plant.	150g Calcium nitrate (19% Ca & 15.5% NO ₃) per 16 liters of water Drench 150mL per plant	150g Calcium nitrate (19% Ca & 15.5% NO ₃) per 16 liters of water Drench 150mL per plant	150g Calcium nitrate (19% Ca & 15.5% NO ₃) per 16 liters of water Drench 150mL per plant	150g Calcium nitrate (19% Ca & 15.5% NO ₃) per 16 liters of water Drench 150mL per plant
Irrigation <i>is essential</i> for protected cropping	Lay out trickle irrigation drip tube along the beds. Use one tube along each planting row. The spacing of drippers in the tube should be about 25cm or closer. The best strategy is to fully wet the soil profile and encourage roots to grow out into the moist soil.				
		Water immediately after transplanting until soil profile is fully wet.	Water every 3–4 days for 4-6 hours or until soil is fully wet.	Water every 3-4 days for 4-6 hours or until soil is fully wet. Do not under or over water plants.	
Pests	Monitor the crop regularly for pest infestations, look in growing points and on underside of leaves. Approved insecticide should be used as indicated on product labels. Where possible squash eggs and young larvae, prune leaf miner infested leaves and remove caterpillar infested fruit. Bury or bag pruned leaves and removed fruit. Avoid moving from a mite infested crop into an uninfested crop.				
		Must commence plant protection immediately after transplanting out.	Cutworm and fruit worm in terminals; Leaf miner, mites	Fruit worm, aphids, white fly, mites, mirids and leaf miner	Fruit worm, aphids, white fly and leaf miner
Diseases	Monitor the crop regularly for early disease symptoms. Rogue infected plants showing systemic symptoms and carefully prune away infected parts for localized diseases. Disease spots, especially bacterial blight caused by <i>Ralstonia solanacearum</i> can be biofumigated with cabbage residues, <i>Chromolaena odorata</i> or wild sunflower (<i>Tithonia diversifolia</i>) by incorporating chopped up plant material into the soil.				
		Must commence plant protection immediately after transplanting out	Bacterial wilt, damping off	Tomato mosaic virus (TMV), late blight, bacterial wilt, bacterial spot, early blight, powdery mildew, leaf mold and blossom end rot.	Tomato mosaic virus (TMV), late blight, bacterial wilt, bacterial spot, early blight, powdery mildew, leaf mold and blossom end rot.

Weed Control

- Cultivate the soil before planting to reduce weeds or stale seedbed.
- Practice mulching to control or minimize the growth of weeds
- Use organic mulch to minimize weeding.
- During the growth of the crop use a bolo to manually remove weeds.
- Spray canals and between beds with contact/systemic herbicide as the need arises.

Harvesting

Immature or over-mature fruit deteriorate fast, therefore it is important to pick at **optimum harvest maturity**. Fruit are usually ready to harvest 55–65 days after transplanting (DAT) when they are mature green to 50% green/breaker stage or according to buyers' preference.

Harvest fruits intended for market preferences at 3–4 day intervals. Harvest early in the morning while the temperature is low to minimize field heat load. Place the harvested fruit immediately under shade to avoid sun exposure.

Postharvest Handling

Once harvested, the fruits are much more susceptible to deterioration than while they are attached to the plant.

1. **Harvest** in the cooler part of the day – early morning or late afternoon.
2. **Store** the harvested fruit out of the sun and in as cool a place as possible.
3. **Remove** and discard any fruit which is deformed or insect damaged.
4. **Grade** the fruit into color and size grades. Keep a premium grade fruit which is the correct size for your market. Grade into green, breaker and colored fruit, and pack separately. Show grade and colour standards. Put the remaining fruit into a second grade category and send it separately from the first grade. This will maximize the price you get for the first grade fruit.
5. **Pack** the fruit carefully in cartons if possible, in a way that will minimize damage to the fruit in transit to the market. Do not sit or stand on top of vegetables.
6. **Deliver** the fruit to market as soon as possible after harvesting. Transport at night or in early morning, if possible. Storage reduces shelf life and quality.
7. **Monitor** and know the condition of the fruit as it arrived at the market and aim to continuously improve its quality.



Tomato fruits a harvestable stage

Follow up

The finished crop should immediately be removed and destroyed, and the ground plowed to prevent pest and disease populations spreading to other crops. This is extremely important!



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