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Agriculture and Food Authority
Horticultural Crops Directorate

Ministry of Agriculture, Livestock and Fisheries
State Department for Crop Development & Agricultural Research

Smallholder Horticulture Empowerment & Promotion Project for Local and Up-Scaling (SHEP PLUS)

"Changing Farmers' Mindset from "Grow and Sell" to "Grow to Sell""

KALE PRODUCTION

Prepared by SHEP PLUS

Photo: SHEP PLUS

Training Title: **Kale Production**

Objective: **To provide a guideline on production of Kale**

Specific Objective:

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

Contents:

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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 Unit Project (SHEP UP) 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, 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 cases. But where applicable, it is recommended that the instructions issued be given due consideration.

Disclaimer

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The cited agrochemicals are in accordance with “Pest Control Product Registered for Use in Kenya 11th Edition, 2018”. The registered agrochemicals are subject to change. Please refer to the latest registered agrochemicals by Pest Control Product Board.

1. Introduction:
1.1 Background

Photo: SHEP PLUS

Kale (Sukuma Wiki, Sukuma Siku)

1. Introduction:
1.1 Background

Kale (Sukuma Wiki)

1. Introduction
1.1 Background

- Kale is a member of the ***Brassicaceae*** **family** which includes crops such as **Cabbage**, **Cauliflower**, **Broccoli**, and **Radish**
- A popular **leafy vegetable** in Kenya grown mainly for the domestic market
- Valuable source of **vitamins (A, B, Folate)** and **minerals (Ca, K, Mg)**
- Other vitamins present include Riboflavin and Niacin
- A source of income for most smallholder farmers
- Has **a lower cost of production** compared to other horticultural crops

1.2 Common Varieties

“Collards”

“Thousand Headed”

Photos: SHEP PLUS

1.2 Common Varieties

“Collards”

“Thousand Headed”

1.2 Some Common Varieties

- “Collards” and “Thousand Headed” are the most common varieties

“Collards”:

- Tolerant to **Soft Rot** and **Black Rot**
- Widely adapted even to warmer areas
- Flowers after **a short period of harvesting**
- **Yield: 15,000kg per acre**

“Thousand Headed”:

- A popular variety with succulent leaves
- Extended **production period of up to 3 months**
- **Yield: 15,000kg per acre**

Photos: SHEP PLUS

1.2 Common Varieties Cont’

Photo: By Goldlocki - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=3128541

“Marrow Stem”

Photo: National Farmers Information Service http://www.nafis.go.ke/vegetables/kales/

“Moss Curled Kale”

1.2 Common Varieties Cont'

Photo: By Goldlocki - Own work, CC BY-SA 3.0, https://commons.wikimedia.org/w/index.php?curid=3128541

"Marrow Stem"

Photo: National Farmers Information Service http://www.nafis.go.ke/vegetables/kales/

"Moss Curled Kale"

1.3 Other varieties grown in Kenya are:

"Marrow Stem"

- Dark green leaves with sweet taste and little fibre
- Good digestibility
- Low dry-matter content
- **Yield:** 15,000kg **per acre**

"Moss Curled Kale" (Sukuma Siku)

- Dark curly leaves that are very tasty
- Not a commonly grown variety
- **Yield: 15,000kg per acre**

1.2 Common Varieties Cont’

Photo: AVRDC https://avrdc.org/ethiopian-kale-brassica-carinata/

“Ethiopian Kale (Kanzira)”

1.2 Common Varieties Cont'

Photo: AVRDC https://avrdc.org/ethiopian-kale-brassica-carinata/

"Ethiopian Kale (Kanzira)"

1.3 Other varieties grown in Kenya Cont':

"Ethiopian Kale (Kanzira)"

- This is a traditional crop of the western and coastal communities though it has gained popularity in major towns
  - Smaller leafed varieties are mainly collected in form of shoots whereas larger leaved varieties one plucks the individual leaves
- Very perishable unlike other varieties

"Mfalme F1"

- A prolific variety of long harvesting period of more than a year.
- Harvesting starts 45 days after transplanting.
- Has uniform dark bluish green leaves.
- Has soft tender leaves that are easy to cook.
- Very sweet taste, non-acidic and highly palatable.
- Yield: 15,000-20,000kg per acre depending on level of management.

1.3 Optimal Ecological Requirements

Altitude	**800 – 2,200 metres above sea level**
Rainfall	**750 mm of rainfall**
Growing Temperature	**17 – 30 ^{0}C**
Soils	**• Well drained loam soils** **• High organic matter content** **• pH range 5.5 – 7.0**

1.3 Optimal Ecological Requirements

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Rainfall	**750 mm rainfall**
Growing Temperature	**17 – 30 ^{0}C**
Soils	• **Well drained loam soils** • **High organic matter content** • **pH range 5.5 – 7.0**

1.3 Optimal Ecological Requirements

Kales can grow almost anywhere in Kenya. The following are the optimal ecological requirements.

- **Altitude:** The optimum altitude range is **800 – 2,000 m** above sea level. In lower or higher altitudes, use the recommended varieties
- **Rainfall:** A high water requirement throughout the growing period and **750 mm** of rainfall is considered optimal. Rainfall should be well distributed throughout the growing period is required.
- **Temperature:** Kale perform well under cool temperatures & the optimum temperature range for production is **17 – 30 ^{0}C**
- **Soil:** Kale requires **fertile**, **well-drained loam soils** with high organic matter content and high water holding capacity. The optimal soil pH range is **5.5 – 7.0**

2. G20 technologies

1. Market survey
2. Crop planting calendar
3. Soil testing
4. Composting
5. Use of quality planting materials
6. Recommended land preparation practices
7. Incorporating crop residues
8. Basal application of compost/ manure
9. Recommended practices of seedling preparation/ seedlings from registered nursery

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[G20 Technologies]
Make sure to support farmers carry out G20 techniques for any crop

2. G20 technologies

10. Recommended spacing
11. Recommended fertilizer application rate
12. Supplementing water
13. Timely weeding
14. Top-dressing
15. IPM practices
16. Safe and effective use of pesticides
17. Use of harvesting indices
18. Appropriate post harvest handling containers
19. Value addition techniques
20. Keeping farm records

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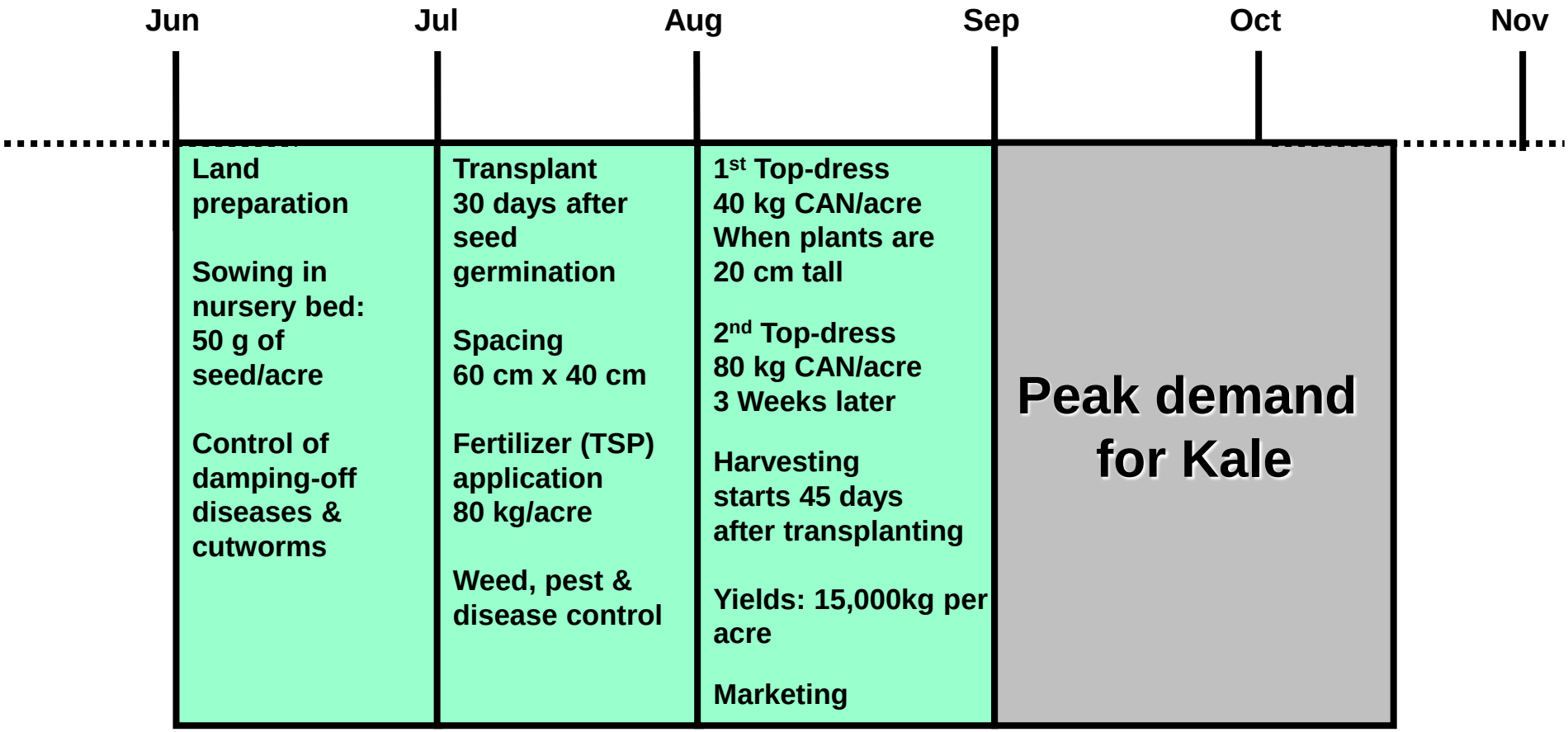
[G20 Technologies]
Make sure to support farmers carry out G20 techniques for any crop

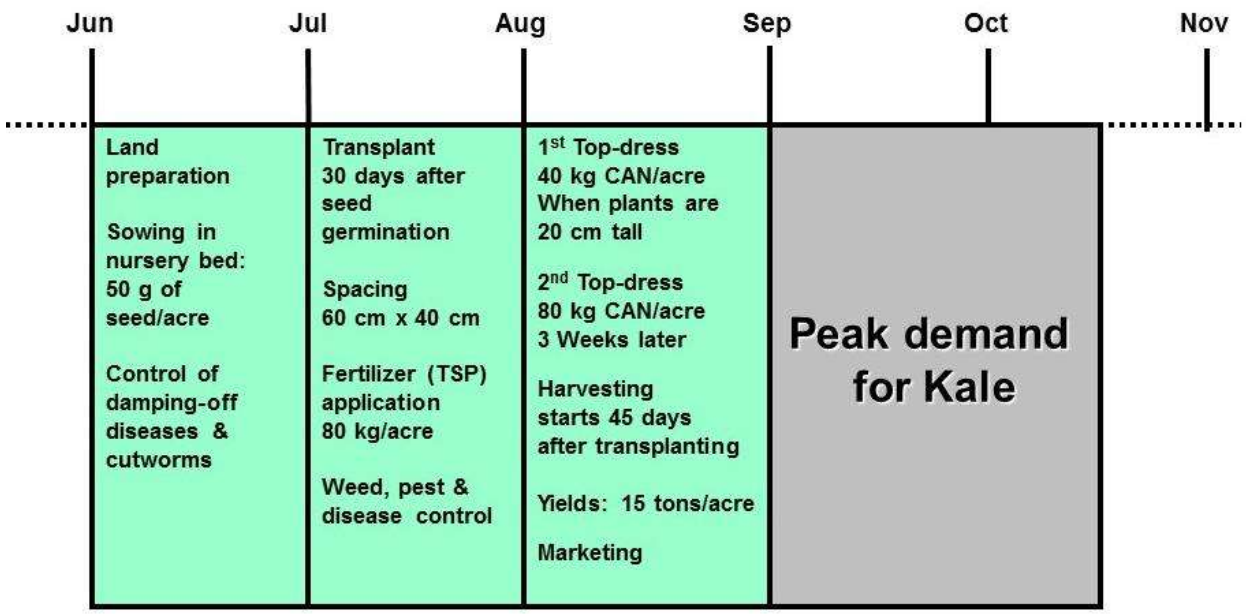
2.1 Crop Planting Calendar

A Sample of a Kale Planting Calendar



2.1 Crop Planting Calendar

A Sample of a Kale Planting Calendar



A Sample of a Kale Planting Calendar: Targeting a peak market demand beginning just after September

2.1 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 Kale
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

2.2 Composting

Photo: SHEP PLUS

Manure preparation through composting

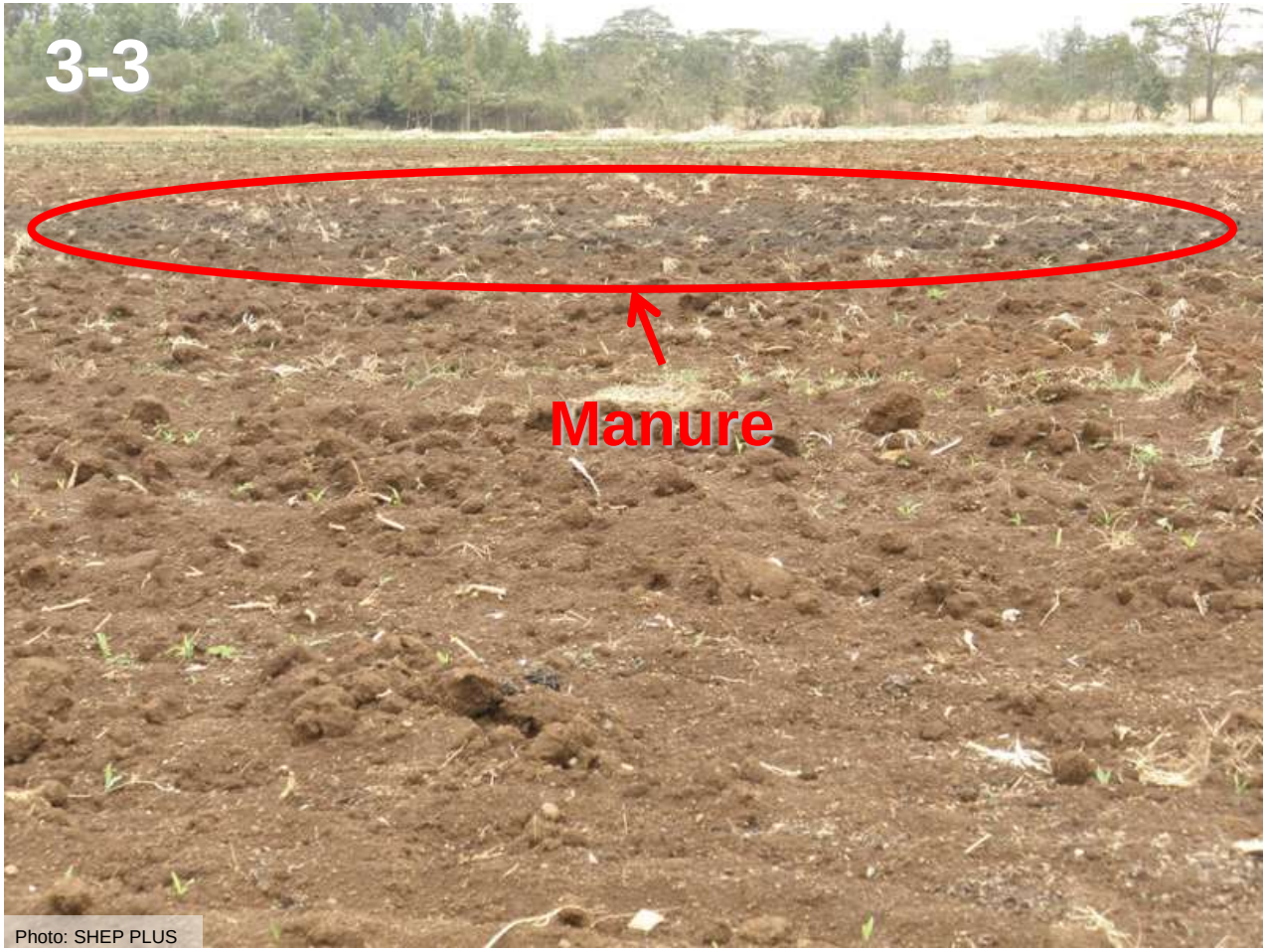
2.2 Composting

Manure preparation through composting

2.2 Composting (GHCP&PHHT20: Q4)

- During compost making, the organic matter need to be covered to prevent leaching of nutrients
- Kale like most leafy vegetables is a heavy feeder and does well in soils with high organic matter (manure)
- Based on the results of the soil analysis, prepare adequate compost for application; the recommended rate of application ranges from **5 – 8 tons/acre** for Kale

3.1 Basal Application



Manure incorporation as a basal application

3.1 Basal Application

Manure incorporation as a basal application

3.1 Basal Application (GHCP&PHHT20: Q8)

- The manure/compost should be broadcasted (**5 – 8 tons/acre**) then worked into the soil (incorporated) preferably using a hoe
- Manure/compost should be applied **1 – 2 weeks** before transplanting the Kale

3.2 Raising Seedlings

Photo: SHEP PLUS

Kales nursery established by a farmer

3.2 Raising Seedlings

Kales nursery established by a farmer

3.2 Raising Seedlings (GHCP&PHHT20: Q9)

- Use certified seed with special attributes, such as tolerance/resistance to pest and diseases and high yielding
- The seed rate is about **50 g per acre**

Nursery Site Selection:

- The nursery should be located in a plot that has not been planted with crops in the ***Brassicaceae*** **family** for at least three (3) years

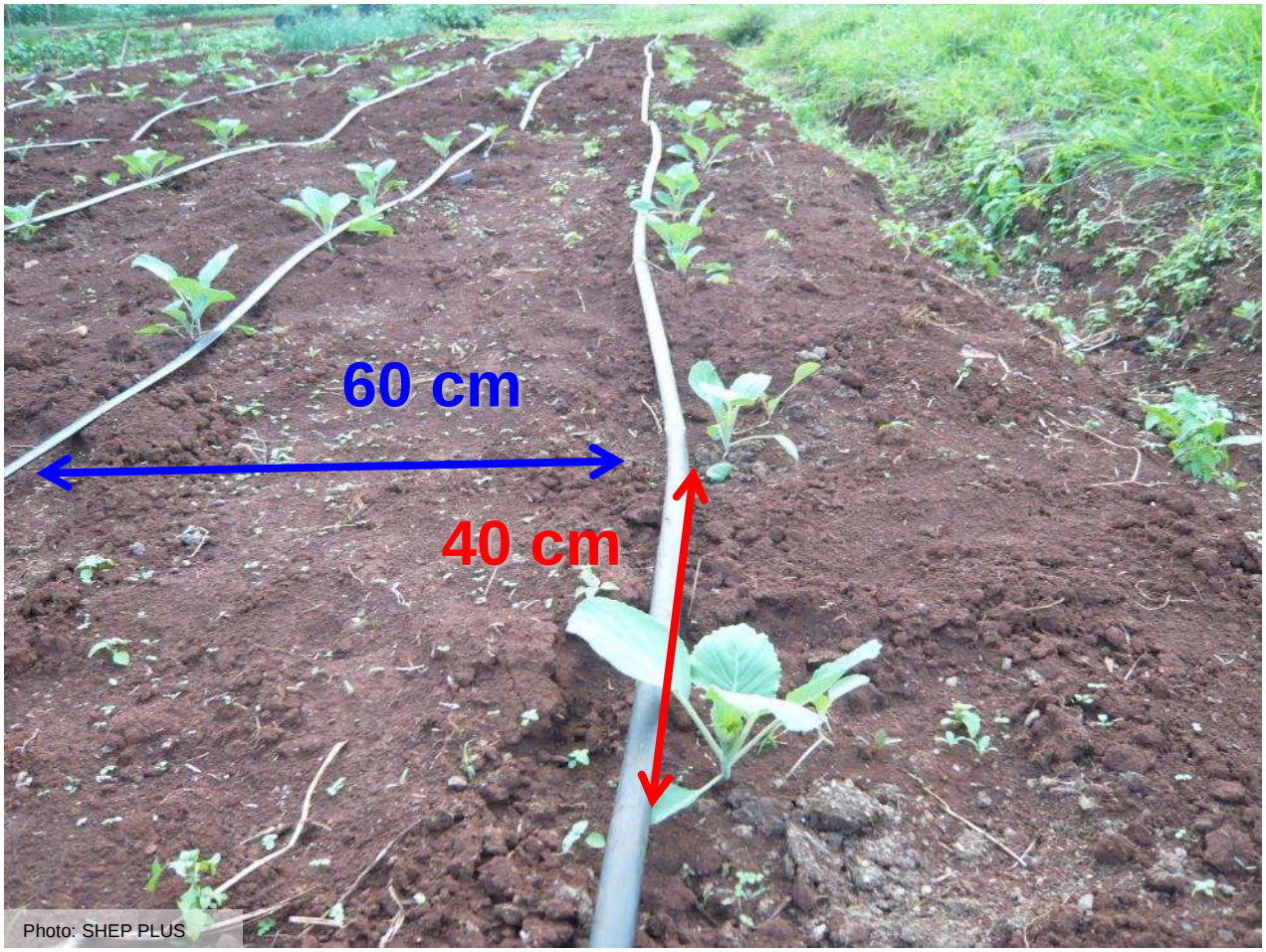
Nursery Establishment:

- Prepare a seed bed of **1 m** width and of convenient length
- Make **2 cm deep drills** on the seed bed at a spacing of **10 – 15 cm** apart
- Thinly sow the seeds in the drills and cover lightly with soil
- **Mulch** seedlings in the seedbed, if possible

Management of Nursery:

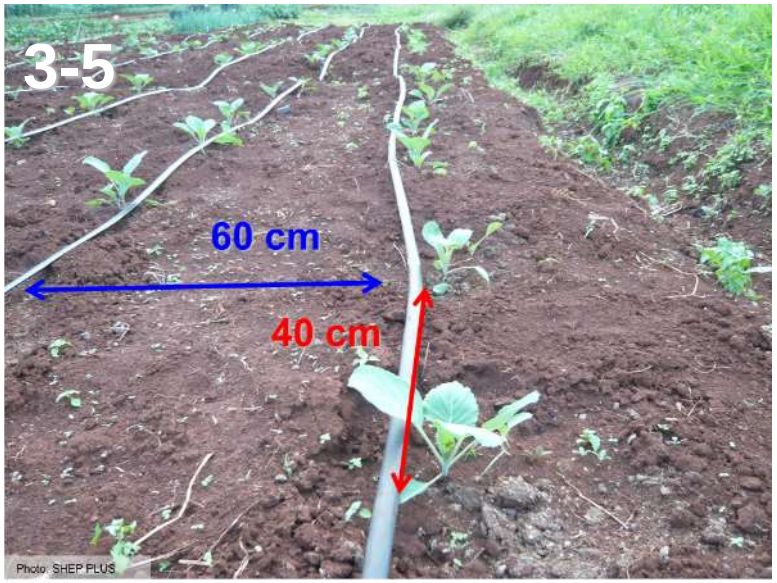
- Water the seedlings regularly
- Avoid over-watering which can lead to **"Damping-off"** disease
- Start hardening the seedlings **1 – 2 weeks** before transplanting by reducing the frequency of watering and the shade over the nursery
- **Notes:** It may be effective to raise seedlings in pots (potting) in order to avoid overgrowing in the nursery

3.3 Transplanting



Transplanted kales seedlings

3.3 Transplanting



Transplanted kales seedlings

3.3 Transplanting

3.3.1 Appropriate Time

- Seedling should be transplanted **30 days** after seed germination
- Transplanting should be done either **early in the morning** or **late in the evening**
- In case farmers did potting, the seedlings can be transplanted **more than 30 days after germination**

3.3.2 Recommended Spacing (GHCP&PHHT20: Q10)

- Transplant the seedling at a spacing of **60 cm** between rows and **40 – 60 cm** between plants **depending on the variety**
- **Plant Population: 11,111-16,666 per acre**

3.3.3 Fertilizer Application Rates (GHCP&PHHT20 Q11)

- In case manure/compost is to be applied during transplanting, apply **1 – 2 handfuls** per hole (**5 – 8 tons/acre**)
- Apply **80 kg/acre (1 teaspoonful/hole)** of **TSP** in the planting holes

[Note]

- Soil testing to determine the type and amount of fertilizer
- Only thoroughly composted manure should be used to avoid possible introduction of pests and diseases in the field
- The TSP should be mixed thoroughly with the soil to avoid possible scorching of the seedlings

3.4 Water Requirement

Photo: SHEP PLUS

Supplementing Kale water requirement through irrigation

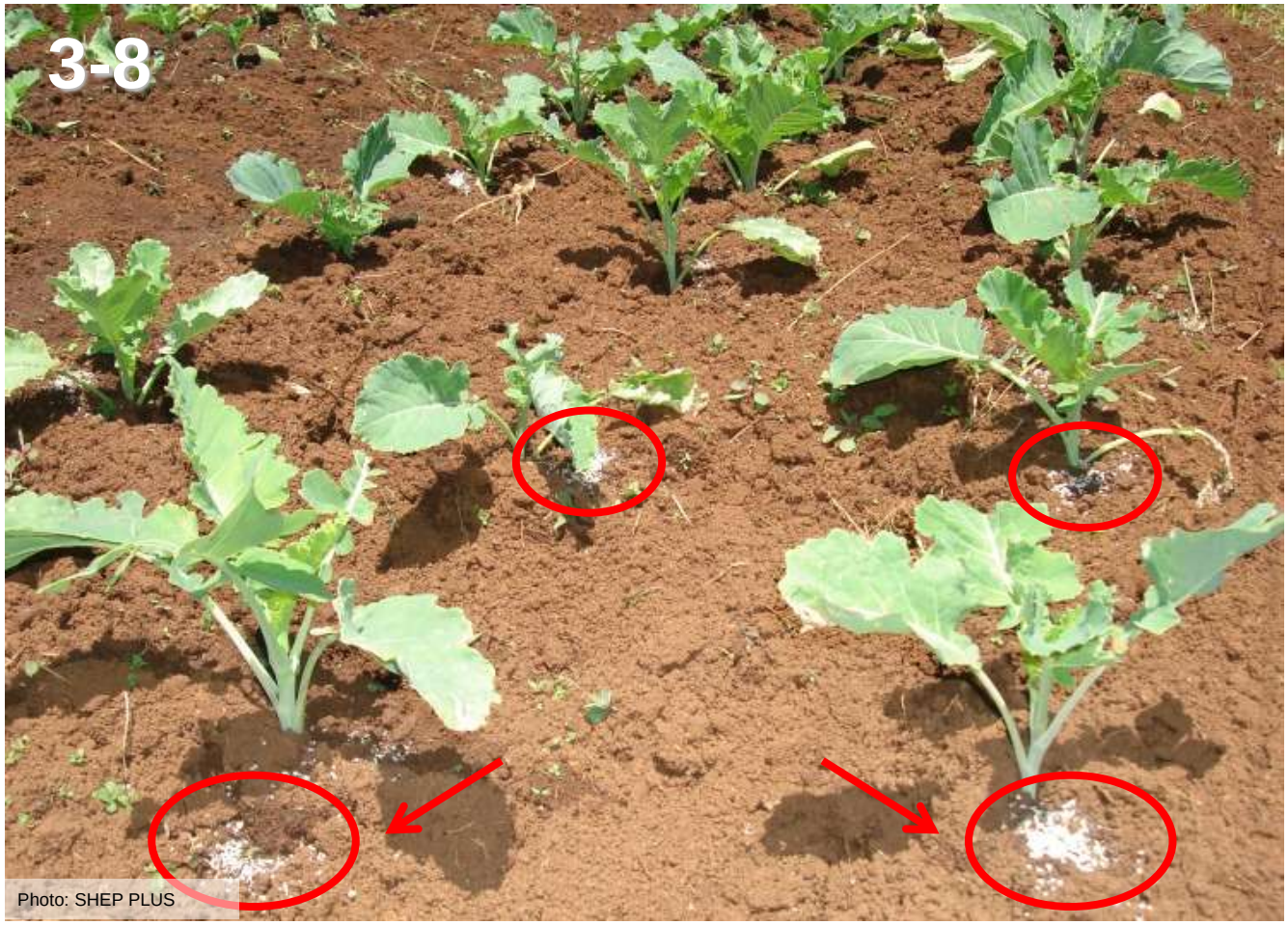
3.4 Water Requirement

Supplementing Kale water requirement through irrigation

3.4 Water Requirement (GHCP&PHHT20: Q12)

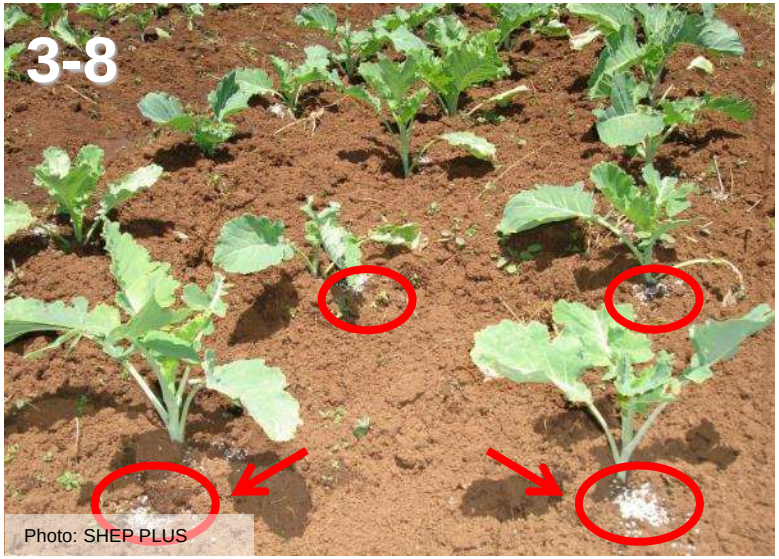
- Kale requires an optimal amount of **750 mm** of rainfall during the growing period
- In areas with lower rainfall, water deficit problems should be addressed through irrigation

3.5 Top-dressing



Top-dressing by placement method

3.5 Top-dressing



Top-dressing by placement method

3.5 Top-dressing (GHCP&PHHT20: Q14)

- Two (2) split applications of CAN are recommended to replenish soil nutrient status
- First split is applied at a rate of **40 kg per acre** (20 g CAN per plant) when plant is 20 cm tall
- Second split application is applied at a rate of **80kg per acre** 3 weeks later
- Placement method is recommended as it is more effective and economical

3.6.1 Major Pests

Photo: Am. M. Varela, icipe (CC BY-NC-SA 3.0)

http://infonet-biovision.org/PlantHealth/Crops/CabbageKale-Brassicas#simple-table-of-contents-5

Photo: © A. M. Valera, icipe (CC BY-NC-SA 3.0)

http://infonet-biovision.org/PlantHealth/Crops/CabbageKale-Brassicas#simple-table-of-contents-5

Photo: SHEP PLUS

Photo: John C. French Sr., Retired, Universities:Auburn, GA, Clemson and U of MO, Bugwood.org (CC BY 3.0 US)

3.6.1 Major Pests

3.6.1 Major Pests

- Pest damage causes a reduction in quality and quantity of produce
- Kale is generally more pest & disease resistant than other crops in the ***Brassicas*** **family**
- The following are the major pests of Kale in Kenya:
  - **A. Diamond Back Moth (DBM)**
  - **B. Cabbage Sawfly**
  - **C. Aphids**
  - **D. Cutworms**

3.6.1.A: Diamond Back Moth (DBM)

Photo: Am. M. Varela, icipe (CC BY-NC-SA 3.0)
http://infonet-biovision.org/PlantHealth/Crops/CabbageKale-Brassicas#simple-table-of-contents-5

“Windows” caused by DBM larvae on a leaf

3.6.1.A: Diamond Back Moth (DBM)

“Windows” caused by DBM larvae on a leaf

3.6.1.A: Diamond Back Moth (DBM)

Identification:

- The adult is a small grey moth whose wings form a characteristic diamond pattern at the back when closed
- Larvae are **pale yellowish-green** to **green caterpillars** covered with fine, scattered, erect hairs
- When disturbed, the larvae will wriggle backward violently and may drop from the plant, suspended by a silken thread

Damages:

- **Windows** on leaves from feeding by larvae
- If larvae are numerous, they may eat **the entire leaf**, leaving only the veins
- Infestations are normally **serious in drier months**

Control:

- **Crop rotation**
- **Use of pesticides**, such as
  - **Bacillus thuringiensis: Bt. (DELFIN 6.4 W.G®) PHI:1day**
  - **Lambdacyhalothrin (TATA UMEME 2.5 EC®) PHI:3days**
  - **Lufenuron 50 g/L (MATCH 50 EC®) PHI:14days**
- **Intercropping: Intercropping with repellants** (e.g. **Tomato**) or **trap crops** (e.g. **Indian Mustard**) reduces DBM destruction on Kale. The mustard is then sprayed with a pesticide. Tomato repels DBM.
- **Natural enemies:** Egg parasitoids of genera Trichogramma and larval parasitoids in the genera Diadegma are some of the predominant and effective natural enemies.

3.6.1.B: Cabbage Sawfly

A “Cabbage Sawfly” larva feeding on a Kale leaf

3.6.1.B: Cabbage Sawfly

A "Cabbage Sawfly" larva feeding on a Kale leaf

3.6.1.B: Cabbage Sawfly

Identification:

- Adult insect resembles a fly except for the presence of 2 pairs of membraneous wings with dark head and thorax and bright abdomen
- Eggs are laid singly inside the leaf
- The **grayish green larvae** with a black head and more than six pairs of legs

Damage:

- Windows on leaves from feeding by larvae
- They feed on the blade of the leaves often leaving only the main veins and midrib

Control:

- Destruction of wild plants in the Cruciferae
- Use of appropriate pesticides such as Methoxyfenozide 240 g/L (RUNNER 240 SC PHI: 10days), Pyrethrins 40g/L (PYAGRO 4 EC)

3.6.1.C: Aphids

Underside of a leaf infested with Aphids

3.6.1.C: Aphids

Underside of a Kale leaf infested with Aphids

3.6.1.C: Aphids

Identification:

- Aphids are **pale green** or light green to yellowish green and are usually covered with **a light dust of mealy powder.** But some types of aphids do not form mealy powder
- They suck plant sap from the central part of the plant and near the base of leaves

Damages:

- Aphid attack results in **curled, discoloured** and **distorted leaves**
- Large colonies of aphids are found on the underside of Kale leaves during drought causing stunted growth

Control:

- **Field hygiene** through removal and destruction of crop residue and alternative wild hosts
- **Use of insecticides**, such as
  - **Lambdacyhalothrin (KARATE 2.5WG®) PHI: 3days**
  - **Thiamethoxam (ACTARA 25 WG®) PHI: 7day**
  - **Deltamethrin (DECIS 2.5EC®) PHI: 1day**

3.6.1.D: Cutworms

Photo: John C. French Sr., Retired, Universities:Auburn, GA, Clemson and U of MO, Bugwood.org (CC BY 3.0 US)

A Cutworm larva

3.6.1.D: Cutworms

Photo: John C. French Sr., Retired, Universities Auburn, GA, Clemson and U of MO, Bugwood.org (CC BY 3.0 US)

A Cutworm larva

3.6.1.D: Cutworms

Identification:

- The **grayish black larvae** that curl up tightly when disturbed
- They are often found **hiding in soil** near the cut seedlings

Damage:

- They **girdle** and **cut-off young seedlings at ground level** during the night dragging them into the tunnel in the soil and feed on them during the day

Symptoms:

- Cut stems
- Attacked plant **wilt** and **die**

Control:

- **Hand removal** since the pest is easily found near the damaged plant, especially at the beginning of infestation
- **Early weeding** destroys sites for egg laying
- Flooding of the field for a few days before sowing or transplanting can help kill cutworm caterpillars in the soil
- Chemical control: **(drench at the base in the evenings)**
  - Lambda-cyhalothrin 25g/L (TATA UMEME 2.5EC®(PHI: 3days), Halothrin 2.5EC® (PHI: 3days))
  - Alpha-cypermethrin (ALPHA CYMBA 10EC®(PHI: 3days))

3.6.2 Major Diseases

Photo: A. M. Varela, icipe (CC BY-NC-SA 3.0)
http://infonet-biovision.org/PlantHealth/Crops/CabbageKale-Brassicas#overlay=node/27240/edit

Photo: © Jack Kelly Clark, courtesy University of California Statewide IPM Program

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3.6.2 Major Diseases

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3.6.2 Major Diseases

- Disease infection leads to reduction in quality and quantity of produce
- The following are the major diseases of Kale in Kenya:
  a. **Black Rot**
  b. **Black Leg (Dry Rot Canker)**
  c. **Ring Spot**
  d. **Downey Mildew**
  e. **Powdery Mildew**

3.6.2.a: Black Rot

Photo: A. M. Varela, icipe (CC BY-NC-SA 3.0) http://infonet-biovision.org/PlantHealth/Crops/CabbageKale-Brassicas#overlay=node/27240/edit

Symptom of “Black Rot” on a leaf

3.6.2.a: Black Rot

Symptom of "Black Rot" on a leaf

3.6.2.a: Black Rot

General Descriptions:

- This is a **seed borne bacterial disease**
- Black rot infection and spread is favored by **wet conditions** and **high temperatures** (**20 – 30 ^{0}C**)
- Crowded plants provide conditions that are ideal for bacterial spread to nearby plants

Symptoms:

- In early stage, **yellowish brown V-shaped lesions** are observed on the leaf margins of affected plants
- On the margins of mature leaves, the veins become distinctly **black**
- The lesions extend into the leaf, **killing large areas of affected leaves**
- A cross sectional cut of infected stem reveals a characteristic **black ring**
- Seedlings that are infected systemically become **yellow**, **drop lower leaves**, and **may die**

Control:

- Use certified planting material
- Use of tolerant varieties e.g.) **Collards**
- Field sanitation (hygiene)
- Minimum two year crop rotation
- Spray **copper** fungicide **(AMICOP 50WP, COBOX 50WP®)** when the first symptoms are seen

3.6.2.b: Black Leg (Dry Rot Canker)

Photo: © Jack Kelly Clark, courtesy University of California Statewide IPM Program

Photo: © Infonet-Biovision http://www.infonet-biovision.org/PlantHealth/Crops/CabbageKale-Brassicas (CC BY-NC-SA 3.0)

Blackleg lesions can girdle the basal part of the stem (Left) and Blackleg infected kale wilting (Right)

3.6.2.b: Black Leg (Dry Rot Canker)

3-14

Photo: © Jack Kelly Clark, courtesy University of California Statewide IPM Program

A stem infected with “Black Leg”

3-15

Photo: © Infonet-Biovision http://www.infonet-biovision.org/PlantHealth/Crops/CabbageKale-Brassicas (CC BY-NC-SA 3.0)

Blackleg infected kale wilting

3.6.2.b: Black Leg

General Descriptions:

- This is a **seed borne disease** caused by a **fungus**
- The inoculum is spread by **infected plants**, **garden tools** and **crop debris**

Symptoms:

- Leaves have **light brown spots** which may be circular and which later develop **ash grey centres with many black spots**
- Severe stem infection results in **a dark dry rot** above the soil line which extends below and kills the roots
- Affected plants **wilt abruptly** and **die**

Control:

- Use of certified seed
- Avoid use of **side shoots**
- Avoid nursery beds where Kales and related crops have previously been planted
- Field sanitation (hygiene) by removing and destroying infected material
- **3 – 4 year crop rotation**

3.6.2.c: Ring Spot

Symptom of “Ring Spot” on a leaf

3.6.2.c: Ring Spot

Symptom of "Ring Spot" on a leaf

3.6.2.c: Ring Spot

General Descriptions:

- This is a **seed borne fungal disease**
- **Infected compost** is the source of the innoculum and it is spread by **wind**

Symptoms:

- **Circular brown grey spots** on the leaves which are often bordered by **a green margin** and with **black – specked concentric zones**

Control:

- Use of certified seeds
- Field sanitation-remove and destroy infected plants
- Crop rotation for at least 2 years
- **Use of fungicides**, such as **Copper Oxychloride (COBOX 50 WP®)PHI: 3days**

3.6.2.d: Downy Mildew

Photo: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org (CC BY 3.0 US)

“Downey Mildew” symptom on Kale

3.6.2.d: Downey Mildew

“Downey Mildew” symptom on Kale

3.9.4d: Downey Mildew

General Descriptions:

- This is **a seed borne fungal disease**
- Spread by **wind**, **rain**, and **overhead irrigation**
- It is severe at **high elevations** where the conditions are **cool and wet**

Symptoms:

- **Fluffy fungal growth** on the underside of leaves which later produce **brown to black spots** on the upper surface

Control:

- Nursery and field sanitation
- Crop rotation
- Follow **recommended spacing** to reduce the risk of incidence
- **Use of pesticides**, such as
  - Metalaxyl+Mancozeb (**METACOZEB 72 WP)** PHI: 7days

3.6.2.e: Powdery Mildew

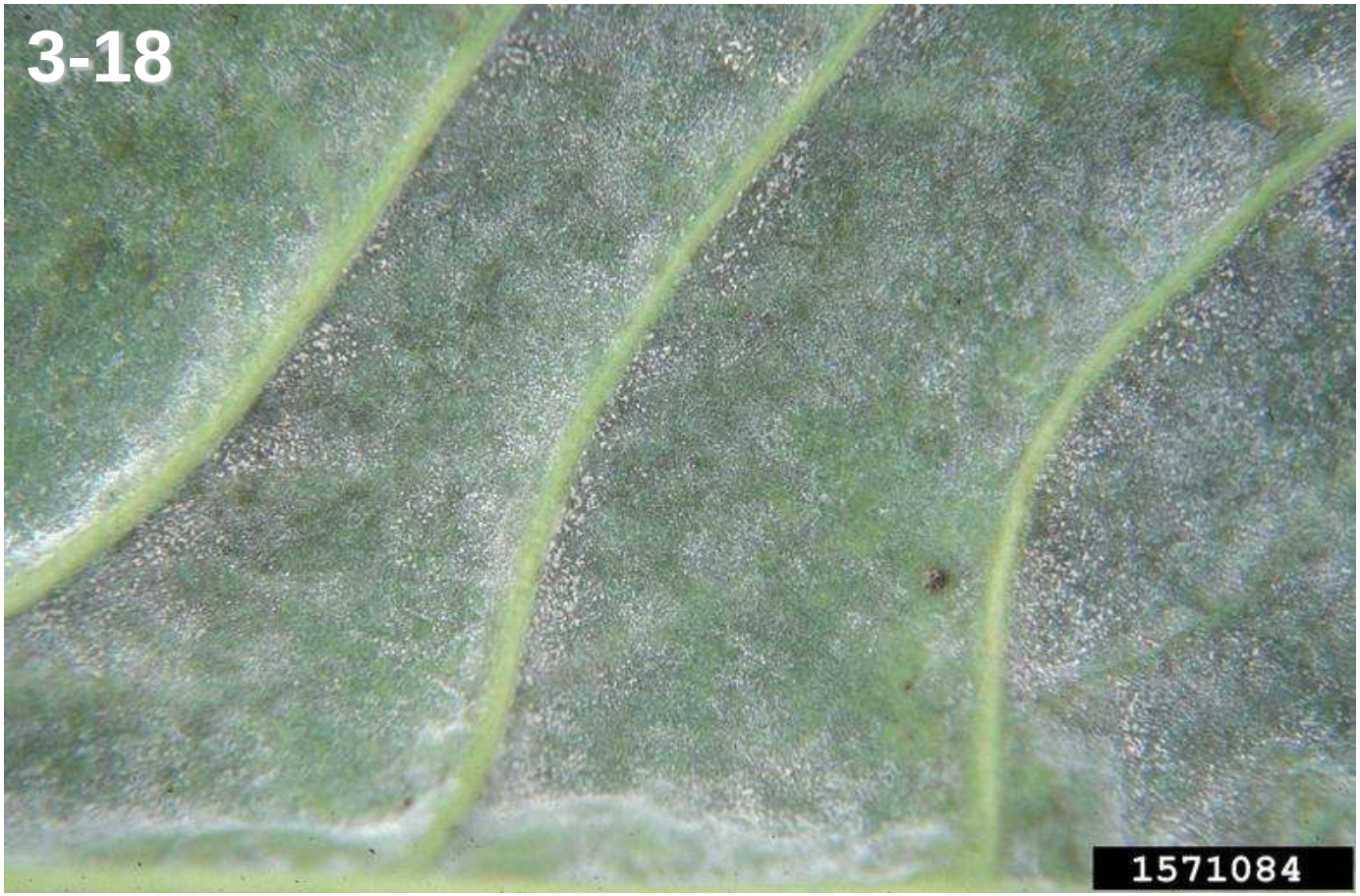

Photo: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org (CC BY 3.0 US)

“Powdery Mildew” symptom on Kale

3.6.2.e: Powdery Mildew

Photo: Gerald Holmes, California Polytechnic State University at San Luis Obispo, Bugwood.org (CC BY 3.0 US)

"Powdery Mildew" symptom on Kale

3.6.2.e: Powdery Mildew

General Descriptions:

- This is **a fungal disease** that affects a wide range of plants
- Powdery Mildews are severe in **warm**, **dry climates**

Symptoms:

- Appears as **white**, **powdery spots** that may form on both surfaces of leaves
- Leaves infected with Powdery Mildew may gradually turn completely **yellow**, **die**, and **fall off**

Control:

- Crop rotation
- **Cultural Control:** Remove infected leaves to reduce the spread
- **Chemical Control:** Use of **fungicides**, such as Sulphur (**COSAVET DF)** PHI: 3days Sulphur 800g/L (**FLOSUL PLUS)** PHI: 3days)

4. Harvest

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Harvesting Kales

4. Harvest

Harvesting Kales

4. Harvest

4.1 Harvesting Indices (GHCP&PHHT20: Q17)

- **Harvesting Period:** Begins 6 weeks after transplanting and can last for 4 – 6 months
- **Harvesting Method:**
  - Kale is hand harvested either as a whole plant, shoots or leaves
  - A picker should look for kale with firm, deeply coloured leaves and moist hardy stems
  - Plucking the lower leaves; each time leaving 3 – 4 top leaves
  - When harvesting the leaves, always leave part of the stalk attached to the stem
- **Yields: 15,000kg per acre**
- The **frequency** and **total duration of harvesting** depends on management practices; for instance, irrigation and additional application of CAN shortens the harvesting interval and prolongs the harvesting duration