



# Onion Production Guide

  
ZARI  
Zambia Agriculture Research Institute  
Researching Soils, Crops and  
Water in Zambia

  
AGRICULTURAL PRODUCTIVITY PROGRAMME FOR SOUTHERN AFRICA  
(APPSA)  
MINISTRY OF AGRICULTURE  
AND RURAL DEVELOPMENT  
ZAMBIA





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## Foreword

Zambia has the potential to produce sufficient food for its citizens and for export.



In order to ensure that good agricultural practices are employed by farmers, crop specific production information should be made available to them.

Due to technological advances and the changing environmental and socio-economic conditions it became necessary to revise the first edition of the Onion Production Guide, which was published in 2002. This revised edition is meant to provide farmers and other stakeholders crop specific information in order to promote good agricultural practices and enhance productivity and production.

The information contained in this booklet has been generated over a number of years of research and is appropriate for all categories of farmers. The information is meant for extension officers, agricultural training institutions and other development partners.

It is my sincere hope that this information will go a long way in stimulating onion production in Zambia.

The Zambia Agriculture Research Institute (ZARI) is committed to alleviating poverty and enhancing food security by contributing to increased and sustainable food production.

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2015

## Acknowledgements

The Editorial Committee wishes to express its gratitude to the Vegetables Research Team of Zambia Agriculture Research Institute for providing the technical information and invaluable advice.

The Zambia Agriculture Research Institute wishes to recognize the support provided by World Bank through the Agricultural Productivity Programme for Southern Africa- Zambia Project (APPSA-Zambia) for financing the publication of this production guide.

## **1.0 Introduction**

Onion (*Allium cepa*) is a popular vegetable of the Liliaceae family. The immature and mature bulbs are eaten raw or they may be cooked or fried and eaten as a vegetable. They are used in soups and sauces and for seasoning many foods. Onions, like most other vegetables, can be produced in all the three agro-ecological zones of Zambia. However, the bulk of the production takes place in areas close to urban areas where there is a ready market.

## **2.0 Climatic and Soil Requirements**

### **2.1 Climate**

Onions can be grown under a wide range of climatic conditions, but they succeed best in a mild climate without excessive rainfall or extremes of heat and cold. Cool conditions with an adequate moisture supply are most suited for early growth, followed by warm, drier conditions for maturation, harvesting and curing. For vegetative growth, onion requires temperatures of between 13°C to 24°C while bulb formation requires temperatures of between 16°C to 21°C for ten hours a day and about 70% relative humidity.

In Zambia only adaptable short-day cultivars should be grown because the crop is sensitive to day length.

### **2.2 Soil Types**

The best soils for onions production are sandy-loam soils which are rich in organic matter and are well-drained. The optimum pH is 6.0 - 6.5.

### 3.0 Recommended Varieties

Some of the varieties commercially available in Zambia and their major agronomic attributes are given in the table below.

Cultivars	Days to Maturity	Bulb Yield (t/ha)	Storage
Red granex	130	17	Poor
Henry special	131	33	Poor
Early lockyer brown	133	28	Poor
R23 74	135	23	Poor
Tropic ace F1	138	27	Poor
Yellow granex F1	139	29	Poor
Texas early grano 502	143	29	Poor
Yellow dessex F1	145	33	Good
Red creole	136	26	Good
Pusa red	150	35	Good

### 4.0 Recommended Management Practices

#### 4.1 Land Preparation

Prior to planting, soils should be ploughed and disked sufficiently to eliminate debris and soil clods. The land should be well levelled for proper irrigation.

#### 4.2 Planting

The recommended planting time for onion is from March to October. However, the best crop is produced from plantings between March and April. Such a crop would mature between September and October, before the onset of the rainy season. Detailed guides for field operations are given in the table below.

Guide to field operations for Onion in Zambia

Planting Time	How to Plant	Seed Rate (kg/ha)	Depth of Sowing (cm)	Optimal Soil pH	Plant Spacing (cm)		Fertiliser(kg/ha)	
					Between Row	Within Row	D	Urea
March-Oct	Nursery	4-8	1 – 1.5	5.8 – 6.5	25-50	5-15	800	200

Seedlings should be raised in a nursery. Seedlings should be ready for transplanting in 6 - 8 weeks from sowing. Close spacing reduces bulb size and smothers weeds, while wider spacing encourages formation of bigger bulbs.

### **4.3 Weed Control**

Weeds should be controlled as need arises. Shallow cultivation by hoe in between rows and hand pulling is recommended. Care should be taken not to damage bulbs during weeding.

To effectively control weeds in onion, use of pre-emergence herbicides followed by hand weeding is recommended.

### **4.4 Fertiliser Use**

Basal dressing fertiliser should be applied to the nursery seedbed before sowing. Kraal manure or compost may also be incorporated at 1.53 kg/m<sup>2</sup>. At about 2 - 3 weeks of age, the seedlings should be top-dressed with 35 g/m<sup>2</sup> ammonium nitrate. A similar amount of ammonium nitrate should be applied when seedlings are 4 - 6 weeks old.

In Zambia 800 kg/ha 'D' compound as a basal dressing is generally recommended for the transplanted crop. A compound fertilizer containing Sulphur is preferred as it enhances bulb keeping quality and pungency. Top dressing with ammonium nitrate at the rate of 200 kg/ha or 150 kg/ha urea should be done 4 - 5 weeks after transplanting.

### **4.5 Crop Rotation Practices**

The land selected for production of onions should not have been planted with other Allium species such as garlic, shallot, leek, spring onion, or Chives for at least two planting seasons. Root crops such as beetroots and carrots should not follow onion in the rotation cycle to avoid utilization of nutrients from the same root zone.

## 4.6 Irrigation

Irrigate at regular intervals to keep the soil moist from seedling emergency to full bulb stage. Irrigation should be withdrawn when the crop has started maturing (when 25 - 50 % of the crop leaves fall). Avoid excessive application of water as it contributes to reducing the shelf life of bulbs. Recommended irrigation intervals should be in accordance with the irrigation intervals given in the table below.

Table showing irrigation intervals (in days)

Growth Stage	Initial Stage			Development Stage			Harvesting Stage		
	Hot	Moderate	Cool	Hot	Moderate	Cool	Hot	Moderate	Cool
Climate	Hot	Moderate	Cool	Hot	Moderate	Cool	Hot	Moderate	Cool
Light Soil	2	2	2	1	2	2	1	2	2
Medium Soil	2	4	4	2	3	3	1	2	3
Heavy Soil	3	5	5	2	3	3	1	2	3

## 5.0 Crop Protection

Onion has relatively few pests of economic importance in Zambia. It is however susceptible to a number of diseases that reduce the yield and quality of the produce. There are measures that can be taken to minimize the damage.

### 5.1 Major Diseases and Control Measures

#### 5.1.1 Purple blotch (*Alternaria porri*)

Purple blotch is a fungal foliar disease that causes blotching of the leaves with yield losses of more than 50 % recorded. The disease is characterized by small white specks on leaves, enlarging to brown lesions, often with purple edges. The leaves die off partly or completely leading to, in some cases, bulb rotting .

## Control Measures

The control measures include the following:

- Use of resistant varieties.
- Practicing rotation
- Minimise disease spread by avoiding use of sprinkler irrigation
- Higher doses of nitrogen and phosphate increase the number of leaves and decrease the amount of disease.
- Treat frequently with an appropriate fungicide depending on the intensity of the rain showers and the relative humidity.

## 5.2 Major Insect Pest and Control Measures

### 5.2.1 Thrips (*Thrips tabaci*)

This is the only major insect pest of onion in Zambia. They are small greenish insects that suck sap from the leaves of onion.

Infested leaves develop whitish grey spots that make them appear as if they have been splashed with soil. Severe infestations result in leaf blasting and collapse. Bulbs become distorted and undersized. Infestations and attacks are more severe in dry seasons and entire fields may be destroyed. The insect has many host plants. Adults and nymphs overwinter on plants or plant debris, or in weeds bordering the field.

## Control Measures

Measures to control thrips include the following:

Practice crop rotation with other crops other than Alliums such as leek, garlic, shallots, or bunching onions.

Sow early after rainy season to reduce incidence of infestation.

Irrigate regularly to avoid moisture stress

Use mulch to reduce pest infestations.



Adult Thrips

In severe infestations spray with Imidacloprid according to manufacturer's instructions

## **6. Harvesting**

Harvesting should be done when bulbs are fully mature, after attainment of 75 % leaf fall. Bulbs harvested under moist conditions are likely to rot in storage. Where irrigation is used, it is recommended to completely withdraw irrigation for at least 7 days before harvesting.

## **7. Post-Harvest Handling and Processing**

The shelf life of harvested onion bulbs can be prolonged by ensuring that the bulbs are harvested when they have attained full maturity. Picking of bulbs should be done under dry conditions.

Bulbs to be stored should be free of injuries. The purpose of a curing period is to allow natural dormancy to develop and to dry the onion sufficiently in order to prolong their shelf lives. A properly cured onion will have a dry shrunken neck and dry outer scales. The respiration rate of a cured bulb is lower than that of an uncured bulb giving it a longer shelf life. The bulbs require to be cured slowly under a shade away from direct sunshine. Cured onions can be stored on racks made from locally available materials such as sticks, poles or planks. The onions can alternatively be tied together and hung under a roof in a well-ventilated structure or building.

Onions should not be packed in unperforated plastic material.



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