THE EFFECT OF THE FLUE-CURED TOBACCO (U. S. TYPES 11 AND 12) PRICE SUPPORT PROGRAM ON THE SALE VALUE OF FARM REAL PROPERTY

by

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Although the flue-cured tobacco price support program was enacted over 20 years ago, practically no research has been undertaken to determine its effects on farmland values. The major objective of the program is to increase the income of flue-cured tobacco farmers by guaranteeing a minimum farm price for tobacco. Tobacco acreage allotments are used as a means of adjusting supply to demand, and any farmer producing tobacco in excess of the allotment under his control is subject to penalty. Acreage allotments are assigned to the individual farm, and farmers acquire a right to produce tobacco only by having ownership or use rights in the land to which the allotment is assigned. Land, therefore, is a limiting factor in flue-cured tobacco production.

Many flue-cured tobacco farms are relatively small businesses on which from 85 to 95 percent of the cash income is derived from the sale of tobacco. It is expected, therefore, that the value of the farm tends to be highly related to the established rights to grow tobacco on it.

The efforts to adjust supply to demand through acreage control have been offset partly by increases in the yield of tobacco per acre. Thus, over a period of years the allotted tobacco acres on a given farm have declined. (In 1955, tobacco allotments were cut 5 percent; in 1956, the cut was 12 percent; in 1957, the cut was 20 percent.) The average allotment in 1957 on Virginia farms was only 2.99 acres and on North Carolina farms only 3.5 acres.

These small acreages reduce the size of business on flue-cured tobacco farms below that needed to employ the farm resources efficiently and thereby produce sufficient income for an adequate standard of living. Since profitable alternative uses of the land are often absent, farmers with small tobacco allotments are faced with either buying additional land having tobacco allotments or shifting to non-farm employment. The price which they must pay for the land in relation to its marginal productivity governs the profitableness of the first alternative.

Thus, research is needed to determine the extent to which the benefits of the price support program have been capitalized into land values. If a significant proportion of the benefits are capitalized into land values, the major objective of the program--an increase in the incomes of flue-cured tobacco farmers--would be defeated through either higher land costs or increased rents. In this event, Congress would need to modify the present program to attain its stated objectives. Likewise, farmers planning to purchase additional land as a means of increasing the size of their businesses need the results of such research to provide them meaningful data on which to base their decisions and actions.

bjective

The objective of this study is to determine the extent to which the benefits of the flue-cured tobacco price support program have been capitalized into farm real estate values.

Area of Study

Pittsylvania County, Virginia, located in the Old Belt flue-cured tobacco (U. S. Type 11) region, and Wilson, Greene, and Pitt Counties, North Carolina, located in the New Belt flue-cured tobacco (U. S. Type 12) region, were selected as areas for the study. The Old Belt corresponds closely to the Piedmont Region of South Central Virginia and North Central North Carolina, while the New Belt is situated in the Coastal Plain Region of East Central North Carolina.

The soils of the Piedmont are loams and sandy loams derived primarily from granite, gneiss, Triassic sandstone, and slate, and they usually have a heavy clay subsoil. The sandy and sandy loam soils of the Coastal Plain are of a marine origin. The topography of the Piedmont Region ranges from hilly to gently rolling, while the lay of the land in the Coastal Plain is generally characterized as undulating to level. The topography and soils have a strong influence upon the type of farming followed and the type of tobacco produced. The Old Belt tobacco is generally heavier in body and darker in color than the tobacco grown in the New Belt.

Specified tobacco subregions, including areas 25 and 24, are described in detail in a special report of the 1954 Census of Agriculture.[1] Pittsylvania County is located in economic subregion 25 and Wilson, Greene, and Pitt Counties are in economic subregion 24. Table 1 of the

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[1] U. S. Census of Agriculture, 1954, Vol. III, Special Reports, Part 9, Farmers and Farm Production in the United States, Chapter III, Tobacco and Peanut Producers and Production.

text is a summary of some of the important characteristics of the farming in these subregions, and the following discussion is based principally upon these data. Where individual counties are referred to, the data were obtained from the 1954 Census of Agriculture.[1]

Most of the farms in the areas are family-sized farms worked primarily by family labor. Tenants outnumber owners in subregion 24, while in subregion 25 tenants and owners are about equally divided. The average size of farm in subregion 24 is smaller in total acreage but larger in acres of tobacco allotment than the average farm in subregion 25. In both areas, however, the acres of cropland per farm are approximately equal. The opportunities for off-farm employment are generally greater in subregion 25 than in subregion 24.

Subregion 25

In subregion 25, 92.5 percent of the gross farm income is derived from the sale of flue-cured tobacco. Livestock and cash grain enterprises are the primary supplements to tobacco income. The average farm has a greater acreage of woodland (37.2 acres) than of cropland (26.9 acres). Tobacco is harvested on 4.8 acres of cropland and corn for grain is produced on 5.4 acres. An average of 4.1 acres of land per farm is used for pasture, and 4.4 acres are used for hay. On most farms livestock and grain are grown primarily for farm consumption.

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[1] U. S. Census of Agriculture, 1954, Vol. I, Counties and State Economic Areas, Parts 15 and 16.

Table 1. Tenure of operator, Land Use, Capital Investment, and Gross Receipts per Farm, Economic Subregions 25 and 24, 1954[1]

	Subregion 25		Subregion 24	
Tenure of operator (percent):				
Owners	48.4		31.3	
Tenants	28.6		39.3	
Croppers	23.0		29.4	
Total	100.0		100.0	
Land use per farm (acres):				
Cropland[2]	20.9		26.8	
Tobacco		4.8		5.7
Corn for grain		5.4		11.5
Cotton		0.1		2.7
Other cropland		10.6		6.9
Woodland[3]	37.2		20.8	
Pasture[4]	4.1		1.1	
Other land	3.5		1.9	
Total	71.7		50.6	
Capital investment per farm (dollars):				
Land and buildings	6,681		9,893	
Livestock	395		364	
Machinery	1,730		1,851	
Total	8,806		12,108	
Gross receipts per farm (dollars):				
Crops	2,788		4,396	
Tobacco		2,682		3,725
Cotton		18		389
Other crops		88		282
Livestock	96		125	
Forest products	16		9	
Total	2,900		4,530	

[1]Source: U. S. Census of Agriculture, 1954, Vol. III, op. cit.

[2]Includes cropland pastured in addition to cropland not harvested and not pastured.

[3]Includes woodland pastured.

[4]Excludes cropland and woodland pastured.

Tobacco production requires a great amount of hand labor, especially during the peak seasons of planting, harvesting and curing, and preparation for market. The farm family furnishes 93.8 percent of the labor used in the production of tobacco and supplementary crops. Of all farm operators, 48.4 percent are owners while 51.6 percent are tenants or croppers. Farm operators have been slow to mechanize the farm unit, mainly because of small tobacco acreages. Only 40 percent of the farms have tractors, while 31 percent have trucks and 60 percent have automobiles. Of the total capital investment per farm, $6,681, or 75.9 percent, is in land and buildings.

Subregion 24

Subregion 24 constitutes a more intense system of agriculture than does subregion 25. Although the farms average 50.6 acres of total land, the acres of tobacco grown per farm average 5.7 acres compared to 4.8 acres in the Piedmont Region. Acreagewise, cropland is more important than non-cropland. Corn for grain is the primary use of cropland, but cotton is the principal income supplement to tobacco. Both cotton and corn are presently allotment crops in this region, but many producers overplant their corn allotments because of the absence of excess-production penalties. Livestock is only a minor enterprise. In 1954, gross income from tobacco averaged $3,725 per farm, or 82.2 percent of the total gross income from agricultural products.

Hired labor accounts for 19.7 percent of the labor use. Only 31.3 percent of the farm operators are owners, while 39.3 percent are croppers and 29.4 percent are tenants. These figures show that the multiple-unit

type of operation is prevalent in this region. In subregion 24, compared to subregion 25, more labor and fertilizer are used per farm resulting in higher per-acre yields from tobacco and other crops. Livestock and machinery investments per farm closely parallel the Old Belt investments, but the average investment in land and buildings is $9,893 or $3,212 greater than the average land and building investment in subregion 25.

Pittsylvania County, Virginia

Pittsylvania County, Virginia, is located in the South Central Piedmont of Virginia and borders on the North Carolina line. It is the largest county in Virginia both in terms of farmland area (486,022 acres) and in number of farms (5,715). It is the leading county in the State in the production of flue-cured tobacco and wheat as well as in total value of crop sales. The average acres of flue-cured tobacco harvested per farm (4.8 acres) is equal to the average for subregion 25, and the yield per acre (1,204 pounds) is only slightly greater than the subregion average (1,193 pounds). Fifty percent of the farm operators are owners. The average value of land and buildings is $7,982 per farm. Approximately 85 percent of the county's gross agricultural income is derived from the sale of flue-cured tobacco, although beef and dairy enterprises have made appreciable gains in recent years.

Pittsylvania County, in general, typifies the more rural counties of the Old Belt. The Virginia counties of the Piedmont Region have less industrialization generally than the North Carolina counties. Danville (population approximately 36,000) is the largest city in the county and

the largest tobacco market in the State. It is a leading city in the production of textiles and has a number of other small manufacturing enterprises.

Wilson, Greene, and Pitt Counties

Wilson, Greene, and Pitt Counties are located in the East Central Coastal Plain Region of North Carolina. These three adjoining counties represent a relatively homogeneous type-of-farming area. Pitt County, with 5,583 farms having an average of 52.5 acres per farm, is the largest of the three counties; Wilson, with 3,919 farms and 49.4 acres per farm, follows; Greene is the smallest, with 2,945 farms having 46.3 acres per farm. In all three counties slightly more than 50 percent of the farmland area is cropland, the remainder being primarily woodland. The prevalence of the multiple-unit type of farm operation is shown by the fact that croppers make up over 50 percent of the farm operators in all three counties, and tenants and croppers account for approximately 75 percent of all operators. Wilson County has an average value of land and buildings of $14,236 per farm compared with $13,790 and $12,589 per farm, respectively, in Greene and Pitt Counties. Both the yield of tobacco per acre and the number of acres of tobacco harvested per farm for each of the three counties are greater than the average yields and acreages for the subregion. Thus, Wilson, Greene, and Pitt Counties constitute a more intensive tobacco-producing area than the remaining counties of subregion 24.

Wilson, North Carolina, the county seat of Wilson County, handles the largest volume of tobacco of all flue-cured tobacco markets in the United

States.[1] Pitt County is the largest tobacco-producing county in the State and its county seat, the city of Greenville, is a leading tobacco market. Greene County is a rural county with no tobacco market. The entire economy, as well as the farm economy, of the area is based on the production of flue-cured tobacco. Off-farm employment in this area offers only a limited opportunity for additional income.

Scope and Sources of Data

All of the data used in this study were secured from public sources. The sale value of farms and data on factors expected to influence the sale value were obtained from courthouse deed books, real property tax assessment records, and Agricultural Stabilization Conservation files in Virginia and North Carolina. These records provided accurate data on sale value of farm, acres of tobacco allotment, assessed value of buildings, acres of farmland, and acres of cropland. Acres of tobacco harvested, tobacco yield and gross receipts, and location of farm were data secured in Virginia but not in North Carolina. In the latter, acres of cotton and corn allotments were secured.

Farm sale value, acres of farmland, and pertinent sale information on all transactions of 20 acres or more[2] were taken from the courthouse

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[1] The Auction Marketing of Flue-Cured Tobacco, Market Research Report No. 101, AMS, USDA, p. 10.

[2] It was anticipated that the majority of land sales of 20 acres or more would include tobacco farms, since most of the farms in these areas have tobacco allotments.

deed records for a four-year period, December 1, 1953, to November 30, 1957.[1] Then the records were edited to eliminate all transactions not considered as bona fide sales of farm property. Properties not discarded were located on the land books from which separate assessment values for land and buildings were taken. After this was completed, the Agricultural Stabilization Conservation office was visited and data on the remaining factors expected to explain farm sale value were secured from the various files in this office.

Pittsylvania County

Pittsylvania County was chosen for the pilot phase of this study. The deed books in the County Clerk's office were searched, page by page for all transfers of 20 acres or more. The data secured from the deed records included the names of grantor and grantee, the location of farm, the size of farm in acres, the purchase price, and the amount of state stamps. The date of sale, rather than the date of recording,[2] was used to insure that the possible observation was within the time limits set for the study. The names of the grantor and grantee, as well as the location of farm, were copied so that the farm could be identified in other public records. The deed records were considered the most accurate

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[1]The land market year was designated as the year beginning December 1, because the Secretary of Agriculture announces the national flue-cured tobacco marketing quota on or before this date. During these years three specific cuts in tobacco allotments were made, 5, 12, and 20 percent, respectively.

[2]The date of recording was not used because in a few instances deeds were not recorded for several years after the date of sale.

source of data on the size of farm, since the acreage figure was normally based on a survey. In most deeds the full purchase price of the property was specified.[1] When the sale value was not given by the deed, it was determined from the amount of state stamps.[2]

After the transactions were taken from the Pittsylvania County deed books for the four-year period included in the study, the records were edited to exclude those transfers which were not bona fide sales of farm property. Sales involving one or more of the following conditions were eliminated:

(1) Sales in which the name of the grantee indicated a relationship to the grantor;

(2) Sales involving corporations;

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[1]For those deeds in which a debt was assumed by the purchaser as part of the sale price, the amount of the debt was added to the cash consideration in determining the full purchase price.

[2]In Virginia, state and federal taxes (in the form of stamps) are collected on all deeds at the time of recording. Federal stamps are recorded with the deed, whereas state stamps are not. The only evidence of the amount of state tax is the tax receipt, issued at the time of recording, a carbon copy of which is kept in the deed office for a given period of time.

The amount of federal or state stamps assessed against any deed transfer depends upon the purchase price of the property. State stamps are assessed upon the recording of the deed at the rate of $0.15 per $100.00 of sale price (or fraction thereof). Federal stamps are $0.55 per $500.00 of sale price (or fraction thereof). State stamps were used instead of federal stamps to determine the approximate sale value represented by the deed, since by using them it was possible to get closer to the actual purchase price of the real estate. It was observed that most properties of more than 20 acres had sale values which were in even $100.00 amounts; therefore, a simple formula was used to determine the approximate sale value of a property which had no stipulated value in the deed book: $100.00 x N (number of $0.15 state stamps) = sale value of property.

(3) Sales in which the grantor did not give a general warranty of title, unless the sale was an auction sale made by a Special Commissioner appointed by the court to transfer the title;

(4) Sales involving transfers of lots near cities or towns or other indications of urban property;

(5) Sales in which timber was the primary value of the property;

(6) Sales transferring only a partial interest;

(7) Sales transferring only a life estate or reserving a life estate;

(8) Sales including personal property in the purchase price; and

(9) Sales in which the total acreage was not given in the deed.

A sale between two parties, having names indicating a kinship, was eliminated because family considerations possibly had an influence upon the sale value. A sale in which a corporation bought or sold land was removed, since the property involved may have been non-farmland or it may have been farmland which was being bought or sold for some non-farm purpose. An auction sale, when made by a Special Commissioner, was considered to be a bona fide transaction even where the names of the grantor and grantee indicated a close kinship. The sale price of the auctioned property should have been representative of the market value, since there were a number of prospective buyers for the real estate. Some sales of property with a strong urban influence, as described in the deed, were excluded. Some sales of timber land were eliminated through use of a list of lumbermen operating in the area, and some timber sales were eliminated on the basis of deed information. Any record involving transfer of partial interests was discarded because

it was not possible to determine the full market price of the farm from the price of the partial interest. A sale involving a life estate could not be used, since the value of such an estate varied with the special conditions surrounding each sale. Where a sale included personal property, it normally was mentioned only in general terms in the deed;[1] therefore, such a transfer was dropped on the basis of inability to arrive at a satisfactory market value for the personal property. A sale was eliminated when total acreage was not given in the deed book description of the property.

The tax assessment records were thought to be the best possible source of a value to place upon farm buildings. In Pittsylvania County these assessment records were compiled by the office of the Commissioner of Revenue, but copies were kept in the County Clerk's office for public reference. The most recent appraisal of farmland in Pittsylvania County was made in 1952 by appraisers from the State Department of Taxation. The 1952 appraisal was based on 80 to 85 percent of the fair market value of the property appraised, but all property was assessed at only 28 percent of the appraised value. Since the time of appraisal, year-to-year changes in buildings and improvements have been adjusted in the assessment records. It was decided that the assessed value of land would be of some use in later phases of the study, so this figure was also taken from the assessment records.

Very little difficulty was encountered in matching the assessment records with the farm sales as taken from the deed records. The magisterial

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[1]For example, "teams, tools, sticks, and flues" were transferred in many deeds of farm property.

districts and the names of the grantor and grantee, as taken from the deed books, were sufficient in most instances to enable the enumerator to locate the farm in the assessment books. The assessment records had the deed book number and page for many of the farms which had been transferred, and this provided an additional check for matching the farm sales with the assessed values.

The only farms eliminated at this phase of the study were those which had no buildings and those which could not be located in the assessment records. The property which had no buildings was eliminated because even the sale of part of a farm with a tobacco allotment should have at least a tobacco barn; therefore, property which had no buildings was probably either woodland or wasteland.

The acres of tobacco allotted and harvested, acres of cropland, yield and gross receipts from tobacco, and location of farms were secured from the Agricultural Stabilization Conservation (ASC) records. If one or more of these factors were missing for any farm or if a farm could not be found in the records, the observation was removed from the usable transactions. The allotted, harvested, and cropland acreages, found on the tobacco listing sheets, were accurate figures since they were based upon surveyed data. Tobacco yields (to the pound) as well as gross receipts (to the cent) were obtained from the tobacco sales receipts, kept on the marketing card from the tobacco warehouse. The actual or approximate location of a farm was found through the use of an aerial photograph of a section of the county, and this location was marked on a map of the county obtained from the Virginia Department of Highways. The farm sales were matched with the ASC records by using the names of the buyers and sellers as well as the magisterial districts.

The Pittsylvania Soil Conservation Service was consulted in an attempt to obtain soil fertility data for the usable farm transactions. It was learned from the SCS that only about one-fourth of the farms in Pittsylvania County had been individually soil mapped. The most recent soil map of the entire county was a 1926 map. Neither of these sources was considered adequate for getting soil data to use in the study.

Since tobacco is the primary source of cash income in Pittsylvania County, tobacco soil is probably the best indicator of soil fertility as relating to the sale value of a farm. It was decided that the limited yield and price data obtained from ASC records would need to suffice as representative of the quality of tobacco soil. Yield and price data, however, are highly correlated with the managerial ability and capital resources of the operator, and often do not truly represent soil characteristics. Also, the yield and price data, secured from the ASC records for only one year, may not have been representative of the productivity of the tobacco soil on the farm, since there are many factors (such as climate, hail, and disease) which contribute to year-to-year variations in tobacco yield and quality. It was hypothesized that tobacco soil may not be as important a determinant of farm sale value as acres of tobacco allotment, value of buildings, or acres or cropland, since the majority of the farms in the county have some soil suitable for tobacco production.

Location is a factor which was expected to have some influence on the value of farmland. Such characteristics of the location of a farm as proximity to market, value for subdivision (involving both nearness to urban developments and frontage on major roads), and location in a good rural neighborhood were considered to have an effect upon the sale value

of farm property. However, almost every farm in the county has some locational advantage to offset any disadvantage it may have. The county has a good system of primary and secondary roads, so that very few farms are more than a quarter of a mile from a hard-surfaced road. Many farms close to Danville, the county's only tobacco market, are considered to be in a poor rural neighborhood, while many farms located some distance from Danville are in a well-settled farm neighborhood with adequate social and business facilities. No attempt was made to include location as a factor in this study, since it would have involved an analysis of each individual situation and thus would have reduced the number of observations obtained.

Wilson, [illegible] and Pitt Counties

The same factors were secured from the deed books in the Register of Deeds offices in North Carolina as were taken from the County Clerk's office in Virginia. The enumerator, who had gained valuable experience in Pittsylvania County, was able to save time by mentally eliminating the transactions that previously had been edited after they had been copied on the data sheets.[1] North Carolina imposed no state tax on the recording of a deed, so the only source of the sale value in many instances was the amount of federal stamps[2] recorded on the deed. It was a customary

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[1]See pages 18 and 19 for the editing restrictions.

[2]Federal stamps are assessed upon the recording of the deed at the the rate of $0.55 per $500.00 of farm sale price (or fraction thereof). Many sales are not of even $500.00 amounts; so the researcher interpolated midway between the maximum and the minimum property value which could be represented by the federal stamps. The formula used to determine the approximate sale value of a property which had no stipulated value in the deed book was: $500.00 x N (number of $0.55 federal stamps) - $250.00 = sale value of property.

practice in this region not to stipulate the full purchase price in the deed; therefore, the federal stamps were the only means of determining the value for many transfers. In Wilson and Pitt Counties the effect of urban influences was removed by the elimination of all sales in the townships in which the cities of Wilson and Greenville are located. In Greene County there were no large towns or cities so no townships were eliminated.

The real estate appraisals for tax assessment in the three North Carolina counties were made in different years by different agencies. In Greene and Pitt Counties, appraisals had been made since 1952, but in Wilson County a complete appraisal had not been conducted since 1948. In Wilson County, however, buildings and other farm improvements were kept up-to-date in the assessment records. Each county assessed property at a different percent of the appraised value. Little difficulty was encountered in Pitt and Greene Counties in matching deed with assessment records, but almost one-half of the transactions were lost in Wilson County because of the difficulty of matching sales with the 1948 appraisal.

The Agricultural Stabilization Conservation records in North Carolina were used to secure acres of tobacco allotment, acres of cropland, acres of corn allotment, and acres of cotton allotment. An observation was eliminated when acres of tobacco allotment or acres of cropland were missing. Corn and cotton allotments were secured for possible future use, but were not used in this study since Pittsylvania County did not have these allotment crops for comparison.

Information on acres of tobacco harvested, tobacco yield and price, and farm location was not secured for the farms in North Carolina. The figure for tobacco acreage harvested was not needed in this study, so it was not

copied from the listing sheets. Yield and price data which had been obtained for one year in Pittsylvania County, were thought to be of minor importance in explaining the sale value of a farm. Since it had been decided not to use locational data in Pittsylvania County no attempt was made to locate the sample farms in North Carolina.

Comparison of Farms Studied[1] with All Farms in the County

Table 2 provides a comparison of sample farms with all farms in the county on selected factors. The sample data seem to indicate that the farms with smaller tobacco allotments and less productive soils were being sold both in Virginia and in North Carolina. However, upon close examination of the factors involved, the differences between sample and county data can be partially explained.

In Pittsylvania County the acres of tobacco allotment, acres of tobacco harvested, and acres of cropland per farm for the county are larger in every year than the corresponding sample acreages. The tobacco acreage allotment per farm for the sample is 84 percent as large as the county allotment in 1954, 78 percent in 1955, 95 percent in 1956, and 91 percent in 1957. Part of the explanation for discrepancies between county and sample data can be found in the way ASC records are filed. The person who owns and/or operates two or more farm units may combine these units as one farm under one farm number with total acreage figures for the combined farms. Many of the farms in the county are so combined, but

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[1]Hereafter, for brevity, the farms studied will be referred to as a sample.

Table 2. Comparison of Sample Farms with All Farms in the County on Selected Factors[1]

County and year[2]	Number of farms[3]		Acres of tobacco allotment per farm		Acres of tobacco harvested per farm		Pounds of tobacco produced per acre		Acres of cropland per farm	
	County	Sample	County	Sample	County	Sample	County	Sample	County	Sample
Pittsylvania										
1954	4,506	63	5.72	4.80	5.62	4.71	1,358	1,309	44.4	35.7
1955	4,489	45	5.49	4.23	5.38	4.23	1,439	1,289	44.5	41.0
1956	4,521	38	4.63	4.59	4.75	4.49	1,647	1,687	44.2	40.2
1957	4,542	47	3.85	3.50	3.71	3.39	1,550	1,395	44.2	35.4
Wilson, Greene, and Pitt										
1954	6,207	36	12.30	7.49	--	--	--	--	--	35.0
1955	6,250	33	12.33	6.74	--	--	--	--	--	46.6
1956	6,271	34	10.69	5.91	10.59	--	1,315	--	37.5	31.3
1957	6,164	26	8.71	4.30	--	--	--	--	--	29.4

[1]All figures in this table were taken from Agricultural Stabilization Conservation records. Blanks were left in the North Carolina county data when complete information for all three counties was not readily available. Blanks were left in the North Carolina sample data for acres of tobacco harvested and yield of tobacco per acre, because data on these factors were not secured.

[2]For the sample data a year is December 1 to November 30. The county data for a given year are summarized at the end of the marketing season.

[3]The number of farms refers to the number of farms having tobacco allotments. A farm, by ASC definition, may be one or more farm units combined under one farm number by the owner and/or operator of these units.

very few of the sample observations represent sales of more than one farm unit. Thus, it would be expected that the allotted, harvested, and cropland acreages would be slightly larger for the county than for the sample.

Wilson, Greene, and Pitt Counties are expected to have more farms in the combined form since the multiple-unit farm is more prevalent in these counties. The average tobacco allotment for the North Carolina sample ranges from 59 percent of the county allotment in 1954 to 49 percent in 1957.

As compared to the number of farms in the county, the number of sample farms seem to indicate fewer bona fide farm sales for the North Carolina region than for the Virginia region for the four-year period covered by the study. In Virginia the yearly sample size ranges from 1.0 percent to 1.4 percent of the number of farms in the county, while in North Carolina the yearly sample size ranges from 0.4 percent to 0.6 percent of the county farms. A factor which had some influence upon the size of sample in North Carolina was the method of determining the sale price from the deed records. Since the majority of transactions did not have the specified price on the deed, the amount of federal stamps was used to arrive at a value representative of the actual price. In some instances, however, apparently bona fide deed transactions had to be eliminated from the sample because there was no indication of the sale price. No quantitative measure of the significance of these possible observations was available.

The figure for pounds of tobacco produced per acre in Pittsylvania County is larger for the county farms than for the sample farms in every

year but 1956. The yield figure for a sample farm, however, comes from the year in which the farm was transferred and is possibly not representative of a normal yield from the farm. If the farm transfer occurred during the growing season, the change in ownership (and usually management) might have adversely affected the yield per acre for that farm in the year of transfer. Even with this qualification, it would be difficult to explain the differences between the county and sample yields in 1955 and 1957 of 150 and 155 pounds, respectively.

A possible reason for differences between county and sample data is the criteria by which farms were eliminated from the sample in arriving at bona fide sales of farm property. The only editing factor thought to have eliminated any of the larger and more productive farms was the exclusion of sales in which the name of the grantee indicated a kinship to the grantor. It would be expected that many of the better farms in any settled farm region would remain in the family for several generations. If this is true, then some of the farms with the larger allotments and higher yields may have been excluded from the sample when probable family transfers were removed. Some sales between persons of the same name may have been family or non-family transfers not involving a biased sale price, but many such sales were probably influenced by family considerations not present in the normal market. An investigation to separate biased from non-biased family sales would have proved difficult. Although the differences between county and sample data can be explained partially, the farms in the sample appear to be slightly inferior in relation to all farms in the county with respect to cropland acreages, tobacco acreages, and tobacco yields.

In both regions an active demand for tobacco allotments is indicated by the fact that virtually all of the allotted acreage was harvested. In Pittsylvania County for each of the years from 1954 through 1956, 98 percent of the county's allotted tobacco acreage was harvested. In 1957, with participation in the Soil Bank Acreage Reserve increasing over that in 1956, the tobacco growers harvested 96 percent of their allotted acres. For the North Carolina counties 99 percent of allotted acreage was harvested in 1956. The small percentage of unharvested acreage could have resulted from the farmers' miscalculations of acres planted, allotted acres in the Soil Bank Acreage Reserve, and/or crop failure due to hail or other natural causes.

REVIEW OF LITERATURE

A search of the literature showed an absence of any comprehensive research conducted specifically to determine the effect of the flue-cured tobacco price support program upon farmland values. Several broad and somewhat generalized studies of the acreage control programs refer briefly to the capitalization of price-support benefits into land values. However, the conclusions drawn were primarily based upon deductive reasoning rather than statistically determined coefficients or empirically measured relationships.

In 1946, John . Mason of the United States Department of Agriculture[1] utilized empirical but somewhat fragmentary data to obtain an estimate of the value of an acre of tobacco allotment. He obtained oral and written statements from informed persons in the flue-cured and burley tobacco regions. In addition, he examined handbill descriptions of farmland sales, newspaper advertisements, and some deed records that specifically mentioned tobacco acreage allotments. Utilizing these data in an informal statistical technique of analysis, he concluded,"That a majority of the farms . . . that were sold in 1945 . . . were enhanced in value by from $300 to $600 for each allotment acre."

Hoover and Ratchford (1951) in their Economic Resources and Policies of the South[2] presented data on inflationary rises in farmland values in

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[1]John . Mason, "Acreage Allotments and Land Prices," Journal of Land and Public Utility Economics, May 1946, pp. 176-181.

[2]Calvin B. Hoover and B. U. Ratchford, Economic Resources and Policies of the South, MacMillan, New York, 1951, p. 357.

the tobacco regions. Relying primarily upon a theoretical analysis, they concluded "that the value of tobacco allotments was a significant factor in the great increase in general farm real estate values." Furthermore, in their judgment, "There can be little doubt that tobacco farming has been . . . considerably more profitable than most other types of farming." This margin of differential profits arising in tobacco farming is protected only by a strict system of acreage control and allotments. Since the profits above normal returns to the factors of production arise from restrictions on land use, "The normal economic process for determining the price of . . . land would be to take the 'normal' price of the land . . . and to add to it the present discounted value of the differential profits to be made from growing tobacco on it for all years in the future, in so far as such profit can be foreseen and estimated. To the extent that this process works out . . . as tobacco land changes hands, the new buyers come to have a very real 'vested interest' in the continuation of the control program."

In a recent article Frank H. Maier[1] used a deductive analysis to distribute the price-raising benefits of a control program to the factors of production. Maier concluded that the land factor is the primary recipient of a governmental control program that serves to raise prices and incomes. He reasoned that future program benefits are capitalized into present land values by the buyers and sellers of land. Those persons buying farms with allotments after the control program has gone into effect

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[1]Frank H. Maier, "Land and One of the Farm Programs," The Yearbook of Agriculture, 1958, USDA, pp. 310-314.

must pay in advance for a part of the future returns from the program in the form of higher land values, whereas those persons receiving allotments when the program is instituted stand to gain from the future rise in land values.

Benedict and Stine[1] provided a fairly detailed history of the tobacco control program coupled with some hypotheses as to its economic effects. From a brief discussion of the influence of the program upon land values, they concluded that, "The value placed on the farm tends to be related to the established rights to grow tobacco on it when neighboring farms of similar types can get such allotments only with great difficulty if at all."

Glenn L. Johnson conducted a comprehensive study[2] of the effects of the governmental control program upon production and prices in the burley tobacco industry. This study indicates what the total benefits of the program are likely to be, but it does not deal with the distribution of these benefits to the factors of production.

A recent U. S. Department of Agriculture study[3] presented a two-year analysis of the allotment programs for cotton, wheat, corn, and rice. It concluded that these programs have been generally successful in

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[1] M. R. Benedict and O. C. Stine, The Agricultural Commodity Programs, The Twentieth Century Fund, New York, 1956, Chap. 2.

[2] Glenn L. Johnson, Burley Tobacco Control Programs, Bul. 580, Kentucky Agr. Exp. Station, February 1952.

[3] Effects of Acreage Allotment Programs, 1954 and 1955, A Detailed Analysis for Selected Crops and Areas, ACP 43-47, USDA, December 1957.

restraining production and maintaining income. No attempt was made to distribute the program benefits to land or to the other factors of production.

REVIEW OF THE FLUE-CURED TOBACCO PROGRAM[1]

From the AAA of 1933 to the AAA of 1938

The demand for governmental control of tobacco production arose in the early third of the Twentieth Century from the large fluctuations in tobacco prices and the feeling that growers were in a poor bargaining position relative to the few buyers. The Agricultural Adjustment Act of 1933, passed under emergency conditions, began a sequence of legislation designed to raise growers' incomes on the production of the basic crops among which tobacco was included. Under the Act, the Secretary of Agriculture was given authority to design and carry out a tobacco program based on production controls and marketing agreements.

Before a flue-cured tobacco program could be put into effect in 1933, low tobacco prices forced the Governors of North and South Carolina to close the markets until a price-raising agreement could be reached. Within two weeks the Secretary of Agriculture had contracted with 95 percent of the growers to reduce acreages for 1934. With the prospect of reduced output for the following year, eight of the largest domestic manufacturers contracted with the Secretary to raise tobacco prices on the unmarketed portion of the 1933 crop. Base acreages and base productions, calculated on past tobacco acreages and yields, were set up for individual farms in 1934, and these bases were reduced by 30 percent

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[1]This section is based primarily upon: R. Charles Brooks and J. C. Williamson, Jr., Flue-Cured Tobacco Programs, 1933-1958, A. E. Info. Bul. No. 66, Dept. of Ag. Econ., N. C. State College, October 1958.

for the 1934 growing season. In order to protect contracting growers, the Kerr Tobacco Act was passed in 1934 to impose a tax upon non-contractors for their failure to adjust production. Rental, adjustment, and deficiency payments made to cooperating growers under the program were paid from revenues secured from a tax imposed upon tobacco manufacturers. In 1934, the average price of tobacco was 78 percent higher than the previous year's price, but in 1935, when the original base acreages and productions were reduced by only 15 percent, price fell by 26 percent from the 1934 level.

On January 6, 1936, the Supreme Court invalidated the Agricultural Adjustment Act of 1933. Congress immediately repealed the Kerr Tobacco Act, thus ending the first program for flue-cured tobacco.

Realizing the need for a continuation of production controls to support farm income, Congress passed the Soil Conservation and Domestic Allotment Act of 1936. Tobacco was classified as a soil depleting crop, and governmental payments for diverting base acreage to soil conserving crops were available at five cents per pound (payments being computed on past yields of tobacco). In 1936, growers were allowed to divert up to 30 percent of their base acreage, but in 1937, the maximum limit was lowered to 25 percent. Regional, state, and local agricultural conservation offices were set up to administer the provisions of the Act. The program served as the only governmental regulation of flue-cured tobacco production in 1936 and 1937. It lacked the stringent restrictions necessary to control total acreage and production since failure to participate was penalized only by the loss of conservation payments. Payments for diverting tobacco acreages were available under the Act through 1943.

From the AAA of 1938 to World War II

The Agricultural Adjustment Act of February 16, 1938, provided for an announcement of marketing quotas on flue-cured tobacco whenever the total supply for the current marketing year exceeded the reserve supply level. The national marketing quota, proclaimed yearly by the Secretary of Agriculture on or before November 15, became effective if two-thirds of the growers voted in favor of it. The national quota was apportioned among the states on the basis of total production and acreage diverted during the preceding five years. A maximum of five percent of the national quota could be used in any year as allotments to new farms and to increase small allotments on old farms.[1] Parity was first mentioned in this Act, and the base period for flue-cured tobacco was designated as the August 1919-July 1929 period. The Secretary was authorized by the Act to grant parity payments to growers through the Commodity Credit Corporation, but the parity level for tobacco support was not specified by the Act.

Community committees, formed under the Soil Conservation and Domestic Allotment Act, were given the primary responsibility under the 1938 Agricultural Adjustment Act for grating poundage allotment quotas to the individual farms on the basis of: (a) past marketings; (b) land, labor, capital, and equipment available for tobacco production; (c) crop rotation practices; and (d) soil and other physical factors affecting production. The tobacco marketed in excess of the farm quota was to be penalized by the higher of two computations--50 percent of the market price or three cents per pound.

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[1]New farms were those on which tobacco had not been grown since 1933, while old farms were those on which tobacco had been grown since 1933.

The Secretary of Agriculture declared a national marketing quota in 1938 and growers voted in favor of it. However, since individual farm quotas had not been announced by planting time, many growers planted in excess of their quotas. The heavy penalties imposed upon excess marketings in 1938 were vivid in the minds of tobacco farmers when they voted in the 1939 referendum to reject marketing quotas. Production in 1939 increased almost 50 percent over 1938, and the average seasonal price was the lowest since 1933.

The markets were temporarily closed in 1939 when British buyers, who purchased almost one-third of the U. S. flue-cured tobacco production, abruptly withdrew from the tobacco market. The Commodity Credit Corporation conducted negotiations leading to a purchase and loan program by which the British buyers would have the option of buying the tobacco stored under the program at later dates. The markets were closed approximately a month during which time growers approved marketing quotas for the 1940 crop.

On August 7, 1939, an amendment to the Agricultural Adjustment Act of 1938 was passed which permitted the Secretary of Agriculture to convert the national marketing quota into state and farm acreage allotments on the basis of average yields and productions in the five preceding years. Each grower was allowed to market all tobacco produced on his allotted acreage without penalty. This amendment changed the time of proclamation of the national marketing quota to December 1 and extended the period covered by a referendum to three years. The penalty rate on excess marketings was increased to 10 cents per pound. The base period for parity price was redefined as the August 1934-July 1939 period.

The World War II Period

Tobacco acreage allotments and marketing quotas remained in effect during World War II. From 1944 through 1946, however, the marketing quotas were announced without strict regard to the reserve supply level since it was necessary to obtain the maximum acreage of essential agricultural products. Acreage allotments were increased yearly, with the 1944 increase of 25 percent being the most significant adjustment.

A sharply increased domestic demand for flue-cured tobacco was primarily responsible for advancing prices against ceiling levels throughout the war period. The strong demand resulted in a reduction in tobacco stocks despite the increase in production due to higher yields and increased acreages. After 1941, no Commodity Credit Corporation loans were required to hold the price of flue-cured tobacco above the parity level. However, the Corporation continued its purchase operations through lend-lease and other wartime exports in an effort to maintain the foreign market for tobacco.

From World War II Through 1957

Since 1946, the basic flue-cured tobacco program has remained essentially unchanged. Marketing quotas, converted into acreage allotments, have continued to depend upon the yearly supply-disappearance ratios. Allotments were reduced by 27.5 percent in 1948, but they were increased in 1949, 1950, and 1951. Starting with 1952, allotments have been reduced in every year except 1954, when they were increased only slightly. The largest reduction (20 percent) occurred in 1957. Seasonal average prices,

supported at 90 percent of parity, have followed a gradual upward trend. There have been a number of relatively minor changes and additions affecting the tobacco program in the last twelve years including the organization of the Flue-Cured Tobacco Cooperative Stabilization Corporation, changes in the computation of parity prices, changes in the determination of penalties on excess production, and the initiation of an export program and a soil bank program.

Tobacco growers organized the Flue-Cured Tobacco Cooperative Stabilization Corporation in 1946 to fill the need for an organization that would make support prices effective to growers. The Cooperative has maintained this function through 1957. It secures loans from the Commodity Credit Corporation and uses the funds to purchase tobacco on the market when prices are below support levels. The tobacco thus purchased is processed and stored under contract for sale to domestic and foreign buyers. Since 1946, approximately one-third of the tobacco handled has been sold to domestic dealers while the remainder has been absorbed by the foreign market. The Cooperative has been successful in organizing growers partly because membership is necessary to place tobacco under loan.

The Agricultural Acts of 1948 and 1949 were designed primarily to modernize the parity formula. The 1948 Act provided for a new parity formula using an adjusted base price which includes the ten preceding years, while the 1949 Act gave the option of determining parity by either the old or the new parity formula, whichever was higher. Since 1950, the new parity formula has been used to compute the support price in every year. The 1949 Act also provided for a minimum support price to be announced

before the planting season, and this price was to be used if it was higher than the actual support price. An additional stipulation was a provision for a support price of 90 percent of parity only if quotas were approved by growers.

Restrictions placed upon tobacco produced in excess of allotments have increased in recent years. In 1947, the penalty for excess planting was changed from 10 cents per pound to 40 percent of the preceding year's price. Public Law 21, 1955, increased the penalty rate to 75 percent of the preceding year's price. In addition, this law provided that underplanting of acreage allotments would not lower future allotments and that overplanting would not add to future allotments. Prior to this time, underplanting by more than 25 percent of the allotment for three consecutive years resulted in a loss of part of the allotment, while overplanting made a grower eligible for an allotment increase.

The demand for tobacco was strengthened by the Agricultural Trade Development and Assistance Act of 1954, which was designed to increase consumption of surplus agricultural products abroad. Through June 30, 1957, shipments of the flue-cured tobacco financed under this Act totaled 112 million pounds, of which approximately one-third was sent to the United Kingdom.

The Soil Bank Act of 1956 authorized flue-cured tobacco growers to reduce plantings of allotted acreage in return for acreage reserve payments based upon past tobacco yields. In 1956, the acreage reserve payment to growers averaged $204 per acre, and only 1.2 percent of the allotted acreage was committed to the acreage reserve. Participation increased to 6.4 percent of the allotted acreage in 1957, and the average payment was $233 per acre.

Summary

The flue-cured tobacco program has been an effort to support and stabilize prices of tobacco at a level that will give tobacco a purchasing power equivalent to that which it had in a past base period or periods. Legislators, administrators, and growers have evolved a long-run price-support program based upon a designated supply-disappearance level of flue-cured tobacco which is maintained by production control through marketing quotas enforced with penalties. This program is supplemented by a short-run program using non-recourse loans as a means of securing minimum prices until the tobacco supply-disappearance position can be corrected by production control.

Under authority of the Agricultural Adjustment Act of 1933, the Secretary of Agriculture administered an emergency tobacco program which set up acreage allotments to control production and marketing agreements to insure minimum prices. The AAA of 1933, supplemented by the Kerr Tobacco Act of 1934, brought about the production adjustments necessary to put the tobacco industry into a favorable position after the emergency economic conditions of 1933. Stringent production control, lacking in the Soil Conservation and Domestic Allotment Act of 1936, was provided by the Agricultural Adjustment Act of 1938. The AAA of 1938 was to become the foundation for the present-day tobacco program since it provided for national marketing quotas based on the supply-disappearance ratio of flue-cured tobacco and support prices based on parity. An amendment to this Act was passed in 1939 to permit the conversion of marketing quotas expressed in poundage allotments into marketing quotas expressed in acreage

allotments. The Agricultural Acts of 1948 and 1949 provided for a new method of parity computation, which has since resulted in a higher parity price for tobacco.

In recent years, the program of acreage controls, backed by strict penalties on the overplanting of allotments, has caused growers to increase per-acre yields on their allotted acreage through the use of higher-producing varieties, additional applications of fertilizer, better tobacco soil, and improved managerial practices. Increased production has weakened the supply-disappearance position of tobacco, making it necessary for administrators to reduce allotments. But, after allotments have been reduced, growers have more incentive to increase per-acre yields, resulting in another allotment reduction. The acreage reserve of the Soil Bank of 1956, as relating to flue-cured tobacco, was designed to strengthen the supply-disappearance position of tobacco by taking acreage out of production and thereby minimizing the need for further reductions of already small allotments. However, the program has met with only limited participation and apparently has had little effect upon the reduction of existing stocks.

Since its beginning, the tobacco control program has been generally successful in regulating production and thereby supporting and stabilizing prices. Tobacco prices have followed a steadily upward trend since 1940, while marketing quotas have varied with the demand and production conditions. Increased carryover of stocks causing acreage allotment reductions has been the primary limitation of the program.

ECONOMIC THEORY OF PURE COMPETITION APPLIED TO THE FLUE-CURED TOBACCO INDUSTRY UNDER GOVERNMENTAL CONTROL

Applicability of Theory to the Industry

The present governmental program for the flue-cured tobacco industry exerts some control over both the acres of tobacco produced and the price received for tobacco marketed. Even with this governmental control, the industry has maintained the basic characteristics of a purely competitive industry. Although there are a number of tobacco grades, the tobacco farmers produce essentially a homogeneous product. There are many small producers of this relatively homogeneous product in a large market; therefore, no individual producer can exert any control over the market price through his own actions. Thus, economic theory relating to pure competition is applicable to the tobacco industry under governmental control, and only modifications of the theory need be made to show the effects of the governmental program upon the industry.

Nature of the Factor Market

An analysis of the pricing of the productive services of land, labor, and capital is a necessary first step in a study of the tobacco control program. The strength of the program rests upon the ability of the government to regulate the supply of tobacco produced through control of the land factor. Any restriction on the land factor, however, is reflected in changes in the labor and capital factors. Thus, the cost structure of a flue-cured tobacco farm is greatly affected by an increase or decrease in the acreage allotment for that farm.

The tenant-or owner-operated[1] tobacco farm uses family labor almost exclusively. The opportunity for off-farm employment is lacking in most primary tobacco areas. Also, profitable alternative agricultural enterprises have not been found in many regions. Thus, family labor tends to be concentrated on the production of tobacco. That is, labor is relatively fixed in the short-run period of time because of the use of a family unit.

Most of a farmer's capital investment is "sunk." He has a given barn space, tractor or mules, planting and cultivating equipment--all of which are relatively fixed in the short-run period. The farmer can vary fertilizer, lime, fumigants, and a few other capital outlays which give a yearly return.

Unless he can buy or rent, an individual farmer is virtually limited in production to the acreage allotment assigned to him by the control program. Since the program is administered on a yearly basis, he does not know whether his acreage allotment will be increased, reduced, or held constant for the next year. Thus, the farmer is forced to operate in a series of yearly short-run periods in which his land is a fixed factor for one year only.

Analysis of Rent--the Return to Land

The return to land as a factor of production is rent. Rent is simply the monetary value given to land for its service in producing goods demanded by consumers. Therefore, land rent is derived from the demand for the product that land helps to produce, but, at the same time, the price of the final product includes a payment for the service of land.

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[1]The term tenant as used here includes croppers.

Rent is the return to land per year and not the value of an acre. The determination of the value of an acre of tobacco requires discounting of future rents, and therefore involves an interest rate whose selection is a separate topic in itself and will be taken up at a later point.

Since the period covered by this tobacco acreage allotment study was one in which acreages were reduced every year, this analysis will stress the effect of an acreage reduction upon the services of the factors of production, especially the land factor. The first question is: What effect does a cut in tobacco acreage allotment have upon the rent of farmland? The market demand and supply curves for tobacco land give the answer to this question.

The supply curve for flue-cured tobacco land is highly inelastic. The supply curve for tobacco land is defined as the schedule of acreages that will be used for tobacco production at all possible rents. The supply curve will be almost perfectly inelastic because the total alloted acreage is fixed by the program. Farmers will produce on virtually all of their alloted acres if rent is high, but at lower rents other land uses compete with tobacco and some underplanting of allotments will take place. However, even at low rents there are few good competitors for tobacco land because of the intensity of tobacco production.

The supply curve for flue-cured tobacco land will become more inelastic as the supply curve shifts to the left. When allotments are large in relation to the supply of labor and capital, farmers will underplant to some extent because they find that labor and capital can be better utilized on less acreage. However, as allotments are reduced by the program, farmers will intensify their production on less land. That is, as the total supply

of land is reduced, farmers will produce closer to their alloted acres, and the supply curve will become more inelastic.

Alfred Marshall[1] presented four principles which govern the elasticity of the demand curve for a productive factor. These are applied to rent of tobacco land to show that the demand curve is highly inelastic. Probably the most important principle relating to this discussion says: If the demand for the product is inelastic then the demand for the productive service will tend to be relatively inelastic. This is recognition that the demand for a factor is derived from the demand for its final product. It is generally accepted as a fact that the final product, tobacco, has a highly inelastic demand curve. The principle indicates that this inelasticity is reflected back to the factor market.

The second principle states that the smaller the proportion spent on a productive factor, the more inelastic the demand for it will tend to be. It would be difficult to determine the ranking of land, labor, and capital as to their importance in the flue-cured tobacco industry. Labor, as compared to capital and land, accounts for a greater percentage of the national resources employed in agricultural production.[2]

A third principle says that if the other factors are poor substitutes for land, then the demand curve for land will tend to be inelastic. This principle indicates that the demand curve will be more elastic in its lower part; that is, labor and capital are fairly good substitutes for land when

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[1] Paul A. Samuelson, Economics, Mc Graw-Hill, New York, Toronto, London, 1958, pp. 523-525.

[2] U. S. Census of Agriculture, 1954, Vol. III, op. cit., p. 18.

land is used extensively. As allotments are cut back and more intensive use of land is made, labor and capital become poorer substitutes for land because of the law of diminishing returns.

Derived demand for one factor will tend to be inelastic if all other factors are in inelastic supply to the industry. This is the fourth principle of demand. Agricultural capital and labor are historically inelastic in total supply in the short-run. This holds true for the tobacco industry also. The uncertainty of the tobacco program has caused farmers to make few major changes in response to year-to-year fluctuations in the tobacco program.

Figure 1 shows the effect of a government acreage allotment cut upon the rent of tobacco land. When the acreage allotments are reduced, this reduces the acres of tobacco produced by virtually the same amount. That is, the supply curve shifts to the left (from S_1 to S_2). Assuming no change in the demand for tobacco, there seems to be no reason for a change in the demand curve for tobacco land. Thus, the economic rent rises from R_1 to R_2 as a result of the reduction in acreage allotments. The percentage increase in rent is greater than the percentage reduction of land because both the demand and supply curves are inelastic.

Least-Cost Substitution of Factors

An individual firm under pure competition will substitute factors until it arrives at the least-cost combination. A change in the price or productivity of a factor will result in changes in the use of other factors. If the price of a service rises, then the firm has an incentive to substitute cheaper services for the dearer service. Conversely, if the price of

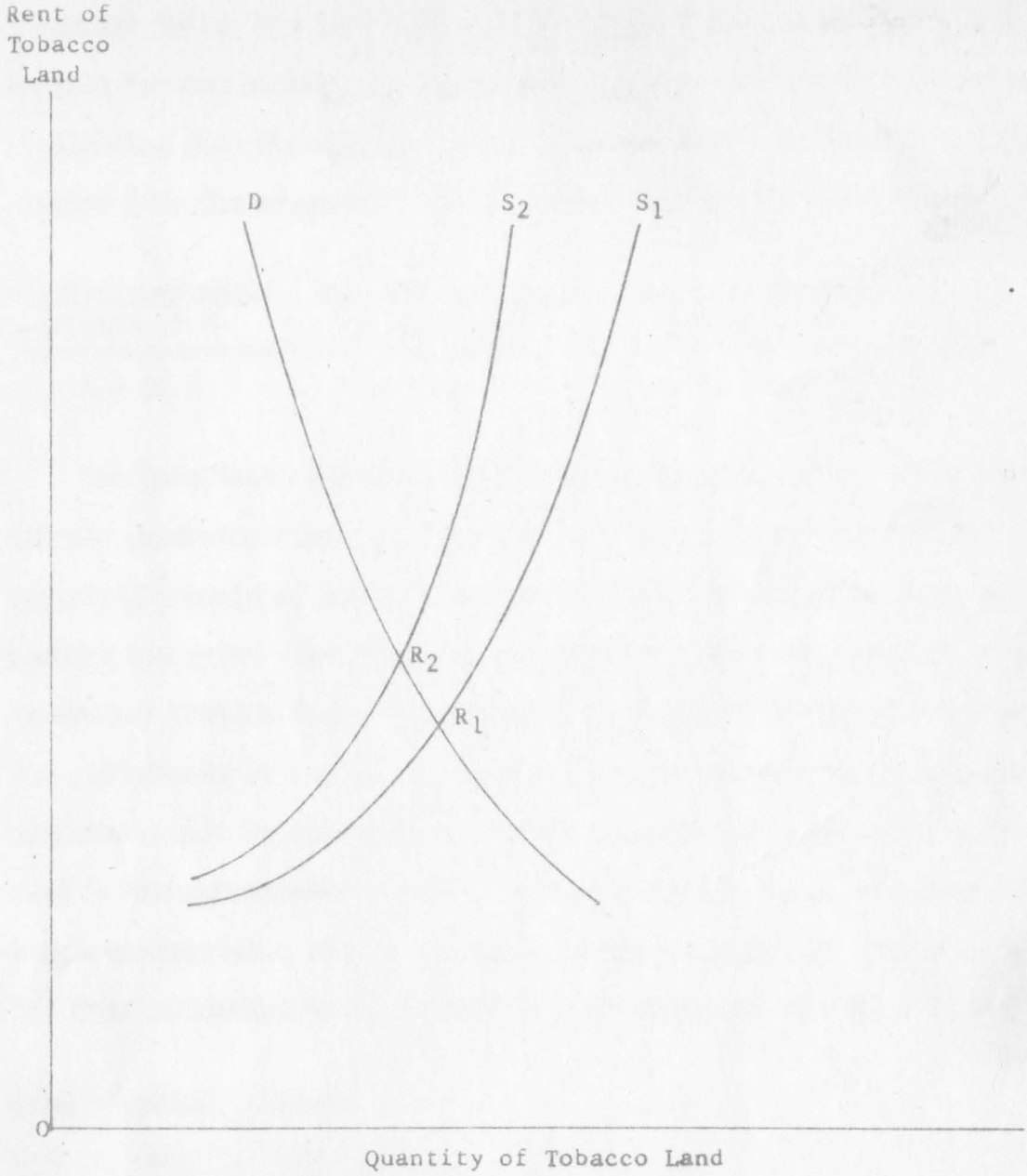

Figure 1.- Industry Demand and Supply Curves for Tobacco Land as Affected by an Acreage Allotment Reduction.

a service falls, the incentive will be to substitute this less expensive service for the higher-priced services. A firm will reach a least-cost equilibrium when the marginal-physical-products of all factors are proportional to the respective market factor prices. By formula this is:

$$\frac{\text{marginal-physical-product of A}}{\text{price of A}} = \frac{\text{marginal-physical-product of B}}{\text{price of B}} = \frac{\text{marginal-physical-product of C}}{\text{price of C}}$$

The least-cost factor principle can be applied to the individual tobacco producing firm. In this discussion it is assumed that the opportunity costs of land, labor, and capital for use other than tobacco growing are zero. Therefore, we can look at factor substitution on an individual tobacco firm without having to consider alternative factor uses. The adjustments of a firm in response to a 15 percent reduction in acreage allotments will be illustrated as to the least-cost equilibrium. Figures used in the substitution formulas are not based on empirical data and are only representative of the direction in which prices and products move. The firm is assumed to be in the stage of diminishing returns to factors.

Land	Capital	Labor
$\frac{MPL}{PL}$ =	$\frac{MPC}{PC}$ =	$\frac{MPL}{PL}$
1. $\frac{500}{100}$ =	$\frac{500}{100}$ =	$\frac{500}{100}$

Firm's equilibrium. A unit of land is one acre and a unit of capital or labor is the investment per acre.

Steps in reaching a new equilibrium after a 15 percent allotment reduction:

2.	$\frac{500}{120} = \frac{500}{100} = \frac{500}{100}$	<u>Increase in land rent resulting from a market reduction of land supply as shown in figure 1</u>. Rent increases more than percentage reduction.
3.	$\frac{540}{120} = \frac{500}{100} = \frac{500}{100}$	<u>Increase in productivity of land caused by farmer moving to better soil</u>.
4.	$\frac{540}{120} = \frac{450}{100} = \frac{405}{100}$	<u>Drop in MPP of labor and capital as these factors are substituted for land</u>. Lower MPP for labor and capital is due to the law of diminishing returns.
5.	$\frac{540}{120} = \frac{450}{100} = \frac{405}{90}$	<u>Drop in market price for labor resulting in a new equilibrium for the firm</u>. The market demand for labor is reduced due to labor's low productivity as a substitute for land.

Note on the substitution of capital for land:

Irrigation equipment, fertilizer, and crop fumigants are examples of capital goods which help to maintain productivity in the face of acreage reductions. Labor-saving investments, such as cultivating and harvesting equipment, are poor substitutes for land. Thus, with successive allotment cuts the demand increases for capital services which are good substitutes for land, while the demand decreases for poor land substitutes. Because of these counterbalancing trends, it is difficult to determine whether the market demand for all capital services increases or decreases over a period of time.

Note on the substitution of labor for land:

Labor is probably a poorer substitute for land than capital if we assume that a firm operated by family labor is the primary producing unit.

The marginal-physical-product attributable to labor is strongly subject to the law of diminishing returns after land is reduced in supply below the most efficient family-sized acreage. After such reductions, the demand for labor will decline, thereby lowering the economic return to labor. This cheaper labor may be substituted to some extent for capital since it is a poor substitute for land.

A Firm's Demand and Cost Curves

The administered flue-cured tobacco program directly affects both the demand and the cost curves of an individual firm. The price support program has a direct bearing on the demand curve, while the acreage allotment program serves to adjust the cost curve in relation to the demand curve.

The effect of the governmental program upon an individual firm will be shown as a deviation from the firm's long-run equilibrium under pure competition in a non-regulated market. It is assumed that all tobacco firms have equal long-run average cost curves. Each firm is assumed to be producing at the lowest point on its long-run average cost curve at which point its perfectly elastic demand curve is tangent to the cost curve. At this point there are no profits (other than normal returns) and no losses, since it is assumed that there is free entry and exit of firms to eliminate any profits or losses.

The initiation of a governmental program of price supports will increase the price of tobacco for the industry. Each firm in the industry will have a higher demand curve, and will increase production until

long-run marginal cost equals price (MC = MR). At this point the firm will have a profit above normal returns since price is above average cost. Unless the price support program is continued to maintain market price above equilibrium price, this profit will last only as long as it takes new firms to enter the industry, increasing market supply thereby lowering market price. If the program is continued the margin of profit will last indefinitely even though new firms enter the industry, since price is supported at a given level regardless of the supply of tobacco on the market.

The firm's long-run equilibrium in a free market as opposed to its equilibrium in a price-supported market is shown in Figure 2. In a free market the firm will reach an equilibrium at point N where the long-run average cost curve is tangent to price. With the innovation of a price-support program, price will be raised from OP to OB, and a new equilibrium will be reached at point T where the long-run marginal cost curve is equal to the support price. Each firm in the industry or entering the industry will have the profit area of ABTO as long as no change is made in the program. However, if the program is abandoned, price will return to OP and profits will disappear.

The support program coupled with the acreage allotment program will now be analyzed with regard to their effect upon the firm's cost and demand curves. The acreage allotment program is an effort to adjust supply to supported price by control of the land factor. The program has historically operated to put stringent restrictions on the entry of new firms into the industry. Therefore, the introduction of an acreage

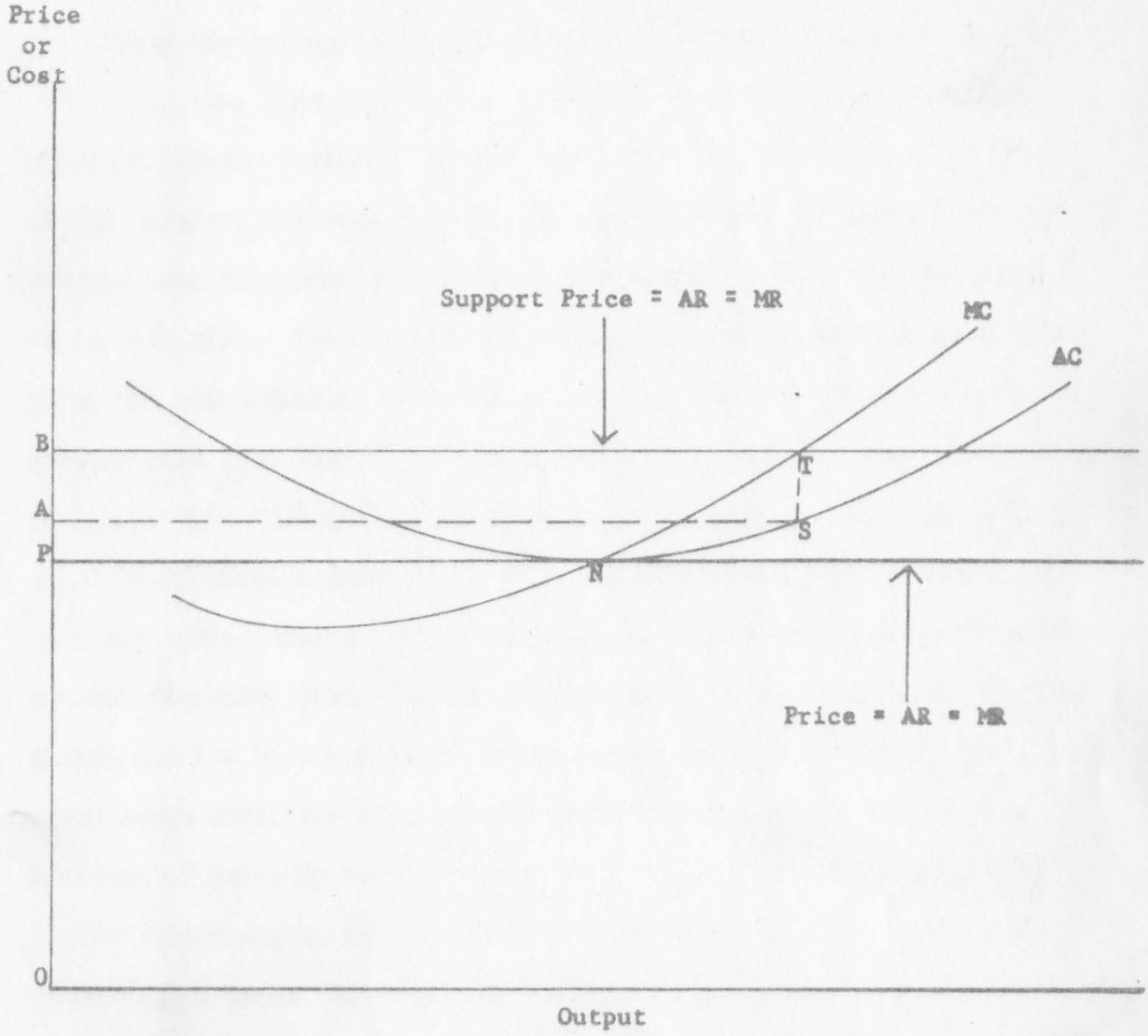

Figure 2.- A Firm's Long-run Demand and Cost Curves Under Conditions of Pure Competition With and Without Government Regulation.

allotment program will be analyzed as to its effect upon the cost curves of a firm in long-run equilibrium with a supported demand curve protected by restriction of entry.

Since the acreage allotment program is administered on a year-to-year basis, the firm must make a series of short-run adjustments to maintain maximum profits. If the allotments are reduced the first year of the program, the economic rent of land will rise as shown in Figure 1. Because each firm must pay a higher rent per unit of land, its fixed costs will rise. This results in an increase in the average cost curve along the same marginal cost curve. At the same time the firm must produce with less land since its allotment has been cut back, therefore, it is not able to extend production to the point where marginal cost is equal to marginal revenue. The firm has an incentive to increase the variable costs, thus shifting the marginal cost curve to the left again equating marginal cost with marginal revenue. With succeeding allotment reductions the firm continues to substitute additional variable for fixed costs until the area of profits which can be derived from the addition of variable costs is equal to [illegible] not less than [illegible] area of profits which can be derived from the same variable cost spread over a higher fixed cost. If acreage is reduced after this point, the firm must use less of the variable cost as well as less of the fixed cost.

The ability of labor and capital to substitute for land determines the trend of the firm's cost curves over a series of acreage reductions. Diminishing returns accrue to labor and capital as they are substituted for less and less land. At first, a reduction in land acreage can be largely offset by small increases in labor and capital. Labor and capital

become poorer substitutes as acres are further reduced. This means that the firm's cost curves rise at an increasing rate, and that output falls at an increasing rate. Thus, the long-run trend of the firm's cost curves is upward to the left, curling upward if cost increases faster than output decreases and downward if output decreases faster than cost increases.

Figure 3 shows the response of a firm to a reduction of tobacco allotments in a price-supported market. Price of tobacco is assumed to be held constant at AP. At the start of the acreage allotment program the firm is producing on AC, the short-run average cost curve which is tangent to the lowest point on the long-run average cost curve (not shown). The firm is producing at the point where marginal cost is equal to marginal revenue (point C), and it has an area of profits of APCB. After the acreage allotment is reduced, fixed cost is marked up, causing the average cost curve (AC_1) to move upward on the same marginal cost curve (assuming no change in variable costs). The firm is not able to extend production to the point where marginal cost is equal to marginal revenue, so it now has a profit of APTS which is less than the former profit of APCB. The firm can add to profit by increasing the variable cost, since substitution of variable for fixed cost has just begun and the variable cost is a good substitute. Because of the law of diminishing returns, the new average (AC_2) and marginal (MC_2) cost curves are above and to the left of the old curves, the marginal cost curve being more inelastic than previously. The new profit area is APUB, which is greater than APTS and less than APCB. Excess of per-unit price over cost (AP) is held constant for all three cost curves only for the purpose of showing relative profit areas.

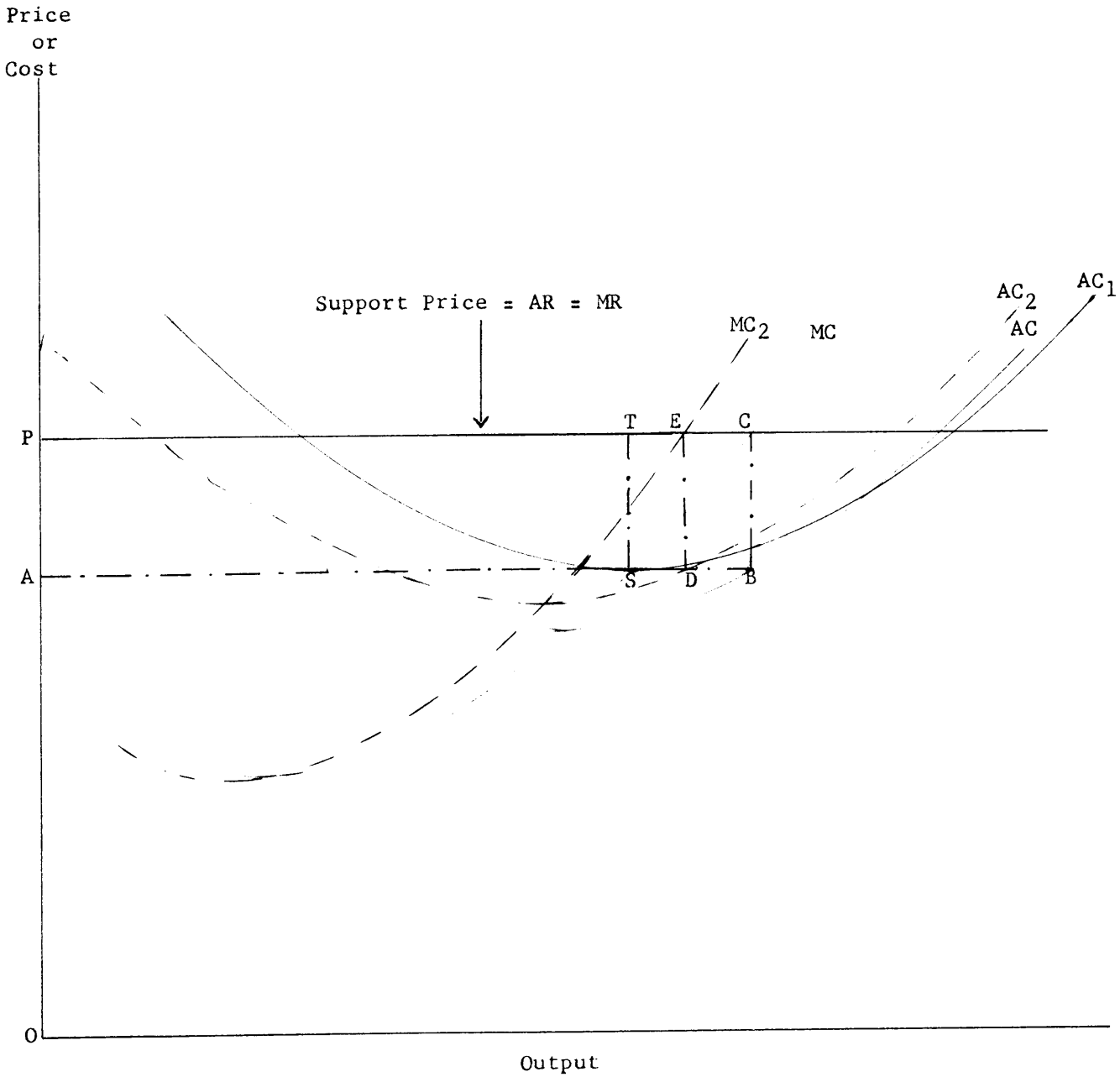

Figure 3.- A firm's short-run demand and cost curves as they react to a reduction in acreage allotments under the government's control program.

As acreage is further reduced, fixed cost continues to rise, and more variable costs are substituted for fixed costs. The cost curves of the firm shift upward to the left at an increasing rate, since the variable costs become poorer and poorer substitutes for the fixed costs. If the government at any time increases the size of tobacco acreage, the trend is reversed and costs shift downward to the right.

In the long-run period most fixed costs become variable to some extent. Capital and labor resources, which are fixed in the short-run, tend to substitute for land and for each other over an extended period of land reductions. These large-scale changes are often delayed by the tobacco firm because of the uncertainty of the control program. For example, a firm may find it profitable to substitute family labor for a tractor, but it will not do so because its allotment may be increased the next year making the tractor again a profitable service. Since changes in fixed factors usually result in large-scale cost changes, the cost curves of a firm are subject to sudden increases or decreases when fixed factors can be substituted for each other with a degree of certainty.

The Industry Demand and Supply Curves

The tobacco program exerts some influence upon both the industry supply curve and the industry demand curve. The price support program, in attempting to hold price at a given level, serves to change the elasticity of part of the tobacco demand curve. The acreage allotment program is used when the support price is above the free market price to adjust supply back to the free market demand.

The support price is based on the concept of parity price, therefore, parity must be examined as to its effect upon the demand curve of the

tobacco industry. Parity is designed to show a calculated price for the farmer's product that will give him purchasing power, with respect to the things he buys, equivalent to the purchasing power of his commodity in a selected base period or periods. For this discussion it is assumed that the support price is held at a constant percentage of parity. If the parity formula and the price-cost data which go into this formula remain unchanged over a period of years, there is no reason for the support pr to change.

The support price replaces the free market price when a quantity of tobacco is offered on the market that would bring a price below the support level on the free market demand curve. The support price (or demand curve) thus replaces the free market demand curve to the right of their point of intersection, whereas the free market demand curve clears the market to the left of their intersection since price is above the support level.

If the support program results in a price above the normal market price, the government must make some effort to control the supply of tobacco produced or it will accumulate large surpluses. In attempting to restrict the supply of tobacco produced by control of acreage planted, the marginal cost curves of all firms are moved upward to the left as shown in the previous discussion. Thus, the industry supply curve is moved to the left by acreage restrictions, since the industry supply curve is the sum of the marginal cost curves of all producing firms. When supply is cut back to the point where the support demand curve intersects the free market demand curve, the government has no incentive to make further permanent land restrictions since no surpluses are accumulated at this point.

This relationship is shown in Figure 4. The unregulated demand and supply curves (DD' and S_1) intersect at point R. The introduction of a support program increases price from P_1 to P_2 and quantity from Q_1 to Q_2 (assuming new firms are restricted from the industry), the new demand curve (DTP') intersecting with the old supply curve at point L. The government now acts to reduce supply because surpluses are accumulated at point L. The reduction in acreage allotments introduces a new industry supply curve. If the reduction were sufficient to shift the supply curve from S_1 to S_2, the normal market operations would take all of the tobacco produced in any given year. The government no longer incurs any increase in tobacco stocks, but it may possibly make further temporary allotment reductions in order to lower accumulated stocks.

In the earlier discussion concerning the adjustment of a firm to a reduction in acreage allotments, the assumption was made that the firm's demand curve remains constant while allotments are reduced. It can now be seen that this is true only when the industry is producing on the perfectly elastic section (TP') of the industry demand curve, since the individual firm must take the constant market price as given. However, when the industry is producing on the DT section of its demand curve, the demand curve for each firm will rise as the industry supply curve shifts to the left.

Capitalization of Rent into Land Value

An acre of productive farmland can be expected to give a flow of income for an infinite period of time. An acre of tobacco allotment is the right to produce tobacco on an acre of land. An acre of tobacco

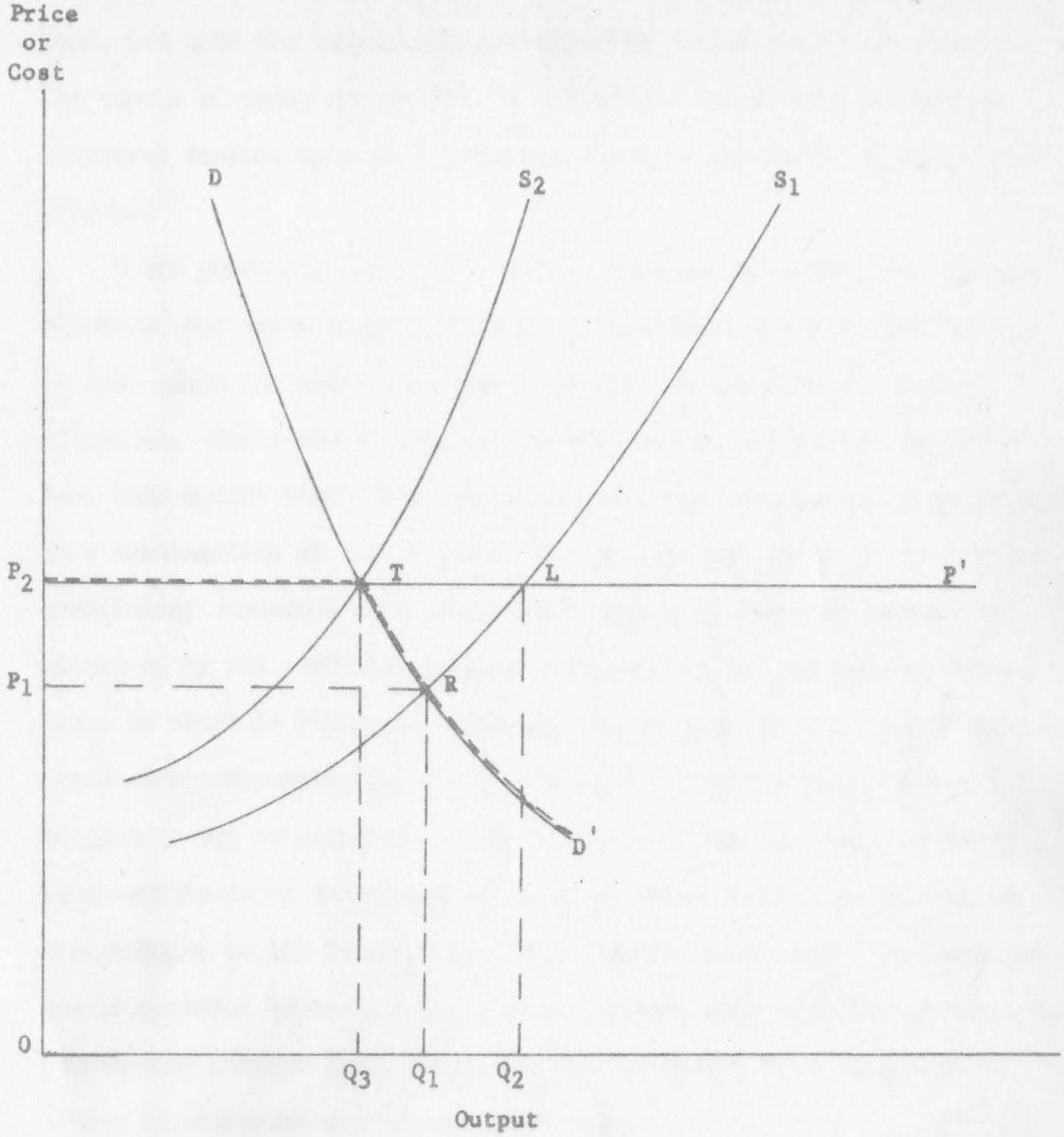

Figure 4.- Industry Demand and Supply Curves for Tobacco Under Regulated and Unregulated Conditions.

allotment carries with it an uncertain flow of income because it is connected with the tobacco program which is subject to future changes. The amount of money a buyer is willing to pay for an acre of tobacco allotment depends upon the confidence which he has in the future of the program.

If the potential buyer of a tobacco farm believes that the acreage allotment and price support program will continue far into the future, he will judge the value of a farm primarily in terms of its acreage allotment. Since the flue-cured tobacco program has been in effect for more than twenty years, the potential buyer has good reason to believe in a continuation of the program. The program has served to reduce the uncertainty connected with large fluctuations in price of tobacco as witnessed by the perfectly elastic section (TP') of the tobacco demand curve as shown in Figure 4. However, the program has resulted in future uncertainty concerning the use of farmland. That is, since acreage allotments may be increased or decreased from year to year, the buyer is uncertain as to the number of acres on which he will be allowed to grow tobacco in the future. If future tobacco land rights are uncertain, the prospective buyer must use a high discount rate when considering the purchase of tobacco land, since the flow of income from this land is likely to fluctuate over a period of years.

If the tobacco farmer believes that the government program will fail, he will emphasize the features of a farm other than the tobacco allotment when considering the pruchase of a farm. The farmer who lacks faith in the existence of the tobacco program will consider the overall potential

productivity of the farm as it relates to future income. He will look for a farm which will give him the greatest return if acreage restrictions are removed and the price of tobacco falls.

This study is an attempt to determine the extent to which acreage allotments have been capitalized into farmland values. Do buyers and sellers base the price of farmland on the size of tobacco allotment? Are buyers willing to pay the same price year after year for a farm on which allotments are being reduced? If the answer to these questions is yes, then the majority of farmers have a high degree of confidence in the future of the program. Those who lack this confidence will be reluctant to buy farmland with a tobacco allotment, because they must pay the market price for the allotment.

The theoretical value of an acre of tobacco allotment is equal to the sum total of its future economic rents discounted to the present. For this discussion it will be assumed that the buyers and sellers accept the present economic rent as the best guide to future rents. They will capitalize the present rent into the value of an acre of allotment through the use of an interest rate which reflects the uncertainty of the tobacco program. The interest rate used must be high enough to allow for the fact that an acre of allotment now may be reduced to less than an acre in the future. The value of an acre of tobacco allotment can be determined from the value of its present rent by the formula:

$$\text{Value} = \frac{\text{Annual Rent}}{\text{Interest Rate}}$$

If the government reduces total acreage allotments between two producing years, the rent of land must increase as shown in Figure 1. Assuming a rent of $100 and an interest rate of 10 percent before an allotment reduction, the value of an acre of tobacco allotment is determined as follows:

$$V = \frac{\$100}{.10} = \$1,000.$$

Assuming a rent of $120 and an interest rate of 10 percent after an allotment reduction, the value of an acre of tobacco allotment is determined as follows:

$$V = \frac{\$120}{.10} = \$1,200.$$

ANALYSIS OF DATA

The multiple linear regression technique was chosen as the appropriate statistical procedure to use in determining the market value of an acre of flue-cured tobacco allotment. With this technique the association between an acre of allotment and the sale value of a farm can be ascertained while holding constant at their averages the association of the other primary variables thought to influence the farm sale value.

The years were not handled together in the regression analysis since it was theorized that the value of an acre of allotment would increase as allotments were reduced.[1] It was hypothesized also that inflation in land values[2] would cause a difference in the data between years, thus making it illogical to combine years in one regression equation without allowance for expected yearly increases in land values.

Virginia and North Carolina were analyzed separately since the counties included are from two distinctly different type-of-farming areas. Greene, Wilson, and Pitt Counties were grouped together since these counties represent a relatively homogeneous region in North Carolina.

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[1]Allotments were reduced in 1955, 1956, and 1957 by 5, 12, and 20 percent, respectively. See pages 62 and 63 of text for theory on increase in per acre allotment value as allotted acreages are reduced.

[2]Land values increased 18 percent in Virginia and 16 percent in North Carolina during the four-year period covered by this study. (These figures were derived from: Current Developments in the Farm Real Estate Market,) AMS 43-101, USDA, May 1959, p. 30.

Regression Variables

The variables selected for use in the multiple regression models were as follows:

Y = Sale value of farm.
X_1 = Acres of tobacco allotment.
X_2 = Acres of cropland.
X_3 = Value of buildings.
X_4 = Acres of non-cropland.
X_5 = Pounds of tobacco produced per acre.
X_6 = Price received for tobacco per pound.
X_7 = Sale occurred Dec. 1, 1953 - Nov. 30, 1954.
X_8 = Sale occurred Dec. 1, 1954 - Nov. 30, 1955.
X_9 = Sale occurred Dec. 1, 1955 - Nov. 30, 1956.
X_{10} = Sale occurred Dec. 1, 1956 - Nov. 30, 1957.

The sale value of farm was chosen as the dependent variable (Y) for this study since the purpose of the multiple regression analysis as employed was to explain farm sale value through the use of a number of selected independent factors. Acres of tobacco allotment (X_1) and acres of cropland (X_2) were considered to be among the most important factors associated with the sale value, but allotted acres were not subtracted from cropland acres because the value desired for an acre of tobacco allotment was the value of the allotment as the right to produce independent of the cropland on which this right was held. The assessed value of buildings was used as representative of the value of buildings (X_3) which was believed to be associated with farm value. Building value, however, was hypothesized as being more important in Virginia than in North Carolina because a greater number of the Virginia farms were thought to be purchased by those who expected to reside

personally on the farms.[1] Acres of non-cropland (X_4) were expected to influence value on some farms, but on many farms these acres were thought to have only a slight degree of association with sale value.[2] The soil productivity for Pittsylvania County was represented, although perhaps inadequately, by pounds of tobacco produced per acre (X_5) and price received for tobacco per pound (X_6).[3] The date of sale variables (X_7 - X_{10}) were included to hold constant at their averages the influence of years upon the regression equation.

The sale value of farm (Y) was used in the regression equations in the same form as specified in the deed record or as calculated from the amount of state or federal taxes collected on the deed at the time of recording.[4] Acres of tobacco allotment and acres of cropland were utilized in their original forms as taken from the Agricultural Stabilization Conservation records. The value of buildings (X_3) was

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[1]More farms were thought to be bought for operation by the owners in Pittsylvania County since approximately 50 percent of the operators are owners whereas approximately 25 percent are owners in Wilson, Greene, and Pitt Counties (see pages 14 and 15 of text).

[2]In many instances timber was thought to add extra sale value to a tobacco farm even though some sales of timber land had been eliminated in the editing process (see page 19 of text). However, the return to non-cropland is very low since tobacco and other cash crops account for approximately 96 percent of the gross income in the Virginia subregion and 97 percent in the North Carolina subregion (derived from Table 1, page 12 of text).

[3]See page 22 of the text for discussion of yield and price as representative of soil characteristics.

[4]See footnotes on pages 18 and 23 of text for methods of calculating approximate sale value from tax value in Virginia and North Carolina, respectively.

adjusted between counties for the purpose of placing all building values on the same assessment basis.[1] The acres of non-cropland (X_4) were calculated by subtracting cropland from farmland for each observation. For each farm the pounds of tobacco produced per acre (X_5) were derived by dividing the total poundage by the acres of tobacco harvested, while the price received for tobacco per pound (X_6) was computed from the gross receipts as divided by the total poundage. The year variables (X_7 - X_{10}) were inserted in the regression equations as one or zero, being one if a particular sale occurred within a given year and zero if the sale did not occur within the year.

Variables X_1 to X_6 are known as <u>continuous</u> variables, while X_7 to X_{10} are called <u>discrete</u> variables. The continuous variables take on values in an unbroken scale of measurement, whereas the discrete variables take on only a definite, limited set of values. In this study acreage of tobacco allotment, a continuous variable, has a distribution of values from 0.43 to 22.00, but date of sale, a discrete variable, has only the values of one and zero.

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[1]The assessed values were adjusted among counties by the following process. The assessed value of <u>buildings and land</u> for each sample farm in a county was divided by the actual sale value of that farm. The resulting ratios for all sample farms in the county were added together and divided by the number of farms to arrive at an average sale value-assessment ratio. The county with the highest ratio (.672 in Pitt County, N. C.) was chosen as the base county, and the building assessed values in other counties were adjusted to the base county level. The county adjustment figure for buildings was computed by dividing the average sale value-assessment ratio for that county into the ratio of the base county. The county adjustment figure thus secured was multiplied by the <u>building</u> assessment value for each of the farms, and the resulting adjusted values were used in this study as the figures for value of buildings.

Table 3 presents regression variable averages which were computed between areas and between years to provide a comparison of relative sample strengths in addition to furnishing figures for use in regression prediction equations.

Because of the differences in type of farming practiced between the two areas, the Virginia average figures are not directly comparable to those of North Carolina. The most meaningful difference between areas is that the sample secured from Pittsylvania County contains 84 observations more than the sample from Greene, Wilson, and Pitt Counties. The average sale value of farm for the North Carolina counties is $8,246 greater than the average value in Pittsylvania County, a divergence partially attributable to the 1.89 acre difference in acres of tobacco allotment.

The disparities in the data between years within an area can be primarily attributed to small sample sizes. However, since tobacco allotments were reduced by 12 percent in 1956, the 0.31 acre increase in tobacco allotments in Pittsylvania County in 1956 apparently is the result of the sale of larger farms than in 1955. This premise is further substantiated by the $2,125 increase in average sale value of farm in 1956.

Pilot Phase of Regression Analysis

In the initial phase of analysis a number of single variable regressions were computed to ascertain if the information secured from public sources was adequate in explaining the sale value of a tobacco farm. The 47 observations taken from Pittsylvania County in 1957 were utilized in this exploratory phase of the study. Acres of tobacco

Table 3. Unweighted Averages of Regression Variables per Farm, Virginia and North Carolina, 1954-1957

Year[1]	X_1 Acres of tobacco allotment	X_2 Acres of cropland	X_3 Value of buildings	X_4 Acres of non-cropland	X_5 Pounds of tobacco produced per acre	X_6 Price received for tobacco per pound	Y Sale value of farm	Number of observations
Pittsylvania County								
1954	4.80	35.7	$2,448	61.6	1,423	$0.51	$ 9,028	63
1955	4.28	41.0	2,586	72.5	1,314	0.57	9,673	45
1956	4.59	40.2	2,752	98.9	1,290	0.54	11,798	58
1957	3.50	35.4	2,646	72.1	1,687	0.54	10,498	47
1954-1957	4.35	38.0	2,603	76.4	1,402	0.53	10,242	213
Greene, Wilson, and Pitt Counties								
1954	7.49	35.0	$4,486	32.8	--	--	$18,206	36
1955	6.74	34.6	3,332	33.3	--	--	19,317	33
1956	5.91	31.3	3,200	39.4	--	--	18,789	34
1957	4.30	29.4	3,307	28.3	--	--	17,433	26
1954-1957	6.24	32.8	3,614	33.8	--	--	18,488	129

[1]A year is December 1 to November 30.

allotment, acres of cropland, value of buildings, acres of non-cropland, and pounds of tobacco produced per acre were used in the single variable regressions since they were the primary factors believed to be correlated with the sale value of farm.

Table 4 gives the statistical results of eight single variable regressions. The first five regressions were calculated to determine the association of each value-influencing factor with the sale value of farm. The last three were designed to ascertain the degree of correlation between the acres of tobacco allotment and the other independent factors.

The two variables having the highest correlation with farm sale value are assessed value of buildings with an r of .78 and acres of tobacco allotment with an r of .77. If a multiple regression were computed using independent variables from the first five regressions as the X's and the sale value of the farm as the Y, the R and R^2 values would be greater than the r and r^2 values for equation three since a multiple regression for a given problem gives a higher correlation than a simple regression.[1] The b value for regression number one indicates that an acre of tobacco allotment in Pittsylvania County in 1957 was worth approximately $2,278, assuming that other value-influencing factors are allowed to vary. Because of the high correlations and the logical regression coefficients obtained from the first five regressions, it was decided that the independent variables influencing farm sale value had been determined.

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[1]Bernard Ostle, Statistics in Research, Iowa State College Press, Ames, Iowa, 1956, p. 223.

Table 4. Results of Single Variable Regressions, Pittsylvania County, 1957

Independent variable (X)	Dependent variable (Y)	Correlation coefficient (r)	Coefficient of determination (r^2)	Regression coefficient (b)	Intercept value (a)
Acres of tobacco allotment	Sale value of farm	.77	.59	$2,277.83	$2,131.37
Acres of cropland	Sale value of farm	.65	.42	$ 149.11	$4,824.36
Value of buildings	Sale value of farm	.78	.61	$ 7.43	$3,634.93
Acres of non-cropland	Sale value of farm	.22	.05	$ 22.51	$8,475.29
Pounds of tobacco produced per acre	Sale value of farm	.36	.13	$ 5.49	$2,499.62
Acres of cropland	Acres of tobacco allotment	.76	.58	.06	1.44
Acres of tobacco allotment	Value of buildings	.78	.61	$ 24.94	$ -.32
Acres of tobacco allotment	Pounds of tobacco produced per acre	.20	.04	3.75	124.87

The associations obtained from regressions six, seven and eight indicate a strong relationship between acres of tobacco allotment and the variables for acres of cropland, value of buildings and pounds of tobacco produced per acre. Therefore, high intercorrelations would be present between these factors in a multiple regression using them as independent variables and farm sale value as the dependent variable.

Regression Analysis by Years

The model used in the initial phase of analysis was:

$$Y = a_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4.$$

This model hypothesizes that the sale value of a farm (Y) is a function of acres of tobacco allotment (X_1), acres of cropland (X_2), value of buildings (X_3), and acres of non-cropland (X_4). A separate regression was calculated for each year and each area. It was thought that, if the years were studied separately, the analysis would produce results as logical and statistically sound as could be obtained by combining the years in one regression model with additional independent variables added to account for yearly differences in the data. A variation in the model was tried for Pittsylvania County by including pounds of tobacco produced per acre (X_5) and price received for tobacco per pound (X_6) as interaction terms with X_1 to account for the effect of differences in soils.

The principal statistical results desired from the multiple regressions were:

(1) Consistently high correlation coefficients (R) and coefficients of determination (R^2) to show that the independent variables included in the regressions are effective in explaining farm sale value;

(2) Logical regression coefficients for the value of an acre of tobacco allotment (b_1) and small error terms for these coefficients.

Pittsylvania County

Table 5 presents the results of the multiple regressions for Pittsylvania County, 1954-1957. All four of the multiple regressions are highly significant at the one percent level of probability, meaning that the regressions are successful in explaining a large proportion of the variation in the dependent variable. The R value, which measures joint linear association among all variables, and the R^2 value, which is the proportion of the sum of squares of the dependent variable explained by the equation, are consistently high for the yearly regressions. In every year from 1954 to 1956, the R^2 values indicate that 77 percent of the variation in farm sale value is explained by the independent variables, whereas 83 percent is explained in 1957.

The regression coefficients for the value of an acre of tobacco allotment (b_1) are significantly different from zero at the one percent level of probability for each year from 1954 to 1956, however the 1957 b_1 coefficient is not significant at either the one percent or the five percent level. In 1954, 1955, and 1956, the value added to a farm by an allotted acre is greater than $1,000, thus corroborating a recent statement that: "The view is widely held in flue-cured and burley tobacco regions

Table 5. Amount of Variation in Sale Value of Farms Explained by Selected Factors and the Value of an Acre of Tobacco Allotment, Pittsylvania County, 1954-1957

$$(Y = a_o + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4)$$

		Correlation coef. (R)	Coef. determination (R^2)	Regression coefficients: Acres of tobacco allotment (b_1)	Acres of cropland (b_2)	Value of buildings (b_3)	Acres of non-cropland (b_4)	Intercept value (a_o)
1954	Statistic	.88**	.77	$1,087.86**	$-3.83	$1.24**	$10.51	$ 436
	Standard error	$2,697[2]		$ 266.87	$23.47	$0.26	$10.36	
	Confidence interval[1]			$± 533.74				
	Standard partial			0.51	-0.04	0.43	0.08	
1955	Statistic	.88**	.77	$1,353.10**	$27.81	$1.16**	$-1.97	$-115
	Standard error	$2,698[2]		$ 249.19	$18.77	$0.26	$ 9.70	
	Confidence interval[1]			$± 503.61				
	Standard partial			0.56	0.16	0.37	-0.02	
1956	Statistic	.88**	.77	$1,504.88**	$35.15	$1.39**	$-2.20	$-133
	Standard error	$3,731[2]		$ 321.10	$29.49	$0.37	$ 7.71	
	Confidence interval[1]			$± 643.48				
	Standard partial			0.50	0.11	0.37	-0.02	
1957	Statistic	.91**	.83	$ 789.74	$46.34	$2.06**	$ 6.62	$ 170
	Standard error	$2,902[2]		$ 482.99	$34.48	$0.37	$ 8.31	
	Confidence interval[1]			$± 976.12				
	Standard partial			0.23	0.16	0.58	0.05	

**Significant at one percent level of probability (F test).
[1]Ninety-five percent confidence interval.
[2]Standard error of regression.

that the value of a tobacco allotment in the mid-1950's averaged more than a thousand dollars an acre."[1] The b_1 coefficients logically increased from 1954 to 1956, but the reduced b_1 value for 1957 is unexplainable from a theoretical standpoint.[2]

Positive statements concerning the value of an acre of tobacco allotment are difficult to make because of large standard errors and confidence intervals for the b_1 coefficients. From the confidence interval for 1954 we can say that we are 95 percent confident that the true population value of b_1 is $1,087.86 plus or minus $533.74, or that the true value lies between $554.12 and $1,621.60. In 1955, the 95 percent confidence interval places the true regression coefficient between $849.49 and $1,856.71; in 1956, between $661.40 and $2,148.36; but in 1957 it can be said only that the true value is between $-136.40 and $1,765.84.

The regression coefficient for the value of buildings (b_3) is significant at the one percent level in all four regressions, whereas the coefficients for an acre of cropland (b_2) and an acre of non-cropland (b_4) are not significant in the regressions. Illogical values are obtained for the b_2 coefficient in 1954 ($-8.83) and for the b_4 coefficients in 1955 and 1956 ($-1.97 and $-2.20, respectively), but the standard errors in each instance are much larger than the coefficient values making it unreasonable to place any confidence in these minus values.

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[1] Frank H. Maier, Op. Cit., p. 314.

[2] See pages 62 and 63 for theory on increase in per acre allotment value as allotted acreages are reduced.

A high degree of intercorrelation between several of the independent variables in the regression analysis is thought to be primarily responsible for some of the illogical regression coefficients and their large standard errors. As described in the literature,[1] a high degree of intercorrelation between two variables often results in unstable regression coefficients having unusually large standard errors. In some instances if the degree of association between two variables passes a certain point, the weaker of the regression coefficients changes sign.

Table 6 was calculated to show simple correlation coefficient values for the primary variables in an attempt to determine the intercorrelations which influence the regression results. It is believed that the high intercorrelation between acres of tobacco allotment and acres of cropland in 1954 (r_{12} of .78) is primarily responsible for the minus regression coefficient for an acre of cropland. The r_{12} value for 1957 (.83) exceeds even the r_{1Y} value for that year (.82), therefore, the regression coefficient for an acre of tobacco allotment is unstable and probably underestimates the true value of the coefficient in 1957.

The large standard errors obtained for the regression coefficients are probably more the result of small sample sizes than of high intercorrelations. There are not a sufficient number of observations in each year to produce a prediction equation of the reliability desired.

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[1] Karl A. Fox and James F. Cooney, Jr., "Effects of Intercorrelation upon Multiple Correlation and Regression Measures," AMS, USDA, April 1954, p. 1.

Table 6. Simple Correlation Coefficient Values for Important Variable Relationships, Pittsylvania County, 1954-1957

Coefficient value	1954	1955	1956	1957
r_{12}	.78	.64	.67	.83
r_{13}	.70	.40	.71	.78
r_{1Y}	.83	.80	.83	.82
r_{3Y}	.79	.64	.78	.87

The standard partial regression coefficients are indicative of the relative importance of the regression variables, but the partials do not take into account intercorrelation between these variables. The partials rank acres of tobacco allotment first, value of buildings second, acres of cropland third, and acres of non-cropland fourth in 1955 and 1956, whereas in 1954 acres of cropland and acres of non-cropland are reversed in rank, and in 1957 acres of tobacco allotment and assessed value of buildings are reversed.

A farm with no tobacco acreage, no cropland acreage, no buildings, and no non-cropland acreage is a meaningless concept; therefore, the Y intercept value (a_0) has little significance as it relates to this study. The low a_0 values obtained for each of the four years sustain the premise that a farm with no acreages or buildings is virtually worthless.

Pounds of tobacco produced per acre (X_5) and price received for tobacco per pound (X_6) were multiplied by acres of tobacco allotment (X_1) for each of the sample observations to form a new regression variable (X_1 X_5 X_6). This new variable is the gross receipts from allotted

tobacco acreage. It was included to represent tobacco soil quality[1] and was thought to possibly increase the R and R^2 values of the regression equations. The interaction variable was used in the following regression equation for each of the four years:

$$Y = a_0 + b_1'' (X_1 X_5 X_6) + b_2X_2 + b_3X_3 + b_4X_4.$$

The R^2 values for 1954 and 1957 remain the same as in the previous equations, but the R^2 for 1955 drops by two percent and the R^2 for 1956 increases by three percent. From these results it was concluded that soil quality as represented by yield and price data add little to the percent of explained variation in the sale value of farm.

The prediction equations for the initial phase of regression analysis in Pittsylvania County are successful in explaining better than three-fourths of the variation in sale value of farms in each year from 1954 to 1957. Although highly correlated with cropland, the regression coefficients for an acre of tobacco allotment are logical as well as statistically significant in every year except 1957. It is believed that the standard errors and the regression coefficients can be improved by combining the data into one regression equation.

Wilson, Greene, and Pitt Counties

Table 7 presents the multiple regression results for Wilson, Greene, and Pitt Counties. Each of the regression equations is significant at

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[1]See page 22 of text for discussion of yield and price as representative of soil characteristics.

Table 7. Amount of Variation in Sale Value of Farms Explained by Selected Factors and the Value of an Acre of Tobacco Allotment, Wilson, Greene, and Pitt Counties, 1954-1957

$(Y = a_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4)$

		Correlation coef. (R)	Coef. determination (R^2)	Regression coefficients: Acres of tobacco allotment (b_1)	Acres of cropland (b_2)	Value of buildings (b_3)	Acres of non-cropland (b_4)	Intercept value (a_0)
1954	Statistic	.91**	.83	$ 1,959.66*	$ -43.40	$0.07**	$-11.50	$3,242
	Standard error	$4,723.72[2]		$ 452.85	$ 64.30	$0.26	$ 32.56	
	Confidence interval[1]			$± 924.72				
	Standard partial			0.82	-0.10	0.24	-0.03	
1955	Statistic	.92**	.85	$ 3,477.96**	$-240.29**	$1.29**	$-61.02	$1,964
	Standard error	$4,596.16[2]		$ 525.38	$ 80.07	$0.46	$ 33.81	
	Confidence interval[1]			$±1,075.98				
	Standard partial			1.11	-0.46	0.31	-0.16	
1956	Statistic	.92**	.85	$ 1,905.84	$ 180.06	$0.80	$ -0.14	$ 643
	Standard error	$4,593.54[2]		$ 1,005.20	$ 186.18	$0.40	$ 33.63	
	Confidence interval[1]			$±2,058.63				
	Standard partial			0.53	0.27	0.19	0.00	
1957	Statistic	.95**	.90	$ 2,768.03*	$ 138.97	$0.01	$ 0.16	$1,488
	Standard error	$3,631.90[2]		$ 996.10	$ 158.16	$0.46	$ 37.00	
	Confidence interval[1]			$±2,071.89				
	Standard partial			0.70	0.26	0.00	0.00	

**Significant at one percent level of probability (F test).
*Significant at five percent level of probability (F test).
[1]Ninety-five percent confidence interval.
[2]Standard error of regression.

the one percent level of probability. The independent variables account for a large percent of the variation in farm sale value, ranging from 83 percent in 1954 to 90 percent in 1957.

The value of an acre of tobacco allotment, although approaching or exceeding $2,000 in each of the four years, is significant only in 1954 at five percent and in 1955 at one percent. The 1954 and 1955 b_1 regression coefficients are thought to be much too high, while the 1956 and 1957 coefficients are more logical but are not significant because of large standard errors. From the confidence intervals for 1956 and 1957, it can be said only that the true value of the b_1 coefficient is plus or minus approximately $2,000.

Many of the regression coefficients cannot be interpreted literally since the variables are highly intercorrelated. For example, the coefficients for 1955 indicate that the value of an acre of allotment is $3,478 and that the value of an acre of cropland is $-245. These coefficients, although significant at the one percent level, are not to be interpreted as absolute figures since the high degree of intercorrelation (r_{12} of .87, Table 8) causes an instability which results in illogical values. The negative b values for cropland and non-cropland, as well as the inconsistent values for tobacco allotment, are believed to be primarily the result of high intercorrelations and secondarily the result of small sample sizes. The large error terms also result from high correlations and inadequate size of samples.

A large percentage of the variation is explained in each of the years in North Carolina, but the regression coefficient for an acre of tobacco allotment is very unstable as a result of strong intercorrelations with

Table 8. Simple Correlation Coefficient Values for Important Variable Relationships, Wilson, Greene, and Pitt Counties, 1954-1957

Coefficient value	1954	1955	1956	1957
r_{12}	.86	.87	.96	.96
r_{13}	.71	.73	.61	.59
r_{1Y}	.89	.87	.91	.95
r_{3Y}	.77	.75	.66	.59

the other value-associated variables. The standard partials rank tobacco allotment first in every year and indicate that cropland is more important than buildings in three of the four years. It is concluded that yearly regressions are unsatisfactory in producing prediction equations that will give accurate values for an acre of tobacco allotment.

Regression Analysis With Years Combined

The model used in the advanced stage of analysis was:

$$Y = a_0 + b_7X_1X_7 + b_8X_1X_8 + b_9X_1X_9 + b_{10}X_1X_{10} + b_2X_2 + b_3X_3 + b_4X_4.$$

This model hypothesizes that the sale value of a farm is a function of acres of tobacco allotment ($X_1X_7 - X_1X_{10}$), acres of cropland (X_2), value of buildings (X_3), and acres of non-cropland (X_4). The continuous variable, acres of tobacco (X_1), is combined with its respective discrete variable for year of sale ($X_7 - X_{10}$) to form the variables $X_1X_7 - X_1X_{10}$. Acres of cropland (X_2), value of buildings (X_3), and acres of non-cropland (X_4) are included in the model independent of the year of sale.

The model attributes any yearly differences in the sale value of farms to the tobacco allotment. Cropland, buildings, and non-cropland are assumed to have a constant influence on farm sale value during the four-year period.

The multiple regressions representing this model were computed by areas. The principal statistical results desired were:

(1) High correlation coefficients (R) and coefficients of determination (R^2) and a significant regression equation which would pass the test of whether one regression with years combined is the same as four regressions representing individual years;

(2) Logical regression coefficients for the value of an acre of tobacco allotment by years (b_7 - b_{10}) and small error terms for these coefficients in comparison with the error terms from the analyses of separate years.

Pittsylvania County

Table 9a presents the statistical results of the multiple regression equation as computed for Pittsylvania County, years combined. Table 9b presents an hypothesis that the combined regression is the same as four yearly regressions, or, stated differently, it presents a test of whether one regression line can be used for the observations in all four years. In accepting the hypothesis at the one percent level, we can say that we are reasonably confident that the regression equation with years combined can be used. The combined regression can be discussed with reasonable assurance that the regression results, if more logical, are

Table 9a. Amount of Variation in Sale Value of Farms Explained by Selected Factors and the Value of an Acre of Tobacco Allotment, Pittsylvania County, Years Combined

$$(Y = a_0 + b_7X_1X_7 + b_8X_1X_8 + b_9X_1X_9 + b_{10}X_1X_{10} + b_2X_2 + b_3X_3 + b_4X_4)$$

	Correlation coef. (R)	Coef. of determination (R^2)	Statistic	Standard error	Confidence interval[1]	Standard partial
Estimation equation	.88**	.77		$3,031.42		
Regression coefficients:						
Acres of tobacco allotment, 1954 (b_7)			$ 962.43**	143.00	$± 282.00	.39
Acres of tobacco allotment, 1955 (b_8)			1,204.74**	175.36	± 345.81	.38
Acres of tobacco allotment, 1956 (b_9)			1,522.51**	162.14	± 319.74	.58
Acres of tobacco allotment, 1957 (b_{10})			1,672.82**	207.96	± 410.10	.45
Acres of cropland (b_2)			22.75	12.34		.09
Value of buildings (b_3)			1.35**	.15		.40
Acres of non-cropland (b_4)			1.36	4.16		.01
Intercept (a_0)			109.71			

Table 9b. Analysis of Variance for Error Terms[2]
Hypothesis: One regression with years combined is the same as four regressions representing individual years

Source of variation	Degrees of freedom	Sum of squares	Mean square[3]	F ratio
Error for combined regression	205	1,883,844,700		
Error for four individual regressions	193	1,804,505,060	9,349,767	.7071[4]
Residual error	12	79,339,640	6,611,637	

** Significant at one percent level of probability (F test).

[1]Ninety-five percent confidence interval.

[2]This analysis of variance technique was taken from: R. L. Anderson, "The Use of Regression Techniques with Economic Data," Proceedings of Auburn Conference on Statistics Applied to Research in the Social Sciences, Plant Sciences, and Animal Sciences, September 7-9, 1948.

[3]In this special analysis of variance technique the residual error mean square is divided by the error mean square for four individual regressions in arriving at the F ratio.

[4]The F ratio is not significant at the one percent level; therefore, we can accept the hypothesis.

a better measure of the true population values than the results of four individual regressions.

The percent of variation in farm sale value explained by the regression equation (R^2 of 77 percent) is identical to the percent of variation explained by three of the four individual yearly regressions. The 23 percent of unexplained variation in farm sale value can be attributed to the heterogeneous nature of the farmland market with its large number of possible value-influencing factors which are not included as variables in this study. The regression equation is significant at the one percent level of probability.

The regression coefficient for an acre of tobacco allotment in each of the four years is significantly different from zero at the one percent level. The value of an acre of allotment logically increases between consecutive years from 1954 to 1957. This increase between years is partially the result of reduction in size of acreage allotments and partially the result of attributing the general rise in farmland values to acres of tobacco allotment in this regression model.

The influence of intercorrelation between acres of tobacco allotment and acres of cropland in 1957 upon the regression coefficient for tobacco allotment in that year has apparently been reduced by combining the years into one regression model. In the combined regression, the coefficient for acres of tobacco allotment in 1957 is logical as well as statistically significant, whereas the 1957 coefficient in the yearly regression is illogical and not significant.

The confidence intervals for an acre of tobacco allotment are narrow enough to make positive statements concerning the value of an acre of

tobacco allotment. We can say that we are 95 percent confident that the true population value for acre of tobacco allotment lies between $680.43 and $1,244.43 in 1954, between $858.93 and $1,550.55 in 1955, between $1,202.77 and $1,842.25 in 1956, and between $1,262.72 and $2,082.92 in 1957. These intervals are approximately one-half the size of the intervals obtained from the individual yearly regressions.

The regression coefficient for value of buildings is significant at the one percent level. The coefficient for buildings is in terms of an adjusted assessed value, therefore, it cannot be interpreted as an absolute value. However, the fact that the coefficient is highly significant indicates that the quantity and quality of residential and farm buildings are given serious consideration in valuing farm property in Pittsylvania County.

Although not significant, acres of cropland and acres of non-cropland have reasonable coefficient values. In view of the fact that approximately 85 percent of the gross agricultural income in Pittsylvania County is derived from the sale of flue-cured tobacco, $22.75 for an acre of cropland and $1.36 for an acre of non-cropland do not seem to be unreasonably low values.

It appears that the combined regression gives a reasonable estimate of the value of an acre of tobacco allotment in each of the years. Logical values for the regression coefficients as well as standard errors of reasonable size are achieved in the combined regression model. This regression analysis is chosen to replace the individual regression analyses in explaining the sale value of farms and the value of an acre of tobacco allotment.

Wilson, Greene, and Pitt Counties

Table 10a contains the statistical results of the multiple regression equation as calculated for Wilson, Greene, and Pitt Counties, years combined. These results are a better measure of the true population values than the results of individual years since we accept the hypothesis in Table 10b at the one percent level.

The coefficient of determination of 83 percent indicates that the variables included are reasonably successful in explaining farm sale value. The 17 percent of unexplained sum of squares is due to the heterogeneous nature of the farmland market with its corn and cotton allotments and other factors possibly associated with farm sale value.

Although significant at the one percent level in all four years, the regression coefficients for an acre of tobacco allotment are unreasonably large in view of the allotment coefficients obtained in Pittsylvania County when the same model is used. The coefficients for an acre of tobacco allotment range from $2,326.88 to $4,036.39 in Wilson, Greene, and Pitt Counties and from $962.43 to $1,672.82 in Pittsylvania County. Known differences in farming and type of tobacco produced in the two areas do not appear important enough to explain the greater values in North Carolina.

Intercorrelation is thought to be the primary cause of the illogical b_2 - b_4 coefficients. In every year but 1954 the simple correlation coefficient between acres of cropland and acres of tobacco allotment (r_{12}) is identical to or greater than the degree of correlation between acres of tobacco allotment and sale value of farms (r_{1Y}) as shown in Table 8,

Table 10a. Amount of Variation in Sale Value of Farms Explained by Selected Factors and the Value of an Acre of Tobacco Allotment, Wilson, Greene, and Pitt Counties, Years Combined

$$(Y = a_0 + b_7X_1X_7 + b_8X_1X_8 + b_9X_1X_9 + b_{10}X_1X_{10} + b_2X_2 + b_3X_3 + b_4X_4)$$

	Correlation coef. (R)	Coef. of determination (R^2)	Statistic	Standard error	Confidence interval[1]	Standard partial
Estimation equation	.91**	.83		$4,509.43		
Regression coefficients:						
Acres of tobacco allotment, 1954 (b_7)			$2,326.88**	274.53	$± 543.84	.89
Acres of tobacco allotment, 1955 (b_8)			2,903.71**	292.75	± 579.94	.92
Acres of tobacco allotment, 1956 (b_9)			3,271.99**	317.22	± 628.41	.92
Acres of tobacco allotment, 1957 (b_{10})			4,036.39**	408.33	± 808.90	.79
Acres of cropland (b_2)			-67.41*	43.96		-.06
Value of buildings (b_3)			.58**	.17		.18
Acres of non-cropland (b_4)			-14.48	16.90		-.04
Intercept (a_0)			1,270.51			

Table 10b. Analysis of Variance from Error Terms[2]
Hyp: One regression with years combined is the same as four regressions representing individual years

Source of variation	Degrees of freedom	Sum of squares	Mean square[3]	F ratio
Error for combined regression	121	2,460,530,000		
Error for four individual regressions	109	2,172,133,800	19,927,833	1.2060[4]
Residual error	12	288,396,200	24,033,017	

**Significant at one percent level of probability (F test).
*Significant at five percent level of probability (F test).
[1]Ninety-five percent confidence interval.
[2]Technique taken from R. L. Anderson, op. cit.
[3]In this special analysis of variance technique the residual error mean square is divided by the error mean square for four individual regressions in arriving at the F ratio.
[4]The F ratio is not significant at the one percent level; therefore, we can accept the hypothesis.

page 81. The effects of intercorrelation, also extending to acres of non-cropland, are apparently so overwhelming that the coefficient for acres of tobacco allotment, the strongest of these three highly intercorrelated variables, has depleted the coefficient values for cropland and non-cropland to such an extent that they have assumed negative signs. These unstable results led to an adjustment of the model for the North Carolina data.

Table 11a presents the results of the regression equation for Wilson, Greene, and Pitt Counties with cropland and non-cropland eliminated. These two independent variables are excluded since their effect upon farm sale value cannot be adequately separated from their association with acres of tobacco allotment. Table 11b presents an analysis of variance which indicates that one regression with years combined and without X_2 and X_4 is a better measure than four regressions by individual years with X_2 and X_4 included.

The R^2 in Table 11a is the same as the R^2 in Table 10a; that is, the deletion of the cropland and non-cropland variables only reduces the explained sum-of-squares slightly--so slightly that the reduction is not apparent after the numbers are rounded to two decimal places.

Regression coefficient values for an acre of allotment are reduced by approximately $500 to $700 by the deletion of the highly intercorrelated variables of cropland and non-cropland. The slight increase in the coefficient for buildings is evidence that there is little association between buildings and the deleted variables.

Table 11a. Amount of Variation in Sale Value of Farms Explained by Selected Factors and the Value of an Acre of Tobacco Allotment, Wilson, Greene, and Pitt Counties, Years Combined

$$(Y = a_0 + b_7X_1X_7 + b_8X_1X_8 + b_9X_1X_9 + b_{10}X_1X_{10} + b_3X_3)$$

	Correlation coef. (R)	Coef. of determination (R^2)	Statistic	Standard error	Confidence interval[1]	Standard partial
Estimation equation	.91**	.83		$4,562.60		
Regression coefficients:						
Acres of tobacco allotment, 1954 (b_7)			$1,835.97**	159.27	± 315.51	.70
Acres of tobacco allotment, 1955 (b_8)			2,372.57**	165.96	± 328.77	.75
Acres of tobacco allotment, 1956 (b_9)			2,696.69**	184.56	± 365.61	.76
Acres of tobacco allotment, 1957 (b_{10})			3,327.81**	250.85	± 496.93	.65
Value of buildings (b_3)			.62**	.17		.19
Intercept (a_0)			1,228.30			

Table 11b. Analysis of Variance for Error Terms[2]
Hypothesis: One regression with years combined is the same as four regressions representing individual years[3]

Source of variation	Degrees of freedom	Sum of squares	Mean square[4]	F ratio
Error for combined regression	123	2,560,529,000		
Error for four individual regressions	109	2,172,133,800	19,927,833	1.3921[5]
Residual error	14	388,395,200	27,742,514	

**Significant at one percent level of probability (F test).

[1]Ninety-five percent confidence interval.

[2]Technique taken from R. L. Anderson, op. cit.

[3]X_2 and X_4 are included in the individual regression but not in this combined regression.

[4]In this special analysis of variance technique the residual error mean square is divided by the error mean square for four individual regressions in arriving at the F ratio.

[5]The F ratio is not significant at the one percent level; therefore, we can accept the hypothesis.

The regression coefficients for an acre of tobacco allotment increase from 1954 to 1957 as expected. These coefficient values do not measure the value of an acre of tobacco allotment as the right to produce since they now include the cropland and non-cropland value which is associated with tobacco allotment. This result is the best obtainable under the existing conditions of intercorrelation.

After combining years and deleting X_2 and X_4, it is possible from the confidence intervals to make positive statements concerning the value of an acre of tobacco allotment (with its included cropland and non-cropland values). Using 1954 as an example, for the individual yearly regression, the value of an acre of tobacco allotment is $1,959.66 $\pm$ 924.72 (Table 8, page 81); for the combined regression with X_2 and X_4 included, the value is $2,326.88 $\pm$ 543.84 (Table 10a, page 87); and for the combined regression with X_2 and X_4 excluded, the value is $1,835.97 $\pm$ 315.51 (Table 11a, page 89). This trend toward narrower confidence intervals holds true in every year.

The regression coefficient for value of buildings is significant at the one percent level as are the tobacco allotment coefficients in each year. The buildings are less important in Wilson, Greene, and Pitt Counties (coefficient of $0.62) than in Pittsylvania County (coefficient of $1.35); however, this is expected since a higher percentage of the farms in Pittsylvania County were thought to be purchased by those who expected to reside personally on the farms.[1]

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[1]See footnote on page 66 of text.

The combined regression equation which proved successful in Pittsylvania County is not adequate in Wilson, Greene, and Pitt Counties because of high intercorrelations resulting in negative coefficients for cropland an non-cropland. After these two coefficients are eliminated, the regression equation explains virtually the same percentage of sale value variation, and the coefficients for an acre of tobacco allotment in each year are more logical and have narrower confidence intervals. Although the regression coefficients for tobacco allotment in each year include some of the value which should be attributed to cropland and non-cropland, it is believed that these coefficient values are uniformly larger than the true values for an acre of allotment as the right to produce.

Comparison of Tobacco Allotment Coefficients with the Allotment Reductions and the General Rise in Land Values

When the 1954 regression coefficient for an acre of tobacco allotment as derived in the regression analysis with years combined was adjusted for reductions in acreage allotments and for the general rise in farmland values, the resulting value should approximate the 1957 regression coefficient for the value of an acre of tobacco allotment. If allotments are capitalized into farmland values to a high degree as hypothesized in this study, a farm which sold for a certain price in 1954 should bring approximately the same price in 1957 after allotments had been reduced

by approximately 33 percent[1] (assuming no rise in farmland values); that is, the value of an acre of tobacco allotment should increase as allotted acreages are reduced by the program. In addition, the rise in farmland values from 1954 to 1957 (18 percent in Virginia and 16 percent in North Carolina)[2] must be added to the 1954 coefficients to arrive at a value to compare with the 1957 coefficients, since the regression model attributed yearly differences in the sale value of farms to the tobacco allotment.

Table 12 presents a comparison of the 1957 tobacco allotment coefficients for Virginia and North Carolina with their respective 1954 regression coefficients adjusted to the 1957 level. The disparities between coefficient values of an acre of tobacco allotment in 1957 and the adjusted value as determined from the 1954 coefficients amounted to only $-19.32, or one percent, in Pittsylvania County and $+154.51, or five percent, in Wilson, Greene, and Pitt Counties.

From these results, it is apparent that the model with years combined was successful in producing coefficients for an acre of tobacco allotment in each area[3] which reflect the tobacco acreage cuts between 1954 and 1957 and the general rise in farmland prices. Because the coefficients increase in a logical manner over the four-year period, confidence in these estimates of the value of an acre of tobacco allotment in both Virginia and North Carolina is greatly strengthened.

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[1]Acreage allotment reductions of 5, 12, and 20 percent from 1954 to 1957 constitute a cumulative allotment reduction of 33 percent.

[2]Current Developments in the Farm Real Estate Market, op. cit., p. 30.

[3]In Wilson, Greene, and Pitt Counties the allotment coefficient values include the associated cropland and non-cropland values.

Table 12. Comparison of Tobacco Allotment Coefficients with the Allotment Reductions and the General Rise in Land Values, Virginia and North Carolina, 1954-1957

	Pittsylvania County	Wilson, Greene, and Pitt Counties
1954 regression coefficient for an acre of tobacco allotment	$ 962.43[1]	$1,835.97[2]
Times adjustment for acreage reduction from 1954 to 1957	1.49[3]	1.49[3]
1957 value of an acre of tobacco allotment adjusted for acreage reduction	$1,434.02	$2,735.60
Times adjustment for general rise in land values from 1954 to 1957	1.18[4]	1.16[5]
1957 value of an acre of tobacco allotment determined by adjusting the 1954 regression coefficient value for acreage reduction and general rise in land values	$1,692.14	$3,173.30
1957 regression coefficient for an acre of tobacco allotment	$1,672.82[1]	$3,327.81[2]
Difference	$ -19.32	$ +154.51

[1]Coefficients from Table 9a, page 83.

[2]Coefficients from Table 11a, page 89, including cropland and non-cropland values associated with an acre of tobacco allotment.

[3]Adjustment for 33 percent reduction.

[4]Adjustment for 18 percent increase.

[5]Adjustment for 16 percent increase.

SUMMARY AND CONCLUSIONS

Although agricultural commodities are sold in a market generally characterized by relatively complete knowledge of the demand-supply situation, land is sold in a market characterized by a less perfect knowledge. This study is designed to add to our knowledge concerning the pricing of the land used for flue-cured tobacco production under the present conditions of supply regulation through acreage allotments attached to the land in the governmental price support program. This knowledge is needed by buyers, sellers, borrowers, lenders, renters, and other evaluators in making their decisions concerning farmland having a tobacco allotment. These decisions are made to allocate land resources to flue-cured tobacco production, and, if they vary from the marginal productivity of the land, a misuse of the individual's and society's resources results. In addition this knowledge is needed by those vitally concerned with the effective functioning of the tobacco program because, if the benefits of the program are capitalized into land values to a significant degree as hypothesized in this study, the program objective of increasing incomes would be defeated through either higher land costs or increased rents.

Pittsylvania County, Virginia, and Wilson, Greene, and Pitt Counties, North Carolina, were selected to represent the specialized flue-cured tobacco-producing regions respectively known as the Old and the New Belt. In both Virginia and North Carolina the data for the four-year period selected for this study (December 1, 1953 - November 30, 1957) were secured entirely from public records. The deed books were the source of farm

transactions from which the sale value, the farmland acreage, and other pertinent information were obtained. These transactions were edited to eliminate all except bona fide farm sales which in turn, were located in the land books to secure an assessed value of buildings. After these data were secured, the farms were located in the Agricultural Stabilization Conservation records where the acres of tobacco allotment and acres of cropland were secured.

The multiple regression statistical technique was used in analyzing the data so that statistical coefficients measuring the change in the sale value of farms associated with a per-acre change in tobacco allotment in each year could be obtained while values for an acre of cropland, a unit of buildings, and an acre of non-cropland were held constant at their averages. In the preliminary phase of analysis a number of single variable regressions were computed for the 1957 Pittsylvania County data to determine some of the important relationships between the independent variables chosen for use in the multiple regression analysis and the sale value of farm.

The initial phase of multiple regression analysis consisted of the computation of a number of yearly regressions using the sale value of farms as the dependent variable and acres of tobacco allotment, acres of cropland, value of buildings, and acres of non-cropland as the independent variables. These regressions explained a high percentage of the variation in the sale value of farms in both areas for every year, but the regression coefficients for an acre of tobacco allotment illogically decreased from 1956 to 1957 in Pittsylvania County, and the allotment coefficients for Wilson, Greene, and Pitt Counties were inconsistent between years.

In an effort to improve these results, the years were combined into one regression model that attributed yearly differences in the sale value of farm to acres of tobacco allotment. The tobacco allotment coefficients, as expected from the reduction in allotments and the general rise in farmland values, increased from 1954 to 1957 in each area. This combined regression analysis for Pittsylvania County resulted in confidence intervals for an acre of tobacco allotment in each year of approximately half the size obtained from the yearly regressions. In Pittsylvania County reasonable coefficient values were obtained for cropland, buildings, and non-cropland, but in Wilson, Greene, and Pitt Counties negative coefficient values were obtained for cropland and non-cropland. Large simple correlation coefficients, between the independent variables involved, indicated a high degree of intercorrelation causing an unstable relationship in which the coefficient value for an acre of tobacco allotment virtually "swallowed up" the coefficient values of cropland and non-cropland. Therefore, cropland and non-cropland were dropped from the model in analyzing the North Carolina data. In the resulting equation an acre of tobacco allotment had smaller coefficient values with narrower confidence intervals, but these coefficient values now included the cropland and non-cropland values associated with an acre of tobacco allotment.

The values for an acre of tobacco allotment in Pittsylvania County were $962.43, $1,204.74, $1,522.51, and $1,672.82 for 1954 to 1957, respectively, in the final regression equation (Table 9a, page 83). This equation explained a significant 77 percent of the variation in farm sale value. The values for an acre of tobacco allotment (including the associated cropland and non-cropland values) in Wilson, Greene, and Pitt Counties were

$1,835.97, $2,373.57, $2,696.69, and $3,327.81 for 1954 to 1957, respectively, in the final regression equation (Table 11a, page 89). A significant 83 percent of the variation was explained by this equation.

From a comparison of the tobacco acreage allotment coefficients with the reduction in acreage allotments and the general rise in farmland values, it was apparent that the regression coefficients for an acre of tobacco allotment accurately measured the expected increase in the value of an acre of tobacco allotment during the four-year period.

This study showed that the increase in prices and incomes resulting from the governmental price support program for flue-cured tobacco was capitalized into land values to an appreciable degree. Those persons wanting to start into tobacco farming and those persons wanting to purchase additional land to increase small allotments are discouraged from so doing by the market price for an acre of tobacco allotment which includes the capitalized future benefits from the tobacco program. The present owners, as opposed to tenants and future owners, are the primary beneficiaries of the program since they control the land factor. The program for flue-cured tobacco has not been successful in raising the incomes for tobacco producers with other than ownership tenure status; therefore, the program needs to be amended to attain its intended objective--that of increasing incomes to producers in an equitable manner.

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ABSTRACT

The problem considered in this study arose from the need for an empirical analysis of the sale value of land to determine if the increased price benefits of the governmental flue-cured tobacco program have been absorbed by higher land rents. If acreage allotments giving the right to produce tobacco under the program are capitalized into farmland values to an appreciable extent, the program objective of increasing farm incomes would be partially defeated through higher rents. The objective of this study was to determine the extent to which allotments have been capitalized into land values.

Data on sale value of farms and factors expected to influence the farm sale value were secured from primary public record sources for the four-year period from 1954 to 1957 in two distinctly different flue-cured tobacco regions--Pittsylvania County, Virginia, and Wilson, Greene, and Pitt Counties, North Carolina. These data were analyzed by a multiple regression statistical technique designed to measure the value of an acre of tobacco allotment as a right to produce. The statistical coefficients indicated that an acre of tobacco allotment increased in value from $962 in 1954 to $1,673 in 1957 for Pittsylvania County and from $1,836 to $3,328 for Wilson, Greene, and Pitt Counties.[1]

The size of the values for an acre of tobacco allotment as well as the increase in values over the four-year period during which allotments were reduced under the program by 33 percent indicate that an appreciable proportion of the price-raising benefits of the program have been capitalized into land values.

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[1] In Wilson, Greene, and Pitt counties the allotment coefficients include the associated cropland and non-cropland values.