

Update on Burley Harvest and Stripping Mechanization

George Duncan, John Wilhoit, and Larry Wells

The opportunity for burley producers to grow more tobacco after buyout legislation and the increasing shortages of labor for harvesting and stripping has prompted a resurgence of interest in burley mechanization options. Several commercial burley harvesters were demonstrated and a new experimental model was on display at Philip Morris USA-sponsored field days the past two seasons at the Roberts' farm near Pleasureville, Ky. Another experimental harvester was also demonstrated in Kentucky this past season. Several innovative stripping aids are also under development and emerging from stripping rooms around the burley belt. Ongoing work will certainly offer additional developments and innovations in the coming seasons. This article summarizes the status of equipment demonstrated or under development during recent years.

Automated Harvester

The former "Big Red" self-propelled, automated harvester developed during the last decade by University of Kentucky Agricultural Engineers is now being commercially manufactured as the "GCH Gold Standard" by GCH International¹ of Louisville. The machine is capable of harvesting up to five acres per "normal" day but could extend harvesting into the night time for additional production. Sturdy 8 x 14 ft. metal frames receive and support approximately 448 plants in the eight slotted rails of each frame. Approximately 15-16 frames are required per acre of harvested burley. Five empty frames are loaded onto the harvester at a time using an extended reach all-terrain forklift. A filled frame is set off the harvester on self-contained support legs. Later, the extended reach all-terrain forklift moves the filled frames to a sod area for covering with special poly tarps and curing. Two workers are required for the harvest, one to drive the harvester and the other to operate the forklift. Additional labor is required for moving and covering the frames. Two commercial prototypes harvested more than 80 acres each during 2007 at maximum rates of up to 0.5-0.75 ac/hr.

Plant-Notching Harvesters

A plant-notching harvester is being built by MarCo Manufacturing Co. LLC¹ of Bennettsville, SC. It is a tractor-mounted 3-point hitch machine powered by a PTO driven hydraulic system that cuts, notches and conveys the plants via the traditional "sticker chain" design onto a wagon pulled alongside the machine.

A French manufacturer has also developed a 3-point hitch plant-notching harvester that is powered by a PTO driven hydraulic system. This machine, called the "Kirpy" harvester¹, uses a small "log chain" type conveyor with small spike-laden metal

plates that convey plants from a standing position to deposit them horizontally onto a flat bed wagon pulled alongside the harvester, as with the Marco harvester. A special requirement experienced by the trial users of the Kirpy harvester in the U.S. is that the tractor must have a very slow "creeper" ground drive (0.6–1.0 mph) while running the PTO near 540 rpm for proper hydraulic flow and pressure. The Kirpy machine was marketed by a U.S. distributor¹ in 2006. Current distributor status is unknown.

Both the MarCo and Kirpy harvesters can fill a farm wagon rather quickly with loosely stacked plants, usually in 400-500 feet of row length. Multiple tractor and wagon units (probably 3 or more) are needed to shuttle wagons from the harvester to the wire type field curing framework to get maximum productivity of the harvester of approximately 2.0–2.5 acres or more per normal day.

Walk-Behind Powered Cutter

Another machine demonstrated at the field days was a walk-behind powered cutter. This machine is also produced by a French manufacturer. The two-wheeled machine cuts and notches the plants and lays them on the ground for later pick up, either for hanging on wire-strung structures or for spearing onto on sticks. This harvesting aid may be a viable low cost mechanization option for smaller operations. Note, however, that since the only commercially available machine of this type is manufactured overseas, the shipping costs can nearly double the machine's price.

Burley Stalk-Spearing Machine

A self-propelled burley stalk-spearing machine developed and tested by University of Kentucky Agricultural Engineers a decade ago has received renewed interest because of labor availability concerns. This "Burley Spiker," which uses two workers (one to grasp plants cut by a saw blade and place them on a conveyor, and another to place filled sticks of tobacco on the ground), keeps the tobacco on the stick so it can be used with conventional stick and barn resources. It was used by one farmer in 2007 to harvest his six acre crop in Anderson County, Ky., and demonstrated at a field day there.

The "Spiker" and the walk-behind powered cutter are both harvesting machines that are more likely to benefit smaller producers because they do not necessarily reduce harvest labor requirements, but instead make the difficult job of harvesting tobacco less strenuous. Such an improvement in working conditions could be an important consideration related to the availability of labor for harvesting operations.

¹More details on the equipment described and manufacturer's contact information can be obtained from the web site: www.bae.uky.edu/ext/tobacco.

Prototype Rail Harvester

A new machine for harvesting burley is under development by the University of Kentucky Biosystems and Agricultural Engineering Department. The new experimental system is similar in function to the automated harvester, but involves a tractor-drawn harvester that cuts, conveys, inverts and notches whole burley plants. Notched plants are inserted into slotted steel rails, 10 feet long, holding 40 plants each. Ten filled rails are unloaded on-the-go by the harvester onto the ground. A tractor-drawn retriever/transporter picks up the ten-rail "loads" and transports them to field curing structures. The rails are unloaded upon and supported by such structures with later covering for rain and wind protection. Preliminary estimates indicate an approximate harvesting capacity of 0.3 acres per hour for two workers.

High Tensile Wire Field Curing Structure

The MarCo and Kirpy machines require a high tensile wire field structure for hanging the plants for curing. Strong construction is essential, as several hurriedly built frameworks have partially failed after loading.

Several workers (possibly 8-10) are needed at the high tensile wire framework to unload the wagons quickly enough to keep up with the harvesting machines and maintain continuous harvesting operations. Thus, a total "crew" of 11-13 workers is needed to harvest 2.0 acres or more per day. An advantage of this method is that the workers are only handling one plant at a time rather than a heavy stick of 5 or 6 plants, and the plants are hung only at a single, low tier level. Thus, hanging operations are considerably less strenuous than with traditional stick hanging. All structures should have some form of plastic cover to protect the tobacco from rain and wind during the cure. The leaf breakage from piling the plants onto the wagon and removing them appears to be somewhat greater than normal manual harvest depending on the condition of the tobacco at harvest and worker care in removing tangled plants from the wagonload. Further studies are needed to determine the extent of leaf breakage and whether improvements can be made to reduce the breakage.

Mechanical Stripping Aids

An experimental, mechanical-leaf-removing stripping machine under development by Carolina Tobacco Services¹ was demonstrated at the tobacco field days. It uses "sticker" type chains that hold the plants hanging vertically downward, conveying them past angled wiper bars that strip off leaves as the plants move through a length of 14-16 ft. Different leaf grades fall into boxes below the plants along that length. Plants can be placed into the chains with either the tip or butt ends up. Leaf removal has been observed to be better with the tip end up, but the tip end is smaller and weaker, so the stalks are more prone to pulling out of the chains. Also, workers must remove 2-3 tip leaves prior to inserting the stalk tip in the chain teeth. Stalk release and removal still needs improvement. Another stripping machine concept is under development the University of Kentucky Biosystems and Agricultural Engineering Department.

Several innovative mechanical stripping aids are emerging from past research and current producers. Stalk choppers and conveyors for removing stalks from the stripping area are also under development.

The use of the stripping-wheel aid and several chain conveyor configurations are part of these mechanical stripping aids. These stripping aids enable the workers to remove leaves more rapidly with both hands while the plants are being conveyed past them. The opportunity for putting non-oriented leaf into the big bales has enabled these aids to become more efficient and productive. One or two workers pick up and insert plants into the conveyor devices, maybe removing the lower grade first, with the additional workers removing additional grades. Another worker removes, stacks, and/or carries the stalks to a wagon or truck bed for periodic disposal. Or, the stalks are directed into a stalk chopper mechanism that chops and conveys the particles into a hopper wagon or similar transport and self unloading vehicle for field distribution or other uses.

Some of these mechanical stripping aids are being built for commercial sale. Videos of operation and some sources of equipment are shown on the BAE tobacco web site. Data on performance and costs are being obtained and will be available later in 2007-2008. Check the BAE web site for periodic updates.

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