

## REQUIREMENTS AND ESTIMATES FOR BUILDING A ½ ACRE HOP YARD

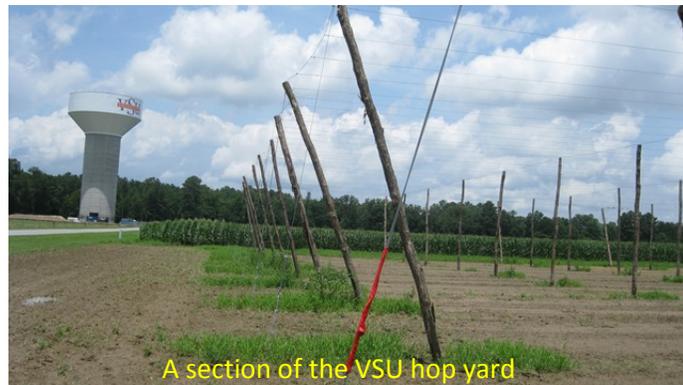
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### Introduction

Hops (*Humulus lupulus* L.) is a key ingredient in brewing that is used primarily to infuse aroma and bitterness (to balance the sweetness of malt), and for stabilizing beer. The plant part harvested for this purpose is the unfertilized female flower collectively referred to as cones.

There is increasing interest in hops as a potential alternative crop in Virginia because of the rapid growth of the craft beer sector both within the Commonwealth and in the greater U.S. Most craft brewers have made it known that they would purchase key ingredients including hops from local suppliers if their quality, quantity, and price considerations are met.

Once known as the hops capital of the New World, Virginia has a long hops history. However, there are currently only a few commercial hops growers in Virginia and there is room to expand production to meet increasing demand. To achieve this objective, popular and newly developed hops cultivars must be evaluated for growth, yield, and quality under Virginia conditions in order to provide potential growers with research-based recommendations.



A section of the VSU hop yard

In response to encouragement from the Virginia Department of Agriculture and Consumer Services and other stakeholders, Virginia State University (VSU) is in the process of establishing a hops research and outreach program. Recommendations from a stakeholder workshop held at VSU in October 2014 identified the following research need areas that must be addressed to enable Virginia growers make an informed decision on whether to grow hops as a cash crop:

- a) Soil preparation and amendments
- b) Disease, pest, and weed management
- c) Irrigation needs (timing and frequency)
- d) Variety selection and recommendations on management practices
- e) Alpha acid testing and other quality analysis
- f) Standardization of crop records for the state and the region
- g) Guidelines on organic vs. standard agricultural practices for hops
- h) Drying and pelletizing resources and methods
- i) Marketing education and support

For the purpose of gaining practical knowledge on hop yard trellis design and determining material and labor needs, we made the conscious decision to construct the hop yard in-house. Based on the experience and lessons learned, we provide, below, information on estimated costs for establishing a ½ acre hop yard.

### Constructing a ½ acre hop yard

The following are inputs and estimated cost for a ½ acre hop yard based on work done at VSU. Suggested layout and dimensions for the yard are presented in page 5.

Item	Quantity/Cost per unit	Total Cost (\$)
Poles	42 units @ \$80 per unit	3,360.00
Wire rope (1/4")	2000 ft. @ \$0.25/foot	500.00
Wire rope (3/16")	4800 ft. @ \$0.25/foot	1,200.00
Eye bolts	42 units @ \$3.25 per unit	136.50
Shoulder bolts	26 units @ \$5.00 per unit	130.00
Turnbuckles	22 units @ \$15.00 per unit	330.00
Ground anchors	26 units @ \$14.50 per unit	377.00
Thimbles (1/4")	80 units @ \$0.85 per unit	68.00
Cable clamps (1/4")	160 units @ \$0.50 per unit	80.00
Cable clamps (3/16")	150 units @ \$0.80 per unit	120.00
<b>Grand Total</b>		<b>6,301.50</b>

As is apparent from the estimates above, posts and wire rope are the most expensive items. While there is little room for playing around with the budget for wire rope, cost saving options exist for most of the other consumables:

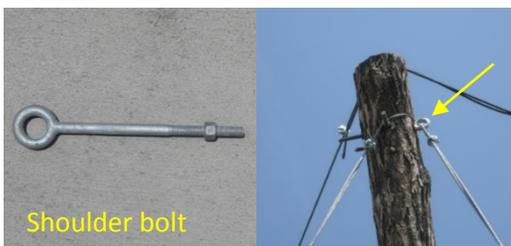
- Poles:** We used black locust (*Robinia pseudoacacia* L.) poles (pictured) because they are known to be extremely hard and resistant to rot. They are also expensive and relatively hard to find, and a lot of the existing Virginia hop yards have used treated pine (poles or lumber) and metal pipe. Although pine may have a shorter life, the cost per pole could be less by between \$30 and \$50 relative to black locust. A landowner with a woodlot could completely eliminate the cost of poles by harvesting from their own land.



- Eyebolts:** The purpose of the eyebolt is to secure and align wire rope for main lines running perpendicular to the rows, and around the perimeter. Eyebolts are screwed into the top after poles are trimmed to size. The use of eyebolts can be avoided by trimming poles with an extra of 3-4" then drilling a hole at the desired height and threading the wire rope through it. However, it is likely that constant contact



between the wood and the wire rope may accelerate the deterioration of both.



Shoulder bolt

- Shoulder bolts:** These are installed only on perimeter poles 6-10" from the top (two are needed for corner poles). A loop of wire rope runs from the shoulder bolts to turnbuckles to stabilize and strengthen the trellis system. The option described for eyebolts applies to shoulder bolts. Wire rope could be threaded through holes meant for shoulder bolts and clamped in place.

- Turnbuckles:** To aid tensioning of the trellis main and secondary lines, turnbuckles are installed between ground anchors and wire rope fastened to shoulder bolts. We used 3/4" units (see opposite) because we trellised an area larger than 1/2 acre. It is possible that 1/2" turnbuckles (cheaper) would suffice for a 1/2 acre trellis.
- Ground anchors:** These are driven into the ground to anchor perimeter poles (two are needed for corner poles). We used 3/4" (49" long) anchors with a capacity of 1.5 tons. Similar



Turnbuckle



Anchor

to the turnbuckles, 1/2" anchors will be adequate for a 1/2 acre or smaller hop yard.

- Thimbles and cable clamps:** Thimbles are used to reduce wire rope abrasion. They are installed whenever two pieces of rope are joined together, when cables are clamped to shoulder bolts or turnbuckles, and when cables are terminated at both ends of a main line. Whereas the use of thimbles can be avoided all together, cable clamps are essential. They are used to clamp wire rope wherever it is terminated and, where necessary, for joining pieces of rope when there is not enough to go the distance. At maturity, the weight of the crop exerts tremendous pressure on the trellis system and it is advisable to use two clamps at each joint or point of termination. It is also important to ensure that the clamps are tight enough and installed correctly (an impact driver is convenient for tightening cable clamps).



Cable clamps

Thimbles

In addition to the expendable materials listed above, the following will be needed during hop yard construction:

- i.) **Hole digger:** For a 18ft trellis, it is recommended that poles be installed in 3-4ft holes for the trellis to carry the crop and withstand strong winds. A tractor mounted auger or any other mechanical digger will be required to sink the holes. Rental fees for a 5.5hp digger range from \$80-120/day.
- ii.) **Tractor equipped with a front end loader:** With the help of a front end loader and a chain, a skilled operator working with one person can hoist poles into the 4ft holes. The implement will

also come in handy for transporting poles over short distances. An option for a grower without a front end loader is to rent a fork lift (a fork lift with a 16ft telescoping boom rents out for \$300-400/day).

- iii.) **Lift:** Wire rope for main and support lines is installed after the poles are in place. For this reason, a lift is necessary to facilitate work at 12-16ft aboveground. We rented an all-terrain scissor lift for this purpose (\$220-250/day). Some growers, and other programs (e.g. [University of Vermont Extension](#)) have rigged a safety cage onto a tractor front end loader to serve as a lift.
- iv.) **Drill:** A drill (preferably corded) and bits are required to drill holes for shoulder bolts and start guide holes for eyebolts.
- v.) **Cable cutter, come-along, and haven grip:** A cable cutter is required to cut the wire rope at termination points, and a come-along (hand operated ratchet winch) is used to tension primary and secondary lines. The haven grip is used with the come-along to ensure the wire rope does not slip as it is being pulled.

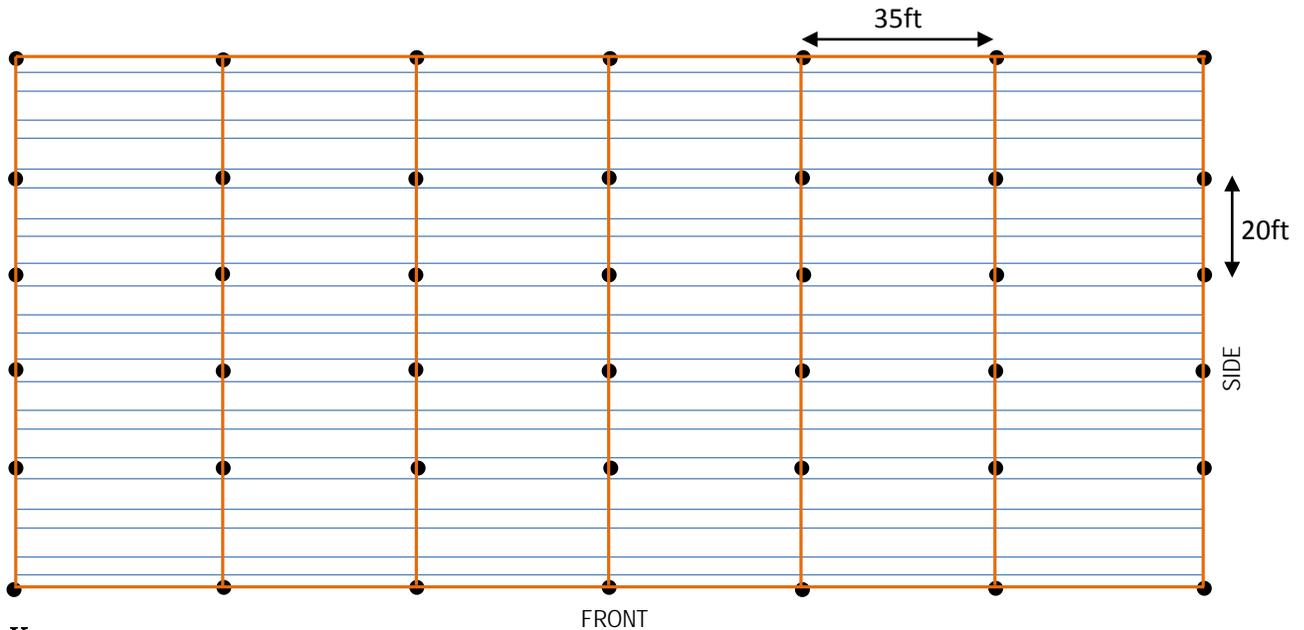
#### Other Considerations:

- Particularly for Virginia, the site selected for a hop yard must have full sun and no barriers to air flow. Avoid forest edges or depressions.
- The site should also be well drained (raised beds may be necessary on poorly drained land).
- If renting equipment, ask about the weekly rate. Things rarely go according to plan and a piece of equipment may be needed longer than planned.
- It is better to hold off buying planting material until the hop yard is ready.
- Plan to irrigate the yard. Hops are sensitive to chlorine and a source of untreated water (well or river) is essential.

#### Additional resources:

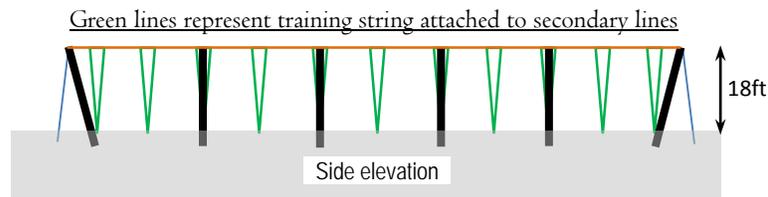
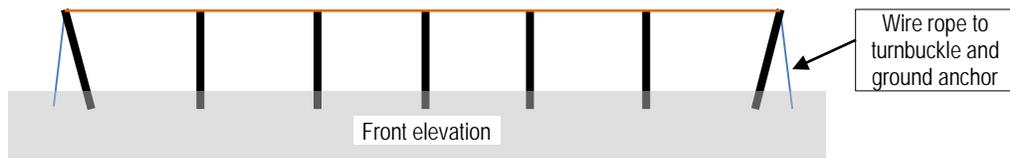
- <http://www.apps.fst.vt.edu/extension/enology/EnoSrvLab.html> (Hops analysis)
- <http://www.pubs.ext.vt.edu/HORT/HORT-167/HORT-167.html>
- <http://pubs.ext.vt.edu/456/456-017/456-017.html>
- <http://www.pubs.ext.vt.edu/HORT/HORT-182/HORT-182.html>
- <http://www.ces.ncsu.edu/fletcher/programs/nchops/>

TRELLIS LAYOUT FOR 1/2 ACRE HOP YARD (210' X 100')



Key:

- Poles (preferably black locust).
- Main lines (3/4" galvanized wire rope).
- Secondary support lines (3/16" galvanized wire rope). These run over the main lines during installation and are clamped to the main line at each end.



- All perimeter poles slant out at an angle and are anchored to the ground.
- Inner poles are 22ft in length; 4ft below- and 18ft aboveground. To accommodate the slant, perimeter poles are 23ft and corner poles are 24ft long.
- Spacing is 20ft between rows and 35ft between poles (within row).