



# Planting, Growing and Harvesting Onions

Everything You Need To Know

Zambia Agribusiness Society

# Planting, Growing, and Harvesting Onions

— *Production guideline* —

2022

**Zambia Agribusiness Society**

# **Planting, Growing, and Harvesting Onions**

## **Table of Contents**

<b>Climatic Requirements .....</b>	<b>1</b>
<b>Soil Requirements .....</b>	<b>1</b>
<b>Planting .....</b>	<b>2</b>
<b>Irrigation .....</b>	<b>2</b>
<b>Crop Nutrition .....</b>	<b>2</b>
<b>Fertilizer Application .....</b>	<b>3</b>
<b>Weed Control .....</b>	<b>4</b>
<b>Pest Control .....</b>	<b>4</b>
<b>Diseases Control .....</b>	<b>5</b>
<b>Harvesting and Handling .....</b>	<b>6</b>
<b>Storage and Conditioning .....</b>	<b>7</b>
<b>References .....</b>	<b>8</b>

## Planting, Growing, and Harvesting Onions



Onions are consumed in almost every household in Zambia. Not only are onions grown for domestic consumption but are also grown for commercial purposes. Onions are one of the few crops in Zambia that will always have a ready market. This simple guide will equip onion growers with recommended practices in the cultivation of onions.

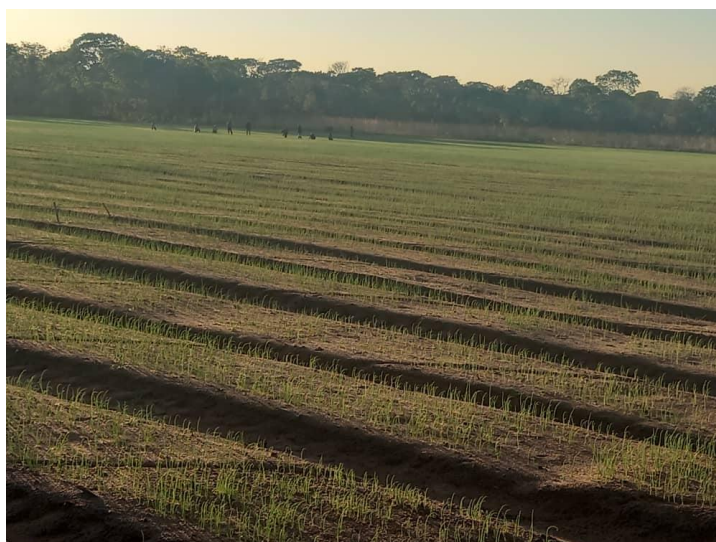
### Climatic Requirements

Onions are a cool season crop. Germination of onions is slow at 6 to 7°C. The optimum germination temperature range is 10 to 35°C, and the maximum temperature is 40°C. Onion is adapted to a growing season with air temperatures at 13 to 24°C. Low temperatures early in the season are desirable with higher temperatures after bulb formation. Onion is tolerant to frost but seedlings are generally only tolerant down to -1°C.

Onions are sensitive to photoperiod. Long days are favourable to onion production as this enhances leaf development and which, in turn, is directly related to bulb size. Early varieties require 13 hours for bulb initiation while late varieties require 16 hours for bulb initiation. Onions begin to form bulbs when day length reaches the appropriate duration for the cultivar, provided temperatures are high enough. Early seeding or transplanting is, therefore, essential. Cool weather during early growth of the plant promotes formation of seed stalks (bolting). Onion bulbs grow quickly in warm than cool temperatures. At 40°C, bulb formation is retarded. In onion, there is an interaction between day-length and temperature in the bulbing process of an individual cultivar.

### Soil Requirements

Soils should be well-drained and well-supplied with organic matter. Sandy loams without stones are optimal. Heavy clay soils should be avoided. Coarse sand soils may be used for specialty onion production under irrigation.



### Planting

Direct seeding will generally require 5 to 8kg/ha. Use high quality seed that has been suitably treated with fungicide dressing. For lands, when transplanting from seedbed, use a seed rate of 3kg/ha. Plant the seedbed at 10g/sq.m and often 300sq.m is adequate to plant out 1 hectare. The recommended planting period is from February to March for transplanting 6 to 8 weeks later when plants are 5 to 7mm in diameter (pencil thickness).



### Irrigation

Onions have a shallow and limited root system which explores mainly the upper 30cm of the soil. This crop should be irrigated frequently throughout the growing season. Soil moisture should not be allowed to fall below 50% of water holding capacity. Most soils should receive 2.5cm of water per week from the combination of rainfall and [irrigation](#). Soil moisture is important in the growth of new roots; the soil moisture must reach the base of the bulb periodically if the newly formed roots from the stem are to grow into the soil. New roots will not grow into dry soil.

### Crop Nutrition

Onions require a fertile but well balanced soil. Manure is not recommended as weeds are a serious problem for this crop and also due to variable nitrogen content. Soils must have a pH of 6.5 to 6.8 for

satisfactory crops. On peat soils, pH of 5.5 is sufficient. The soil must contain adequate calcium for crop growth. This means that calcium must be evenly distributed and incorporated into the field. Crop failure is common on fields with inadequate [liming](#). Also, some cultivars may be more sensitive than others to low pH.

**1. Nitrogen** – Apply most of the nitrogen pre-plant incorporated (at least 2/3 of the required amount). Side-dress the remainder in mid-to-late June after the seeded onions are about 15cm tall. Excessive nitrogen especially in July can cause delayed maturity (thick necks) and soft bulbs.

**2. Phosphorus** – Should be banded if possible at the time of seeding. Otherwise relatively heavy applications of phosphorus must be broadcast and pre-plant incorporated.

**3. Potash** – Potash should be broadcast and pre-plant incorporated. Application rates depend on the level in the soil.



### Micronutrients

**a. Copper** – deficiency occurs on acid or peat soils. Copper may be mixed with the fertilizer and applied. On peat soils (as an initial application), 50kg of copper sulphate per hectare is recommended. Copper Sulphate can be applied by spraying it onto the soil surface and incorporating it into the soil (this material is extremely corrosive to metal).

**b. Manganese** – At high soil pHs a deficiency may show up. Soil application of this element is not suggested due to the large amounts required. Foliar applications of manganese sulphate are recommended, starting when the plants are about 15cm tall with 1.5 to 2.75kg manganese per hectare in 300 ltr of water and repeated in 4 to 5 sprays 10 days apart. Use the low rate on small plants increasing the rate as the season progresses.

### Fertilizer Application

For seedbeds, apply basal fertiliser Compound S (7:21:7 9S 0.04B) at the rate of 45g/m<sup>2</sup>. After 2 to 3 weeks of emergence, apply Ammonium Nitrate (34.5% N) as top dressing at the rate of 35g/m<sup>2</sup>.

For lands, apply basal fertiliser of Compound C (5:15:12 11S.01B) fertiliser at the rate of 600kg/hectare. Apply Ammonium Nitrate (34.5% N) at the rate of 100kg/hectare after 4 to 6 weeks after transplanting.

## Weed Control

Onions do not compete well with weeds. Good [weed control](#) requires integration of cultural and chemical techniques. [Herbicides](#) will provide pre-emergence and post-emergence control of annual weeds but repeat applications may be necessary. Cultivation and hand weeding are usually required to supplement chemical control. Onions should be planted in soil where the annual weed seed population has been reduced by cultural procedures such as crop rotation, fallowing or stale-seedbed technique. Specialty onions can be successfully grown by transplanting through black plastic mulch. This method provides excellent weed control and crop growth. Care must be taken to avoid fields where residual herbicides from previous years persist in the soil as crop injury may occur. For pre-emergent control of annual weeds and broad leaf weeds, apply Ronstar 25 EC or Linurex 50 WP. Use Agil 40 EC for post emergent weed control.

## Pest Control

### 1. Nematodes

Onions are often prone to nematode attack. It is recommended that one applies Basamid GR against them in the seed bed.

### 2. Onion Maggot

Onion maggots overwinter in the pupal stage with adult flies emerging in the summer. Adults resemble the common housefly but are slightly smaller (6mm) and pale grey. The elongate white eggs are laid in the soil at the base of onion plants. The creamy-white larvae emerge within one week, and reach a length of 7mm when fully grown. If onion maggots have been a problem it would be possible to use onion setts along the margins of the field as a trap crop. When injury is seen, or if onion maggots are known to be a problem in your area, apply a fallow treatment. After harvest remove and dispose of any onions that are left in the field. Diazinon 30 EC is a good remedy.

### 3. Onion Thrips

Onion thrips are minute insects that puncture the leaves or stems and suck up the exuding sap. This causes the appearance of whitish blotches on the leaves. The insects may be found in large numbers between the leaf sheaths. Thrips are slender, yellow, active insects, at most 1mm long. They usually enter the field border areas first and become problems especially under hot, dry weather conditions.

The threshold for thrips can be determined by counting their numbers. This is done by generally looking at the newest leaves on the plant – the greatest number of thrips will be found between the new leaves. Count the number of thrips per plant on 30 to 50 plants throughout the field to calculate the average number of thrips per plant. You then divide by the leaf number to give the average number of thrips per leaf. Apply insecticide treatments when the number of thrips observed exceeds the threshold of 3 thrips per leaf for cooking, onions, or 1 thrips per leaf for Spanish and green bunching onions. After the crop is harvested, the tops should be raked together and burned. A chemical recommendation will be Malathion 25 WP.

### 4. Cutworms

Upon detection of cutworms, apply Dursban/ Pyrinex 48 EC, Fenveralate 20 EC, or Lamda-Cyhalothrin 5 EC.



## Diseases Control

### 1. Damping-off and Root rots

Damping-off occurs in seedlings which may topple over and die because of decay at the soil surface. Surviving seedlings may be stunted because of a brownish rot on the roots and shoot. Pink root is a type of root rot which results in reduced bulb size. Affected plants turn yellow and wither and roots have a pink colour which eventually turns brown to black.

**Control:** Treat seed with Thiram 80 WP for damping-off. To control pink root-rot, practise a rotation of several years.

### 2. Botrytis Leaf Blight

Botrytis leaf blight develops as white spots 1 to 5mm in length with light green to silvery halos. The centres of the spots become sunken and straw coloured. When spots become numerous, the leaf tips die back down the entire length of the leaf.

**Control:** A regular spray of Dithane M45 schedule throughout the summer is necessary to control Botrytis leaf blight.

### 3. Downey Mildew

Downy mildew first appears on leaves as elongated patches varying in size and slightly paler than the rest of the foliage. Under moist conditions, these areas turn violet grey, which may spread to surrounding tissue. Leaves fold over at the affected areas and the leaf tips wither. Onions that are severely infected do not cure properly and are susceptible to storage rots.

**Control:** A regular spray of Dithane M45 schedule throughout the summer is necessary to control Downey mildew.

### 4. Purple Blotch

Purple blotch appears on leaves as brown spots 1 to 3cm in length with red-purple margins. The brown areas may have alternating dark and light zones giving a target board effect. Leaves weakened by purple blotch may fall over. Purple blotch frequently develops after Botrytis leaf blight or downy mildew has appeared.

**Control:** A regular spray of Dithane M45 schedule throughout the summer is necessary to control Purple blotch. Practice a 2-year rotation and destroy infected crop debris after harvest and destroy refuse heaps of onions culled from storage.

### 5. White Rot

This is a very destructive disease of the onion family. The characteristic symptoms are a white fluffy fungal growth and soft rot around the base of the bulbs. Masses of tiny black sclerotia form in the fungal growth and in bulb tissues. These sclerotia allow the fungus to survive in the soil for 4 to 5 years or longer.

**Control:** The use of infected onion setts or transplants can introduce the disease to new areas. Do not introduce the disease from infected areas, equipment, pallet boxes, etc. Follow a 4 to 5 year rotation. For chemical control, use Quintozine 75 WP or Allisan 50 WP.

### 6. Bacterial Diseases

There are at least three different diseases caused by bacteria; soft rot, slippery skin, and sour skin. The bacteria causing slippery skin and sour skin enter the onion through wounds on leaves and when heavy irrigation or rainfall results in water standing in leaf axils and the neck. These bacteria can enter the bulb prior to harvest at windrowing or through injuries at harvest. Soft rot often occurs when bulbs are damaged by onion maggot, bulb diseases, or mechanical injury.



### Harvesting and Handling

You can always tell when onions have stopped growing. The leaves will lose their colour, weaken at the top of the bulb and flop over. It's not good to leave the onions in the ground for longer than two weeks after the tops die because they become open to organisms that can cause rots in storage, or they might even start growing again. Pull your onions up on a sunny day if you can, then let them sit in the sun for another day or so to dry (in hot climates this usually takes just a few hours). This drying kills the root system at the bottom of each bulb. The roots will be like little brittle wires when they're dry. Picking the right day to pull the onions can determine how well the onions will keep. If you

harvest them after some rainy weather they'll have a lot more moisture in them and won't dry out well.

### Storage and Conditioning



#### a. Curing

Undercut or pull and windrow onions when at least 60% of tops have fallen down, and leave in windrow until inside neck tissues are dry before topping and storing. If the season is too damp for field curing, dry in storage at temperatures between 27 to 35°C with relative humidity at 70 to 80% for 2 weeks or cure with forced ventilation at 27 to 35°C. Curing with forced air at 35°C can be complete in as little as 48 hours. Best skin colour develops when onions are cured at 24 to 32°C with 80% relative humidity. Properly cured onions will have a tight neck and dry outer scales that rustle. Onions for sets are pulled and cured in late summer or early fall while the tops are still green, and when the bulbs reach 2cm in diameter. Larger sets produce a high proportion of “bolters.”



## **b. Storage**

Following the curing period, onions should be cooled and held at 0°C and 65 to 70% relative humidity. With forced air circulation, it may be possible to allow humidity as high as 85%. Root growth and decay are stimulated at high humidity, and sprouting occurs at high temperatures. Thick-necked onions will not keep and should be removed before storing if possible. Onions are frequently stored in bulk storage, two or four meters deep, constructed so that the bulbs can be cured by forcing air up through them. This method is considered more efficient and economical than curing and storing in crates. Properly cooled onions can be successfully stored at 0°C for 6 to 8 months.

## **References**

Maynard, D. M., and G. J. Hochmuth. *Knott's Handbook for Vegetable Growers*. 5<sup>th</sup> Ed. New York: John Wiley and Sons, 2006.

Pennsylvania Commercial Vegetable Production Recommendations. University Park: Penn State Extension, 2012.

Swaider, J. M., and G. W. Ware. *Producing Vegetable Crops*. 5<sup>th</sup> Ed. Upper Saddle River, N.J.: Prentice Hall, 2001.