Stripping and Preparation of Tobacco for Market

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The market preparation phase of tobacco production involves the removal of cured tobacco from the curing facility, temporary bulking, removal of leaves from the stalk (stripping), sorting by physical characteristics and packaging in conventional small bales or newer big bales.

Takedown and Bulking

Takedown and bulking are the processes of removing cured tobacco from the curing structure and consolidating onto a scaffold wagon or in a pile, or bulk, for access by workers or transport to the stripping location. Tobacco should be bulked on a clean dry surface such as wooden boards, a wagon bed, or similar materials. A plastic sheet can be used for a protective barrier on which to bulk the tobacco but be aware that a layer of moisture can condense against the plastic under certain temperature and moisture conditions. Check the tobacco against the plastic periodically to detect any moisture problems.

Tobacco must be in a pliable condition for handling and bulking, often referred to as being in "order" or "case," which results from exposure to a surrounding environment of 70 percent relative humidity or higher for several hours (4-12 depending on the temperature and dynamics of relative humidity). Tobacco should not be removed from the curing location until all the stems (midribs) of the leaves have dried to a firm condition (not "fat" or "mushy"). Producers typically await natural weather conditions of good humidity and temperature above 35 degrees for conditioning the tobacco for handling. In extreme dry periods, steamers or overhead misting systems (in dark fired barns) can be used in rather air tight barns for artificially conditioning tobacco for handling (see separate article in publications section of the BAE web site: www.bae.uky.edu/ext/tobacco).

Tobacco in equilibrium with air below approximately 60-65 percent relative humidity will be so dry that leaves will likely shatter when handled, thus losing quality and weight. Conversely, exposure to a continuous relative humidity of greater than 85 percent will cause the tobacco to become too moist and subject to deterioration and damage when bulked or baled. High moisture tobacco will "heat up" in the bulk after a day or so in warmer weather (above 50-55°F daily average) causing undesirable mold development, a bad smell, potential discoloration and, in a worst-case scenario, rot.

There are several different methods used for bulking tobacco. Tobacco harvested and cured using wooden sticks can be bulked with sticks still inserted or with sticks removed. Leaving the sticks inserted is often done early in the fall to provide better air and moisture diffusion from the bulk when the stalks are still "green" and moisture laden. "Stick bulking" also facilitates further handling convenience at the stripping location. Removing the sticks when bulking can be done when the stalks are dried enough (general brown color) that the moisture will not cause "heating" and other problems when the bulked stalks are tightly packed for several days of rather warm weather (above 45-50°F daily average) before stripping. If the stalks are still rather green and moist when bulked, then strip within two to three days or put wooden sticks between bunches of stalks to permit better ventilation and moisture diffusion for the extended period of bulking.

Bulking of notched plants from wire type curing structures should use the above stalk techniques according to whether the stalks are still green and moist or more dried and brown.

In any bulking method, put your hand deep into the bulk daily to determine that the tobacco is still cool and not beginning to heat up. If warmth is detected, then prepare to strip the bulk promptly, open up the bulk or move the tobacco around to air out.

The bulk of tobacco can be left uncovered in mild fall weather to allow moisture diffusion if dust or other contaminants are not prevalent. Later in the cooler and drier fall or winter weather, a tarp or plastic cover can be put loosely over the bulk to protect from excessive drying and prevent dust accumulation or other contamination.

Tobacco can also be taken down and put on scaffold wagons until stripping if wagons and storage space are available. In warmer fall weather, tobacco taken down onto scaffold wagons will be less likely to heat and does not have to be stripped as quickly as if it were bulked.

Stripping Burley

Stripping is the process of removing and grouping leaves by stalk position and physical characteristics to meet marketing requirements. A full-leafed mature burley plant can have 20-24 leaves. Over-mature harvest and/or loss of lower leaves during harvest may reduce the lower stalk position ("flyings") group. Often weather, soil and curing variations are such that only three distinct grades of leaf characteristics may exist on most plants. Several of the newer burley varieties maintain such sound lower leaves that a true flying may not be produced. Stripping of these plants into three grades might be done without significant loss in value if the marketing process permits. Past studies have shown that the labor cost to remove a fourth grade of limited quantity and value is not always economically feasible (Bridges, et. al. 2006).

However, with the advent of contracting in the year 2000, many companies suggest four grades but still get a high percentage of three-grade tobacco. Tobacco companies can utilize a small percentage of mixed stripped tobacco, but the handling characteristics of the four stalk positions differ substantially during processing. As the companies make their blends, they look for specific characteristics that differ from grade to grade.

A comparison of farmer produced burley tobacco reveals the different distribution of leaves between three-grade and four-grade tobacco. Tobacco stripped into three grades is typically grouped into flyings, lugs, and a leaf/tip grade. With three-grade tobacco, producers tend to strip too high on the first grade (lower stalk) and put too many leaves into the tip grade (top of stalk). Percentages for three grade tobacco in a

past study were 25.6% for flyings, 54.9% for lugs, and 19.5% for the leaf/tip grade. Producers who strip their tobacco into four grades typically grouped it into the four appropriate grades (flyings, lugs, leaf and tips) that are true to previous Federal Grade Standards. Percentages for four grade tobacco in the study were 17.1% for flyings, 34.0% for lugs, 31.1% for leaf, and 17.8% tips. Assuming 20-24 leaves per plant, the breakdown for three grades would be 5-6 leaves stripped as flyings, 11-13 leaves as lugs and 4 leaves as leaf/tips. With four grades, one to two fewer leaves are stripped with the flyings. Approximately 7-8 leaves are stripped as lugs with 6-7 leaves stripped as leaf tobacco and 3-4 leaves as tips. The top grade represents a true tip in the four-grade tobacco, but could be graded as a leaf grade in three-grade tobacco. Three-grade tobacco generally will have a mixture of flyings and lugs in the first grade, a mixture of lugs and leaf in the second grade and may have a mixture of leaf and tips in the third grade. This may reduce market grades from 1's to 2's reducing the overall price paid for each grade. However, the difference between 1's and 2's is slight and may not be enough incentive to encourage four-grade stripping.

Some tobacco company contracts ask for a crop throw (percentage in each grade) that is different from how typical Kentucky tobacco farmers strip. One such crop throw would strip less tobacco into flyings with only 1-3 leaves in that grade, 4-6 leaves as lugs, half of the stalk, or 10-12 leaves, as leaf tobacco with the remaining 4-6 leaves as tips.

The predominant means of leaf removal is still by hand methods with the "relay" method generally being the best. The "relay" method uses workers along a 32-34 inch high bench or wagon bed with a source (pile) of cured plants at one end. The first worker pulls the "flyings" and lays the stalk on a next pile for the next worker to remove the next grade, and so on until all leaf grades have been removed. The stripped leaves are generally placed on the table or in a receptacle (tray, box, etc.) adjacent to the worker so another worker can conveniently gather the leaves for baling and do other support tasks. The receptacle can be a small device to hold a large handful of leaves for small bale (nominally 12" x 36" x 24") preparation. For handling into the new big bales (nominally 42" x 42" x 40"), larger plastic hampers, heavy duty cardboard boxes (up to 40 and 48 inches such as vegetable bins) or "burlap sheets" are being used to accumulate leaves of each grade prior to "big baling."

The accumulation of bare stalks at the end of stripping are periodically carried to a separate wagon, manure spreader, or similar vehicle for later transport to a field for spreading and disposal. Stalk choppers and conveyors for removing the stalks have been adapted by some producers. A prototype design is now under development.

Another manual method of hand stripping is for each worker to remove all grades from a plant, place the leaves in separate receptacles and the stalks in a "stalk rack." Other workers collect and carry the leaves and stalks to appropriate boxes, sheets, balers or wagons. This method makes the distribution of unstripped plants and collection of bare stalks more cumbersome as well as requiring efficient handling of the various grades of stripped leaves from each person.

With the introduction of non-oriented leaf packaging via the "big balers" (see later section on "baling"), innovative mechanical stripping aid devices are resurging across the burley growing regions. The advantage of these mechanical devices is that stalks are conveyed past the workers who then can use both hands (in most cases) for faster removal of leaves from the stalk. Such aids include devices like: the "stripping wheel" which conveys stalks upright in "cups" in a circle so workers can remove each grade; the single chain linear conveyor with cups attached for conveying upright stalks past the workers; the "dual chain" stick conveyor (dubbed by the originator as the "Stripping Line") which conveys sticks with plants still hanging on the sticks past workers who remove each grade and a horizontal mating-corrugated-belt-chain conveyor that grips the base of the plant for conveying upright plants past the workers. While accurate data on the performance of all these various innovations is not fully available yet, stripping wheel studies in the 1990s showed a 30–40 percent increase in stripping productivity for a 5-6 worker crew. Other devices have shown benefits to the farm managers and crews using them. These different devices have characteristics that dictate the minimum and maximum number of workers that can work efficiently with the device, some with 4-5 workers and others with 10-12 (see the BAE web site for videos and more information) The keys to increased productivity with these devices are that each worker must perform efficiently within the "team," the tasks are reasonably balanced or staged as to time required per worker-task, and the flow of tobacco and stalks in and out is smooth and efficient with minimum human handling distance.

One mechanical stripping machine has been demonstrated at recent field days, and another is known to be under development (see section Update on Burley Harvest and Stripping Mechanization).

Stripping Dark Tobacco

A fully mature dark tobacco plant will have 16–18 leaves. Dark tobacco (fire-cured and air-cured) has traditionally been sorted into 3 grades at stripping. These grades include lugs (3–6 leaves showing some ground injury from the lower portion of the stalk), seconds (4–6 leaves from the middle portion of the stalk), and leaf (4–6 leaves from the upper stalk). In addition, separate grades should be kept for "trash" and "green." The trash grade is leaves from the bottom of the stalk that show excessive ground injury and the green grade is leaves from anywhere on the plant that show an excessive green cast appearance or that have dark green areas from sunburn in the field. Many marketing contracts will only support lug, second, and leaf grades and will not support trash and green. Refer to marketing contracts for specific stripping and grading specifications.

Baling

The small conventional bale of oriented leaves with air cylinder compression in wooden-boxes (nominally 12" x 36" x 24") has been the industry standard since the 1980s. A dark tobacco version with varying width boxes and a "pre-flake" box was developed in the early 1990s. During the 2005 season, a "big baler" system originally developed for use in flue cured tobacco was introduced by the buying industry to make 500-600 pound burley bales in a steel fabricated chamber (nominally 42" x 42" x 40") using hydraulic cylinder compression (see BAE web site for an example operation). The use of the "big baler" was quickly adopted by several larger producers, some with cost sharing funds. Detailed labor studies are under way to evaluate potential labor savings of big bale packaging. Comprehensive data records kept by the U. K. Woodford County Research Farm Manager show a 26.6 percent increase in productivity per labor hour for bulking, stripping, and "big baling" 66,842 pounds into three grades in 2005 compared with similar production in 2004 and previous years of small bale packaging (see BAE web site for data).

The hydraulically operated big balers can be powered by a 230 volt electric motor or remote tractor hydraulic connections. The tractor power provides a lower cost baler and permits movement to various barns and stripping room locations where 230 volt power may not be available. The big balers have optional load cells and an electronic display to show the weight of leaves in the chamber thus permitting desired bale weights. Big balers can receive non-oriented ("tangled") leaves, which presents new options and opportunities for mechanically removing and handling leaves from stalks when stripping as discussed above.

No studies have been reported yet as to whether any difference exists in the maximum or minimum moisture content of leaves that can be baled, thus similar management of leaf moisture for baling is important. The delivered big bales are tested by the same electronic equipment as small bale stacks for moisture content. The upper level of acceptable moisture content is specified by each buying company. Great compressive force of the hydraulic system (10,000–15,000 pounds at the press head) is required to apply compression over the large surface area of leaves. Over-compression of high-moisture leaves can lead to "caking" and "bruising" if the quantity placed in the chamber is not limited to specified weights, thus showing the benefit of the extra cost for the electronic scales.

The larger mass of leaves and longer moisture diffusion flow path of the big bale from the inside to the outside supports the theory that big bales will not equalize with the surrounding environment as quickly as small, oriented leaf bales, thus they cannot be expected to "dry out" or "cool down" as rapidly as similar high moisture content small bales. Big bales of 500–600 pound weight have essentially the same mass density as the small 80-90 pound bales, therefore they are not automatically more open to ventilation, moisture diffusion and/or migration. Further, the cardboard liner partially enclosing these bales may limit effective air ventilation from about 40 percent of the bale surface. Thus, the moisture content of leaves going into the big balers should be below the acceptable level of marketing for safe storage and subsequent marketing. Big bales that are rejected for too high moisture content are more difficult to "dry down." The big bale cannot be as easily opened and flaked apart to facilitate drying even though some producers are finding it necessary to remove the wire ties and spread the tobacco out for drying and later re-baling.

References

Bridges, T.C., L.G. Wells, M.A. Peters and W.O. Peterson 2006. Evaluation of labor requirements and work rates for conventional stripping of burley tobacco. Tobacco Science (2003/2004) 46: 28-32.