

SOME IDEAS FOR MECHANICAL SOLUTION OF THE VOLUNTEER POTATO PROBLEM

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Overview

Problem source

Constraints

How 15 mm to 45 mm (9/16 to 1-3/4") tubers are harvested in England

What must be determined for our conditions

Some mechanical alternatives we'll try

Final thoughts

The Problem

Volunteer or groundkeeper potato plants result from tubers left in the field after harvest. These tubers are left in the field mostly in one of two ways:

- By falling through the chains (a trade-off problem between saving tubers and eliminating soil with current harvester configuration and operation)
- By spilling out of harvesters and/or trucks (primarily a management problem). The tubers sprout and produce plants the following spring.

The apparent solution is to remove all the tubers from the field, either by harvesting or by harvesting plus moving all small tubers and parts of tubers to the soil surface for winter frost kill, or by killing the small tubers or resulting volunteer plants in some other way. Harvesting or moving the tubers to the soil surface becomes a soil-sieving problem.

Two as yet undefined constraints on the fineness of sieving tubers from the soil are:

- What is the maximum harvester chain gap that will reduce the volunteer problem to an acceptable level?
- What is the minimum chain gap that will pass sufficient soil on the potato harvester to allow efficient potato harvesting?

These constraints are influenced or even determined by the costs of eliminating the small tubers from the field versus the benefits of doing so. Those benefits include reducing the spread of diseases like late blight, reducing volunteer competition with succeeding crops, and possibly the development of markets for small tubers.

This Presentation is part of the 1998 Proceedings of the Washington State Potato Conference and Trade Show.

English Small Tuber Harvest

The next question is, what is the small tuber that is currently being harvested profitably? In England there are markets for potato tubers down to 15 mm (9/16") in the smallest dimension (fig. 1). The harvest is accomplished with typically "up-and-out" style harvesters (fig. 2) with 28-mm pitch chain. Chain rods are 11-mm diameter, so the chain gap is 17 mm (21/32").



Figure 1. Tubers 15 to 45 mm in size harvested in England.

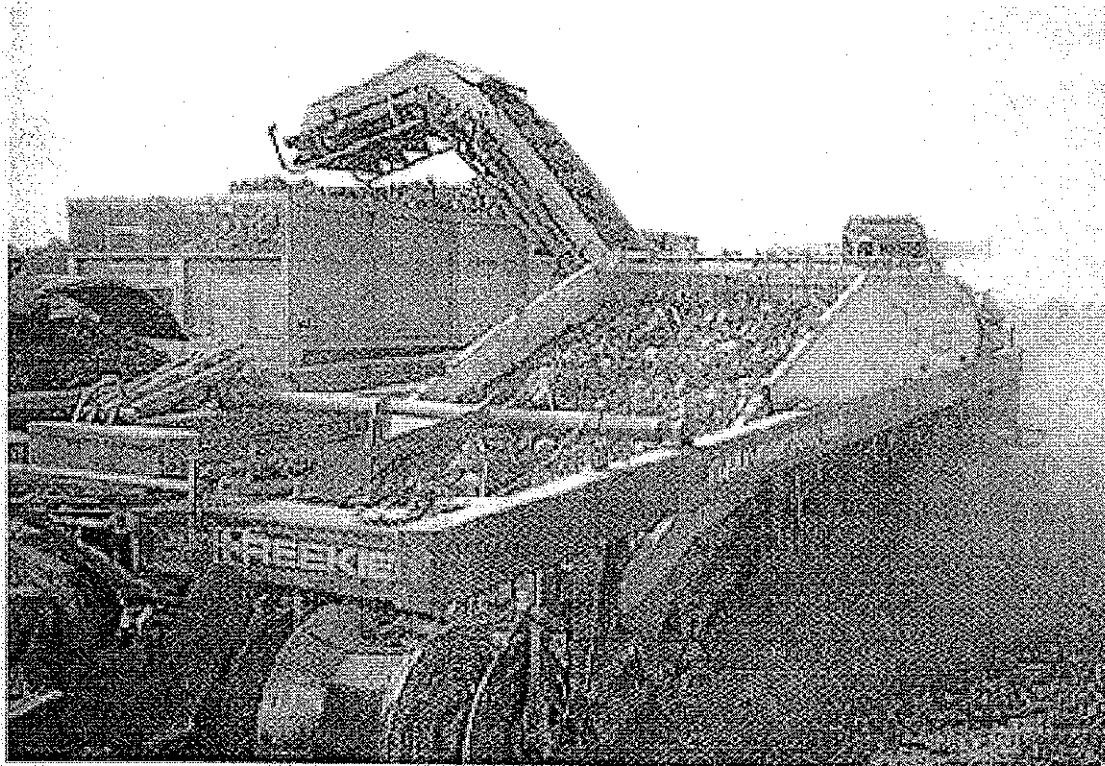


Figure 2. "Up-and-Out" Harvester in England.

Following the long 28 mm primary chain is a set of rubber rollers (fig. 3) parallel to the flow of tubers. These rollers eliminate soil and apparently do less bruising than the steel-roller "M" tables used on some U.S. harvesters a few years back. A pintle belt above the rollers helps move the material along, and in dry conditions a fine spray of water on the rollers improves tuber flow. Observation of these rollers running in the 1997 potato harvester trials in Suffolk, England showed that they will crush small tubers and drop them to the soil surface.

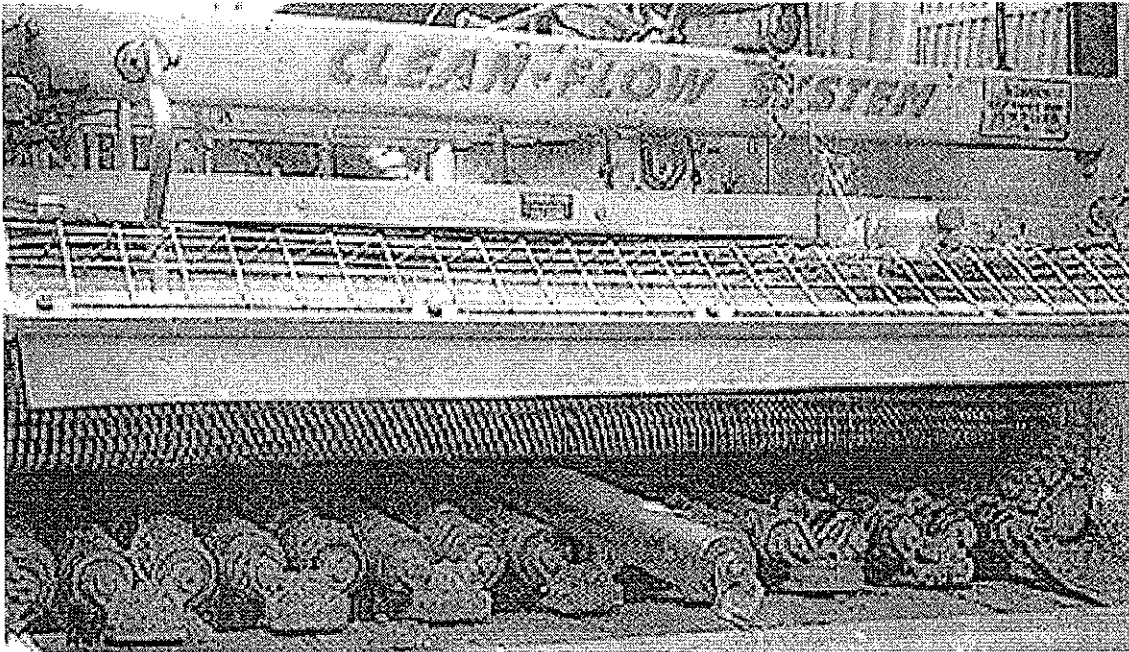


Figure 3. Parallel rubber roll table, showing one steel roller used for onions.

So the answer to the small tuber question is that growers in England profitably harvest tubers as small as 15 mm (9/16") in diameter with harvesters similar to that shown here.

What are Washington's Conditions?

Field Sampling of 'Leavings' in Washington

Preliminary sample by Bob Thornton and his crew during the fall of 1997 showed, as their presentation showed, that Washington's harvesters leave small tubers down as deep as the harvester blade goes. The average size of those tubers was around 0.6 ounce, but some were as small as 0.1 ounce--about 15 mm (9/16") in diameter. So that preliminary data indicates that we could harvest, or at least "surface" our small tubers using equipment like that used in England.

Questions to be Answered

- How small a tuber is still viable by spring?
- What is an acceptable level of volunteers?
- What equipment will save enough small tubers and still eliminate the soil?
- What equipment will bring enough tubers to the soil surface for winter kill?

Mechanical possibilities

The following is a list of ideas for dealing with the small tubers at or after harvest. They are categorized by desired outcome.

- Practices to keep tubers at surface
- These practices would definitely include NOT fall plowing or other tillage that would tend to bury tubers.
- Devices to bring all objects above a certain size to the surface

These devices might include using fine-pitch chain on the harvester primary and then dropping small tubers through to the soil surface further back on the harvester. Other approaches include using a lifter or digger with fine-pitch chain as a separate operation after harvest (fig. 4).

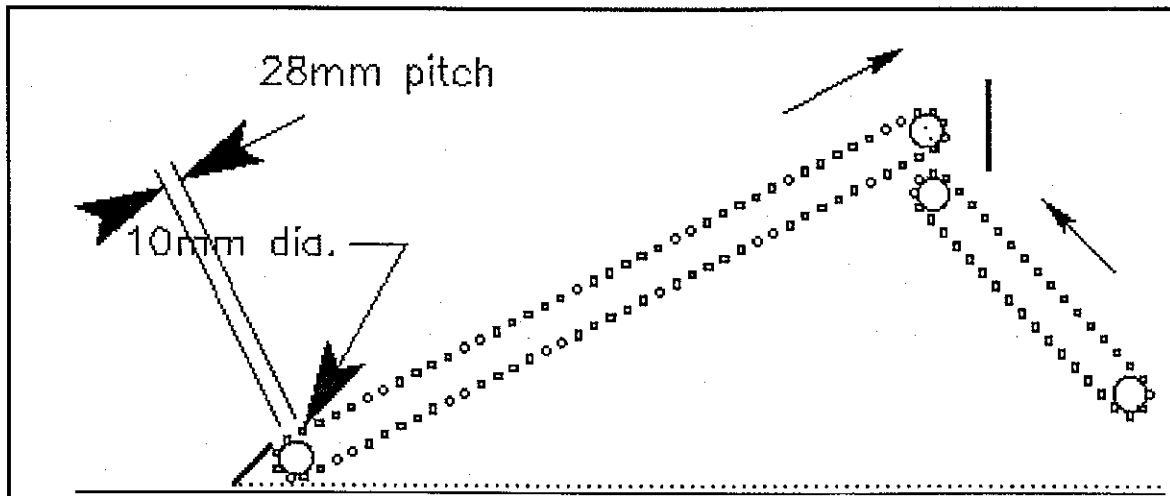


Figure 4. Fine-pitch chain lifter. Might be used with or without the short second conveyor.

- **Devices to work the tubers to the surface**

These devices include tillage tools that might tend to work the tubers to the surface. For shallower tubers, a rod weeder with a spiral on it (fig. 5), or a series of them might be useful.



Figure 5. Weeder rod with 3" spiral.

Another tillage idea (as yet untried) is a lifter blade followed by a series of powered coil spring rollers (fig. 6). These and other ideas are illustrated in a web page that you can access at the following address:

<http://www.wsu.edu:8080/~gmhyde/volunteer/-volunteer-potatoes.html>

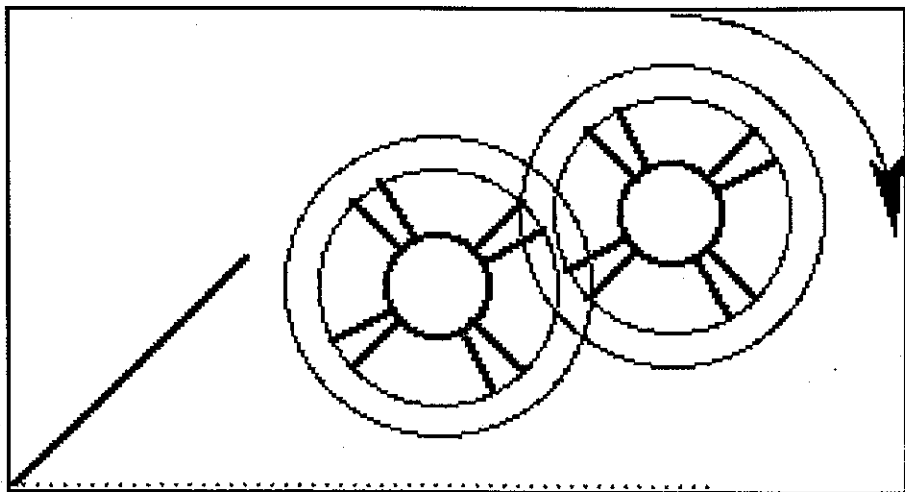


Figure 6. Blade and powered coil spring rollers.

- **Devices to shred the tubers**

These machines might include a digger with a steel-roller "M" table, flail choppers, rototillers, or some other devices for destroying tubers.

Final thoughts

- It's possible to save all of the tubers down to about 9/16" diameter, but will require new attention to soil elimination.
- Leaving tubers on soil surface over winter may not always solve the problem.
- Shredding tubers left in field may work and may be needed.
- A market for small tubers may develop, particularly with the increasing demand for potato starch, both for fry coatings and for packaging materials. It may be wise to plan to harvest and sell them sometime in the future.