PRACTICAL ACTION
Technology challenging poverty

TOMATO PRODUCTION: TECHNICAL GUIDELINES

technical brief

INTRODUCTION

Before you think of growing tomatoes or any other cash crop, you need to think of your market. Where will you sell the tomatoes? Is it in the village, at the growth point or town? How are you going to get your tomatoes to the market?

If you are using a river or well to irrigate, does the river or well have enough water to get your crop to maturity?

You also need to think of the cost of the production, seeds, fertilizers, and other pest and diseases control chemicals against the price you are likely to get for your crop.

You need to talk to your local extension services officer for advice on the cash crop you intend to grow. The extension services officer's advice must be taken into account before choosing a crop to grow.

When these factors have been taken into account you need to plan when you want your crop to reach the market.

Figure 1: Tomato production. Photo: Practical Action Southern Africa / Thembinkosi Nyath.

These technical guidelines provide details of the key steps for establishment and production of a tomato crop by individuals, enterprise and/or community groups.

Uses

Fresh fruits are used in salads and cooked with relish. Cultivars grown for processing are canned and made into purees, sauces or juices.

The nutrient content of the fresh per 100g is as follows:

Water 93ml, calories 21, protein I g: fat 0.2g; carbohydrate 4g, fibre 0.6g; plus minerals and vitamins.

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The Tomato Growing Calendar

Below is an estimate guideline of sowing time. First fruit ripening to peak harvest.

Sowing Time	First Fruit Ripening	Peak Harvest
January	April/May	May/June
February	May/June	August
March/April	July-August	August/September
May	September	October
September/October	January/February	February/March
November/December	February/March	March/April

Estimate times of sowing, ripening and harvesting

Avoid sowing in the cold winter months in areas prone to frost. Your extension worker will advise on the appropriate dates to plant and what protective measures to take during the periods of frost.

Below are stages of crop growth. These stages are affected by temperature, cultivar and moisture levels.

- Germination will take 7-10 days.
- From emergency to transplanting 4-6 weeks
- Plants should be transplanted when approximately 10-12 cm tall
- From transplanting to first flowering 4 to 6 weeks
- From first flowering to first fruit ripening 4 to 6 weeks
- Harvest period can vary from 10 to 15 weeks

Establishing the Crop

- Tomatoes should be grown in a nursery first before transplanting to the field.
- Tomatoes grow well on well drained soil

Seeds must be obtained from a reputable source and must not have expired or near expiry date. Expired seeds may not germinate or if they germinate may produce weak plants which may not produce best fruits or high yields.

Preparing the Seedbed

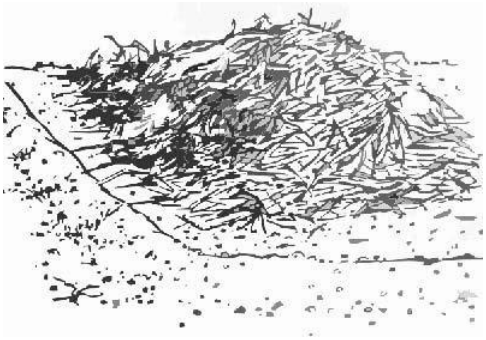
Choosing a seedbed site

When choosing a nursery site consider the following points.

- Choose a site far away from any related crops to reduce the risk of disease and pest transfer.
- Select a site that had not been under tomato or a related crop for the past three seasons to avoid disease and pest attack.
- Select a site with medium to light textured soils that are deep and fertile.
- Select a site with well drained subsoil to reduce water logging.
- Select a site closer to a permanent water source.
- Choose a secure place preferably closer to a homestead.

Sterilization of the soil

This soil should be sterilized to kill pests and diseases that affect the crop. You can sterilize your soils by burning stalks inside the seedbed before planting. This should reduce nematodes and other soil borne diseases of tomatoes.



Making the seedbed

Peg the area first then dig the area and thoroughly level it. Make ridges so that water wont flow out when watering.

Fertilizing the seedbed

You can add manure or fertilizer. Mix manure with top soil. You can broadcast about 3 kg of compound D in your nursery bed and mix. Water the bed.

Sowing the Seeds

Planting

Mark furrows of 1 cm deep and plant seeds every 4 cm in the row. Leave about 7 to 10 cm distance between rows cover the seed with fine sand. Approximately 120-170g of seeds will be enough for one hectare. This should give approximately 14,000 plants per hectare when transplanted.

Watering

Water the nursery twice a day lightly for the first week in the morning and afternoon. Then once a day in second week and once every two days in third week until transplanting this will harden the seedlings before transplanting.

Mulching

Cover the seedbed with grass to retain water and also prevent excessive burning of seed by the sun.

Weeding

Pluck out weeds in the nursery bed by hand.

Step III Transplanting the Seedlings

Tomato grows well in a variety of soils provided they are deep, well drained and fertile. Avoid growing tomatoes after egg plants, tobacco and related crops. It is susceptible to frost so grow it in warm areas during winter.

Best soils to use are deep fertile black, red or brown clay loam, sandy clay or sandy loam on gentle slope. Avoid grey or white sandy soils in veils and on steep slope.

Preparing the Land

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 over grow and in worst cases, flowering takes place in the nursery bed.

Plough the land or dig with a hoe up to 20 cm deep. Apply well decomposed organic manure at 10 to 20t/hectare 3 weeks before transplanting and mix well with the soil.

- Manure builds soil structure by gluing the soil particles.
- Manure is cheaper

Apply Compound Cor S at 400kg/hectare when making planting stations. If irrigation is to be used construct furrows/ridges spaced at 1m apart. If irrigation is to be done using watering cans, make long raised flat beds with a width of 1m.
Beds are raised to ensure good drainage and aeration especially in the rainy season. Water the furrows or beds thoroughly.

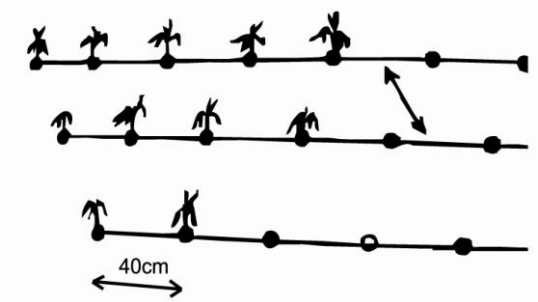
Transplanting

Transplant seedlings when they are 4-6 weeks from emergence approximately 10-12cm tall. Select healthy seedlings only. Transplant during the morning or evening when it is cool or on a cloudy day.

Other factors to consider when transplanti ng tomato seedlings are:

- Do not leave roots exposed (ensure that some soil is kept on the roots) or put them in a sack so that the roots are in damp soil.
- Ensure that there is firm contact between the soil and the roots
- Do not plant the tomatoes in the furrow irrigation is to be used

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.



Trasplant during the morning or evening when it is cool or on a cloudy day,

Watering

Water immediately after planting and every 4-5 days after that. When plants are fully established water once every seven days but increase watering from flowering onwards. The amount of water can be scheduled as follows:

- Transplanting to establishment-up to a depth of 6cm per every 4 day
- After establishment, increase to 8cm depth per week till maturity.

Step IV Top Dressing

Apply ammonium nitrate at first stage of flowering at rate of 100kg/ha when fruits are marble size, at every three weeks interval. Place the fertilizer 5cm from the plant. Water the crop to allow this fertilizer to dissolve.

N.B. Do not place the fertiliser on the plant because it will kill the plant.

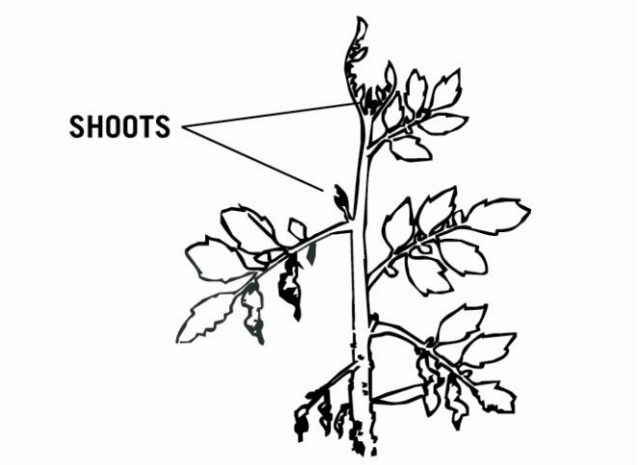
Step V Tendering the Crop

Trellising

Trellising is done to prevent tomato plant lodging which can result in loss of fruit due to disease and rodents.

There are three methods for trellising.

- Single stake - place stake along one side of the row and tie plants to the stake. This is suitable for home garden.
- Single wire tied between two poles to the end of each row. Place wire at 0.5m intervals. Three wires will be enough to keep plants standing. In between support poles can be spaced as needed. Plant lodging can decrease the quality of the fruit and also yield. Plants can also be susceptible to disease.
- Double wire - Pairs of wire one each side of the post are placed at intervals up the pole.
- The plant is supported between wires and three sets are required at 0.5m interval.



Removal of buds and shoots

Removal of side shoots to encourage single stem growth is not recommended.
Removal of lower branches and leaves is not recommended.

Hygiene

- Sterilize equipment using 2 percent formalin if disease is present.
- Forbid smoking or taking of snuff in field
- Ensure personnel wash hands before entering the seedbed and field
- Discard diseased seedling

Harvesting

Yield of between 75-100 tonnes/ha are possible

There are four distinct stages of picking depending on intended markets

- Pale yellow blossom end - fruit will last a week or more before ripening depending on cultivator
- Pink blossom end – fruit will ripen in 4 days or more
- Pink stages - fruit will ripen in one or two days
- Ripe stage (fruit ripe but firm) market or use immediately.

Grading

- Remove disease fruits
- Arranging according size, colour, ripening stage

Packing

Pack fruit on same grade separately. The most ideal is wooden box (50x23x15) cm usually weighing 5.5 kg for table tomatoes.

For long distance transportation wooden boxes must be used. These boxes usually weigh 20kg when full. Do not overfill the boxes as tomatoes may be crashed if bearing the weight of the top boxes.

Storage

Ripe tomatoes can be stored in a shade for 8-10 days

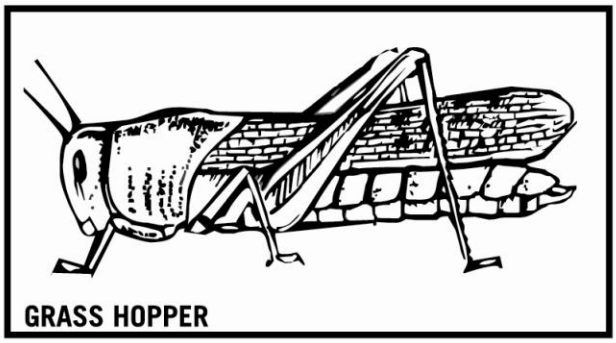
Marketing

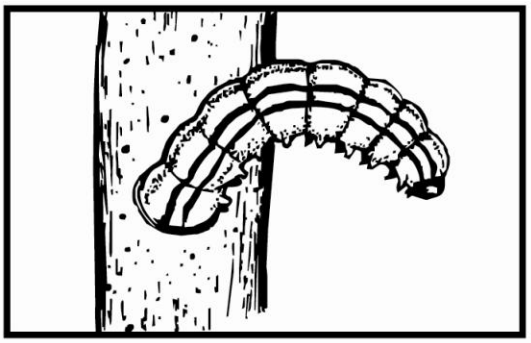
Tomatoes can be sold to villagers, local markets and to urban centers. Try your local grocery shop you may find a ready market.

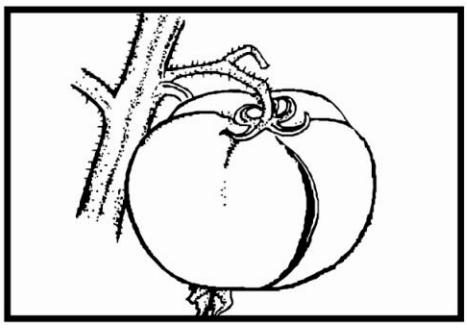
Pests and Diseases

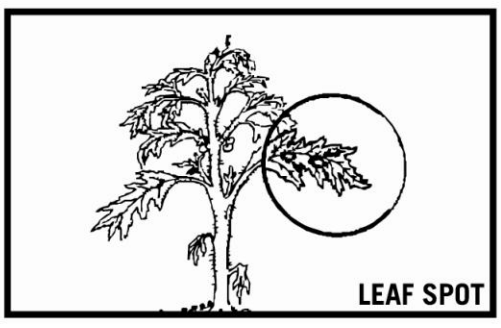
Common pests and diseases

It is recommended to ask your area AGR ITEX representative on which control measures to take when pests or disease is observed in the field. This way you are guaranteed to get the best control measure available and alternative. AGRITEX representative will know which chemicals are available and which chemicals are no longer suitable or in use in Zimbabwe.









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Pest/Disease	Remarks	Symptoms	Control
Bacterial Bacterial Canter	Wilting foliage, mealy breakdown internal tissues of stem with separation off from pith. Brown horseshoe-shaped area seen when leaves are cut off flush with stem small sports on fruit usually with a white or yellow halo	Correct seed and site selection should eliminate the problem	Soil on whIch a diseased crop has been grown becomes contaminated can transmit Infection to subsequent crops. Seed borne. First observed In ZImbabwe in 1960 and now wider spread. If canter does not occur on the land the grower should preferably select seed from his own crop rather than buy It.
Bacterial Spot	Dark brown raised pustules on the fruit, later becoming slightly sunken & scabby; leaf spot	Correct seed selection copper oxychloride sprayed at a rate of 0.4kg/100 litre water	Seed-borne infection only occurs during the wet weather
Bacterial Wilt	Sudden wilting of plant browning of woody tissues from which bacterial drained soil slime oozes after cutting across the main root & lower part of stem	Plant on well drained soil	Widespread in Eastern Districts, but seldom serious
Virus Mosaic	Mild strains cause a light dark green mottling of the foliage. Plants infected early may become stunted, but infection after the crop has become established in land normally has little influence on growth. Blotchy ripening of the fruit may occur. b) Severe stains cause stunting, leaf curling, purpling of the veins; severe brown markings sometimes appear on the fruit	Remove and burn infected plants. Plant resistant cultivar	Substantial loss have occurred as a result of strains
Bunch Top shoot elongation	Causes a marked reduction in resulting in leaves at the top of the plant small and distorted	Remove and burn infected plants	Outbreaks are sporadic but can cause failures. As insect vector may be involved
Fungal Botrytis Rot	Green fruit are generally attached. A small water-soaked spot appears on the stalk-end or on the side of the fruit. The spot enlarges, becomes soft and dirty, light grey to brown in colour and fruits turn soft. Also Ghost Spot and Leaf Stem Rot	Spray with dicloran 50% wp at a rate of 150g/100 litres water	Spray stem to a height of 450-600mm and from February, repeat every 7 days if necessary
Collar rot	Dark-brown sunken lesions on the stem of seedlings and young transplant at soil level	Spray with sulphur mancozeb (48/32% wp) at a rate of 500-800g/100 litres water	Full cover spray and repeat at 5/10 day intervals in humid conditions same fungus as Early Blight. This disease is common at all times of the year
Early Blight	Dark reddish-brown leaf spots with concentric marking appear first on the lower most leaves; cause defoliation. Infection of the fruit is usually around the calyx but may be associated with cracks and other skin injuries	Several chemicals are available. Mancozeb 80% wp at a rate 200/100 litres water can be used	

Late Blight	Greyish green water soaked lesions on the leaves, rapidly turning black. Under moist conditions white downy fungal growth develops on the margins of the lesions. Stem lesions are dark brown; large mottled areas develop on the fruit.	As for early blight	Likely to cause severe damage in wet weather
Late Blight	Greyish green water soaked lesions on the leaves, rapidly turning black. Under moist conditions white downy fungal growth develops on the margins of the lesions. Stem lesions are dark brown; large mottled areas develop on the fruit.	As for early blight	Likely to cause sever damage in wet weather
Leaf Spot	Small spots with light coloured centers, appear first on the older leaves and cause leaf yellowing and defoliation.	Several chemicals available, two being copper oxychloride, 80%wp at a rate of 500g/100 litres water and captain 50% wp at a rate of 200g/100 litres water.	Likely to cause severe damage in wet weather
Powdery mildew	Yellow blotches on leaves and premature defoliation	Spray with copper oxychloride carbonyl/malathion dinocap (ready for use) or sulphur 80% wp at a rate of 200g/100 litres water	Can be troublesome when hot and dry
Damping off	Poor germination and collapse of young seedlings	Mix seed with thiram seed dressing	
Physiological (None-infectious) Blossom-end rot	Blossom end of fruit turns brown and is depressed	Follow correct watering regime	Associated mainly with wide fluctuations in soil moisture measure and poor root development
Catface	Fruit deformed and with deep cavities	Follow correct watering regime	Some large fuited cultivars susceptible
Cracking	In some varieties cracks radiate from the stalk, whilst in others the cracks are arranged in concentric rings around the fruit	Follow correct watering regime	Caused by sudden changes in soil moisture and atmospheric humidity, most sever when foliage sparse puffiness
Sunscald plant	The area of fruit exposed to the sun fails to turn red and stays yellow	Make sure plants are trellised properly	Only occurs on sudden defoliation or when are disturbed, or trellising systems inadequate
Insect Aphis	Small green insect on underside of leaf	Many chemicals available Dimethoate 40%ec at a rate of 100ml/100 litres water as a fruit cover spray	Only occurs on sudden defoliation or when are disturbed, or trellising systems inadequate
Erinose Mite	Minute, cream-coloured mite with 2 pairs legs. Causes a hair-like out-growth resembling mildew	Dicofol 40% ec at a rate of 95ml/100 litres water or endosulfan 35% mo at a rate of 190ml/100 litres water	Carboryl/molasses at a rate of 3/100 litres water

Bollworm	Dark-green or reddish-brown caterpillars with a pale border line along the back and on each side of the body. Hollows out buds from body	Carborly/molasses at a rate of 3/100 litres water or endosulfan 35% mo at a rate of 190ml/100 litres water	Carboryl is supplied at 150 litre/ha. Endosulfan is applied as a full cover spray.
Leaf Hoppers	Small sun-loving plant bugs. Body narrow and elongate	Malathion 25% wp at a rate of 200g/100 litres water	
Loppers	Green caterpillars	Carboryl 85% wp at a rate of 200g/100 litres water	Carboryl is applied at 150 litre/ha. Endosulfan is applied as a full cover spray.
Nematodes	Microscopic worms attack roots and cause knotting	Rotation, fumigation or resistant varieties	
Red Spider Mite	Small, orange to red mite with 4 pairs of legs of equal length. Spins fine webbing underside leaves. Causes silvering and mottling of leaves	Dimethoate 40% ec at a rate of 100ml/100 litres water	Fully cover spray
Russet Mite	Minutes worm-like mite with 2 pairs of legs	Sulphur 9% up at a rate of 200g/100ml/100 litres water	Fully cover spray, repeat when necessary
Thrips	Small torpedo-shaped insects with hairy strap-like wings suck spay and cause silvering of leaves	Malathion 25% wp at a rate of 500g/100 litres water	Full cover spray

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