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David P. Lambe

*University of Nebraska - Lincoln*, [dlambe1@unl.edu](mailto:dlambe1@unl.edu)

Stacy A. Adams

*University of Nebraska - Lincoln*, [sadams1@unl.edu](mailto:sadams1@unl.edu)

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# Estimated Costs of Producing Hops in Nebraska

David P. Lambe, Associate Professor of Horticulture  
Stacy A. Adams, Associate Professor of Horticulture  
Department of Agronomy and Horticulture

## Introduction

Consumers are passionate about the food they eat, and desire fresh, unique, and visually appealing ingredients. For many people, dining is no longer just a “quick bite,” but rather a social event with friends, sharing culinary creations served with accompanying libations in a unique ambiance. Appropriate to this experience, craft brews have become essential to local restaurants and brewpubs.

Nebraska presently has 33 commercial brewers (Brewers Association, 2015 craft brew statistics), which produced 39,505 barrels in 2014. This resulted in an economic impact of \$424 million to the state through product sales and indirect consumer purchases of food and merchandise. Most of the raw brewing ingredients are Nebraska sourced; however, the availability of the essential flavoring ingredient, hops (*Humulus lupulus* L.) is limited locally. Brewers have expressed interest in using locally grown hops if growers can produce uniform and consistent qualities appropriate to the hop cultivars.

For these reasons, an emerging market exists for specialty-crop farmers to increase their on-farm income with strategic planning, marketing consideration, and clear implementation. However, it is important to first consider the large infrastructural costs associated with various aspects of hops production and handling prior to brewer use. These include:

- Hops production on a high trellis system
- Hops cone harvest, kilning, conditioning, and baling
- Processing, pelletizing, testing, and marketing

Profitability is directly affected by plant productivity and cone quality, as influenced by an individual’s cultivation skill and efficiencies in cone harvest and handling. Depending upon marketing strategy, it has been noted that hop farms of 10 acres or more are more financially sustainable, having appropriate financial resources for best production optimization. Increased crop value is possible with niche marketing or sales of proprietary cultivars, but marketing must be clearly identified through a well-developed marketing plan.

## Hop Yard Considerations

Once a marketing plan is in place, a grower can best identify the appropriate initial hop yard size, with consideration for future expansion as the business develops. This publication summarizes the costs associated with establishing a one-acre hop yard, which is a suitable size to explore a grower’s individual capabilities and continued interest for growing hops, and an appropriate “building block” unit for considering expansion. When deciding to install a hop yard, growers must first consider:

- Topography, soil type, and uniformity
- Soil testing, improvement, and preparation
- Management of diseases, pests, and weeds
- Irrigation water source
- Selection of cultivar(s)
- Cone testing and harvesting
- Cone processing and holding



Figure 1. Mature hop bines trained using a "V" pattern.



Figure 2. A 20-foot tall hop trellis showing diamond pole placement and angled end posts for additional support.

## Planting Density

Trellis systems often vary by farmer and are dependent upon the size of equipment used for cultivation and preferred bine training methodology. A widely adapted hop yard design has planting rows spaced 14 feet on-center with plants spaced 3.5 feet within each row using a “V” training pattern (Figure 1).

The number of poles used within the trellis system varies upon the individual design and the spacing selected between the inside support poles. Given the potential for high winds in Nebraska, the design example used in this publication positions the poles at 42 feet on-center within the row, using a diamond pattern (Figure 2), whereas growers in less windy areas may set poles as much as 56 feet apart. The number of plants typically lying under an acre of trellis is 900, but this estimate may vary as a result of pole anchor locations, land shape, topography, and turning radius of equipment.

## Hop Production Development Cost

Hop plants are perennial plants that overwinter just below the soil surface as an underground stem, or rhizome. Plants must be trained on trellises that are of appropriate height for the cultivar being grown. Trellises typically are 18 feet to 20 feet in height and require cabling that can support roughly 40 pounds per plant weight plus an additional 25 percent, or more, load to compensate for wind load. For example, a 210-foot row of hops would have 70 plants, each weighing approximately 40 pounds at maturity. The plant load on this cable would be 2,800 pounds, but at minimum, an additional 700 pounds of strength would be needed to allow for wind pressure on the mature bines.

Optimum productivity is achieved through proper nutrition, irrigation, and a comprehensive integrated pest management (IPM) program. The following assumptions were made to calculate production costs and associated income for the example hop yard:

- A one-acre plot contains 900 plants under trellis.
- Field laborers paid at \$12 per hour and management at \$20 per hour.
- Productivity is assumed to be 1,500 pounds of dried hops cones per acre.
- Three to four years to full production since maximum yield is typically not observed until the fourth year (operational costs and income are calculated for year four).

Labor cost varies upon how much work is done using contracted labor and that accomplished by the producer. Crop productivity ultimately is based upon plant age, indi-

vidual farming practices, environmental conditions, extreme weather events, and yield reductions from pests. Productivity is cultivar dependent, but a goal to strive for at plant maturity (year three) is 2 pounds per plant. Table 1 provides estimated costs for development of a one-acre hop yard.

**Table 1. Estimated Startup Costs for a One-Acre Hop Yard.**

Expense	\$ Cost/Acre	Cost/Acre Notes
<b>Land Preparation</b>		
Field preparation—disc or rip	\$75	
Drip irrigation*	\$1,500	Includes materials and installation
Irrigation well	Not Included	Variable
<b>Hop Yard Setup</b>		
Post holes—digging	\$313	2.5 hrs @ \$125/hr (145 hp tractor)
Post holes—placement	\$750	6 hrs @ \$125/hr
Field poles	\$4,800	60 poles @ \$80/pole (22' long)
End poles	\$2,700	30 poles @ \$90/pole (24' long)
Cable**	\$1,055	Mainline and Row
Clamps, anchors, turnbuckles, eyebolts ***	\$2,657	228 clamps, 42 anchors, 42 turnbuckles, 72 eyebolts
Labor—pole and cabling	\$576	4 workers @ 12 hrs each @ \$12/hr
Management	\$240	12 hrs @ \$20/hr
Hop plants	\$3,600	\$4/plant—900 plants 14'x3.5' on-center
Labor—hop planting	\$900	75 hrs @ \$12/hr
<b>Estimated Total Initial Costs</b>	<b>\$19,166</b>	

\*Irrigation calculation is based on a system capable of applying unfiltered water at a rate of 50 gallons per minute through a 2-inch main line. The cost will vary depending on actual irrigation needs and the number of irrigation zones in the hop yard.

\*\*Main line cables—¼" galvanized aircraft cable for main lines 7x19 twist = 7,000 test. 2,798' needed @ \$627 plus shipping. Row cables—3/16" galvanized 7x7 cable, 3,010 needed @ \$428 plus shipping.

\*\*\*Clamps—168 to affix cables to anchors @ 80 cents each; 60 row cables @ 55 cents each; anchors—42 to affix poles to ground—average of \$25 each; turnbuckles—42 to tighten cables to ground anchors 3/4" x 12" @ \$24 each; eyebolts—72 for end cables 5/8" x 10" @ \$6 each.

## Annual Operating Costs

Once the production site is developed with the trellis, irrigation system, and hop propagates (plant starts) planted, successive years have additional costs associated with cultivation and harvest. Hop cone value is variable and dependent upon individual quality, postharvest handling, processing, and, ultimately, marketing.



Figure 3. Hop cone pellet processing line includes a cone sieve, hammer mill, pelletizer, and pellet sieve. It is important to note that pellets are considered a food product and may require strict food processing guidelines and specialized equipment.

Profitability is directly affected by efficiencies in production and cone processing. A grower should carefully consider “essential” tools that should be purchased and have multiple uses, and limited use items that would reduce financial outlay if rented on an as-needed basis. In addition, a grower may find that certain aspects, such as cone stripping and drying, could be contracted out to service providers at a lower cost than purchasing specialized equipment.

In this hop yard example, the farmer harvests at cone maturity by dropping the bines into trucks and transporting them to a nearby hop processor. The processor has the appropriate equipment to remove (strip) the cones from the bine and lower the cone moisture content to 9–10 percent. The cones are compressed into bales or, with additional processing, pressed into pellets (*Figure 3*).

The final product then is immediately marketed or held in cold storage until sold. Estimated annual operating costs and potential for income are shown in *Table 2*.

## Summary

A significant investment is required prior to receiving the first revenue dollars from a hops yard. First year harvests are rare. Harvests typically begin in year two, and full production is typically attained by the fourth year. Depending upon the individual marketing plan, a return on investment may not be observed until year six or seven using the assumptions in this cost estimate publication. Careful planning is critical for greatest success and should include identification of tasks a farmer can perform and those that are best performed by contractors.

Much of the equipment used postharvest is specialized—and costly. Unless a grower is committed to having a large production farm (>10 acres) warranting the purchase of such equipment, growers should consider cooperative agreements for drying, pelletizing, and distributing. Smaller growers can increase crop value through direct marketing with craft brewers, but these should be agreed upon prior to the growing season.

**Table 2. Estimated Operating Costs and Returns for a One-Acre Hop Yard (Year 4).**

Operating Costs/ Returns	Year 4	Notes to Annual Costs	Operating Costs/ Returns	Year 4	Notes to Annual Costs
Coir	\$405	20 cents/string; 5 cents/ ground clip per plant	<b>Postharvest Costs</b>		
Labor—stringing	\$384	2 workers @ 16 hours @ \$12/hr	Cone picking and drying	\$5,250	Stripping, drying, baling, \$3.50/lb @ 1,500 lb estimated
Labor—training hop bines	\$384	2 workers @ 16 hours @ \$12/hr	Optional pelletizing	\$2,250	Pelletizing \$1.50/lb @ 1,500 lb (processors are limited and pricing highly variable)
Pesticides	\$700	Insecticide, fungicide, herbicide	Transport to processor	\$315	15 trips estimated @ \$1.05/ mile, each trip is 20 miles
Fertilizer	\$300	Cost may be higher if organic production	<b>Postharvest costs subtotal</b>		
Repairs, parts, and maintenance	\$350		<b>Total Expenses</b>	<b>\$13,650</b>	
Plant care labor—12 weeks	\$1,152	1 worker/8 hrs per week @ \$12/hr Mowing, tilling, weeding, spraying	<b>Gross Revenue/Acre</b>		
<b>Annual operating subtotals</b>	<b>\$3,675</b>		Dried and processed hops product	\$18,112	Market dependent/ estimated \$11.50/lb 1,575 lb x \$11.50/ lb = \$18,112.50
<b>Harvest Costs</b>			<b>Total Gross Revenue/Acre</b>	<b>\$18,112</b>	
Harvesting labor— Aug/Sept	\$1,080	3 workers @ 30 hours @ \$12/hr	<b>Net Revenue/Acre</b>		
Management	\$80	4 hrs @ \$20/hr	<b>Net Revenue/Acre</b>	<b>\$4,462</b>	\$18,112-\$13,650 = \$4,462
Machinery use/rental	\$1,000	4 days @ \$250/day			
<b>Harvest costs subtotal</b>	<b>\$2,160</b>				

### More Information

Learn about Nebraska hop research and specific cultural considerations for the region by visiting the Nebraska Hops website at <http://agronomy.unl.edu/nebraska-hops>.

Learn about hops farming, national statistics, and other research through the USAHOPS organization website: [www.usahops.org](http://www.usahops.org).

Nebraska hop yard supplier and postharvest processing: <http://midwesthopproducers.com>.

### Resources

- Brewers Association. (2016). *Nebraska craft beer sales statistics, 2015*. Retrieved from [www.brewersassociation.org/statistic/by-state/?state=NE](http://www.brewersassociation.org/statistic/by-state/?state=NE)
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