



# Garlic Production in Hawaii

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STATE OF HAWAII



SUSTAINABLE AND ORGANIC  
AGRICULTURE PROGRAM  
COOPERATIVE EXTENSION, UNIVERSITY OF HAWAII AT MĀNOA  
COLLEGE OF TROPICAL AGRICULTURE AND HUMAN RESOURCES



# Challenges

- Climate
- Daylength
- Access to seed material
- Pest and Diseases
- Import competition





# Garlic Types

- Garlic (*Allium Sativum*)
  - Hardnecks (*A. sativum ssp. Ophoscorodon*)
    - Rocamboles
    - Purple Stripe
    - Porcelain
    - Asiatic/Turban
    - Creole
  - Softnecks (*A. sativum ssp sativum*)
    - Artichoke
    - Silverskin
- Elephant Garlic (*Allium ampeloprasum*)
  - Leek produces cloves



# Hardnecks

- Hardnecks (*A. sativum* ssp. *Ophoscorodon*)
- Groups
  - Rocamboles
  - Purple Stripe
  - Porcelain
  - Asiatic/Turban
  - Creole
- Short shelf life (3-4 months)
- Subtle flavor differences
- Typically form scapes



# Rocamboles

- Most widely grown hardneck
- Produce large cloves
- Clove color range from tan to brown
- Scapes are curly and straighten out as they become woody
- Loose skin
- 6-11 cloves
- Stores approx. 4-6 months
- 1lb of seed = 60 plants





# Purple Stripe

- Named for purple streaks on skin and cloves
- 8-12 cloved per bulb
- Store slightly longer than Rocamboles (6months)
- 1lb of seed = 60 plants





# Porcelain

- Satin white wrappers
- 4-6 cloves
- Mistaken for elephant garlic
- Stores 6 months
- 1lb of seed = 40 plants
- German Extra Hardy





# Asiatic/Turban

- Asiatic
  - Size up well with out flower removal
  - Tend to have stripes
  - Mature suddenly
    - Harvested as soon as leaves begin brown
    - Wrapper leaves split open (40% brown)
  - Stores about 4months
  - 1lb of seed = 45 plants
- Turban
  - Possibly artichoke types
  - Weak bolting and early maturing
  - Soft neck in mild winter
  - Harvest a week after seed head emerge
  - Heavily striped
  - Stores 4 months
  - 1lb of seed = 60 plants
  - Thai purple, Blossom, Shandong, Xian, Chinese Purple, Thai Fire, Uzbek, Lotus, Tzan, Early Portuguese, Chengdu, Red Janice



PC: <https://www.filareefarm.com>





# Creole

- Genetically softneck
- silverskin that bolts weakly
- behave like hardnecks
- Solid purple cloves
- Weak flower stalks
- Sweet tasting
- Stores 10-12 months
- 1lb of seed = 80 plants
- Ajo Rojo, Burgandy, Rose de Lautrec, Native Creole, Labera Purple





# Garlic Types

- Softnecks (*A. sativum ssp sativum*)
- Groups
  - Artichoke
  - Silverskin
- Most common in markets
- Mild flavor
- Stores long (10-12 months)
- Early to harvest



# Artichoke

- Very vigorous and large bulbed
- May form seed heads under stress
- Named for overlapping layers of cloves
  - 3-5 clove layers containing 12-20 cloves
  - Outer cloves are fat and round
  - Inner cloves vary in shape
- Storage of 10 months
- 1lb of seed = 65 plants
- Lorz Italian, Sonoran, Sicilian Artichoke, Early Red Italian, Red Toch, Transylvania, Polish White, Susanville





# Silverskin

- Most commonly found on market shelves
- Highest yielding
- Rarely produce flower in mild weather
- Usually all white wrapper
- Three clove layers
- 12-20 cloves per bulb
- Popular for braiding
- Latest harvested
- Stores 10-12 months
- 1lb of seed = 70 plants
- Idaho Silver, Silver White, Mild French, S & H Silver, California Select





# Selecting Planting Material

- Filaree Garlic Farm
- Southern Exposure Seed
- 31 Varieties in Trial





# Vernalization



- Is the induction of a plant's flowering process by exposure to the prolonged cold of winter, or by an artificial equivalent
- Refrigeration for 1-2 months (November-December)



# Field Prep



- Grows best in
  - well-drained soils
  - pH 6.0-7.0
  - High organic matter



# Planting (Dec-Feb)







# Planting



- Rows 6-12' apart
- Cloves spaced 4-6 inches apart
- 1-1.5" deep



# Irrigation/Fertilization



- 1 inch of water per week during dry months (27,000gal/acre)
- Fertility based on soil sampling
- Preplant phosphorus and calcium requirements
- Medium to high nitrogen demand
  - Early in vegetative stage
- Fertigation recommended
- 200-300lbs of nitrogen per acre.
  - Urea/Calcium Nitrate
- 150lbs of potassium per acre.



# Garlic Scapes



- Flowering portion of most hard necks and some soft neck varieties.
- Can be eaten like asparagus when harvested young.
- Removal is required to maximize bulb growth.
  - Cut ½" above top leaf
  - Prior to uncoil/straighten



# Monitoring Growth





# Pest and Diseases

- Thirps
- Mealy bugs
- Garlic Mosaic Virus
- Downy Mildew





# Curing



- Important for storage
- Bunch 10-12 freshly harvest plants using string or twine
- Suspend bunches using a single wire in a shady cool and dry area.
- About 3 weeks or outer two leaves are dry.
- Once dry trim shoots and roots and clean off remaining soil.



# Field Curing

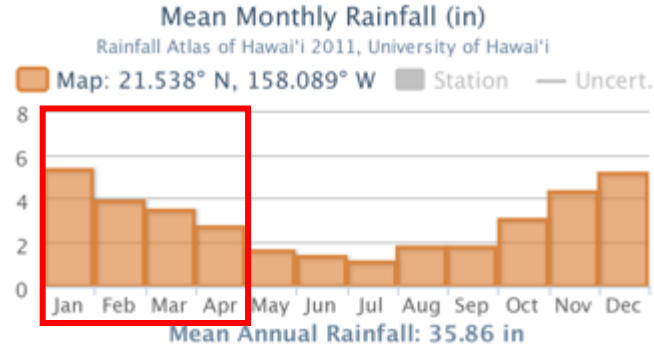


- In areas where rainfall is not common bulbs can be harvested and left on the soil surface to dry.
- Bunched and hung on nearby fences.



# Field Trials, Oahu

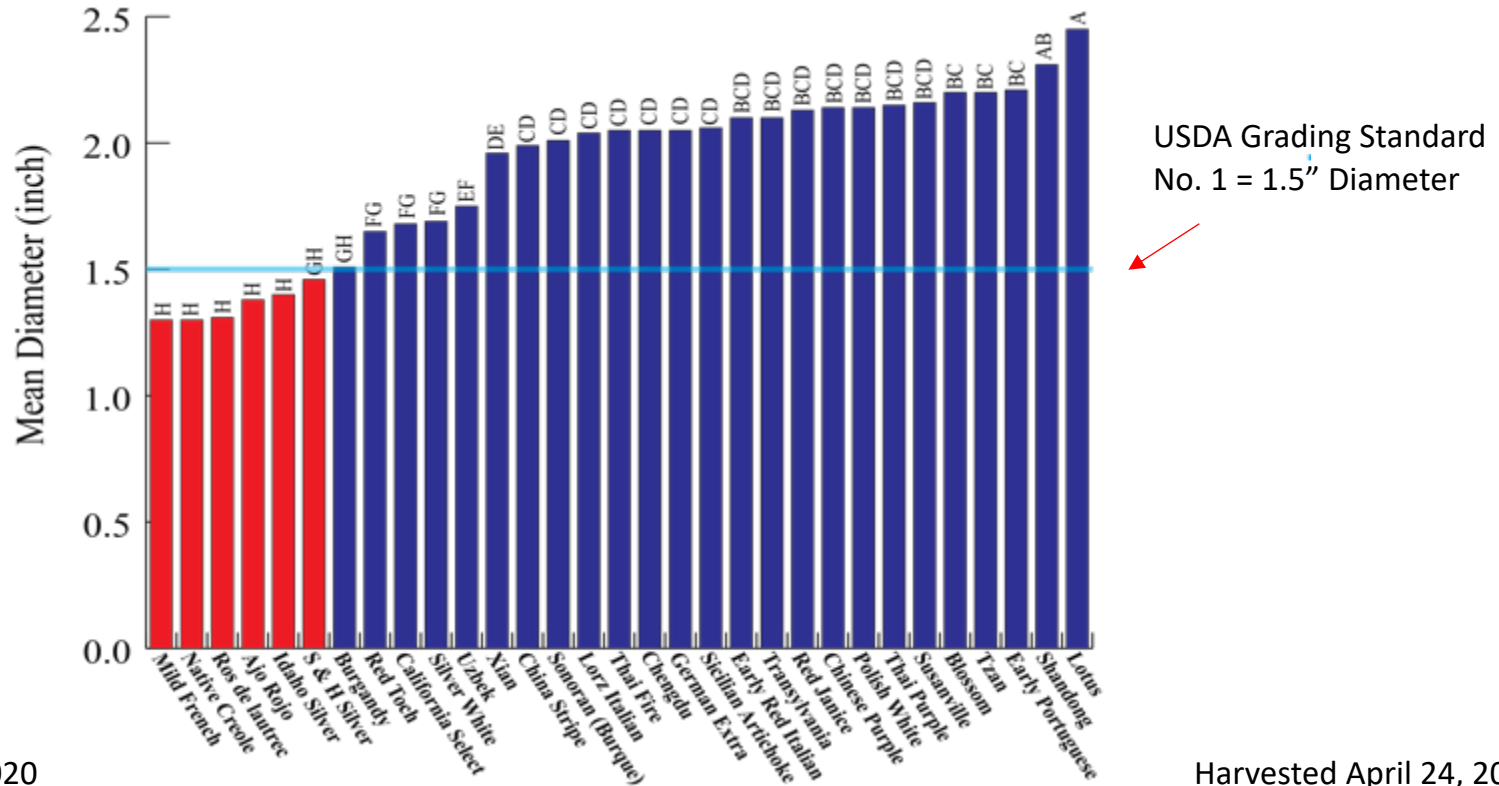
- Location: Poamoho, Oahu
- Elevation: 700'
- Average Annual Rainfall: 36"
- Average Temperature: 61F-83F
- Planted January 6, 2020
- Harvested April 24, 2020







# Field Trials, Oahu

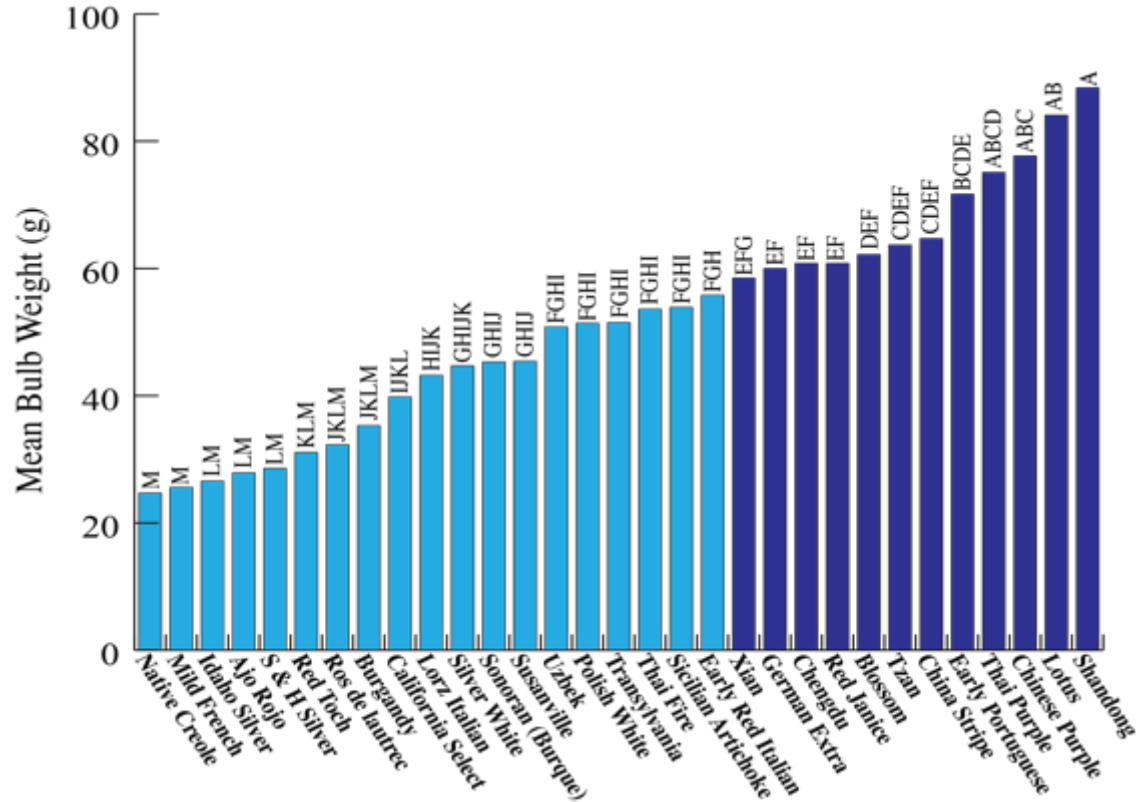


Planted January 6, 2020

Harvested April 24, 2020



# Field Trials, Oahu



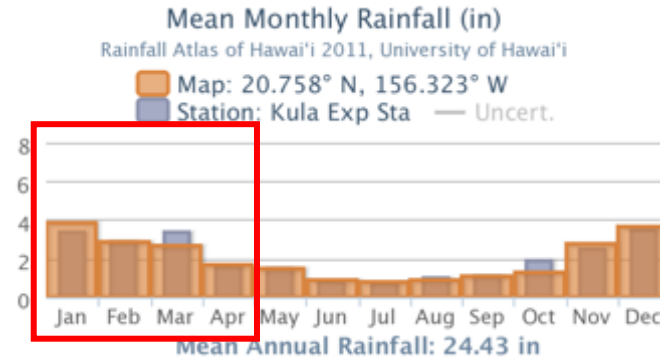
Planted January 6, 2020

Harvested April 24, 2020



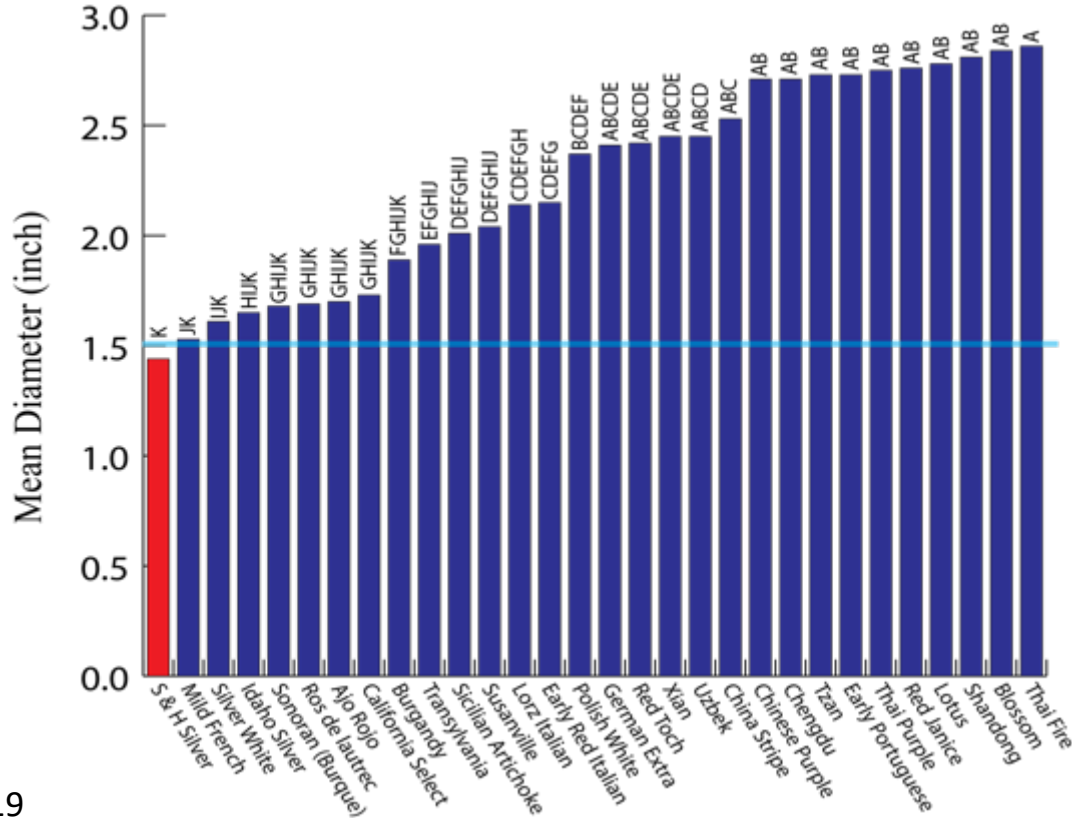
# Field Trials, Maui

- Location: Kula, Maui
- Elevation: 3000'
- Average Annual Rainfall: 24"
- Average Temperature: 54F-76F
- Planted December 18, 2019
- Harvested April 27, 2020





# Field Trials, Maui

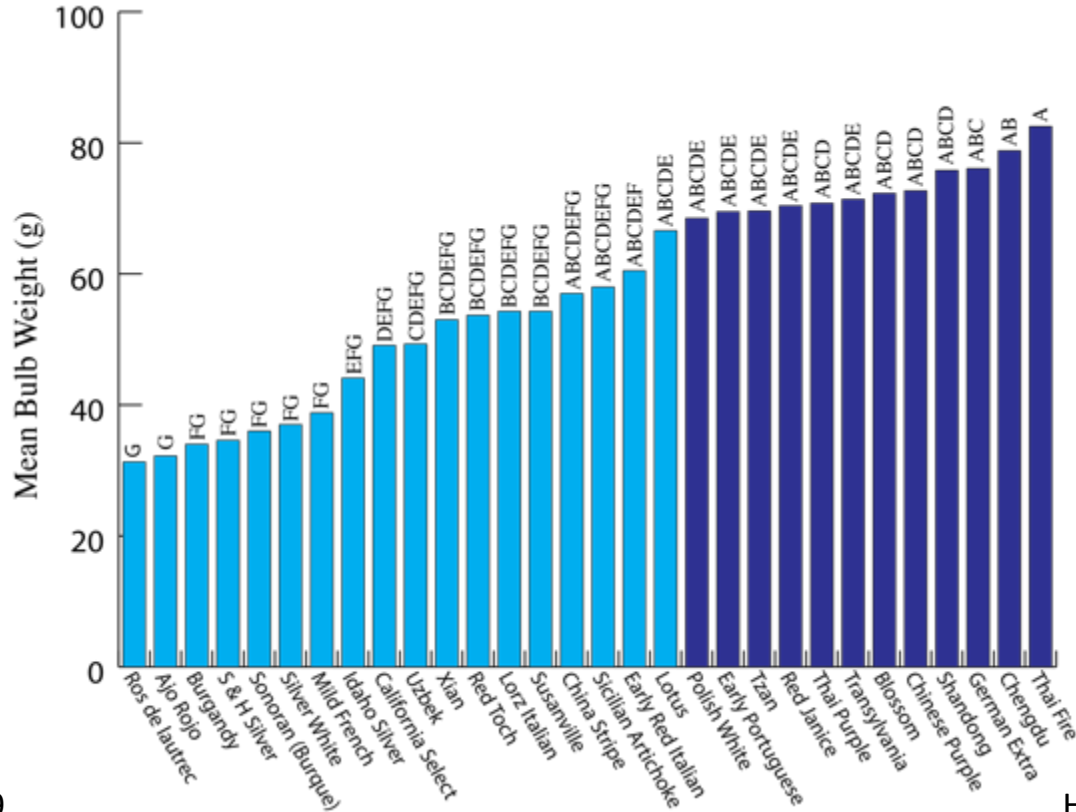


USDA Grading Standard  
No. 1 = 1.5" Diameter





# Field Trials, Maui



Planted December 18, 2019

Harvested April 27, 2020



# Porcelain



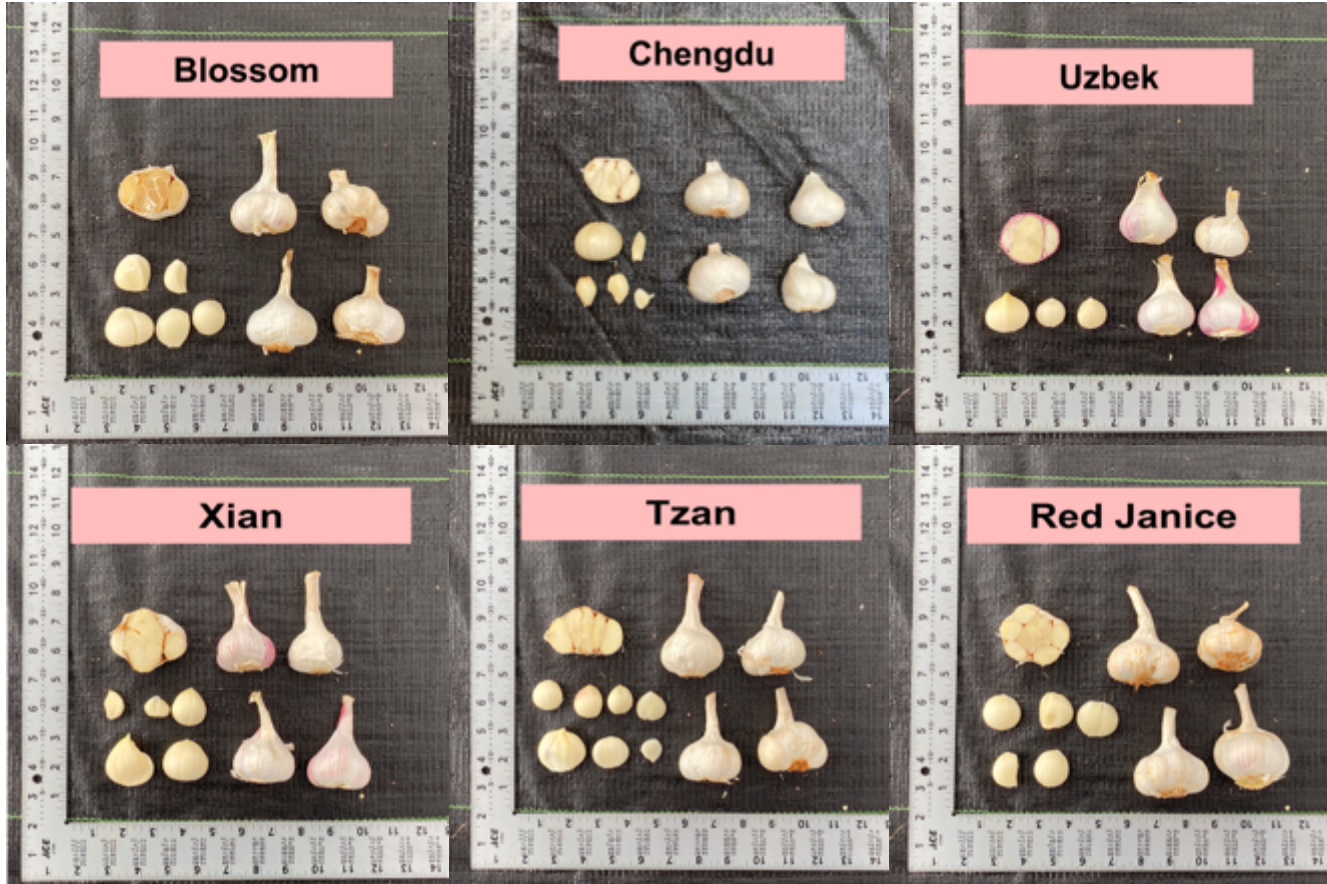


# Asiatic/Turban





# Asiatic/Turban







# Artichoke





# Silverskin



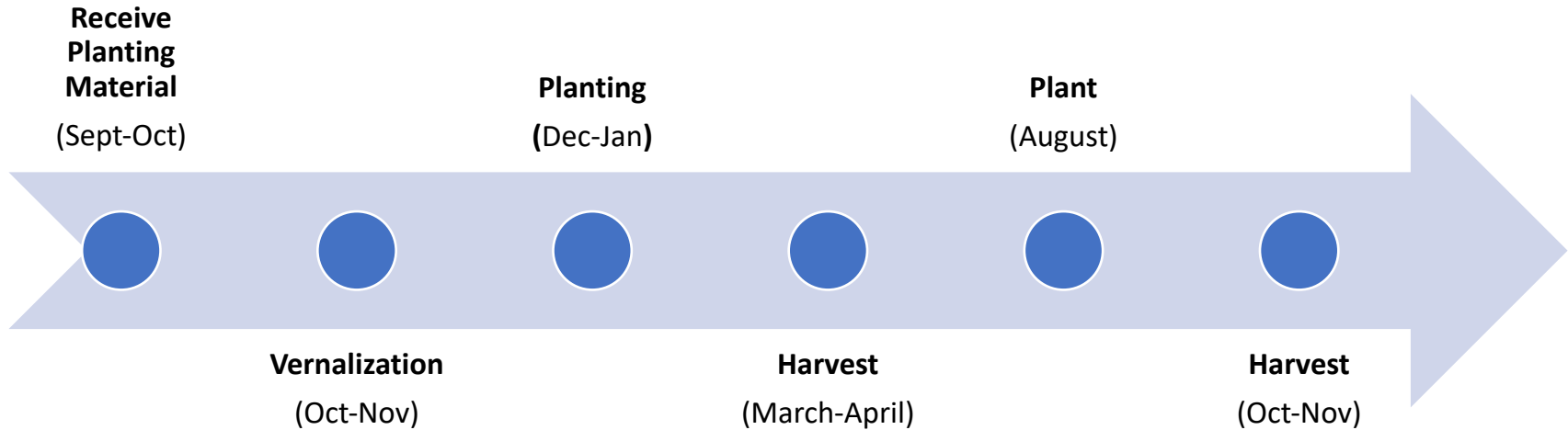


# Creole





# Garlic Season





# Garlic “Sets”

- Small, dry, immature bulbs grown the season before.
- Plant stored garlic cloves in August.
- Harvest in October-November.
- Not likely to form multiple cloves
- Mature into multi-cloves in the following season
- Fresher than saving cloves over 6 months





# Summer Garlic Planting

- Shandong (Turban)
- Lotus (Turban)
- Chinese Purple (Turban)
- Thai Purple (Turban)
- Early Portuguese (Turban)
- China Stripe (Turban)
- Tzan (Turban)
- Blossom (Turban)
- Red Janice (Turban)
- Chengdu (Turban)
- Xian (Turban)
- German Extra Hardy (Porcelain)

## Observational Evaluation

- Ajo Rojo (Creole)
- Burgandy (Creole)





# Harvest/Storage

- Most varieties harvest 40-60% of leaves yellow
  - Generally have 6 leaves
- Early harvest results in poor storage
- Late harvest results in splitting
- Softnecks
  - 9 months at 32F
  - 1-2 Months at 68-86F
- Hardnecks
  - 6 months at 32F
- 40F is not ideal for garlic storage as it stimulates sprouting
- 60F in a well ventilated container can last 3-5 months
- Moderate humidity (65-75%)
- Paper or mesh bag



# Value Addition

