Mobile Hops Picker & Modular Oast





CULTIVATING HEALTHY COMMUNITIES

Mobile Hops Picker

- Started in 2011, 2012 was our second year of use
- Design team growers, brewers, crop specialists
- Goal: Provide efficient mechanized harvesting to multiple yards
- Bridge the gap hand picking vs. large centralized harvesters
- Public domain design -<u>http://www.uvm.edu/extension/cropsoil/wikis</u> alternatively: <u>uvm.edu</u> search "hops wiki", 1st link.



Picking









Mobile Hop Picker

A project of University of Vermont Extension, Vermont Agency of Agriculture and Massachusetts Department of Agricultural Resources through the USDA Specialty Crops Block Grants Program.



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Picker Design Requirements

2 bine/min 8 hr/acre 10,000 lbs/day wet {2,000 lbs/day dry}

Portability over road with standard tow hitch

Safety similar to farm equipment training req'd

Power

Capacity

PTO / direct hydraulic

Cone Damage / Loss

<5% by volume

team of two trained operators



Operation



Square Nail Hop Farm Ferrisburgh, VT 2012

Improvements in 2012

- Shortened bine feed (no longer extends beyond machine)
 - Faster setup & no loss in performance with 2 person crew



Before (2011)





After (2012)

Improvements in 2012

- Improved conveyor belt tracking
 - Added support rollers under belts and fencing on sides





Improvements in 2012

- Containing cones within the machine
 - Left open in the first year due to schedule, to allow troubleshooting and to see what was working and how.
 - Fences added to sides of conveyors
 - Chute added to front to prevent hops from being stripped right out of the machine





Nation Hops Alexandria, ON, Canada 2012

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Borderview Research Farm Alburgh, VT 2012 – Dribble Belt Adjustment Trials

Dribble Belts @ 1 ft /sec



Dribble Belts @ 2 ft /sec





Belt speed increase resulting in better cone separation.

Main Lessons in 2012

- Logistics
 - Have to keep the machine fed (120 bines /hr)
 - Have to keep the cones shuttled to the oast
- Machine tuning / adjustment
 - Opened the front end of the stripping fingers to reduce number of stripped lateral branches
 - Stripping speed and dribble belt speed adjustment
 - Containing cones within the machine for sorting



Prototype Cost Summary

- Trailer
- Frame & Subframe
- Stripping Section
- Motors, Pump & Hydraulics
- Conveyor Belts & Rollers
- Bine Feed
- Total Material
- Fabrication Labor
- Total



\$3,500 \$1,800 \$4,100 \$5,800 \$4,200 \$1,200 \$20,600 \$32,000 \$52,600

Harvester Options

Option	Initial Cost	Crew	Bine per Hour
Manual	Zero	1	1
Bine 3060 (Addison Hop Farm, Addison, VT)	\$14,250	1	10
UVM Mobile (UVM)	\$52,600 (prototype, labor outsourced)\$35,000 (projected repeat, labor outsourced)\$23,000 (projected repeat, DIY 4 weeks)	4	120
Wolf WHE140 (Four Star Farm Northfield, MA)	\$30,000 (delivered and converted, 2 weeks labor)	8	170



Cost / Benefit (1 of 2)

- Assume \$35,000 cost of harvester
- 120 bine/hour harvesting rate with machine
 - compared to 1.5 bine/hour manually
 - \$7.25/hr wage assumed
- 6 acres harvest per year
- 1500 bines per acre
- 1 lb dry cones per bine
- Retail pricing of \$10 per lb (dry)



Cost / Benefit (2 of 2)

- Net hourly revenue:
 - Machine \$1,171 vs. \$7.75 by hand
- Per pound harvest cost:
 - Machine \$0.37 vs \$4.83 by hand
 - Includes machine cost and labor
 - Per pound harvesting cost reduction of 92%
- Net hourly profit potential:
 - Machine \$1,126 vs. \$0.50 by hand
 - And few people would attempt harvesting 6 acres by hand (6000 person hours).
- Machine simple payback period 0.43 years



Modular Hops Oast

- Goal: Provide rapid, heated ("but not hot!") hop drying in modular design
- Cabinet & tray design based on an ostrich egg incubator
- PID Controlled 3,500 Watt heater and circulation / stripping fan
- Public domain design -<u>http://www.uvm.edu/extension/cropsoil/wikis</u> alternatively: <u>uvm.edu</u> search "hops wiki", 1st link.



















Oast cost

Materials

Lumber-screws-hardware \$493 Angle Iron for Tray Racks \$208 1/3 H.P. Fan Motors (2) @ \$110.00 \$220 Fan Blades (2) @\$78.00 (Multi-Wing) \$156 Heating Elements 3000 Watt (2) @ \$332.00 \$664 Heating and Fan Controls \$200

Total \$1941

Labor 30 Hours



Drying Calculator

http://www.uvm.edu/extension/agriculture/engine ering/?Page=hopscalc.html

Google: "uvm hops moisture calculator", 1st link.

Also available as an Excel spreadsheet for offline use.

