

BULB ONION PRODUCTION



SHERP

The logo for SHERP features the word "SHERP" in large, bold, stylized letters. The letters are colored: 'S' is yellow, 'H' is green, 'E' is blue, 'R' is red, and 'P' is red with a white outline. The 'P' has a unique shape with a white circle inside the top curve.

Training Title: Onion Production

Objective: To provide a guideline on production of Onion

Specific Objective:

- To provide basic information on production, post-harvest handling, and marketing of Onion

Contents:

1. Introduction: Background, Some Common Varieties and Optimal Ecological Requirements
2. Pre-Cultivation Preparation 1 – 5
3. Cultural Practices 1- 9
4. Harvest
5. Post-Harvest Handling
6. Cost & Income Analysis
7. Post-Training Evaluation Exercise

Contacts:

- **Oromia Bureau of Agriculture and Natural Resource**
- **Bureau of Agriculture, Amhara Region**
- **Ministry of Agriculture (MoA)**

On the way to Megenagna to Gurd Shola; Behind Ethiopian Geological Survey, Addis Ababa, Ethiopia

P.O. Box 62347, Addis Ababa, Ethiopia Tel: +2511164660746

- **Ethio-SHEP Project Office**

3rd Floor, Building A Horticulture Development & Technology Transfer Directorate (HDTTD)

E-mail: ethioshep@gmail.com

- **Japan International Cooperation Agency (JICA) Ethiopia Office**

Kirkos sub-city, Kebele 02, House No676/05, Addis Ababa, Ethiopia (MINA Building, 6 – 7F),

Mailing Address: P.O.Box5384, Addis Ababa, Ethiopia

Tel: (251)-11-5504755

Email: et_oso_rep@jica.go.jp

Disclaimer

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The proposed agrochemicals are in accordance with "Pest Control Product Registered for Use in Edition, 2015". The registered agrochemicals are subject to change. Please refer to the latest registered agrochemicals by Plant variety release, protection and seed quality control directorate .

Preface

- This training material applies the fundamental practices essential for crop production and successful marketing to put into perspective the case of horticultural crop production.
- The fundamental practices are categorized into seven (7) broad topics and twenty (20) sub-topics; the twenty sub-topics are referred to as the General Horticulture Crop Production and Post-Harvest Handling Techniques (GHCP&PHHT20). This categorization is based on the Smallholder Horticulture Empowerment & Promotion (SHEP) experience in mitigating production and marketing challenges facing smallholder horticultural farmers.
- The seven (7) broad topics are: Pre-Cultivation Preparation; Land Preparation; Crop Establishment (Planting/Transplanting); Crop Management; Harvest; Post-Harvest Handling; and Cost and Income Analysis.
- The sub-topics under each topic are as follows: **Pre-Cultivation Preparation** (market survey, crop planting calendar(s), soil sampling & analysis, or using ETHIOSIS soil test results as well as regional soil labs, composting, and quality seed/planting material(s)); **Land Preparation** (land preparation practices, incorporation of crop residues, and basal application); **Crop Establishment** (raising seedlings, planting/transplanting, fertilizer application); **Crop Management** (water requirement, managing of weeds, top-dressing, pests & diseases management practices, and safe & effective use of pesticides); **Harvest** (harvesting indices); **Post-Harvest Handling** (appropriate containers/standard packaging materials, and value addition techniques); and **Cost and Income Analysis** (cost and income analysis).
- The issues outlined in the twenty (20) sub-topics might not necessarily be applicable in all the cases. But where applicable, it is recommended that the instructions issued be given due consideration.

1. Introduction:

1.1 Background



Bulb Onion (Shinkuret Kuret)

1. Introduction:

1.1 Background



Bulb Onion (Shinkurt Kuret)

1. Introduction:

1.1 Background

- Onion is one of the **widely grown & consumed vegetables** in Ethiopia
- It is a **source of income** to smallholder farmers
- It is an important spice for **foods**, salad, **soups** and **stews**
- It is rich in **Calcium, Iron, Vitamin B, Vitamin E** and has **therapeutic properties**

1.2 Some Common Varieties



“Adama Red”



“Bombay Red”

1.2 Some Common Varieties



“Adama Red”



“Bombay Red”

1.2 Some Common Varieties

“**Bombay Red**” and “**Adama Red**” are the most common varieties in Ethiopia

“**Adama Red**”:

- A popular variety which produces **red, flat-round, globular bulbs**
- **Maturity period 120-135 days**
- **Long shelf life**
- It has **very pungent taste**
- **Excellent in storage**
- Ave. weight of the bulb: **65-80 g**
- **Yield: 350 qt/ha**

“**Bombay Red**”:

- Purplish red
- **Maturity period 135-145 days**
- Variety for dry and warmer conditions
- Produces small to medium sized bulbs, which are globe shaped, pungent
- Ave. weight of the bulb: **70-80 g**
- **Yield : 250-300 qt/ha**

*Both improved varieties have low resistant to diseases, especially susceptible to **purple blotch** and **thrips** attack. However, the Ethiopian **shallot** is resistance to leaf diseases, therefore, rainfed production without disease control by fungicide, shallot is recommended

1.3 Optimal Ecological Requirements

Altitude	700 – 2,200 meter above sea level
Rainfall	350 – 650 mm of water
Growing Temperature	18 – 24⁰C day temp. 10 – 15⁰C night temp.
Soils	<ul style="list-style-type: none">• Fertile and well drained soil• pH range 6.0 – 6.8

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1.3 Optimal Ecological Requirements

- **Altitude:** Onion can be cultivated up to **2,200 m** above sea level
- **Rainfall:** Onions require **well-distributed rainfall** of between **350** and **650 mm** during the growing period. Dry spell is needed at maturity.
- **Temperature:** The optimum temperature for growth is **18 –24 °C day temp., 10–15 °C night temp** If the temperature exceeds **30 °C**, maturity is hastened & small bulbs are produced, consequently lowering the yields. Higher temperatures (25-27°C) speed up bulbing. Bolting (flowering) is triggered by low temperatures (8 – 13°C)
- **Soil:** Onions require **fertile** and **well-drained soil**. The optimum pH range is **6.0 – 6.8**. Sandy to silty loams with **fine tilth** are adequate.

2. Pre-Cultivation Preparation:

2.1 Market Survey



Conducting a market survey on Onion

2. Pre-Cultivation Preparation:

2.1 Market Survey



Conducting a market survey on Potato

2. Pre-Cultivation Preparation: 2.1 Market Survey (GHCP&PHHT20: Q1)

How to conduct a market survey

- Identify major dealers of the target crops
- Introduce yourself what the purpose of a market survey
- Find the potential market nearby your area (local market, big market in town, hospital, University, boarding school)
- It is important to consider seasonal or religious event, such as Christmas or fasting)
- People consume more vegetables during fasting season
- Continuous surveys are important in order to find the new market opportunities and also establish business relationships with the market players.

Note: It is recommended to conduct a market survey when you go to local market during your local market day

2. Pre-Cultivation Preparation:

2.2 Market Survey Questionnaire

Market Survey Questionnaire

Date : ____ / ____ / ____

Region: _____

Zone: _____

Woreda: _____

Name of Group: _____

Name & Contact of the Produce Dealer	Produce & Variety	Produce Quality Market Requirements	Peak Demand (months)	Quantity (kg) & Frequency (daily/weekly etc.) of Supply	Place of Production	Purchasing Unit Price (ETB/kg)	Mode of Payment	Terms of Payment	Marketing Challenges	Dealer's Willingness to Purchase the Produce from the farmers
Mr. Abdela Qasim (0917-xxxxxx)	Onion (Bombey Red)	Medium size, well cured, dark red	February to March	50 qt/day (1qt = 110 kg)	Waliso	14 ETB/kg	Cash	Cash on Delivery	Poor quality (diseased)	Willing to buy at shop
Mr. Kernal Husen (0911-xxxxxx)	Onion (Adama Red)	Medium to small size	January to April	50 qt/day (1 qt=110 kg)	Shewarobit	15 ETB/kg	Credit	Within a week	Poor quality (not well cured)	Willing to buy at farm gate
Mr. Kernal Husen (0911-xxxxxx)	Onion (large variety from Sudan)	Medium	April to June	300 qt/week	Sudan	25 ETB/	Cash	Cash on Delivery	No supply from Ethiopia	Willing to buy at farm gate

2. Pre-Cultivation Preparation:

2.2 Market Survey

Market Survey Questionnaire

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2. Pre-Cultivation Preparation: 2.2 Market Survey Questionnaire

Prepare sample questions to enable you gather the following information

- When (month) is the peak demand for Potato
- The price of onion during the peak demand
- The Onion variety(s) that has the highest demand
- Supply requirements (quantities and frequency)
- Quality market requirements
- Potential buyers and terms of payment etc.

Market Survey Questionnaire

2.2 Cropping Calendar

A Sample of a Bulb Onion Cropping Calendar Under Irrigation

Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Land preparation Seed rate 6.5-7.5kg/ha on nursery 3 - 4 kg/ha for hybrid Manure 120 qt/ha Control of damping-off diseases & cutworms	Transplant 40-50 days after sowing Spacing: 40 x 20 x 5 cm (666,666 plants/ha) Fertilizer rate: DAP: 200kg/ha , Urea: 100kg/ha Urea to be applied in split, 15 days after transplanting	Weed, pests & diseases control Uneathering of bulbs Half of Urea 30-40 days after transplanting	Stem Bending Reducing Irrigation water Application	Harvesting starts 120-145 days after transplanting Bulb curing Sorting & grading Yields 300- 350 qt/ha Marketing	Peak demand for Bulb Onion		

2.2 Cropping Calendar

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A Sample of a Bulb Onion Planting Calendar: Targeting a peak market demand beginning just after January

2.2 Crop Planting Calendar (GHCP&PHHT20: Q2)

- A tool used by farmers to plan for production to ensure that marketing coincides with the period of the year when the market price of a produce is highest

Procedure:

1. Determine from the market survey results (2.1) when there is peak demand for Bulb Onion
2. Work backwards from the month when there is peak demand to prepare a monthly farm activities preceding the peak period
3. Use the monthly activities preceding the peak as a procurement plan for farm inputs and a guide for farm operations

Notes:

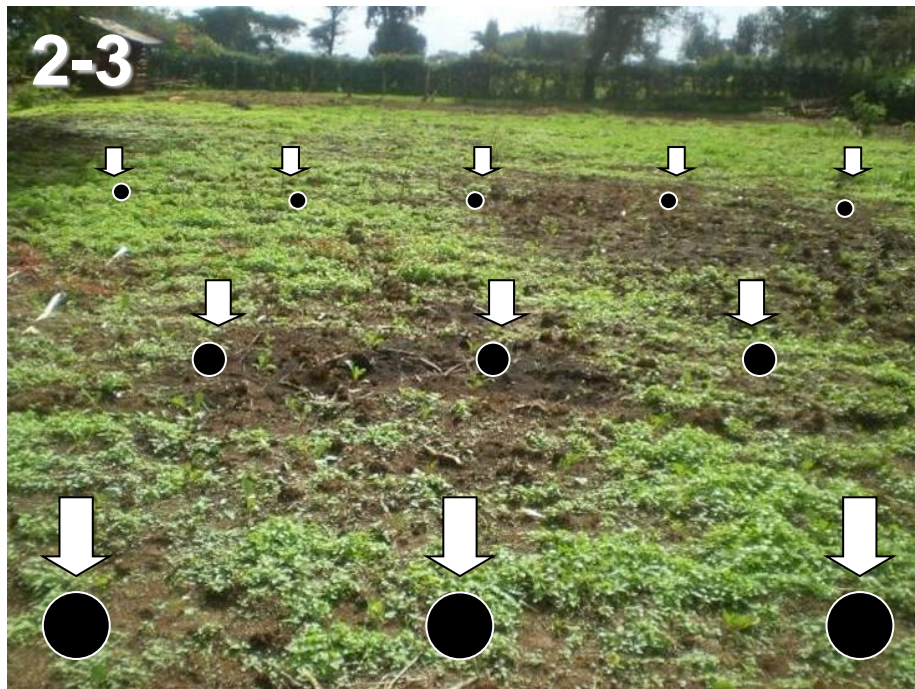
- To meet the peak demand period of the market, there may be need of supplemental irrigation

2.3 Soil Sampling & Analysis



Depending on the farm, sample the soil using the most appropriate method

2.3 Soil Sampling & Analysis



2.3 Soil Sampling & Analysis (GHCP&PHHT20: Q3)

- It is recommended to have the soils analyzed for nutrient availability and other factors vital to crop production **after every 2 - 3 years**
- The results of the soil analysis can be used to determine fertilizer and manure requirement

Depending on the farm, sample the soil using the most appropriate method

2.4 Composting



Manure preparation through composting

2.4 Composting



Manure preparation through composting

2.4 Composting (GHCP&PHHT20: Q4)

- Good quality compost is rich in plant nutrient
- It is black, dark brown so easily hold moisture.
- Mature compost is best stored in the pit or heap until it is used.
- During compost making, the organic matter need to be covered to prevent leaching of nutrients
- Mature compost should be taken to the field in the morning or late afternoon, should be spread equally in the field or row planted crops then ploughed in immediately to mix with the soil for prevent loss of nutrient.
- Bulb Onion is a heavy feeder and does well in soils with high organic content (manure)
- Based on the results of the soil analysis, prepare adequate compost for application
- The recommended rate of application ranges from **100-120 qt/ha** for Bulb Onion

2.5 Quality Seed/Planting Materials



Samples of certified seed on sale

2.5 Quality Seed/Planting Materials



Samples of certified seed on sale

2.5 Quality Seed/Planting Material (GHCP&PHHT20: Q5)

- Like any other planting material, onion seed should be of high quality and certified **by seed quarantine service** which is a government agency responsible for seed certification
- To avoid diseases, ensure you obtain seeds from **certified seed companies, authorized dealers or a research station**
- Purchase **just enough seed** for the season
- Once seed container is opened viability deteriorates if not sown immediately
- Farmers should pay attention to information on seed label such as **expiry date, spacing, storage** etc.

3. Cultural Practices:

3.1 Land Preparation



Prepared land ready for transplanting

3. Cultural Practices:

3.1 Land Preparation



**Prepared land ready for
transplanting**

3. Cultural Practices:

3.1 Land Preparation Practices (GHCP&PHHT20: Q6)

- Soils should be ploughed and disked sufficiently to eliminate debris and soil clods and ensure a **fine tilth**
- Prepare beds to depth of **20 – 30 cm**

3.2 Incorporation of Crop Residues



Crop residues to be incorporated in a field

3.2 Incorporation of Crop Residues



Crop residues to be incorporated in a field

3.2 Incorporation of Crop Residues (GHCP&PHHT20: Q7)

- Incorporating crop residues in the farm land can significantly increase the soil organic matter content
- The crop residues should be incorporated at a depth of about **30 cm** at least **1 – 2 months** before transplanting the Bulb Onions. However, this can vary depending on the area and type of crop residues.
- **If the crop residues belong to the *Alliaceae* family (such as onions, garlicks, etc.), remove and burn it to avoid possible risk of disease build up**

3.3 Basal Application



Manure incorporation as a basal application

3.3 Basal Application

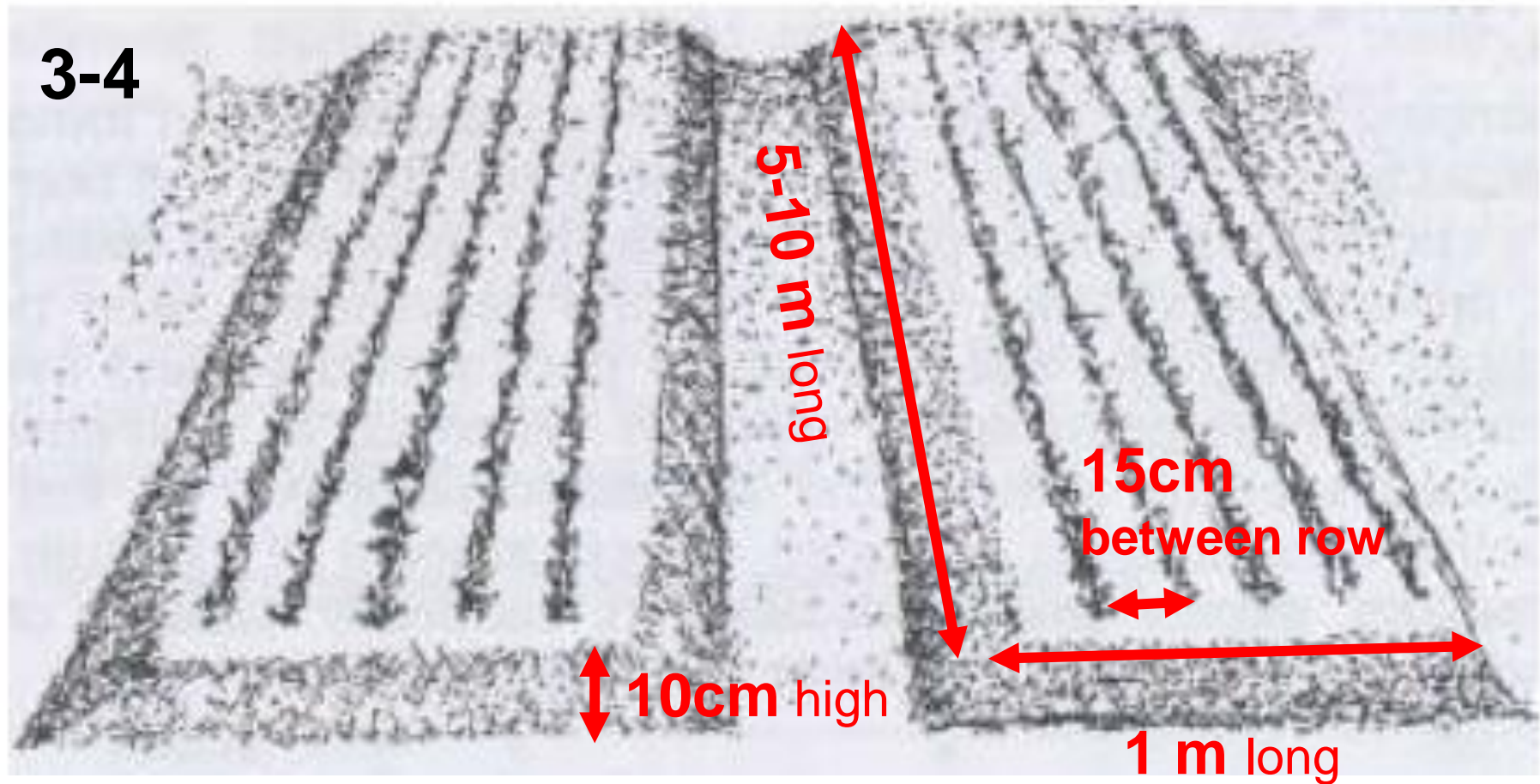


3.3 Basal Application: (GHCP&PHHT20: Q8)

- The manure/compost should be broadcasted (**100– 120 qt per ha**) then worked into the soil (incorporated) preferably using a hoe
- Manure/compost should be applied at least **1 – 2 weeks before transplanting** the Bulb Onions
- Onions respond very well to well decomposed organic manure

Manure incorporation as a basal application

3.4 Raising Seedlings



A Bulb Onion nursery

3.4 Raising Seedlings

3.4 Raising Seedlings (GHCP&PHHT20: Q9)

- Onion is **propagated by seed**
- Seed rate is **3.0-4.0 kg/ha for hybrid**
- **6.5-7.5 kg/ha for open variety**
- Seeds are sown a nursery with mulch
- Do not sow too thickly, as this results in weak plants which transplant poorly.
- Sowing densities should be between 1,500 – 2,500 seeds/m² (about 7g of seed/m²)

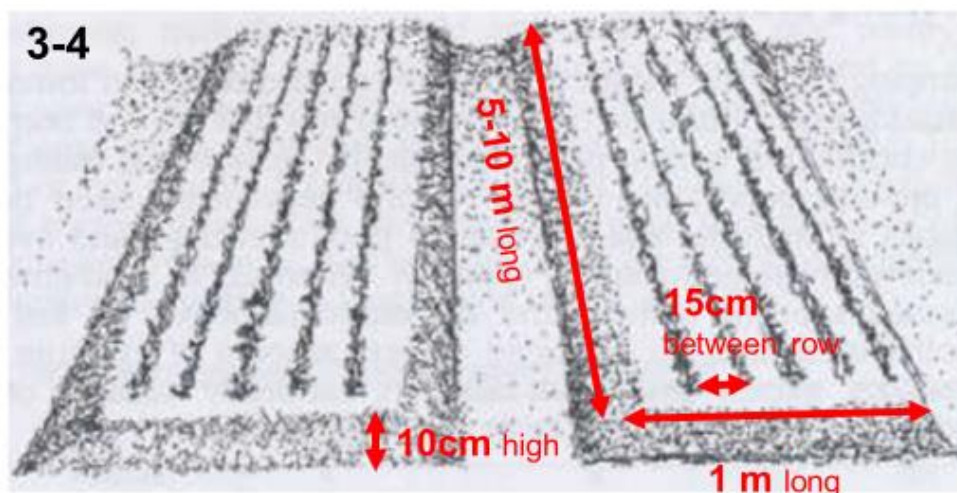
Nursery Establishment:

- Prepare raised beds maximum **1 m wide** and incorporate plenty of well-decomposed compost
- Make rows about **15 cm apart**, drill the seed and **cover lightly with soil and mulch**

Nursery Management:

Irrigate liberally for **the first 10 days**

- After the seed emerges, remove the **mulch**
- **7 – 10 days** before transplanting, do **hardening off** by gradually reducing watering, **withholding nitrogen fertilizer** and any other tender care which the seedlings have been receiving



A Bulb Onion nursery

3.5 Transplanting



Recently transplanted Onion seedlings

3.5 Transplanting



**Recently transplanted
Onion seedlings**

3.5 Transplanting

3.5.1 Appropriate Time

- Seedlings are transplanted **6 - 8 weeks** after sowing
- **Seedling base** is pencil thick
- Before transplanting, pre-irrigation should be carried out

3.5.2 Recommended Spacing (GHCP&PHHT20: Q10)

- The seedlings are transplanted at a spacing of 40cm between ridge, 20cm between planting rows, and 5 cm between plants
- 1 hectore of land requires around **600,000 to 650,000 seedling transplants**

3.6 Water Requirement



Bulb Onion seedlings under furrow irrigation

3.6 Water Requirement



Bulb Onion seedlings under irrigation

3.6 Water Requirement (GHCP&PHHT20: Q12)

- Onions require light and frequent irrigation because they have shallow root system not more than 30cm deep:
 - **At the growing stage: excessive moisture** must be avoided
 - **At the bulbing stage:** need a substantial amount of water
 - Watering should be reduced/discontinued towards bulb maturity
- Lighter soils need more frequent water applications, but less water applied per application
- Increase the water application as plant and roots increase in size
- Irrigation should be discontinued **3-4 weeks before harvest**
- Proper moisture management is important in alleviating:
 - **“Bulb Rot”** problems (Refer to the [page No. 27/33](#))
 - General root health
 - Vigorous bulb growth

3.7 Managing of Weeds



Weeding Bulb Onion”

3.7 Managing of Weeds



Weeding Bulb Onion

3.7 Managing of Weeds (GHCP&PHHT20: Q13)

- Onions have shallow and fibrous root system and their canopy cannot shade out weeds
- This can be done through use of appropriate weeding tools, such as jembe, “**Finger Hoe**”, “**Split Hoe**” and “**Flat Hoe**”
- Weeds can also be removed by hand pulling to avoid damaging the roots
- Since weeding is labour intensive and hence costly, some farmers prefer using **selective herbicides** to control weeds such as:
 - **Galigan EC® & Oxygold EC®** (a.i. **Oxyfluorfen**)
 - **Stomp EC®** (a.i. **Pendimethalin**)
- The frequency of weeding depend on weed infestation. Generally keep the field weed free as much as possible to avoid competition for **nutrients, sunlight, and moisture**
- Mulching can also be done to suppress weeds

3.8 Top-dressing



Strip/banding top-dressing of Bulb Onions

3.8 Top-dressing



**Strip/banding top-dressing
of Bulb Onions**

3.8 Top-dressing (GHCP&PHHT20: Q14)

- Phosphorus and potassium are essential nutrients for onion growth, therefore, applying ash every 2 weeks would increase bulb size and quality
- Strip/banding method is preferred over broadcasting as it is more effective
- Top-dress using Urea (**100kg /ha** in 2 splits)
 - 1st Top-dressing: **15-20 days** after transplanting
 - 2nd Top-dressing: **30-40 days** after transplanting
- Top-dressing should be completed **before initiation of bulbing**
- Delayed application results in **thick necks** and **reduces storability**

Unearthing:

- **Unearthing** or **removal of excess soil around the bulb** is done to allow the bulb expand/develop well
- If the soil is hard during bulb formation, loosen the soil to allow bulbs to develop well
- Soil removal is done **by hand**
- Unearthing is done **during weeding**

3.9 Pests & Diseases Control

3.9.1. Control/Management Strategies

1.	Cultural Control
2.	Mechanical Control
3.	Biological Control
4.	Chemical Control
5.	Integrated Pest Management (IPM)

3.9 Pests & Diseases Control

3.9.1 Control/Management Strategies

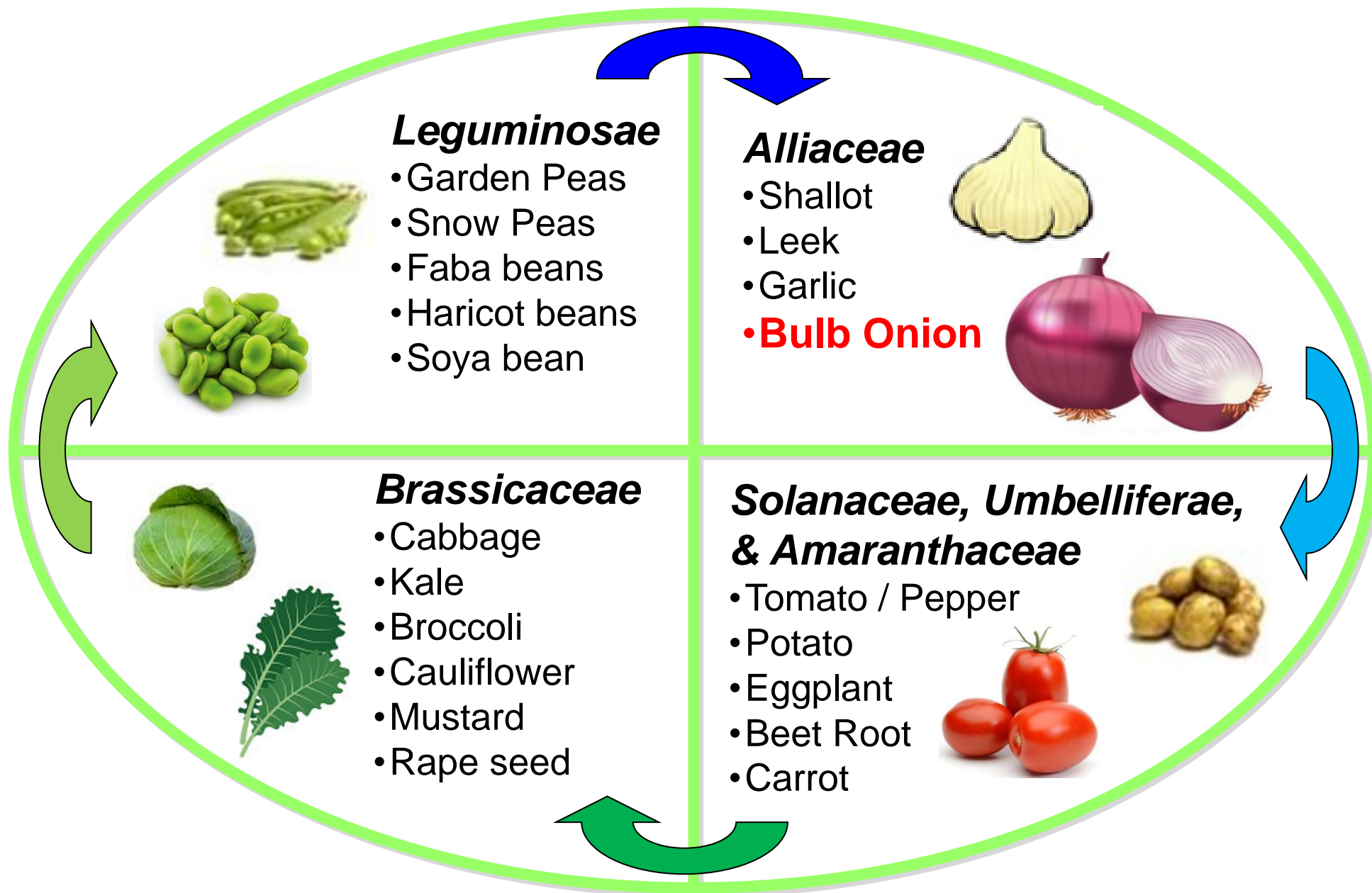
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3.9 Pests & Diseases Control

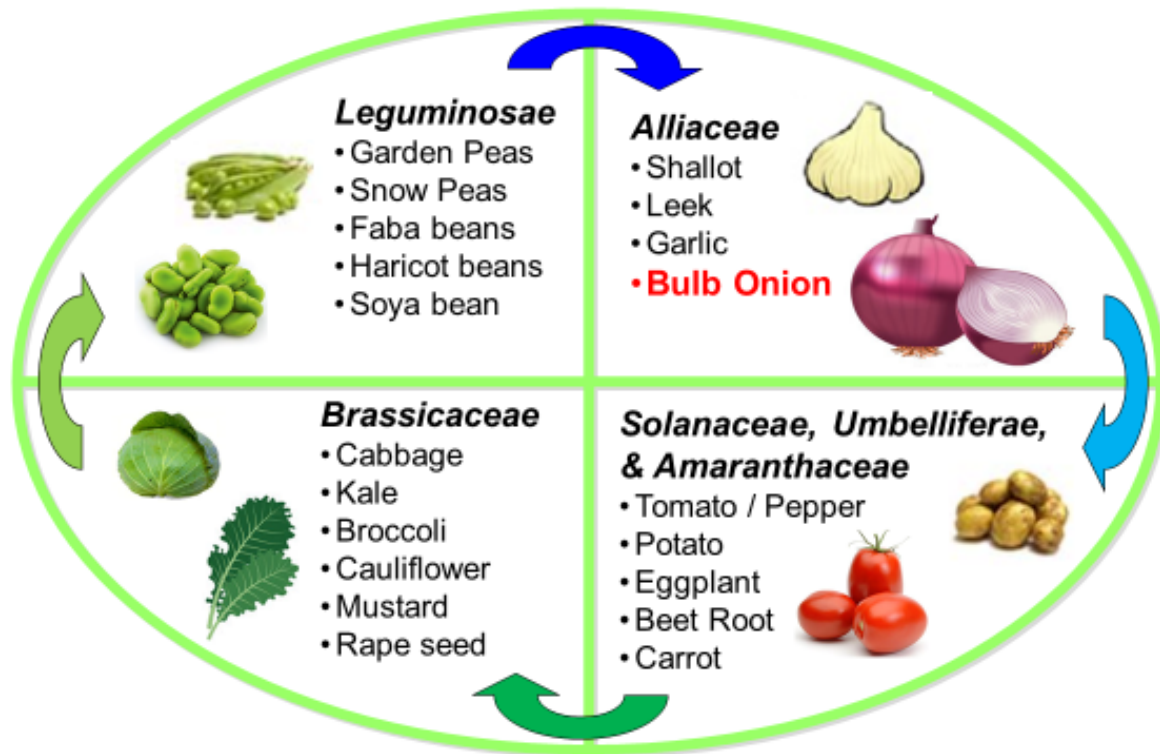
3.9.1 Control/Management Strategies (GHCP&PHHT20: Q15)

- Pests and diseases can be managed through either single control strategies or an integration of two (2) or more methods. The single control strategies are: cultural; physical; biological; and chemical.
- 1. **Cultural Control:** This involves managing the environment in which the crop is growing/grows with a view of maintaining pest and disease below the harmful level. The cultural methods include: field sanitation/hygiene, intercropping, crop rotation, furrowing, flooding, solarization etc.
- 2. **Mechanical Control:** This involves use of insect traps, hand picking, screening house, weeding etc.
- 3. **Biological Control:** This involves use of natural enemies (predators and parasitoids), resistant/tolerant varieties, trap plants, push and pull system, and repellent plants
- 4. **Chemical Control (GHCP&PHHT20: Q16):** This involves use of pesticides. Pesticides are preferred because of the quick knock down effect; they have high efficacy. Pesticide usage has been linked to environmental degradation and should be used as last resort
- 5. **Integrated Pest Management (IPM):** Due to limitation of a single control strategy, use of IPM is a more recommended strategy. IPM integrates cultural, mechanical, biological and as a last resort, chemical control to minimize the crop loss caused by pests and diseases.

3.9.2 Crop Rotation



3.9.2 Crop Rotation

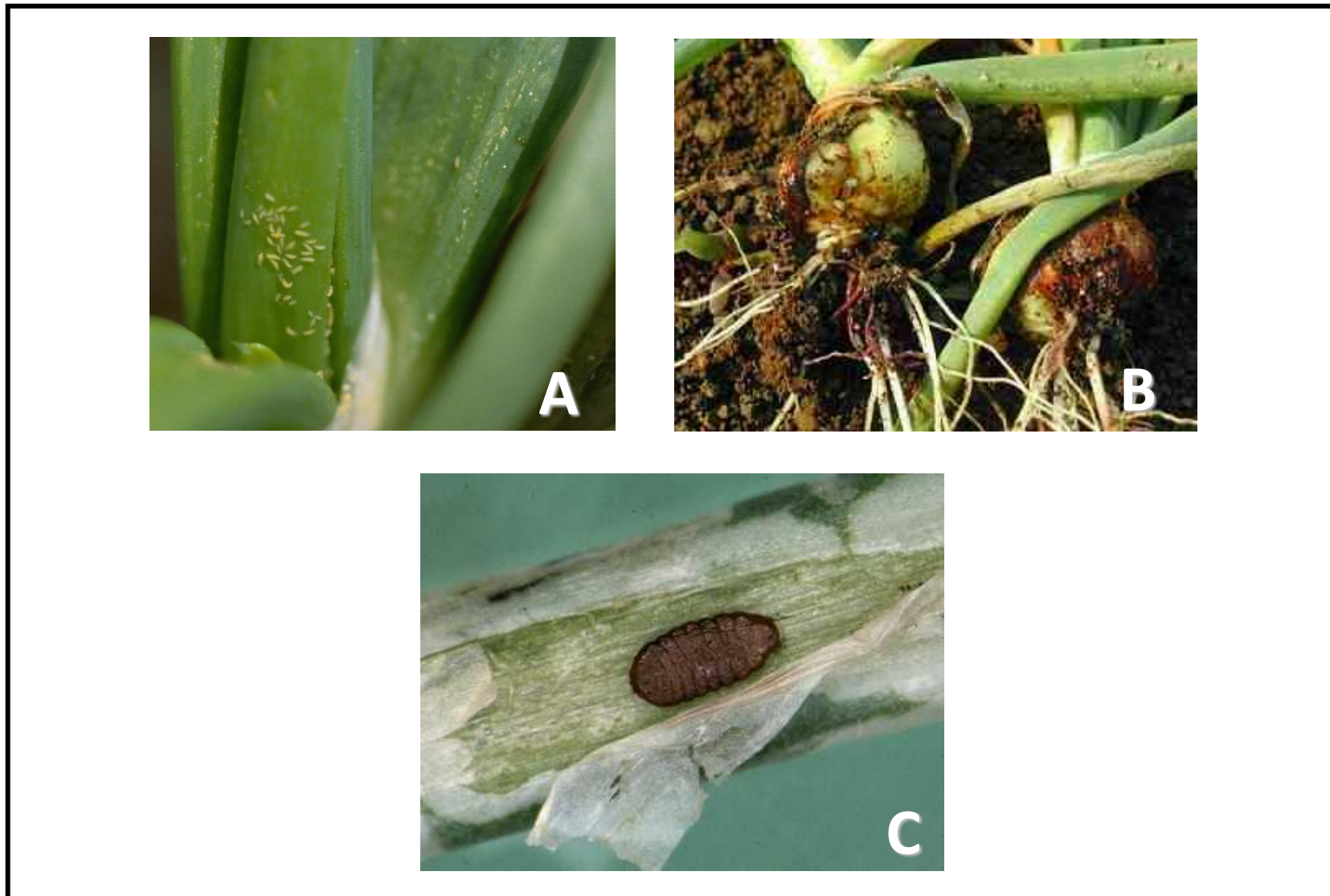


3.9.2 Crop Rotation

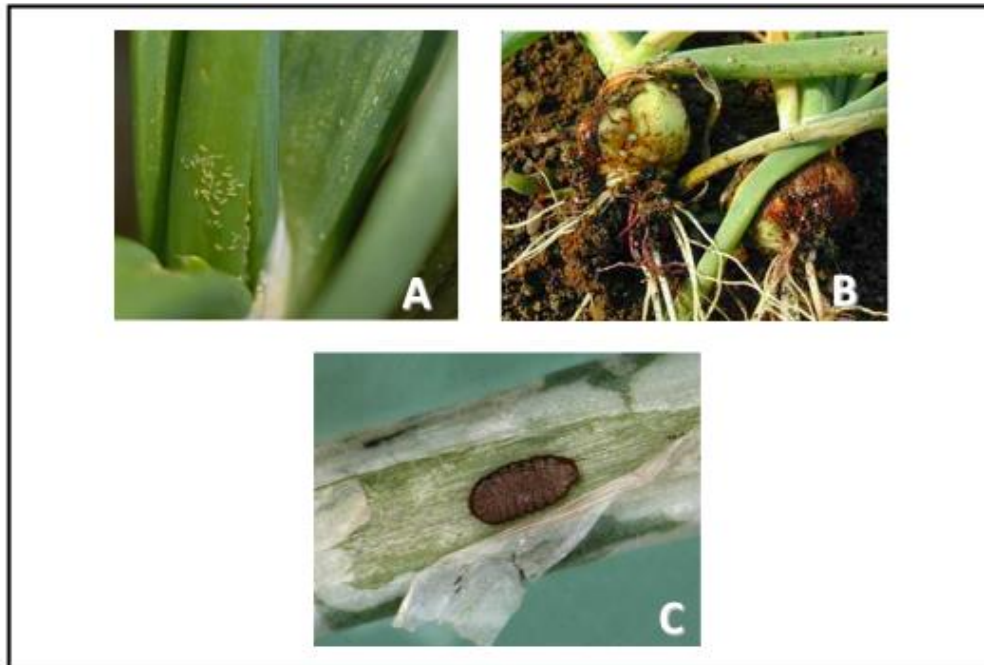
- One of the most important strategies of IPM is crop rotation
- Crop rotation prevents pest and disease build-up and in addition, it replenishes soil nutritional status
- It is recommended to rotate crops with those from different families; an effective rotation program should last for 3 – 4 years

An example of a Crop Rotation

3.9.3 Major Pests



3.9.3 Major Pests



3.9.3 Major Pests

- Pests damage causes a reduction in quality and quantity of produce
- The following are the major pests of Bulb Onion in Ethiopia:

A. Onion Thrips

B. Onion Fly

C. Leaf miner

Note: Onion thrips is the most common pest in Ethiopia, but **onion fly (B) and leaf miner (C)** is not common. No need to explain farmers if these pests are not problematic in the area.

3.9.3.A: Onion Thrips



Information Source: <https://www.plantvillage.com>

Onion Thrips on Bulb Onion leaves

3.9.3.A: Onion Thrips



**Onion Thrips on Bulb
Onion leaves**

3.9.3.A: Onion Thrips

Identification:

- The pest feeds on **the base of the plant** within **the leaf sheaths**
- Attacked leaves have **sunken silvery patches**

Damages:

- Under severe attack, the entire plant appears **silvery** and later the leaves **wither, dry up** and **die**
- The pest excreta appears as **black spots** on the silvery leaves

Control:

- **Keep plants well irrigated** since water stressed plants are more susceptible to thrips damage
- Maintain weed-free plots
- Rogue heavily infested plants
- When 5 to 10 insects are observed per plant, **Spray with insecticides**, such as
 - **Cypermethrin 10% E.C (0.5l/ha)** mixing with 200 l of water and spray every 2 weeks for 3-4 times
 - Spray with 3 l/ha of **thiodan** by mixing with 600 l of water and spray every 1 to 3 times
 - Decamethrin at 12.5kg a.i /ha sprayed at 7 days interval
 - **Diazinon 60% EC and Daimethiot 49% EC** are also effective chemicals to control onion thrips

3.9.3.B: Onion Flies



Symptoms of infestation by Onion Flies

3.9.3.B: Onion Flies



**Symptoms of infestation
by Onion Flies**

3.9.3.B: Onion Flies

Identification:

- The onion fly **maggots** are the destructive stage which measure **8 mm long** and **white cream or color**

Damages:

- They eat the lateral roots causing tunnels into the taproot then the plants become **shrivelled** or eventually **die**
- They are also found inside developing onion bulbs and their feeding exposes the plant to infection by diseases, such as **Bacterial Soft Rot**

Control:

- Use well decomposed manure/compost
- Practice crop rotation
- **Practice field sanitation:** remove and destroy infested plants and carefully plough in crop residues immediately after harvest

3.9.3.C: Leafminer



Information Source: <https://www.insectimages.org>

Leafminer pupa within tunnel of onion leaf

3.9.3.C: Leafminer



**Leafminer pupa within
tunnel of onion leaf**

3.9.3.C: Leafminer

Identification:

- The leafmining larvae are small yellow maggots (**3 – 4 mm** long when fully grown)
- They are the **damaging stage**
- They go through **3 larval stages** and after 5 – 7 days, the maggots pupate either on the leaf surface or in the soil
- In some cases, maggots pupate within the mines

Damage:

- The maggots are found feeding inside the leaf tissue, leaving a long, slender, winding white tunnels (mines) through the leaf

Control:

- Field sanitation / hygiene
- Spray with appropriate insecticides such as:
 - **Escort EC®** (a.i. **Emamectin**)
 - **Achook EC®** (a.i. **Azadirachtin**)
 - **Agrimec EC®** (a.i. **Abamectin**)
 - **Amazing Top WDG®** (a.i. **Abamectin + Acetamiprid**)

3.9.4 Major Diseases



3.9.4 Major Diseases



3.9.4 Major Diseases

- Disease infestation leads to reduction in quality and quantity of produce
- The following are the major diseases of Bulb Onion in Ethiopia:
 - a. **Onion Downy Mildew**
 - b. **Purple Blotch**
 - c. **Rust**
 - d. **White Rot**

3.9.4.a: Onion Downy Mildew



Information Source: <https://www.plantvillage.com>

**Symptoms of “Onion Downy Mildew”
infection on a Bulb Onion leaf**

3.9.4.a: Onion Downey Mildew



Symptoms of “Onion Downy Mildew” infection on a Bulb Onion leaf

3.9.4.a: Onion Downey Mildew

General Descriptions:

- The disease is caused by a **fungus**
- It is prevalent in **cool, humid and poor drainage conditions**

Symptoms:

- **Formation of lesions** near the tips of the older leaves, **yellow patches covered with grey wet fields, the leaf tips shrinks, turn pale brown and later dies**

Control:

- Field hygiene
- Crop rotation
- **Use of fungicides**, such as
 - **Tower WP®** (a.i. **Metalaxyl + Mancozeb**)
 - In addition to these chemicals (based on their availability) **Ridomil Gold** and **Agrolaxin, Dithane** and **Esthamina** to be considered

3.9.4.b: Purple Blotch



Information Source: <http://www.extension.umn.edu>

**Symptoms of “Purple Blotch”
infection on a Bulb Onion leaf**

3.9.4.b: Purple Blotch



Symptoms of “Purple Blotch” infection on a Bulb Onion leaf

3.9.4.b: Purple Blotch

General Description:

- The disease is caused by a **fungus**

Symptoms:

- **Small white spots** on the foliage
- Under moist condition, the spots rapidly increase to **large purplish blotches** often surrounded by a **yellow to orange border**
- The lesions extend to girdle the leaf which leads to its collapse
- The infection may spread to the **bulb**, where it may cause a **wet, orange rot** starting at the neck

Control:

- Use resistant cultivars e.g.) **Red Creole**
- Crop rotation
- **Field Sanitation:** remove & burn crop remains after harvest, do not leave volunteer plants in the field and avoid over fertilization
- Field hygiene
- **Wide spacing** and **good drainage** to decrease humidity in the plant stand
- **Use of fungicides**, such as
 - **Ridomil MZ63.5®** (a.i. **Metalaxyl + Mancozeb**) 3.5 kg/ha
 - **Milraz®** (a.i. **Propineb + Cymoxanil**)
 - **Mancozeb** (3.0kg/ha) or **Captafol 80% WP**, 0.3% at about 500-700 liters of water/ha at 7 days interval for 5 -7 times

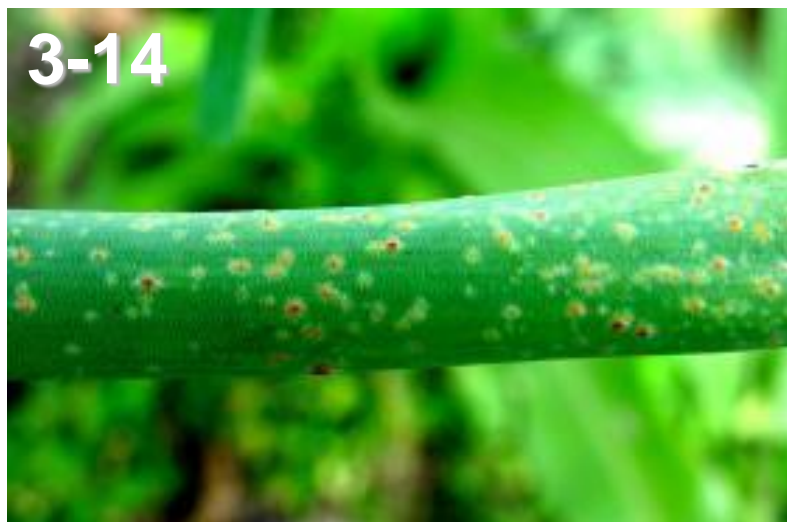
3.9.4.c: Rust



Information Source: <http://www.infonet-biovision.org>

Symptoms of “Rust” infection on a leaf of Bulb Onion

3.9.4.c: Rust



**Symptoms of “Rust”
infection on a leaf of
Bulb Onion**

3.9.4.c: Rust

General Description:

- The disease is caused by a **fungus**

Symptoms:

- Symptoms include **chlorotic spots** on leaves
- Heavily infected leaves **turn yellow** and **die** prematurely
- **High humidity, high temperatures, dense plant population** favor the disease development

Control:

- Crop rotation
- Application of proper agronomic practices i.e. proper nutrition and spacing
- **Use of fungicides**, such as
 - **Cadillac 80 WP®** (a.i. Mancozeb)
 - **Vondozeb 75 DG®** (a.i. Mancozeb)
 - **Folicur** (a.i. Tebconazole)

3.9.4.d: White Rot



**Symptoms of “White Rot” infection
on Bulb Onion**

3.9.4.d: White Rot



Symptoms of “White Rot” infection on a Bulb Onion

3.8.3.d: White Rot Disease

General Descriptions:

- The disease is caused by a soil borne fungus
- It may **survive 10 – 15 years** in soil without the presence of an *Allium* host. Only onion family (onion, leek and shallot) are attacked.
- Optimum soil temperature for the **fungus is 16-18°C**

Symptoms:

- Infected leaves show **yellowing, leaf dieback** and **wilting**
- Leaf decay** begins at the base
- Older leaves collapse first
- Roots are **rotted**, and the plant can be pulled out from the ground easily

Control: (Integrated approach is needed)

1. If disease is observed, **cessation of irrigation** will minimize damage but not stop the disease
2. Follow a long-term (**over 5 years**) rotation schedule
3. Do not follow onion family with other onion family
4. **Clean farm tools** before moving from the field
5. Use clean planting materials or treat seeds by 45 °C **hot water for 15 minutes** (**Apron Star 42 WS** or **tebuconazole** is also effective for seed treatment)
6. Treat cloves with Sodium hypochlorate (berekina) at 1:100 dilution ratio (1 liter berekina with 100 liter of water)
7. Remove infected plants as early as possible from the field
8. Plant early maturing cultivars or **resistant cultivars**

4. Harvest



Harvest when $\frac{3}{4}$ of the tops are dry and falls on the ground

4. Harvest



Harvest when $\frac{3}{4}$ of the tops are dry and falls on the ground

4. Harvest

4.1 Harvesting Indices (GHCP&PHHT20: Q17)

- Harvesting can be done **120– 145 days** after transplanting depending on the variety
- Bulb Onions are ready for harvesting when **75%** of the plants have their **necks** bent over and tops dried
- If onions are harvested earlier than this stage, it doesn't store well
- Onions should be harvested before the leaves are completely dried up, otherwise the bulb will rot
- Leaf tops begin to **discolor, bend** and **dry** towards the ground
- **Reduced thickness of sheath leaves** surrounding the bulbs

5. Post-Harvest Handling

5.1 Curing



Field Curing



Protected Curing

5. Post-Harvest Handling

5.1 Curing



Field Curing



Protected Curing

5. Post-Harvest Handling

5.1 Curing

What is “Curing”?

- Curing is a **drying process** intended to dry off the necks and outer leaves of bulbs
- It is done to **prevent moisture loss** and **attack by diseases**, hence **prolonging the shelf life** of Bulb Onions
- It can be done **in the field** or **in a protected environment** away from adverse weather conditions, such as rain or direct sunlight

5.1.1 Field Curing

- Curing can be done in the field if the maturity and harvesting coincides with dry months
- Harvested onions are placed in rows with leaves partially covering the bulbs to prevent **sunburn** or **greening**
- Onions are then left in the field **until the outer leaves and neck are completely dry and papery**
- Field curing can take **2 – 3 weeks** depending on the environmental conditions

5.1.2 Protected Curing

- Drying of Onions in a protected environment
- Curing is done in a **warm, dry and well-ventilated location** protected from **direct sunlight**
- Onions can be cured by tying tops of bulbs in bunches and hanging in a horizontal pole in a well-ventilated shade

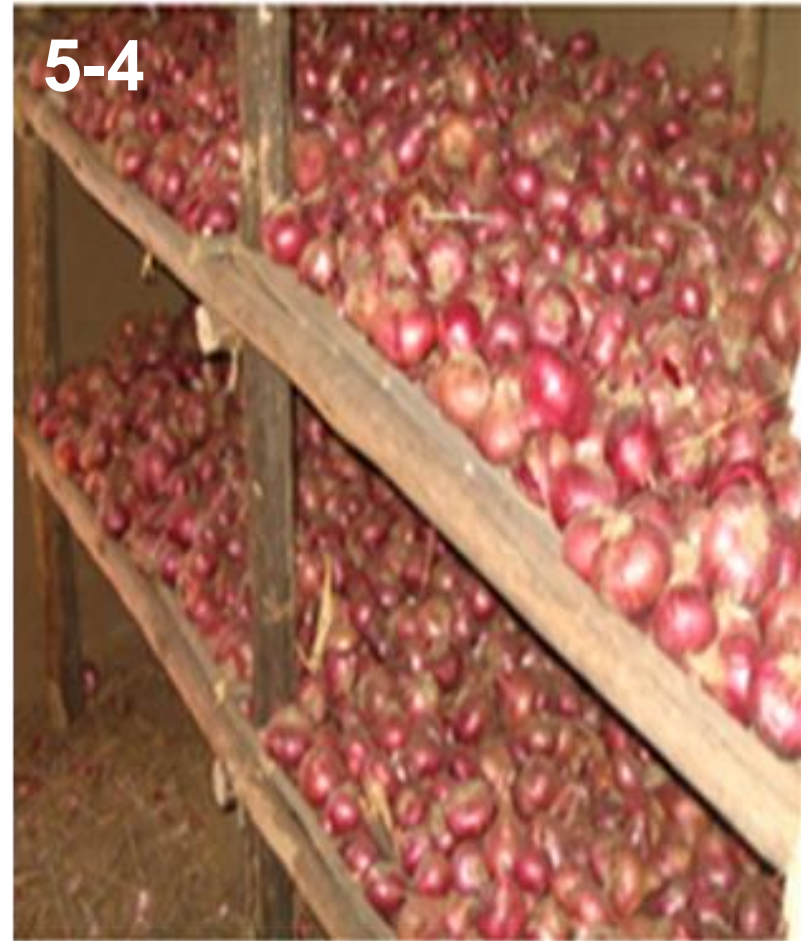
5. Post-Harvest Handling

5.2 Storing

5-3



5-4



Onion Storage

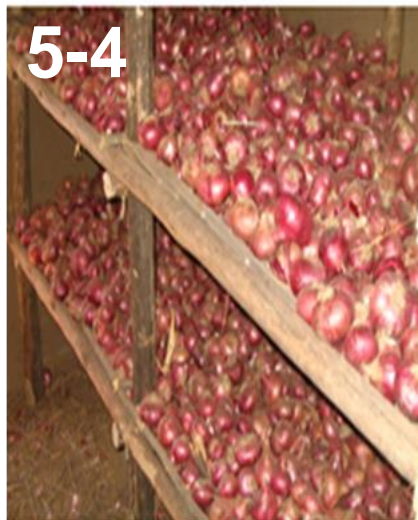
5. Post-Harvest Handling

5.2 storing

5-3



5-4



Onion Storage

5. Post-Harvest Handling

5.2 Storage (GHCP&PHHT20: Q17)

- When plants dried enough, remove the bulbs from the tops leaving at least **1-2cm of top** should be left on the bulb to prevent disease entrance.
- **Roots should be trimmed** as close as possible to the bulb

Traditional: hanging from ceilings, storage in burlap sacks, drying on open floor that can extend the shelf life of dry bulbs

Improved:

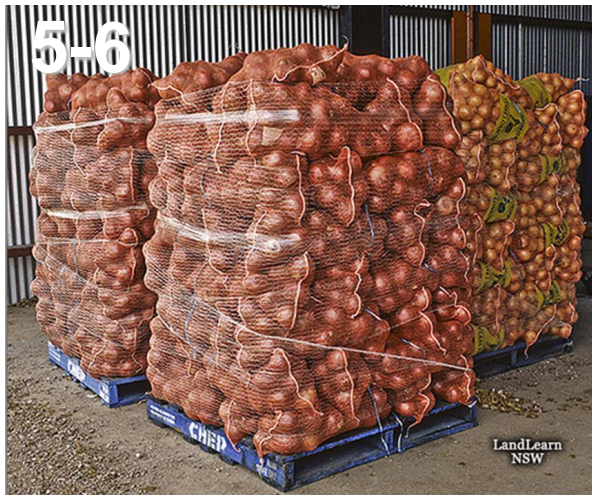
- Simple ventilated storage can be constructed from locally available materials such as bamboo, grasses, small poles and sheets of grass roofing (Fig:5-2)
- This found effective in extending the self life
- This ventilated structure or the traditional method would reduce losses, which commonly caused by rotting, rooting, and sprouting and weight loss
- Properly cured onion bulbs could be stored for 2-3 months

5.3 Value Addition Techniques



Bulb Onions packed in the nets

5.3 Value Addition Techniques



Bulb Onions packed in the nets

5.2 Value Addition Techniques (GHCP&PHHT20: Q19)

5.2.1 Sorting

- Before storage, Bulb Onions are sorted to remove the following:
 - Onions with thick necks
 - Onions which have bolted
 - Injured onions
 - Decayed onions
 - Doubles and small bulbs

5.2.2 Grading

- Grading should be done **before & after storage**
- For domestic market onions are put into **3 Grades: large, medium and small**
- Bulbs must be:
 - Intact with firm flesh which is not exposed
 - Sufficiently dry with the first two outer skin and stem fully dry
 - Free from abnormal external moisture
 - Free from foul smell

5.2.3 Containers & Packaging Materials (GHCP&PHHT20: Q18)

- **Store/package Bulb Onions** in well ventilated containers, such as **nets**

6. Cost & Income Analysis

Item	Quantity	Unit Price	Total (ETB)
Marketable Yield			
Variable Costs			
Land Preparation			
Manure/Compost			
Seeds			
Fertilizers			
Fungicides			
Insecticides			
Others e.g.) selective Herbicides			
Labour			
Planting			
Spraying/Weeding/Harvesting/Grading			
Transportation/Packaging			

6. Cost & Income Analysis

Item	Quantity	Unit Price	Total (ETB)
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Others e.g.) selective Herbicides			
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Planting			
Spraying/Weeding/Harvesting/Grading			
Transportation/Packaging			

A sample sheet of items and activities to be considered for determining an enterprise's gross margin

7. Cost & Income Analysis

- Farmers are encouraged to keep accurate records of all enterprise activities **(GHCP&PHHT20: Q20)**
- This is vital in determining the enterprise profitability
- Record keeping is very important for farmers practicing commercial agriculture

There are 2 types of records:

•Individual Records:

- Kept by individual farmers and include the cost of production and sales
- Useful in analyzing whether the farmer is making profit or losses in his farming enterprise
- Records are very important for traceability of produce

•Group Records:

- Include activities such as group purchase of inputs, selling of produce etc.

7. Post-Training Evaluation Exercise

QUESTION	YES	NO
1. Growing Bulb Onion in areas with cool temperature makes the plant produce flower stalk.		
2. Manure/compost should be applied at least 1 – 2 weeks before transplanting the Bulb Onions.		
3. Bulb Onion seedlings are ready for transplanting 6 – 8 weeks after sowing.		
4. One ha. requires less than 50,000 Bulb Onion seedlings during transplanting.		
5. Bulb Onion fields can be weeded by digging deeply when the crop is in the farm.		
6. “Onion Thrips” attack leaves causing sunken silvery patches.		
7. “Onion Downy Mildew” disease does NOT attack leaves of Bulb Onions.		
8. Moist condition favor the spread of “Purple Blotch” disease.		
9. Bulb Onions are ready for harvesting when 1/2 of the tops have fallen over and dried.		
10. Weather is NOT an important consideration during curing of Bulb Onions.		

7. Post-Training Evaluation Exercise

* Please ask the farmers to appropriately indicate answers to each of the following questions.

PAGE NUMBER	QUESTION	YES	NO
3/33	1. Growing Bulb Onion in areas with cool temperature makes the plant produce flower stalk.	✓	
11/33	2. Manure/compost should be applied at least 1 – 2 weeks before transplanting the Bulb Onions.	✓	
13/33	3. Bulb Onion seedlings are ready for transplanting 6 – 8 weeks after sowing.	✓	
13/33	4. 1 ha requires less than 50,000 Bulb Onion seedlings during transplanting.		✓
15/33	5. Bulb Onion fields can be weeded by digging deeply when the crop is in the farm.		✓
20/33	6. “Onion Thrips” attack leaves causing sunken silvery patches.	✓	
24/33	7. “Onion Downy Mildew” disease does NOT attack leaves of Bulb Onions.		✓
25/33	8. Moist condition favor the spread of “Purple Blotch” disease.	✓	
28/33	9. Bulb Onions are ready for harvesting when 1/2 of the tops have fallen over and dried.		✓
29/33	10. Weather is NOT an important consideration during curing of Bulb Onions.		✓

[Note]

- If there is any question which half of the participants gave the wrong answer, you need to repeat the specific area regarding to question