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One-Tier Plastic-Covered Tobacco Curing Structure—Tier Rail Design

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TOBACCO in KENTUCKY

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Introduction

A tobacco grower occasionally has insufficient barn space to house his crop. This problem is especially severe when a barn is damaged or destroyed and cannot be repaired or replaced before harvest. Also, those leasing or having extra poundage may need short-term, low-cost housing.

Kentucky weather conditions are suited for curing in conventional barns as well as in other special structures with adequate covering and crop protection.

Curing Studies

Simply constructed field scaffolds covered with temporary materials have often been used to cure burley tobacco in several areas of the world. The availability of durable polyethylene and other film in recent years has increased the practicality and reduced the risk of air-curing tobacco under plastic-covered structures.

In Kentucky, research studies have shown that the market value of stalk-cut burley cured under plastic is equivalent to tobacco cured in a conventional barn. Various studies where stalk-cut burley was cured on portable frames or field structures with a plastic roof and side curtains yielded the following results:

- Value differed little between tobacco cured under plastic at 4-inch and 5-inch stick spacing.
- With rails six feet above ground and the tips from one to two feet above the sod, tobacco from the tip and leaf positions was darkened during curing and graded about $0.01 per pound lower. However, tobacco from the flying and lug positions was equivalent in condition and value to tobacco cured in a conventional barn.
- Color of plastic did not affect the value of cured tobacco, but dark or opaque plastic is preferred to keep the sunlight from “bleaching” the tobacco.
- Total labor for housing and taking down the tobacco was about 45 man-hours per acre, whereas the labor required for performing the same tasks by conventional practices was about 64 man-hours per acre. (This represents a 30% reduction in total labor.)
- Black 6-mil polyethylene plastic installed on the sidewalls with nailed battens did not fail during the curing season. Roof coverings continuously exposed for two seasons did not fail until the end of the second season.
- Temperatures and relative humidities recorded within the plastic-covered framework were nearly the same as those recorded outside.

Pole-Frame Curing Study

A specially built, pole-type, low-cost structure was tested for housing and curing burley tobacco. Tier rails were eight feet above ground to allow a worker standing on a truck or wagon to conveniently house the crop. This also raised the tips off the sod sufficiently to ensure good ventilation under the tobacco.

The sod turf under the structure was mowed immediately before housing. Black 6-mil polyethylene plastic was installed with battens on 3:12 sloped rafters spaced four feet apart.

Labor Data

Labor data are tabulated in Table 1. Field workers preferred working in the plastic-covered structure compared to a conventional barn.

Adapted from Yoder, E.E. and W.H. Henson, Jr. "Curing tobacco in Plastic Covered Structures," ARS 42-179. Nov. 1970.

TABLE 1. LABOR REQUIRED TO HOUSE, CURE, AND TAKE DOWN TOBACCO IN A PLASTIC-COVERED STRUCTURE.

ITEM	MAN-HOURS/AC[a]
Install roof plastic	10.2
Transport tobacco 100 yards & house	22.6
Install sidewall and end wall plastic	3.5
Remove cured tobacco	8.8[b]
TOTAL	45.1

[a]Labor to construct the wooden structural framework and to remove used roof plastic is not included.
[b]Includes removal of sidewall plastic.

Plastic Performance

Roof plastic expanded during hot days and sagged loosely between the rafters. The plastic contracted during cool days and became taut. Although the 6-mil black plastic remained intact throughout the curing season, a -8°F temperature during the following winter caused the plastic to contract enough to fail (split) in several places.

There was no evidence that sagging of the plastic between the rafters during warm weather caused any problems. The excessive tightening of the plastic during the sub-zero winter might be solved by installing the plastic rather loosely during summer weather. In this way, black 6-mil roof plastic might be used for two seasons. Some newer types of woven and mesh reinforced plastic films on the market now would be even stronger for the roof covering. It does not seem practical to obtain multiple-year service from roof plastic by removing it from the structure at the end of each curing season and reinstalling it the following season.

Plastic along the sides of the structure can be removed at the end of the curing season, especially one or both sides for removing the cured tobacco. If battens for attaching this plastic are thick enough to withdraw the nails without breaking the battens, 6-mil sidewall plastic can be conveniently salvaged for reuse.

Curing Results

Cured leaves at stalk positions toward the tip of the plant were slightly darker than corresponding leaves cured in the conventional barn, resulting in a $0.01 per pound lower market value for the tip grade. Since the tips were approximately three feet above the sod, the only apparent explanation for the darkened leaf is the high nightly humidity around the leaves and the high case of the tip leaves. Since the potential gain in value of this grade of tobacco was only $17 per acre (at 1968 prices), there is no apparent justification for any additional investment or labor to correct the situation other than selecting a well-mowed site with good water drainage and air movement.

Figure 1. *Construction of a pole-type plastic-covered curing structure.*

Figure 2. *Tobacco housed from wagon bed. The wagon can be pulled through the structure during housing if end boards are removed, and tobacco can be loaded from front to rear.*

Figure 3. *During the first two to three weeks of curing, the sides and ends of the structure can be left open. After approximately three weeks of curing, sidewall and end wall plastic curtans are attached to the rails and rail supports with nailed battens to protect the dry tobacco.*

Curing Guidelines

When using such a field curing structure, the early harvested tobacco ought to be housed in the structure to achieve early curing and permit removal for stripping early in the fall before bad weather can affect the tobacco.

Such a structure offers the possibility of "double-barning," or two or three weeks of "pre-curing" before taking the tobacco to a barn for closer spacing. This practice offers greater barn capacity for final curing.

Design for a Pole-Type Plastic-Covered Field Curing Structure

The essential features of a plastic-covered field curing structure for short-term curing are shown in Figure 5. A list of materials is given in Table 2.

Lumber should be structurally sound. Poles should be treated with preservative if the structure is to be used for more than four to five seasons. Untreated lumber will seriously deteriorate in four to five years or longer if left uncovered and unprotected, especially if it is in contact with the ground.

Color of plastic is optional, but black will last longer against sunlight exposure.

Materials and dimensions may be varied in accordance with available new or used lumber. Regardless of structural revisions, the following specifications should be followed:

- For unbraced poles, hole depth should be at least three feet.
- Tier rails should be 7 1/2 feet or more above the ground.
- Rafters should be spaced approximately four feet apart. Rafter slope should be 3:12 or more to minimize water puddling in sagging plastic. Minimum vertical clearance between the upper face of the rafter and the end of the tier rail should be about 1'-9". This is required to prevent plant stalks from puncturing the plastic. A rafter tie should be installed to prevent rafter separation at the ridge and to provide longitudinal reinforcement.
- The thickness of polyethylene plastic should be at least 6 mil. Other equivalent or better materials can be used. The plastic should be securely attached with nailed battens to structural members which are free of rough faces or sharp projections. Install the battens the full length of the ridge, fascias, and all rafters. Install roof plastic somewhat loosely during mild or warm weather to prevent excessive tautness during cold weather. Attach the sidewall plastic along the upper edge and at the poles. Roll the edges of roof plastic and wall plastic around the battens and then nail them to obtain uniform fastening.
- The rafter structure is not designed for a heavy snow or ice load (six inches of snow or more of depth or similar ice). Obviously no tobacco should be in the structure when such a snow or ice load occurs because plastic or rafters could fail under such conditions.

Figure 4. *Cured tobacco can be easily bulked onto a wagon when in case for transport to a stripping room.*

Table 2. Materials for One 12-Foot Bent of Structure Shown in Figure 5.

QUANTITY	ITEM	SIZE
1	Center pole 5" Dia. or 4 x 6 x	15' length
2	Side-wall pole 5" Dia. or 4 x 6x	12' length
6	Tier rail	4" x 4" x 14'
4	Rail support	2" x 8" x 12'
5	Scab	2" x 6" x 2'
6	Rafter	2" x 4" x 16'
2	Rafter support	2" x 4" x 12'
4	Rafter support brace	2" x 4" x 2'
2	Ridge support brace	2" x 4" x 5'
3 (Avg.)	Diag. rafter spt. brace	x" x 4" x 7'
1	Ridge board	2" x 4" x 12'
3	Rafter tie, ridge	2" x 4" x 12'
2	Rafter tie, longitudinal	1" x 4" x 4'
2	Fascia board	1" x 4" x 12'
170 lin. ft.	Batten	1/2" x 1-1/4"
12 lin. ft.	Roof plastic	6-mil x 32' or equal
24 lin. ft.	Side plastic	6-mil x 6' or equal
3 lb.	Nails	16d common
2 lb.	Nails	6d common
ENDS ONLY:		
56 lin. ft.	End wall plastic	6-mil x 10' or equal
12 ea.	End wall girts for plastic	2" x 4" x 14'
4	Diag. rafter spt. brace	2" x 4" x 7'

Construction Notes

1. Install poles in 3' hole. Backfill with well-tamped earth. Cut top ends to level alignment.

2. Install rail supports to provide 7'-6" vertical distance between ground and top surface of stick rails.

3. Install 14' stick rails at a 4' nominal spacing or less if desired.

4. Install top surface of rafter supports 1'-6" above top surface of stick rails and flush with top of 12' sidewall poles.

5. Install ridge board on top of 15' poles and attach with scab.

6. Install rafters at 4' nominal spacing for large sheets of black poly plastic or other spacing for special widths of newer plastic materials. Install ridge and longitudinal rafter ties.

7. Install 2" x 4" x 2' long vertical brace between rafter support and rail support at end of each rail to strengthen rafter support.

8. Install 6 mil x 32' black plastic roof covering with battens nailed to rafters and fascia.

9. After two to three weeks of curing, install 6 mil x 6' black plastic end-wall and side-wall covering with battens nailed to rails and rail supports.

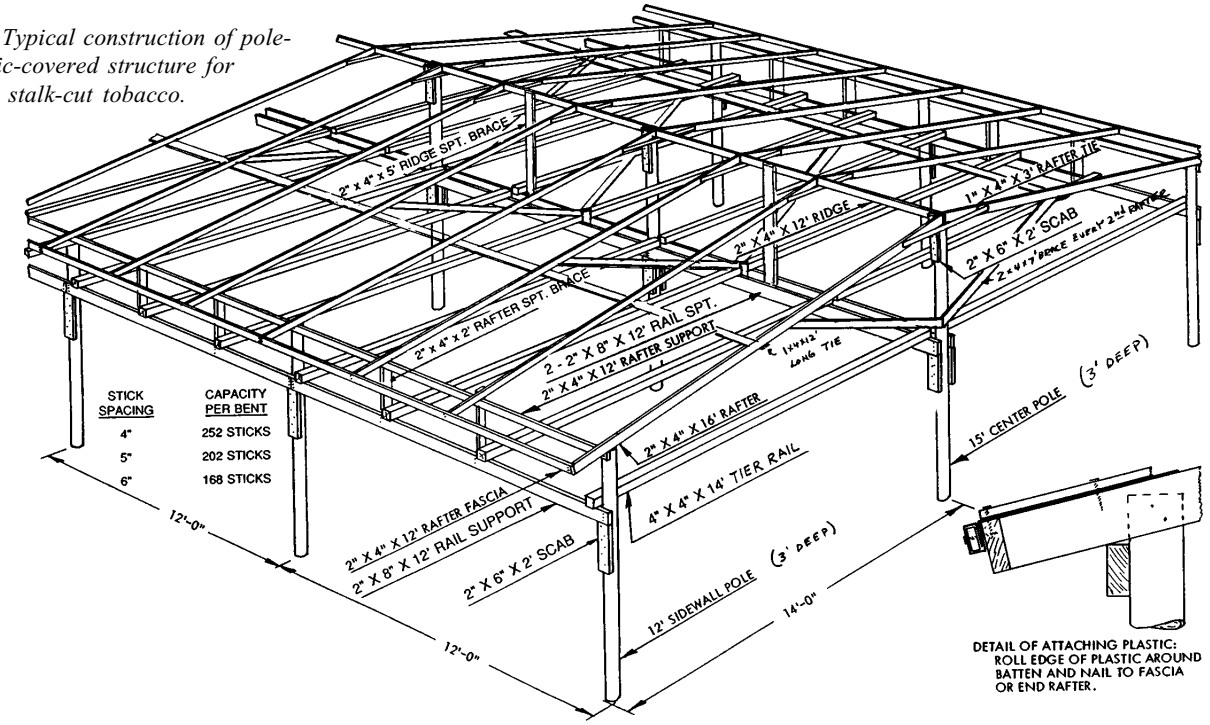

Figure 5. *Typical construction of pole-type plastic-covered structure for air-curing stalk-cut tobacco.*

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