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Ja REEACH II Project
JAMAICA RURAL ECONOMY AND ECOSYSTEMS ADAPTING TO CLIMATE CHANGE II

The Jamaica Rural Economy and Ecosystems Adapting to Climate cHange II (Ja REEACH II) project is a four-year initiative funded by the United States Agency for International Development (USAID), and implemented by ACDI/VOCA and Government of Jamaica partners.

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FARMERS HANDBOOK

FOR ONION PRODUCTION

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Welcome

The United States Agency for International Development (USAID) funded Jamaica Rural Economy and Ecosystems Adapting the Climate cHange II (Ja REEACH II) project is pleased to share with you to this “Farmers Handbook for Onion Production.” This handbook was developed to equip you our stakeholders and your stakeholders with fundamental knowledge and best practices information aimed at providing guidance through the onion production cycle to help ensure onions bulbs at harvest that are free from disease, wholesome and adequately field cured and dried.

We do hope that you will find the information in this handbook useful in assisting to optimize the profitability of your agribusiness and to sustain and promote your livelihood pursuits, and by extension improve the onion value chain competitiveness and resilience.

NOTES

Onion Insect Pests

Thrips *(Thrips tabaci, Frankliniella species)*, Maggots *(Delia antiqua, D. platura)*, Leafminers *(Liriomyza species)*

FIGURE 1

FIGURE 2

FIGURE 3

FIGURE 4

FIGURE 5

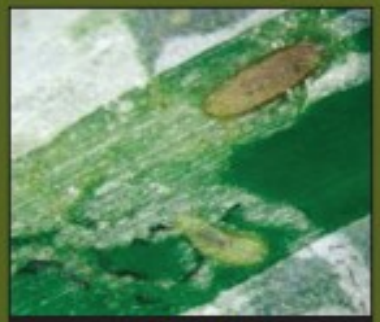

FIGURE 6

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Introduction

» Onions are one of the oldest vegetables in continuous cultivation, dating back to at least 4,000 BC as recorded by ancient Egyptians. This fact is documented in the Bible and Holy Quran.

» The common dry onions (Allium cepa), a member of the Amaryllidaceae family, originated in central Asia (Afghanistan, Tajikistan, and Uzbekistan) where it is widely used.

» Dry onions are a crop that lends itself well to small scale and part-time farming operations.

» The term “dry onion” is used to distinguish them from green onions which are pulled while ops are still green and usually before a large bulb has formed.

» Onions cultivars (varieties) are classified into groups according to when they bulb. They can be long-day (14-16 hours), short-day (10-12 hours) or intermediate day types (12-14 hours), depending on the day length required to initiate bulb formation.

» Bulbs vary in colour (red, yellow, and white), shape (round or flattened), and flavour (sweet or pungent).

Onion ipmPIPE
Onion ipmPIPE Diagnostic Pocket Series

Onion Insect Pests

AUTHORS: B. Nault (Cornell University), W. Cranshaw (Colorado State University) & D. Alston (Utah State University) **PHOTOGRAPHS:** Courtesy of B. Nault & J. Ogrodnick (Cornell Univ.), and W . S. Cranshaw & H. F. Schwartz (Colorado State Univ.) [01/2011]

COMMON HOSTS: Onion, Garlic

SYMPTOMS (ON ONION):

FIGURES 1 & 2 • Thrips (onion, western flower) feed primarily on leaves reducing bulb growth. Larvae are 0.5–1 mm (0.02–0.04 inch) long, yellow and elongate (cigar-shaped). Adults (2 mm or 0.8 inch) are winged and darker (gray to brown) in color. Onion thrips transmit Iris yellow spot virus (IYSV).

FIGURES 3 & 4 • Maggot larvae tunnel in roots, seedlings and young bulbs causing reduced stands and stunted plants. Larvae are cream colored and legless (8 mm or 0.3 in long). Adults are brownish gray flies (10 mm or 0.4 in) similar in appearance to a housefly.

FIGURES 5 & 6 • Leafminers are the larvae of small flies that make meandering tunnels under the surface of onion (and other crop) leaves. Flies are small (1.5–2 mm or less than 0.08 inch), and yellow and black. Larvae are pale-colored maggots found only within the leaf mines, and may have pale green or yellow coloration as they become full grown.

FACTORS FAVORING:

- High temperatures greater than 30°C (86°F) favor thrips, while lower temperatures favor maggots.
- Moisture stress (drought) also favors thrips; while excess moisture favors maggots.
- These insect pests are favored by frequent cropping to Alliums (every 3–4 years), early-season planting; and variable plant density (thrips).

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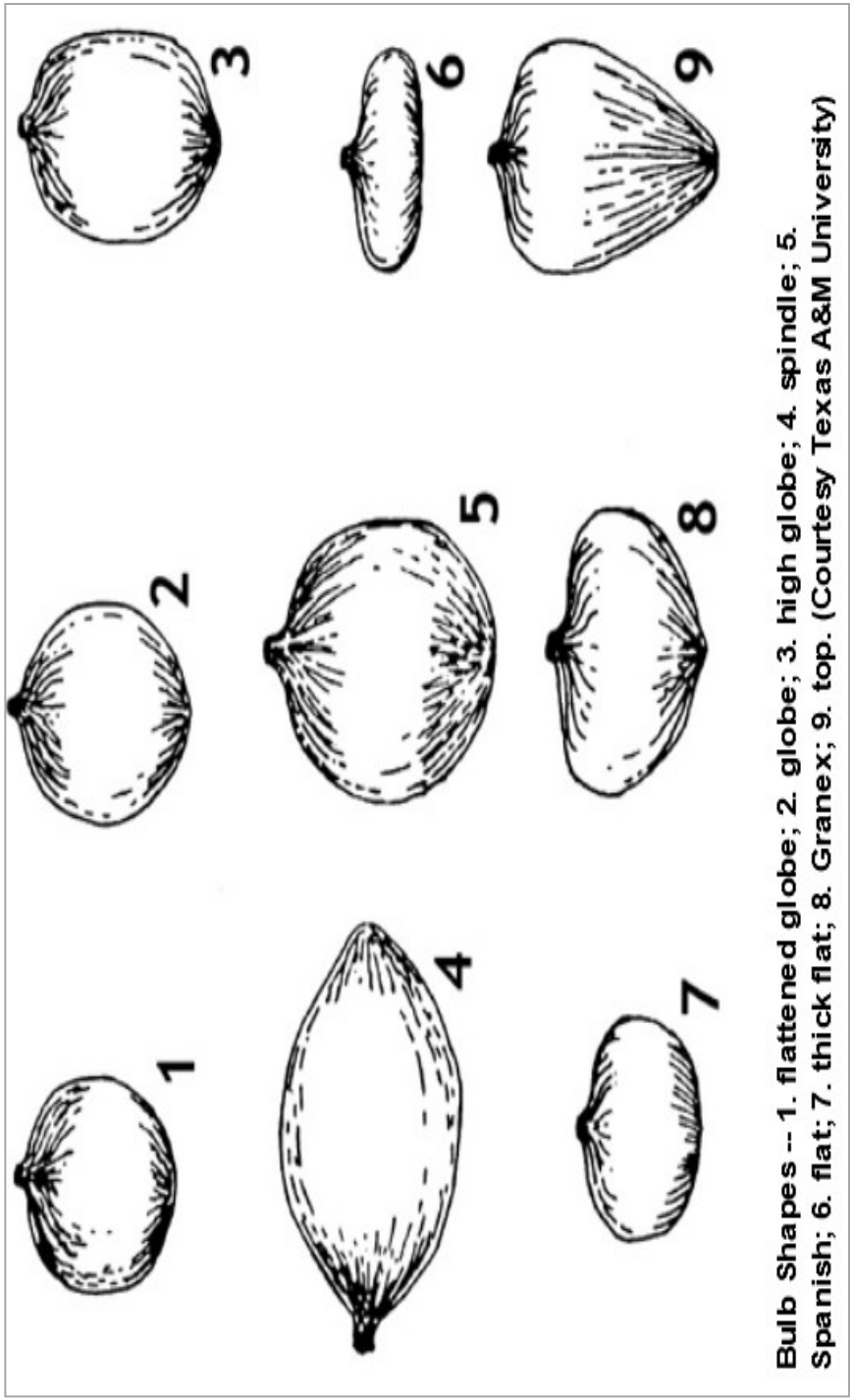
Major Onion Insecticides

1. Abamectin (Newmectin)); broad spectrum insect control – including mites, thrips, leaf miners and aphids.
2. Bacillus Thuringiensis (Xentari); provides good control of hornworms and beet armyworms.
3. Acetamyprid (Caprid); broad spectrum insect control – including thrips, leaf miners, leaf hoppers, aphids and beet armyworms.
4. Lambda-Cyhalothrin (Karate Zeon); broad spectrum insect control – including mites, thrips, leaf miners and aphids.
5. Indoxacarb (Avaunt 30 WG) - broad spectrum insect control – including beet armyworms, thrips and aphids.

Biological Control in Onions

Insect	Biological Control Organisms
Onion Maggot	Braconid
Leaf Miner	Eulophidae, lacewing and parasitic wasps
Onion Thrips	Flower bug, lacewing and predatory mites
Beet army worm	Soldier bug



Bulb Shapes -- 1. flattened globe; 2. globe; 3. high globe; 4. spindle; 5. Spanish; 6. flat; 7. thick flat; 8. Granex; 9. top. (Courtesy Texas A&M University)

Botanicals

» The onion plant is biennial monocot. The bulb is developed at the culmination of the first-year vegetative growth.

» Onion bulbs go through a period of dormancy which is broken by a period of cool temperatures and when planted in the second season, they produce seed stalks.

» Methods of crop establishment:
- Direct seeded in field
- Use of transplants
- Use of sets “small onion bulbs”

Requirements for Successful Planting

» Seeds must be viable and treated “coated” with fungicide and insecticide combination.

» Well prepared, deep, smooth and fertile soil beds. Onions grow better on light sandy loam soils.

» Proper fertilization before planting and during the season with complete fertilizers containing all the needed major and minor elements. The amount of fertilizers needed varies by location, soil fertility (soil analysis), type of onion grown and local recommendation. In addition to the need levels of nitrogen, phosphorus and potassium, onions need Magnesium (4kg.), Boron (1kg.) and Zink (2kg).

» Proper regulated irrigation must be applied during the season and extra care in irrigation must be used during bulb maturation. Irrigation must be stopped in about 3 weeks before harvest.

» Good weather is needed for vegetative growth and bulb formation. Moderate temperatures (20-30oc) and good light intensity are essential to initiate bulbing response.

» Larvae emerge, crawl beneath the leaf sheath and enter the bulb.

» There are 3 generations of onion maggot per season. The first generation is often the largest and most damaging.

» Cool, wet weather favor this insect while hot, dry weather is detrimental to its survival.

B. Onion Thrips (Thrips tabaci)

» Very important and damaging pest.
» Adults and nymphs over winter on plants and debris and along weedy field edges.

» Females can reproduce without mating and laying eggs beneath the leaf surface.

» Eggs hatch after 5-10 days and nymphs are fully grown after 15-30 days.

» There are usually 5-8 generations per year.

» Feeding damage causes whitish blotches on leaves.

» Hot, dry weather favor thripes infestation.

C. Aster Leafhopper (Mycrosteles Fascifrons)

» This insect is a vector of the phytoplasma that causes the Aster yellows disease on many plant species.

» In general adult leafhoppers have low preference for onions and the nymphs will not feed on onions at all.

» There is 2-5 generation per year.

» Economic damage caused by leafhopper is primarily the transmission of the aster yellow disease with symptoms of chlorosis of the leaves and stunting and twisting of stem and leaves.

Fungicides for Control of Onion Disease

A. Protective Fungicides

1. Copper Products; effective for the control fungal and bacterial diseases.
2. Sulfur Products; effective for fungal disease and provide some insect controls.
3. Maneb Products; provide good fungal disease control.
4. Chlorothalonil; provide very good control of most fungal disease.

B. Systemic Fungicides

1. Mefenoxam (Ridomil) products; provide excellent control of Downy mildew and systemic diseases.
2. Azoxystrobin (Amistar); provide excellent control of Downey mildew, purple blotch and botrytis leaf blight (blast).
3. Copper Sulphate Pentahydrate (Phyton-27); provide good control of Downey Mildew, purple blotch and botrytis leaf blight (blast).

Onion Insects

THREE MAJOR INSECTS

A. Onion Maggot (Hylemya antique)

» Most serious onion pest.

» Highly host specific to plants in the onion family.

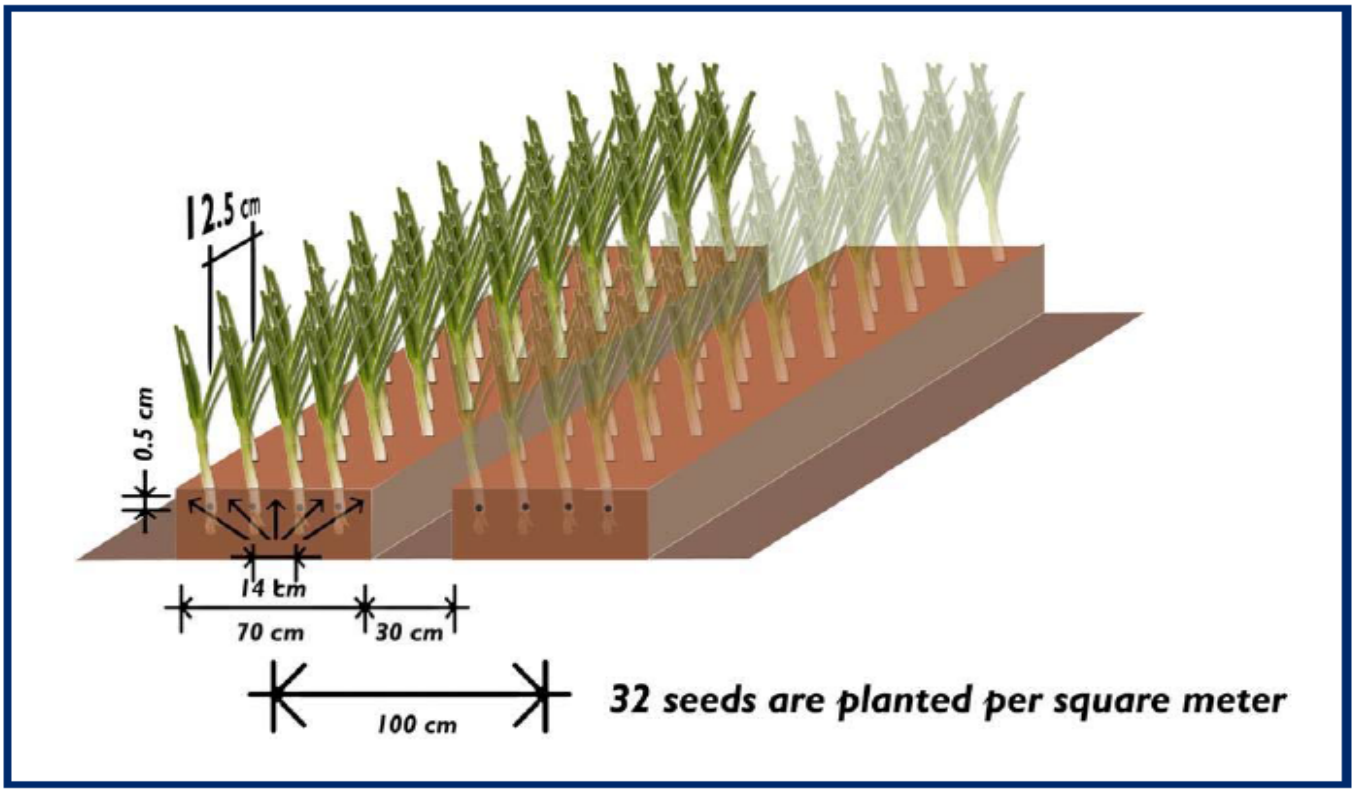
» Over winter as pupae in the soil or in culls in the field or in cull piles.

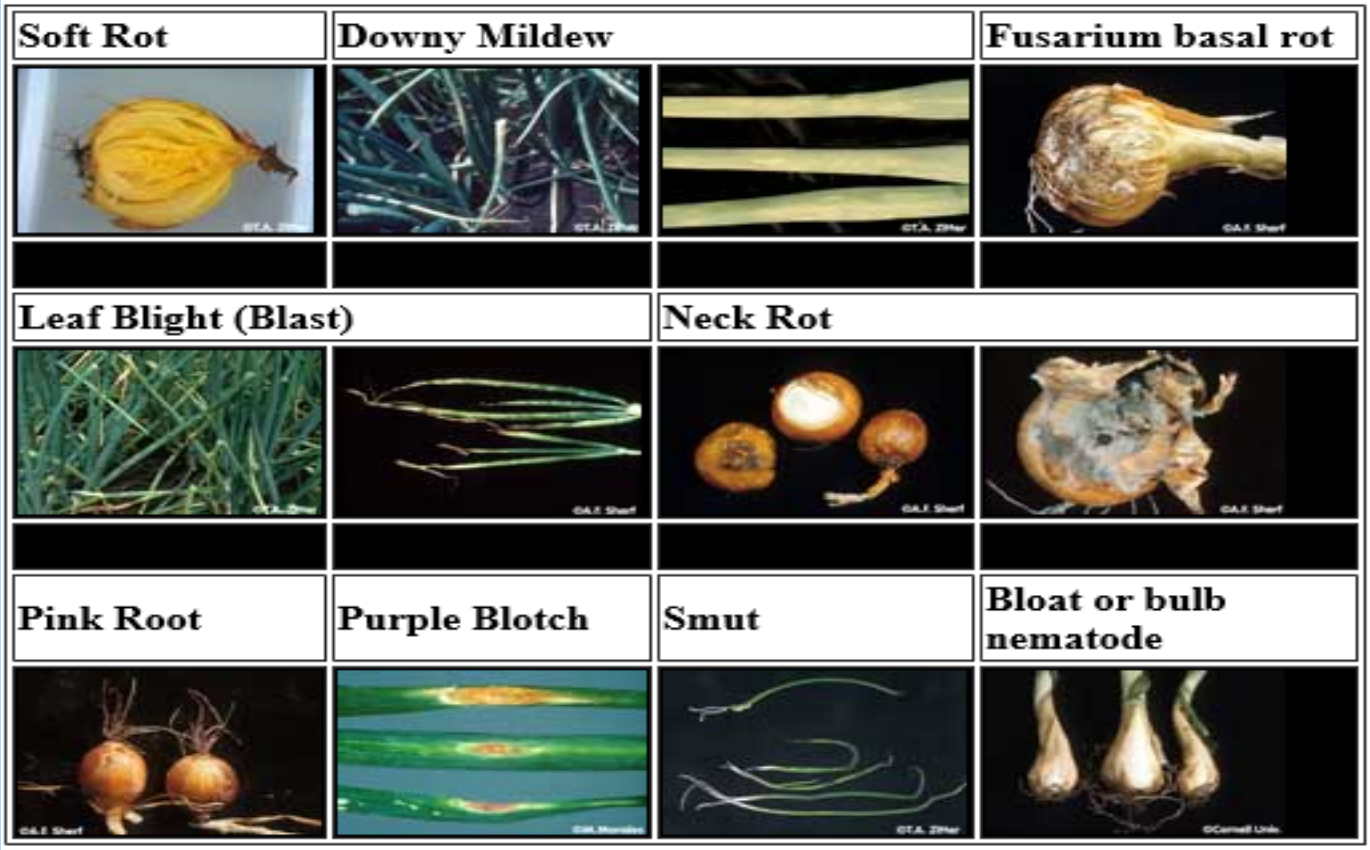
» Adults emerge early in the season and begin laying their tiny white eggs at the base of the plant.

» Good weed control is a must for producing quality onions.

» Regular field scouting and proper diseases and insects. Control measures must be used during the different stages onion crop development.

Onion Planting Diagram





plants may be stunted, distorted and have pale green leaves.

OTHER ONION DISEASES

A. Neck Rot

» Caused by the fungus Botrytis allii.

» Initial infection start in the field and symptoms appear after harvest.

» Reduce the chance of infection by harvesting nature bulbs in dry weather.

B. Onion Smut

» Caused by the fungus Urocytis Cepulae.

» Only important in cold and damp weather and affect seedlings.

C. Fusarium Basal Rot

» Caused by the fungus Fusarium Oxysporum Cepae.

» Affect onion plants in midseason and continue after harvest as a storage rot.

» Infectious happen in warm weather, through wounds or after maggot damage.

D. Pink Root

» Caused by the fungus Pyrenochaeta terrestris.

» It affects onion roots and does not affect bulbs; however, it reduces bulb size from infected plants.

» Affected roots turn pink, shrivel and die.

» During severe infections, onion tops turn white, yellow or brown and finally dies.

Physiology of Onion Growth & Development

A. Vegetative Growth

1. Juvenile phase

2. Adult phase

B. Bulb Initiation

1. Initial enlargement of the bulb.
2. Leaves in the center of the plant abort their blades and their bases start to enlarge.
3. Foliage growth ceases and mobilization of reserves to the leaf bases increases and so is the bulb size.
4. When the bulbs are Mature, the oldest outer three to four leaves bases dry up and disappear or remain as papery coverings.

Onion Diseases

THREE MAJOR FOLIAR DISEASES

A. Botrytis leaf blight (blast)

» Caused by: botrytis squamosa.

» Very destructive and is found everywhere.

» Symptoms appear as oval whitish or yellowish spots approximately 1-3 mm long, slightly depressed and bordered with a diffuse silver halo.

» When infection is severe it reduces the yield considerably and disease may continue in storage and cause neck and bulb rots.

B. Purple Blotch

» Caused by = Alternaria porri.

» Symptoms appear as small, water soaked, brownish spots on leaves. As spots enlarge, they assume a zonate appearance and become somewhat sunken and purplish in colour and with reddish borders.

» When infection is severe, lesions may girdle the entire leaf.

» Onion bulbs maybe infected at harvest or later, in storage through the neck or through wounds in the bulb scales.

C. Downy Mildew

» Caused by Peronospora destructor

» Very serious disease under cool, moist and humid conditions

» Older, outer leaves usually become infected first.

» Symptoms appear as long, pale-green lesions and slightly sunken. Under moist conditions infected areas maybe covered with a fuzzy, pale, purplish mold.

» The fungus may infect small plants systemically and infected

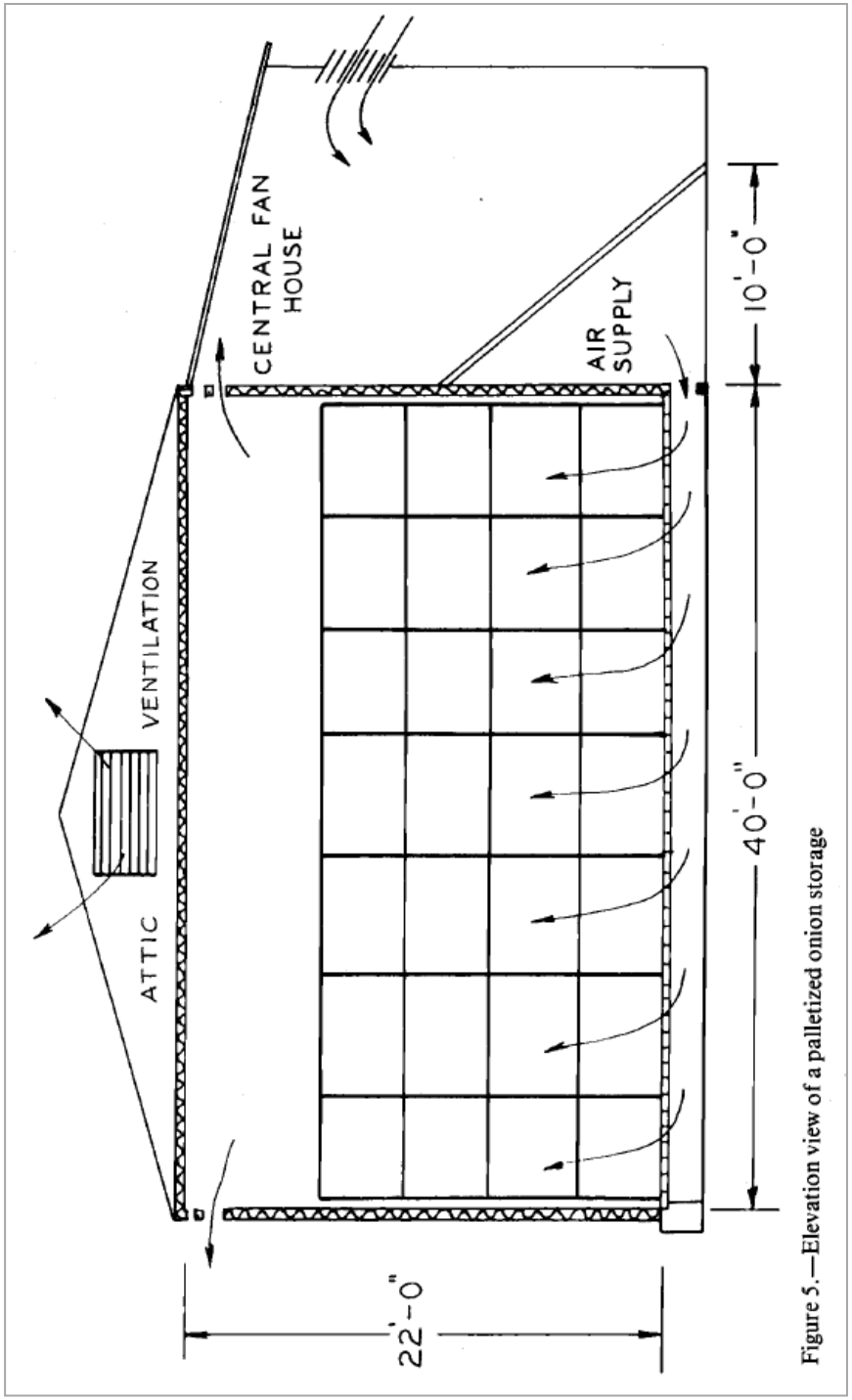


Figure 5.—Elevation view of a palletized onion storage

C. Factors Affecting Bulb Production

1. Photoperiod; longer photoperiods cause earlier maturation.
2. Temperature; higher temperatures increase bulb development.
3. Nitrogen supply; excessive levels stimulate leaf growth more than the growth of bulbs. Lower levels may stimulate bulbing but delay scale development and bulb maturation.
4. Water supply; irrigation prolongs leaf blade development and delay bulb maturation.
5. Other factors; such as plant size, plant age, cultivars, and inter-plant competition.

Production of Onion Transplants in Nurseries

A. Soil

1. Must be light soil and prepared well before planting.
2. Must be free from grasses and weeds.
3. Must be free from diseases and insects and was not planted with onion in previous year.
4. Should be easy to irrigate.

B. Seeds

1. Should be true to its cultivar.
2. Should be treated (coated) with fungicides.
3. Must be free from any grass or weed seeds.
4. Should not be old and must have high germination rate.

C. Fertilizers

1. Calcium super phosphate is applied during land preparation and before planting at the rates recommended locally.
2. Nitrogen and potassium fertilizers are applied at 2 or 3 times on a 3 weeks schedule.
3. It is highly recommended to apply a foliar application of micro-nutrients to onion seedlings when they are about 45 days old.

D. Pest Control

1. As indicated before, nurseries must be from grasses and weeds.
2. One or two applications of fungicides and insecticides are needed during the period of transplant production.
3. One application of protective fungicides such as bravo (chlorothalonil) or Dithane M45 is needed and followed by one application of systematic fungicide like Ridomil are needed for

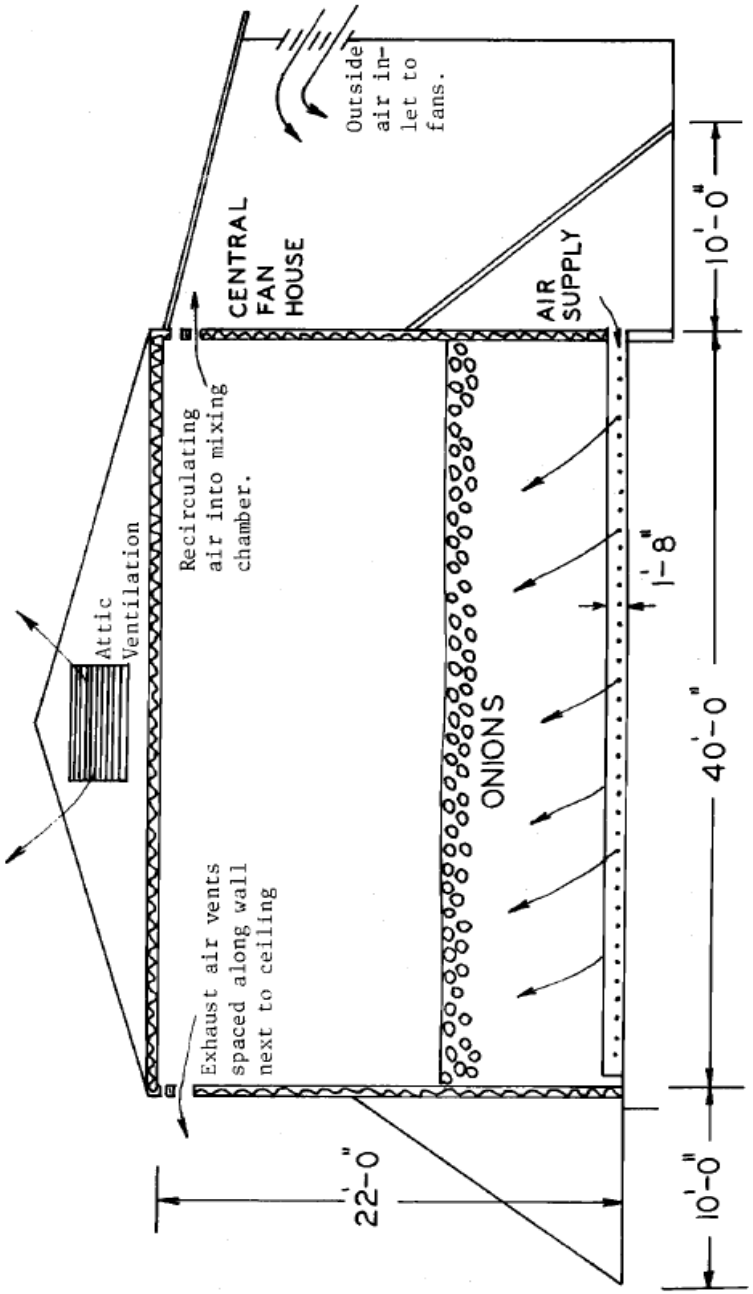
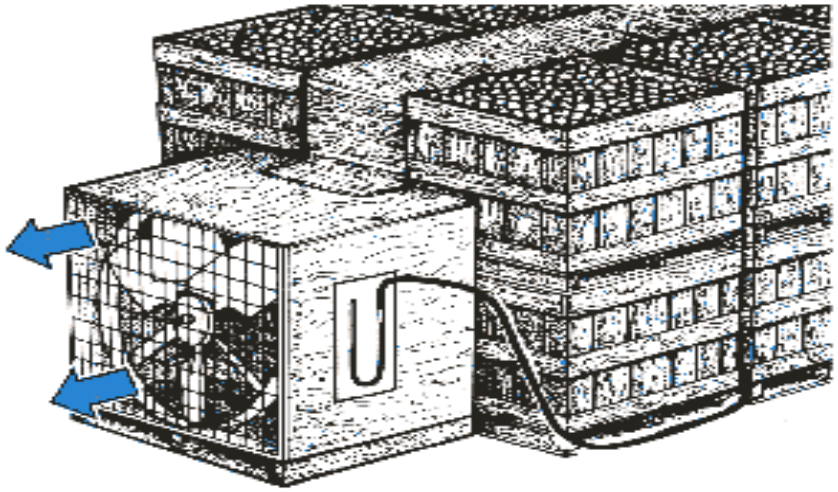


Figure 3.—Elevation view of a bulk onion storage. In this and similar figures, keep in mind that 1 foot = approximately .3 meter.

Fan and pallet bin arrangement used to dry onions.



good disease control.

4. Extra care must be utilized when selecting and applying herbicides to onion nurseries.

E. Irrigation

Depending on soil type irrigation on a 4-7 days schedule is optimum. However, soil should not be over irrigated or let be dried and cracked.

Crop Harvesting

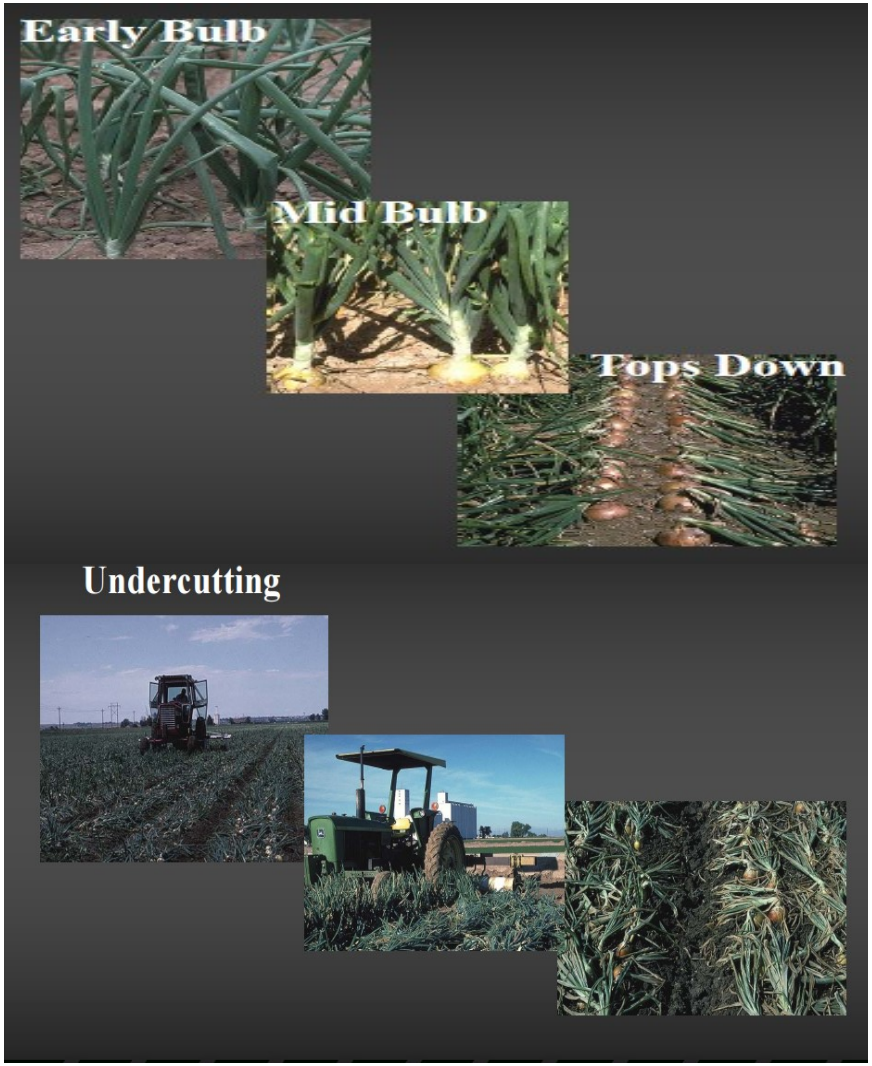
In the USA harvest season begins when the onion plant leaves have senesced, the necks have sealed and the bulbs have matured and reached their normal size.

» The roots are undercut to reduce water uptake and to stop further growth.

» Onions are lifted and tops are cut to leave about 2 inches (5cm) of neck.

» Bulbs are placed in winrows, transported in bulk to storage and cured with forced air and drying temperature of 85-90oF (30-35 C).

Steps of Onion Development and Harvesting



In general:

» The harvest process should begin when 75% of plant tops fall over.

» Irrigation should be stopped at least 15 days before harvest.

» Care must be used in harvest in order to avoid any damage to the bulbs.

» Diseased and insect infested bulbs must be removed from the rest of the harvested crop.

» Onions should be left to cure when necks are tight and the outer scales are dry and rustle.

» Harvest onions when weather is dry. Bulbs must be firm with mature necks and scales and must be a good size.

Quality Standards for the Bulbs

» Outer skin must be intact.

» Bulbs must not be rotten or affected by diseases or pests.

» Bulbs must be clean and free from impurities.

» Bulbs must be free from any damage due to frost.

» Bulbs must be dry and free of foreign smell or taste.

Control of Fungal and Bacterial Rots of Onions Can be Achieved by:

» Pre-Harvest application of registered fungicide;
» Harvesting at proper maturity;
» Minimizing bruising of bulbs;
» Discarding defective onions;
» Prompt and effective curing; and
» Storing as quickly as possible.