THE OPTIMUM GEOGRAPHICAL LOCATION OF BURLEY TOBACCO PRODUCTION WITHIN THE BURLEY BELT

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Burley tobacco is a major crash crop in Kentucky, middle and eastern Tennessee, and Southwestern Virginia. Burley tobacco acreages and the farm acreage distributions of burley tobacco have been determined by the United States Department of Agriculture since 1933. In 1966, approximately 250,000 acres of burley tobacco was alloted to farmers in the United States.

The purpose of burley acreage allotments has been to equate the supply and demand for burley tobacco at a price considerably higher than that which a free market would establish. This price incentive, coupled with acreage restrictions, has caused farmers to increase fertilization rates, space plants closer, top the plant higher, improve insect, disease and sucker control, improve curing practices, and to use improved varieties of burley as they have become available. This has resulted in a doubling of burley yields since 1943, and, although the demand for burley has increased during most years, several cuts in burley acreage allotments have been necessary. The net effect has been that the value productivity of resources devoted to burley production has been raised above that of alternative uses.

The Federal acreage control program for burley tobacco and the resulting acreage distribution have not generally reflected the forces of competition. Acreage allotments on individual farms are largely based on historical acreages of burley grown, although such devices as minimum allotment sizes, new allotments, and acreages made available for the correction of individually felt inequities in allotments have allowed some change in the regional distribution of burley acreages. However, these changes usually have not reflected the forces of competition.

The purpose of this article is to evaluate the changes that would take place in the distribution of burley acreages under various assumptions that might be relevant if the forces of competition were allowed to determine this distribution. Major issues concerning burley tobacco are presently very much in evidence and may affect future demand for burley tobacco and future legislation pertaining to burley tobacco programs. First, recent studies have shown a high correlation between cigarette smoking and such diseases as lung cancer and heart disease. These findings may have a detrimental effect on the demand for burley tobacco. However, even if these findings do not have a noticeable effect on the demand for burley tobacco, they may affect future legislation with regard to price supports and acreage allotments. Second, this study sheds light on the movements that would probably occur should a lease and transfer allotment program—a program that has been suggested from time to time—or an allotment sale program be established for burley tobacco. Third, technological advances and changes in resource complexes are a continuing process in the burley belt as they are in all sectors of the economy and, thus, warrant continuing research into their effects.

Specifically, the purposes of this study are: (1) to evaluate the optimum geographical location of burley tobacco production under four different tobacco price and allotment control programs, (2) to determine the optimum geographical distribution of other important enterprises, (3) to evaluate the overall effects of varying different economic variables on the distribution of burley tobacco acreages within the burley belt, and (4) to evaluate the overall impact of a burley tobacco program based on a competitive distribution of acreage allotments.

THE STUDY AREA

The burley belt was divided into nine substantially homogeneous production regions, containing approximately 222,000 acres of burley tobacco in 1966. The regions were delineated on the basis of their similarity in topography, soil types, resource complexes, and types of enterprises. These regions are modifications

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of the 1964 agricultural census subregions and are designated as follows:

Region 1. Nashville Basin of Tennessee.

Region 2. Western Pennyroyal regions of Kentucky and Tennessee and four lower Ohio Valley counties of Kentucky.

Region 3. Western Coalfield region of Kentucky.

Region 4. Inner and outer Bluegrass of Kentucky.

Region 5. Intermediate Bluegrass of Kentucky.

Region 6. Eastern Pennyroyal region of Kentucky.

Region 7. Highland rim region of Tennessee.

Region 8. Cumberland Plateau region of Kentucky and Tennessee.

Region 9. Eastern Tennessee and six counties in south Western Virginia.

THE MODEL

The model used in this study was a modified version of the model used by Heady and Egbert in estimating the optimum geographical distribution of grain crops [1]. A total burley tobacco acreage allotment was specified for the nine regions as a whole. Crop production alternatives other than burley tobacco were corn, wheat, barley, alfalfa hay, red clover hay, and lespedeza hay, improved permanent pasture, unimproved permanent pasture, and sudan grass. Production regions 2 and 3 also included soybeans as a production alternative. Wheat and soybeans, along with burley tobacco, were considered as cash crops. The products of the other crops could be used only for two beef cow-calf enterprises, two beef-feeder enterprises, market hogs from homegrown or purchased pigs, and feeder pig production. The model distributed the acreage allotment among regions so that it was used most efficiently in the sense that the returns to to the resources of all nine regions were maximized.

Restraints and Coefficients Used in the Model

Available resource supplies, crop yields, and input requirements were estimated separately for each of the individual regions. Prices for inputs and outputs were assumed the same for the nine regions. Except for land and labor availabilities, all estimates were projected to 1972. Land and labor estimates were projected to 1972 for only one phase of the study and the effects of these projections are reported briefly, in a later section.

Distribution of Burley Tobacco Acreages (Present-1966) and Solution Results

Initially, four tobacco price and allotment levels were considered without changing the values of any of the other coefficients or constraints (Table 1). Due to lack of data concerning the demand for burley tobacco hypothetical prices were used except for the base price which was approximately the equilibrium price in 1966. The assumption that the demand curve was downward sloping is based on traditional demand analyses and the fact that in the past the burley tobacco support price has steadily increased over time while acreage allotments have been reduced.

The burley tobacco acreages in the four initial solutions were concentrated in three regions at the three lower allotment levels and in four regions at the highest allotment level (Table 2). Comparing the optimum distribution of burley tobacco acreages with that of the 1966 distribution at approximately the equilibrium price and allotment level of 1966, regions

TABLE 1. BURLEY TOBACCO ACREAGE ALLOTMENTS IN NINE REGIONS OF KENTUCKY, TENNESSEE, AND VIRGINIA FOR FOUR INITIAL SOLUTIONS

Tobacco (cents per pound)	Acres of allotment[a]
82	112,725 (60 percent of base)
74	150,301 (80 percent of base)
66	187,876 (base)
58	225,451 (120 percent of base)

[a]Acreage based on that located on farms with 10-999 acres.

2 and 6 gained considerable tobacco acreage. Although region 4 gained some acreage, the amount was considerably less than that of regions 2 and 6, but region 4 contained the largest acreage as it does under the current allotment program.

A major factor responsible for the location of burley tobacco in regions 2, 4 and 6 were the higher projected yields. Due to the relative shortness of the time period under consideration, projected yields were based primarily on the average yield and its trend in each of the regions during the period from 1961 to 1965. The higher yields obtained in regions 2, 4 and 6 result from higher average managerial skills of farmers in these regions in purchasing and combining resources in the production of tobacco. This, coupled with production costs that are among the lowest of the nine regions, provides these regions with a competitive advantage in the production of burley tobacco.

With a burley tobacco allotment decrease of 40 percent of the 1966 allotment, the tobacco acreage is concentrated largely in regions 2 and 4. The acreages in regions 4 and 6 are not significantly different from present allotments, but the acreage in region 2 is much larger. When tobacco acreage was reduced, soybean and feeder calf production were increased. Soybeans were relatively unimportant when tobacco acreages were at present or higher levels. However, since livestock production within the nine regions was limited to 2.25 times that of the total number of beef animals on farms in 1966, 2.5 times the number of swine on farms in 1966, and to approximately the 1966 level of milk cows, and since all but beef feeders were produced to the maximum level, soybeans became an important enterprise in region 3 as tobacco allotments were reduced and livestock production was moved to other regions.

In each of the initial solutions, the general pattern of the enterprise combinations centered around: (1) tobacco and beef-feeder production, and (2) market hog production and dairying. These production patterns tended to provide a high level of supplementarity in resource use.

Effects of Changes in Variables From Those Initially Assumed

The distribution of tobacco acreage was unresponsive to price changes. However, the tobacco acreage

TABLE 2. REGIONAL DISTRIBUTION OF BURLEY TOBACCO ACREAGES IN NINE REGIONS OF KENTUCKY, TENNESSEE, AND VIRGINIA, 1966, AND FOUR ALTERNATE SOLUTIONS[a]

Region			RESULTS		
	1966 Actual	60 percent Base	80 percent Base	Base	120 percent Base
	1,000 acres				
1	8.36	0	0	0	0
2	19.80	51.62	51.33	59.38	67.74
3	18.11	0	0	0	0
4	46.93	44.10	44.09	65.80	65.80
5	23.54	0	0	0	0
6	16.50	17.01	54.88	62.70	66.37
7	7.35	0	0	0	0
8	15.01	0	0	0	0
9	32.28	0	0	0	25.54

[a]Does not include the 1966 burley acreage located on farms that contained from 0-9 acres of land or 1,000 acres or more.

distribution was responsive to changes in the prices of other products. Furthermore, the distribution of tobacco acreage was responsive to changes in resource availability and changes in the limits on, or production possibilities of livestock.

A crucial input in the production of burley tobacco is hired labor, particularly during the harvest season. Three forces that were not taken into consideration in the initial solutions are the fact that wage rates are increasing at a much more rapid pace than in the past, wage rates are not uniform among regions, and the supply of labor is not unlimited and may be somewhat immobile. Increasing wage rates by $1.00 per hour from those originally projected, to $2.75 per hour from May 1 to October 31 and $2.50 per hour from November to April 30, had the effect of more widely distributing tobacco acreages (The effects of specified changes are discussed only for the base price-base allotment). Likewise, raising the wage rate in the regions holding competitive advantages in the production of tobacco caused some of the acreage to be produced in region 9.[1] The widest dispersion, however, occurred when the quantity of labor was restricted in each region to the amount hired in that region in 1964. This suggests that without mechanization in burley tobacco production the major deterrent to a rather large concentration of burley tobacco in regions 2, 4 and 6, under its most efficient production pattern, is the mobility of the labor force among the nine regions at wage rates that do not result in these regions losing their competitive advantage in the production of tobacco.

In addition to hired labor, family labor is an important resource used in the production of tobacco. Based on the decline in family hours spent at farmwork between 1954 and 1964, the family labor supply was projected to 1972. (Land availability was also projected to 1972, but this did not affect the tobacco acreage distributions). This resulted in a wider regional distribution of tobacco acreages than was initially obtained with similar acreages of tobacco produced in regions 2, 4, 6 and 9.

Incorporating an off-farm work alternative of $1.75 per hour into the model resulted in region 2 producing more tobacco, region 4 slightly less, and region 6 somewhat less than in the initial solution. The overall level of agricultural production declined in the nine regions and region 5, a region of rough terrain, produced no agricultural commodities.

Milk, hog, and beef price reductions only slightly affected the acreage distributions of burley tobacco from that in the initial solution. However, regions 2 and 4 gained a slight advantage when beef prices were reduced. Allowing unrestricted production of all livestock dispersed the tobacco acreage somewhat.

CONCLUSIONS

The results of this study indicate that regions 2 and 4 hold the greatest competitive advantage in the production of burley tobacco, and regions 6 and 9 hold an advantage over the other five regions. If a given burley allotment were assigned to the entire burley belt and farms allowed to compete for it, tobacco acreages would tend to gravitate to the regions holding competitive advantage in its production. A shift in tobacco acreages among regions would have a major impact on owners of tobacco warehouses, farm input suppliers, and the general economic conditions of the communities affected. The initial impact would be felt by marginal farmers since the competition for tobacco acreages would bid the prices of allotments upward and the opportunity cost of growing tobacco for them would fall below that of selling the allotment. The capitalized value of an acre of burley tobacco allotment is difficult to derive because of the present uncertainty of the continuation of the tobacco program in its present form. The marginal value product of an acre of tobacco was estimated to be $762, with an allotment of 187,876 acres and a price of 66 cents per pound. Assuming an infinite stream of returns equal to an interest rate of 8 percent the capitalized value of an acre of allotment would be $9,525. In a study by Shuffett and Hoskins, however, it was found that the rate of return was somewhat higher than the interest rate. Consequently, a capitalized value of $9,525 is probably high. For example, at a rate of return of 12 percent, the value of an acre of allotment is $6,350. For an analysis of the capitalized value of burley tobacco allotments see [2].

Production efficiency would be enhanced by a shift in tobacco acreages since fewer inputs would be used in producing a given amount of product. The cost per pound would decrease by about 9 percent. In the less efficient tobacco producing regions some resources would be diverted from tobacco production to other agricultural production. Substantial economic waste would be averted by converting tobacco warehouses to full-time use in the regions that lose tobacco acreage and by more efficiently utilizing existing warehouses in those regions gaining tobacco

[1] Wage rates were increased from $1.50 per hour to $2.00 per hour during the period from November to April and $1.75 per hour to $2.25 per hour during the period from May to October in region 4. Wage rates were increased from $1.50 per hour to $1.75 per hour during the period from November to April and from $1.75 per hour to $2.00 per hour during the period from May to October in regions 2 and 6. Due to the close proximity of urban centers and the historically higher wages paid in region 4, region 4 wage rates were greater than those in regions 2 and 6.

acreage. Furthermore, a shift of tobacco acreages to larger more efficient production units would give rise to an increased market for mechanical tobacco harvesters. This, in turn, would result in greater production efficiency and would result in still further releases of labor which would be available for other productive uses and would need to be absorbed in the industrial labor market.

The extent of the movement of tobacco acreages among regions hinges importantly on the costs and availability of labor with the confines of the present state of the arts in burley tobacco production. Wage rates in the more efficient tobacco producing regions would rise relative to those of less efficient production regions, and workers would be attracted to the more efficient production regions, ceteris paribus. However, the extent to which labor in the burley belt is immobile or the availability of labor for import is unknown. Consequently, the extent to which tobacco production would be dispersed, because of a shortage of labor at prices consistent with their competitive advantage range, is not readily determinable. However, should allotments be reduced by as much as 40 percent of the present allotment level, regions 2 and 4 would likely grow the bulk of the tobacco under a competitive market for allotments.

REFERENCES

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