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I am submitting herewith a thesis written by Robert Bailey Elliott entitled “Quantitative Comparison of Mechanical Harvesting Methods and Conventional Harvesting Methods of Burley Tobacco in the Southeast.” I have examined the final paper copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural and Extension Education.

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**Quantitative Comparison of Mechanical Harvesting Methods and Conventional
Harvesting Methods for Burley Tobacco in the Southeast**

**A Thesis Presented for the Master of Science Degree
The University of Tennessee, Knoxville**

**Robert Bailey Elliott
December 2008**

DEDICATION

This thesis is dedicated to my parents, William and Cheryl Elliott, my wife Lindsay Elliott, my brother Will Elliott, my family, my friends, and fraternity brothers. All of whom have molded me into the person I am today. Their encouraging words of wisdom, positive attitudes, and belief and faith in my abilities have driven me to achieve my goals and aspirations.

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Abstract

The purpose of this study is to examine burley tobacco growers decision making processes as they pertain to labor usage during the harvest of their crop and adoption rates of mechanical harvesting technology in order to create a laudable document that could be used by those who disseminate knowledge in agricultural communities. This study sought to compare current conventional harvesting methods to mechanical harvesting methods to determine efficiency and affordability of each of the two methods for the tobacco grower. This study incorporated both survey data and focus group data in order to develop the findings herein. Survey data were used to examine burley tobacco growing regions in order to effectively site focus groups and to collect descriptive statistics on burley tobacco growers. Focus groups were conducted in Kentucky and Tennessee, the two major burley tobacco producing states in the southeast. There were 41 growers who participated in the focus groups with burley acreages ranging from 9 – 350 acres and years experience of tobacco production ranging from 3 – 60 years. The study revealed overall that growers were very satisfied with their conventional labor practices. The growers were reluctant to invest in mechanical harvesting technology due to uncertainty about the future of the burley tobacco market, inefficiency of the machines, cost of the harvesters and the availability of migrant labor. Survey data that were collected directly correlate with focus group findings, and recommendations for further study are provided in this thesis.

Table of Contents

Chapter I.....	1
GENERAL INTRODUCTION.....	1
Thesis Statement.....	1
Background.....	1
Statement of Purpose.....	4
 Chapter II.....	 6
REVIEW OF LITERATURE.....	6
History.....	6
Harvester Development.....	7
Harvesters of Today.....	9
Current Research.....	12
 Chapter III.....	 21
METHODS AND PROCEDURES.....	21
Mail Surveys.....	21
Focus Groups.....	26
 Chapter IV.....	 29
FINDINGS.....	29
Introduction.....	29
Instrument Development.....	29
Grower Characteristics from Survey.....	30
Types of Labor.....	32
Survey Farm Characteristics.....	33
Focus Groups.....	36
Daviess County.....	37
Pulaski County.....	38
Fleming County.....	40
Macon County.....	42
Harvester Owner Interviews.....	44
 Chapter V.....	 50
QUANTITATIVE COMPARISON OF MECHANICAL HARVESTING METHODS AND CONVENTIONAL HARVESTING METHODS FOR BURLEY TOBACCO IN THE SOUTHEAST.....	 50
Abstract.....	50
Introduction.....	51
Methods.....	54
Findings.....	56

Conclusions.....	67
Implications and Discussion.....	69
Recommendations.....	71
REFERENCES.....	72
APPENDICES.....	75
APPENDIX A HUMAN SUBJECTS RESEARCH APPROVAL FORM.....	76
APPENDIX B 2008 TOBACCO SURVEY.....	78
APPENDIX C 2008 COSTS AND RETURNS SURVEY.....	95
APPENDIX D LABOR/MECHANIZATION FOCUS GROUPS.....	103
APPENDIX E MECHANICAL HARVESTER USE QUESTIONNAIRE.....	108
VITA.....	111

LIST OF TABLES

Table 1. Mechanical Harvester Price List.....	14
Table 2. Labor Efficiency for Burley Tobacco Harvest.....	19
Table 3. Grower age from survey.....	31
Table 4. Grower employment from survey.....	31
Table 5. Grower education from survey.....	31
Table 6. Producers Indications of whether or not the following are true about their tobacco farms.....	33
Table 7. Descriptions of how likely growers are to produce tobacco in the future.....	34
Table 8. How important are the following factors in your decision to produce tobacco in 2007.....	35
Table 9. Daviess County, Kentucky – Participant Summary.....	38
Table 10. Pulaski County, Kentucky – Participant Summary.....	40
Table 11. Fleming County, Kentucky – Participant Summary.....	43
Table 12. Macon County, Tennessee – Participant Summary.....	46

LIST OF FIGURES

Figure 1. GCH Gold Standard Harvester.....	10
Figure 2. MarCo Harvester.....	10
Figure 3. Kirpy Harvester.....	12
Figure 4. County Locations.....	36

Chapter I

GENERAL INTRODUCTION

Thesis Statement

This thesis discusses the present day uses of mechanical harvesting equipment and the current labor situation for harvesting burley tobacco in the southeast. This research explores two major issues in burley tobacco production. The first issue was to analyze the feasibility and profitability of conventional labor usage on burley tobacco farms in the southeast. The second issue is the exploration of incorporating mechanical harvesting equipment into burley tobacco production and management for the purpose of reducing the need for conventional labor. Therefore, this research outlines what are perceived to be the advantages and disadvantages of each harvesting option.

Background

Tobacco is a labor intensive crop, which requires delicacy and precision in all facets of the growing and harvesting season. At peak periods of its cultivation, tobacco requires waged labor to assist the farmers in harvesting the crop. Activities typically involving hired labor include cutting the plants in the field, housing the tobacco in a barn or outside curing structure, and stripping the leaves from the plant in preparation for market. Each of these tasks require different amounts of laborers, and these laborers are often pulled from a pool of local individuals such as high school aged children, neighbors, family members, or other community members. The advantages of having family members, neighbors, and other community members available for harvest time is they often provide

service to the farmer free of charge. But, free labor is hard to find for such a labor intensive crop or even low cost local workers.

Because of this, farmers have to turn to another alternative, which is to hire immigrant workers who will assist with the tobacco crop production. Farmers have the option to hire undocumented immigrant laborers and pay below minimum wage to these workers. If Federal immigration authorities discover employers who are intentionally hiring undocumented laborers, they can be charged with conspiracy to transport, harbor and employ illegal immigrants for private gain. In previous years, involvement in hiring illegal immigrants has resulted in a small civil fine, however today employers who violate worksite enforcement laws are criminally charged.

According to the United States Department of Labor, one of the legal options for hiring immigrant labor is the H-2A agricultural guest worker program. Congress passed this in 1986 as a part of the Immigration Reform and Control Act (IRCA). This law states when there are not sufficient workers who are able, willing, qualified or available at the time and place needed, and the employment of an immigrant worker for such labor or services will not adversely affect the wages and working conditions of workers in the United States similarly employed. Since its inception, the program has been the primary legal mechanism through which U.S. employers have hired seasonal agricultural guest workers. Under this program foreign workers enter into a contract with employers and then locate to the United States for work. Once this contract has expired, immigrant workers must return to their home country (United States Department of Labor, n.d.).

In addition, the law requires employers to add certain terms in the H-2A contract. The worker contract must state the start and end dates of the contract; all significant

conditions of employment; certain days laborers are not required to work; the hours per day and the days per week a laborer is required to work during the contract period; the crop and area to be worked; the rate of pay for each job; proof of employer providing all required tools and employer payment of these tools; and workers' compensation insurance provided for the workers (United States Department of Labor, n.d.).

Workers may not be paid less than the federal or state minimum wage whichever is higher. However, the laborers may be eligible to earn a higher wage rate called the adverse effect wage rate. The United States Department of Labor calculates the adverse effect wage rate based on how much other farm workers are paid in the area. For example, if the minimum wage is \$5.15/hour but local farm workers earn \$7.00/hour, H-2A workers must be paid \$7.00/hour. Employers must also provide free housing that meets strict safety and health standards established by law. Three low cost meals must be provided per day and the cost of these meals is disclosed in the worker contract, or the employer must provide free cooking facilities. Furthermore the employer must also provide free transportation between local housing and the place of work for all workers receiving housing (United States Department of Labor, n.d.).

Mechanizing the harvest of tobacco is not a new concept. Documents dating back to the 1950's from North Carolina State University displayed how researchers explored and developed alternatives to make the labor intensive process easier (Grise, Shugars, Givian, and Hoff, 1975). These developments have resulted in the mechanization of several phases within tobacco production processes. Mechanization began in the final phase of tobacco harvest, which is stripping the leaves from the stalk. Recently there has been a great push for mechanization of burley tobacco harvesting in the field, not only of the

leaves, but also of the entire plant. Several companies and universities including Kirpy, MarCo Manufacturing Co. LLC, GCH International, University of Kentucky and North Carolina State University have worked to develop harvesters, which address the labor and economic needs of the burley tobacco farmers.

Additionally, growers producing other types of tobacco, aside from burley, have taken great strides to become fully mechanized while others are limited to conventional harvesting. Flue cured tobacco, mainly grown in North Carolina, has become almost fully mechanized due to alternate handling methods and preparation for market. Dark fire cured tobacco growers in areas of Tennessee and Kentucky are unable to mechanize due to the extreme care that has to be taken to secure a quality crop.

Statement of Purpose

It is the purpose of this document to disseminate knowledge to extension agents and other agricultural stakeholders providing a current forecast of labor usage among burley tobacco growers in the southeast and their willingness to adopt new technology. In the wake of labor shortages, the increased cost of labor and the increased cost of other inputs, farmers will look to alternative means by which to harvest their crops in order to reduce costs. This study provides extension agents in burley tobacco growing regions with a document for farmers expected to show an increasing interest in alternative harvesting means. Mechanically harvesting tobacco has taken flight in flue-cured tobacco regions and this has spawned interest among burley tobacco growers.

Survey data shows that the following sources of information are the most important when burley tobacco farmers are making production decisions; other farmers

(23.4%), county extension agents and meetings (23.3%), and farm supply retailers (20.8%). As burley tobacco growers turn to these sources, it is the purpose of this study to carry out this research and provide extension agents and other agricultural professionals with a useful research document they can reference. Otherwise this information would not be readily available to burley tobacco farmers. This study considers not only the welfare of the extension agents and other knowledge disseminators, but also the farmers who are producing burley tobacco.

The first step of this study is to identify burley tobacco growers in the southeast. Step two is to establish the locations of key burley tobacco producing regions in the southeast. The third step is to discern decision making processes among burley tobacco growers preferences to certain labor options, and create a comprehensive document detailing grower preferences and why burley tobacco farmers are choosing those preferences. This research proposes that burley tobacco growers in the southeast will be unwilling to adopt mechanical tobacco harvesting technology due to cost.

Chapter II

REVIEW OF LITERATURE

History

The mechanics of current conventional burley tobacco harvesting consists of laborers cutting plants at the base and impaling five to six of the plants on a rough cut wooden stick. Once the plants are on the stick they are placed in the field with the leaf tips typically being placed away from the sun to prevent burning. Sticks will sit in the field for two or three days for wilting. During the wilting process, the plant loses water weight, which makes for easier handling by laborers. After wilting, the tobacco is picked up out of the field, loaded onto wagons, and transported to conventional curing barns. Once the wagon is in the barn, sticks are lifted and hung on tier rails to air-cure. The air curing process is complete in six to eight weeks. This process has seen little change over the course of history.

In 1954, researchers at North Carolina State University began searching for ways to mechanically remove tobacco leaves from the stalk. The breakthrough came when tobacco specialists realized that serrated rollers could break off leaves at a preset height (Grise et al., 1975). In this way, several leaf picking passes could be made without the destruction of the plant itself. The leaves were deposited in attached bins, which were transported to a curing structure. Prototypes of this machine were developed in 1963, but the machine's cost, leaf waste, and the availability of low wage labor slowed adoption. By 1972, mechanical leaf harvesters were in use on less than one percent of the total tobacco acreage (Grise et al., 1975).

The search for affordable labor in tobacco harvest has been an issue for a long time. In addition to the search for labor, the search to decrease the inputs of labor in tobacco harvest has also been a concern among tobacco farmers. Traditional harvest options for tobacco require 186 man-hours per acre harvested, making this process extremely labor intensive (Grise et al., 1975).

The development of mechanical systems to transport and house tobacco continued into the 1970's. Yoder and Henson (1974) developed a system in which one worker operated a front-end tractor loader to move portable curing frames filled with conventional sticks from the field to a specially modified open interior curing barn in which the frames were stacked. Curing frames were constructed of wood or steel and could be stacked two or three high in curing barns. The combined cost of these frames and open interior barns was higher than that of conventional curing structures. Some farmers tweaked the system to make it more efficient, but sufficient improvements and efficiencies could not be realized and the time requirement to move the empty frames to and from the field could never be reduced. In addition, these frames had to be stored in barns during the off-season, denying farmers use of their barns for other storage purposes. From these early systems research has continued with more modern machines that are more suitable for the harvest situations of the current day.

Harvester Development

Recently there have been significant efforts to mechanize tobacco harvest in the field, not only of the leaves, but the entire plant. Several companies and universities have worked to create a harvester, which meets both labor and economic needs of farmers who

raise burley tobacco. These two primary needs have yet to be acceptable and affordable for burley tobacco farmers.

Mechanical harvesting aides have been developed to cut and place tobacco plants in the field on traditional sticks that were cut to specified dimensions. Casada, Smith, and Abrams (1972) developed one of the first mechanical stick harvesting mechanisms that involved a machine cutting and placing tobacco plants onto sticks. A more recent mechanism that harvests in the same manner is Duncan's floating spear mechanism (Duncan, Shearer, Tapp, and King, 1999). Though it followed the same concept as the first mechanical stick harvesting mechanism, there were some improvements. This mechanism cut and transported plants up a conveyor and impaled them on a floating spear. Once a stick was filled it was released from the mechanism and placed on the ground.

Wells, Day, Smith and Smith (1990) developed an automated burley harvesting system. Only two workers were required to operate the harvesting system. The harvester cut plants at ground level and engaged plants near the base of the stalk with special opposed roller chains having pointed attachments. The plants were conveyed up an incline and inverted. Plants were then notched on each side of the stalk and placed into slotted rails in all metal portable-curing frames. The frames were then dispensed and unloaded by the harvester. The portable curing frames were equipped with folding legs and each held 450 plants.

Harvesters of Today

A resurgence of interest in burley tobacco mechanization options following the tobacco quota buyout legislation and the increasing shortages of labor for harvesting has inspired ongoing development of mechanical harvesters. The first of these harvesters is an automated harvester. Biosystems and agricultural engineers from the University of Kentucky developed a self propelled, fully automated harvester called “Big Red,” which is currently being manufactured as the “GCH Gold Standard” by GCH International of Louisville, KY. This machine, as shown in Figure 1, is capable of harvesting up to 5 acres per day, but could extend harvesting into the night time for additional production. Sturdy 8 x 14 foot metal frames receive and support approximately 448 plants in the eight slotted rails of each frame. It takes approximately 15 to 16 of these frames to hold an acre of harvested burley tobacco. 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 forklift moves the filled frames to a sod area for covering with special poly tarps for 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. In one field study, two commercial prototypes of this machine harvested more than 80 acres each during 2007 at maximum rates of up to 0.5-0.75 acres per hour (Seebold, Pearce, Duncan, Wells, and Wilhoit, 2008).

The second is a group of plant-notching harvesters. MarCo Manufacturing Co. LLC of Bennettsville, SC, manufactures the first of these two machines (see Figure 2). This is a tractor mounted 3-point hitch machine powered by a power take off (PTO)



Figure 1. GCH Gold Standard Harvester



Figure 2. MarCo Harvester

driven hydraulic system that cuts, notches and conveys the plants utilizing a “sticker chain” design onto a wagon pulled alongside the machine. The other is a similar machine developed by a French manufacturer called the Kirpy (see Figure 3). The Kirpy harvester uses a “log chain” type conveyor with small spike laden metal plates that convey plants from a standing position to deposit plants horizontally onto a flatbed wagon pulled alongside the harvester. A special requirement experienced by the trial users of the Kirpy harvester in the U.S. is the tractor must have slow ground drive while running the PTO (near 540 revolutions per minute (rpm) for proper hydraulic flow and pressure) (Seebold et al. 2008).

Both the MarCo and the Kirpy harvesters can fill a farm wagon rather quickly with loosely stacked plants. Multiple tractor and wagon units are needed to shuttle wagons from the harvester to the wire type field-curing framework to get maximum production from the harvester of approximately 2.0 – 2.5 acres or more per normal day (Seebold et al., 2008).

Another French manufactured machine is the walk-behind powered cutter. This two wheeled machine cuts and notches the plants and lays them on the ground for later picking up, either for hanging on wire strung curing structures or for spearing onto sticks. This particular harvesting aid may be a viable low cost mechanization option for smaller operations, but since the only commercially available machine of this type is manufactured overseas, the shipping costs can nearly double the machine’s price (Seebold et al., 2008).

The most recent of these innovations came from the University of Kentucky Biosystems and Agricultural Engineering Department. This new experimental system is



Figure 3. Kirpy Harvester

similar to the automated harvester, but involves a tractor drawn harvester which cuts, conveys, inverts and notches whole burley tobacco plants. Notched plants are inserted into slotted 10 feet long steel rails that hold 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. Preliminary estimates indicate an approximate harvesting capacity of 0.3 acres per hour for two workers (Seebold et al., 2008).

Current Research

Many tobacco harvesting techniques have been developed and producers have adopted some of the components. However, no mechanical harvesting system has yet received widespread acceptance by burley tobacco producers. Such harvesters have not

been accepted because of insufficient capacity or excessive cost. Compared with conventional manual methods of harvest, the mechanical harvesters do not substantially reduce labor requirements per acre of tobacco harvested. The harvester's high investment cost is apparently unacceptable to growers as long as laborers are available for conventional harvesting and as long as the producers have accessible curing barns with adequate space for their burley crop.

Table 1 describes the estimated costs of each harvester that is currently in production. This is shown to give perspective for the research basis that high investment cost is an identified issue.

Not only does the producer absorb the initial cost of the harvester, but in the case of the GCH Gold Standard, MarCo and Kripy harvesters there is additional equipment required for production that would not otherwise be necessary with conventional harvesting methods. In the case of the GCH Gold Standard harvester, the producer must also purchase an all terrain extended reach forklift to load the metal frames onto the harvester and to remove them from the field. Furthermore, it takes 15-16 frames to hold an acre of burley tobacco, resulting in extremely high costs. Special poly tarps that will be used to cover the frames once they are filled will also need to be purchased. In the case of the MarCo and Kirpy harvesters, special slow ground drive tractors that can sustain slow ground speeds (0.6 – 1.0 mph) while maintaining 540 rpm to sustain hydraulic flow pressure for the machines may also prove to be an added cost for the harvesting system. Multiple tractor and wagon units would need to be available to move the crop from the field to the wire curing structures. Farmers would also have to construct high tensile wire field curing structures with sufficient capacity to hold their entire crops.

**Table 1. Mechanical Harvester Pricing List
(estimated)**

Machine	Price
GCH Gold Standard ^a	
Harvester	\$379,000.00
Metal Frames	\$850.00
Cover	\$100.00
MarCo ^b	
Harvester	\$27,500.00 ^c
Field Curing Structure (per acre)	\$900.00
Kirpy ^a	
Harvester	\$23,000.00 ^c
Field Curing Structure (per acre)	\$900.00

Note. ^aFrom Duncan, G.A. & Wells, L.G. (2007). Will Mechanization soon bring relief to burley producers?. *2007 Tobacco Trends*. Retrieved February 20, 2007 from <http://magissues.farmprogress.com/STF/FF02Feb07/stf070.pdf>

^bFrom Boyette, M. & Ellington, G. (2006). *Mechanization*. Retrieved February 20, 2007, from North Carolina State University Web site: http://ipm.scsu.edu/Production_Guides/Burley/chptr15.pdf

^cIndicates free on board

These must be sturdily constructed to withstand the elements and support the weight of the tobacco, which must be covered with plastic once filled with the crop.

Obviously the economics involved in acquiring a harvester and all of the equipment that goes with it is the real barrier to adoption. Current research efforts are focused on making the acquisition of the harvester more cost effective. One way researchers are looking to cut costs is by simplifying mechanical components of the machines (Wells et al., 1990). The other is by replacing the portable steel curing frames with wooden two-beam structures, but this one only applies to the machines that require steel curing frames (i.e. GCH Gold Standard or Big Red).

In order for the harvesters to be labor efficient in the fields, there must be organization and coordination among laborers and related equipment and activities. A special requirement realized by the farmers using the machine showed that the tractor used to operate the machine needs a very slow ground drive while running the tractor at a specified rpm in order to keep the proper hydraulic flow pressure. This is an added cost to the farmer because there are few tractors that operate at such a slow engine rpm. Several observations have shown that plants need to be properly and erectly conveyed by the chain to receive a suitable forty-five degree notch. A normal farm wagon is soon filled with the loosely stacked plants, usually within a 400 – 500 feet row length. The wagon and the machine are stopped at the end of each row so that the conveyor can be emptied of plants in preparation for turning around and realigning for the next row.

Approximately 20 – 25 feet of field edge is required for the first passage of the machine. Adequate turning space is also required at the end of the field for the accompanying wagon. Blocks of rows and driveway space need to be planned, or cut by hand to

minimize end of field travel and non-productive harvest time. One field trial on sloping and uneven terrain showed difficulty in keeping the cutting head on the row (Duncan, Wells, Day, and Boyette, 2006).

Leaf loss is another concern producers have while using the harvesters. While no definite study has been done on the comparison of leaf loss by conventional harvesting and leaf loss with the harvester, at least three tractor and wagon units with at least two drivers will be needed to shuttle the units from the field to the curing structure. The leaf breakage from piling the plants on the wagon and removing them appears to be somewhat greater than normal manual harvest depending on the condition of the tobacco and worker care in removing plants from the wagon load (Duncan et al., 2006).

Timed data projections and limited on-farm operations of plant notching harvesters show that 8 – 10 workers are needed at the curing structure to unload wagons to maintain continuous harvester operation. Thus, a crew of 11 – 13 workers will likely be needed to harvest approximately 2 acres per day. One advantage of this method, as acclaimed by several burley tobacco producers is the workers only have to handle the plant one time (Duncan et al., 2006).

Wear and tear on machinery is another factor farmers face when buying new equipment, especially when it is only used once a year. Duncan et al. (2006) described that the operational life of the machine is not known at present, but the developer of the Kirpy machine revealed personally to them that the chain has an expected life of 1.0 to 1.5 million plants (approx. 140 to 214 acres). Use of the harvesters with large U.S. plants requires proper adjustment of the chain guides, without this adjustment rapid wear of a sprocket has been experienced.

In the summer of 2007 the University of Tennessee Research and Education Center in Greeneville, TN, in conjunction with Philip Morris USA, performed a labor study with the Kirpy harvester to evaluate labor efficiency and leaf loss (Velandia, Denton, and Witcher, 2007). In order to evaluate the mechanical system, they designed a four-way experiment. The first was a conventional system where burley tobacco was hand cut, spiked/speared on sticks, left out to wilt over a period of three sunrises and hung in low tier structures for curing. In the second system, the burley tobacco was mechanically cut, notched, conveyed onto a wagon, hauled to low tier curing structures and housed on a wire curing structure. For system three the burley tobacco was mechanically cut and notched, then left on the ground to wilt for one to three hours to allow wilting before sun burning of the leaves could occur. The plants were then placed on a wire strung scaffold wagon. The burley tobacco was then cured outside on the scaffold wagon with highly managed black plastic covering. In System four the burley tobacco was mechanically cut, notched, and left on the ground to wilt one to three hours then loaded onto a conventional wagon by hand, hauled to a low tier curing structure and hung on high tensile wire stretched across a bottom tier to cure.

While published records of this report are not yet available, personal communication was obtained with two of the projects leaders Dr. Paul Denton and Mrs. Vickie Witcher. When asked if the processes used in this research could be improved, their comments were that the results displayed in Table 2 could most likely be improved under more organized working conditions and more adequate supervision of laborers. With greater supervision, leaf loss figures could also be improved for each of the systems. Table 2 depicts the labor efficiency of each of the aforementioned systems in

number of man-hours per acre. This shows that under the conventional system the total man hours per acre is sufficiently less than the three other systems and even involved an extra step in the process.

The other evaluated factor of this research was the leaf loss and damage to the leaf as a result of each of the four systems used. This is a major concern for tobacco producers as the leaves are where the money is derived. Significant percentages of leaf loss and damage can lead to a major loss in profit. Since all of the data has yet to be analyzed on leaf loss, stalk loss, and damage, this evaluation has yet to be completed. Preliminary results compare leaf loss in the field and hanging on the curing structure. With the conventional method in system one, total leaf loss was 5%. System two reported leaf loss in the field was 2.8% and in the curing structure loss was 5.4% for a total reported total leaf loss at 8.2%. System three reported leaf loss in the field as 5.3% and results have not been tabulated for curing structure leaf loss. System four reported 3.7% loss in the field and 2% loss at the curing structure for a total of 5.7%. Stalk loss was also recorded in this research study. With a plant notching harvester system, each of the stalks are notched at the bottom with a 45° angle so that they may be inverted and hung on the wire curing structure. If the plant does not receive a proper notch it will break and fall to the ground underneath the curing structure. In poorly managed systems this can lead to rotting of the plant and total loss of product profit. Currently the only recorded stalk loss has been with system 4 where there was a recorded 11.1% stalk loss. (Velandia et al. 2007)

**Table 2. Labor Efficiency for Burley Tobacco Harvest
(Man Hours/Acre)**

Activity	System 1 Conventional	System 2 Mechanical no wilting	System 3 Mechanical with wilting	System 4 Mechanical with wilting loaded by hand
Dropping Sticks	2.8	0	0	0
Cutting	12.2	15.4	3.8	3.2
Pickup/ loading/ hanging	15.8	45.6	36.6	59.6
Total	30.8	61	40.4	62.8

Note. From Velandia, M., Denton, P., Witcher, V. (2007) [Mechanized Burley Harvesting: A partial budget analysis]. Unpublished raw data.

As illustrated in Table 2, the conventional method appears to be the most labor efficient and has the least amount of leaf loss. The preliminary results of the experiment showed that the labor increase/decrease can vary according to the system used. Significant labor savings were shown with systems three and four. There was an increase in labor used in loading and hanging tobacco. In addition, mechanical problems increased the man hours used and the leaf loss increases when using the Kirpy machine. There were also negative changes in net profit using the Kirpy machine verses the traditional hand-cut method (Velandia et al. 2007).

Reviewing available research and literature has shown that mechanically harvesting tobacco is not a new concept, but one that needs to see some technological and

cost improvements. From the research found, farmers will be reluctant to adopt such a technology due to the lack of current field testing and lack of investment returns to the farmers. Therefore, the research gap still remains in the areas of burley tobacco farmers opinions and thoughts related to mechanical harvesters.

Chapter III

METHODS AND PROCEDURES

This study quantitatively describes the what, where and when of burley tobacco growers' decision making processes as they pertain to labor and mechanical harvesting of burley tobacco. The primary research portion of this study is based upon mail survey data that have been recently collected by the Center for Tobacco Grower Research (CTGR) at the University of Tennessee at Knoxville. The administrator of this research conducted focus groups based in burley tobacco growing regions of the south and personal interviews with burley tobacco growers who were currently using mechanical tobacco harvesters.

Mail Surveys

The mission and objective of CTGR is to conduct timely research in areas of tobacco production, economics, and markets that will provide information to support the sustainability of U.S. production of burley, flue-cured, dark and other types of tobacco. The objective of the project was to collect and summarize unbiased information about U.S. tobacco production. The two surveys utilized for the purposes of this research were the 2008 Tobacco Survey and the 2008 Costs and Returns Survey. The research subjects included tobacco producers who agreed to participate in the CTGR surveys by returning an opt-in brochure (IRB approved #7463B).

Methods and procedures used by the CTGR mail surveys were that surveys be mailed to tobacco producers who have volunteered to participate in CTGR research

projects. The CTGR 2008 Tobacco Survey was designed to collect general production, marketing and demographic information and estimated to take 10-15 minutes to complete. The CTGR Costs and Returns Survey was designed to collect information about the costs and returns of producing flue-cured, burley and dark tobacco types and also estimated to take 10-15 minutes to complete. Participation in the surveys was completely voluntary and recipients were informed that they could have their names removed from the CTGR producer database at any time by contacting the CTGR. The information that was provided to the CTGR is not considered sensitive and all responses were aggregated, so no foreseeable risk to the participants was shown. The surveys did not contain any personal identifying information about the participants. Survey data records are kept confidential with redundant security mechanisms in place. Individual participants cannot be linked to the study.

The 2008 Tobacco Survey was distributed to current and former tobacco growers in February of 2008. This survey captured information about changes that have occurred in production and collected growers' views on important tobacco production and marketing issues. Additionally, information was collected from former growers about their farming operations and production decisions. The major sections of the survey cover tobacco production and marketing issues, general farm structure and demographic information.

The CTGR mailed out 3,838 of the 2008 Tobacco Surveys and collected data from 2,150 producers who were either in current production or had produced tobacco in the past, a 56% response rate. Eight hundred and seventy-nine of the respondents produced tobacco in 2007. The complete version of this survey is located in Appendix B.

Key questions from this survey were analyzed using standard statistical software and techniques (SPSS) for those current burley growers and were used for the purposes of this study. Questions from this mail survey that were used in this research are as follows:

1. Please list the number of acres of each type of tobacco that you produced?
2. How did your 2007 tobacco acreage compare to the amount of tobacco you produced during the last year of the federal tobacco program (2004)?
3. Please indicate whether or not the following statements are true about your tobacco farm.
 - a. Burley
 - i. I have trouble finding enough labor for my farm
 - ii. Most manual labor on my farm is done by migrant labor
 - iii. Most manual labor on my farm is done by family members
 - iv. Local workers are an important source of labor on my farm
 - v. The H-2A program is an important source of labor for my farm
4. How many people worked on your farm to produce your 2007 tobacco crop?
5. Please describe how likely you are to produce tobacco in the future.
 - a. Burley
 - i. 2008?
 - ii. In 5 years?
 - iii. In 10 years?
 - iv. In 15 years?
 - v. In 20 years?
6. As you consider future tobacco production, how important are improvements or additions of the following items to your operation?
 - a. Burley
 - i. Curing Barns / Structures
 - ii. Migrant worker housing
 - iii. Mechanized harvesting equipment
7. How important were the following factors in your decision whether or not and how much tobacco to produce in 2007?
 - a. Burley
 - i. Your current age
 - ii. Availability of labor
 - iii. Cost of labor
 - iv. Cost of fuel
 - v. Cost of financing

- vi. Availability of curing barns
8. How likely are the following to be true?
- a. Burley
 - i. When I reach retirement age, a family member will manage the farming operation.
 - ii. When I reach retirement age, I will rent my farm to another producer.
 - iii. After I retire, tobacco will be produced on my farm.
 - iv. After I retire, my land will be sold and remain in agricultural use.
 - v. After I retire, my land will be sold for development.
 - vi. It is likely that I will sell my farm before I reach retirement age.
9. Please estimate the size of the total farming operation that you manage in acres.
10. For the 2007 crop year, how many acres in your farming operation were used for each of the following?
- a. Burley tobacco
11. Please describe how important the following sources of information are to helping you make production decisions?
- a. Burley
 - i. Internet
 - ii. Farm magazines or newspapers
 - iii. County extension agents and meetings
 - iv. Regional extension meetings and field days
 - v. Other farmers
 - vi. Contractor information and meetings
 - vii. Farm supply retailers
12. Which best describes the age of the farm's primary decision maker?
- a. Burley
 - i. Younger than 30
 - ii. 31 to 40
 - iii. 41 to 50
 - iv. 51 to 60
 - v. 61 to 70
 - vi. 71 and older

The second survey distributed by CTGR was the 2008 Costs and Returns Survey. This survey was designed to collect information about the costs and returns of producing tobacco. This allowed for the study of cost structure by types of tobacco grown, farm size and geographic location. Additionally, this study provided new information about how tobacco growers view their cost structure and the inputs used by growers. These surveys were also coded numerically and do not include any identifying information about the growers.

The CTGR mailed out a total of 874 Costs and Returns Surveys, 646 surveys to burley growers, 117 to dark-fired tobacco growers and 111 to flue-cured tobacco growers. Burley tobacco growers returned 230 surveys (35.6%) and since this is the primary focus of this research, their responses were the only ones used for this study. Key questions from this survey were analyzed using SPSS version 12.0 for Windows. The full version of this survey is located in Appendix C. This survey was split up into four different sections: production, average sales price, variable costs, and general information. The analysis of this research focused on questions from the variable costs section of the survey. Questions from this mail survey that were used in this research are as follows:

- A. Variable Costs – Please focus on your 2008 burley operation and indicate either your actual or expected costs for the following items.
 - 1. Hired Labor – Estimate the total number of hours and wage rate per hour of hired labor required for your operation in 2008. If you are not sure about the number of hours for each activity, or use a different method of payment, please enter the total amount spent per acre for each activity.

	# hrs. per acre	Wage rate per hour	OR	Total spent per acre
Pre-Harvest (all labor prior to cutting)		\$		\$
Harvest (cutting and hanging)		\$		\$
Market Preparation (baling)		\$		\$

2. Other hired labor expenses

Besides the wages paid , how much do you expect to spend in 2008 on other hired labor related expenses such as taxes, travel, housing, processing fees, etc.?	\$ Total Spending
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As previously stated, surveys collected by CTGR were coded so that each producer could be identified in a SPSS database. The principal investigator for the study, in conjunction with the CTGR database, sought to identify burley tobacco growers in the southeast. Once identified, a representative sample of growers were selected to participate in focus groups.

Focus Groups

The purpose of the focus groups was to collect and summarize unbiased data about current southeastern burley producers who provided information about recent labor utilizations in burley tobacco harvest, thoughts on mechanical harvesting options, and explored the factors influencing tobacco producers' decisions. In addition, the research

subjects included burley tobacco producers who agreed to participate in CTGR surveys.

The following procedures were created by the principal investigator of this research.

Procedures for the focus groups were:

1. Identify geographic focus group locations and contact extension agents in those regions to help with arranging meetings with burley tobacco growers who are not using mechanical tobacco harvesters.
2. Set up meeting dates, times and locations with the focus groups.
3. Develop a meeting agenda and discussion outline.
4. Visit each focus group region in order to obtain needed information.
5. Analyze the data collected from each group.
6. Incorporate that data into other study materials in order to create a more laudable document.

Geographic locations of focus groups were Central Kentucky, Western Kentucky, and Middle Tennessee. Individuals who were asked to assist in the recruitment of participants included Extension agents and others involved in tobacco extension and research activities in each state. Each session included 10-12 participants who were actively managing a burley tobacco farming operation and did not currently use mechanical tobacco harvesters in that operation. The participants' farming operations varied in size and types of commodities produced. The full copy of the discussion outline can be found in Appendix D. The discussion outline was created by the administrator of this research and was used while conducting burley tobacco grower focus groups.

Due to limited adoption of mechanical harvesting equipment for burley tobacco, there were only a few producers who had mechanical harvesters on their burley tobacco farms.

Additionally, separate interviews were conducted with several producers who were using mechanical harvesters. Objectives for this phase of the study were to identify growers who used mechanical harvesters in their burley tobacco harvest, contact and request a face-to-face interview with the farmer, develop a questionnaire to use during the interview, conduct the interview and analyze the data collected. The complete list of questions developed by the administrator of this research can be found in Appendix E. The questions listed were asked to the farmers who used mechanical tobacco harvesters.

The researchers analyzed the data collected from the focus groups and face-to-face interviews in order to compile average responses from the samples of current burley tobacco growers. The results of these focus groups and face-to-face interviews, compiled with the results from the mail surveys provided information needed to create an unexpurgated document, which future researchers can use to further develop the materials herein.

Chapter IV

FINDINGS

Introduction

This chapter is designed to describe the findings of this study and how they relate to the research. Each section within this chapter will contain an interpretation of the data that was collected from the respondents. Following the sections on the interpretations will be a series of tables future researchers can use to bolster new research.

Instrument Development

Two survey instruments were developed to retrieve descriptive statistics from burley growers in the southeast. The first survey was developed to capture current and former tobacco growers in order to gather information about changes that have occurred in production and to collect growers' views on tobacco production, production decisions and marketing issues. This survey also collected general farm structures and demographic information. The second survey developed was a cost and returns survey designed to collect information about the cost and returns of growing tobacco. This allowed for the study of cost structure by types grown, farm size and geographic location. Additionally, this study provided new information about how tobacco growers view their cost structure and the inputs used by growers.

These two surveys yielded information that allowed the principal investigator to pinpoint key burley producing regions in the southeast. From this information a discussion outline was developed and presented to focus groups in these key regions of

burley tobacco producers. In conjunction with the focus groups, personal interviews with growers who were using mechanical harvesters during burley harvest were also conducted.

Grower Characteristics from Survey

The age of the farm's primary decision maker was broken into categories shown in Table 3, younger than 30 (3.5%, n=28), 31 to 40 (9.0%, n=72), 41 to 50 (25.7%, n=206), 51 to 60 (33.0%, n=256), 61 to 70 (19.5%, n=156), 71 and older (9.4%, n=75). The majority of the primary decision makers were male (96.5%, n=768), with females comprising the minority (3.5%, n=28). A majority of the primary decision makers were white (99.0%, n=798) with very few respondents indicating American Indian or Alaska Native (0.6%, n=5) and Black or African Americans comprising the rest of the sample (0.4%, n=3). Most of the respondents in Table 4 were full time farmers (45.8%, n=364), others were employed full time off of the farm (28.6%, n=227), employed part time off the farm (13.0%, n=103), or retired (12.7%, n=101). Table 5 shows that the highest level of education for the farm's primary decision maker varied from no formal education (3.3%, n=26), some high school (6.9%, n=55), completed high school or equivalent (47.8%, n=382), some college (22.1%, n=177), completed 4 year college degree (14.1%, n=113), to completed graduate or professional degree (5.9%, n=47).

Table 3. Grower age from survey

Age	N	Percent
Less than 30	28	3.5%
31 to 40	72	9.0%
41 to 50	206	25.7%
51 to 60	256	33.0%
61 to 70	156	19.5%
71 and older	75	9.4%

Table 4. Grower employment from survey

Employment	N	Percent
Full-Time Farmer	364	45.8%
Full-Time Off Farm	227	28.6%
Part-Time Off Farm	103	13.0%
Retired	101	12.7%

Table 5. Grower education from survey

Education	N	Percent
No Formal Education	26	3.30%
Some High School	55	6.90%
Completed High School or Equivalent	382	47.80%
Some College	177	22.10%
Completed 4 Year Degree	113	14.10%
Completed Graduate or Professional Degree	47	5.90%

Types of Labor

Labor issues were the main focus for the information gathered from burley tobacco farmers. All information in this section was gathered from the 2007 crop year data. Respondents' characteristics pertaining to the acquisition of labor and the sources of the labor they used are summarized in Table 6. Producers were asked to answer yes or no questions about whether or not the questions in Table 6 were true of their current farming operations. The majority of respondents (60.4%) stated that finding labor for their farm was a challenge. Few of the farmers utilized the H-2A program (13.3%) and only 36.0% used migrant laborers. Statistics show that most farmers continue to utilize local laborers and the rest are using family members to complete tobacco work on their farms.

Combined with labor shortages is the uncertainty that seems to loom over tobacco producers as they are forced to make future production decisions. Table 7 displays the producers responses to how likely they are to produce burley tobacco in the future. Beginning with the next crop year in 2008, most producers (86.9%) will produce in the next crop year. As the time frame moved up to five years the percentage of burley tobacco producers who would continue to grow burley tobacco dropped by 30% and continued to decline as more growers became unsure about their future decision to produce burley tobacco as the years increased.

The following are the top five factors that influenced farmers' decisions whether to produce burley tobacco in the future. At the top of this list was the price of tobacco where 74.4% of the respondents stated that was extremely important, a close second was the price of fertilizer with 64.6%, uncertainty about future of tobacco was third with

Table 6. Producers indications of whether or not the following statements are true about their tobacco farms.

Item	Yes	No	Total Responses
I have trouble finding labor on my farm.	471 (60.4%)	309 (39.6%)	780
Most manual labor on my farm is done by migrant labor.	279 (36.0%)	496 (64.0%)	775
Most manual labor on my farm is done by family members	432 (56.4%)	334 (43.6%)	766
Local workers are an important source of labor for my farm.	448 (58.9%)	313 (41.1%)	761
The H-2A program is an important source of labor for my farm.	97 (13.3%)	634 (86.7%)	731

56.7%, cost of fuel came in fourth with 53.1%, and cost of labor completed the top five at 50.6%. The complete comprehensive list of responses is located in Table 8.

Survey Farm Characteristics

The average burley tobacco farm in 2007 according to the survey data collected consisted of a part time farmer, age 53 with a 13.3 acre burley tobacco crop. These farmers owned 202.5 acres and rented 165 acres with farm cash receipts totaling \$50,000 and a net household income of \$48,000. These farmers received 42% of their income off the farm and 50% of their farm receipts came from tobacco. These farms also averaged 6.3 hired workers who worked to produce their 2007 burley crop with the help of 3 family members.

Table 7. Descriptions of how likely growers are to produce in the future.

	Definitely will not	Probably will not	Not sure	Probably will	Definitely will	Responses	% Prob. or def. <u>will not</u> produce	% Prob. or def. <u>will</u> produce
2008	21	13	49	114	438	635	5.4%	86.9%
5 Years	21	49	193	225	122	610	11.5%	56.9%
10 Years	69	79	270	124	57	599	24.7%	30.2%
15 Years	124	94	271	63	36	588	37.1%	16.8%
20 Years	178	81	249	46	33	587	44.1%	13.5%

Table 8. How important are the following factors in your decision to produce tobacco in 2007

	Not Important at All					Extremely Important					
	1	2	3	4	5	6	7	8	9	10	Total Responses
Your current age	27.1%	2.6%	4.6%	2.8%	6.6%	8.9%	7.4%	8.9%	5.1%	25.8%	797
Price of tobacco	1.7%	0.1%	0.0%	0.6%	1.6%	2.6%	3.2%	6.7%	9.0%	74.4%	808
Availability of labor	6.5%	1.9%	2.5%	1.8%	6.6%	6.1%	6.5%	12.4%	9.9%	45.9%	800
Cost of labor	6.2%	1.5%	1.6%	1.1%	5.2%	5.1%	6.1%	11.6%	10.9%	50.6%	804
Cost of fuel	3.3%	0.6%	2.1%	1.9%	5.3%	6.8%	8.7%	9.6%	8.6%	53.1%	806
Cost of fertilizer	1.6%	0.4%	1.1%	1.0%	2.1%	5.8%	5.0%	7.6%	10.8%	64.6%	805
Cost of financing	27.2%	4.2%	3.7%	5.5%	7.1%	6.9%	5.1%	5.9%	3.6%	30.7%	801
Availability of financing	34.1%	4.9%	5.3%	4.5%	7.2%	7.1%	4.4%	4.7%	2.5%	25.3%	794
Cost of land	33.9%	4.8%	3.3%	3.2%	6.6%	6.3%	4.8%	5.2%	4.7%	27.4%	793
Availability of land	30.9%	3.6%	3.6%	2.3%	6.3%	5.6%	4.9%	6.3%	6.6%	29.9%	797
Availability of curing barns	23.5%	2.4%	3.0%	3.0%	6.0%	6.3%	4.7%	6.0%	7.7%	37.5%	805
Age of equipment and/or curing barns	19.5%	3.3%	4.5%	3.7%	11.8%	10.8%	8.8%	7.9%	4.5%	25.3%	807
Opportunity to grown other crops	27.0%	5.0%	6.1%	5.0%	10.9%	11.1%	6.5%	6.7%	5.4%	16.4%	801
Opportunity to raise livestock	21.7%	2.6%	3.2%	3.5%	8.0%	7.6%	7.3%	8.9%	7.3%	29.8%	805
Off-farm income opportunities	28.1%	4.4%	4.5%	2.6%	7.6%	8.0%	6.2%	7.0%	6.4%	25.2%	801
No one to manage the operation	45.2%	8.3%	4.4%	2.9%	7.4%	6.8%	4.1%	3.5%	3.9%	13.6%	799
Uncertainty about future income from tobacco	9.0%	1.4%	1.6%	1.9%	4.7%	4.5%	5.6%	7.1%	7.7%	56.7%	808

Focus Groups

Focus groups were conducted in four of the top producing burley regions of the southeast. Growers of various acreages and farm dynamics were asked to attend with the help of extension agents and other extension personnel. These sessions were held in Daviess County, Kentucky; Pulaski County, Kentucky; Fleming County, Kentucky; and Macon County, Tennessee (Fig. 4). Each session followed a discussion outline and responses to the questions presented were answered verbally and recorded for accuracy.

Focus group participants totaled 41 farmers, all male, who produced between 9 and 350 acres, with a group average of 54.4 acres. Years of experience in burley tobacco production ranged from 3 to 60 years and an average years experience of 30.24 years. Full time farmers comprised 78% (n=32) of the growers in the focus groups, 7.3% (n=3) had full time jobs off the farm, 12.2% (n=5) held part time jobs off the farm, and 2.4% (n=1) were retired.

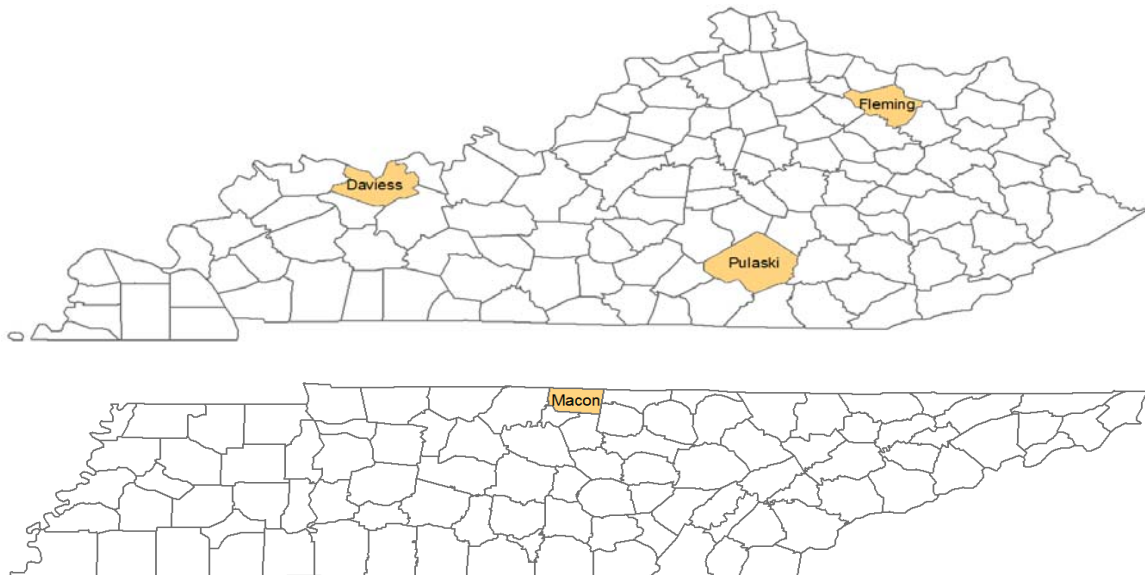


Figure 4. County Locations

Daviess County

Ten growers from this area attended the focus group session. Growers produced from 10 to 150 acres of burley tobacco and the overall average burley acreage for the growers was 71.1 acres. These growers owned an average of 556.6 acres and rented an average of 840 acres. Experience in burley tobacco production ranged from 3 to 40 years with an overall average of 23.1 years experience. Seven of the ten farmers reported that they were full time farmers, two stated that they had full time employment off of the farm and one reported that he worked a part time job off of the farm. Shown in Table 9, all but one of these producers had a diversified farming operation consisting of row crops, livestock, hay, fruits and vegetables and dark air cured tobacco.

Sources of labor in Daviess County varied. H-2A laborers were utilized by five of the growers, four growers used other forms of migrant labor and one hired high school students to complete the harvest of tobacco on their farms. Wage rates for harvest were reported between \$7.00 and \$7.50 for migrant laborers and high school laborers and H-2A wage rates were between \$9.13 and \$9.35. No growers reported their satisfaction with the labor they were currently using.

When asked what the growers thoughts were when they heard the words “mechanical harvester,” growers reported thoughts of leaves flying everywhere, 500 acre growers with \$1,000,000 machines, and hesitation to invest money in an industry with so much uncertainty. However, most of them had never seen a harvester. After presentation of the harvester video to the growers they were asked to give their reactions to the mechanical harvesters. The growers provided overall negative responses toward the machines stating that manual labor outperforms the machine and that until their labor

Table 9. Daviess County, Kentucky - Participants Summary

	N	Mean	Median
Farmland			
Acres Owned	10	557	170
Acres Rented	7	840	400
Crops			
Burley	9	71	50
Dark-Air	2	20	20
Soybeans	6	936	525
Wheat	3	583	300
Corn	5	688	500
Hay	2	76	76
Fruits/Vegetables	2	52.5	52.5
Livestock			
Beef cattle	4	134	116
Employment			
Full-time farmer	7		
Employed full-time off farm	2		
Employed part-time off farm	1		
Retired	0		
Years farming	10	23.1	27.5

source was gone there would be no reason to invest in such a machine. Others responded that potential adoption is slowed by fear of better technology becoming available and the overall price is just too high.

Focus group participants stated that there are other areas that could be taken into consideration to make their jobs much easier. The major suggestion was making and/or obtaining paperwork easier. Others stated concern over current tobacco prices and stated that factory workers are making more money than they were growing burley tobacco. All these farmers agreed that as long as the workers and the farmer are making money they would continue to produce burley tobacco. If this was not the case, the farmers would be forced to stop growing tobacco.

Pulaski County

As shown in Table 10, this focus group consisted of 12 growers who owned an average of 335.17 acres and rented an average of 271.88 acres. Their years of experience in burley tobacco production ranged from 12 to 60 years with an average of 35.42 years overall. Their burley acreage ranged from 10 acres to 90 acres and averaged a total of 24 acres overall. Each of these growers farmed full time but one who held a part time job away from the farm. These farming operations were all diversified with hay acreage and livestock production.

These growers obtained their labor from only two sources. Migrant laborers were used in 8 of the farming operations and was stated to be where the majority of the labor came from in the county; however, only 4 of the growers utilized the H-2A program. Wage rates varied across the group ranging from 38 to 15 cents per stick, and \$9.00 for

Table 10. Pulaski County, Kentucky - Participants Summary

	N	Mean	Median
Farmland			
Acres Owned	12	335	300
Acres Rented	8	272	200
Crops			
Burley	12	24	20
Soybeans	3	95	90
Wheat	4	60	35
Corn	1	30	30
Hay	12	191	175
Fruits and Vegetables	2	6.75	6.75
Livestock			
Beef cattle	12	273	225
Dairy cattle	1	150	150
Goats	4	79	45
Sheep	2	83	83
Horses	1	4	4
Employment			
Full-time farmer	11		
Employed full-time off farm	1		
Years farming	12	35.4	36.5

migrant laborers to the standard \$9.13 for H-2A laborers. Overall satisfaction with the labor force was very high. Participants agreed that without migrant laborers there would be no labor for tobacco harvest and tobacco and other industries would fail. Due to a flour mill closing in a neighboring county there was an influx of migrant laborers looking for work harvesting tobacco which spurred a price war among farmers who were looking for harvest laborers.

When asked what they thought when they heard the words “mechanical harvester,” one grower stated that he would buy the first one. Another grower expressed interest and stated that he would buy one if it worked. Most of the farmers were familiar with the pull behind tractor unit from a tobacco field day they visited.

After the presentation of the harvester video, farmers were asked to express their thoughts on the machine. Most farmers were uninterested and provided negative responses toward the machine. The most common response among the growers was the uncertainty of the tobacco market and the increasing costs of inputs relating to the costs of the mechanical harvesters. Some growers stated that the mechanical harvester would slow their production down and that manual labor was much more efficient. Other concerns from the growers related to the way the machines handled the tobacco stating that there was too much breakage of the tobacco plant and bruised tobacco is hard to sell.

Two of the growers stated that they would continue to grow burley tobacco as long as they possible could as long as it was profitable. The consensus of the group came with the availability of migrant labor, as long as labor could be found they would continue to grow burley tobacco. The current price of burley tobacco in the market also

limited most of the grower's ability to continue to grow burley tobacco. One grower stated that the 2008 crop year was his last in the tobacco business.

Other comments from growers stated that there needed to be more focus on mechanization of the market preparation portion of tobacco production called stripping. This is where the growers saw the most potential for a machine to gain some labor savings. The majority of the growers in this county are 50 years of age and older and they stated that they need more money in order to continue burley tobacco production. A 20 acre grower stated that a \$6,000 profit at the end of the year is just not worth it.

Fleming County

Eleven growers participated in this focus group that owned an average of 264 acres and rented 269.1 acres. Years of experience in burley tobacco production ranged from 18 to 58 years and an overall average of 35.09 years. Burley tobacco acreages amongst the growers ranged from 9 to 38 acres with an overall average acreage of 23.45. Table 11 shows that those considering themselves to be full time farmers consisted of 6 of the growers, 3 were part time farmers who held apart time job off of the farm, one held a full time off the farm and the other was retired. All of these farmers reported hay production with row crops and livestock production scattered throughout the group.

Labor sources varied with 8 growers using migrant laborers, 2 using H-2A, and 1 using an immigrant labor contractor from Texas. Wage rates ranged from the standard \$9.13 for H-2A laborers, 37 to 40 cents per stick for harvest and some paying \$8.00 to \$12.00 for harvest. Satisfaction with harvesting labor forces was very high. Most of the laborers had already been trained to harvest tobacco and many farmers had to turn

Table 11. Fleming County, Kentucky - Participants Summary

	N	Mean	Median
Farmland			
Acres Owned	11	264	140
Acres Rented	9	269	200
Crops			
Burley	11	23.5	22
Soybeans	2	39	39
Wheat	3	46	50
Corn	1	25	25
Hay	11	229	200
Livestock			
Beef cattle	9	126	100
Dairy cattle	3	125	130
Broilers/poultry	1	12	12
Horses	3	4.3	4
Employment			
Full-time farmer	6		
Employed full-time off farm	1		
Employed part-time off farm	3		
Retired	1		
Years farming	11	35	35

migrant laborers away because they already had enough help. Due to the tight restrictions on H-2A laborers, one farmer had quit using them all together because it was just too much trouble.

Growers were asked what they thought when they heard the words “mechanical harvester.” Growers who had never seen a harvester stated that this simply could not be done and that it was not cost efficient. The four farmers in the group who had seen the harvester stated that migrant labor was more efficient and the machines would slow down their production. The average age of farmers in this area ranged from 50 to 55 years of age and the youngest farmer they could think of was 37. Due to the increasing age of farmers in this area adoption of such equipment would be limited. Thoughts on the mechanical harvesters after the presentation of the video remained negative. Tangling of stalks, leaf loss, too much breakage, and inefficiency of the machines were the main reactions to watching the harvesters work in the field. One grower stated that he would be willing to try one but he would not be able to afford the cost of the machine. The benefits do not justify the costs of the machine and as long as immigrant labor was available the growers were unwilling to invest in any of the harvesters.

When asked about future production of burley tobacco, 7 of the growers stated that they would still be growing in 5 years, but beyond that they were uncertain. The other four growers were uncertain if they would be able to continue tobacco production in the future. This was mainly due to the increasing age of the farmers and the increasing cost of production and other inputs. Uncertainty in the tobacco market was also a limiting factor in the decision to continue burley tobacco production on their farms.

The potential in other areas of tobacco production, as stated by the growers, was a mechanical stripping machine to assist in market preparation of the crop. Growers also stated some continuing thoughts on future production such as alternative crops they could turn to in order to continue farming. Alfalfa in this area is making the farmers more money per acre than burley tobacco and other crops could also take its place such as catfish and grapes. Farmers stated the need for new varieties to help them increase their yields. Most who were still collecting tobacco quota buyout payments stated that when those payments end they would be forced to quit growing tobacco.

Macon County

Due to a devastating tornado in this area in early 2008, all of the 8 growers in this focus group were working to rebuild what they had lost. Burley tobacco being the main farming enterprise in this county, most farmers were working to rebuild curing structures and recoup their losses relying on burley tobacco production to offset the costs of rebuilding. As seen in Table 12, these growers owned an average of 672.63 acres and rented an average of 545 acres. Burley tobacco acreage ranged from 27 to 350 acres with an average burley tobacco acreage of 123.75. Years experience in burley tobacco production ranged from 12 to 35 years with an overall average of 24.75 years experience. Each grower reported that they were full time farmers with a diversified operation consisting of hay and livestock production. Half of the group reported that they maintained small acreages of row crops such as corn, wheat and soybeans.

Labor usage on these farms and in the county was primarily from migrant labor with 6 of the growers using immigrants and the other two utilizing the H-2A program.

Table 12. Macon County, Tennessee - Participants Summary

	N	Mean	Median
Farmland			
Acres Owned	8	673	195
Acres Rented	8	545	575
Crops			
Burley	8	124	49
Soybeans	1	400	400
Wheat	4	95	78
Corn	2	140	140
Hay	2	140	140
Livestock			
Beef cattle	8	237	140
Hogs	2	1500	1500
Employment			
Full-time farmer	8		
Years farming	8	25	25

Wage rates for harvest laborers were 40 to 45 cents per stick or \$7.00 to \$7.50 per hour for immigrant labor. Standard prices for H-2A laborers were \$9.13 per hour. Collectively among the group, satisfaction with labor was down from the previous years. Growers stated that the quality of H-2A laborers had decreased and the immigrant laborers were being deported and were much slower in harvesting compared to previous years. Only one grower in the group stated that his laborers were the best that he had ever seen.

When growers were asked what they thought of when they heard the words “mechanical harvester,” cost was the big issue. One grower stated the first thing he thought of was \$1,000,000; another stated that if he had the money to purchase a harvester then he would not be growing tobacco. Among these responses, inefficiency and problems with the machines ability to properly harvest the tobacco were also major concerns with the machines.

After presentation of the video, all of the growers remained negative about the use of a mechanical harvester on their farm. Growers main concerns with the machines were the piling un-wilted tobacco, leaf breakage, and the presence of leaves left in the field. One grower stated that the costs of the machines might not be the issue; it may be inefficiency, production and quality of the mechanical harvesters.

Future burley production for these growers remains uncertain. Market prices for burley tobacco verses their cost of inputs is a very limiting factor when it comes to future tobacco production. These farmers are making their production decisions from year to year due to the uncertainty of the burley tobacco market. Some only continue production because of their children and their interest in farming in the future. Most stated that if it were not for their children they would quit burley production all together. One grower

reported that due to long-term uncertainty, he does not want his child to farm, but 5 years ago that was a different story. Making a living farming would be impossible without burley tobacco, stated one grower.

When asked about the potential for improvements in other areas of tobacco production farmers stated that mechanization of the market preparation process has more potential than mechanization of the harvesting process. Other comments were about immigration reform to make it easier to obtain legal immigrant workers, the development of more disease resistant varieties, and the ease of restrictions on certain chemicals used in tobacco production. Final thoughts from the growers were that Macon County is an aggressive county when it comes to technology. If they can see that something works, they will adopt it. Mechanical harvesting equipment is just too slow, stated one grower, as another grower stated that the machines are just too expensive for the benefits they have the potential to receive.

Harvester Owner Interviews

Due to limited adoption of mechanical harvesting technology in these key burley-producing regions, only two growers were found who had actually purchased a harvester to use during harvest. These growers had purchased the Kirpy Harvester at the end of the 2007 crop year and it was used in conjunction with their existing labor force as a compliment to their operation. Each grower produced 150 acres of burley tobacco. Other than the mechanical harvester, no other special equipment purchases had been made and each of the growers continued to employ the same labor force as they had in the previous years. One grower utilized his current curing structures to cure the tobacco and the other

had to retrofit his current outdoor curing structure to accommodate the mechanical harvesting method. Both growers had one year of experience with the mechanical harvester at the time of the interviews.

Both growers agreed that the mechanical harvester did not do a good job handling the tobacco and leaf breakage was a big problem. The Kirpy was hard to keep in the row as some of the terrain in the fields tended to be rolling hills instead of ideal flat ground. The growers also agreed that manually harvesting the tobacco continued to be more efficient and the quality of the tobacco was better. These growers purchased the machines in hopes that it would reduce their labor costs without sacrificing quality.

Improvements in machine efficiency and handling of the tobacco need to be made before the mechanical harvesters become a true benefit to the farmer stated the growers. Both growers agreed that uncertainty in the marketplace and the slow progression of the harvesting technology would continue to be a barrier to mechanical harvester adoption. The costs of the machine were only justified due to the large acreage of burley tobacco both growers produced.

Chapter V

Quantitative Comparison of Mechanical Harvesting Methods and Conventional Harvesting Methods for Burley Tobacco in the Southeast

(An article prepared for submission to the Journal of Extension)

Abstract

The purpose of this study was to examine burley tobacco growers decision making processes as they pertained to labor usage during the harvest of their crop and adoption rates of mechanical harvesting technology in order to disseminate knowledge in agricultural communities. This study sought to compare current conventional harvesting methods to mechanical harvesting methods to determine efficiency and affordability of each of the two methods for the tobacco grower. This study incorporated both survey data and focus group data in order to develop the findings herein. Survey data was used to examine burley tobacco growing regions in order to properly conduct focus groups and to collect descriptive statistics on burley tobacco growers. Focus groups were conducted in Kentucky and Tennessee, the two major burley tobacco producing states in the southeast. There were 41 growers who participated in the focus groups with burley acreages ranging from 9 – 350 acres and years experience of tobacco production ranging from 3 – 60 years. The study revealed overall that growers were very satisfied with their conventional labor practices. The growers were reluctant to make the investment in mechanical harvesting technology due to the uncertainty in the future of the burley tobacco market, inefficiency of the machines, cost of the harvesters, and the availability of migrant labor. Survey data that was collected directly correlates with focus group findings.

Introduction

The mechanics of current conventional burley tobacco harvesting consists of laborers cutting plants at the base and impaling five to six of the plants on a rough cut wooden stick. Once the plants are on the stick they are placed in the field with the leaf tips typically being placed away from the sun to prevent burning. Sticks will sit in the field for two or three days for wilting. During the wilting process, the plant loses water weight, which makes for easier handling by laborers. After wilting, the tobacco is picked up out of the field, loaded onto wagons, and transported to conventional curing barns. Once the wagon is in the barn, sticks are lifted and hung on tier rails to air-cure. The air curing process is complete in six to eight weeks. This process has seen little change over the course of history.

In 1954, researchers at North Carolina State University began searching for ways to mechanically remove tobacco leaves from the stalk. The breakthrough came when tobacco specialists realized that serrated rollers could break off leaves at a preset height (Grise, Shugars, Givan and Hoff, 1975). In this way, several leaf picking passes could be made without the destruction of the plant itself. The leaves were deposited in attached bins, which were transported to a curing structure. Prototypes of this machine were developed in 1963, but the machine's cost, leaf waste, and the availability of low wage labor slowed adoption. By 1972, mechanical leaf harvesters were in use on less than one percent of the total tobacco acreage (Grise et al., 1975).

The search for affordable labor in tobacco harvest has been an issue for a period of time. In addition to the search for labor, the search to decrease the inputs of labor in tobacco harvest has also been a concern among tobacco farmers. Traditional harvest

options require 186 man-hours per acre harvested, making this process extremely labor intensive (Grise et al., 1975).

The development of mechanical systems to transport and house tobacco continued into the 1970's. Yoder and Henson (1974) developed a system in which one worker operated a front-end tractor loader to move portable curing frames filled with conventional sticks from the field to a specially modified open interior curing barn in which the frames were stacked. Curing frames were constructed of wood or steel and could be stacked two or three high in curing barns. The combined cost of these frames and open interior barns was higher than that of conventional curing structures. Farmers tweaked the system to make it more efficient, but the time requirement to move the empty frames to and from the field could never be reduced. In addition, these frames had to be stored in barns during the off-season, denying farmers use of their barns for other storage purposes. From these early systems research has continued with more modern machines that are more suitable for the harvest situations of the current day.

A resurgence of interest in burley tobacco mechanization options following the tobacco quota buyout legislation and the increasing shortages of labor for harvesting has inspired ongoing development of mechanical harvesters. The first of these harvesters is an automated harvester. Biosystems and agricultural engineers from the University of Kentucky developed a self propelled, fully automated harvester called "Big Red," which is currently being manufactured as the "GCH Gold Standard" by GCH International of Louisville, KY. This machine is capable of harvesting up to 5 acres per day, but could extend harvesting into the night time for additional production. Sturdy 8 x 14 foot metal frames receive and support approximately 448 plants in the eight slotted rails of each

frame. It takes approximately 15 to 16 of these frames to hold an acre of harvested burley tobacco. 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 forklift moves the filled frames to a sod area for covering with special poly tarps for 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. In one field study, two commercial prototypes of this machine harvested more than 80 acres each during 2007 at maximum rates of up to 0.5-0.75 acres per hour (Seebold, Pearce, Duncan, Wells, and Wilhoit, 2008).

The second is a group of plant-notching harvesters. MarCo Manufacturing Co. LLC of Bennettsville, SC, builds the first of these two machines. This is a tractor mounted 3-point hitch machine powered by a power take off (PTO) driven hydraulic system that cuts, notches and conveys the plants utilizing a “sticker chain” design onto a wagon pulled alongside the machine. The other is a similar machine developed by a French manufacturer called the Kirpy. The Kirpy harvester uses a “log chain” type conveyor with small spike laden metal plates that convey plants from a standing position to deposit plants horizontally onto a flatbed wagon pulled alongside the harvester. A special requirement experienced by the trial users of the Kirpy harvester in the U.S. is the tractor must have slow ground drive while running the PTO (near 540 revolutions per minute (rpm) for proper hydraulic flow and pressure) (Seebold et al. 2008).

Methods

This study used quantitative research to describe the what, where and when of burley tobacco growers decision making processes as it pertained to labor and mechanical harvesting of burley tobacco. The primary research portion of this study was based upon mail survey data that had been recently collected by the Center for Tobacco Grower Research (CTGR) at the University of Tennessee at Knoxville. The two mail surveys used for the purpose of this research were the 2008 Tobacco Survey and the 2008 Costs and Returns Survey.

The CTGR mailed out 3,838 of the 2008 Tobacco Surveys and collected data from 2,150 producers who were either in current production or had produced tobacco in the past. Eight hundred and seventy-nine of the respondents produced tobacco in 2007. Key questions from this survey were analyzed using a Statistical Package for the Social Sciences (SPSS) version 12.0 for those current burley growers and were used for the purposes of this study.

The second survey distributed by CTGR was the 2008 Costs and Returns Survey. This survey was designed to collect information about the costs and returns of producing tobacco. This allowed for the study of cost structure by types of tobacco grown, farm size and geographic location. Additionally, this study provided new information about how tobacco growers view their cost structure and the inputs used by growers.

The CTGR mailed out a total of 874 Costs and Returns Surveys, 646 surveys to burley growers, 117 to dark-fired tobacco growers and 111 to flue-cured tobacco growers. Burley tobacco growers returned 230 surveys and since this is the primary focus of this research, their responses were the only ones used for the purpose of this study.

Key questions from this survey were analyzed using SPSS version 12.0 for Windows. This survey was split up into four different sections; production, average sales price, variable costs, and general information. The analysis of this research focused on questions from the variable costs section of the survey.

The principal investigator for the study, in conjunction with the CTGR database, sought to identify burley tobacco growers in the southeast for focus group participation. Utilizing data found in the mail surveys, key geographic burley tobacco growing regions were identified. Once identified, a representative sample of growers was selected to participate in focus groups.

The geographic locations of focus groups were Central Kentucky, Western Kentucky and Middle Tennessee. Each session included 10-12 participants who were actively managing a burley tobacco farming operation and did not currently use mechanical tobacco harvesters in that operation. The participants' farming operations varied in size and types of commodities produced.

Additionally, burley tobacco growers were identified who were currently using mechanical tobacco harvesters in their farming operation. Personal interviews were conducted with these individuals to obtain key insights to the production decisions made by farmers who actually utilized the technology made available to them.

Findings

Survey Data

The age of the farms primary decision maker was broken into categories, younger than 30 (3.5%, n=28), 31 to 40 (9.0%, n=72), 41 to 50 (25.7%, n=206), 51 to 60 (33.0%, n=256), 61 to 70 (19.5%, n=156), 71 and older (9.4%, n=75). The majority of the primary decision makers were male (96.5%, n=768), with females comprising the minority (3.5%, n=28). A majority of the primary decision makers were white (99.0%, n=798) with very few respondents indicating American Indian or Alaska Native (0.6%, n=5) and Black or African Americans comprising the rest of the sample (0.4%, n=3). Most of the respondents were full time farmers (45.8%, n=364), others were employed full time off of the farm (28.6%, n=227), employed part time off the farm (13.0%, n=103), or retired (12.7%, n=101). The highest level of education for the farm's primary decision maker varied from no formal education (3.3%, n=26), some high school (6.9%, n=55), completed high school or equivalent (47.8%, n=382), some college (22.1%, n=177), completed 4 year college degree (14.1%, n=113), to completed graduate or professional degree (5.9%, n=47).

The average burley tobacco farm in 2007 according to the survey data collected consisted of a part time farmer, age 53 with a 13.3 acre burley tobacco crop. These farmers owned 202.5 acres and rented 165 acres with farm cash receipts totaling \$50,000 and a net household income of \$48,000. These farmers received 42% of their income off the farm and 50% of their farm receipts came from tobacco. These farms also averaged 6.3 hired workers who worked to produce their 2007 burley crop with the help of 3 family members.

Labor issues were the main focus for the information gathered from burley tobacco farmers. All information was gathered from the 2007 crop year data. Respondents' characteristics pertaining to the acquisition of labor and the sources of the labor they used are summarized in Table 6. Producers were asked to answer yes or no questions about whether or not the questions in Table 6 were true of their current farming operations. The majority of respondents (60.4%) stated that finding labor for their farm was a challenge. Few of the farmers utilized the H-2A program (13.3%) and only 36.0% used migrant laborers. Statistics show that most farmers continue to utilize local laborers and the rest are using family members to complete tobacco work on their farms.

Combined with labor shortages is the uncertainty that seems to loom over tobacco producers as they are forced to make future production decisions. Table 7 displays the producers responses to how likely they are to produce burley tobacco in the future. Beginning with the next crop year in 2008, most producers (86.9%) will produce in the next crop year. As the time frame moved up to five years the percentage of burley tobacco producers who would continue to grow burley tobacco dropped by 30% and continued to decline as more growers became unsure about their future decision to produce burley tobacco as the years increased.

The following are the top five factors that influenced farmer's decisions whether to produce burley tobacco in the future. At the top of this list was the price of tobacco where 74.4% of the respondents stated that was extremely important, a close second was the price of fertilizer with 64.6%, uncertainty about future of tobacco was third with 56.7%, cost of fuel came in fourth with 53.1%, and cost of labor completed the top five at 50.6%.

Focus Groups

Focus groups were conducted in four of the top producing burley regions of the southeast. For the purposes of this document they will be labeled County 1, County 2, County 3, and County 4. Each session followed a discussion outline and responses to the questions presented were answered verbally and recorded for accuracy.

Focus group participants totaled 41 farmers, all male, who produced between 9 and 350 acres, with a group average of 54.4 acres. Years of experience in burley tobacco production ranged from 3 to 60 years and an average years experience of 30.24 years. Full time farmers comprised 78% (n=32) of the growers in the focus groups, 7.3% (n=3) had full time jobs off the farm, 12.2% (n=5) held part time jobs off the farm, and 2.4% (n=1) were retired.

County 1

Ten growers from this area attended the focus group session. Growers produced from 10 to 150 acres of burley tobacco and the overall average burley acreage for the growers was 71.1 acres. These growers owned an average of 556.6 acres and rented an average of 840 acres. Experience in burley tobacco production ranged from 3 to 40 years with an overall average of 23.1 years experience. Seven of the ten farmers reported that they were full time farmers, two stated that they had full time employment off of the farm and one reported that he worked a part time job off of the farm. All but one of these producers had a diversified farming operation consisting of row crops, livestock, hay, fruits and vegetables and dark air cured tobacco.

Sources of labor in County 1 varied. H-2A laborers were utilized by five of the growers, four growers used other forms of migrant labor and one hired high school aged kids to complete the harvest of tobacco on their farms. Wage rates for harvest were reported between \$7.00 and \$7.50 for migrant laborers and high school laborers and H-2A wage rates were between \$9.13 and \$9.35. No growers reported their satisfaction with the labor they were currently using.

When asked what the growers thoughts were when they heard the words “mechanical harvester,” growers reported thoughts of leaves flying everywhere, 500 acre growers with \$1,000,000 machines, and hesitation to invest money in an industry with so much uncertainty. However, most of them had never seen a harvester. After presentation of the harvester video to the growers they were asked to give their reactions to the mechanical harvesters. The growers provided overall negative responses toward the machines stating that manual labor outperforms the machine and that until their labor source was gone there would be no reason to invest in such a machine. Others responded that potential adoption is slowed by fear of better technology becoming available and the overall price is just too high.

Focus group participants stated that there are other areas that could be taken into consideration to make their jobs much easier. The major suggestion was making and/or obtaining paperwork easier. Others stated concern over current tobacco prices and stated that factory workers are making more money than they were growing burley tobacco. All these farmers agreed that as long as the workers and the farmer are making money they would continue to produce burley tobacco. If this was not the case, the farmers would be forced to stop growing tobacco.

County 2

This focus group consisted of 12 growers who owned an average of 335.17 acres and rented an average of 271.88 acres. Their years of experience in burley tobacco production ranged from 12 to 60 years with an average of 35.42 years overall. Their burley acreage ranged from 10 acres to 90 acres and averaged a total of 24 acres overall. Each of these growers farmed full time but one who held a part time job away from the farm. These farming operations were all diversified with hay acreage and livestock production.

These growers obtained their labor from only two sources. Migrant laborers were used in 8 of the farming operations and was stated to be where the majority of the labor came from in the county; however, only 4 of the growers utilized the H-2A program. Wage rates varied across the group ranging from 38 to 15 cents per stick, and \$9.00 for migrant laborers to the standard \$9.13 for H-2A laborers. Overall satisfaction with the labor force was very high. Participants agreed that without migrant laborers there would be no labor for tobacco harvest and tobacco and other industries would fail. Due to a flour mill closing in a neighboring county there was an influx of migrant laborers looking for work harvesting tobacco which spurred a price war among farmers who were looking for harvest laborers.

When asked what they thought when they heard the words “mechanical harvester,” one grower stated that he would buy the first one. Another grower expressed interest and stated that he would buy one if it worked. Most of the farmers were familiar with the pull behind tractor unit from a tobacco field day they visited.

After the presentation of the harvester video, farmers were asked to express their thoughts on the machine. Most farmers were uninterested and provided negative responses toward the machine. The most common response among the growers was the uncertainty of the tobacco market and the increasing costs of inputs relating to the costs of the mechanical harvesters. Some growers stated that the mechanical harvester would slow their production down and that manual labor was much more efficient. Other concerns from the growers related to the way the machines handled the tobacco stating that there was too much breakage of the tobacco plant and bruised tobacco is hard to sell.

Two of the growers stated that they would continue to grow burley tobacco as long as they possible could as long as it was profitable. The consensus of the group came with the availability of migrant labor, as long as labor could be found they would continue to grow burley tobacco. The current price of burley tobacco in the market also limited most of the grower's ability to continue to grow burley tobacco. One grower stated that the 2008 crop year was his last in the tobacco business.

Other comments from growers stated that there needed to be more focus on mechanization of the market preparation portion of tobacco production called stripping. This is where the growers saw the most potential for a machine to gain some labor savings. The majority of the growers in this county are 50 years of age and older and they stated that they need more money in order to continue burley tobacco production. A 20 acre grower stated that a \$6,000 profit at the end of the year is just not worth it.

County 3

Eleven growers participated in this focus group that owned an average of 264 acres and rented 269.1 acres. Years of experience in burley tobacco production ranged from 18 to 58 years and an overall average of 35.09 years. Burley tobacco acreages amongst the growers ranged from 9 to 38 acres with an overall average acreage of 23.45. Those considering themselves to be full time farmers consisted of 6 of the growers, 3 were part time farmers who held apart time job off of the farm, one held a full time off the farm and the other was retired. All of these farmers reported hay production with row crops and livestock production scattered throughout the group.

Labor sources varied with 8 growers using migrant laborers, 2 using H-2A, and 1 using an immigrant labor contractor from Texas. Wage rates ranged from the standard \$9.13 for H-2A laborers, 37 to 40 cents per stick for harvest and some paying \$8.00 to \$12.00 for harvest. Satisfaction with harvesting labor forces was very high. Most of the laborers had already been trained to harvest tobacco and many farmers had to turn migrant laborers away because they already had enough help. Due to the tight restrictions on H-2A laborers, one farmer had quit using them all together because it was just too much trouble.

Growers were asked what they thought when they heard the words “mechanical harvester.” Growers who had never seen a harvester stated that this simply could not be done and that it was not cost efficient. The four farmers in the group who had seen the harvester stated that migrant labor was more efficient and the machines would slow down their production. The average age of farmers in this area ranged from 50 to 55 years of age and the youngest farmer they could think of was 37. Due to the increasing age of

farmers in this area adoption of such equipment would be limited. Thoughts on the mechanical harvesters after the presentation of the video remained negative. Tangling of stalks, leaf loss, too much breakage, and inefficiency of the machines were the main reactions to watching the harvesters work in the field. One grower stated that he would be willing to try one but he would not be able to afford the cost of the machine. The benefits do not justify the costs of the machine and as long as immigrant labor was available the growers were unwilling to invest in any of the harvesters.

When asked about future production of burley tobacco, 7 of the growers stated that they would still be growing in 5 years, but beyond that they were uncertain. The other four growers were uncertain if they would be able to continue tobacco production in the future. This was mainly due to the increasing age of the farmers and the increasing cost of production and other inputs. Uncertainty in the tobacco market was also a limiting factor in the decision to continue burley tobacco production on their farms.

Potential in other areas of tobacco production as stated by the growers was a mechanical stripping machine to assist in market preparation of the crop. Growers also stated some continuing thoughts on future production such as alternative crops they could turn to in order to continue farming. Alfalfa in this area is making the farmers more money per acre than burley tobacco and other crops could also take its place such as catfish and grapes. Farmers stated the need for new varieties to help them increase their yields. Most who were still collecting tobacco quota buyout payments stated that when those payments end they would be forced to quit growing tobacco.

County 4

Due to a devastating tornado in this area in early 2008, all of the 8 growers in this focus group were working to rebuild what they had lost. Burley tobacco being the main farming enterprise in this county, most farmers were working to rebuild curing structures and recoup their losses relying on burley tobacco production to offset the costs of rebuilding. These growers owned an average of 672.63 acres and rented an average of 545 acres. Burley tobacco acreage ranged from 27 to 350 acres with average burley tobacco acreage of 123.75. Years experience in burley tobacco production ranged from 12 to 35 years with an overall average of 24.75 years experience. Each grower reported that they were full time farmers with a diversified operation consisting of hay and livestock production. Half of the group reported that they maintained small acreages of row crops such as corn, wheat and soybeans.

Labor usage on these farms and in the county was primarily from migrant labor with 6 of the growers using immigrants and the other two utilizing the H-2A program. Wage rates for harvest laborers were 40 to 45 cents per stick or \$7.00 to \$7.50 per hour for immigrant labor. Standard prices for H-2A laborers were \$9.13 per hour. Collectively among the group, satisfaction with labor was down from the previous years. Growers stated that the quality of H-2A laborers had decreased and the immigrant laborers were being deported and were much slower in harvesting compared to previous years. Only one grower in the group stated that his laborers were the best that he had ever seen.

When growers were asked what they thought of when they heard the words “mechanical harvester,” cost was the big issue. One grower stated the first thing he thought of was \$1,000,000; another stated that if he had the money to purchase a

harvester then he would not be growing tobacco. Among these responses, inefficiency and problems with the machines ability to properly harvest the tobacco were also major concerns with the machines.

After presentation of the video, all of the growers remained negative about the use of a mechanical harvester on their farm. Growers main concerns with the machines were the piling un-wilted tobacco, leaf breakage, and the presence of leaves left in the field. One grower stated that the costs of the machines might not be the issue; it may be inefficiency, production and quality of the mechanical harvesters.

Future burley production for these growers remains uncertain. Market prices for burley tobacco verses their cost of inputs is a very limiting factor when it comes to future tobacco production. These farmers are making their production decisions from year to year due to the uncertainty of the burley tobacco market. Some only continue production because of their children and their interest in farming in the future. Most stated that if it were not for their children they would quit burley production all together. One grower reported that due to long-term uncertainty, he does not want his child to farm, but 5 years ago that was a different story. Making a living farming would be impossible without burley tobacco, stated one grower.

When asked about the potential for improvements in other areas of tobacco production farmers stated that mechanization of the market preparation process has more potential than mechanization of the harvesting process. Other comments were about immigration reform to make it easier to obtain legal immigrant workers, the development of more disease resistant varieties, and the ease of restrictions on certain chemicals used in tobacco production. Final thoughts from the growers were that County 4 is an

aggressive county when it comes to technology. If they can see that something works, they will adopt it. Mechanical harvesting equipment is just too slow, stated one grower, as another grower stated that the machines are just too expensive for the benefits they have the potential to receive.

Harvester Owner Interviews

Due to limited adoption of mechanical harvesting technology in these key burley-producing regions, only two growers were found who had actually purchased a harvester to use during harvest. These growers had purchased the Kirpy Harvester at the end of the 2007 crop year and it was used in conjunction with their existing labor force as a compliment to their operation. Each grower produced 150 acres of burley tobacco. Other than the mechanical harvester, no other special equipment purchases had been made and each of the growers continued to employ the same labor force as they had in the previous years. One grower utilized his current curing structures to cure the tobacco and the other had to retrofit his current outdoor curing structure to accommodate the mechanical harvesting method.

Both growers agreed that the mechanical harvester did not do a good job handling the tobacco and leaf breakage was a big problem. The Kirpy was hard to keep in the row as some of the terrain in the fields tended to be rolling hills instead of ideal flat ground. The growers also agreed that manually harvesting the tobacco continued to be more efficient and the quality of the tobacco was better. These growers purchased the machines in hopes that it would reduce their labor costs without sacrificing quality.

Improvements in machine efficiency and handling of the tobacco need to be made before the mechanical harvesters become a true benefit to the farmer stated the growers. Both growers agreed that uncertainty in the marketplace and the slow progression of the harvesting technology would continue to be a barrier to mechanical harvester adoption. The costs of the machine were only justified due to the large acreage of burley tobacco both growers possessed.

Conclusions

Burley tobacco growers between the ages of 51 and 60 comprised 32.5% of the respondents, while 26.5% of the respondents ranged in age from 41-50 rounding out the top half of total respondents (n=833). These burley tobacco growers were predominantly male (96.7%) and white (99.0%). Almost half of the burley tobacco growers were full time farmers (47.4%) with 27.5% of burley growers employed full time off of the farm.

It can be concluded that burley tobacco farmers are unwilling to invest in mechanical harvesting technology. This is primarily attributed to the availability of low cost immigrant and local labor and small average farm size (13.3 acres). Due to the high input costs and inefficiency associated with the mechanical harvesters, along with the uncertainty of the tobacco market, the price of tobacco, and the increasing costs of other inputs burley tobacco growers are reluctant to invest in mechanical harvesting technology.

The increasing average age of burley tobacco farmers combined with small average farm sizes adds to the reluctance to invest in mechanical harvesting technology. Burley tobacco farmers of substantial size are also reluctant to invest stating that their

immigrant laborers can harvest their crop more efficiently and with less breakage of the leaves than the mechanical harvester.

One may conclude that the number of burley tobacco producers is in steady decline. Due to the increasing age of the average burley tobacco farmer and growing concerns over the market price for burley tobacco and the rising input cost for fuel, fertilizer and labor has lead to uncertainty about the future of burley tobacco production in the southeast. As 86.9% of the current burley tobacco producers responded that they would grow burley tobacco during the 2008 crop year, the number of growers who will grow burley tobacco in 10 years falls to 30.2%. The number of growers who will be producing burley tobacco in 20 years falls even lower to 13.5%. This is a 73.4% drop in grower numbers over the course of 20 years.

However, it is possible that the number of burley tobacco acres will not decrease over this time period. Other younger burley tobacco growers may continue to expand their respective burley tobacco operations as aging burley growers discontinue production.

One may also conclude that mechanical harvesters are at this time unable to match the efficiency and quality of conventional labor. Negativity resonates among burley tobacco growers who view the mechanical harvesters in action. The mechanical harvesters inability to handle the burley tobacco plants in the delicate fashion that is required for top quality leaves little to be desired by burley tobacco growers. Conventional workers are much faster and can be trained on how to correctly handle each tobacco plant. With the price of tobacco already low, burley tobacco farmers cannot afford to take any price cuts due to poorly handled tobacco.

Implications and Discussion

One has to wonder what lies in the future for burley tobacco production in the southeast. A large majority of the burley tobacco growers are increasing in age and as the market price of burley tobacco remains somewhat constant all of the production inputs are increasing. Fuel and fertilizer costs are at an all time high and the affordability of labor is in slow decline. This leaves little room for burley tobacco producers to make a large investment in a mechanical tobacco harvester that may reduce their labor force, but in return decrease the quality of their product and the efficiency of their harvest.

One must also take into consideration the small average farm size of burley tobacco growers and how it relates to the capacity of these mechanical tobacco harvesters. The harvesters are designed to accommodate a large number of acres while most of the farms are less than fourteen acres in size. One could surmise that a harvester manufacturer would take this into consideration when designing a labor saving type of technology. One can assume that by reducing the size and capacity of the mechanical harvester would reflect a less significant initial cost.

As input costs are a definite barrier to adoption of mechanical harvesting technology, there are also other identified barriers to adoption. Thus costs associated with the mechanical harvesters may not be the real issue. Inefficiency, production, and quality may be the real issues when burley tobacco growers are faced with purchase decisions. Conventional labor provides burley tobacco producers with proper quality, care, and handling that cannot be achieved by a mechanical harvester. Though the costs of the machines may be substantial, the potential loss of quality and increased time spent in the

field harvesting the burley tobacco crop may create much of the negativity that surrounds the decision whether or not to purchase a mechanical harvester.

With all of the risks identified to making an investment in a crop with so much uncertainty, burley tobacco farmers must make progressive decisions in order to overcome great financial obstacles. As generations of burley tobacco farmers are faced with such decisions one must realize that as profitability continues to decrease alternative means of farm income necessitate exploration. The question of crop replacement will have to be answered if some type of change is not realized.

Recommendations

Further study is warranted to determine if the patterns of this study endure over an extended period of time.

Questions that may relate to further research in this area are:

1. What new mechanical harvesting technologies have become available to burley tobacco growers in the southeast?
2. Are migrant laborers readily available to burley tobacco growers?
3. Has the number of burley tobacco growers increased since 2008?
4. Have costs of the mechanical tobacco harvesters become more affordable to burley tobacco farmers?

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APPENDICES

APPENDIX A
HUMAN SUBJECTS RESEARCH APPROVAL FORM



MEMORANDUM

TO: Ms. Brenda Lawson, Office of Human Subjects Research
404 Andy Holt Tower

FROM: Randol G. Waters, Chair, Departmental Review Committee (DRC) for the IRB

DATE: January 18, 2008

RE: Attached Form A Protocols

Agricultural and
Extension Education
2621 Morgan Circle
Room 201
Knoxville, TN 37996-4511
Phone: (865) 974-7371
IRB (865) 974-7383

Attached are three Form A protocols that our DRC have recently reviewed and approved. The first, entitled "CTGR County Agent Survey" was actually reviewed and approved prior to the Christmas holidays, but I am only now sending a copy forward along with these other two. The second, entitled: "CTGR County Mail Survey" and the third, entitled: "Local Resident Perceptions and Values Regarding . . ." were reviewed and approved shortly after the return from the holidays. I have been out of the office much of the time since our last meeting and I'm only now getting the copies mailed to you.

All three protocols were approved by the committee as Form A Exempt Research Protocols. Upon review, I believe you will agree with our committee that each qualifies for that status. The two CTGR protocols are similar and related to an earlier protocol that was approved for the Center for Tobacco Grower Research. The other protocol is a follow-up study of residents living near a new dairy farm facility that UT will be developing over the next few years.

As is customary, we will keep the original Form A protocols for these research projects on file in the DRC office until they are completed and the files are closed. Please let me know if you have questions.

CC: (Letter Only)
Mr. Green
Dr. Tillar
Dr. Lambert
Dr. Cho
Dr. Clark
Dr. Smith
Dr. Wilcox
Dr. de la Torre Ugarte
Dr. Gerloff

UT INSTITUTE OF AGRICULTURE

Education, Research and Service through the Agricultural Experiment Station ♦ Agricultural Extension Service
♦ College of Agricultural Sciences and Natural Resources ♦ College of Veterinary Medicine

APPENDIX B
2008 TOBACCO SURVEY

2008 Tobacco Grower Survey

Introduction

This survey is designed to collect general information about tobacco production across all types of tobacco produced in the United States.

As research and extension workers in tobacco, we need this type of data to help farmers remain profitable in tobacco production. **Even if you no longer produce tobacco, you can provide valuable information.**

Once the data are collected and analyzed, the summary results of this survey will be available through research summaries and reports.

This survey is printed with a number that allows us to enter your name and address in the flat panel TV drawing* when your completed survey is returned. It is not necessary to include your return address. **All individual responses to the questionnaire will be kept strictly confidential!**

Our testing indicates it will take you 10-15 minutes to fill out this survey. If possible, we would like for the household's primary decision maker to fill out this survey.

Thank you for your participation!

If you have questions about this survey, you may contact:

Daniel Green, Coordinator
Center for Tobacco Grower Research
ctgr@utk.edu
Toll free: 1-866-974-0414

You could win a free flat panel TV!*

** The flat panel TV promotion is open to Center for Tobacco Grower Research participants who return a completed survey and are over the age of 18 and residents of the continental United States. The odds of winning are dependent upon the number of surveys returned, but are estimated to be approximately 1 in 2,000. Please visit www.TobaccoGrowerResearch.com or call 1-866-974-0414 for full details.*

You received this survey as a member of the Center for Tobacco Grower Research mailing list. If you do not wish to receive future surveys, please contact us toll free at 1-866-974-0414 or ctgr@utk.edu to remove your name from the mailing list.

TOBACCO PRODUCTION & MARKETING

1. Did you produce a tobacco crop in **2007**?

☐ Yes (Please continue to question 2)

☐ No

– If no, are you still actively managing a farming operation?

☐ Yes (Please skip to question 11 on page 10)

☐ No (Please skip to question 29 on page 18)

2. Please list the number of acres of each type of tobacco that you produced.

	2008 Expected Production (Acres)	2007 Actual Production (Acres)	2006 Actual Production (Acres)
Burley			
Flue-cured			
Dark-Air			
Dark-Fired			
Maryland			
Cigar			

3. How did your 2007 tobacco acreage compare to the amount of tobacco you produced during the last year of the federal tobacco program (2004)?

☐ I produced **more** acres of tobacco in 2007 than in 2004.

☐ I produced **fewer** acres of tobacco in 2007 than in 2004.

☐ I produced the **same** number of acres of tobacco in 2007 and 2004.

☐ I **did not** produce tobacco in 2004 or any year prior to 2004.

4. Please list your average yield **per acre** for each type of tobacco.

	2007 Actual Yield (pounds per Acre)	2006 Actual Yield (pounds per Acre)
Burley		
Flue-cured		
Dark-Air		
Dark-Fired		
Maryland		
Cigar		

5. Which company/companies did you contract to sell tobacco with in 2007?

- ☐ Alliance One
- ☐ Conwood
- ☐ Hail and Cotton
- ☐ Philip Morris USA
- ☐ Philip Morris International
- ☐ Reynolds American Inc
- ☐ Universal Leaf Tobacco
- ☐ U.S. Tobacco
- ☐ I did not contract to sell my tobacco.
- ☐ Other company/companies: (please specify below)

6. Please indicate how important the following marketing issues are to you.

	Not important at all										Extremely important
Price	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Simple contract terms	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Simple pricing method	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Consistent moisture testing	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Number of stalk positions required	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Consistent grading	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Distance to the receiving station	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Wait times to unload	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Good communication from the buying company	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

LABOR

7. Please indicate whether or not the following statements are true about your tobacco farm.

	YES	NO
I have trouble finding enough labor for my farm.	☐	☐
Most manual labor on my farm is done by migrant labor.	☐	☐
Most manual labor on my farm is done by family members.	☐	☐
Local workers are an important source of labor for my farm.	☐	☐
The H-2A program is an important source of labor for my farm.	☐	☐

8. How many people worked on your farm to produce your 2007 tobacco crop?

_____ Hired workers

_____ Family members

FUTURE TOBACCO PRODUCTION

9. Please describe how likely you are to produce tobacco in the future.

	I definitely will not produce	I probably will not produce	I am not sure	I probably will produce	I definitely will produce
In 2008	☐	☐	☐	☐	☐
In 5 years	☐	☐	☐	☐	☐
In 10 years	☐	☐	☐	☐	☐
In 15 years	☐	☐	☐	☐	☐
In 20 years	☐	☐	☐	☐	☐

10. As you consider future tobacco production, how important are improvements or additions to the following items to your operation?

	Not important at all	Extremely Important
Curing barns/ structures	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Migrant worker housing	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Tobacco baling equipment	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Mechanized harvesting equipment	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Market preparation facilities (location to strip/bale tobacco)	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Irrigation equipment	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Buying more land	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Leasing more land	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	

FARMING DECISIONS AND OPERATION

11. How important were the following factors in your decision whether or not and how much tobacco to produce in 2007?

	Not important at all	Extremely Important
Your current age	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Price of tobacco	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Availability of labor	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Cost of labor	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Cost of fuel	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Cost of fertilizer	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Cost of financing	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Availability of financing	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Cost of land	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Availability of land	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Availability of curing barns	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	

	Not important at all	Extremely Important
Age of equipment and/or curing barns	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Opportunity to grow other crops	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Opportunity to raise livestock	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Off-farm income opportunities	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
No one to manage the operation	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
Uncertainty about future income from tobacco	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	

12. How likely are the following to be true?

	Not likely at all	Extremely likely
When I reach retirement age, a <u>family member</u> will manage the farming operation.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
When I reach retirement age, I will <u>rent my farm</u> to another producer.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
After I retire, tobacco will be produced on my farm.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
After I retire, my <u>land will be sold</u> and remain in agricultural use.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
After I retire, my <u>land will be sold</u> for development .	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	
It is likely that I will sell my farm before I reach retirement age.	☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐	

13. Please estimate the size of the total farming operation that you manage in acres:
(please fill in the number of acres for those that apply to you)
Acres managed that **you own** _____ acres
Acres managed that **you rent** _____ acres
14. For the 2007 crop year, how many acres in your farming operation were used for each of the following?
tobacco _____ acres
livestock _____ acres
grain crops _____ acres
cotton _____ acres
peanuts _____ acres
hay _____ acres
pasture _____ acres
fruits/vegetables _____ acres
other - please specify: _____
_____ acres
15. Which crop or livestock enterprise do you consider **most** capable of replacing tobacco acreage on your farming operation?
(select only one)
☐ grain crops ☐ fruits/vegetables
☐ cotton ☐ hay
☐ peanuts ☐ beef cattle
☐ cow/calf ☐ dairy
☐ hogs ☐ goats
☐ pasture ☐ broilers/poultry
☐ nursery/landscape ☐ other: _____

16. Which category describes your **total cash receipts** for your **total farming operation** for 2007?

- | | |
|---|---|
| ☐ Less than \$1,000 | ☐ \$100,000 to \$199,999 |
| ☐ \$1,000 to \$4,999 | ☐ \$200,000 to \$299,999 |
| ☐ \$5,000 to \$9,999 | ☐ \$300,000 to \$399,999 |
| ☐ \$10,000 to \$24,999 | ☐ \$400,000 to \$499,999 |
| ☐ \$25,000 to \$49,999 | ☐ \$500,000 to \$999,999 |
| ☐ \$50,000 to \$99,999 | ☐ \$1,000,000 or more |

17. What portion of your **total cash receipts** for your **total farming operation** were from tobacco in 2007?

- | | |
|--|-------------------------------------|
| ☐ None | ☐ 50% to 59% |
| ☐ less than 10% | ☐ 60% to 69% |
| ☐ 10% to 19% | ☐ 70% to 79% |
| ☐ 20% to 29% | ☐ 80% to 89% |
| ☐ 30% to 39% | ☐ 90% to 99% |
| ☐ 40% to 49% | ☐ 100% |

18. If you produced tobacco in 2007, how many other households farmed with you and shared in your 2007 tobacco receipts?

- ☐ 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4 or more

GENERAL INFORMATION

19. Describe how important the following sources of information are to helping you make production decisions.

	Not important at all										Extremely Important
The Internet	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Farm magazines or newspapers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
County Extension agents and meetings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Regional Extension meetings and field days	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Other farmers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Contractor information and meetings	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Farm supply retailers	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

20. What is the state and county of your **primary** farming operation?

State _____

County _____

21. Does your farming operation include other counties or states?

☐ yes ☐ no

22. What is the size of your household?
- ☐ 1 person ☐ 5 people
 - ☐ 2 people ☐ 6 people
 - ☐ 3 people ☐ 7 people
 - ☐ 4 people ☐ 8 people or more
23. Which best describes the age of the farm's primary decision maker?
- ☐ younger than 30 ☐ 51 to 60
 - ☐ 31 to 40 ☐ 61 to 70
 - ☐ 41 to 50 ☐ 71 or older
24. Please indicate the gender of the farm's primary decision maker.
- ☐ male ☐ female
25. Please indicate the race of the farm's primary decision maker.
- ☐ American Indian or Alaska Native
 - ☐ Native Hawaiian or Pacific Islander
 - ☐ Asian
 - ☐ White
 - ☐ Black or African American
 - ☐ Spanish, Hispanic or Latino origin
26. Which best describes your 2007 net household income after taxes?
- ☐ less than \$10,000 ☐ \$50,000 to \$74,999
 - ☐ \$10,000 to \$24,999 ☐ \$75,000 to \$99,999
 - ☐ \$25,000 to \$49,999 ☐ \$100,000 or more

27. Approximately what percentage of your 2007 net household income was from employment away from your farm?

- | | |
|--|-------------------------------------|
| ☐ None | ☐ 50% to 59% |
| ☐ less than 10% | ☐ 60% to 69% |
| ☐ 10% to 19% | ☐ 70% to 79% |
| ☐ 20% to 29% | ☐ 80% to 89% |
| ☐ 30% to 39% | ☐ 90% to 99% |
| ☐ 40% to 49% | ☐ 100% |

28. Which describes the primary occupation for the farm's primary decision maker?

- ☐ Full-time farmer
- ☐ Employed **full** time off the farm
- ☐ Employed **part** time off the farm
- ☐ Retired

29. Which describes the highest level of education for the farm's primary decision maker?

- ☐ no formal education
- ☐ some high school
- ☐ completed high school or equivalent
- ☐ some college
- ☐ completed 4-yr college degree
- ☐ completed graduate or professional degree

END OF SURVEY – THANK YOU FOR YOUR PARTICIPATION!

Please insert the survey in the enclosed envelope and drop it in the mail, no postage required. Please return the survey by February 21, 2008.

Once the data are collected and analyzed, the summary results of this survey will be available. **All individual responses will be kept strictly confidential!**

THE FOLLOWING QUESTIONS ARE FOR FORMER TOBACCO GROWERS WHO ARE NO LONGER ACTIVELY MANAGING A FARM.

29. When was the last year you produced a tobacco crop? _____

30. How many acres of each type did you produce that last year?

	Production (Acres)		Production (Acres)
Burley		Dark-Fired	
Flue-cured		Maryland	
Dark-Air		Cigar	

31. Please select yes or no for each of the following questions.

	Yes	No
A family member now manages my former farming operation.	☐	☐
I rent my farm to another producer.	☐	☐
Tobacco is still produced on the farm I once managed.	☐	☐
I sold my land and it remains in agricultural use.	☐	☐
I sold my land and it is now in non-agricultural use.	☐	☐

END OF SURVEY – THANK YOU FOR YOUR PARTICIPATION!

Please insert the survey in the enclosed envelope and drop it in the mail, no postage required. Please return the survey by February 21, 2008.

Once the data are collected and analyzed, the summary results of this survey will be available. **All individual responses will be kept strictly confidential!**

R11-1216-115-003-08 08-0114

UT is an EEO/AA/Title VI/Title IX/Section 504/ADA/ADEA Institution.

APPENDIX C
2008 COSTS AND RETURNS SURVEY

CTGR

Center for Tobacco Grower Research

2008 Burley Tobacco Costs and Returns Survey

Thank you for participating in Center for Tobacco Grower Research (CTGR) projects!

CTGR's mission is to conduct timely research in the areas of tobacco production, economics and markets that will provide information to support the sustainability of U.S. production of burley, flue-cured, dark and other types of tobacco.

You have been selected to participate in a study of the costs and returns of producing burley tobacco. By taking a few minutes to complete this survey, you are contributing valuable information about U.S. tobacco production that will be used in research and Extension projects to support tobacco growers. Once the data are collected and analyzed, the results of this survey will be available through research summaries and reports. **Each person who returns a survey will receive a summary of the study results by mail after the information is processed.**

This survey is designed to collect information about the costs and returns of **burley** tobacco production. We would like you to focus on your 2008 burley tobacco operation. At times, it will be necessary for you to estimate some of your 2008 crop year costs.

As research and Extension workers in tobacco, we need this type of data to help farmers remain profitable in tobacco production.

All individual responses to this questionnaire will be kept strictly confidential!

Surveys are coded only by number and do not include identifying information about the responder.

Our testing indicates it will take you 10-15 minutes to fill out this survey. If possible, we would like for the household's primary decision maker to fill out this survey.

Thank you for returning this survey!

This project is supported by funding from Philip Morris USA and Philip Morris International.

You received this survey as a member of the Center for Tobacco Grower Research mailing list. If you do not wish to receive future surveys, please contact us toll free at 1-866-974-0414 or ctgr@utk.edu to remove your name from the mailing list.

Please answer all that apply to your Burley operation

Production – Please list the **number of acres** of burley tobacco that you **harvested**. For 2008, provide or estimate acres planted.

2008 Expected Production (**acres**) _____

2007 Actual Harvested (**acres**) _____

2006 Actual Harvested (**acres**) _____

Please list the total **number of acres** of burley tobacco on your operation that you planted but **did not harvest** due to drought, excessive moisture, hail, wind, frost/freeze or other causes.

2007 Not Harvested (**acres**) _____

2006 Not Harvested (**acres**) _____

Yields – Estimate your **yield per acre** for harvested burley tobacco. For 2008, estimate your expected yield under normal growing conditions.

2008 Expected Yield (**Lbs. per acre**) _____

2007 Actual Yield (**Lbs. per acre**) _____

2006 Actual Yield (**Lbs. per acre**) _____

Average Sales Price– Estimate your burley **average sales price** for the past three years, including any additional payments by the purchaser. Please provide as much information as you can, even if only the average for all stalk positions.

2007 Average Sale Price (**\$ per pound**)

Flyings (X) \$ _____

Cutters (C) \$ _____

Leaf (B) \$ _____

Tips (T) \$ _____

Average (All stalk positions) \$ _____

2006 Average Sale Price (**\$ per pound**)

Flyings (X) \$ _____

Cutters (C) \$ _____

Leaf (B) \$ _____

Tips (T) \$ _____

Average (All stalk positions) \$ _____

2005 Average Sale Price (\$ per pound)

Flyings (X) \$ _____

Cutters (C) \$ _____

Leaf (B) \$ _____

Tips (T) \$ _____

Average (All stalk positions) \$ _____

Please list the **total dollars received** from any **crop insurance** claims.

Burley crop insurance claims \$ \$

2007 Total \$ _____

2006 Total \$ _____

Hired Labor – Estimate the total number of hours and wage rate per hour of **hired labor** required for your operation in 2008. If you are not sure about the number of hours for each activity, or use a different method of payment, please enter the total amount spent per acre for each activity.

	# of hours per acre	Wage rate per hour	OR	Total spent per acre
Pre-harvest (all labor prior to cutting)				
Harvest (cutting and hanging)				
Market preparation (baling)				

Other Hired Labor Expenses

Besides the wages paid, how much do you expect to spend in 2008 on other hired labor related expenses such as taxes, travel, housing, processing fees, etc.?

Total spending \$ _____

Interest on Operating Capital

Interest you will pay for operating loans for your 2008 burley operation

Total spending \$_____

FIXED COSTS

Curing Barns & Structures – Owned – Estimate the capacity and the total value of curing barns and other types of curing structures **that you own**.

	Capacity (acres)	Total Value
Curing barns		\$
Other curing structures		\$

Curing Barns – Rented

Capacity of curing barns that you rent.		acres
Estimate the cost per acre of any curing barns rented	\$	Per acre

Tractors and Machinery – Estimated value of all tractors and other machinery used in the production of burley tobacco on your farm.

Total value \$_____

VARIABLE COSTS - focus on your 2008 burley operation and indicate either your actual or expected costs for the following items.

Tobacco Plants – Purchased or Produced – Estimate the cost of your 2008 burley tobacco plants for any plants you purchased or produced.

	Number of plants per acre	\$ per thousand plants
Purchased		\$
Produced		\$

Fertilizer and Lime – Total spending per acre for all fertilizer and lime for your burley tobacco operation (include custom application costs).

	\$ per acre
Fertilizer	\$
Lime	\$

Pesticides and Other Chemicals – How much do you expect to pay per acre for all applications of pesticides and other chemicals?

	\$ per acre
Fungicides	\$
Herbicides	\$
Insecticides	\$
Sucker Control	\$
Other Chemicals	\$

Crop Insurance– Spending per acre on crop insurance purchased for your burley operation.

Acres insured	\$ per acre
	\$

Irrigation - How many acres of your 2008 burley crop can be irrigated if necessary?

How many acres of your 2008 burley crop can be irrigated if necessary?		Acres
How much do you normally expect to spend per acre on irrigation expenses?	\$	Per acre

Fuel, Oil and Repairs – Expected spending per acre for fuel, oils and repairs for tractors and machinery used in your burley operation.

\$ per acre _____

Land Value – Estimate the value of any farmland that you own. For farmland rented, please provide rent paid per acre.

	Number of acres	Total value per acre and/or rent paid per acre
Farmland that you own used for burley production		\$
Farmland that you rent used for burley production		\$

GENERAL

What is the state and county of your **primary** farming operation?

State _____ County _____

Does your farming operation include other counties or states?

☐ yes ☐ no

Do you produce any other types of tobacco?

☐ yes ☐ no

What is the size of your household?

- ☐ 1 person ☐ 5 people
☐ 2 people ☐ 6 people
☐ 3 people ☐ 7 people
☐ 4 people ☐ 8 people or more

Which best describes the age of the farm's primary decision maker?

- ☐ younger than 30 ☐ 51 to 60
☐ 31 to 40 ☐ 61 to 70
☐ 41 to 50 ☐ 71 or older

For how many years has the primary decision maker been growing burley tobacco? _____ years

Which category describes your **total cash receipts** for your **total farming operation** for 2007?

- ☐ Less than \$1,000 ☐ \$100,000 to \$199,999
☐ \$1,000 to \$4,999 ☐ \$200,000 to \$299,999
☐ \$5,000 to \$9,999 ☐ \$300,000 to \$399,999
☐ \$10,000 to \$24,999 ☐ \$400,000 to \$499,999
☐ \$25,000 to \$49,999 ☐ \$500,000 to \$999,999
☐ \$50,000 to \$99,999 ☐ \$1,000,000 or more

What portion of your **total cash receipts** for your **total farming operation** were from tobacco in 2007?

- ☐ None ☐ 50% to 59%
- ☐ less than 10% ☐ 60% to 69%
- ☐ 10% to 19% ☐ 70% to 79%
- ☐ 20% to 29% ☐ 80% to 89%
- ☐ 30% to 39% ☐ 90% to 99%
- ☐ 40% to 49% ☐ 100%

Which best describes your 2007 net household income after taxes?

- ☐ less than \$10,000 ☐ \$75,000 to \$99,999
- ☐ \$10,000 to \$24,999 ☐ \$100,000 to \$149,999
- ☐ \$25,000 to \$49,999 ☐ \$150,000 to \$199,999
- ☐ \$50,000 to \$74,999 ☐ \$200,000 or more

Approximately what percentage of your 2007 net household income was from employment away from your farm?

- ☐ None ☐ 50% to 59%
- ☐ less than 10% ☐ 60% to 69%
- ☐ 10% to 19% ☐ 70% to 79%
- ☐ 20% to 29% ☐ 80% to 89%
- ☐ 30% to 39% ☐ 90% to 99%
- ☐ 40% to 49% ☐ 100%

Which describes the primary occupation for the farm's primary decision maker?

- ☐ Full-time farmer
- ☐ Employed **full** time off the farm
- ☐ Employed **part** time off the farm
- ☐ Retired

Which describes the highest level of education for the farm's primary decision maker?

- ☐ no formal education
- ☐ some high school
- ☐ completed high school or equivalent
- ☐ some college
- ☐ completed 4-yr college degree
- ☐ completed graduate or professional degree

END OF SURVEY – THANK YOU FOR YOUR PARTICIPATION!

Please insert the survey in the enclosed envelope and drop it in the mail, no postage required. Once the data are collected and analyzed, the summary results of this survey will be mailed to each person who completes a survey. **All individual responses will be kept strictly confidential!**

APPENDIX D

LABOR/MECHANIZATION FOCUS GROUPS

CTGR

Center for Tobacco Grower Research

The mission of the Center for Tobacco Grower Research is to conduct timely research in the areas of tobacco production, economics, and markets that will provide information that will support the sustainability of U.S. production of burley, flue-cured, dark and other types of tobacco.

Background and Objective

Tobacco grower participants in previous focus group sessions have identified the cost and availability of labor as a significant production restriction in their operation. Further, 60.4 percent of burley producers responding to the 2008 CTGR Current and Former Growers survey indicated they have trouble finding enough labor for their farming operation. The cost and lack of available labor was also named as an important factor in producers' decisions of whether or not to produce and how much tobacco to produce. Sixty-seven percent of burley respondents indicated the lack of available labor was a very important factor to their production decision, while 73 percent indicated the cost of labor was a very important factor.

While the adoption of mechanical harvesters among flue-cured producers has been quite successful, very few acres of burley tobacco are harvested using mechanical harvesters. Several different systems have been developed for mechanically harvest and strip burley tobacco, but no system has received widespread acceptance by producers.

This study will further explore the labor challenges tobacco growers are facing and the potential for adoption of mechanical harvesters and mechanical stripping machines. The main objective will be to collect information from burley producers about their labor use, their thoughts on new labor-saving technology, and to explore the factors influencing tobacco producers' decisions to invest in such labor-saving technology.

Participants

Extension agents and others involved in tobacco extension and research activities in each state will assist in the recruitment of participants with varying ages and farm structure. Each session will include 10-12 participants who are actively managing a burley tobacco farming operation and do not currently use mechanical tobacco harvesters in that operation. The participants' farming operations will vary in size and types of commodities produced.

Focus groups will be held in both traditional and non-traditional burley producing regions. Additionally, separate interviews will be conducted with several producers that are currently using mechanical harvesters to collect information about their experiences.

Locations

Central Kentucky
Western Kentucky
Middle Tennessee

Schedule

The meetings will be held during the last week of August and the first two weeks of September.

Discussion Outline

Introductions

1. Please share your name and a brief summary of your farming operation and any other employment.

Tobacco Labor

2. How many acres of burley tobacco will you harvest this year?
3. From where do you get your labor to harvest your burley tobacco?
4. How many laborers do you use during harvest including yourself?
5. What is the rate of pay for laborers who **harvest** burley tobacco on your farm?
6. What is the rate of pay for laborers who **strip** burley tobacco on your farm?
7. How satisfied are you with your current workforce?

Labor- Saving Technology

8. What do you think about when you hear “mechanical tobacco harvester”?
9. How many of you have seen a mechanical harvester in action?
10. What are your thoughts on the potential development of a mechanical harvester for burley tobacco?

Videos of Labor-Saving Technology

- *(We will now view a 10 minute video from the 2006 burley mechanization field day that shows several different labor-saving technologies for burley tobacco including the GCH Gold Standard harvester, Kirpy harvester, MarCo harvester and mechanical stripping machine. This video contains no audio or written commentary)*

Response to videos

11. What are your initial thoughts about the mechanical harvesters and mechanical stripping machine?
12. Would you be interested in using one of these harvesters or the mechanical stripping machine on your operation?

Presentation of Costs for the Labor Saving Technology

(General information collected from each harvester and stripping machine manufacturer will now be presented accompanied by the costs of the machines.)

General Thoughts

13. What are your thoughts on the costs and benefits of the machines?
14. Do you see any potential for cooperative ownership of any of the machines?

Would you be interested in participating in cooperative ownership in any of the machines? *(Several producers would invest in one machine and share the equipment.)*
15. Do you see potential for any of these machines to be used in a custom hire service?

16. Besides the cost, what other factors are important in your decision about whether or not to adopt this type of technology.
17. What other areas of tobacco production do you see potential for reducing the use of manual labor?
18. Assuming tobacco production remains profitable, for how many years do you expect to continue producing burley tobacco?
19. In what areas of tobacco production would you like to see additional research to improve productivity?

Additional Comments

20. Does anyone have any additional comments or questions?

APPENDIX E

MECHANICAL HARVESTER USER QUESTIONNAIRE

Mechanical Harvester User Questionnaire

1. How many acres of burley tobacco do you have this year?
2. How many years have you been growing burley tobacco?
3. What influenced your decision to purchase a mechanical tobacco harvester?
4. Prior to your purchase of a mechanical tobacco harvester, from where did your primary source of harvesting labor come?
5. How many waged laborers do you use to harvest your burley tobacco now that you have a mechanical harvester?
6. How many waged laborers did you use prior to the purchase of your mechanical tobacco harvester?
7. What type of harvester do you use?
8. How long have you been using your mechanical harvester?
9. Did you have to make any special equipment purchases or have to invest in updating preexisting equipment on your farm supplemental to your purchase of the mechanical harvester?
10. What types of curing structures do you use for your burley tobacco?
11. Were these preexisting structures or did you have to build them to accommodate your new method of harvest?
12. If these are new structures, what is the cost associated with erecting such a structure?
13. What are your thoughts on the cost of the mechanical harvesters?

14. Would you say your leaf loss is greater or less than when you used manual labor to harvest your burley tobacco?
15. Would you say that your stalk loss is greater or less than when you used manual labor to harvest your burley tobacco?
16. What are some things that you really like about your harvester?
17. What are some things that you do not like about your harvester?
18. Is there anything that you would like to change about your harvester?
19. Why do you think that more burley tobacco farmers are not using mechanical harvesters?
20. Would you encourage other burley tobacco farmers to purchase a mechanical harvester? Why or why not?

VITA

Robert Bailey Elliott was born July 24, 1983, to Mr. William and Mrs. Cheryl Elliott of Robertson County, Cedar Hill, Tennessee. He graduated from Jo Byrns High School, Cedar Hill, Tennessee, in May of 2001. He graduated from the University of Tennessee, Knoxville with a Bachelor of Science degree in agriculture in December of 2005. While attending the University of Tennessee, Knoxville, he became an active member of Alpha Gamma Rho Fraternity, was very active in student government, and became a member of Collegiate 4-H, Gamma Sigma Delta, and Phi Kappa Phi.

In the fall of 2006 he began his career as a graduate student in the Master of Science program with the Agricultural and Extension Education Program at the University of Tennessee. In the summer of 2007 he accepted a position with the University of Tennessee College of Agricultural Sciences and Natural Resources as a Graduate Teaching Assistant with the Agricultural and Extension Education Department.

Presently he and his wife, Lindsay Elliott, reside in Cheatham County, Pleasant View, Tennessee. He is currently employed with Wheat Tech, Inc. as an agronomist.