

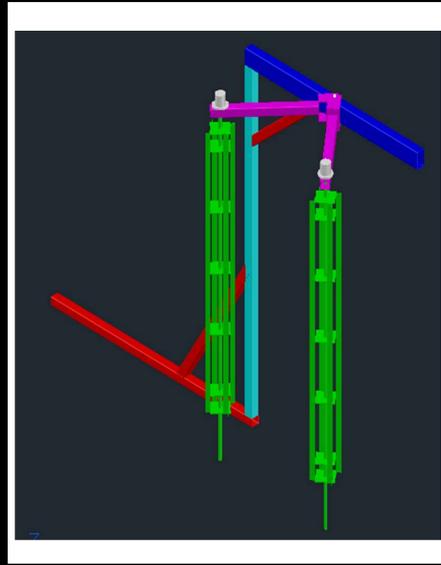
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Objective:

Hop growers in Indiana and Michigan are looking for a feasible way to harvest their crops without removing the vine or damaging their specific trellis system. Leaving the vine aids in higher yields for the following growing season. Hop vines are grown on many different types of trellis systems. Midwestern trellis systems vastly differ from Western systems. Western hop farms can exceed 400 acres and use a twenty foot tall trellis system. Midwestern farms are inferior in size, use smaller trellis systems, and grow dwarf hop varieties. The objective of the project was to create a harvesting method that was practical, economical, and efficient for the Midwestern hop farmer.

Background:

- Horticulture Department has a hop research farm and is looking for an efficient way to harvest their crop mechanically.
- Three trellis systems
- Forty-Five feet runs
- Ten feet tall



Final Design:

The final design of the harvester utilized 3/16" tubing throughout the frame. 3x3 square tubing was used for everything except the top support. Brush brackets were constructed with 1/4" flat and 1-1/2" angle.

Alternative Solutions:

- Pull behind trailer- This solution would ensure that the harvester would have enough storage for the hops during harvest but was not feasible for tracking the trellis.
- Self-Propelled Harvester- This solution is the most efficient concept but not feasible due to the cost.

Design Process:

AutoCAD was used to design the harvester. Each team member drafted a design of their own and incorporated all of the drafts into one design. The toughest part to design was the shield and pan design which is not shown in the drawing below. A solution to fastening the pan to make it structurally sound and effectively catch the hop cones was absent in our minds. With that being, fabrication on the frame of the harvester began. Problems arose again as the arms were being built but AutoCAD allowed the team to accurately fabricate them to not collide as the arms almost touch during harvest.



Budget:

Being cost efficient was a main concern for the team. Steel and bearings were the only costs charged to the team due to donations from the garlic cart team and Purdue's Grounds Department. Hydraulic motors and hoses were donated by the garlic cart team to spin two bristled arms. Street sweeper brushes were donated by the Grounds Department used for pulling the hops off of the vines. The total cost of the project totaled \$863.29, which is under our total budget of \$1,000.00.

Solution:

The hop harvester team decided a three point hitch design was the best option for harvesting hops because of the cost, ease of storage and use, and simplicity of design. The amount of steel needed to build a three point hitch was less than amount of steel to build a pull behind trailer harvester. Pulling a device behind the tractor takes more effort and skill versus a harvester attached directly to the tractor. Storage was also an issue with a self-propelled and trailer harvester. The three point hitch can be stored in a corner which will create more space in the shop. Lastly, engineering and fabricating a three point hitch design was more feasible than a trailer or self-propelled harvester.

Impact and Sustainability

Mechanization of an operation that was previously hand harvested will increase time efficiency and be cost effective. If proven effective by the Horticulture Department, the design could be manufactured and sold to other Midwest hop farmers in need of mechanization.

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