Growing Hops
Seasonal Practices, Agronomics, and Sustainability

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Critical Tasks

CRITICAL TASKS
- Propagation and Planting
- Pruning
- Twining
- Training
- Growth/Bloom
- Harvest

ONGOING TASKS
- Fertility
- Disease Management
- Pest Management
## Critical Tasks – Propagation/Planting

<table>
<thead>
<tr>
<th>CRITICAL TASKS</th>
<th>TIMING</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Propagation and Planting</td>
<td>---Mid February</td>
</tr>
<tr>
<td>• Fertilizer</td>
<td>• Before sprouting</td>
</tr>
<tr>
<td>• Pruning</td>
<td>• Roots Kept Cold</td>
</tr>
<tr>
<td>• Twining</td>
<td>• 2-8 per hill</td>
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<tr>
<td>• Training</td>
<td>• Potted Plants = Alternative</td>
</tr>
<tr>
<td>• Growth/Bloom</td>
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<tr>
<td>• Harvest</td>
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</table>
Propagation and Planting

- **Dig rhizomes**
  - Mid February

- **Plant rhizomes**
  - Mid March

- **Make potted plants**
  - Mid March

- **Plant potted plants**
  - Early May

- **Harvest**
  - As ground thaws
  - Before roots sprout too much
  - Keep in cold storage

- **Plant**
  - As ground becomes workable

- **Pots**
  - Greenhouse/hoop-house optional

- **Potted plants**
  - Allow more flexibility
Dig Rhizomes

- Quantities = variety dependent
- 1,200 / person / day is about average
- Piece rate pay
- 4 week window
**Good Rhizomes**

- Thick
- Lots of ‘eyes’
- Not too sprouted
- Hill up to generate future rhizomes

**Hop Hill**

- Rhizomes
- Crown, Deep Roots, Feeder Roots
Propagation and Planting

- Dig rhizomes
- Plant rhizomes
- Make potted plants
- Plant potted plants

- When conditions are favorable
- Ground worked
  - Good “seedbed”
  - Rotovator is best
- 2-8 per hill
  - Eyes UP!
Propagation and Planting

- Dig rhizomes
- Plant rhizomes
- Make potted plants
- Plant potted plants

- March-April
  - Enough time to grow and fill the pot before planting (4+ weeks)
  - After threat of prolonged frost/freezing temps
- 0.5qt - 2qt pots
- Potting soil or field soil
- Very labor intensive
- As little as 1 ‘eye’ per pot
- Make an extra 10%
- Labor intensive
- Fastest way to expand acreage
Propagation and Planting

- Dig rhizomes
- Plant rhizomes
- Make potted plants
- Plant potted plants

- Much later
  - May+
- Allows flexibility
  - Finish Trellis
  - Finish irrigation system
  - Not enough rhizomes
  - True to type
- Yields generally similar
- More difficult
  - More labor, management, than planting rhizomes
Other Tasks

- Fertility
- Trellis
- Construction/Repair
- Gather supplies and labor
Other Tasks

- Fertility
- Trellis
- Construction/Repair
- Gather supplies and labor
Critical Tasks - Pruning

CRITICAL TASKS

- Propagation and Planting
- **Pruning**
  - Trellis Repair, Fertilizer, Scheduling
- Twining
- Training
- Growth/Bloom
- Harvest

TIMING

--- Emergence to Training

- March – April
- Prior to twining!
Pruning

- **Schedule**
  - Early

- **Mechanical**

- **Chemical**

- **Multiple Prunings?**
  - May be needed
Pruning

- Schedule
- Mechanical
- Chemical
- Multiple Prunings?

- Schedule early
- Work back from desired date-to-wire, then training date
- 28-30 days from prune to train
- Critical to success
Pruning

- Schedule
- Mechanical
- Chemical
- Multiple Prunings?
- Slower
- More thorough
- Weed issues
  - Removes weeds
  - Spreads seed
  - Creates seedbed
- Equipment requirements
- First pass if multiple prunings needed
- Can get results with mower
Pruning

- Schedule
- Mechanical
- Chemical
- Multiple Prunings?
- Herbicides
  - AIM, 2,4-D
  - Can mix others for grass control
- Fast
- Coverage issues
  - Too much biomass
- Weather issues
Pruning

- Schedule
- Mechanical
- Chemical
- Certain varieties/years
- Mow-Mechanical-Chemical
- Multiple Prunings?
Other Tasks

- Finish Dry Fertilizer
- Finish Trellis repair
- Twining
- Training Labor
- Planting
### Critical Tasks - Twining

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<tr>
<td>Propagation and Planting</td>
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<tr>
<td>Pruning</td>
<td>April</td>
</tr>
<tr>
<td>Twining</td>
<td>Scheduling</td>
</tr>
<tr>
<td>Trellis repair, fertilizer, pruning, training</td>
<td></td>
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<tr>
<td>Training</td>
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<td>Growth/Bloom</td>
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<td>Harvest</td>
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Twining

- Schedule

- Twine

- Finish pre-twine tasks
  - Cultivation
  - Mowing
  - Mechanical Prune
  - Trellis Repair
  - Wire Spacing
  - Cover crop seeding

- Based on training date
Twining

- Schedule

- Twine options
  - Coir (85#/100#)
  - Paper

- Skilled labor
  - Labor intensive
  - Takes practice
  - Up to 15+ acres/day

- Anchor
  - Steel ‘W’ clips
Twining

Other Tasks

- Finish Fertilizer
- Cultivation
- Training
- Planting
- Irrigation Repair
Critical Tasks - Training

CRITICAL TASKS

- Propagation and Planting
- Pruning
- Twining
- Training
  - Fertility, IPM, pest management, TIMING
- Growth/Bloom
- Harvest

TIMING

--- Depends on variety

- Rule of Thumb
  - Early harvest – earlier training
  - Less vigor – earlier training
  - ***not always
- Trial and error
- Seasonal differences

Rule of Thumb:
- Early harvest – earlier training
- Less vigor – earlier training
- ***not always

--- Depends on variety

Trial and error

Seasonal differences
Training

- Schedule/Plan
- First Training
- Second Training

- Timing
- Number of shoots
  - Depends on variety
  - 2-4 shoots per string

- Need to tear down?
  - Reset the schedule
  - Things are ahead
  - Vigorous varieties

- Labor
- Weather/Wind
Training

- Schedule/Plan
- Timing is critical
  - First > Second Train
- First Training
- Second Training
Training

- Schedule/Plan
- First Training
- Second Training
- Re-train
  - Bines that fell off
  - Poor first pass
  - Ensure you have proper number of shoots trained
- 1-2 weeks after first training
- Make first training a priority
Critical Tasks - Growth

CRITICAL TASKS

- Propagation and Planting
- Pruning
- Twining
- Training
- Growth/Bloom
  - IPM and Fertility Management
- Harvest

TIMING

--- Training → Harvest
(May – September)
Growth

- Fertility
- IPM
- Irrigation

- Soil structure
  - Sampling
- Soil health
  - Cover crop
  - Living roots
  - Organic matter
- Nitrogen
  - 100-160lbs
  - Petiole and Soil test
- P+K
  - Usually not limiting
- Micros
  - Soil applied and/or foliar
Growth

- Fertility
- IPM
- Irrigation
Growth

- Fertility
- IPM
- Irrigation

- Scouting
  - Late May → harvest

- Cultural practices
  - Remove inoculum
  - Encourage beneficials
  - Use ‘soft’ materials

- Stay ahead of mildew

- Rotate chemistry
  - Within year
  - Every-other year
Growth

- Fertility
- IPM
  - In-Season burn back
- Irrigation
- Weed control
  - AIM (Oil, 2,4-D, Select)
- Sucker control
  - Forces growth ‘upward’
- Inoculum control
  - Probably most important
- Not always necessary
  - Hurts energy production?
Growth

- Fertility
- IPM
- Irrigation
- Hops like water
  - Overwater = yellowing/nitrogen deficiency
- Irrigation begins
  - March, early and often for babies
  - May for mature hops
- Fertigation or Chemigation
  - Extremely valuable
  - Easy
  - Targeted
Growth

- Fertility
- IPM
- Irrigation
## Critical Tasks - Harvest

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<td>Propagation and Planting</td>
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<tr>
<td>Pruning</td>
<td>Late August through September</td>
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<td>Twining</td>
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<tr>
<td>- TIMING – Per variety and farm-wide</td>
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<tr>
<td>- QUALITY – Drying temperature, handling, packaging</td>
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Timing

- **Aroma**
  - Smell your hops!

- **Dry matter**
  - Every 2-3 days
  - Keep a record
  - Be consistent
Harvest

• Timing
  • Dry matter sampling

Three Methods:

• (1) Toluene extraction
  • (+) Relatively Fast
  • (+) Accurate
  • (-) Complicated
  • (-) Not ‘set and forget’
  • (-) Expensive
  • (-) Dangerous
Harvest

- Timing
  - Dry matter sampling

Three Methods:

- (2) Microwave
  - (+) Fast
  - (+) Cheap
  - (+) Easy
  - (-) Inconsistent?
  - (-) Smelly
Harvest

- Timing
  - Dry matter sampling

Three Methods:

- (3) Food Dehydrator
  - (+) My favorite
  - (+) Cheap
  - (+) Easy
  - (+) Consistent
  - (-) Slow, so plan ahead
    - 12-14 hours minimum
A Sustainable Approach
Integrated Pest Management

- Pest control
  - SCOUTING
  - Find (or estimate) economic threshold
  - Alternate chemistry
  - Target the pest
  - Learn to live with some pest population
  - Give the beneficials time, AND food
  - Keep nitrogen levels under control
  - Healthy plants don’t taste as good to bugs/fungus

- Weed control

- Mildew control
Integrated Pest Management
**Integrated Pest Management**

- **Pest control**
  - Hops are competitive, some weeds won’t hurt
  - ***Babies are an exception

- **Weed control**
  - Alternate your herbicide program
  - Let cover crops clean the middles, worry about rows
  - Proper materials in burn-backs can help

- **Mildew control**
  - Alternate cover cropping/tillage strategies
  - Develop a rotation?
    - Fall Plant (rye/vetch/rape)
    - Spring till, replant (clover, barley, brassicas)
    - Till, Fall Plant (winter wheat, pea)
    - No spring till
    - Fall till, replant
Integrated Pest Management

- Pest control
- Weed control
- Mildew control

- Stay ahead of mildew
  - Prophylactic applications
  - Early sulfur/oil

- Rotate chemistry

- Difficult to control once infested
  - Oil
  - Oxidate/Jet-Ag (peroxyacetic acid)

- Assess susceptibility
  - Develop a program accordingly
Fertility

- Soil Chemistry/Structure

- Soil Biology

- Fertilizer

- Soil testing
  - Spring or fall
  - Consistency
    - Lab, location, timing

- Structure is priority
  - Without balance, everything else will be more difficult

- Effects water and air movement
  - Most important
    - Resist compaction
    - Resist clumping
    - Water and nutrient use efficiency
    - Improved rooting
Fertility

- Soil Chemistry/Structure

- Soil Biology

- Fertilizer

- Encourage soil biology
  - Living roots in the field
  - But, not too much competition

- Carbon
  - Cover crops
  - Other inputs
    - Compost, manure, humic acid, etc...

- Let the biology help buffer the system

- Probably don’t need ‘bugs in a jug’
Fertility

- Soil Chemistry/Structure

- Soil Biology

- Fertilizer

Applications
- Dry – broadcast or banded
- Fertigation
- Foliar

Nitrogen
- Dry, liquid, organic
  - A combination is best
- Spoon feed, don’t flood
- 100-160# is common
- Can get away with less, but not always

P, K
- Maintain soil levels, late K is common practice
- Usually dry applications are sufficient (SOP, MAP)

Micros
- B, Mg, Mn, Fe, Zn, Ca
  - Can all be limiting depending on soil
- Soil applied and/or foliar
The genetic potential of hops is massive!