

# Guide for Growing Tomatoes Successfully on Open Space



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— *Production guidelines* —

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## Guide for Growing Tomatoes Successfully On Open Space



**Figure 1.** Tomatoes Packed In Boxes

### Introduction

Tomatoes are a favourite vegetable for most farmers. They don't require much space, produce a high value for the small amount of space and are a consumer favourite. They do however present a number of challenges for even the most experienced open-field grower. These range from wildly fluctuating prices to problems with weather conditions and disease.

If you are a first timer, you should start off on a small site. This way you can keep your costs down while you learn how to manage your new crop.

What you'll learn in this guide:

- Choosing your tomato variety
- Preparing your soil
- Tips for cultivating your tomatoes
- Techniques for disease and weed prevention
- Marketing your tomatoes

## 1. Choosing Your Tomato Variety

There are hundreds of different tomato cultivars. So choosing the right variety is not always easy.

So how do you decide?

Well, it helps to first understand tomatoes. Tomatoes are members of the [Solanaceae](#) family, which includes peppers, eggplant, and Irish potatoes. Tomato varieties fall into a few categories, described more or less by use (slicing, plum or paste, and cherry or grape), by season (early, mid, and late), by vine type (determinate or indeterminate) and those bred for special climates and disease resistance.

You should select your tomato varieties based on the fruit quality, adaptability and reliability, disease resistance, plant growth habit, market preferences and planting time (date to maturity). Do your research on your target market's preferences, and also read the descriptions on the seed packets. Once you've done all that choose the tomato varieties with the qualities that are most important to you.

## 2. Types Of Tomatoes

- a. **Large-fruited beef tomatoes:** Such as 'Delicious' are popular for slicing. Beefsteak tomatoes are pumpkin shaped and sometimes ridged; they are deep red and called oxheart tomatoes. They have a good firm texture, plenty of flesh and a sweet, mellow flavour due to low acidity and high water content. Other beefsteaks come in green, yellow, purple, or pale rose versions.
- b. **Medium-sized round-fruited tomatoes:** Such as Moneymaker are favourites for cooking, canning, and juicing. Pear-shaped, thick-skinned, and nearly seedless tomatoes, often called Italian or paste tomatoes. Some of the best options are Roma VF, San Marzano and Veeroma VF.
- c. **Small-fruited cherry tomatoes:** Have fruits about 1.5 cm across, produced in great profusion. These are used in salads or as snacks. Some examples are "Sweet 100", Gardener's Delight and Golden cherry.
- d. **Hybrid tomatoes:** These come from at least two parent tomatoes that possess desirable characteristics such as disease resistance, or good colour with the aim to produce a tomato that combines both features.

There are a number of commercially available tomato varieties, many of which perform well in African conditions:

Fresh market cultivars include Florodade, Heinz 1370, Karino, Rodade, Fortress, Hytec, Star 9001, Star 9003, Sundance and Zeal. Baldo, Blockbuster, Disco, P 747 and Shirley are also fresh market cultivars that have a long shelf life.

Tomato cultivars suitable for pastes include HTX 14, Legato, Roma VF, Rossol, Star 9056F, Sun 6216 and UC 82B. Cherry tomato cultivars are Bamby and Josephine while those suitable for planting in tunnels are Atletico, Daniella and Gabriella.

### **Understanding the tomato seed packet lingo**

**Date to maturity (DTM):** The maturity date for tomatoes listed on seed packets is based more or less from the time of transplanting. Other terms you will find on your seed packet are indeterminate and determinate.

**Indeterminate or Determinate:** The growth of tomatoes is either determinate or indeterminate. Understanding these terms will help you select which varieties to grow, where to plant them and how you will support them.

#### **I. Determinate:**

- Grow into shorter, bushier plants with a predetermined growth limit
- Set one good load of fruit, and then they are done.
- Grow in smaller spaces
- They need little to no staking
- Their fruit all ripen within a short period of time
- Tend to ripen more closely together.
- Make up most of the commercial and early ripening varieties
- Are the best type for tomato paste

#### **II. Indeterminate**

- Keep forming new vines
- Keep forming new fruit
- Grow larger and have no natural size limit.
- Need lots of space

- Need staking or trellis to support them and maximize their potential
- Produce later in season
- Ripen fruit throughout the season
- Are great for eating alone
- Are more convenient for drying

Occasionally you see semi-determinate, which means it has habits of both determinate and indeterminate.

### **3. Soil Preparation**

It all starts with the soil.

You need good soil to grow healthy plants and get good yields. While tomatoes can produce in a variety of soils, they are better suited to fertile, well-drained and moisture retentive soils. Soils with a pH of between 6.2 - 6.8 are ideal for tomatoes. Though 6.5 is the best. You can begin to improve your soil by adding organic matter such as compost. This will improve the soil structure and biological activity. You should read our post on making your own compost.

But how do you know how good your soil is?

By getting a proper soil test.

Getting a soil test is a great way of assessing your soil fertility. To get a soil test take soil samples of your field. Contact a soil testing lab like the Kutsaga Research Board in Zimbabwe, Mount Makulu or SGS Inspection Services Zambia, Plot No 2 of 32254 Lusaka, Zambia (+260 972 207066). In Botswana "The Soil and Plant Analytical Laboratory service provider is in the Department of Agricultural Research (DAR) and Malawi try the Kusamala institute of Agriculture & Ecology. When you are ready to send or deliver your soil sample to them. They will give you a report on their analysis and fertiliser recommendations for improving your soil. If you are looking to begin organic farming, try to ask if they can recommend organic amendments.

### **4. Soil pH**

It is important to keep soil pH in the proper range in order to produce the best yields of high-quality tomatoes. The soil pH influences plant growth, nutrients and the activities of microorganisms in the soil. Your soil test will tell you your soil's pH and provide

recommendations. Most African soils are acidic from continuous cropping and too much nitrogen.

Soil acidity or alkalinity, which is measured by soil pH, can affect plant yields in heavy feeders like tomatoes. If your soil is too acidic, you can adjust the pH by working in lime to the soil. This needs to be done 2 to 3 months before transplanting to allow time for pH to rise. If your soil is too alkaline, you can use peat moss. When adding soil amendments like lime or peat moss follow the recommendations of your soil test and don't over lime.

## 5. Cultivation

- i. **Timing and Site Selection:** Tomatoes are a hardy annual, warm-season crop that is sensitive to frost. An average daily mean temperature of 20 °C to 24 °C is optimum for growth, yield and fruit quality. Pick a sunny spot, unless you are in an extremely hot part of the country.

If possible, avoid planting tomatoes near or in fields that have had tobacco, peppers, eggplants or potatoes. These plants and vegetables are affected by many of the same pests and diseases as tomatoes.

Plant your tomatoes next to plants that are considered tomato companions (garden friends). These include asparagus, basil, bee balm, bush bean, cabbage family, carrot, celery, cucumber, chive, garlic, head lettuce, marigold, mint, onion, parsley, pepper or marigold. These plants provide tomatoes with numerous benefits including pest control, soil enhancement, weed control, erosion control, plant protection, better plant yields and profits!

### ii. Seed or Transplants?

- a. **Starting with transplants:** Tomato transplants are available from reputable nurseries like Badze Garden Nursery. Buying transplants is a good option for beginning farmers. If you buy transplants look for stocky plants with uniform green leaves. Avoid buying plants that are already flowering.
- b. **Seeds:** Starting tomatoes from seeds are cheaper and provide more plant options, but it takes more time and care than buying transplants. If you are starting from seed, you need to prepare your seeds in seed trays or in a seedbed/nursery. Purchase your unexpired, high-quality seeds from a

reputable seed store or local agro dealer. You can calculate your seeds needs based on the germination rate and the size of your plot and beds.

- c. **Seed trays:** Dilute your starter fertiliser with water and hand mix with soil. Fill your seed trays with the soil mixture. Spread the soil evenly but be careful not to compact. Plant the seeds using tweezers and guide towards the centre of each cell. Cover the seeds with an even layer of soil. Then water the seedling. Place the tray in a black plastic bag to germinate for 2-8 days. Then place the seedling tray in the nursery for anywhere for up to 28 days. Check on the wetness of the soil before watering. Ready for transplanting when the plant has 2-4 true leaves.
- d. **Making a seedbed:** Choose a site with full sun for your seedbed. Start preparing your seedbed early. Build a raised bed 20 cm high and 1m wide. Incorporate manure in the top soil of your seedbed. Make sure the soil is not wet and sticky when you are setting up, this make it hard to work the soil. Use the back of a rake to make the seedbed smooth and level. This makes it easier to place all the seeds at the same depth. Remove any pebbles or large bits of organic matter.
- e. **Solarize soil:** Solarizing your seedbed soil is an effective way to control soil borne problems. To solarize your soil, you need to cover it with clear plastic for 1-2 months to generate high temperatures in the top soil this kills pests, insects, nematodes, weed seeds and many disease organisms. This also helps seedlings get a good start.
- f. **Sowing your seeds:** To make a furrow for sowing seeds, use a long piece of 2.5 cm square lumber. You can easily regulate depth and make a nice, straight row. Just lay the piece of wood along the bed where you want your row and gently press it into the soil to the desired depth.

Sow seeds in rows 10-15cm apart and 2cm between seeds. Sow seed 5 - 10mm deep. After sowing the seed, gently fill the furrow by dribbling a handful of soil into it, crumbling any lumps as you go. Gently pat the soil to make sure it contacts the seeds

but don't pack it down. Sow more seed than needed to cover plants that don't germinate. Label the row, so that you know what you planted and when you planted it.

Water the bed very gently, but evenly and thoroughly after sowing. Check the moisture daily. You should water the nursery twice a day lightly for the first week in the morning and afternoon. Then water once a day in the second week and then once every two days in the third week until you transplant the seedlings. The goal is to moisten the bed, but not to make it too soggy. This will harden the seedlings before transplanting.

Cover the seedbed with straw to retain water and also prevent excessive heating from the sun. Remove any weeds in the nursery bed by hand. Seedlings are usually ready for transplanting about three to four weeks after sowing.

- g. **Land preparation:** Land should be prepared as soon as the seed is sown in the seedbed to allow decomposition of organic matter: Late land preparation will lead to seedlings over-staying at nursery level, making them overgrow and in worst cases, flowering taking place in the nursery bed. Proper land preparation is critical for soil management and good yields.

To prepare the land plough and till the land to a 20 cm ridge height. Prepare raised bed, they create good environments for strong root foundation. They also make managing fields much easier. Apply well decomposed organic manure at 10 to 20t/hectare and mix well with soil. This should be done 3 weeks before transplanting.

## 6. Transplanting

Transplant seedlings in the field in a single row when they are 5 to 6 weeks from emergence and have 4 to 5 true leaves. Carefully select and remove the healthy seedlings with well-developed roots only. Ensure that you practice proper plant spacing, of about 40 to 50cm. Transplant during the morning or evening when it is cool or on a cloudy day to lessen the shock.

Make the planting holes twice the size of the root ball. Set tomato transplants in the ground so the lowest set of leaves is at soil level. Fill the hole with a mixture of compost and soil. Have your support systems ready at the time of planting.

- b. **Starter/basal fertiliser:** Apply the starter fertiliser (such as Super Veg Feed or Miracle Grow) that is dissolved in water, and apply it to the soil around the plant roots at or just after transplanting. Be careful to mix and apply starter fertilizer according to the manufacturer's recommendations.

You can also apply wood ash after transplanting to protect transplants against ants and termites. It also acts as fertiliser supplying potash, which is responsible for fruit quality.

- c. **Water:** Water immediately after planting to avoid transplant shock. Water daily if possible for the first week or so, until plants are fully established. When plants are fully established water once every seven days but increase watering from flowering onwards. As the plants get a bit taller, add mulch.
- d. **Proper Spacing:** Tomatoes can be planted in one of many different arrangements that provide adequate space for plant growth. Often the spacing is based on the type of trellising and equipment that will be used in the field. Plant spacing is between 45cm and 60cm depending on the type and staking method. Row distances are about 75cm.



**Figure 2.** Well-Spaced Tomato

- e. **Mulches:** Add mulches, from organic or inorganic materials like straw, hay, grass or green manure, after transplanting. This helps smother weeds,

keep the roots from drying out by retaining moisture. Place 7.6 to 10.2 cm layer of straw within two inches of the stem.

- f. **Record Keeping:** To help you remember what you planted, and how well it performed keep written/ typed records.

## 7. Trellising And Pruning

- a. **Trellising:** Cultivars that have an indeterminate growth habit require training on trellises or suspended on twine from overhead wires. The crop grown for the fresh market should also always be trellised. You need to establish your stakes to support your tomato plants in the soil at the time of planting. This is to avoid damaging plant roots and to have the trellis ready when it's needed.

Trellis can be built from any new or disinfected material available such as wire, wood or string. Plants are usually tied using soft string or twine initially when the plants are about 12 - 15 inches tall and should be secured prior to any plants forming.

When selecting the method best suited to you and your design, consider the types and spacing of your plants, and the expense and labour you are willing to invest. Staking, trellising or otherwise training tomato plants off the ground can, however, be expensive due to materials and labour costs.

These costs can be offset by the many benefits of trellising/ training your tomato plants. These benefits include improved spraying to control diseases and pests, less sunburn, better air circulation around the plant and less fruit loss from disease and rodents.

- b. **Pruning Your Tomato Plants:** If you stake your plants you should prune them by hand. To prune, you use your fingers to snap off suckers {these sprouts that grow between the main stem and leaf axils}. Pruning helps increase the fruit size. It can also enhance earliness of the crown set, reduce pest pressure and enhance spray coverage. Do avoid over pruning to avoid sunscald.

## 8. Fertilisation

The tomato is a heavy feeder of plant nutrients including nitrogen, phosphorus and potassium and it responds well to organic fertilisers. The amount of fertiliser applied is influenced by fertility status of the soil, season and the cultivar.

The main foods required by plants are nitrogen, phosphorus, (P) and potassium (K) with smaller quantities of magnesium (Mg), calcium (Ca) and Sulphur (S). They also require small amounts of trace elements, including iron (Fe) and manganese (Mn). The fertilizer should be spot placed 10cm from the plant, at 10cm deep.

- a. **Nitrogen (N):** Tomatoes have a moderately high need for nitrogen. Nitrogen is for promoting rapid growth of the green parts of the plant and for a better flower and fruit set. Compost is a good slow release nitrogen source.

A minimum of 250 kg per hectare of nitrogen is recommended in high rainfall areas or for high production. Apply 50% of required Nitrogen when you transplant. Follow it up with 10% 1 week later, 20% when first fruit cluster and last 20% when first fruit starts turning red. Apply only the recommended nitrogen, excessive fertilizing with nitrogen can delay maturity and make your plants more attractive to pests like aphids

- b. **Phosphorous (P):** They require phosphorous for root growth as well as helping with ripening fruits. All the recommended phosphorus should be applied during or near transplanting as part of starter solution. Bonemeal is a good source of phosphorus.
- c. **Potassium (K):** Tomatoes require high levels of potassium. Adequate levels of potassium result in improved colour, taste, firmness, sugars, acids and solids of the fruit. Plant cells are also strengthened. A minimum of 100 kg of potassium should be applied per hectare. Phosphorus promotes root development, early flowering and fruit set and ensures more vigorous growth. A total of 40 to 60 kg of phosphorus per hectare is suggested in soils with a built-up of the nutrient.

Tomatoes also require micronutrients for growth and development. If soil tests show deficiencies of magnesium then lime is sometimes recommended.

**Fertigation:** Which is the application of water-soluble fertilisers through drip irrigation, is a cost-effective way of applying fertilisers to crops. This method cuts down on labour, improves precision and reduces fertiliser run-off.

## 9. Irrigation

Water is the lifeblood of your tomatoes. If you have a small farm or garden you can use watering cans or a garden hose to water your plant. For larger farms, it is often

impractical, and you need to install some sort of irrigation system like drip irrigation for watering.

**Drip irrigation:** Is a great option for watering your tomatoes. It is more practical than hand watering on a large farm. If you can't afford it, you can use a garden hose or DIY your own drip line. Overhead sprinklers are not a good option for tomatoes because they get water on the leaves, this can spread diseases like leaf blight. With drip irrigation water seeps to the base of the plants and less water is used.

Irrigation is essential for producing consistent yields of high-quality tomatoes when growing for market. The combination of the current erratic rainfall patterns and soils with poor water holding capacity make it necessary for supplemental watering. Irrigation also reduces the risk of disastrous crop losses from fruit cracking due water shortages.

a. **Here are some tips for effective watering:**

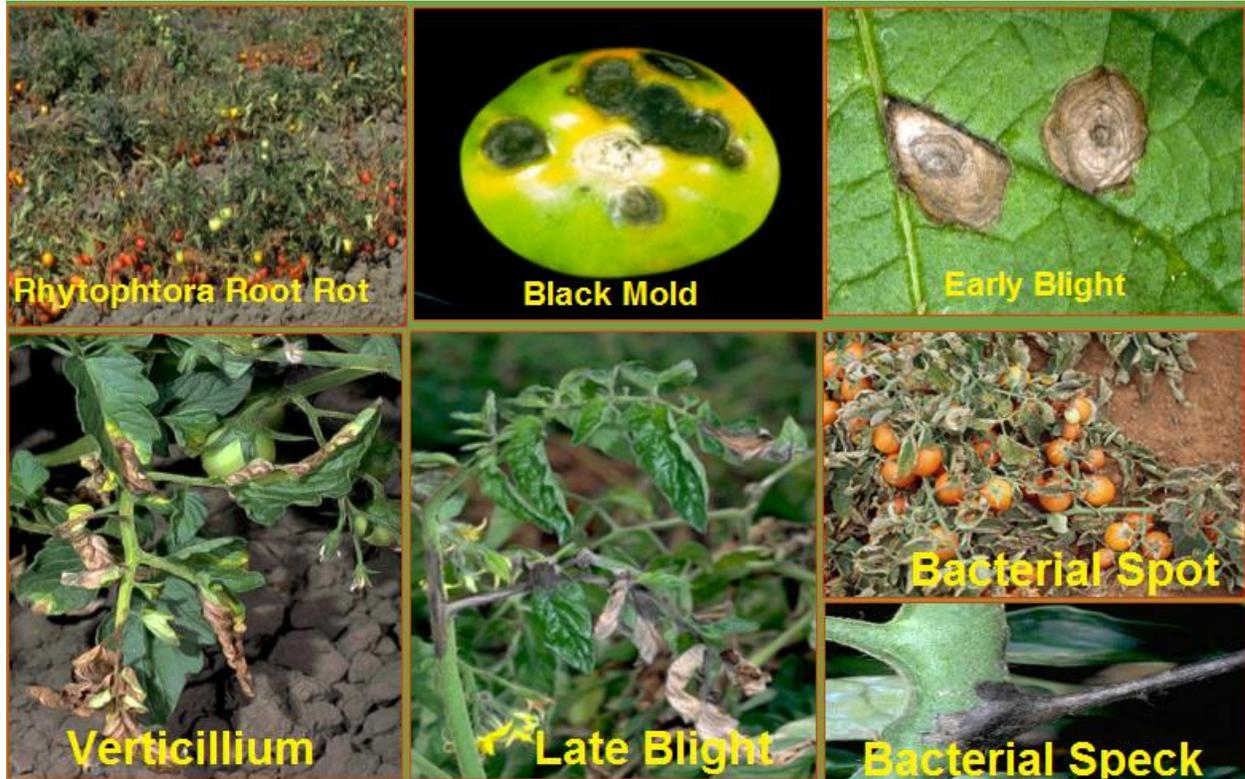
- Apply water to the soil, below the mulch.
- A long, slow soak every few days is better than a short sprinkle every day.
- Tomatoes need plenty of water early in the season when initiating foliage and fruit.
- Monitor the soil moisture using your fingers. Put your finger in the soil up to your first knuckle and take it out. If the soil on your finger is moist you are fine, if it's dry it's time to water. Waiting too long to water can cause your fruit to split and ruin your crops.

b. **Weed control**

Start weeding early and maintain it throughout the season. Because tomatoes are planted with such wide spacing, controlling weeds are critical. Weeds compete with tomato plants for light, nutrients, water and space as well as interfere with harvesting. They can also hold insects and diseases.

Remove all weeds within 1" of your tomato plants. Mulch around your plants to control weeds and retain moisture. Plant windbreaks along any side of the garden that borders on woods. Shrubs and trees can help filter out weed seed carried by the wind.

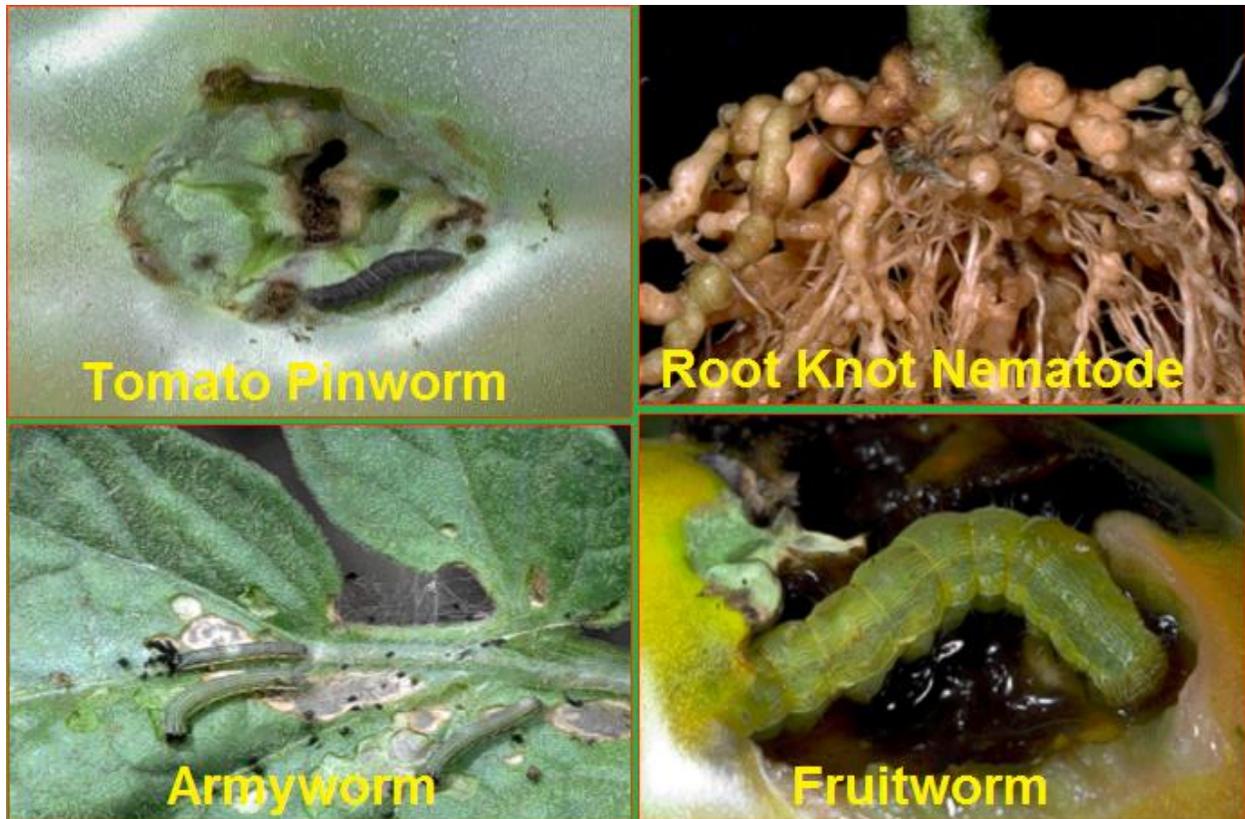
## 10. Pests, Disease And Problems



**Figure 3.** Fungal and Bacterial Pathogens of Tomatoes

Tomatoes produce well when given what they need. But sometimes things go wrong like facing poor weather conditions (either too wet in the rainy season or too dry in the dry season) and pests and disease.

**Other problems:** Tomato plants can suffer from too much nitrogen which causes the plant to produce more foliage instead of fruit. Other problems that may affect your tomatoes are pests and diseases like nematodes, aphids, fungal diseases, bacterial wilt, tobacco mosaic virus, sunscald, blossom rot, thrips, rust mite, fruit cracking and others.



**Figure 4.** Insects - Nematodes Affecting Tomatoes

**Here are some things you can do to reduce problems:**

- Select tomato seed and seedling varieties that are disease resistant. The code VFNT on a seed package, means the cultivar is resistant to Verticillium (V), Fusarium (F), wilts as well as nematodes and tobacco mosaic (T)
- If you are in a hot area choose heat-tolerant seed varieties
- Remove pests by hand or with insecticidal soap if you are using organic pest management
- For chemical sprays, spray fungicide every 7 to 10 days starting the first week after transplanting especially in the rainy season
- Wash your tools, boots and clothes after your work day to avoid spreading disease
- Keep fields clean from weeds because they can hold insects and diseases

- Destroy infected plants and discard them away from the field or compost
- Prune off infected leaves and burn them in sealed containers
- Avoid watering the leaves because wet leaves are prone to disease
- Keep your plants adequately watered
- Wash your hands after smoking to avoid tobacco mosaic
- Don't over prune the plants
- Keep the soil evenly moist by using mulch and watering when needed while avoiding over watering.
- Practice crop rotation and companion planting
- Spray for disease using the correct doses of recommended herbicides or use a neem
- Use coloured sticky traps to control and monitor pests

Make notes about what worked and didn't during the growing season. Make a note of what you used, how much you used and where. This will help you refine your plan the next season.

## **11. Harvesting**

The payoff for growing your tomatoes come at harvest time. So when and how do you harvest?

Carefully hand harvest your tomatoes when they reach the mature-green stage or when the fruit is orange in colour. Light is not necessary for ripening mature tomatoes. When harvesting you should use a clean picking container. Your picking container should be cleaned on a daily basis to maintain good hygiene.

When you are harvesting don't only pick the best tomatoes. Also pick the rotting and diseased tomatoes and compost them. You don't want to leave them in the field or they will spread the problem to the healthy fruit.

Transfer the freshly picked tomatoes immediately to your pack house or shaded packing area. If you don't have a pack house you can use low-cost shade cover for your packing area. Your tomatoes should not be left in a holding area for extended periods of time. Make a note of how much you harvested, in terms of boxes and kgs.

## 12. Post-Harvest Handling

Good post-harvest handling is very important for preventing tomato loss. Avoid being rough when handling your tomatoes. Poor handling of your tomatoes can lead to bruising, moisture loss, and even rotting. You don't want to lose your tomatoes after all your hard work and expenses in the field.

**Grading:** Tomatoes are graded according to size, colour and quality. Fruit of good quality must be sound, well-shaped, and uniform in size and colour and be free from diseases, cracks, blemishes, foreign matter or spray residues.

Higher grade fruit is packed in plastic crates. If you are supplying supermarkets, restaurants and other food institutions, they expect high-quality tomatoes packed in plastic crates. Plastic crates are more durable and stackable. While they are more expensive than wooden crates they last longer, are easier to clean and can help prevent tomato damage and loss.

The storage conditions are dictated by the stage of ripeness. Generally, tomatoes should be stored at 12 °C and 86% to 90 % relative humidity. Due to current extreme energy challenges it is worth exploring solar cooling units and evaporative cooling.

## 13. Marketing

Supermarkets, wholesalers, processors, and fresh markets are all markets for tomatoes. The price level of tomatoes on the market fluctuates due to supply and demand at daily spot markets. These vary from month to month, and year to year.

Supply is influenced by production due to weather conditions. Demand is influenced by how much and how often buyers buy tomatoes. Consumers make their decisions based on quality, freshness and prices. If you have adequate storage then it is worth timing the market to get a higher price.

If you can look into contracts with specific retailers or canners. That will stabilize your market and pricing.

## 14. Preservation

Tomatoes are used in a variety of ways. Ripe tomatoes are consumed fresh or sun-dried, processed into a puree, paste, powder, ketchup (tomato sauce), sauce and soup or canned as whole fruits. The unripe ones are pickled or used for preserves.

## **References**

[Pests and Diseases for Home Gardeners](#)

[Precautions & Application Tips on Specific Pesticides](#)