**Watering**

[www.usbr.gov/pn/agrimet/chart/hrmoch.txt](http://www.usbr.gov/pn/agrimet/chart/hrmoch.txt)

**ESTIMATED CROP WATER USE - MAR 9, 2011 HRMO**

<table>
<thead>
<tr>
<th>CROP START DATE</th>
<th>PENMAN ET</th>
<th>MAR</th>
<th>DAILY FORECAST</th>
<th>TERM SUM</th>
<th>DAILY USE</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>6</td>
<td>7</td>
<td>8</td>
<td>0.07</td>
<td>0.07</td>
</tr>
<tr>
<td></td>
<td>0.08</td>
<td></td>
<td></td>
<td>0.08</td>
<td>215</td>
</tr>
</tbody>
</table>

Etr 215

- **sandy loam:** 1.75"/foot available, water at 40% depletion
  - so (2' depth)(1.75"/ft)(0.4) = 1.4" daily use = 0.4", water every 3 days
daily use = 0.25", water every 5-6 days

- **silt loam:** 2.5"/foot available, water at 40% depletion
  - so (2' depth)(2.5"/ft)(0.4) = 2.0" daily use = 0.4", water every 5 days
daily use = 0.25", water every 8 days
Watering

Heavier soils hold more water, so water less frequently?
But slower infiltration rate, so if surface run-off or puddling, water more often, applying less water/irrigation
Most common irrigation method: overhead sprinkler
Wind drift
Most efficient irrigation method: drip
Conserves water & energy
Dry row middles (easier to work & reduced weeds)
Dry foliage (less disease, increased efficacy of applied pesticides)
Water & fertilizer under mulch

Crop rooting depths w/ ideal conditions
Reduce w/shallow soils, hardpans, transplants (no tap root)
1-2": broccoli, cabbage, celery, sweet corn, potato, onion, radish, sweet corn
1-4": beans, carrots, cucumber, eggplant, peas, pepper, summer squash
1-6": asparagus, cantaloupe, pumpkin, tomato, watermelon

Other methods: soaker hose
Uneven watering w/ longer hose
Other methods: furrow or flood
Very inefficient
Uneven watering w/ longer rows
Measurement:
Sprinkler: tuna can
Others: trowel or shovel after irrigating
Depth by crop rooting, size

Avoid
Frequent shallow watering, except seedlings
Promotes shallow root depth
Overwatering
“Drowns” roots (no oxygen)
Leaches nutrients
Delaying watering until plants are stressed
dark bluish green or wilting
Once stressed, never fully recover

Common Problems Frequently Observed

Sunscald
Poor pollination
Radial & Concentric Cracking
Symptoms of tomato late blight on foliage and fruit:

A. Brown, water-soaked lesion on leaf surface.
B. Brown lesion with white sporulation on leaf underside.
C. Brown, sporulating lesion on stem.
D. Plum tomatoes with dead foliage.
E. Brown, firm lesions on 'Roma' tomato fruit.
F. Sporulating lesion on shoulders of a ripening fruit.

Beet Curlytop Virus
COMPANION PLANTING CHART FOR HOME & MARKET GARDENING (compiled from traditional literature on companion planting)

CROP COMPANIONS INCOMPATIBLE
Asparagus Tomato, Parsley, Basil
Beans Most Vegetables & Herbs
Beans, Bush Irish Potato, Cucumber, Corn, Strawberry, Celery, Summer Savory Onion
Beans, Pole Corn, Summer Savory, Radish Onion, Beets, Kohlrabi, Sunflower

Cabbage Family Aromatic Herbs, Celery, Beets, Onion Family, Chamomile, Spinach, Chard Dill, Strawberries, Pole Beans, Tomato

Carrots English Pea, Lettuce, Rosemary, Onion Family, Sage, Tomato Dill

Celery Onion & Cabbage Families, Tomato, Bush Beans, Nasturtium

Corn Irish Potato, Beans, English Pea, Pumpkin, Cucumber, Squash Tomato

Cucumber Beans, Corn, English Pea, Sunflowers, Radish Irish Potato, Aromatic Herbs

Organic Matter & Soil:
Improves the soil’s physical condition.
Improves soil "tilth" (the soil’s ability to resist compaction).
Increases water infiltration/retention, decrease erosion.
Supplies/retains plant nutrients (CEC).
Increased microbiological activity.

Building Soil Organic Matter:
Compost: intentionally decomposed plant and animal remains; rich earthy smell, dark brown and crumbly. Use to enrich soil, as top-dress/mulch, in making planting mixes. Moderate N level, good balance of all plant nutrients.
Manure: un-decomposed animal manure; may be easily available; give it time to decompose in soil; salt buildup potential. Higher N level.

Building Soil Organic Matter:
Green manure: crop (often legume) grown to be returned to soil; adds bulk carbon, may add nitrogen; feeds soil ecosystem; least loss.
Leaves, grass clippings, etc. can have a place but be aware of limitations (high carbon, matting, etc.).

Compost:
Requires right mix of dry (brown) and fresh (green or manure) materials; C:N between 25:1 and 35:1.
Blend equal parts by volume of grass clippings with dry leaves and shredded twigs or branches. Urea fertilizer or other nitrogen source can be used in place of green vegetation if necessary.
- 1 lb. urea to 1 cubic yd. leaves.
- 6 lb. urea to 1 cubic yd. wood chips.
- Collected urine from healthy people can also be used.
Compost - organic

- Or mix 5 parts leaves to 1 part manure.
- Or add dried blood meal, alfalfa meal at the rate of 2 cups to a wheelbarrow load of brown leaves or other carbon rich wastes such as shredded paper.

Nitrogen (N): blood meal, fish emulsion, manure tea, alfalfa mulch (slow release).
Phosphorus (P): bone meal, rock phosphate; at high pH may become unavailable – mix 50:50 with elemental sulfur at application.
Potassium (K): greensand (+ micronutrients)
Humic and fulvic acids (benefits?).

Carbon to nitrogen (C/N) ratios

<table>
<thead>
<tr>
<th>Waste</th>
<th>C/N Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kitchen wastes</td>
<td>15 to 1</td>
</tr>
<tr>
<td>Grass clippings</td>
<td>19 to 1</td>
</tr>
<tr>
<td>Cornstalls</td>
<td>60 to 1</td>
</tr>
<tr>
<td>Leaves and straw</td>
<td>80 to 1</td>
</tr>
<tr>
<td>Paper</td>
<td>170 to 1</td>
</tr>
<tr>
<td>Sawdust</td>
<td>500 to 1</td>
</tr>
</tbody>
</table>

Compost

Pile should be at least 3x3x3 to heat up properly (135°F).
Restrict size of the pile to no more than 5 ft. high and 5 ft. wide. 4x4 makes an ideal size. Any length will do. Or make additional piles.
Turn after temperature comes down.
Provide adequate ventilation by turning the pile frequently or by venting.
Use a multiple bin system for easy turning.

Acceptable
Grass clippings
Leaves and Weeds
Manures
Coffee Grounds
Wood Chips, Sawdust
Bark, Stems, Stalks
Garden & Canning Waste
Fruit & Vegetables

Not Acceptable
Meats
Bones
Large Branches unless chipped
Synthetic Products
Plastics
Pet or Human Solid
Wastes
### Common Compost Problems*

<table>
<thead>
<tr>
<th>Problem</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet, foul-smelling pile.</td>
<td>Turn pile, add high-carbon material.</td>
</tr>
<tr>
<td>Dry center and little or no decomposition of materials.</td>
<td>Turn pile, soak thoroughly; cover with plastic to retain moisture.</td>
</tr>
<tr>
<td>Dampness and warmth only in middle.</td>
<td>Increase volume of pile and maintain moist.</td>
</tr>
<tr>
<td>Damp, sweet-smelling but no heat</td>
<td>Add nitrogen-rich materials, turn.</td>
</tr>
<tr>
<td>Matted, un-decomposed layers of leaves, paper or grass clippings</td>
<td>Break up layers, or shred, re-layer pile; avoid adding these materials in heavy layers.</td>
</tr>
</tbody>
</table>

*Taken from *The Rodale Book of Composting*
**Mulch:**
Any material used to protect the roots from heat, cold, or drought, or to keep the fruit clean.

**Molsh:**
Old English for "Soft and Rotten"

**Advantages:**
- Weed Control
- Modify Soil Temperature
- Moisture Conservation
- Reduce Compaction, Erosion, Leaching
- Ease Operations
Results:
- Increase Yield
- Improve Quality
- Reduce or Increase Inputs
- Increase Returns
- Improve Profits

Categories:
- Organic
- Synthetic

Organic Mulches:
- Straw
- Leaves
- Compost
- Sawdust
- Paper
- Bark
Advantages of Organic Mulches:
- Weed Control
- Moisture Conservation
- Cool Soil
- Ease Operations
- Add Organic Matter
- Reduce Disease

Disadvantages:
- Weed Source
- Harbor Insects
- Increase Disease
- Cool Soil
- Extra Fertilizer
- Phytotoxic

Synthetic Mulches:
- Plastic
- Latex
- Asphalt
- Foil
Advantages of Synthetic Mulches:

- Weed Control
- Moisture Conservation
- Moderate Soil Temperature
  Cool (white, white-on-black)
  Warm (black, clear, IRT)
- Reduce Disease

Disadvantages:

- Removal
- Disposal
- Specialized Equipment
  Applicator
  Seeder
  Lifter/baler
Degradable Synthetic Mulches:

- polyethylene (photo)
- starch (bio)
- asphalt (bio)
- latex (photo/bio)
Non-Degradable Synthetic Mulches:

polyethylene
- black, clear, white
- wave-length selective (IRT, Polyone, Al-OR) - green, brown
Row Covers:
- increase soil and air temperatures
- frost protection
- insect exclusion
- wind protection
- moisture conservation

Results:
- increased earliness
- higher early yield
- higher total yield
- improved quality

Row Cover Materials:
- extruded polypropylene
  (Agronet)
- spunbonded polypropylene
  (Agryl, Gromax, Kimberly Farms, Lutrasil)
- spunbonded polyester
  (Reemay)
- perforated polyethylene
  (Linktuf, Vispore)
Management:

- pest control
  - weeds
  - insects
- venting
  - >85°F → flower drop
- wind
  - edges anchored
  - hoops properly spaced