

Double Crop Curing Dark Tobacco

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Double crop curing is the practice of curing two crops of tobacco in the same barn and growing season. The practice of double crop curing has been utilized by some dark-fired tobacco growers for several years but has increased in recent years as growers have attempted to consolidate operations and increase efficiency of production. Tobacco buying companies have started accepting the crop earlier than in the past to better accommodate this practice.

Double crop curing offers several advantages over the traditional practice of curing a single crop per barn per season. With the current price of new dark-fired barn construction ranging from \$6,000 to \$8,000 per acre of barn capacity, double crop curing drastically reduces the need for costly new barn construction and reduces depreciation, maintenance, insurance, and interest related to new construction or multiple barns. Because fewer barns are needed, transportation costs are reduced for transporting workers, equipment, and both green and cured tobacco from multiple barns to a central site for stripping. The period for harvesting and housing is extended with double crop curing, so it may be easier to keep a labor force occupied. Finally, being able to deliver crops to buying companies earlier reduces the amount of time storage space is required and reduces risks of crops being damaged before delivery.



Special Considerations

1. The first crop must be set earlier than normal, which means land must be prepared earlier and plants must be ready to transplant earlier. Variety selection for early transplanting may also be limited.

Timetable

One of the major challenges for new growers unfamiliar with the double crop curing system is maintaining a timetable and managing two crops separately throughout the growing and curing seasons. The first crop must be set earlier than in traditional methods. Land must be prepared earlier, and plants must be ready to transplant earlier. Transplanting must be staggered by 4 to 6 weeks (the amount of time needed to cure the first crop), and the tobacco must be managed as two distinctly different crops throughout the season. Dark tobacco performs best when transplanted in mid-May to early June. With the double cropping system, neither crop is transplanted in this ideal time frame; transplanting

occurs in early May and mid-June. As a result, yields for both crops are usually below normal. The first crop must be fired aggressively in an effort to complete the cure in approximately 5 weeks, as opposed to the traditional 7 to 8 weeks. This usually means firing almost continuously with little or no delay between firings. Storage space is required for the first crop while the second is being cured. Because the second crop will usually be ready to harvest immediately after taking down the first crop, storage of the first crop until it can be stripped and prepared for market may be the biggest challenge.

Time between transplanting the early and late crop is based on the time needed to harvest, house, fire, and take down the first crop. Although some growers have attempted to cure first crops in 3 to 4 weeks, this is a very minimal time period that requires starting fires early and with excessive heat, which often results in poor cured leaf quality. A good general rule is to maintain a 5-week differential between the early and late crop. This timing means that the first crop should be transplanted by about May 10 and the second crop should be transplanted by about June 15.

This 5-week separation in transplanting dates means that there will be two distinctively different crops to manage in the float bed, the field, and the curing barn. Seeding of the two crops in the float bed should also be separated by about 5 weeks. Temperature regulation, fertility, pest control, and clipping schedules in the float beds will obviously be different for the two crops. Growing the two crops of transplants in two different greenhouses or outdoor float beds may allow for the best management. Moving the first crop out of the greenhouse

to an outdoor float bed and seeding the second crop in the greenhouse is a common management strategy that works well. Avoid placing first crop trays on unsterilized surfaces while moving, and use fresh water that is free of fertilizer and fungicides (i.e. Terramaster®) for floating the newly seeded second crop trays.

This transplanting schedule should allow the first crop to be harvested in late August and the second crop to be harvested in late September. Weather conditions are the major hindrance to maintaining this time differential, as wet conditions in early May can delay transplanting of the early crop. If adverse weather delays transplanting of the first crop until May 15 or later, it is advisable to still maintain the five week delay and not transplant the second crop until later in June. In order to maintain a fairly favorable window for curing the second crop, the first crop should be transplanted by May 20 at the latest. Crops that have only a 2- to 3-week separation in transplanting may mature at about the same time at the end of the season. Allowing more than 5 to 6 weeks between transplanting early and late crops may place both crops in more unfavorable growing and curing conditions.

The 5-week separation between crops means that the first crop may receive at least one insecticide application and other operations such as sidedress fertilizer application before the second crop is transplanted. The first crop may be topped and receive sucker control applications at about the time the second crop is receiving its first insecticide application. Because most growers will use the same sprayer on both crops, they should be aware of chemical damage that can occur when making applications to the two crops. Be sure to clean sprayers diligently with tank cleaner and water between crops, particularly when applying sucker control chemicals on the first crop and going back to apply insecticides on the second crop. Sucker control chemicals such as contact fatty alcohols, local systemics such as Butralin®, Prime+®, and Flupro®, and particularly systemic products containing maleic hydrazide

(MH) can severely damage young tobacco. Because of this risk and since dropline applications for sucker control are common in dark-fired tobacco anyway, it may be advisable to have two sprayers available, one equipped with droplines and the other with nozzles.

Yields

Each crop will usually yield 200-400 fewer pounds per acre than normal, with the first crop usually having better yield and quality than the second. The earlier crop may suffer more from slow early growth and diseases associated with cooler, wetter conditions that may occur in early May. The later crop may be impacted by drier conditions after transplanting and cooler fall weather prior to harvest. Drier conditions and lower transplant quality in the second crop may result in poorer stands in the field, requiring more plants to be reset. In addition, dynamics of pest management will be different for the two crops. The first crop transplanted in early May will be more likely to encounter black root rot and additional feeding from flea beetles and budworms; the later second crop may sustain more aphid feeding.

Special Considerations

2. Transplanting must be staggered by 4 to 6 weeks (the amount of time needed to cure the first crop), and the tobacco must be managed as two distinctly different crops throughout the season.

Variety Selection

Proper variety selection for the two crops is one of the most important considerations for double crop curing. Variety selection for early transplanting may be limited. Maturity, disease resistance, and curability should be the most important characteristics of the varieties chosen. In most situations, two different varieties will work best.

Special Considerations

3. Ideally, dark tobacco performs best when transplanted in mid-May to early June. With the double cropping system, neither crop is transplanted in this ideal time frame; transplanting occurs in early May and mid-June. As a result, yields for both crops are usually below normal.

First Crop

Resistance to black root rot is essential for the first crop, as black root rot is much more prevalent in the cooler, wetter soils that are common when transplanting in early May. In addition, avoid legumes such as soybean and clover in the rotation the year prior to tobacco, as legumes can increase the potential for black root rot in tobacco the following year. Varieties with high black root rot resistance that are most suitable for early crops include KY 171, TN D950, PD 7312LC, PD 7302LC, and KT D6LC. KY 171 is a common variety used for first crops. KY 171 performs well as an early crop, has good black root rot resistance, is relatively early maturing, and has good curing characteristics. KY 171 should be harvested by 6 weeks after topping. TN D950 also performs well as an early crop and is very early maturing. TN D950 has a tendency to spot very quickly, usually between 4 and 5 weeks after topping, and should be harvested by 5 weeks after topping as it will deteriorate in the field very quickly after 5 weeks. In addition to high black root rot resistance, TN D950 also has medium resistance to race 0 and race 1 black shank. Although TN D950 is a better yielding variety than KY 171, it can be much more difficult to cure than KY 171. Setting good color during curing can be difficult with TN D950, as this variety contains more chlorophyll than other varieties and may require more heat and time to achieve good cured leaf color. PD 7312LC is a recently released hybrid of KY 171 and Narrowleaf Madole. PD 7312LC has the black root rot resistance of KY 171

with some of the better leaf quality and curing characteristics of Narrowleaf Madole. Maturity of PD 7312LC will be slightly later than KY 171 but earlier than Narrowleaf Madole. PD 7312LC should be harvested at around 6 weeks after topping. PD 7302LC has high resistance to black root rot as well as excellent resistance to race 0 black shank. Like PD 7312LC, PD 7302LC shows some of the better leaf quality and curing characteristics of Narrowleaf Madole but with earlier maturity. PD 7302LC should be harvested around 6 weeks after topping. KT D6LC is another recently released hybrid, from the parents KT D4LC and TN D950. KT D6LC has resistance to black root rot and medium resistance to both races of black shank and will generally produce better cured leaf quality than TN D950, but lesser quality than KY 171 or PD 7312LC. DF 911 has high resistance to black root rot but does not perform as well as other varieties such as KY 171 when transplanted in early May.

Special Considerations

4. The first crop must be fired aggressively in an effort to complete the cure in approximately 5 weeks, as opposed to the traditional 7 to 8 weeks. This usually means firing almost continuously with little or no delay between firings.

Second Crop

The second crop should be less affected by black root rot during the growing season but will likely be more affected by adverse curing conditions of cool temperatures and low humidity. For these reasons, the variety chosen for the second cure can be one that has lesser disease resistance, if the field does not have a history of black shank or black root rot, but better curability and firing characteristics. Narrowleaf Madole is later maturing than most other varieties and will hold up in the field longer than any other variety, al-

lowing additional time if the first crop is harvested later or takes longer to cure than expected. Narrowleaf Madole also has excellent curing characteristics and can be very forgiving in the barn during adverse curing conditions. In fields with no history of disease, particularly black shank, Narrowleaf Madole can be a good choice for the second crop. Other varieties that also have very good curing characteristics and may be good choices for second crops are TR Madole and Little Crittenden. Like Narrowleaf Madole, these varieties should only be chosen for fields with no history of disease, as these varieties have no disease resistance, although they do have excellent curing characteristics. Little Crittenden has excellent leaf quality and curing characteristics and can stand in the field almost as long as Narrowleaf Madole. TR Madole is fairly early maturing and will not stand as long as either of these, but it has very good curing characteristics.

One of the most common complaints with early crops each year is the perceived threat of early or premature flowering. Early and premature flowering is influenced by cool temperatures and low light conditions that mimic the short days of fall and induce the plant to flower early. This can occur while plants are in the float bed or even shortly after transplanting in the field. Crops seeded early have more opportunity to experience these conditions and may show an increased incidence of early flowering than crops seeded later. Although the percentage of plants showing symptoms of early flowering can be higher in dark tobacco than in burley, it is nearly always a low percentage of less than 10 percent and usually no more than 3 to 4 percent. Early flowering plants can be topped early and treated with a fatty alcohol or local systemic sucker control product until the rest of the crop flowers at the normal time. Research has shown that early flowering can be reduced with the use of artificial lighting in the float bed for short periods at night while conditions that induce early flowering are occurring. As little as 12 minutes of fluorescent light in the middle of the night can drastically reduce early flowering.

Special Considerations

5. Adverse curing conditions in the form of cool, dry weather will often occur during curing of the second crop. Setting a good color in the second crop can be slow and difficult, and may require adding moisture to the sawdust to provide moist smoke to the tobacco.

Barns

Some barns are not suitable for double crop curing. The barn should be well ventilated with top and bottom vents and should also be tight enough so that moisture in the barn can be carefully controlled. A 3-tier design saves barn costs, reduces housing labor, and allows faster and more uniform curing compared to barns built 4-6 tiers high. Installation of high-volume, belt-driven ventilation fans mounted in the ridge of the barn roof and run for the first several days after housing will help to further speed the curing process for the first cure.

A good barn design for double crop curing is a 3-tiered barn 28-32 feet wide and 48-72 feet (4-6 12-foot bents) long with metal siding and/or roof. Vertical tier spacing of 5 feet is used with 42- to 48-inch horizontal spacing between tiers. The narrower 42-inch horizontal tier spacing is more comfortable for shorter workers to stand on when housing; the 48-inch horizontal spacing allows for better uniformity of air flow around each plant. Shorter sticks may be needed for outer rails with the narrower horizontal tier spacing. Normal sized tobacco that is fully wilted before housing can be housed as close as 8 inches between sticks in this barn, allowing a capacity of approximately 400 sticks or 0.5 acre per bent (2,400 sticks or 3 acres if the barn is 6 bents long). The barn should have horizontal bottom vents on each side that cover at least two-thirds of the length of the barn (1 by 8-foot vent in every 12-foot bent).

Condensation inside the roof of the barn or “barn drip” is a concern in any dark-fired barn and may be more of a concern during the more intensive firing of first cures in double cropping. Increased condensation occurs with galvanized metal roofing unless moistureproof insulation is placed underneath the metal. Aluminum roofing can be acceptable with or without insulation, but the best way to eliminate barn drip is to place moisture-resistant foam boards such as extruded polystyrene tightly over the purlins of the trusses and under the metal roofing. Materials used for insulation should be sealed and separated from the tobacco to prevent any risk of contamination of the tobacco.

Risk of fire is always an increased concern during more aggressive firing of first cures. It is recommended that the barn include a concrete foundation that extends at least 18-36 inches above the ground as a safety precaution against fire. Fireproof metal sheeting should also be placed over each wooden post inside the barn, extending from ground level to at least 18 to 36 inches high.

Fans are a major feature that is recommended in double crop curing barns. It is recommended that one fan be installed for every 3-4 bents (12 feet long). For the 6-bent barn design previously described, two fans would be needed. Fans recommended for use in dark-fired tobacco barns should be belt driven with a totally enclosed motor and sealed ball bearings to reduce maintenance required and to protect against smoke, soot, and other residue. Cast aluminum or welded steel blades are preferred over thinner riveted aluminum blades for longer life under these conditions. The sizes of fans are described in cubic feet of air flow per minute at a required static pressure. Static pressure is a rating procedure used to ensure that the fan will move a certain amount of air against a given resistance; in this case the resistance is the tobacco. For the two fans required for the 6-bent barn described above, the fans should have at least a 6,000 cfm (cubic feet per minute) air delivery at 0.1 inch static pressure.

For more information on the barn design and specifications described here, see the website <http://www.bae.uky.edu/ext/Plans/Tobacco/735-31.pdf> for construction plans and the website <http://www.bae.uky.edu/ext/Tobacco/PDFs/DrkFirBn.pdf> for additional guidelines on construction and operation.

Special Considerations

6. Not all barns will work in double crop curing. The barn should be well ventilated with top and bottom vents and should also be tight enough so that moisture in the barn can be carefully controlled.

Firing

For most growers, the firing and curing process for both crops in double crop curing will need to be modified somewhat compared to traditional single crop curing. The first crop will need to be cured aggressively in about a month, and the second crop may require more patience for curing under adverse conditions of dryer, cooler weather. Although many growers allow 7 days or so between housing and starting the first fire to allow the tobacco to yellow thoroughly before adding heat, the short time frame for the first cure may dictate that fires be started only 2 to 4 days after housing.

First Cure

Proper stick spacing is a very important aspect of curing any dark tobacco crop but is especially important during the first cure of double cropping. Proper stick spacing increases air flow around the tobacco, which speeds yellowing and curing and improves finishing. Stick spacing should be at least 8 to 9 inches in newer barns with wider tier spacing where average sized tobacco does not overlap between tiers. Although older barns with narrower tier spacing are not recommended for double cropping, stick spacing in these barns should be at least 12 inches.

Extremely large tobacco should also be spaced 12 inches or more in either barn type.

Under normal August conditions of high temperatures and high relative humidity, all vents and doors should be open and fans should be run continuously to hasten yellowing and reduce moisture content prior to the first firing. Under conditions of lower temperature and relative humidity, yellowing can progress adequately without using maximum ventilation and fans. The degree of yellowing in the tobacco prior to the first firing affects the color of the cured leaf. Although a typical first cure will not be as yellow as a typical single cure at first firing, a good color can be set with initial firings as long as yellow spots show on the majority of the leaf lamina. The entire lamina does not have to be solid yellow prior to firing. KY 171 yellows quickly and usually cures easily in the short 5-week time frame. PD 7312LC also has excellent curing characteristics for a first crop and should yellow and cure easily in 5 weeks. TN D950 and, to a lesser degree, KT D6LC, require more patience during the coloring process. These varieties may need initial firing before much yellowing occurs and more constant and intensive heat than other varieties during color setting. Curing these varieties in 5 weeks with adequate color and finish can be challenging.

After a solid brown color is set in any variety, fires should be kept as warm as the buyer allows. Firing should be nearly continuous with as little time period between fires as possible. Although the tobacco takes finish better when it has some order, there will not be time to reorder the tobacco between fires during the first cure.

Second cure

With the cooler, dryer weather that typically occurs during the second cure, even good curing varieties such as Narrowleaf Madole may be slow to yellow and more difficult to cure to a solid color. Cooler temperatures slow down the chemical reactions that cause color change in the leaf. Even in a tight barn with fires going, cold north winds in

October will keep the barn cooler than with the first crop. Fires that may have brought the barn temperature up to 110°F or more in September may only maintain temperatures in the nineties in October. Dry conditions may cause the tobacco to dry out too quickly before a solid color is reached. These adverse curing conditions often result in increased levels of green tobacco in the second cure.

More wood may be needed on fires to keep the barn warmer. Temperatures should be maintained at 100°F to 115°F during color setting, and 120°F to 130°F during drying. If tobacco begins to dry out too quickly before a solid color is set, conserve moisture in the barn by closing all ventilators, and use wet sawdust on fires to produce a moist smoke. Adding moisture directly to the tobacco by spraying, misting, or steaming during curing is not recommended.

Special Considerations

7. Ordering the tobacco by artificial means such as steamers or overhead misting systems is essential in double crop curing as there will not be time to wait for natural ordering from rainfall when taking down the first crop, and conditions are often dryer later in the season when it is time to takedown the second crop.

Takedown

As mentioned previously, ordering of the tobacco, particularly the first cure, will almost certainly have to be done by artificial means. The most common methods of artificial ordering are the use of steamers and overhead misting systems.

With steamers, one or two heated coils superheat water as it passes through the steamer and into long metal rods that can be placed on the floor of the barn. Steam emerges from the rods and rises into the tobacco.

The combination of heat and moisture quickly conditions the dry tobacco so that it can be handled for takedown without shattering. For more information on steamers, see the website http://www.bae.uky.edu/ext/Tobacco/tobacco_cond.htm.

With overhead misting systems, sprinkler nozzles are permanently mounted in the ceiling of the barn to spray a circular pattern over the top of the tobacco. Nozzles used are small high-volume irrigation-grade sprinkler nozzles that produce coarse droplets at low pressure. Piping is run from a water source up the sidewall of the barn to supply water to the sprinklers. Plastic PVC piping is not recommended unless it is a heat resistant grade that can withstand intensive temperatures of 130°F or more. Rust resistant metal piping is a better choice. Before installing sprinklers, check the size of the spray pattern to insure that spacing allows for overlap and complete coverage over all sticks in the top tier of the barn. Sprinklers can be run at low ambient pressure, and extra pressure is not needed.

The most common mistake made during misting or steaming is adding too much water and getting the tobacco too wet. With steaming, the tobacco will feel wet initially but this moisture will soon evaporate and leave the tobacco dry when exposed to outside air. Most crops, particularly those with heavier finish, will need an initial preconditioning steaming or misting and then a second steaming or misting before the tobacco can be handled. It is easier to add too much water with overhead misting, and this water only runs off the tobacco, removing finish, staining the tobacco, and encouraging bacterial action. Several short steaming or misting events are best, allowing a few hours in between for moisture to stabilize in the tobacco. With misting, turn the water off as soon as the first drops start to fall from the bottom tier.

Research has shown that the method of conditioning or ordering the tobacco before takedown can have a substantial effect on levels of certain harmful chemicals in the cured leaf. Although

either conditioning method should be used in moderation, overhead misting is usually the better method of conditioning the tobacco with regard to improved leaf chemistry. It generally takes less water to order a barn of tobacco with an overhead misting system than it does with a steamer.

Special Considerations

8. Because the second crop will usually be ready to harvest immediately after taking down the first crop, storage of the first crop until it can be stripped and prepared for market may be the biggest challenge.

Handling the First Cure

How to handle the first cure may be the biggest decision to be made in a double crop curing system. Most likely there will not be enough labor to work on stripping the first crop while the second crop is being harvested, so at least some of the cured first crop cannot be stripped right away and will have to be stored for a certain period of time. In most instances the stalks of the first crop will also have some moisture and green in them at takedown. Tobacco in this condition could rot quickly with warm fall temperatures if bulked down in piles for storage until stripping. Loading the tobacco on scaffold wagons for storage is a much better option, but adequate storage space for these wagons will most likely be limited as will the availability of scaffold wagons while harvesting the second crop. It may be necessary to construct a simple, well-ventilated storage facility where tobacco is held until it can be stripped. The quicker the tobacco can be stripped and delivered to the buyer, the better the physical and chemical properties of the tobacco will be. The goal should always be to deliver the tobacco to the buyer as quickly as possible.

Conclusions

Double crop curing can be a very effective tool for reducing curing costs and increasing efficiency, but it may not be suitable for every operation. Growers considering double crop curing should closely evaluate their barns and storage facilities, labor force, equipment, and capacity to manage two crops during the growing and curing seasons before making a decision on double cropping.

References

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