Water-Wise Vegetable Gardening

Israel Calsoyas, NMSU Vegetable Program Manager
How much water do crops need?

- Depends on the type of crop
- Depends on the soil
- Depends on the climate
Three Approaches:

- 1) Modify the environmental conditions to minimize water loss to evaporation and leaching
- 2) Plant vegetables that need less water to produce a crop
- 3) Manage growth of vegetable plants for minimal supplemental water needs
The Garden Environment
Transpiration

• Loss of water by a growing plant
• Critical for cooling, nutrient uptake, and turgidity
• Increased rate with
  - high air temperature
  - low relative humidity
  - windy conditions
  - sunlight

http://ga.water.usgs.gov/edu/graphics//evapotranspiration.gif
Transpiration

• Drought resistant plants reduce transpiration through
  - Heavy cuticle
  - Small leaves
  - Less leaf area
  - Spines or hairs on leaves

• Most vegetable plants are not drought tolerant
How do we minimize transpiration?

• **Increased rate with**
  - high air temperature
  - low relative humidity
  - windy conditions
  - sunlight

• **Reduce rate with**
  - wind protection
  - shading
Control Weeds

• Weeds compete with vegetable crops for water, as well as nutrients

• Weeds also frequently harbor diseases that will harm your vegetable plants
Soil

- Soil type affects frequency and duration of watering
Soil Texture

- Coarse textured soils (high % sand)
  - Good drainage and tilth
  - Hold very little water
  - Minerals readily leached
  - ‘Light’ soil
Soil Texture

• Fine textured soils (high in silt and/or clay)
  – Poor drainage, hard to manage
  – Hold soil water tightly
  – Bind more nutrients
  – ‘Heavy’ soil

http://www.semp.us/_images/biots/Biot226PhotoF.jpg
Prepare Soil to Maintain Moisture

• Best soil is deep, well drained & contains plenty of organic matter

• Organic matter holds soil moisture
  Example: Sponge vs. Gravel

• Most soil in NM is very low in organic matter

• To increase, add compost and manure
Water Conservation Techniques
Mulch

- Material placed on soil surface around vegetable plants


http://www.ext.colostate.edu/mg/gardennotes/715.pdf
Mulch

• Pros
  – Keeps weeds at bay
  – Conserves soil moisture
  – Keeps fruit off ground

• Cons
  – Could harbor pests
  – Labor and cost investment
  – Wind

http://thailand.ipminfo.org/images/components/Organic_farm_egg_plant_mulching_3.JPG
Mulch

• How to apply
  – Once plants are established, cover ground 2 – 4 inches
  – Don’t cover vegetable plants

• Types
  – Straw, leaves, wood chips, newspaper, plastic, pecan shells, compost
Irrigation

• Check soil moisture regularly
  – Irrigate when top two to four inches is dry to the touch

• Automate the system with controllers

• 1 inch of water in a 1’X 1’ space is a little over half a gallon

https://www.pinterest.com/explore/irrigation-systems/
Irrigation Systems

- Sprinkler
- Drip
  - Tape
  - Emitter
  - Low pressure
- Soaker Hose
- Flood
Check Your Flow Rate

• Measure the amount of water coming out of your spigot or valve
  – Time it takes to fill a five gallon bucket
Consumptive Use of Water

• From: “Consumptive Use of Water by Major Crops in the Southwestern United States”

• United States Dept. of Agriculture – Agricultural Research Service Conservation Research Report Number 20

https://cals.arizona.edu/crops/irrigation/consumuse/conusefinal.pdf
Cauliflower – Consumptive Water Use

SEASONAL SOIL MOISTURE DEPLETION

Depth in feet

- 0-1: 10.6" (57%)
- 1-2: 5.0" (27%)
- 2-3: 2.2" (12%)
- 3-4: 0.8" (4%)

SEASONAL USE 18.6"

SEASONAL USE IN INCHES

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NM STATE
All About Discovery!™
New Mexico State University
nmsu.edu
Cantaloupe – Consumptive Water Use

![Graph showing consumptive water use for cantaloupe](image)
Water Requirements

• Tomatoes, Eggplants, and Peppers
  – Need most water during flowering and fruiting

• Vine Crops (cucumbers, summer and winter squash, and melons)
  – Need most water during flowering and fruiting

• Carrots, Onions, Lettuce
  – Need consistent water throughout the season

• Sweet corn
  – Need the most amounts of water to produce quality crops
Vegetable Water Application

• In general, approximately 1 inch of irrigation water is applied to vegetables weekly (about $\frac{1}{2}$ inch every other day, depending on soil type and other factors)
Water Harvesting

• Gray Water: Example: Place bucket in shower to catch water while it’s heating

• Rainwater: Depending on size of collection area, even small rain events can provide helpful quantities of irrigation water
The Three Sisters

- Corn, Beans, and Squash benefit each other when planted closely together
  - Corn provides support for beans
  - Beans (legume) provide nitrogen to soil
  - Squash leaves keep weeds suppressed
Zuni Waffle Garden

• Waffles are approx. 12’ x 12’
• Each individual square is indented and surrounded by a high rim
• Sunflowers are often planted along the edges
• Allows maximum water efficiency in arid, southwest climate

Zai Holes

• Dig pits to plant seeds or transplants
• Capture water and concentrate compost
• 7 inch diameter and 3-7 inch depth
Ollas

- Unglazed clay/terracotta pots
- Dig a hole and place pot into the ground
- Plant seeds or plants within 2-5 inch radius based on olla size
- Refill every 24-72 hours

Ollas

Cultivar and Plant Selection
Low Water-Use Vegetable Crops

- Tepary Beans
- Black-eyed Peas (Cowpeas)
- Okra
- Asparagus
- Squash (some varieties)
Tepary Beans (Phaseolus acutifolius)

- From the Papago Indian phrase “t’pawi”, meaning “it’s a bean”
- Small beans in a wide variety of colors (black, white, brown, mottled)
Tepary Beans (Phaseolus acutifolius)

- Big Fields White
- Black
- Blue Speckled
- Brown Speckled
- Chihuahuan Wild Tepary
- Cocomo Brown
- Colonia Morelos Speckled
- Cuppas White
- Guanijio White
- Hopi White
- Kickapoo White
- Kitt Peak Wild Tepary
- Menagers Dam Brown
- Palute White
- Pinacate

Courtesy of Native Seed Search
Tepary Beans

- Native to the American Southwest where they’ve been a staple crop for thousands of years
- Use in a water-wise “Three Sisters Garden”
Cowpeas

- Black-eyed peas, as well as many other types
- Immature beans can be eaten like green snap beans
- Most produce long vines; allow 3-5’ between rows
Cowpeas (*Vigna unguiculata*)

- Originated in Africa
- Need little water to grow; grow poorly if watered too much
- Thrive in high heat

http://www.rareseeds.com/store/vegetables/cowpeas/
Okra (*Abelmoschus esculentus*)

- Member of the mallow family (Malvaceae), closely related to hibiscus and cotton
- Origins in northern Africa
- Grown for their immature pods
- Known for glutinous consistency (gumbo)
Okra Planting

- Okra plants prefer humidity and heat
- Well-drained, fertile soil is optimum
- Intolerant of prolonged wet soil
  - Plant in areas with good drainage
- Plant when soil is warm (> 60°F)
Okra Harvest

• Harvest pods when less than 4” (2-3” optimum); larger pods are tough & bitter
• Harvest every other day (4-6 days after flowering)
• Wear gloves & long sleeves when harvesting
Okra Cultivars

• ‘Clemson Spineless’: 56 days to harvest. Dark green, slightly grooved pods with minimal spines

• ‘Red Burgundy’ plants with green leaves, burgundy stems branches and leaf ribs
Okra Cultivars - Heirlooms

• ‘Silver Queen’ 80 days to harvest. Light, whitish-green pods

• ‘Star of David’ Thick, heavily ribbed pods

• ‘Eagle Pass’ Landrace from the Carrizo Springs and Eagle Pass, TX area
Asparagus (Asparagus officinalis)

- Tolerant of heat, drought and salinity
- Perennial; productive for many years
- Dioecious
  - male and female plants
- Modern varieties all male for higher yield
Asparagus

- Wild asparagus near the Rio Grande
Asparagus Culture

- Start from crowns
- Don’t harvest 1\textsuperscript{st} year
- Stop harvesting
  - spears are less than diameter of a pencil
- Allow ferns to develop to feed the plants
Asparagus Varieties

• Open-pollinated varieties:
  ‘Mary Washington’
  ‘Martha Washington’

• Hybrid, all-male varieties:
  ‘Jersey Giant’
  ‘Jersey Knight’
  ‘Purple Passion’
# The Cucurbits: Pumpkins, Squash and Gourds

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<thead>
<tr>
<th>Cucurbita Species</th>
<th>Pumpkins</th>
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<td><em>C. argyrosperma</em></td>
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Squash: *Cucurbita argyrosperma*

- *C. argyrosperma*: Includes ‘Cushaw’, many of the best tasting pumpkins and squash
  - Requires a long, warm growing season
  - Many are grown for their edible seeds

- *C. argyrosperma* varieties:
  - ‘Tennessee Sweet Potato’,
  - ‘Hopi Cushaw’
Squash: *Cucurbita moschata*

- *C. moschata*: Includes the butternut and “cheese pumpkins”
  - Require 1-2 week curing
  - Some varieties will hold even longer than *C. maxima*

- *C. moschata* varieties: ‘Waltham Butternut’, ‘Long Island Cheese’
‘Seminole Pumpkin’ (C. moschata)

- Cultivated by the Seminole Indians in Florida
- Large, spreading vines
- Fruit with long shelf-life

http://www.southernexposure.com
Squash: *Cucurbita maxima*

- *C. maxima*: Includes many of the winter squash
  - Many require a month storage indoors to cure
  - Some will keep for several months and may develop improved flavor
- *C. maxima* varieties: Kabocha, Buttercup, Hubbard
Red Kuri Squash (C. maxima)

• Also called ‘Baby Red Hubbard’
• Thick-skinned, orange colored, winter squash
• Delicate, chestnut-like flavor
• Drought tolerant
Summer Squash

• Zucchini (C. pepo) cultivar ‘Dark Star’ - bred for deep, penetrating roots for drought tolerance

http://www.seedsofchange.com
Drought Tolerant Cultivar Selections: Tomatoes

- **‘506 BUSH’**
  - Bright red fruit grows on strong vines that reach only about 18 inches tall.
  - Plants are drought tolerant and yield well. Determinate. 62 days.

- **‘Celebrity Tomato’**
  - Hybrid, determinate, 70 days, red, globe (8-12 ounces)
  - 1984 All-America Selections Award Winner

- **‘Punta Banda’**
  - Collected from the Punta Banda Peninsula in Baja California
  - Plants produce hundreds of red meaty, thick skinned fruits despite heat, water stress and poor soil
  - Renowned for its early maturity

[Image of tomatoes from Nativeseeds.org]
Drought Tolerant Cultivar Selection: Cucumbers

- ‘Beit Alpha Cucumber’
  - Its middle eastern heritage makes this a heat tolerant plant.
  - Beit Alpha is generally gynoecious (producing mostly female flowers) which means it starts fruiting earlier and is very productive.
  - Pick fruit when small, 6-8“
In Summary, Water-Wise Vegetable Gardens:

• Incorporate organic matter into the soil
• Deliver water slowly & directly to the roots
• Cover bare ground with mulch
• Eliminate weeds
• Modify the growing environment through wind breaks and shading
In Summary, Water-Wise Vegetable Gardens:

• Consider drought tolerant vegetables
• Select proper irrigation system
• Pay attention to plants’ current needs—don’t under- or over-water
• Each garden is unique; consider your situation & plan accordingly
Thank You

- Questions?

icalsoya@nmsu.edu
PlantShare

Sunday, April 9th, 2017
12:00 – 3:00 or until plants are gone
Community Garden at Spruce & San Pedro

Seedlings - Cuttings
Xeriscape Plants

Collect seeds and plants for your garden. Meet other local growers.

This is a free community event. You are not required to bring anything, but if you have some extra seeds, seedlings, bulbs, or cuttings, please bring some to share.

SeedShare Las Cruces
## SeedShare

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**Plant Care Tips:**
- **Artichokes:** Seed in January, February, March.
- **Beans:** Bush/pole and seed in April, May.
- **Beans, Fava:** Seed in April.
- **Beans, Lima:** Bush/pole and seed in April.
- **Beets:** Seed in April.
- **Broccoli:** Start transplanting in March.
- **Brussels Sprouts:** Seed in April.
- **Buckwheat:** Seed in May.
- **Cabbage:** Seed in April.
- **Cabbage, Chinese:** Seed in April.
- **Carrots:** Seed in May.
- **Cauliflower:** Seed in April.
- **Chard:** Seed in April.
- **Chiles/Peppers:** Start transplanting in April.
- **Clover:** Seed in May.
- **Collards:** Seed in May.
- **Corn:** Seed in May.
- **Corn Salad/Mache:** Seed in May.
- **Cucumbers:** Seed in May.
- **Eggplant:** Seed in May.
- **Garlic:** Bulbs in June.
- **Kale:** Seed in May.
- **Kohlrabi:** Seed in May.
- **Leeks:** Seed in May.
- **Lettuce:** Seed in April.
- **Melons:** Seed in May.
- **Mustard:** Seed in May.
- **Okra:** Seed in May.
- **Onions:** Spring variety in April, Fall variety in September.
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Last frost for Las Cruces area usually occurs April 1st - 20th. First fall frost usually occurs early October - early November.

Thank you NMSU, Cooperative Extension Service, SeedShare participants, and Darrol Shillingburg for your contributions. Send comments: jonsimmons@hotmail.com

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