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Implications of Watershed Development on Land value & Landowner attitudes

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Implications of Watershed Development on Land Value and Landowner Attitudes

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RESPONSIBILITY FOR DEVELOPMENT of the nation's water resources has rested primarily with the Federal Government. In 1902 an appropriation of $75,000 was provided to "remove snags, sawyers, planters, and other impediment of that nature" from the Ohio and Mississippi rivers.[1]

Federal interest in the flood control problems of the United States also resulted in an 1892 appropriation for $4 million for work in the Mississippi River Valley. From this beginning, a series of acts was passed by Congress authorizing flood control projects.

In a 1936 Flood Control Bill, the Soil Conservation Service of the U.S. Department of Agriculture was authorized to implement soil erosion retardation activities. Erosion was the primary concern for the Soil Conservation Service until the Watershed Protection and Flood Prevention Act of 1954 was passed. This Act, Public Law 566, consolidated national efforts to reduce flood damage in localized areas. It made it possible for state and local soil and water conservation districts, counties, or municipalities to obtain Federal technical and financial assistance for small watershed projects for flood prevention and related water management purposes.

Watershed activity in Alabama under P.L. 566 began in 1955. By 1974 there were 71 approved watershed applications in the State. Objectives of the various development projects include:

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[1] HAVEMAN, ROBERT H. 1965. Water Resource Investment and the Public Interest. Vanderbilt Univ. Press. Nashville, Tenn.

land treatment, flood prevention, drainage, irrigation, municipal and industrial water supplies, recreation, water storage for quality management, and critical area stabilization.[2]

Eight projects have been completed since 1955, all of which were planned and initiated prior to the passage of the National Environmental Policy Act of 1969 and before revision of the principles and standards for project evaluation by Federal agencies. Thus, questions have been raised regarding the relative merit of many older projects. In this respect a reevaluation of selected projects was begun to determine if they fulfilled the intended objectives and if the same project would be justifiable under more rigorous standards.

Each completed project in Alabama has been reviewed on a regular basis for evaluation of technical standards. However, it was felt that a more comprehensive examination is needed to answer the questions raised above.

The Cheaha Creek Watershed in Talladega County, Alabama, was one watershed selected for review. This particular watershed project was initiated in 1962 and essentially completed in 1972. Although land treatment work was continuing when this report was prepared, data on all phases of activity in the watershed were available.

The Cheaha Creek drainage area includes a small area in Cleburne and Clay counties, but most of the watershed's 72,934 acres is in Talladega County. In fact, the drainage basin encompasses approximately 15 percent of the total Talladega County area. Principal agricultural enterprises in the basin included soybeans, cotton, and beef cattle. There was a small amount of agricultural and forest industry in the mountainous region of the watershed, but most of the bottom lands were devoted to crop and livestock farming at the time of this study. The soils of the floodplain are primarily a silty clay loam, excellent for many types of agriculture.

The primary objective of the Cheaha Watershed Project was flood protection. Land treatment (planting vegetation, rotating crops, and constructing conservation devices such as grassed waterways) was a goal proposed to assist in flood prevention. The project was sponsored by the Cheaha Creek Watershed Conservancy District, the Talladega County Soil and Water Conser-

[2] U.S. Department of Agriculture, Soil Conservation Service. Alabama Watershed Progress Report, January 1974. Texas Govt. Print. Off. Fort Worth, Texas.

vation District, and the Talladega County Commission. Federal funds accounted for approximately 80 percent of the construction costs.

Several factors must be considered in measuring the benefits and detriments of a watershed development project. Normally, costs or detriments are much more directly allocable than project benefits. Estimated construction costs of the various structures and improvements in the Cheaha Creek Project, according to USDA Soil Conservation Service State Office, Auburn, Alabama, are listed below by years:

Year	*Expenditure*
1965	$ 82,899
1966	222,117
1967	204,655
1968	119,179
1969	221,988
1970	299,462
1971	2,863
1972	7,415
TOTAL[1]	$1,160,578

[1] Estimated total project cost as of January 1974 equalled $2,228,671. Costs for flood retention structures totaled $1,214,690 in 1974.

Development of the project was estimated to have only limited effects on the county economy.[3] However, since the development was concentrated in one small segment of the county, perhaps the more relevant questions are: What has been the effect on land and people within the watershed itself? How did project benefits compare with total costs in terms of the watershed proper?

Two measures of project benefits in all developments of this nature are the changes in land use and land value resulting from the project. When an area previously subject to frequent flooding is relieved of that problem, land uses often change to more intensive activities. Land values may rise at the same time. This report presents an analysis of land use and land value changes resulting from the Cheaha Creek Watershed development project.

OBJECTIVES AND PROCEDURE

The overall objective of this research was to evaluate the Cheaha Creek Watershed project developed under Public Law 566. Specific objectives were to:

[3] PEPPER, RUFUS DAVIS AND HOWARD A. CLONTS. 1974. The Economy of Talladega County, Alabama: An Input-Output Analysis with Special Reference to Effects of Watershed Development. Auburn Univ. (Ala.) Agr. Exp. St. Bull. 453.

(1) Describe the present attitudes of watershed landowners towards the watershed development.

(2) Describe land use changes in the watershed area.

(3) Estimate the change in land value resulting from watershed development.

A survey of landowners in Talladega County was conducted to obtain data necessary to achieve study objectives. Research interest in watershed activities was centered primarily on agricultural and residential uses rather than commercial forest or recreational uses associated with corporate and government ownership. The latter land uses were excluded from the analysis because such owners would not be expected to initiate intensification of land uses.

Land tracts in the watershed were divided into two major groups – floodplain and upland. Within each major group, parcels were further divided into farms over 100 acres and farms under 100 acres. The larger parcels were divided into general farms, with cotton, soybeans, and beef cattle, and livestock farms producing only beef cattle, Table 1. Forty-nine parcels that contained under 100 acres each and accounted for a total of 2,900 acres in the watershed were not used in the analysis because most of the landowners utilized their holdings only as home sites. These respondents reported they did not depend on farm revenue as a major source of income. Owners in this group participated mainly in "home use" types of agricultural activities such as gardens and

TABLE 1. SELECTED DATA ON GENERAL FARMS AND LIVESTOCK FARMS IN THE CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Average per farm	
	Floodplain	Upland
General farms		
Total land area, acres	542	270
Pastureland, acres[1]	100	56
Beef cattle, head	30	22
Cotton, acres	95	12
Soybeans, acres	135	157
Woodland, acres[1]	185	45
Livestock farms		
Total land area, acres	270	393
Pastureland, acres[1]	192	210
Beef cattle, head	58	63
Woodland, acres[1]	77	183

[1] Some double counting of acreages resulted from farmers' practice of treating grazed woodland as both woods and pasture.

cattle for personal consumption. Average size of the omitted tracts was 59 acres.

Tracts in the total sample accounted for 28 percent of the 72,934-acre watershed in Talladega County. The remaining 52,829 acres included 24,600 acres in government ownership and 20,964 acres divided among 16 large corporate holdings. Most of the latter land was devoted to commercial forest use. Approximately 7,265 acres were in farms which were not surveyed. These included holdings by absentee landowners, rural non-farm residents, and a few respondents who chose not to cooperate with interviewers.

Many full-time farmers in the watershed area rented or leased additional acres to expand their enterprises. Cotton and soybeans dominated the crops produced on leased acres. Pasture rental was also common in the region.

The survey of farmers in the watershed during June 1973 was used to collect data on farm production, equipment, land value, land use changes, and attitudes toward the watershed program. The complete population of landowners in the floodplain area was interviewed because of the greater impact of watershed activities on this group, and because of the small number (42) of cooperating landowners. A 50-percent sample of the 106 landowners was taken in the upland area of the watershed. This sample size was believed sufficient since the latter group was less directly affected by watershed development.

Linear programming was used to estimate returns to land, labor, capital, and management for an optimum organization of a typical farm in each watershed group. Enterprise budgets showing average inputs and outputs were used to derive a net return per enterprise, which was then used in the linear programming model to estimate returns to the fixed resources, Appendix Tables 1-21. From the residual returns to land, a capitalized value for land was derived. This value was compared with a computed 1962 land value for the general floodplain farms. The 1962 value was estimated using USDA Soil Conservation Service data on land use and crop yields in the Cheaha Watershed compiled in a preproject survey. These data were analyzed on the basis of 1973 average prices to derive values for comparison with the 1973 estimate. In addition to the comparison, alternate enterprise combinations were considered to depict changes in economic rent as affected by differences in net farm income.

GENERAL ASSUMPTIONS

Certain general assumptions were made to calculate net farm income and economic rent. These assumptions concerned prices and yields of both product and input items.

Production data. Production data came from the survey questionnaire. Averages of inputs and outputs for each type of farm enterprise were calculated to establish a typical farm situation. These data comprised the enterprise budgets necessary for linear programming.

Prices. Prices of inputs and outputs on the typical farms were calculated using an average of annual Alabama prices during 1970-73[4]. The 4-year averages were used to eliminate any bias in current price trends, and thus to develop more "normal" price relationships, Table 2.

Interest rates. Interest rates used for income capitalization and interest on operating capital were assumed to be 7.5 percent, the prevailing interest rate in 1973.

Labor. Labor was assumed available in the watershed area for $1.75 per hour. Farm operators were assumed to work 2,500 hours per year. Opportunity cost for operator's labor, estimated to be $2.50 per hour, represented the income an operator could earn if he worked off the farm. Wages of this level were available in nearby textile mills and other industrial installations.

Management. Returns to management were estimated at 5 percent of gross farm income. These returns account for the management fee required to operate a farm. A fee of 5 percent is representative of fees charged by professional farm managers in Alabama.

Property taxes. Real property assessed values for tax purposes in Talladega County, Alabama, varied from approximately $5.00 to $8.00 per acre in 1973. Using a tax rate of 30 mills and an assumed assessed value of $7.50 per acre, taxes averaged $0.23 per acre. Variations in taxes were attributed to differences in assessments of the property's fair market value.

The above assumptions provided the basis for calculating net farm income and economic rent. Once established, economic rent can be capitalized to estimate a value for land using the income

[4] U.S. Department of Agriculture, Statistical Reporting Service, Agricultural Prices.

TABLE 2. ESTIMATED PRODUCT AND INPUT PRICES, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Price/unit
	Dol.
Products	
Corn, bushels	1 .35
Cotton lint, pounds	.41
Cottonseed, tons	51.00
Soybeans, bushels	4.00
Feeder calves, hundredweight	42.00
Cull cows, hundredweight	22.00
Cull bull, hundredweight	26.00
Feeder pigs, hundredweight	25.00
Cull sows, hundredweight	18.00
Cull boars, hundredweight	14.00
Inputs	
Seed	
Corn, pounds	.37
Cotton, hundredweight	18.50
Soybeans, bushels	6.40
Fertilizer	
0-20-20, hundredweight	3.00
5-20-20, hundredweight	3.08
13-13-13, hundredweight	3.40
Ammonium nitrate, hundredweight	3.71
Lime—custom spread, tons	8.00
Insecticides, applications	1.71
Defoliants, applications	1.80
Herbicides—pre-emerge & post-emerge, applications	7.50
Fungicides, applications	4.50
Ginning, bales	16.96
Corn—processed, tons	76.80
Coastal bermudagrass hay, tons	34.00
Mineral supplement, hundredweight	3.67
Protein supplement, tons	110.00
Veterinary expenses, head	1.50
Leased cotton allotment, pounds	.10
Labor, hours	1.75

Source: Prices were derived from local markets in the Cheaha Watershed area.

capitalization approach. The mathematical equation for this procedure is:

$$V = \frac{a_1}{(1+r)} + \frac{a_2}{(1+r)^2} + \frac{a_3}{(1+r)^3} + \frac{a_n}{(1+r)^n},$$

where V = value of the property
a = average annual economic rent
r = capitalization interest rate

The value for "a" was calculated from net farm income, and the value of "r" was assumed to be equal to the prevailing first mortgage interest rate at the time of the study. The income capitalization approach to land value assumes that the market value

of the property equals the sum of all future economic rents, discounted back to the present.[5]

The above equation represents the geometrical progression which may be reduced to $V = \frac{a}{r}$ provided that land use, income, and interest rates may reasonably be expected to remain unchanged during the planning horizon.[6] The degree attained was directly related to the accuracy of the estimate of economic rent, especially for future periods.

ANALYSIS OF RESULTS

Data collected during the survey were used to complete the objectives of describing landowners' attitudes toward watershed development, describing land use changes, and estimating land value. These objectives were phrased as questions to be answered by the study: Did the landowners support initial watershed development and what are their present attitudes towards the development? Did watershed activities influence land use changes? In other words, did the lack of flooding intensify farm production in the floodplain area? Finally, with flood protection and land stabilization practices in effect, have land values in the area increased? In answering these questions, this study was not concerned with defending or rejecting watershed activities. Rather, the purpose was an objective evaluation of the watershed's effect on the farmlands and farm operators in the area and, indirectly, on citizens of surrounding areas.

Attitudes

All land areas from which water drains into Cheaha Creek compose the Cheaha Creek Watershed. Landowners in the watershed were divided into the two basic groups—floodplain and upland—as explained earlier. The area within the watershed once

[5] BARLOWE, RALEIGH. 1972. Land Resource Economics. Prentice-Hall, Inc. Englewood Cliffs, N.J. 2nd ed. pp. 316-317.

[6] If economic rent ("a") is expected to change in the future, the equation may be modified to: $V = \frac{a}{r} \pm \frac{i}{r^2}$

where a = average economic rent currently received
i = annual increment of increased or decreased economic rent predicted in the future
r = capitalization rate

subject to flooding was designated as the floodplain, and the area free of periodic floods was designated as upland. This stratification was important because of vast differences in watershed activities in the two areas. Floodplain landowners were more directly affected by floods prior to the watershed's development. Watershed development not only protected a farmer's land from flooding, but Federal funds allocated for land stabilization assisted the landowner in better utilizing his resources. Floodplain owners who received benefits granted channel construction rights through their property. In addition, landowners had to bear a small portion of the cost resulting from construction of flood retarding structures.

Upland landowners did not directly reap the benefits of flood protection, but funds were allocated to this group for land stabilization. A portion of the direct benefits of the development did go to upland landowners, however, and without their having to share in the direct costs.

Criticisms have been directed towards watershed development by various individuals and groups on nearly all aspects of the program. Any evaluation of the attitudes or criticisms of the Cheaha Creek Watershed requires consideration of opinions of the landowners and farm operators directly affected by the project. Landowners and operators received the benefits and experienced the site problems associated with the project. Therefore, they were the logical persons with whom to begin an evaluation of watershed programs.

Several questions were presented to the landowners to ascertain attitudes towards the watershed project. The questions were designed to obtain an expression of the landowner's personal opinion. After an initial discussion to orient landowners toward discussing the watershed, the first question asked was: Did you initially support the watershed program? Response to this question strongly indicated that landowners in both the floodplain and upland areas initially favored watershed development. Eighty-five percent of the landowners responding in the floodplain and 81 percent in the upland area replied they favored the project. Fifteen percent of the floodplain and 19 percent of the upland owners gave a neutral or negative answer. Initial support by the landowners suggested that needs for watershed development existed, and that individual property holders favored such a program.

Concern over environmental damages resulting from watershed development was eased by the response of landowners to questions on environmental damages. Approximately 94 percent of the floodplain and 89 percent of the upland landowners indicated no environmental damage had occurred since the watershed project began. Damages they reported consisted mainly of vegetation loss along creek banks and excess erosion of the stream channel sides. Landowners in the directly related floodplain area reported less environmental damage than did owners in the upland.

Several landowners expressed dissatisfaction with the watershed project because of occurrences after construction was completed. Most of the negative responses centered on problems such as overly deep channels which presented stream crossing problems for livestock and vehicles, fences which were not properly replaced, and loose sediment on channel bottoms which was dangerous for livestock. Although problems were expressed, 71 percent of the floodplain and 79 percent of the upland respondents were satisfied or highly satisfied with the project. The remaining respondents were undecided or dissatisfied.[7]

Although the project was generally satisfactory to those responding, problems have arisen which should be corrected on future projects. Most of the problems were similar to those listed above. Twenty-eight percent of the respondents in the floodplain and 16 percent in the upland had some objections to the project.

Landowners were queried on whether they thought selected watershed activities should be expanded into other areas outside the floodplain. The response was 70 percent of the upland owners and 44 percent of the floodplain owners favoring expansion. Evidently owners outside the immediate floodplain felt they could benefit substantially from the types of programs enacted in the floodplain. Residents and owners of land in the previously flooded lowlands could see no justification for expenditures in the upland area if floods were not a problem.

Concerning who should pay for the project, 77 percent of the floodplain and 68 percent of the upland landowners said Federal funds should be used. Several landowners in the upland area believed landowners in the floodplain should finance the project since they were directly affected by the development.

Conversely, when asked who should have access to lakes

[7] A five-part attitude ranking scale was used to record responses. Answers ranged from highly dissatisfied to highly satisfied. Respondents made their own distinction between answers.

formed by the watershed dams, 90 percent of the landowners in the upland replied "the general public." On the other hand, only 38 percent of the floodplain owners thought the public should have access to the lakes. Individual landowners closely associated with the lakes wanted them to remain private, and landowners not directly associated with the lakes and who did not have access wanted public use.

Land Use Changes

A pre-project survey of Cheaha landowners, conducted by SCS in 1962, covered approximately one-third of the total 4,341 acres in Cheaha Watershed subject to flood damage. Study results revealed rather limited plans by landowners for land use changes. Interviews with 24 farm operators indicated plans for conversion of 68 acres of forest and idle land to pasture and a shift of 27 acres of pasture to cropland.

Types of actual land use changes between 1962 and 1972 varied among floodplain and upland farms, Table 3. Changes in the potential for flooding appeared to be a major factor in many land use decisions on floodplain farms. Since upland areas did not have pre-project flooding, causes for change were not so obvious.

Upland farmers produced more beef cattle than did floodplain farmers as evidenced by the change of 335 acres from cropland to pastureland. A shift to upland pastures was logical because

TABLE 3. LAND USE CHANGES ON FLOODPLAIN AND UPLAND FARMS SURVEYED IN THE CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1962-72[1]

Land use changes	Acreage changed	
	Floodplain	Upland
	Acres	*Acres*
Cropland to pastureland	225	335
Pastureland to cropland	382	0
Pastureland to woodland	0	14
Woodland to other uses	65	0
Woodland to cropland	0	0
Woodland to pastureland	36	236
Cropland to other uses	216	7
Pastureland to other uses	8	0
Cropland to woodland	0	0

[1] These data reflect the changes accounted for on farms included in the survey of Talladega County. Some land use shifts from cropland or pasture to woodland were missing from these data. Nearly all of the acreage in Cheaha Watershed omitted in this study was devoted to forest use. As land owned by government or some of the large timber corporations became available for use changes, a large proportion was planted for commercial pine forests. This fact is not reflected in the data.

lands outside the fertile bottom acres were less suitable for crop production. With bottom lands free of floods, the more productive areas were farmed more intensively. Owners with acreage in both areas were leaders in the land use shifts reported. Land use changes in the floodplain were both from pastureland to cropland and vice versa. Both changes were practical because the floodplain land has the capability of producing either crops or pasture. The change from woodland to pastureland in both areas indicated the current trends toward increases in beef cattle production in this area. Nearly all changes indicated additional land was being brought into more concentrated production. Cotton, soybeans, and beef cattle dominated the enterprises of the county, and reported changes substantiate this dominance.

Both groups of landowners considered current price trends and labor costs as the reasons for current land use. Higher prices of agricultural products increased the desire of farm operators to concentrate production. While concentrating production, labor costs have soared; therefore, farmers sought enterprises which required less labor, such as beef cattle. Several farmers in the area were willing to hire necessary labor and adopt technological changes to profitably produce row crops. These farmers generally leased additional cropland to expand production. Row-crop farmers avoided excess labor costs by investing in modern machinery. Farmers who leased cropland to other operators produced mainly beef cattle on a part-time basis while earning income from the leased acreage.

Soybeans were the dominant row crop produced in the area, with cotton second. Soybean production increased in response to higher prices in 1973-74 and because of the near totally automated production techniques which decreased labor costs. The bottom land in the floodplain area is excellent for soybean production. The soil's silt loam texture, coupled with a high level of moisture, allowed farmers to produce high average yields at a minimum cost.

The response of landowners to questions about land use changes did not reflect radical shifts in land use because of the watershed project. At least two reasons accounted for this. First, a "wait-and-see" attitude prevailed during the time of the survey. Landowners had seen that the project might work in a period of unusually heavy rain in 1970. However, most channels and structures were not fully operational at that time. Further extensive

rains in 1973 demonstrated adequate flood retention by the project. Yet most farm operators were still cautious about making large scale resource commitments at the time of the survey. Second, land use conversion is a slow process. Instant changes were not expected. Although no specific questions were asked about anticipated land uses, most farmers expressed optimism that crop prices would be such that they could take advantage of the now available flood-free lands. Thus, while extensive changes had not occurred in 1973, they were anticipated.

Land Value

A third objective of research in Talladega County was to estimate land values in the Cheaha Creek Watershed. One primary benefit attributed to watershed projects in pre-project evaluation was an increase in land value.[8] Value increases were assumed to result from flood protection and land stabilization practices. To evaluate this particular benefit, changes in land values resulting from the development were estimated. These estimates were compared with actual sale values of property in the area and with property value estimates in 1962, the year prior to initiation of development. In addition, alternative combinations of enterprises, prices, and acreage designations were analyzed to determine the actual causes for land value changes.

Linear Programming Analysis

Linear programming is a budgetary technique that can be used to determine optimum operating conditions under various kinds of imposed restrictions. As mentioned earlier, farms in both the floodplain and upland areas were divided into general farms and livestock farms. Each of the four farm situations was analyzed separately. Basic farm data used in initial linear programming solutions were derived from the personal interview survey of watershed landowners and farm operators. A typical, or representative, farm was developed on the basis of average data for each of the four farm situations. Average data for each typical farm are shown in Table 1.

General Farms in the Floodplain

Typical resource combinations for general farms in the floodplain were analyzed to determine the optimum resource combi-

[8] USDA Soil Conservation Service. 1962. Watershed Work Plan for Cheaha Creek Watershed, Talladega, Clay, and Cleburne counties, Alabama. Auburn, Ala.

TABLE 4. OPTIMUM ENTERPRISE COMBINATION FOR GENERAL FARMS IN THE FLOODPLAIN, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Enterprise or activity	Optimum amount
Cotton (solid plant) allotted acreage, acres	56.0
Cotton (solid plant) leased acreage, acres	39.0
Soybeans, acres	135.0
Bahiagrass and fescue permanent pasture, acres	42.0
Beef cattle (brood cows), head	30.0
Fescue hay, acres	9.0
Buy Coastal bermudagrass hay, tons	19.5
Hire seasonal labor (June-August), hours	276.4
Hire seasonal labor (September-November), hours	123.8

Utilization in watershed

Resource	Amount available	Amount used	Amount unused	MVP[1] dol.
Total land, acres	542	281	260	0
Cropland, acres	257	230	27	0
Pastureland, acres	100	51	49	0
Cotton allotted acreage, acres	56	56	0	121
Cotton leased acreage, acres	39	39	0	75
Soybeans, acres	135	135	0	65
Beef cattle, head	30	30	0	57

[1] MVP is defined as marginal value of the product—the change in income caused by an additional increment of the given resource. MVP here represents the value of an additional unit of the resource if it were available. Estimates of the marginal value were available in the linear programming procedure used only if the supply of a resource were exhausted.

nation for comparison with the actual resource use on such farms in the area. An optimum combination of enterprises is the combination of given resources which maximizes net farm income with given input and product prices. Optimum enterprise combination on the general farms, Table 4, yielded a maximum net return to the fixed resources, land, operator's labor and management, and capital of $22,333, Table 5.

Costs of the fixed resources, land, operator's labor and management, and capital were not charged against the various enterprises in the partial budgeting procedure. Rather, a fixed charge was established for each resource based on estimated opportunity returns. The opportunity return is the gain from using the resource or its money value in the best alternative manner for maximizing income. This procedure allowed determination of the residual value of each resource after all others were deducted from the net returns. Residual annual values when capitalized provided an estimate of the current market value of the particular resource.

An estimated annual management cost, a fixed labor cost, and an annual capital cost were subtracted from net returns to derive

the residual net returns to land. The residual returns to land, minus property tax, were capitalized at 7.5 percent to estimate land value. The 7.5-percent interest rate was the prevailing first mortgage rate at the time of this study. The estimated value of land for general farms in the floodplain derived by the procedure was $309 per acre, Table 5.

TABLE 5. NET RETURNS TO LAND AND CAPITALIZED LAND VALUES, TYPICAL FARM SITUATIONS, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973 (INTEREST ON INVESTMENT CHARGED AT 7.5 PERCENT)

Type of farm	Net returns to fixed resources	Annual management costs[1]	Net returns to land[2]	Real estate tax per acre	Per acre returns	Capitalized value
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Floodplain						
General farms	22,333	2,336	12,674	0.23	23.15	309
Livestock farms	4,289	535	−2,007	.23	−7.66	------
Upland						
General farms	10,662	1,114	2,225	.23	8.01	107
Livestock farms	4,667	582	−2,114	.23	−5.60	------

[1] Management allocated 5 percent of gross receipts annually.
[2] Fixed labor cost of $6,250 and annual capital cost of $1,073 have also been deducted.

Annual management costs were assumed to equal 5 percent of gross farm receipts. This value represented the opportunity cost of the farm manager. That is, the 5 percent rate was assumed sufficient to compensate a farm manager for operating another farm of similar magnitude; or, expressed in another way, the cost required to hire a manager for the typical general farm. The fixed labor cost was calculated as an opportunity cost for the operator's labor. Assuming that the operator worked 2,500 hours on the farm and that he could earn $2.50 per hour working at a nearby factory or other occupation, the fixed labor cost was $6,250. An annual capital cost of $1,073 was charged as depreciation on barns and fences for the given farm. The extra capital charge was over and above the amount allocated to enterprises through the budgeting procedure.

As indicated, fixed resource costs subtracted from net farm income yielded returns to land. However, property taxes were also subtracted to reflect true returns to land. Land in the Cheaha Watershed area of Talladega County was assessed for tax purposes at $7.50 per acre. The real property tax millage rate was approxi-

TABLE 6. NET RETURNS TO LAND AND CAPITALIZED LAND VALUES, SELECTED VARIATIONS FOR GENERAL FARM SITUATIONS, CHEAHA CREEK FLOODPLAIN, TALLADEGA COUNTY, ALABAMA, 1973 (INTEREST ON INVESTMENT CHARGED AT 7.5 PERCENT)

Situation	Net returns to fixed resources	Annual management costs[1]	Net returns to land[2]	Real estate tax per acre	Per acre returns	Capitalized value
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Yield data for 1962 updated to 1973 conditions	18,610	2,336	8,951	0.23	16.28	217
Typical farm, average prices	25,791	3,906	14,562	.23	26.64	355
Typical farm, 1973 prices	42,756	2,336	33,097	.23	60.83	811
Typical farm, no restrictions, 1973 prices	58,744	3,906	47,515	.23	87.43	1,165
Alternative corn-hog enterprises, size restricted	25,444	3,394	14,727	.23	26.94	360
Alternative corn-hog enterprises, no restrictions	48,521	12,775	28,423	.23	52.21	696

[1] Management receives 5 percent of gross receipts annually.
[2] Fixed labor cost of $6,250 and annual capital cost of $1,073 have also been deducted.

mately 30 mills. Therefore, the actual tax was approximately 23 cents per acre. The latter value was deducted from economic rent to determine the residual income to land.

Land values determined under the capitalization approach were compared with a similar capitalized value estimated for 1962, the year prior to watershed development. The relative value of land per acre in 1962 was estimated to be $217, Table 6. This value was computed using average prices for 1970-73[9] and 1962 yield data. Inflationary effects of price change were avoided by using 1973 price levels for 1962 production data. An estimate of land values along the stream channel in 1962 was made by Cheaha Creek Conservancy District personnel. The estimated value ranged between $45 and $75 per acre at the various structural sites and $75 along the channel itself. These areas were subject to periodic severe flooding, hence values were retarded. The $217 derived value was based on whole farm productivity income. In view of the critical flooding situation, the SCS estimates of $75 or less appeared to be realistic and acceptable.

[9] A 3-year average of prices for 1970-73 was considered necessary to account for abnormal price conditions prevailing in 1973. Use of 1973 prices as normal would have seriously biased the analysis.

The $92 increase in land value ($217 to $309) for this particular area was attributed to several factors, but primarily to flood protection. Technological advances and population pressures also may have affected this increase in value. However, watershed development was the most influential change occurring in this area over the 10-year period. Thus, flood protection was hypothesized to be the major factor causing land value appreciation.

The capitalized land value of $309 was compared with the average sale value of $415 per acre.[10] This difference implies that land value was determined not only by the income realized from the property, but also by other factors such as location, urban influence, market expectations for land use shifts, and aesthetic values. Market value of land is influenced by many factors, such as those stated, but a capitalized land value reflects only the property's income potential during the relevant planning horizon. Also, since the watershed project was completed in 1972, consideration was given to the fact that sufficient time had not elapsed for the full value of flood protection to be capitalized into land value. Land use changes and associated farm income changes generally lag behind dramatic technological or price changes. However, in the Cheaha Watershed, the value of flood protection did appear to be reflected slightly in the market value of the property. The influence of flood protection was affirmed by the landowner's response to questions on land use and value.

TABLE 7. VALUES OF LAND AND BUILDINGS IN TALLADEGA COUNTY COMPARED WITH VALUES FOR THE STATE OF ALABAMA, 1954-69

Year	Value per acre		Percent change between years	
	Talladega County	Alabama	Talladega County	Alabama
1954	60.85	58.52		
			51	58
1959	92.20	92.25		
			29	35
1964	118.83	124.57		
			75	60
1969	208.17	199.60		

Source: U.S. Bureau of the Census, *Census of Agriculture, Statistics for the State and Counties, Alabama* (Washington: U.S. Government Printing Office).

[10] Data on all known sales occurring in 1970-73 were reviewed to determine the prevailing market value for a typical farm. The average sale value for the few transactions was $415 per acre for land and buildings. However, there were too few sales for statistical analysis.

Emphasis of the difference in farm real estate values in Cheaha Watershed and all of Talladega County was provided by a comparison of the residual and observed sale values with census data for the county and State. Comparable values of land and buildings in Talladega County and Alabama are given in Table 7.

When alternative enterprises were considered for the general floodplain farm in addition to cotton, soybeans, and beef cattle, significant land value and income changes were observed. First, a herd of 20 brood sows and 27 acres of corn for grain were added to the general farms.[11] With this addition, net farm income increased $3,111. The increase in net farm income directly increased the capitalized land value $51 per acre, Table 6.

In the initial farm enterprise organization, each crop and livestock enterprise was limited to the average acreage or number reported for the typical (average) farm. These restrictions were removed to determine the true optimum enterprise combinations and subsequent maximum farm income. Without restrictions, income increased $26,188, and capitalized land value rose to $696 per acre, Table 6. The optimum, unrestricted enterprise combination consisted of 56 acres of allotted cotton, 201 acres of leased cotton, and a 200-sow swine herd. Such a farm situation is possible, although not typical of this area, and illustrates the potential of alternative enterprise combinations.

Typical farm operators restrict themselves on the types and amounts of various enterprises. Among farmers surveyed, a market hog operation was considered least desirable among alternative enterprises. Thus the typical general farm was also analyzed without the corn and hog alternates illustrated above. Under this condition and assuming no other restrictions, the optimum combination of unrestricted enterprises was 56 acres of allotted cotton, 201 acres of leased cotton, and 59 head of beef cattle. This combination produced a net farm income of $25,791, which increased residual capitalized land value to $355 per acre, Table 6. Most of the increase was attributed to extra cotton production, although cattle were reasonably profitable too.

Prices of most agricultural commodities rose during 1973, some to record high levels. Although such relative price levels are not expected to continue indefinitely, annual price fluctuations are important in farm management. Hence, an analysis of the effects

[11] The alternative allowed a maximum of 40 acres of corn for grain to be used on the farm. However, the optimum acreage for corn was only 27 acres.

of higher commodity prices was performed. Price levels for selected commodities in 1973 were:

Item	*Unit price*
Cotton lint, pounds	$0.60
Soybeans, bushels	6.00
Beef steers, pounds	.60

If the typical farm were operated under 1973 prices and with the previously stated restrictions on crop acreage and livestock numbers, net farm income would be $42,756. Removing restrictions on crops and livestock resulted in a net farm income of $58,744. The resulting estimated land values were $811 and $1,165 per acre, respectively, Table 6. While such increases are possible, they may not be probable. The large amounts of labor and fescue hay required by the high levels of cotton and cattle, respectively, may be illogical for the Cheaha area. Labor necessary to attain this level of production was not available in the area at a price the farmer would be willing to pay. Also, beef cattle fed a basic ration of fescue hay would not maintain a desirable rate of growth necessary for profit maximization. On the other hand, the potential increase in net farm income should encourage farmers to pay the wages necessary to hire ample labor and to produce a sufficient feed ration.

The additional enterprise combinations were programmed to indicate whether net farm income could be increased by more concentrated farming practices. With diversification, farmers possibly could realize higher returns to fixed resources. Flood protection would assist in these concentration and diversification measures by providing greater acreages of tillable soil. The risk of flood damage has been removed except for the 100-year flood.[12] Thus, farmers can confidently plant crops or pasture on land which once flooded regularly.

General Farms in the Upland Area

General farms in the upland area produced cotton, soybeans, and beef cattle in differing proportions as compared with the

[12] A 100-year flood is one of such magnitude that it is expected to occur only once each 100 years. According to rainfall records, such a flood did occur while construction was underway. On March 19, 1970, 8.75 inches of rain fell in less than 24 hours. An additional 1.05 inches fell March 22, bringing the 3-day total to 9.8 inches. Extensive damage occurred to nearly completed dams and channels. However, completed structures and channels contained the abnormal flow. Extensive rains in 1973 were totally contained in the structures and channels.

TABLE 8. OPTIMUM ENTERPRISE COMBINATION FOR GENERAL FARMS IN THE UPLAND AREA, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Enterprise or activity	Optimum amount
Cotton solid plant allotted acreage, acres	12.0
Soybeans, acres	157.0
Bahiagrass and fescue permanent pasture, acres	30.2
Unimproved pasture, acres	8.0
Beef cattle (brood cows), head	22.0
Fescue hay, acres	6.5
Buy Coastal bermudagrass hay (Dec.-Feb.), tons	14.3
Hire seasonal labor (June-Aug.), hours	49.0

Utilization in watershed Resources	Amount available	Amount used	Amount unused	MVP[1] dol.
Total land, acres	270	214	56	0
Cropland, acres	176	169	7	0
Pastureland, acres	48	37	11	0
Unimproved, acres	8	8	0	0
Cotton allotted acreage, acres	12	12	0	126
Beef cattle (brood cows), head	22	22	0	85
Soybeans, acres	157	157	0	43

[1] MVP is defined as marginal value of the product—the change in income caused by additional increment of the given resource. MVP here represents the value of an additional unit of the resource if it were available. Estimates of the marginal value were available in the linear programming procedure used only if the supply of a resource were exhausted.

floodplain farms. Optimum combinations of enterprises for the typical general farm in the upland, Table 8, yielded a return to land, operator's labor, and management of $10,662, Table 5. The residual returns to land for this farm situation after deducting operator's labor and management costs amounted to $8 per acre. The capitalized land value at the 7.5-percent interest rate yielded a property value of $107 per acre, Table 5.

Data were not available to compare the capitalized values of 1973 with 1962, but a comparison was made between the average sale value in the upland and the estimated capitalized value. As in the floodplain, the estimated value was lower than the average sale value—$107 compared with $358. The difference between the sale and income values indicated that factors other than income from the property significantly influenced the land value. Since this was the upland area, the advantage of having flood protection did not directly affect land value. Hence, other factors, such as urbanization, location, and aesthetic values, appeared to be rather significant in determining land value. Land stabilization practices should assist in making the farms more desirable,

TABLE 9. NET RETURNS TO LAND AND CAPITALIZED LAND VALUES, SELECTED VARIATIONS FOR GENERAL FARM SITUATIONS, CHEAHA CREEK UPLAND AREA, TALLADEGA COUNTY, ALABAMA, 1973 (INTEREST ON INVESTMENT CHARGED AT 7.5 PERCENT)

Situation	Net returns to fixed resources	Annual management costs[1]	Net returns to land[2]	Real estate tax per acre	Per acre returns	Capitalized value
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Typical farm, 1973 prices	20,460	1,114	12,023	0.23	44.30	591
Typical farm, no restrictions, average prices	11,450	1,250	2,877	.23	10.42	139
Typical farm, no restrictions, 1973 prices	23,405	1,250	13,832	.23	51.00	680
Alternative corn-hog enterprises, size restricted, average prices	14,180	2,084	4,773	.23	17.44	233
Alternative corn-hog enterprises, unrestricted, average prices	32,939	10,297	15,319	.23	56.50	753

[1] Management receives 5 percent of gross receipts annually.
[2] Fixed labor cost of $6,250 and annual capital cost of $1,073 have also been deducted.

but the effect of stabilization on value appeared minute in comparison with other factors.

As in the floodplain situation, the effect of alternative enterprises on income and rent was analyzed. Thus, corn and hogs were considered in a hypothetical solution. The optimum farm organization under this revised plan called for only 7 acres of corn and a 20-sow swine herd. With only 7 acres of corn produced, most of the feed necessary for the hogs was purchased. Under this organization, net farm income increased $3,518, which resulted in an increased property value—$233 compared with $107 per acre, Table 9. However, the solution was not entirely logical. For example, 7 acres of corn would not be sufficient to justify the investment in machinery and storage facilities necessary for its production. The hypothetical increase in land value does exemplify the farm income effect on value. When acreage and livestock restrictions were removed from the enterprises of cotton, soybeans, beef cattle, and hogs to allow maximization of income, net farm income was increased to $32,939. The income increase produced an estimated land value of $753 per acre, Table 9. The optimum, unrestricted enterprise combinations were:

Item	*Amount*
Cotton, acres	12
Soybeans, acres	155
Brood sows, head	200

The unrestricted solutions suggest that, with more diversified enterprises, land value could possibly increase. On the other hand, most operators in the area expressed low preference for hogs because of high labor requirements. Thus, the option was not considered feasible.

Under the original conditions in which only the enterprises found on the typical farm were considered, farm incomes were lower, but the enterprise combinations appeared more feasible for the upland area. In the initial solution for upland farms, limits equal to the average typical farm situation were placed on crops and livestock numbers. With acreage and livestock restrictions removed, but with enterprises limited to those of the typical farm, the optimum combination of enterprises for the general farm in the upland was:

Item	*Amount*
Cotton, acres	12
Soybeans, acres	164
Brood cows, head	33

This organization of enterprises yielded a net farm income of $11,450, a $788 increase over the typical, restricted solution, and an increase in land value of $32 per acre, Table 9.

Agricultural commodity prices for 1973, when applied to situations both with and without acreage and livestock restrictions, provided additional insights into management of upland farms. Net farm income increased $9,798 over the original returns with the acreage and livestock restrictions, and $12,743 without restrictions. Price increases and land use changes had a significant effect on net farm income and ultimately on land value, as evidenced by the increases of $484 per acre with restrictions and $573 per acre without restrictions, Table 9.

Livestock Farms in the Floodplain

Livestock farms in the watershed typically had only one cash enterprise – beef cattle. Many farmers producing beef cattle were part-time operators or retirees. Livestock farmers in general did not depend solely on farm income for family needs. Rather, farm income was combined with rental income from leased cropland, retirement compensation, or salaries from other occupations.

The optimum combination of enterprises for the typical livestock farm in the floodplain, Table 10, yielded a return to operator's labor, management, and land of $4,289, Table 5. The opti-

TABLE 10. OPTIMUM ENTERPRISE COMBINATION FOR LIVESTOCK FARMS IN THE FLOODPLAIN, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Enterprise or activity	Optimum number
Bahiagrass and fescue permanent pasture, acres	75.0
Beef cattle (brood cows), head	58.0
Fescue hay, acres	41.7

Utilization in watershed

Resources	Amount available	Amount used	Amount unused	MVP[1] dol.
Total land, acres	270	177	153	0
Pastureland, acres	192	177	75	0
Beef cattle, head	58	58	0	38

[1] MVP is defined as marginal value of the product—the change in income caused by an additional increment of the given resource. MVP here represents the value of an additional unit of the resource if it were available. Estimates of the marginal value were available in the linear programming program used only if the supply of a resource were exhausted.

mum farm had 58 head of brood cows on 192 acres of fescue and bahiagrass pasture. The number of cattle and acres of pasture were restricted to the actual levels reported for the typical farm in this group.

When the procedure of allocating returns to land, labor, and management was followed, operator's labor cost required all the net income available; consequently, residual return to land dropped to −$7.66 per acre, Table 5. The negative return indicated livestock farmers in this area did not earn enough from farm operations to cover the minimum supply prices for land, labor, and management. Rather, the costs of labor and management were supported by the land factors. Thus, a negative economic rent was realized. The only way to overcome such a situation for the typical livestock farm was to allocate labor and management a smaller portion of the income as opportunity cost payments.

The average 1972-73 sale value for livestock farms in the floodplain, $330 per acre, obviously was not a result of the income potential of livestock production. The value arose from other factors, which indicated livestock farmers cannot sustain production and recover land costs without either more enterprise diversification or more intensive farming practices.

One means by which low farm returns are overcome is to increase the volume of operations. An analysis of the typical floodplain livestock farm without restrictions on the number of cattle revealed that the optimum number of brood cows was 123 head.

This change in cattle number would increase net farm income by $3,482. However, even under optimum conditions, per acre returns to land remained negative, Table 11.

With an assumed market price of $60 per hundredweight for light steers (used to measure the effect of 1973 price levels), net farm returns to fixed resources would increase $3,752 above the original income level. Brood cows were limited to 58 head because of acreage limitations. With the current high prices and livestock restricted, per acre return to land was $6.24. This positive return yielded a capitalized land value of $83 per acre, indicating that a price increase would directly affect the estimated land value, Table 11.

The optimum number of brood cows increased to 300 when livestock restrictions were removed and higher prices were assumed. At the same time, income increased by $13,570 and capitalized land value rose to $380 per acre, Table 11. The unrestricted beef cattle solution was essentially a feedlot operation requiring great amounts of labor and cattle feed. While the solution is not typical, the income increase did indicate that intensified land use would result in greater profits. Greater profits would enable the farmer not only to cover opportunity cost for manage-

TABLE 11. NET RETURNS TO LAND AND CAPITALIZED LAND VALUES, SELECTED VARIATIONS FOR LIVESTOCK FARM SITUATIONS, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973 (INTEREST ON INVESTMENT CHARGED AT 7.5 PERCENT)

Situation	Net returns to fixed resources	Annual management costs[1]	Net returns to land[2]	Real estate tax per acre	Per acre returns	Capitalized value
	Dollars	*Dollars*	*Dollars*	*Dollars*	*Dollars*	*Dollars*
Floodplain						
Typical farm, cows unrestricted, average prices.	7,771	1,161	—713	0.23	—2.87	------
Typical farm, cows restricted, 1973 prices...	8,041	535	1,746	.23	6.24	83
Typical farm, cows unrestricted, 1973 prices...	17,860	2,773	7,764	.23	28.52	380
Upland						
Typical farm, cows unrestricted, average prices.	8,322	1,275	—276	.23	—.93	------
Typical farm, cows restricted, 1973 prices...	8,749	582	1,969	.23	4.80	64
Typical farm, cows unrestricted, 1973 prices .	19,165	3,022	8,620	.23	21.70	289

[1] Management receives 5 percent of gross receipts annually.
[2] Fixed labor cost of $6,250 and annual capital cost of $1,073 have also been deducted.

ment and labor, but also to realize a residual return to land as evidenced by the positive land values derived by higher incomes.

Livestock Farms in the Upland Area

Optimum levels of enterprises specified for the typical livestock farms in the upland area, Table 12, produced a return to operator's labor, management, and land of $4,667, Table 5. The farm had 63 head of beef cattle on 210 acres of bahiagrass and fescue pasture. Allocating returns to land, labor, and management resulted in a residual return to land of −$5.60.

The hypothetical volume of operations on the upland livestock farms was increased to overcome the low farm returns. The first alternative was removal of restrictions on the average number of brood cows. The unrestricted solution increased the number of cows to 138, thereby increasing returns to fixed resources by $3,655. The second alternative was to increase the price of beef steers to the 1973 price of $60 per hundredweight as in the other farm situations. The higher price coupled with the average number of 63 brood cows produced an increase of $4,082 in net returns, and a residual return to land of $4.80 per acre for a capitalized value of $64 per acre, Table 11. With the same prices for steers and number of livestock unlimited or equal to the optimum 327 head, income increased by $14,498 and a subsequent land value of $289 per acre, Table 10. The latter solutions indicated

TABLE 12. OPTIMUM ENTERPRISE COMBINATION FOR LIVESTOCK FARMS IN THE UPLAND AREA, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Enterprise or activity	Optimum amount
Bahiagrass and fescue permanent pasture, acres	81.6
Beef cattle (brood cows), head	63.0
Fescue hay, acres	45.3

Utilization in watershed

Resource	Amount available	Amount used	Amount unused	MVP[1] dol.
Total land, acres	393	127	266	0
Pastureland, acres	210	127	83	0
Beef cattle (brood cows), head	63	63	0	35

[1] MVP is defined as marginal value of the product—the change in income caused by an additional increment of the given resource. MVP here represents the value of an additional unit of the resource if it were available. Estimates of the marginal value were available in the linear programming procedure used only if the resource were exhausted.

the possibility of producing greater returns by intensifying livestock production.

To sustain production and cover all factor costs, livestock farmers in both areas need to maximize their animal production or diversify the whole operation to include crop or other livestock activities. The income increase obtained by more intensified production indicated that higher income was possible. Elimination of flood risk in the floodplain and use of land stabilization practices in both areas to increase forage production should help increase production.

CONCLUSIONS

Conflicts arising between estimated benefits attributed to watershed development in pre-project analysis and actual results of the development provided justification for this project. Conclusions drawn herein were based on the findings accumulated through the survey questionnaire and subsequent farm analyses.

A majority of landowners in the watershed were satisfied with the watershed development. The directly affected floodplain landowners were content with the functioning of the retarding dams and channel improvements, even though small amounts of flood damage were reported in isolated areas. Upland owners, being less affected, were not as aware of the watershed's benefits as were the floodplain owners, but they believed that an expansion of the watershed activities in addition to land stabilization benefits would be an asset to their land. Expansion would involve more channel improvement and greater land stabilization efforts.

Although the general concensus was that the watershed program was satisfactory and beneficial, there were some problems or objections to the project which should be considered in future projects. From the environmental standpoint, loss of vegetation and channel bank erosion were the main objections. In general, landowners were disappointed in the depth of the channel, the loose sediment in the channel bottom, and the unrepaired damage to fences and other personal property by construction crews.

Most of the problems expressed by the landowners were centered around channel improvement. Therefore, if future projects are to be more satisfactory to landowners, emphasis should be placed on constructing retarding structures which would eliminate most of the flood damage while preserving the original stream channel with a minimal amount of improvement. This combina-

tion of improved retarding structures and minimal channelization would eliminate most of the grievances of the landowners with the watershed projects.

Evaluating the causes of land use changes was difficult because such changes are normally long-term, subtle moves which are difficult to attribute to any one influence. Many times landowners make land use changes because of short-term pressures, such as higher agricultural prices or labor shortages. The changes in the floodplain from pasture to crops and vice versa were made possible by not having the risk of flood damage. The change in the upland area from crops to pasture possibly could have been influenced by land stabilization funds included in watershed expenditures. Data in this report led to the conclusion that flood protection and land stabilization funds influenced the land use changes in a long-term, subtle manner.

Further research will lead to more substantive conclusions concerning effects of watershed activities on land use because of the time element involved. Since the watershed project was recently completed, sufficient time has not elapsed for extensive changes to occur. Future data will enable researchers to more effectively evaluate watershed development effects on these changes.

The change in Talladega County land values compared with the State indicate that watershed activities have affected county land values. Development of Cheaha Watershed was one of the more significant events for the area during the period 1962-72. This point is further supported by the comparison of the estimated 1962 value with the estimated 1973 value for general farms in the floodplain. A significant portion of the increases in land value in the area studied was attributed to watershed activities and subsequent productivity increases.

The market values observed in the various areas of the watershed differed significantly from the estimated capitalized values. The differences were in part attributed to other factors, such as location, urban influence, market expectations for land use shifts, and aesthetic values. The income produced by the property had limited influence on the market value of the land. Therefore, the estimates formed using the income capitalization approach were not fully representative of the true market value. Perhaps as more time elapses, the income effects will become more pronounced and become incorporated more fully into the market value.

The effects of more intensive land uses, which would normally result in greater incomes, were illustrated by the alternative solutions programmed. The additional enterprises, acreage changes, and price increases caused significant increases in net farm income. Increases in income would result in the capitalized land value more nearly equaling the market value of the property. Until more concentrated land uses are employed, the sale value will be considerably higher than the land value estimated by the farm income approach based on a limited planning horizon.

Land values were affected by watershed activities. However, the total effect of the project on land value will not be clearly expressed until some time in the future. Land use changes to more intense farm practices in the future will ultimately change land value. The present effect of the project is evidenced by reduced flooding and widespread conservation practices which enhance more profitable land uses.

Research on actual project benefits and costs is continuing. Forthcoming publications will report a review of total costs and estimated benefits resulting from land use shifts and productivity changes as well as other social benefits from flood reduction.

APPENDIX

APPENDIX TABLE 1. COTTON BUDGET, SOLID PLANT, ESTIMATED COSTS AND RETURNS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Quantity	Rate	Amount
		Dol.	*Dol.*
Cash receipts			
Lint, lb.	575	0.41[1]	235.75
Cottonseed, tons	.53	51.00	27.03
Total receipts			262.78
Cash expenses			
Seed, acid delinted, cwt.	.17	18.50	3.14
Fertilizer, 13-13-13, cwt.	4.75	3.40	16.15
Lime per year, tons	.80	8.00	6.40
Herbicide			
Preemergence			3.30
Postemergence			4.20
Fungicide			4.50
Insecticide			15.00
Tractor operating expenses, hr.	4.20	1.44	5.50
Equipment operating expenses			14.38
Defoliation			1.50
Ginning (500 lb. bale), bagging and ties/bale	1.15	14.75	16.96
Labor, hired, hr.	6.21	1.75	10.87
Truck expense (haul to gin), miles	30.00	.07	2.10
Interest on operating capital, $85.04 @ 7.5% for 6 months			3.18
Total cash expenses			107.18
Noncash expenses			
Machinery expense			
Depreciation			20.59
Insurance, interest, housing, and taxes			4.12
Total noncash expenses			24.71
Net returns (to land, operator's labor, and management)			130.89

[1] This price includes market price plus government payments.

APPENDIX TABLE 2. COTTON, SOLID PLANT, ESTIMATED ANNUAL VARIABLE COSTS AND LABOR REQUIREMENTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Operation and type of equipment	Times over	Machine time per acre	Operating time per acre	Operating cost per hour use	Cost
		Hours	*Hours*	*Dol.*	*Dol.*
Cut stalks, 7-ft. rotary cutter	1	0.45	0.45	0.68	0.30
Disk, 9-ft. trailing	1	.35	.35	.40	.14
Spread fertilizer, 12-ft. spreader	1	.28	.28	.32	.09
Break, 4-bottom, mounted plow	1	.67	.67	1.03	.69
Disk & herbicides, 9-ft. trailing & spreader	1	.30	.30	.75	.22
Plant & in-furrow fungicide, 4-row planter	1	.33	.33	.75	.25
Postemergence cultivation, 4-row cultivator and sprayer	2	.74	.74	.55	.40
Cultivate & side dress, 4-row cultivator	1	.37	.37	.50	.18
Cultivate, 4-row cultivator	2	.74	.74	.50	.37
Apply insecticide, 20-ft sprayer	8	1.60	1.60	1.36	2.17
Picking, 2-row self propelled	2	1.50	1.50	6.34	9.51
Haul cotton, pickup truck and trailer		.60	1.00	.10	.06
Tractor, 65-H.P. diesel		4.20		1.31	5.50

APPENDIX TABLE 3. COTTON, SOLID PLANT, ESTIMATED ANNUAL FIXED MACHINE COSTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Type of equipment	Depreciation cost/hour	Use per acre	Cost per acre
	Dol.	*Hours*	*Dol.*
7-ft. rotary cutter	0.26	0.45	0.12
9-ft. trailing disk	.36	.35	.13
12-ft. fertilizer spreader	.22	.28	.06
4-bottom mounted plow	.44	.67	.29
4-row planter	1.19	.33	.39
4-row sprayer (20-ft.)	.18	2.34	.42
4-row cultivator	.40	.74	.30
2-row self propelled cotton picker	10.34	1.50	15.51
Cotton wagons (2)	.23	.60	.14
Tractor (65-H.P.)	.77	4.20	3.23
TOTAL			20.59
Interest, insurance, housing, etc.[1]			412

[1] Calculated at 2 percent of average value.

APPENDIX TABLE 4. SOYBEAN BUDGET, ESTIMATED COSTS AND RETURNS PER ACRE, CHEAHA CREEK FLOODPLAIN, TALLADEGA COUNTY, ALABAMA, 1974

Item	Quantity	Rate	Amount
		Dol.	*Dol.*
Cash receipts			
Soybeans, bu.	30.00	4.00	120.00
Cash expenses			
Seed, recommended variety, bu.	1.00	6.40	6.40
Fertilizer, 0-20-20, cwt.	2.75	3.00	8.25
Lime, custom, tons	.80	8.00	6.40
Herbicide, broadcast			2.00
Insecticide, (2 applications)			3.20
Tractor operating expenses, hours	3.92	1.30	5.10
Equipment operating expenses			3.73
Truck	.79	1.75	.90
Labor, hired, hours			1.38
Interest on operating capital, $37.36 @ 7.5% for 6 months			1.40
Total cash expenses			38.76
Non-cash expenses			
Machinery			
Depreciation			8.44
Interest, insurance, housing, and taxes			1.66
Total non-cash expenses			10.10
Total expenses			48.86
Net returns (to land, operator's labor, and management)			71.14

APPENDIX TABLE 5. SOYBEAN BUDGET, ESTIMATED COSTS AND RETURNS PER ACRE, CHEAHA CREEK UPLAND, TALLADEGA COUNTY, ALABAMA, 1973

Item	Quantity	Rate	Amount
		Dol.	*Dol.*
Cash receipts			
Soybeans, bu.	24.00	4.00	96.00
Cash expenses			
Seed, recommended variety, bu.	1.00	6.40	6.40
Fertilizer, 0-20-20, cwt.	3.00	3.00	9.00
Lime, custom, tons	1.00	8.00	8.00
Herbicide, broadcast			2.00
Insecticide, (2 applications)			3.20
Tractor operating expenses, hours	3.92	1.30	5.10
Equipment operating expenses			1.63
Truck			.90
Labor, hired, hours	.79	1.75	1.38
Interest on operating capital, $37.61 @ 7.5% for 6 months			1.41
Total cash expenses			39.02
Non-cash expenses			
Machinery			
Depreciation			8.44
Interest, insurance, housing, and taxes			1.66
Total non-cash expenses			10.10
Total expenses			49.12
Net returns (to land, operator's labor, and management)			46.88

APPENDIX TABLE 6. SOYBEANS, ESTIMATED ANNUAL VARIABLE COSTS AND LABOR REQUIREMENTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Operation and type of equipment	Times over	Machinery hours	Operator hours	Operating cost per hour use	Cost
		Hours	*Hours*	*Dol.*	*Dol.*
Break, 4-bottom mounted plow	1	0.67	0.67	1.03	0.69
Disk, 8-ft. trailing	2	.78	.78	.38	.30
Spread fertilizer, 10-ft. spreader	1	.34	.34	.28	.10
Plant and weed control, 4-row planter	1	.33	.33	.70	.23
Cultivate, 4-row	2	1.46	1.46	.20	.29
Apply insecticide, 20-ft. sprayer	2	.34	.34	.05	.02
Combine, 50-H.P. self propelled	1	1.00	1.00	2.10	2.10
Total equipment operating expenses per acre					3.73
Haul, 1.5-ton truck					.90
Tractors, 65-H.P. diesel		3.92		1.30	5.10
Total equipment expenses					6.00

APPENDIX TABLE 7. SOYBEANS, ESTIMATED ANNUAL FIXED MACHINE COSTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Type of equipment	Depreciation cost/hour	Use per acre	Cost per acre
	Dol.	*Hours*	*Dol.*
4-bottom mounted plow	0.20	0.67	0.13
8-ft. trailing disk	.26	.78	.21
10-ft. fertilizer spreader	.25	.34	.08
4-row planter	.54	.33	.18
2-row cultivator	.11	1.46	.16
20-ft. sprayer	.18	.34	.06
1.5-ton truck			.18
Tractor	.77	3.92	3.02
Combine	4.42	1.00	4.42
TOTAL			8.44
Interest, insurance, housing, etc.			1.66

APPENDIX TABLE 8. BEEF COW-CALF BUDGET, ESTIMATED COSTS AND RETURNS, 30-COW HERD, TALLADEGA COUNTY, ALABAMA, 1973

Item	Quantity	Rate	Amount
		Dol.	*Dol.*
Cash receipts			
Calves, (95% calf crop), 24 @ 450 lb., cwt.	108.00	42.00	4,536.00
Cull cows, 4 @ 1,000 lb., cwt.	40.00	22.00	880.00
Bull, ¼ per year @ 2,000 lb., cwt.	5.00	26.00	130.00
Total cash receipts			5,546.00
Cash expenses			
Veterinary medicine, head	60.00	1.50	90.00
Spray, head	60.00	.50	30.00
Salt and minerals, cwt.	14.25	3.67	52.30
Bull purchase, ¼ head			175.00
Building, equipment, and fencing, head	30.00	1.10	33.00
Tractor equipment used other than hay or pasture			7.44
Transportation, head	28.00		59.92
Marketing commission (3% gross receipts)			169.14
Labor, hired, hours	184.00	1.75	322.00
Interest on operating capital, $594.66 @ 7.5%			44.60
Total cash expenses			983.40
Non-cash expenses			
Interest and insurance[1]			732.41
Total expenses excluding feed and pasture			1,715.81
Returns to land, operator's labor, and management			3,830.19

APPENDIX TABLE 9. FIXED COSTS FOR COW-CALF HERD, 30 BROOD COWS, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Value of beginning	Average	Interest[1]	Insurance	Total
	Dol.	*Dol.*	*Dol.*	*Dol.*	*Dol.*
Cows[2], 30	8,400	7,500	562.50	75.00	637.50
Replacement heifers[3], 4	646	646	48.45	6.46	54.91
Bulls, 1	500	470	35.30	4.70	40.00
TOTAL	9,546	8,616	646.25	86.16	732.41

[1] Interest charged at 7.5 percent annually.

[2] Cows average value is based on salvage value of $22 per hundredweight for 1,000-pound cull cows.

[3] Replacement heifers are based on beginning weight of 475 pounds at a price of $34 per hundredweight.

APPENDIX TABLE 10. BAHIAGRASS PASTURE BUDGET, ESTIMATED COSTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Quantity	Rate	Amount
		Dol.	*Dol.*
Cash expenses			
Fertilizer, 13-13-13, cwt.	3.00	3.40	10.20
Lime, custom, tons			1.95
Tractor operating expenses, hours	1.47	1.31	1.92
Equipment operating expenses			.52
Seasonal labor, hours	1.02	1.75	1.78
Interest on operating capital, $16.37 @ 7.5% for 6 months			.61
Total cash expenses			16.98
Non-cash expenses			
Establishment, 1/15 of establishment cost			3.39
Interest, ½ of establishment cost @ 7.5%			1.90
Machinery expenses			
Depreciation			1.71
Interest, insurance, housing, and taxes			.82
Total non-cash expenses			7.82
Total annual costs per acre			24.80

APPENDIX TABLE 11. FESCUE PASTURE BUDGET, ESTIMATED COSTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Quantity	Rate	Amount
		Dol.	*Dol.*
Cash expenses			
Fertilizer, 13-13-13, cwt.	3.00	3.40	10.20
Lime[1], custom, tons			1.95
Tractor operating expenses, hours	1.47	1.31	1.92
Equipment operating expenses			.52
Seasonal labor, hours	.68	1.75	1.19
Interest on operating capital, $15.78 @ 7.8% for 6 months			.59
Total cash expenses			16.37
Non-cash expenses			
Establishment, 1/15 of establishment cost			2.94
Interest. ½ of establishment cost @ 7.5%			1.65
Machinery expenses			
Depreciation			1.71
Interest, insurance, housing, and taxes			.82
Total non-cash expenses			7.12
Total annual costs per acre			23.49

[1] Based on 1 ton of lime applied every 4 years @ $7.80 per ton.

APPENDIX TABLE 12. PASTURE BUDGET, ESTIMATED ANNUAL VARIABLE COSTS AND LABOR REQUIREMENTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Operation and type of equipment	Times over	Machine hours	Operating hours	Operating cost per acre	Cost
		Hours	*Hours*	*Dol.*	*Dol.*
Topdress, 10-ft. spreader	3	1.02	1.02	0.28	0.29
Mow, 7-ft. rotary cutter	1	.45	.45	.51	.23
Tractor, 65-H.P. diesel		1.47		1.31	1.92

APPENDIX TABLE 13. PASTURE BUDGET, ESTIMATED ANNUAL FIXED MACHINE COSTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Type of equipment	Depreciation per hour use	Use per acre	Depreciation costs	Other fixed cost/hour used	Other fixed costs
	Dol.	*Hours*	*Dol.*	*Dol.*	*Dol.*
10-ft. fertilizer spreader	0.34	1.02	0.35	0.22	0.22
7-ft. rotary cutter	.51	.45	.23	.23	.10
65-H.P. diesel tractor	.77	1.47	1.13	.34	.50
TOTAL			1.71		

APPENDIX TABLE 14. FESCUE HAY BUDGET, ESTIMATED COSTS PER ACRE, TWO CUTTINGS, 3.5 TONS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Quantity	Rate	Amount
		Dol.	*Dol.*
Cash expenses			
Fertilizer, 13-13-13, cwt.	3.00	3.40	10.20
Lime, custom, tons	.25	8.00	2.00
Tractor, 65-H.P. diesel, hours	3.80	1.31	4.97
Truck, 1.5-ton, hours	4.00	.66	2.64
Labor, hired, hours	1.90	1.75	3.33
Equipment operating expenses			14.20
Interest on operating capital, $37.29 @ 7.5% for 6 months			1.39
Total cash expenses			38.73
Non-cash expenses			
Depreciation, 1/15 of establishment cost			2.94
Interest, ½ of establishment cost @ 7.5%			1.65
Machinery			
Depreciation			6.69
Interest, insurance, housing, etc.			1.89
Total non-cash expenses			13.17
Total annual costs per acre			51.90
Total annual costs per ton			14.83

APPENDIX TABLE 15. FESCUE HAY, ESTIMATED ANNUAL VARIABLE COSTS AND LABOR REQUIREMENTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Operation and type of equipment	Times over	Machinery hours	Operation hours	Operating cost per hour use	Cost
		Hours	*Hours*	*Dol.*	*Dol.*
Mowing, 7-ft. mower	2	0.90	0.90	0.78	0.70
Raking, side delivery rake	2	.90	.90	.42	.38
Baling, PTO baler	2	3.50	3.50	3.75	13.12
Equipment operating expenses					14.20
Tractor, 65-H.P. diesel	2	3.80	3.80	1.31	4.97
Truck, 1.5-ton	2	4.00	4.00	.66	2.64
Total equipment expenses					21.81

APPENDIX TABLE 16. FESCUE HAY, ESTIMATED ANNUAL FIXED MACHINE COSTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Type of equipment	Depreciation per hour use	Use per acre	Costs per acre
	Dol.	*Hours*	*Dol.*
7-ft. mowing machine	0.17	0.90	0.15
Side delivery rake	.28	.90	.25
PTO baler	.70	3.50	2.45
Tractor	.77	3.80	2.92
Truck	.23	4.00	.92
TOTAL			6.69
Interest, insurance, housing, etc.			2.50

APPENDIX TABLE 17. CORN BUDGET, ESTIMATED COSTS AND RETURNS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Quantity	Rate	Amount
		Dol.	*Dol.*
Receipts			
Corn, bu.	65.00	1.35	87.75
Cash expenses			
Seed, recommended hybrid, lb.	10.00	.37	3.70
Fertilizer			
5-20-20 (120-40-40), cwt.	5.00	3.08	15.40
Ammonium nitrate, cwt.	2.00	3.71	7.42
Lime, custom application, tons	1.00	8.00	8.00
Herbicides			3.76
Tractor operating expenses, hours	3.77	1.44	5.43
Equipment operating expenses			4.08
Seasonal labor, hours	1.50	1.75	2.62
Interest on operating capital, $50.41 @ 7.5% for 6 months			1.89
Total cash expenses			52.30
Non-cash expenses			
Machinery expenses			
Depreciation			7.54
Interest, insurance, housing, and taxes			2.61
Total non-cash expenses			10.15
Net returns (to land, operator's labor, and management)			25.30

APPENDIX TABLE 18. CORN, ESTIMATED ANNUAL VARIABLE COSTS AND LABOR REQUIREMENTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Operation and type of equipment	Times over	Hours/acre		Operating costs per hour use	Cost
		Machine	Operator		
		Hours	*Hours*	*Dol.*	*Dol.*
Break, 4-bottom mounted plow	1	0.67	0.67	1.03	0.69
Disk, 8-ft. trailing	2	.78	.78	.38	.30
Spread fertilizer, 10-ft. spreader	1	.34	.34	.28	.10
Plant and preemergence, 4-row planter	1	.70	.70	.70	.49
Postemergence, 4-row sprayer	1	.37	.37	.05	.49
Cultivate and sidedress, 4-row cultivator	1	.37	.37	.50	.19
Combine, self propelled 4-row	1	.53	.53	4.25	2.25
Haul, 4-wheel wagon		.80	.80	.05	.04
Tractor, 65-H.P. diesel		3.77		1.44	5.43

APPENDIX TABLE 19. CORN, ESTIMATED ANNUAL FIXED MACHINE COSTS PER ACRE, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Type of equipment	Depreciation cost per hour use	Use per acre	Depreciation costs	Other fixed cost[1] per hour use	Other fixed costs
	Dol.	*Hours*	*Dol.*	*Dol.*	*Dol.*
4-bottom mounted plow	0.44	0.67	0.30	0.20	0.13
8-ft. trailing disk	.26	.78	.20	.28	.22
10-ft. spreader	.34	1.02	.35	.22	.22
4-row planter	1.19	.33	.39	.52	.17
4-row sprayer	.35	.37	.13	.16	.06
4-row cultivator	.40	.37	.15	.18	.07
Self propelled combine, 4-row	5.84	.53	3.09	.84	.45
4-wheel wagon	.08	.30	.03	.03	.01
65-H.P. diesel tractor	.77	3.77	2.90	.34	1.28
TOTAL			7.54		2.61

[1] Interest, insurance, housing, and taxes.

APPENDIX TABLE 20. HOG BUDGET, ESTIMATED COSTS AND RETURNS FOR 20-SOW HERD, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Quantity	Rate	Amount
		Dol.	*Dol.*
Receipts			
Hogs[1], 330 @ 220 lb., cwt.	726.00	25.00	18,150.00
Sows, 10 @ 325 lb., cwt.	32.50	18.00	585.00
Boar, 1 @ 400 lb., cwt.	4.00	14.00	56.00
Total receipts			18,791.00
Cash expenses			
Pasture, acres	7.00	22.06	154.42
Corn, bu.	4,148.00	1.35	5,599.80
Protein supplement, cwt.	470.00	9.00	4,230.00
Creep and starter feed, cwt.	110.00	7.00	770.00
Other feeds			500.00
Vaccination and veterinary, head	342.00	.48	164.16
Electricity, mo.	12.00	10.60	127.20
Trucking, head	342.00	.41	140.22
Boar, head	1.00	150.00	150.00
Repairs			95.50
Other cash expenses			158.56
Interest on operating capital, $12,089.86 @ 7.5% for 6 months			453.36
Total variable expenses			12,543.22
Non-cash expenses			
Interest, taxes, insurance, depreciation, and repairs			1,735.71
Total fixed expenses			1,735.71
Net returns (to land, operator's labor, and management)			4,512.08

[1] Assumes 8.5 pigs per litter, 2 litters per year, 10 gilts saved as replacements.

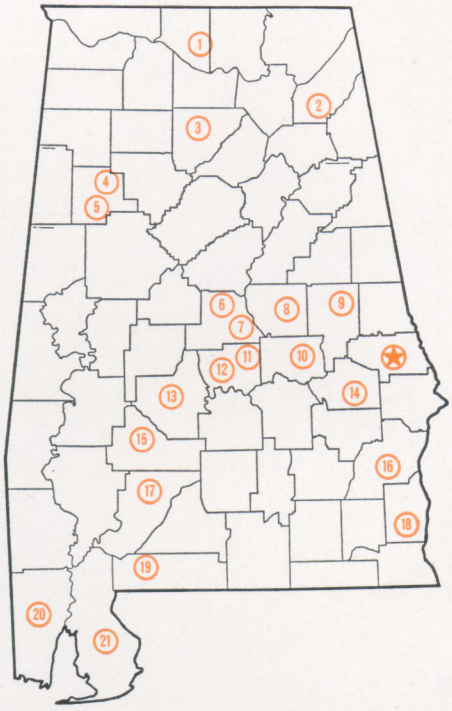
APPENDIX TABLE 21. HOG BUDGET, ESTIMATED FIXED COSTS FOR 20-SOW HERD, CHEAHA CREEK WATERSHED, TALLADEGA COUNTY, ALABAMA, 1973

Item	Value		Interest	Annual fixed costs		Total
	New	Average		Depreciation and repairs	Taxes and insurance	
	Dol.	*Dol.*	*Dol.*	*Dol.*	*Dol.*	*Dol.*
Gilts[1], 24	1,440.00	1,440.00	108.00		16.20	124.20
Farrowing-nursing parlor (10 units), 1	2,500.00	1,250.00	93.75	187.50	18.75	300.00
Finishing parlor and equipment, 1	3,500.00	1,750.00	131.25	262.50	26.25	420.00
Feed room (20 × 24 ft.), 1	1,000.00	500.00	37.50	75.00	7.50	120.00
1,000-bu. grain bin, 1	850.00	425.00	31.88	63.76	6.37	102.01
Feed mill, 1	3,500.00	1,750.00	131.25	262.50	26.25	420.00
Lagoon (70,000 cu. ft.), 1	700.00	350.00	26.25	52.50		78.75
Equipment for sow and boar lots	1,000.00	500.00	37.50	75.00		112.50
Fencing	500.00	250.00	18.75	37.50	2.00	58.25
TOTAL	14,990.00	8,215.00	6,161.30	1,016.26	103.32	1,735.71

[1] Have 24 gilts to assure 20 being bred.

Alabama's Agricultural Experiment Station System
AUBURN UNIVERSITY

With an agricultural research unit in every major soil area, Auburn University serves the needs of field crop, livestock, forestry, and horticultural producers in each region in Alabama. Every citizen of the State has a stake in this research program, since any advantage from new and more economical ways of producing and handling farm products directly benefits the consuming public.



Research Unit Identification

★ Main Agricultural Experiment Station, Auburn.

1. Tennessee Valley Substation, Belle Mina.
2. Sand Mountain Substation, Crossville.
3. North Alabama Horticulture Substation, Cullman.
4. Upper Coastal Plain Substation, Winfield.
5. Forestry Unit, Fayette County.
6. Thorsby Foundation Seed Stocks Farm, Thorsby.
7. Chilton Area Horticulture Substation, Clanton.
8. Forestry Unit, Coosa County.
9. Piedmont Substation, Camp Hill.
10. Plant Breeding Unit, Tallassee.
11. Forestry Unit, Autauga County.
12. Prattville Experiment Field, Prattville.
13. Black Belt Substation, Marion Junction.
14. Tuskegee Experiment Field, Tuskegee.
15. Lower Coastal Plain Substation, Camden.
16. Forestry Unit, Barbour County.
17. Monroeville Experiment Field, Monroeville.
18. Wiregrass Substation, Headland.
19. Brewton Experiment Field, Brewton.
20. Ornamental Horticulture Field Station, Spring Hill.
21. Gulf Coast Substation, Fairhope.