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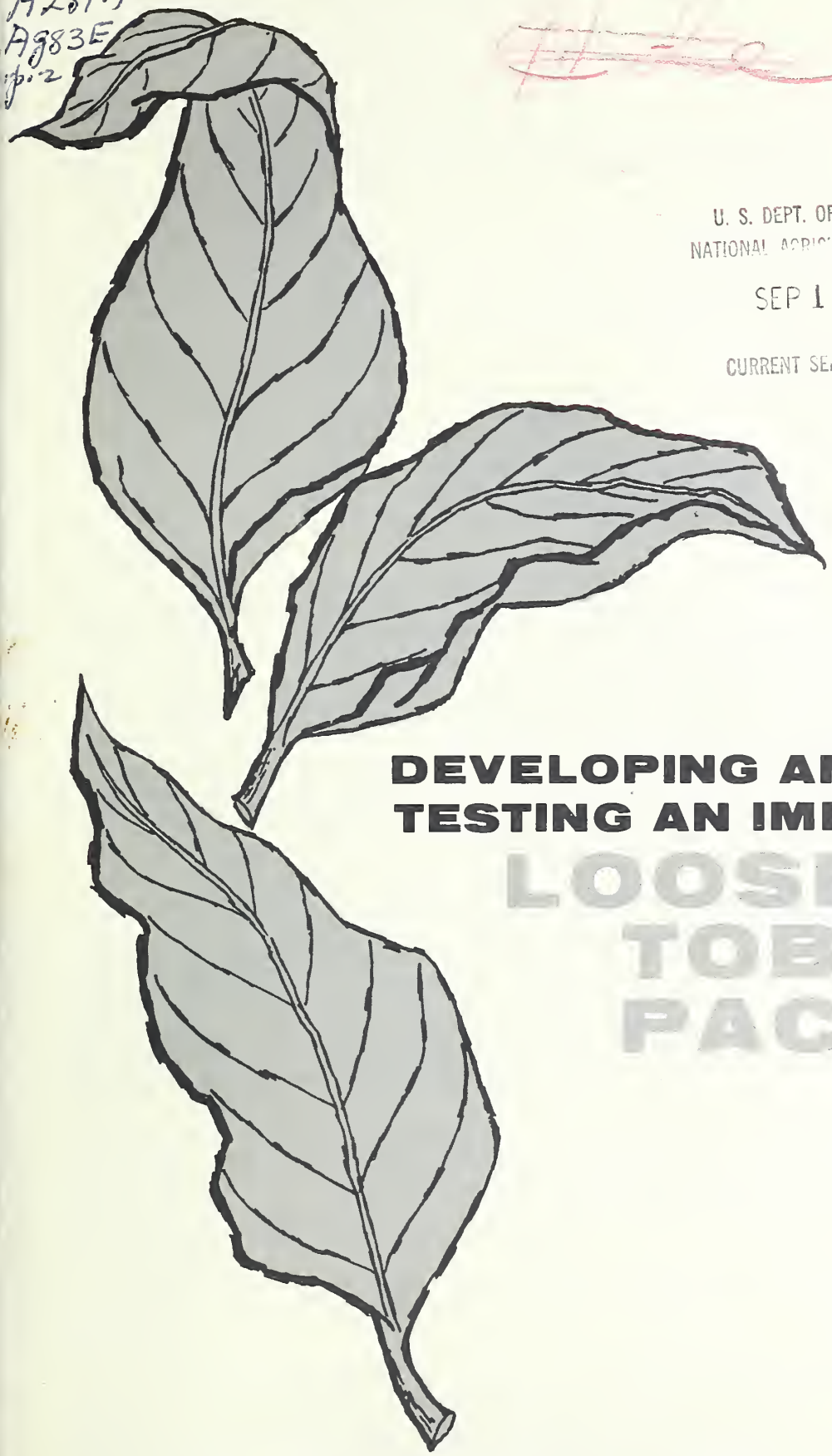

DEVELOPING AND MARKET TESTING AN IMPROVED LOOSELEAF TOBACCO PACKAGE

MARKETING ECONOMICS DIVISION • ECONOMIC RESEARCH SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

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SUMMARY

Growers of types 11(a), 11(b), 12, and 13, flue-cured tobacco tie bundles of 25 to 30 leaves together for market in Virginia, North Carolina, and South Carolina. Only type 14 flue-cured tobacco, grown primarily in Georgia and Florida, is marketed by growers in looseleaf form.

In the past 5 years over 50 percent of domestic processing capacity has been converted to new types of plants and equipment which produce tobacco strips. Because of this technological change, bundles are no longer required for processing the major part of flue-cured production. But selling the leaves loose instead of in bundles permits them to become tangled before reaching the processing plant. Tangled leaves interfere with efficient processing.

To facilitate keeping the leaves straight-laid as they pass through the auction markets and are transported to the processing plants, a new packing method and covering material were developed and tested. Actual farm and auction warehouse conditions were used to test the method and material in South Carolina, North Carolina, and Virginia. In total, 273 packages (36,753 pounds) of tobacco were sold on 5 local markets.

The proposed packaging method for handling loose leaves offers several important advantages over bundle tying. Under farm conditions with the new packaging method, two workers can package 300 pounds of tobacco in 30 minutes, a total of 1 man-hour. A conservative estimate is that farmers preparing tobacco for market would save about 100 hours of farm labor per acre. Tobacco growers and their families were enthusiastic about the new packaging method because it saves labor and eliminates the usually boring and monotonous task of tying the leaves.

Adoption of the new packaging method in the area where flue-cured tobacco is tied before marketing would save growers approximately 6 million man-days of labor, or $36 million in labor costs. The saving would amount to about 3 cents per pound of tobacco.

The packing frame developed for the test is inexpensive and easily constructed. Only one or two frames would be needed on the average farm with 3.5 acres of tobacco. The packing frame produces a bale of tobacco that can be easily assimilated into the present auction markets, transportation system, and processing plant technology. Leaves which are packed in straight-laid bales can be rapidly inspected and loaded on processing conveyors without tangling of the leaves or broken midribs. The square-cornered package conserves transporting and storing space and is readily adaptable to mechanized handling throughout the marketing channels.

A new type of knit-paper sheet was designed and used to cover the tobacco package. This sheet, which replaces burlap or cotton sheets and wooden warehouse baskets, remains with the tobacco from the farm to the processor. Knit-paper sheets have the advantage of being inexpensive and nonshedding, with physical properties of elastic conformity and high wet strength.

The new package would reduce labor costs at the warehouse because the tobacco would not need to be put into warehouse baskets before sale and back into sheets after sale.

The flue-cured tobacco growers have strong competition, primarily from Southern Rhodesia and Canada. These countries have what the world tobacco trade considers to be superior farm packaging methods and materials. It is important that the sales appeal of U.S. tobacco in the world markets be increased if the growers expect to maintain or increase their relative competitive position.

DEVELOPING AND MARKET TESTING AN IMPROVED LOOSELEAF TOBACCO PACKAGE

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BACKGROUND

Traditionally, type 14 flue-cured tobacco produced in Georgia and Florida has been marketed untied, in round packs of loose leaves. Flue-cured tobacco marketed in other States is tied in bundles. There is substantial agreement among leaf buyers that the present method of selling looseleaf, flue-cured tobacco in cotton or burlap sheets is damaging to the leaf and that the packages thus handled present a poor appearance on the market. Tobacco growers can improve salability and decrease preparation cost by adopting a new form of looseleaf package, such as the one described here.

Methods of processing tobacco have changed rapidly during the past 5 years. The processing of tobacco strips for storage and aging has gained prominence in the tobacco industry, especially among the domestic manufacturers and larger dealers and exporters. The U.S. processing capacity for tipping and threshing tobacco into a strip product increased from an insignificant amount to over 50 percent of total processing capacity in the past few years. 1/

Due to the technological changes in tobacco processing and the demands by farmers in areas other than Georgia and Florida to market their flue-cured tobacco untied, the U.S. Department of Agriculture in the 1962 marketing season began experimental sales of loose leaves of types 11, 12, and 13. The experiment was limited to tobacco from the lower part of the stalk, which is utilized almost entirely by domestic manufacturers. The experiment did not include tobacco sold to exporters because foreign manufacturers are changing to the use of a strip tobacco at a slower rate than domestic companies. However, the world's leading tobacco importer, the United Kingdom, received 58 percent of its total imports for 1963 in strip form. 2/ Forty percent of the total U.S. flue-cured tobacco shipped to the United Kingdom in 1963 was in strip form. 3/

Newly developed processing machinery and technology are making the old methods of redrying and packing bundles into hogsheads obsolete. Modern methods of handling the leaves in loose form utilize belt and vibration conveyors and air-pressure systems which eliminate the requirement that leaves be tied in bundles for the conveyor sticks. This change in tobacco processing technology has created the opportunity for farmers to reduce the amount of labor needed to prepare tobacco for market if an efficient method of packing loose leaves can be developed.

1/ Cockroft, L. U., and Brown, J. W. H. Econ. Res. Serv., U.S. Dept. Agr., unpublished data.

2/ Tobacco Situation. Econ. Res. Serv. U.S. Dept. Agr., March 1964, p. 25.

3/ Conover, A. G., and Sackrin, S. M. Econ. Res. Serv., U.S. Dept. Agr., unpublished data.

REQUIREMENTS FOR THE NEW PACKAGING METHOD

The Department of Agriculture, in developing the new packaging method, established the following requirements:

(1) The method should require no more labor on the part of the grower than is consistent with the needs of the auction marketing system and modern processing technology.

(2) The package should be open to rapid and easy inspection for foreign material at the auction market with a minimum of disarray.

(3) The package should be square or rectangular to conserve space in transit and storage and to reduce unpacking labor at the processing conveyor.

(4) The package should be adaptable to mechanized handling at the manufacturing plant and in marketing.

CONSTRUCTION OF THE PACKING FRAME

After several types of frames had been developed, two sizes of rectangular, bottomless packing frames of constructional and operational simplicity were adopted. The smaller frame, 30 inches high and with side dimensions of 30 by 38 inches, was designed for packing shorter leaves found in primings and nondescript grades. A larger frame, 38 by 38 inches square and 30 inches high, was made for packing the considerably longer leaves found in lugs and cutter grades. A frame not quite as wide as the combined average length of two leaves, but wide enough to allow the leaves to overlap at the tips, will produce a package that will maintain its form during inspection and movement. The packing frame, shown in figure 1, can be constructed in a few hours. There is no bottom or top and the smooth interior surfaces allow the frame to be easily lifted off the tobacco when the packing is finished. A packing board is used to compress the layers of leaves as they are placed in the packing frame. The board can be readily cut out from three-quarter-inch plywood. So the board can be easily removed after each layer of leaves is packed down, its dimensions should be about 2 inches less than the interior dimensions of a packing frame. The materials used in constructing the experimental frames were one-quarter-inch masonite hardboard and 1 by 2-inch fir reinforcing strips; but plywood, galvanized steel, aluminum, or other suitable material can be substituted. The exterior surface of the construction material is of little concern. It is important only that the frame be strong and its interior smooth. In constructing the frames, tobacco growers can use materials that are least expensive and most readily available.

PROPER USE OF THE PACKING FRAME

A sheet is laid on the packhouse floor and a frame is placed diagonally on the sheet. Loading can be done rapidly if the leaves have been previously taken from the curing sticks or bulk curing racks, graded, and piled along a wall of the packhouse with the butts all pointing in the same direction. The two workers are not in each other's way and can pack more efficiently if they work from opposite sides of the frame, facing each other. An armload of leaves can be quickly picked up and placed in the box. The leaves are laid straight in the frame with the butts against only two opposing sides of the frame and with the tips of the leaves overlapping in the center. When the smaller 30 by 38-inch box is used for packing, the leaves should be placed parallel to the 30-inch sides with the butts touching the 38-inch sides.

Figure 1

Packing is done after placing a layer of leaves about 15 inches deep in the bottom of the frame. The leaves are arranged so that the tips overlap several inches in the center of the pack, serving to hold the pack together. The packing board is then placed on top of the tobacco and stepped on to pack down the leaves. The board is removed, another layer of about 12 inches of tobacco is added, and the leaves again pressed down with the packing board. Successive 12-inch layers of leaves are added and pressed down until the desired weight is reached. With a little experience, workers are able to judge the weight of the pile and adjust it to the desired weight.

After packing the frame, each worker grasps a side of the frame and lifts it up and off the tobacco. Then, diagonally opposite corners of the sheet are picked up and exchanged with the partner across the top of the pile. The two ends are stretched tight and tied together. The other two diagonally opposite corners of the sheet are then tied over the top of the pile. Using this method, two workers can average packing 300 pounds in 30 minutes.

DESCRIPTION OF THE DISPOSABLE KNIT-PAPER TOBACCO SHEET

After being packed on the farm, the bale needs to be protected against contamination by foreign matter, breakage, and weight loss in the marketing channels. A disposable knit-paper tobacco sheet was substituted for the conventional burlap-and-cotton sheet used for transporting loose tobacco (fig. 2). The kraft knit-paper sheet has several physical properties which make it suitable for use in tobacco marketing. One of the foremost is the high wet strength of the paper, made possible by special treatment

Figure 2

during manufacturing. The moisture content of flue-cured tobacco at sales time will not weaken the sheet if the kraft paper has been manufactured with the desired wet strength.

The elasticity provided by knitting is another useful characteristic. Stretching the sheet material by pulling at the corners makes it conform well to the square shape in which the tobacco is packed. If the corners of the sheet are stretched and tied in square knots, a secure and neat-looking package can be made.

A third characteristic is the nonshedding type of paper yarn used in knitting the sheet. Burlap and cotton covering materials often shed unwanted fibers into the tobacco. But knit paper is manufactured from a monofilament twisted yarn that does not shed fibers.

WAREHOUSE HANDLING PROCEDURES

At the warehouse, the looseleaf tobacco packages can be handled in either of two ways. The packages can be unloaded from the grower's truck and placed in baskets in the conventional manner, or the baskets can be eliminated by placing the package directly on a handtruck for weighing in and positioning the tobacco on the warehouse floor. If the floor is damp in the selling rows, a roll of plastic, commonly used for covering tobacco, can be rolled out on the floor. The tobacco is placed on the warehouse floor with the butts facing the walkway. The knots are untied, and the sheet is dropped to the floor and tucked under the edge of the pile to clear the walkway. With

the tobacco displayed in this manner, buyers and graders can pull a sample very easily by grasping a handful of butts. Experience in the 1962 season indicates that the samples of tobacco are usually thrown back on the piles with little disturbance to the pile. After the tobacco is sold, the knit-paper sheet is again used to secure the package in preparation for shipment to storage or processing plants.

The new looseleaf package helps to prevent folded leaves and broken midribs, which are often found in the conventional looseleaf packages if the leaves are loose, tangled, and folded, they may be broken by pressure in transit when loads are stacked 10 to 15 feet high as shown in figure 3.

Figure 3

Results of the Market Test

A total of 273 experimental looseleaf packages (36,753 pounds) of types 11(a), 11(b), and 13 tobaccos were placed on auctions for market testing during the 1962 season. The packages were sold during a 5-day experimental sales period for looseleaf tobacco conducted by the Department of Agriculture at the beginning of the 1962 marketing season. In the warehouses, packages of frame-packed tobacco in knit-paper sheets were intermingled with the traditional round-packed baskets in the sales rows. The auction warehouses cooperating in the experiment were located in Lake City, Dillon, and Pamplico, S.C.; Fuquay-Varina, N.C.; and Danville, Va.

Sales by Grade and Type

Table 1 shows the price averages for conventionally packed loose tobacco and for frame-packed tobacco, by grade, and the differences between the price averages during the 5-day experimental sales period. Most of the prices for frame-packed tobacco were within a few cents of prices for round-packed tobacco except for those grades of which only one or two baskets were sold. The average prices for frame-packed tobacco of particular grades and types were above average for round-packed tobacco in 16 comparisons, below in 10 comparisons, and the same as the conventional loose pack in 2 comparisons. This limited sales test indicated that frame-packed tobacco did command a slight premium over the conventional method of selling loose leaves.

Condition of Tobacco and Sheet at the Processing Plants

In order to evaluate the package and sheeting material, a small questionnaire printed on a post card was included with each basket of tobacco after it was sold. Sixty-three out of 273 post card questionnaires were completed by the processing plant personnel and returned for tabulation. The questions asked and the tabulated results are as follows:

(1) Is this lot of "frame-packed" tobacco worse, better, or about the same as other flue-cured tobacco purchased this year in the conventional untied (loose) pack with respect to:

(a) Proportion of tangled leaves: Worse, 5; better, 46; same, 9.
(b) Spoilage from overheating: Worse, 0; better, 5; same, 55.

(2) Condition of sheeting material: Good, 31; fair, 1; poor, 28.

(3) Weight of tobacco when received in plant? _____ pounds.
(The average weight loss was 0.7 pound, which is well within the allowable tolerance of 2.0 pounds for up to 150 pounds of tobacco.)

The questionnaire summary indicates that the frame-packed tobacco arrived at the processing plants in better condition for processing than the conventional sheets of loose leaves. Most of the packages contained fewer tangled leaves and broken midribs than are usually found in sheets of loose tobacco. The amount of spoilage from overheating was the same or less than normal, even though the straight-laid leaves are tightly pressed together. With respect to the knit-paper sheet retaining its condition, the replies were almost evenly divided between good and poor condition. A followup investigation indicated that the sheets that were rated poor may have been torn by hooks used for loading packages on dollies in the warehouses. It should not be difficult to eliminate the use of hooks in handling the packages. The paper sheet was designed to be disposable after one use. Therefore, sheeting material arriving at the plants in poor condition is not objectionable if the tobacco remains in good condition.

Advantages to Growers

One of two independent studies conducted within the past several years indicated that tying tobacco requires about .74 more man-hours of farm labor per acre than

Table 1.--Average prices received per pound of looseleaf flue-cured tobacco, round-packed and frame-packed, by grade and type, first 5 days of 1962 selling season

Grade	1962 loan rate for untied tobacco	Type 13			Type 11(b)			Type 11(a)		
		Round-packed	Frame-packed, straight-laid	Difference between frame-packed and round-packed	Round-packed	Frame-packed, straight-laid	Difference between frame-packed and round-packed	Round-packed	Frame-packed, straight-laid	Difference between frame-packed and round-packed
	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents	Cents
N1L	23.0	38.0	40.3	+2.3	36.0	37.9	1.9	28.0	27.0	-1.0
N1GL	21.0	36.0	--	--	37.0	--	--	--	--	--
N2	--	27.0	27.3	+.3	27.0	1/20.0	-7.0	20.5	2/35.0	14.5
P2L	58.0	65.0	2/65.0	.0	--	--	--	--	--	--
P3L	55.0	63.0	60.3	+3.0	63.0	--	--	59.0	54.0	-5.0
P4L	50.0	60.0	61.9	+1.9	54.0	--	--	52.0	56.1	+4.1
P5L	37.0	53.0	1/35.0	-18.0	49.0	--	--	43.0	46.3	+3.3
P3F	55.0	62.0	62.1	+.1	61.0	62.6	+1.6	--	--	--
P4F	50.0	58.0	55.7	-2.3	56.0	55.8	-.2	52.0	51.7	-.3
P5F	34.0	49.0	50.8	+1.8	45.0	48.1	+3.1	38.0	35.1	-2.9
P5G	23.0	42.0	40.0	-2.0	42.0	--	--	--	--	--
X3L	64.0	65.0	--	--	--	64.0	--	--	--	--
X4L	61.0	64.0	63.0	-1.0	63.0	--	--	--	--	--
X3LV	55.0	62.0	63.5	+1.5	--	--	--	--	--	--
X4F	62.0	64.0	64.0	.0	63.0	--	--	--	--	--
X5F	55.0	60.0	62.5	+2.5	59.0	--	--	56.0	--	--
X4FV	51.0	60.0	1/64.0	+4.0	--	--	--	--	--	--
X5FV	43.0	--	1/62.0	--	--	--	--	--	--	--
X4KF	49.0	59.0	1/60.0	+1.0	--	--	--	--	--	--
B4KR	48.0	--	--	--	--	--	--	--	62.6	--
H5L	50.0	--	--	--	--	--	--	--	58.0	--

1/ Only 1 frame-packed basket of this grade was sold.
2/ Only 2 frame-packed baskets of this grade were sold.

Data from Tobacco Market Review, U.S. Dept. Agr., Mktg. Serv., Mar. 1963, p. 30.

preparing looseleaf packages for market. 4/ The other investigation indicated a labor saving more than twice as great, or 161 man-hours per acre. 5/

On the basis of the experience gained in the conduct of this marketing experiment, a conservative estimate would be approximately 100 man-hours per acre saved by packing tobacco loose with the frame instead of tying the leaves into bundles. If average yield is 1,900 pounds per acre, the estimated labor saving amounts to 5.3 man-hours per 100 pounds of cured tobacco. An aggregation of the labor savings in the three States where flue-cured tobacco is marketed in tied form shows that approximately 6 million man-days or $36 million could be saved by growers (table 2). Market preparation is one operation where flue-cured tobacco growers have a very good opportunity to reduce production costs.

Table 2.--Estimated savings in farm labor and costs from selling flue-cured tobacco loose rather than tied in bundles 1/

Area	Acreage (1963) 2/	Labor savings		Cost savings
	Acres	1,000 man-hours 3/	1,000 man-days 4/	1,000 dol. 5/
Virginia	69,500	6,950	695	4,170
North Carolina	460,500	46,050	4,605	27,630
South Carolina	80,000	8,000	800	4,800
Total	610,000	61,000	6,100	36,600

1/ A yield of 1,900 pounds per acre is assumed.
2/ Annual Report on Tobacco Statistics--1963. U.S. Dept. Agr., Agr. Mktg. Serv., Statis. Bul. 343, Apr. 1964.
3/ Reduction in labor used is 100 hours per acre.
4/ One man-day equals 10 hours.
5/ An average wage of $.60 per hour is assumed.

Advantages to the Industry

Improvements in farm-packing tobacco for market can have important effects on the cost and efficiency of operations in auction selling, transporting, and warehousing. By further design development and cooperation within the industry, it should be possible to adopt a package which will advantageously affect all segments in the industry.

In the auction warehouse, the package of straight-laid leaves could decrease costs in several ways. At the time growers unload the tobacco from their trucks inside the warehouse, considerable labor is expended in taking bundles from the sticks and packing them on baskets before the tobacco can be weighed in at the scales. In contrast,

4/ Brooks, R. C., and Toussaint, W. D. Labor Requirements in the Market Preparation of Flue-Cured Tobacco. N.C. State Col., Raleigh, N.C., AE Inf. Series 98, Feb. 1963, p. 3.
5/ Crawford, D. E., Wynn, N. A., and Bickley, D. W. Marketing Flue-Cured Tobacco Tied and Untied. S.C. Agr. Expt. Sta. and U.S. Agr. Mktg. Serv., AE 206, Mar. 1961, p. 11.

the looseleaf package can be quickly unloaded, weighed, and trucked to the sales row without using a basket, and the warehouse cost for baskets can be eliminated. After the auction sale, the sheet is retied and the package quickly removed to the buyer's truck. Labor used in dumping baskets over on the sheets is also eliminated.

On leaving the auction warehouse, bundle-tied tobacco is usually repacked into collapsible hogsheads at the local market if it is to be shipped by truck or rail to a distant processing plant. Looseleaf tobacco in sheets is usually stacked on a truck for direct transporting to processing plants. Tobacco in the new package can be stacked in trucks or placed in square, collapsible hogsheads for palletized truck or rail shipments. Much less labor is needed to place the packages in square hogsheads than to pack the bundle-tied tobacco in round hogsheads for shipment.

Placing leaves with the butts together in the package is advantageous in new processing plants. Modern tobacco processing lines begin with conveyor belts on which the tobacco is laid instead of chain conveyors which move tobacco hung on sticks. At the beginning of the conveyor belt, the bundle cutter cuts the tie leaf. Rotating knives cut off the tips of the leaves, and sometimes the butts are also removed. Because the stem is small in the tip, this part of the leaf does not have to be threshed; and plant capacity is increased 20 to 30 percent by not running the tips through the threshing cylinders and separators. The butts may be cut off and threshed in a separate threshing line where the machinery can be adjusted for handling the thick part of the midrib. Because of these processing techniques, which improve the quanlity control of the strips being packed for storage, the direction of leaves in the grower's package has become very important.

Knit-paper sheets have an advantage to the processor as well as to the grower. The paper material, unlike burlap, is nonshedding. The fibers which are shed from the conventional sheets into the tobacco must be cleaned from the tobacco during processing and kept from accumulating in the machinery. A sheet material which does not shed will aid in the packing of a higher quality strip product.

The overall economic advantages of a new package to the flue-cured tobacco marketing systems are many. Some of them have already been described in this report. One other very important factor is present in the world markets. Southern Rhodesia and Canada are our strongest competitors in the world market for flue-cured tobacco. These countries have what the world tobacco trade considers to be superior farm-packaging methods and covering materials for the package. All tobacco in Canada is sold straight-laid without tying into bundles; and each bale of Southern Rhodesian tobacco has a neatly sewed cover of waterproof paper and burlap. Both countries prepare their tobacco in compact, rectangular packages. For these reasons it is imperative that U.S. growers of flue-cured tobacco meet this competition with the highest quality tobacco and package that are economically practicable.

SUGGESTIONS FOR FUTURE RESEARCH

Tobacco packaging research is closely interrelated with changing technology in all segments to the tobacco industry. The most acceptable package is a compromise that is best suited to minimize costs in all these segments. For the continued improvement of tobacco packaging and handling, the technological and economic factors must be first identified and assimilated into the best overall compromise.

Several areas have been identified for future research. To ensure the development of a suitable sheet at minimum cost, further testing is required on manufacturing

variables such as the monofilament thickness, closeness of the knit, amount of twist, wet strength of the paper, and other quality factors.

Further work is needed to develop the optimum sizes of sheets and the method of distributing the material. The price of commercial quantities of the sheet has not been determined; this price must be acceptable to the tobacco trade.

Because resources and time were limited in this experiment, it was impossible to test all suitable package sizes. One practical alternative may be to enlarge the package size and utilize the maximum area available in a basket space on a warehouse floor and thereby conserve on other marketing costs.

An examination of tobacco movement as a problem in materials handling and engineering will likely uncover other significant economies. Functions of the marketing system such as assembling, grading, packing, selling, handling, loading, shipping, and unloading all appear to offer opportunities for innovations that will reduce costs and improve the movement of tobacco in the marketing system.

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