AZ1435

10 STEPS TO A VEGETABLE GARDEN

By Pam Perry
Master Gardener
“A garden’s productivity is proportional to the gardener’s generosity!”
We can plant and harvest something fresh to eat every day of every month here in the low desert!
Mission statement for U of A Maricopa County Master Gardeners:

“To teach people to select, place, and care for plants in an environmentally responsible manner based on research specific to the low desert.”
Resources

• University of California Master Gardener Manual
• http://extension.arizona.edu/maricopa/
  – University of Arizona Master Gardener Manual—on line
  – AZ 1005 Veg planting calendar
  – AZ1435 10 steps to a vegetable garden
• Desert Gardening by George Brookbank
Books from Master Gardener Press

Desert Gardening for Beginners

Earth-Friendly Desert Gardening

How to Grow Vegetables, Flowers and Herbs in an Arid Climate
STEP 1
SELECT A GOOD LOCATION

We can make shade, but not sunlight

• 6-8 hours of sun light
• Morning sun is best
• The sun moves: gardens are possibly sunny in some seasons, but not others
  – Changes angles
  – And intensity!
Why in the sun? It is so hot here!

- Photosynthesis turns water and nutrients into growth
- No sun
  - no photosynthesis
  - no growth
  - no produce
When is enough sun enough?

• Enough
  – Bushy, vigorous plants
  – Good, deep green color
  – Reach maturity in a timely fashion
  – Grow, flower, fruit
• Not enough
  – Plants are leggy, stretchy, not vigorous, pale
  – Slow to mature
  – Few flowers
  – Fewer beans, tomatoes, cucumbers...
A good location is

- Near a water source
- Easy to access
  - Hauling soil amendments in
  - Produce out!
  - Composting
  - Tools and equipment near by
STEP 2
PLAN YOUR GARDEN LAYOUT

• Determine the garden configuration
  – Raised beds
  – Containers
  – On the ground
  – A mix of some or all of the above
  – Integrated into the landscape

• Start small, but allow for room to expand
Characteristics of raised beds

- Heat up more quickly than in-ground beds
- Dry out more quickly than in-ground beds
- If possible have raised bed irrigation separate from in ground or containers
Containers can be pretty!
Container gardening

• At least 1 foot deep, 18-24 inches across
• On wheels if possible
• Well drained
• Near water source
• Choose a soil mix specific for container vegetable gardening
Traditional: at ground level

- Traditional ‘victory’ garden rectangle with rows and paths
- Make the paths permanent
  - Mulch them well
- Dig and amend planting rows only
- Irrigate planting rows only
- Rows and furrows
- Or lower than surrounding soil: irrigated by flooding whole garden
Determine what to plant

• Make a list of crops you want to grow
  – Choose food you like to eat
  – Choose veggies that are so expensive you will not buy them
  – Choose crops you are curious about!
  – Choose produce that is really great only if eaten fresh
Research and Select Varieties Use Seed Catalogs or Seed Packets

• Compare characteristics of several varieties
• Recognize which will make better spring or fall crops
• Be suited to the space available to your garden
• Disease and pest resistance
Determine When to Plant

- Refer to the *Planting Calendar AZ1005, AZ1425*
- Select from your list crops recommended for the month you are planting in, real time
- Start your layout
  - Note planting dates, days to maturity
  - Special characteristics, spacing
- Seed catalogues have interactive planning programs, fun to play with, useful!
Select varities appropriate to the seasons, soil, and space available

- **1st SEASON: Fall**
  - Begins Sept/Oct
  - Green and leafy
  - Days get shorter: cooler, frost possible
  - Winter dormancy in Dec/Jan
- Select cool tolerant, short day to maturity varieties
2nd SEASON
Winter/early spring

- Days get longer after solstice, nights shorter
- Temperatures warm
- Soils get warmer
- Feb 14 frost date
- Early fall plantings mature for harvest
• Plant “summer” garden beginning late February
  – Tomatoes, summer/winter squash, peppers, beans
  – Days get warmer, nights shorter
  – Plant heat tolerant green/leafy crops
3rd SEASON: Summer
Our long, hot season

- Tropical, sub-tropical, Mediterranean crops do well
  - Native beans, black eye peas, lima, and yard long beans
  - Melons, lots of melons, gourds
  - Armenian cucumbers
  - Eggplants, okra, basil
  - Sweet potatoes
MONSOON

- Not summer, not fall, just hot... Plant fall crops
  - Beans, corn, short season melons, cucumbers, short season tomatoes
  - Summer squash and short season pumpkins or winter squash
STEP 3
GROW RECOMMENDED VARIETIES

• Seasonally adapted:
  – Warm season = heat tolerant
  – Cool season = cool or cold tolerant
• Daylight neutral
• Short or long season to maturity
• Pest and disease resistance
• AAS- All America Selections
• Local seed sources
  – nativeseedsearch.com
  – Local nurseries and garden centers
Learn about vegetable varieties

- Local nurseries and garden centers
- Seed catalogues
  - Hard copy
  - On-line
- Local farmers’ markets
- Books
- Classes
- Gardening magazines
STEP 4

SEED/PLANTS
EQUIPMENT/SUPPLIES

• SEEDS
  – Fresh-check expiration date
  – From a reliable source
  – Can be stored in a cool dry place
  – Do a germination test
  – Organic, heirloom, hybrids
- Pest free—buy from a reputable source
- Healthy root ball just filling the container
- Good proportion of plant to root
- Plant intact, dark green
TOOLS AND EQUIPMENT

• Hoe, spade or shovel, spading fork
garden rake, trowel, to work the soil
• Pitchfork for composting
• Measuring stick, planting string
• Hoses, nozzles, and watering cans
• Shade and frost cloth, supports
• Gloves, hats, sunscreen, shoes
• Wheelbarrow
FERTILIZERS: Guaranteed Analysis

- Arithmetically described – 21-0-0, 16-20-0.
- Powder
- Granular
- Liquid concentrate
- Water soluble
FERTILIZERS

• Macro nutrients N-P-K
  – Nitrogen - green and leafy, volatile,
  – Phosphorous - flowers, roots
  – Potassium - fruits, flowering, stems

• Store in a cool, dry place, sealed and labeled

• Synthetic or 'organic'
Organic

- Animal or vegetative based
  - urea
  - blood meal
  - bone meal
  - worm castings
  - seaweed
  - compost
Micronutrients----17 elements needed for growth

• Valley soils test well for most micronutrients
• If soil is lacking specific micronutrients apply and work into soils, after soil tests confirm the need
Why Fertilize?

• To supplement nutrients in short supply or depleted by repeated crops
• To provide extra nutrients when plants require them
• To make nutrients more available in our alkaline soils
• To compensate for climatic conditions which inhibit nutrient absorption
HERBICIDES AND PESTICIDES

- Fresh-short shelf life
- Buy in smaller amounts
- Keep in a clearly labeled, sealed container
- Store under lock and key
- Read and follow **ALL** directions for use
- These are toxic, they mean to kill something after all!
Vegetables are not desert adapted plants!

- Soil properties
  - Physical
  - Chemical
  - Biological
• Role of soil
  – Provide water and nutrients necessary for growth
  – Provide a stable place for plants to grow
Low Desert Soils
Physical properties
Soil texture

• The relative amounts of different size particles
• Product of eons of erosion-mineral rich
• Eroded mountain, not really soil at all
• Superfine particles-clay
  – Bonds well, become almost impermeable
• Heavy
• Hard to get wet
Soil structure
Grouping of soil particles

• We protect soil structure - never work oversaturated soil

• We accommodate non desert adapted plants by changing soil structure
  – With soil organic soil amendments
  – By cultivating
  – Mulching with materials that decompose
Chemical characteristics of desert soil

- Alkaline
- 19 nutrients
- Underlaid with layers of calcium carbonate: caliches
- They are not yet eroded mountain
Missing Links in Desert Soils: the biology

Remember: we are talking about Vegetable gardens

- Organic material
- Living organisms
  - Single celled organisms
  - insects, worms, etc...
Living organisms

- Continue the decomposition process
- Improve nutrient availability
- Keep soil aerated
- Can be engaged in symbiotic relationships with plants.

New soil delivered from commercial source may not have many of these critters
Soil Preparation: A Transition 'Desert soil' to 'Garden soil'

1. Physical manipulation of soil
   - Tilling, spading, digging
2. Add "soil amendments"
   - Stuff we put into the soil
3. Compensatory measures
   - Raised beds, irrigation, mulches
Soil Amendments: things we add to the soil

- Compost
- Manures
- Minerals
- Fertilizers
- Inoculants
- Living organisms
  - Single celled
  - Worms
  - Insects
What is Compost?

• Decomposing organic materials:
  • When we talk about vegetable garden soil preparation we are talking about adding vegetative matter
  • Anything that was once living with roots, leaves and stems; not faces
Where does compost come from?

• Homemade
  – Kitchen scraps
  – Garden plants
  – Yard trimmings
  – Available manures from plant eating animals....
Commercial

- Nurseries, garden centers, retail operations
  - Google or use yellow pages under 'landscape materials'
  - Bagged or bulk
Manures
Digestion is a composting process

- Herbivores are the manure source
- The composting process begins in the digestive track of the animal
- Different animal manures have different properties and nutrient values
• Manure can be applied directly to the garden
• Can be composted on its own
• Added to a compost pile
• Is *not* necessary to add manure to a garden or a compost pile to have success
• Horse
  – Horses are inefficient digesters
  – Often contains weed seed; learn to recognize seedlings
  – Can be added to garden or composted
Dairy or steer manure

- Not so high in salts
- Available in bags or at farm sources
- Urea or nitrogen content is secondary to organic components without a guaranteed analysis
• **Chicken and other poultry**
  – High in nitrogen
  – Allow soil to rest after incorporating
  – Do not use in the same volume as other manures
  – A good addition to compost high in carbon material
Sheep, goat, rabbit, llama manure
- Not high in nitrogen
- Without additional bedding matter can be added directly to garden
- If mixed with bedding material composting is preferred before use
Green manure: a crop grown

- To break up heavy soil
- To increase nitrogen in the soil
- To hold moisture
- To prevent erosion
- To control pests/disease

• Cultivated or turned under before the crop matures and allowed to decompose
Other Amendments and Chemicals

- Soil sulfur - to mitigate alkalinity
- Gypsum - counteract excessive salt build up AZ1413
- Inoculants for legumes
Do not use as soil amendments

• Peat moss
  – no nutrients
  – hard to re-wet
  – often used in potting soils

• Lime
  – A common east coast component NEVER recommended for soils in the desert!
  – Wood ashes or ashes from bar-b-que or fireplace
• Sand
  – Suggested to improve drainage

Remember: Adding sand to clay gives us adobe or concrete

Alternative: pumice— a volcanic rock that helps change physical soil structure
Garden preparation

• Add 3-6 inches of organic materials
• Add fertilizer at recommended rate
• Add other minerals as needed
• Did the garden to the depth of 15-18 inches to integrate all this
• Rake level, remove debris, irrigate, and plant
STEP 6
Planting Vegetables Properly

- Seeds
- Transplants
- Sets
- Roots
- Cloves
Planting seeds

• Benefits
  – Greater choice of varieties
  – Ease in successive plantings
  – Seeds are *magic*
  – Costs are different
Other considerations

– Irrigating sufficient to germinate and maintain young seedlings
– Protecting young seedlings from predation
– Having to decide among all-l-l-l-l those choices
– Storing seed: cool dry place in airtight containers
Plant from seed

• Root vegetables
  – Beets, carrots, parsnips, radishes, turnips

• Easy to grow
  – Lettuce, spinach, kales and other greens, sunflowers, zinnias and cosmos

• ‘Big seed’
  – Beans, peas, corn, squash, melons, gourds, cukes
• Label each row
• Follow suggested distance between rows to allow for growth
• Space seed as package recommends
• Tamp soil gently over seed to insure good seed / soil contact
• Follow guidelines for depth
  – Seed requiring 1/8th inch soil will need light to germinate, too much = burying the seed, not planting it
Transplants

• Transplants are plants grown in containers to be transplanted into the garden

• Some plants need 6-8 weeks head start to bear a crop
  - Tomatoes, eggplants, sweet potatoes, peppers, broccoli, cauliflower, cabbage, Brussels sprouts...
Plant seeds or transplants?

• Down side of purchased transplants
  – Restricted to varieties available
  – Plants may not be optimal for planting
  – Plants may not be available at optimal time for planting
• The benefits of using transplants
  – Quicker to see ‘the garden’
  – 3-8 weeks quicker to harvest
  – No uncertainty about germination
Handling young plants

• Never damage the stem: Xylem and phloem conduit
  – there is only the one
  – you can do irreparable harm

• Always handle young plants and seedlings by leaves or roots
  – the plant has the capacity to grow more
Planting suggestions

• All soil prep should be finished
• Prior to planting, water plants well
• Plant in the evening or on a cloudy day
• Dig a planting hole the depth of the root ball
• Gently remove the plant from container and set into hole
• Backfill to cover root ball
  – plant level with the soil
• **Gently** firm soil around the root ball
• Use a starter fertilizer 1—50-10
• Fiber or peat pots: Remove exposed rims and break apart
• Protect newly planted plants from pests, sun, wind, or cold
The planting rule: “Always plant level with the soil”

Tomatoes: the exception to “the rule”

• Tomatoes grow roots along their stems
• Bury the stem leaving a few inches of plant above ground
Spacing your crops

Seed Packets

- Follow spacing directions indicated on packages and labels
- Thin plants as directed, allowing proper room for healthy, productive growth
- If using old seed, plant extra seeds, but thin after germination to proper spacing
  - *Cut* weak or extra sprouts away
Rotate your crops:
Vegetable plant families
beans-leaves-roots-fruits

- **Leguminosae**
  - Peas, beans, peanuts
- **Compositacae**
  - Sunflowers
  - Endive and lettuce
• Chenopodiaceae
  – Beets, chard, spinach, amaranth

• Amaryllidaceae
  – Leeks, onions, garlic, shallots

• Cruciferae
  – Cabbage, kale, broccoli, collards, cauliflower
• **Solanaceae**
  – Tomato, potato, pepper, eggplant, tomatillo

• **Cucurbitaceae**
  – Cucumbers, Armenian cucumbers, muskmelons, watermelons, squashes, pumpkins and gourds
“Sets, Cloves, and Crowns”

- **Onion “sets”**—young onion plants that have been dug, cleaned, packaged, and sold to be replanted.

- **Cloves**—garlic and shallots
  - A whole garlic is comprised of several parts called cloves.
  - Each is planted individually, pointy end up, a couple inches deep
  - Fat cloves grow fat garlic, shallots
• Crowns—often perennial plants
  – Asparagus, rhubarb, horseradish
  – Plants with several years growth that are dug for replanting in a different place
Grow your own transplants

- Use seed starting mix, sterile containers with bottom drainage
- Start 6-8 weeks before planting date
- Follow directions on the seed envelope
- Label everything
- Bottom water seed trays to keep soil moist
- Use a dilute fertilizer once a week when true leaves appear
- Provide enough light
“Gardening in the west is easy. All you have to do is make the soil, and make the water.”

Eleanor Welshom
Irrigation Information

- Books
- Arizona Municipal Water Users Association
  - Smartscape
- City water departments
- Cooperative Extension
  - Inspect several options in garden
- Desert Botanical Garden
Irrigation criteria
Design a system with flexibility

• Accommodate additional beds
• Seasonal needs
• Run a line to the compost pile.
  • Things in the desert petrify they do not putrefy.
• Spigot and a hose
  – use to water transplants, special needs plants
  – washing insect pests
  – mixing liquid fertilizers
  – washing veggies, hands, tools, etc.
• Sub system to apply a mist or spray for newly seeded areas or new transplants
• A watering can
• A reliable timer that you understand and can adjust to the seasons
What Sort of System?

• Apply water at the soil level
  – Inline drip
  – Soaker hoses
  – Emitters
  – Laser tube
  – Furrows

• Shrub sprays
How often do I water?

- 1 gal. of water wets 1 cubic foot of soil
- Vegetable plants need higher soil saturation than desert adapted plants
- Plants use more water on long, hot, dry, windy days than short, overcast, rainy, cool days
- Mature, bearing plants use more water than seedlings
- Transplants have their own needs...
- Learn how long to run water to achieve desired depths, adjust frequency not length of run time
• Container gardens and raised beds have different needs than ground level gardens

• Soil type impacts the rate of water applied and the frequency of applications.
  – sandy
  – gravelly
  – mostly clay
STEP 8
Mulches and Mulching

- A mulch is something that is used to cover the soil between plants or rows
- Organic or inorganic
- Permanent, temporary
- Can be rock, carpet, compost, hay, straw, chips, newspaper, commercial compost.....
Mulches in Summer

• Moderate soil surface temperatures
• Help prevent evaporation
• Help to prevent a crust from forming on the soil surface
• Keep many weeds from germinating
• Can protect tender crops from insects, pests and rot
Mulches in Winter

- Can slow soil warming as spring progresses
- May provide home for unwanted insect pests
- Prevent weeds from germinating
Which Mulch, Where?

• Use compost where you will want to dig it in after harvesting a crop
• Use straw/pine needles to protect melons/tomatoes from soil contact
• Use a more permanent type for paths chipper chips, rock, carpet...
Weeds

- Compete for water and nutrients
- Can shade less aggressive, valued plants
- Host insect pests
- Remove them small before they flower and make seed!
- Are a rich nitrogen source when added to a compost pile, before they seed
Control

Use least toxic methods first!

• Identify the plant
• Mulch: weed seed needs light to germinate
• Mechanical removal—pulling or hoeing young and tender
  – add to compost!
• Applications of herbicides
  – not all pesticides work on all plants
  – pre emergent vs. post emergent
STEP 9
BE PREPARED FOR PESTS AND PROBLEMS

Know thy enemy!
A-biotic or biotic????

• 2, 4, 6, or 8 legged critters
• Wind, climate, soils, irrigation
A-biotic damage

- Wind, sun, salt, irrigation, frost, rain or hail as well as nutrient challenges, age
  - Browning edges
  - Irrigation
  - Wilting
  - Poor growth
  - Leaf color changes
  - Sunburn
  - Spotting
Insects/IPM: Know the enemy

- Always identify insects before treating
- Few insects are pests
- Pests are attracted to stressed plants
Prevent Stress
Follow good cultural practices

• Do soil preparation
• Follow spacing suggestions
• Select resistant varieties
• Rotate crops
• Irrigate and fertilize as needed
• Plant plants that host beneficial insects
Use least toxic means of control first!

- Mechanical controls
  - Use row covers, screens, mulch
  - Hand pick eggs and adults
  - Wash plants vigorously
  - Remove damaged or diseased plants,
  - Eliminate host plants (weeds)
- Control insects at optimum time in life cycle
• Weeds host unwelcome pests
• Use least toxic pesticides first and only as a last resort
  – follow all directions
• Plants can withstand some predation and produce well
2 or 4 legged pests

- Build walls, erect fences
- Use hardware cloth as under layer for beds
- Use netting or light shade cloth for tenting threatened plants
STEP 10: HARVEST AT PEAK QUALITY!

- Do not use grocery store produce as the gage to judge your crop
- Refer to the days to maturity notes on seed packet!
- Young and tender and often!
- Repeated harvest will encourage many veggies to set more fruits
Ah-h-h-h technology!

• Check seed catalogue sites and cooperative extension offerings for harvesting tips and videos
Storing and curing

- Handle your crop carefully
- Refrigerate after harvest
- Cure garlic, shallots, onions, sweet potatoes
- Store non perishables in cool, dry, dark locations
- Share the bounty! Ampleharvest.org
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