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PLANNING FOR DEVELOPMENT OF HORTICULTURAL CROPS

in Sand Mountain Area of Alabama

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PLANNING FOR DEVELOPMENT OF HORTICULTURAL CROPS IN SAND MOUNTAIN AREA OF ALABAMA[1/]

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Introduction

The Sand Mountain area of Alabama is the southernmost part of the Cumberland Plateau located in the extreme northeast part of the State, and is composed of parts of Dekalb, Etowah, Jackson, and Marshall Counties. Elevation of the area ranges from 1,000 to 1,800 feet. Soils are gray to brown silt and fine sandy loams. They are well drained and are easy to till where topography is not too rugged. The soils respond readily to good management and high fertilization rates.

Cropping patterns in the area have historically been relatively intensive row-crops, primarily cotton and corn. The trend is to even more intensive enterprises such as potatoes, pimentos, and other horticultural crops, and poultry. In 1959, sales of horticultural crops were relatively unimportant, and poultry production was valued at $10.8 million. According to preliminary data from the 1964 Census of Agriculture, sales of horticultural and poultry products have increased rapidly. Although data cannot be obtained for the specific area, county data indicate that poultry sales have perhaps doubled, and sales of horticultural crops have increased by 300 per cent or more.

Reasons for this increased intensity of production are several. Perhaps among the more important forces are the small farms occurring in

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1/ Research on which this report is based was carried out under Hatch Research Project 195 titled "Supply Response in the Production of Selected Vegetables in Alabama."

the area, and the relatively little amount of cropland available per farm. In 1959, farms averaged 63 acres of total land and 38 acres of cropland. Farms are small and numerous and most farms are occupied by a farm family. The area has been described as the most thicky populated rural area in the United States. The resulting population-to-land ratio indicates a labor supply that is good relative to other areas of the state. Another probable explanation for the shift toward intensive crops has been the decline of interest in cotton production. There are, no doubt, numerous forces contributing to the greater incidence of intensive enterprises in the area.

The shift to horticultural crops creates many new problems for farmers in the area. Farmers having only limited experience with commercial production of horticultural crops are faced with many uncertainties such as choice of crops suited to their individual operations. All horticultural crop producers are faced with rising labor costs, unstable marketing conditions, plant diseases and insects, in addition to weather variables. Some of the problems connected with individual farm and area planning have been analyzed in this study from a production standpoint. Specific objectives were:

1. To develop basic cost and returns data for horticulture and fruit crops.
2. To develop representative or model resource situations existing in the area, with emphasis on labor availability.
3. To develop optimum farm plans for the several model resource situations.
4. To determine what extent varying prices of labor affect farm organization.
5. To develop aggregate supply curves for selected vegetable crops.

Scope and Method of Study

This study is normative in scope in the sense that it is an analysis of what can happen with best technology as opposed to a prediction of what will happen. As such it should be regarded as a tool in establishing programs and plans that have economically feasible goals. Results are presented that are the consequence of basic assumptions about resource scarcity, technical efficiency and management. Limitations of the area are, thus specified in terms of economic feasibility. As other alternatives for agriculture are found they will of course affect the results.

Special tabulations from the 1959 Census of Agriculture were made for the study area and were used to select five different farm resource situations. Data for these farms, with the exception of labor, are in Table 1.

Assumptions

Four classes of labor were identified as part of the resource base. They were: (1) total operator labor, (2) operator field labor, (3) total family labor, and (4) family field labor.

Total operator labor was obtained from unpublished data developed for regional project S-42 in the Department of Agricultural Economics and Rural Sociology, Auburn University. Monthly distribution of days when field labor could work was obtained from data on distribution of rainfall.[1/] Estimates of total family labor available were obtained from the 1960 Census of Population. Based on population data on age and sex, it was estimated that the model farms, except for the part-retired classification, had an operator, wife, one daughter, and one son of

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1/ "Effects of Changes in Prices of Cotton and Level of Cotton Allotment on Optimum Farm Organization in the Delta Area of Mississippi," unpublished Master's Thesis, by James G. Dillard, Department of Agricultural Economics, Mississippi State University, May 1963.

Table 1. Land Resources for Five Economic Classes of Farms, Sand Mountain Area, 1959

Resources of the area	Unit	Economic class of farm				
		$5,000 & over	$2,500-4,999	$50-2,499	Part-time	Part-retired
Farms	No.	1,459	1,280	1,240	1,450	529
Total land per farm	A.	106	71	43	37	39
Openland per farm	A.	84	52	31	22	19
Row-crop land per farm	A.	63	41	22	12	19
Good pasture per farm	A.	8	3	2	2	3
Poor pasture per farm	A.	13	8	7	8	7
Cotton allotment per farm	A.	19	11	6	5	5
Off-farm work per farm	Days	65	45	26	179	22

SOURCE: 1959 Census of Agriculture, Special Tabulation.

working age. Labor available from these dependents was converted to man-month equivalents of total family labor (see Table 2) and added to total operators labor to yield total labor as shown in Table 3.

Linear programming techniques were used to obtain optimum farm plans for each model farm. Coefficients for the several models were obtained from materials on file in the Department of Agricultural Economics, Auburn University, and Agricultural Economics Branch, TVA. The linear programming matrix (nearly 5,000 cells) is much too large for practical publication, hence, some of the important budget material is listed in Table 4. Net returns given in Table 4 are the result of using budgets that show the best technology available. An example of one of the budgets is given in Appendix Table 4 to illustrate the procedure that was used. Net returns in Table 4 are primarily returns over cash costs and returns have not been allocated to land, management, family labor or machinery investment. Thus, the analysis is a comparison of horticultural crops in the absence of significant differences in farm resources other than land.

Table 2. Family Labor as Man-Equivalents by Season

Month	Wife	Son	Daughter	Total man-month equivalents
January, February, March	0	.1	0	.1
April, May	.1	.5	.1	.7
June, July, August	.2	.7	.2	1.1
September, October	.1	.5	.1	.7
November, December	0	.1	0	.1

Table 3. Total Hours of Family Labor Available by Months as Determined by Family Size and Weather, Sand Mountain Area, 1959

Month	Economic class of farm		
	5,000 & over 2,500-4,999 50-2,499	Part-time	Part-retired
	Hours	Hours	Hours
January	219	66	100
February	209	64	95
March	263	75	120
April	393	112	120
May	452	109	133
June	540	130	128
July	540	130	128
August	559	134	133
September	437	105	128
October	406	99	120
November	219	55	100
December	209	64	95
Total	4,446	1,143	1,400

Table 4. Yields, Prices, Total Labor Requirements and Net Return Per Unit Used in Programming Model, Sand Mountain Area, Alabama

Enterprise	Unit	Yield	Price	Total labor[1]	Net return/ unit[2]
		Units	Per unit	Hours	Dollars
Horticultural Crops:					
Potatoes	Cwt.	150	2.75	96	195
Sweet potatoes	Bu.	250	1.50	130	147
Pimento pepper	Ton	4.0	90.00	114	258
Sweet corn	Crate	185	1.25	30	122
Bush beans	Ton	2.5	60.00	28	62
Pole beans	Bu.	215	3.00	243	447
Ground tomatoes	Ton	15	30.75	153	302
Trellis tomatoes	Bu.	800	4.00	846	2,790
Field peas	Ton	2.0	100.00	115	156
Cucumbers	Bu.	200	1.75	113	200
Squash	Ton	4	80.00	127	268
Strawberries	Qt.	4,000	.12	485	588
Sorghum (syrup)	Gal.	100	2.00	65	104
Cabbage	Cwt.	180	2.20	166	297
Cantaloupe	Ton	5	40.00	23	146
Potatoes & squash	--	--	--	223	463
Potatoes & field peas	--	--	--	211	351
Potatoes & sweet corn	--	--	--	126	317
Potatoes & pole beans	--	--	--	339	642
Potatoes & cucumbers	--	--	--	209	395
Other Field Crops:					
Cotton (hand harvest)	Lb. lint	700	.356	115	202
Cotton (machine harvest)	Lb. lint	650	.341	16	127[3]
Corn	Bu.	65	1.15	9	48
Livestock & Poultry:					
Beef cattle	25 cows	--	--	331	1,354
Market hogs	Sow	--	--	82	242
Feeder pigs	10 sows	--	--	286	1,289
Broilers	40,000	--	--	960	1,465
Forestry	acre	--	--	--	1

1/ Assumes hand harvest when not indicated otherwise.

2/ Net return to land, management, and family labor as well as investment expense not allocated to enterprise, see Appendix Table 4.

3/ Less than hand harvest because of lower yield per acre and price per pound and also because of custom charges for harvesting.

Activities were included in the models to permit hiring both supplemental operator field labor and family field labor by months. Different wage rates were used to reflect differences in operator and family field labor. The hiring of an entire family on an annual basis was included as an alternative. Additional operating and investment capital could be hired with no restriction other than labor cost.

Long and short-run periods of adjustment were studied. The short-run period was thought of as being about 5 years in length and resulted principally in restrictions on management decision-making. Horticultural crops were withheld from an optimum plan in the short-run period (at levels) greater than (eight) acres per farm. Eight acres planted would represent a decision to double vegetable acreage on the average farm that was already in vegetable production. Assumption of limited adjustment was made primarily to reflect the effect of managerial capacity on aggregate supply response in the area. Perfect aggregation specifies that the sum of the solutions for each of the individual farms in a set equals the estimate obtained by determining the optimum solution for the entire set directly.

Thus, the final result is a marginal analysis of area management capacity to move from the present system of agriculture to more intensive horticulture. The present system of agriculture in the area was fixed in the short-run by specifying minimum levels of cotton, corn, broilers, beef cattle and market hogs that were consistent with recent area production levels. Hired labor per farm was also restricted in the short-run to 258 hours per year, which was about average for the area. Management decisions were unrestricted with respect to adjustment in vegetable production acreage in the long-run.

Optimum Farm Plans

Optimum short-run plans were developed for the five model farm resource situations listed in Table 1. Optimum plans for commercial farms are shown in Table 5. For discussion purposes, commercial classes of farms will be identified as Class I ($5,000 and over), Class II ($2,500-4,999), and Class III ($50-2,499). Labor available on these farms was assumed to be constant; thus, the variability of results stems from differences in land resource base.

Commercial Farms

Optimum plans for commercial farms are highly diversified, including up to 12 different enterprises. Optimum plans are quite similar for these classes--the most obvious difference being in the plan for Class III, farms that do not include market hogs and feeder pigs. These enterprises are included at a low level in plans for Classes I and II, but were forced out in favor of horticultural crops and broilers as land became more restrictive. Surprisingly, net returns are not significantly lower on Class III farms, which have 40 per cent fewer acres of openland than Class II farms.

Another point to note is the importance of unused land in the optimum plan. More than half of the openland in the area is not needed to produce the present agricultural output and the indicated adjustment to horticultural crops. For example, the plan for Class I farms includes 46.5 acres of pine timber, which occupies 44 per cent of total land and 52 per cent of openland. Although returns from timber are relatively low, timber production requires an insignificant amount of labor, which explains the enterprise being in the plan. However, any alternative not requiring labor would be indicated here. Land rented out would be the most frequent alternative sought by the individual farmer.

Table 5. Optimum Farm Plans for Three Classes of Commercial Farms Sand Mountain Area, Alabama

Enterprise	Unit	$5,000 & over	$2,500-4,999	$50-2,499
Cotton	Acre	19.1	10.9	5.9
Corn	Acre	18.0	18.0	8.6
Pimento	Acre	2.8	2.4	2.5
Tomatoes (processing)	Acre	0.5	0.5	1.1
Tomatoes (fresh market)	Acre	1.7	1.8	2.0
Sweetpotatoes	Acre	0.6	0.5	1.4
Sweet corn	Acre	2.5	2.8	1.0
Beef cattle	Cows	6.0	6.0	4.0
Feeder pigs	Sows	16.0	16.0	0
Market hogs	Sows	1.0	1.0	0
Broilers	Thous.	56.0	60.0	68.0
Pine timber	Acre	46.5	20.0	7.7
Hired operator and field labor 1/	Hours	258.0	258.0	258.0
Operating capital	Dol.	2,986.0	2,737.0	1,026.0
Investment capital	Dol.	9,804.0	10,060.0	7,367.0
Net returns to land, mgt., family labor and investment not allocated to enterprise	Dol.	12,244.0	11,513.0	9,468.0

1/ Scarcity of hired labor in June and September was restrictive to further production.

Variability in Farm Plans Related to Net Returns

The optimum farm plans appeared to be relatively stable with respect to variability of price and yield of horticultural crops. Levels of price and yield of non-horticultural activities were not varied since these activities were in general limited in the short-run to average amounts according to historical levels. Net revenue of each vegetable crop in the plan was allowed to vary from 50 per cent below to 50 per cent above the net revenue shown in Table 4. A 50 per cent change in net revenue (resulting from a change in total revenue) could be interpreted at the extremes as either a 50 per cent change in selling price, a 50 per cent change in yield, or some combination.

Varying the net revenues of each of the crops gave the following results. As the net revenue of pimento peppers went 10 per cent below that

expected, sweet corn already in the plan increased and replaced pimentos as the best crop. Sweet corn remained in the optimum plan even at a 50 per cent decrease in net revenue, although at a lower level. At near 50 per cent decrease, pole beans gained some of the decrease in sweet corn acreage. Sweetpotatoes stayed in the optimum plan at nearly the same small acreage regardless of whether net revenues were increased or decreased 50 per cent.

Stake tomatoes also remained in the optimum plan at a 50 per cent decrease in net revenue although acreage was reduced almost to half. Pole beans were again closely competitive with crops in the optimum plan since they began to replace stake tomatoes when net revenue reached a point of 35 per cent below that in Table 4. Any further reduction in stake tomato net revenue also made it possible for potatoes to enter the plan. Potatoes double-cropped with squash, pole beans, slicing cucumbers, or sweet corn were indicated in the presence of low net returns on stake tomatoes. Slicing cucumbers completely replaced ground tomatoes when ground tomato net revenue went 20 per cent below that specified in Table 4.

Vegetable crops that came into the optimum plan as a result of decreasing net revenues were slicing cucumbers, pole beans, and potatoes double-cropped with sweet corn, squash, pole beans, or cucumbers. Thus, three sets of crops are indicated in order of competitiveness, Table 6. The first set consists of those in the optimum plan. The second set consists of those above that come in when net returns are less favorable on the first set. The third set consists of those that do not enter into optimum plans. These were cabbage, bush snap beans, field peas, strawberries, and sorghum for syrup.

Table 6. Technically Feasible Vegetable Crops of the Sand Mountain Area and Their Estimated Order of Profitability

Most attractive	May be indicated when returns are less than expected in Set I	Least attractive
Set I	Set 2	Set 3
Pimento	Slicing Cucumbers	Cabbage
Tomatoes	Pole beans	Snap beans
Sweetpotatoes	Irish potatoes doubled cropped with:	Field peas
	Sweet corn	Strawberries
	Squash[1/]	Sorghum (for syrup)
	Pole beans	
	Cucumbers	

1/ Could also be considered as a crop in Set 3.

Cabbage, bush snap beans, field peas, strawberries, and sorghum for syrup were not competitive with the best set under any net revenue conditions considered in the study. Squash was not competitive at any price except when double-cropped with potatoes. These crops are ruled out, however, based on average resource availability for the area. There are, possibly, special or non-average situations in which they should be considered. Cantaloupe was also judged to be a speciality crop and was deleted in the final analysis. Labor requirements for cantaloupe are low as compared with other horticultural crops and could make cantaloupe very attractive for some farms.

Noncommercial Farms

Labor was limited to the amounts shown in Table 3 on part-time and part-retired farms; consequently, optimum farm organizations on these farms differ distinctively. Cotton, corn, and pine forest are the major land using enterprises, while broilers take up most of the labor. Tomatoes were the only horticultural crop that appeared in the optimum farm

plan. As expected, net returns of $2,500 to $3,500 associated with optimum plans were much lower on noncommercial than on commercial farms. The lower returns are explained primarily by the fact that noncommercial farmers, part-time, and part-retired have less farm labor available.

A greater percentage of openland would be rented out or placed in pine timber in noncommercial farm plans. Labor supplies are exhausted by land intensive enterprises, and a majority of openland is idle. This was found true to a lesser extent on optimum plans for commercial farms.

Aggregation of Farm Plans in the Short-Run

The important question of how the area might adjust to optimum farm plans containing vegetables as the major crop of the area (see appendix tables) is answered in part by examining how adjustments could take place within original short-run conditions specified in this analysis.

Adjustment in area production takes place in response to forces of supply and demand that are national in scope. Local resource availability and ability to supply are, nevertheless, an important area of study. Aggregate area supply curves for selected crops of the area were estimated and are shown in Figures 1-6. A characteristic of vegetables that were economically feasible was that present production could profitably be expanded over a relatively wide range.

Acreages of area crops compiled from preliminary 1964 census of agriculture data for the four-county Appalachian area have been compared with estimates of what the Sand Mountain area could do with its present resource base. These acreages appear in the following six figures and are marked with an "x," which matches census acreage with the prices used in the study, Table 4. Optimum farm plans in Table 5 are also based on the prices marked "x." Each of the figures indicates the quantities of supply that would maximize profit given the indicated prices and other

assumptions of the study. The effect of the indicated price changes on the production of other crops in the farm plan, Table 5, may be seen by referring to the section titled "Variability in Farm Plans Related to Net Returns."

Pimento pepper production in the area was estimated from census data to be 3,277 acres, but is unlimited by present resource availability and net returns until acreages reach about 10,000. Production above this level would require steady increases in price per ton to bid labor resources away from other profitable enterprises, Figure 1.

Potatoes, another important crop of the area were planted on about 3,600 acres. As indicated by Figure 2, a price of $2.75 per cwt. used in this study is slightly below the level needed to justify present production. About $3.20 per cwt. for potatoes under the assumed cost and yield conditions would maximize returns to resources used in present potato production. At this price area production could be expanded to near 8,000 acres before serious resource returns problems would be encountered. Above this level of production more than $4.50 per cwt. would be required for potatoes to compete with other enterprises.

Tomato acreage on the ground, estimated in the 1964 census of agriculture to be 225 acres, is at least 2,000 acres below the level that would maximize returns to the area resource base, Figure 3. Stake tomato acreage also could be expanded from near zero at present to about 7,000 acres for maximum returns. An increase in price of 25 cents per bushel would mean that perhaps another 1,000 acres would be profitable. Production beyond that level would require an even greater price.

Present sweetpotato acreage was estimated at about 200 acres. Profitable production could be expected from about 1,000 acres of the area

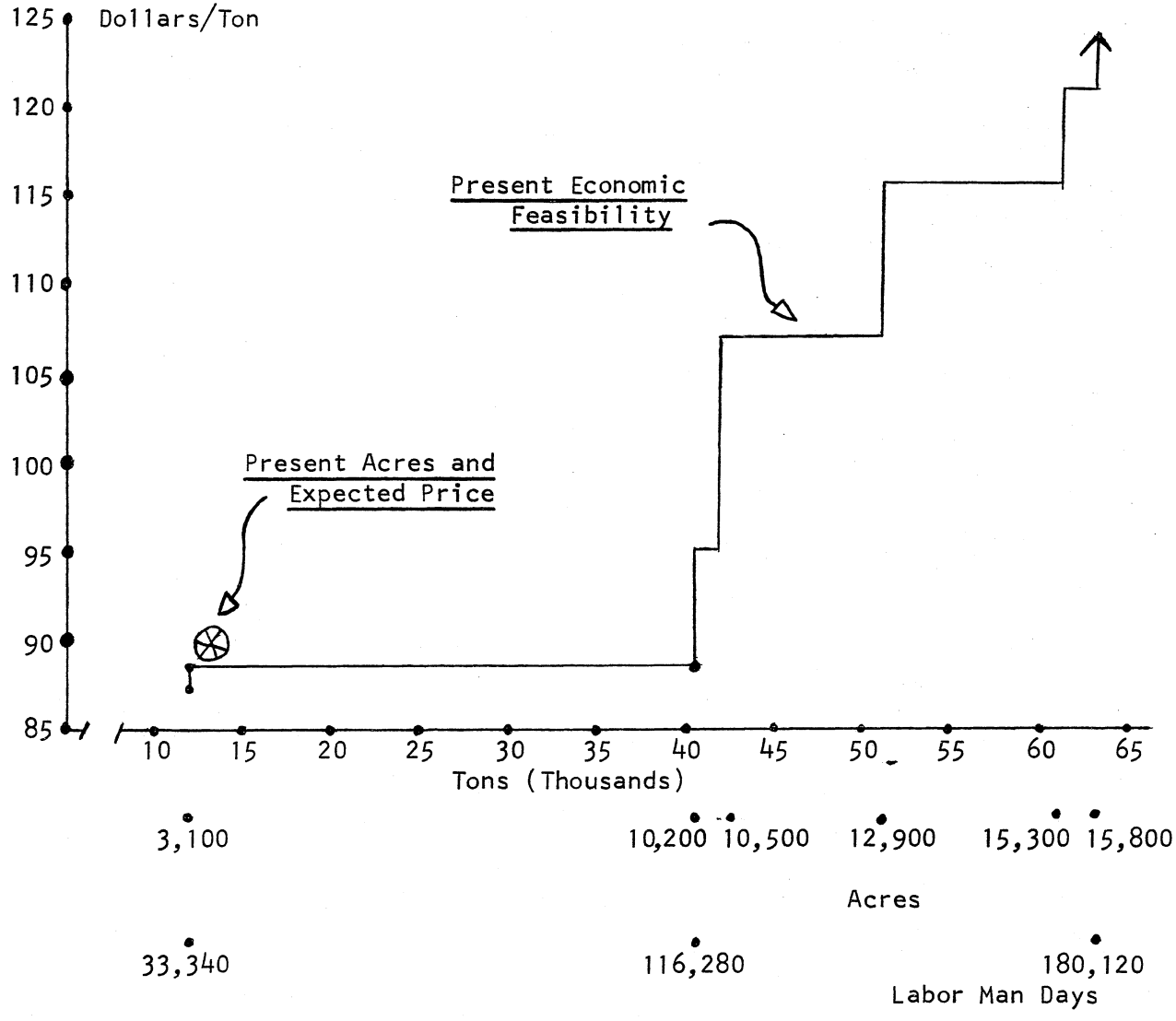


Figure 1. Sand Mountain Pimento Pepper Supply Present and Economically Feasible

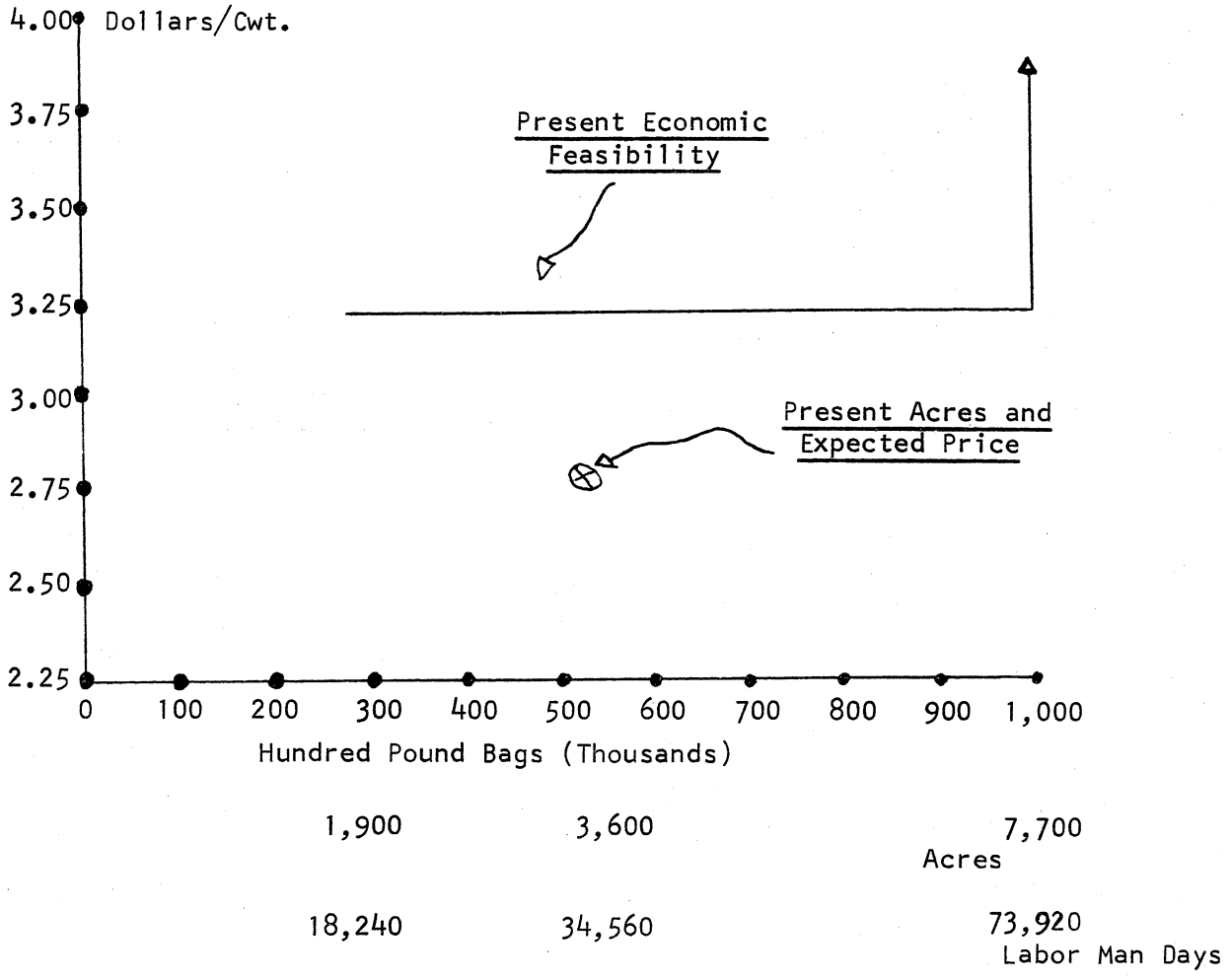
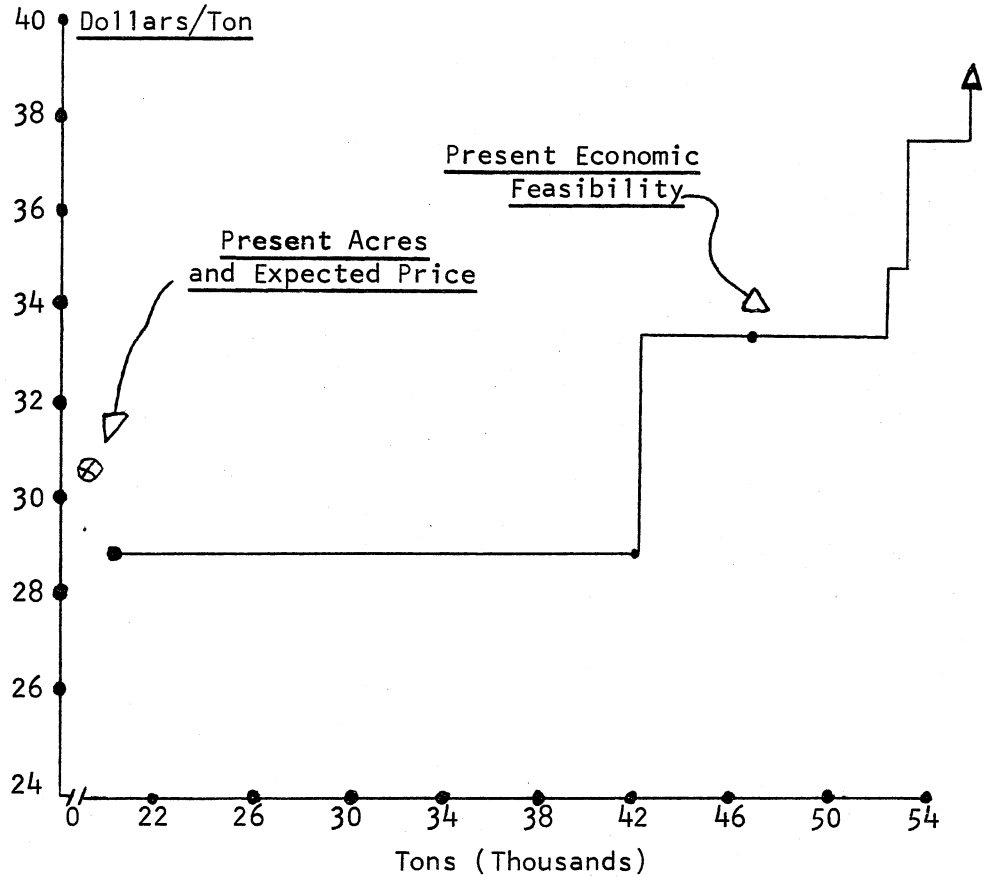


Figure 2. Sand Mountain Irish Potato Supply Present and Economically Feasible



225	1,400	Acres	2,700	3,500	3,700
3,442	21,420	Labor Man Days	41,310	53,550	56,610

Figure 3. Sand Mountain Ground Tomato Supply Present and Economically Feasible

at present prices and net returns indicated in the study. Any further expansion in production might require increases in prices greater than would normally be expected, Figure 4.

Acreage of cucumbers, which along with potatoes is in the second best set of crops, was estimated at 212 acres both for slicing and pickling. Therefore, this is about maximum in terms of the study. Prices in the range of $2.00 to $2.15 per bushel would, however, indicate up to 2,500 acres for the area, Figure 5. Pole snap beans, also in the second best set, would be a dominant crop in the area under present conditions if prices or technology were appreciably different than assumed. A price of $3.76 per hundredweight, for example, might command resources capable of producing 30,000 acres.

Sweet corn production also offers a possibility for large expansion. Present acreage is about 200 acres, whereas the present resource base could profitably produce up to 8,000 acres. A slight increase in price of about 5 cents per crate or yields greater than those assumed in the study could mean profitable production on as much as 20,000 acres, Figure 6.

Any one of the projected acreages indicated in Figure 1-6 could be on open land available to commercial farms of the area even though the historical production levels of other crops remained the same. Open land on the 1,979 non-commercial farms of the area provides an even larger base for vegetable production.

Long-Run Effects of Varying Labor Cost on Optimum Farm Plans

A slightly different model was used to analyze effects of changes in labor prices on optimum farm organization. Part-retired farms were omitted from the analysis. The only restriction on quantity of labor

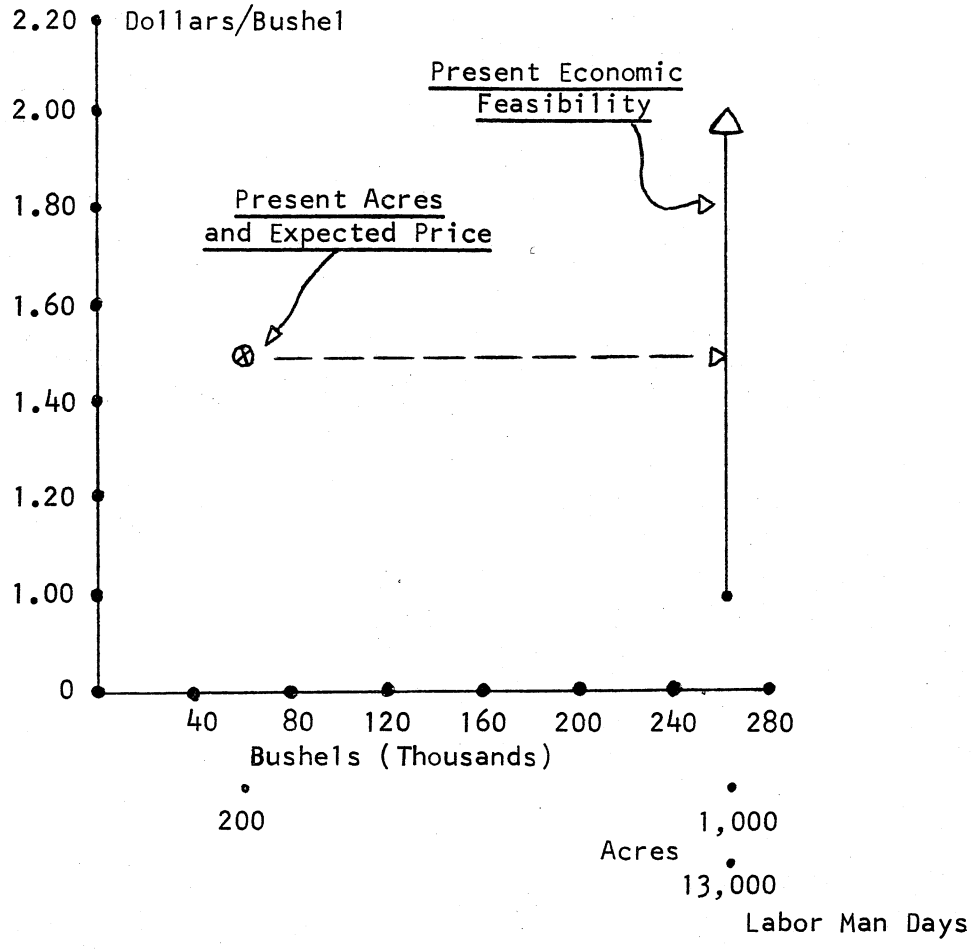


Figure 4. Sand Mountain Sweetpotato Supply Present and Economically Feasible

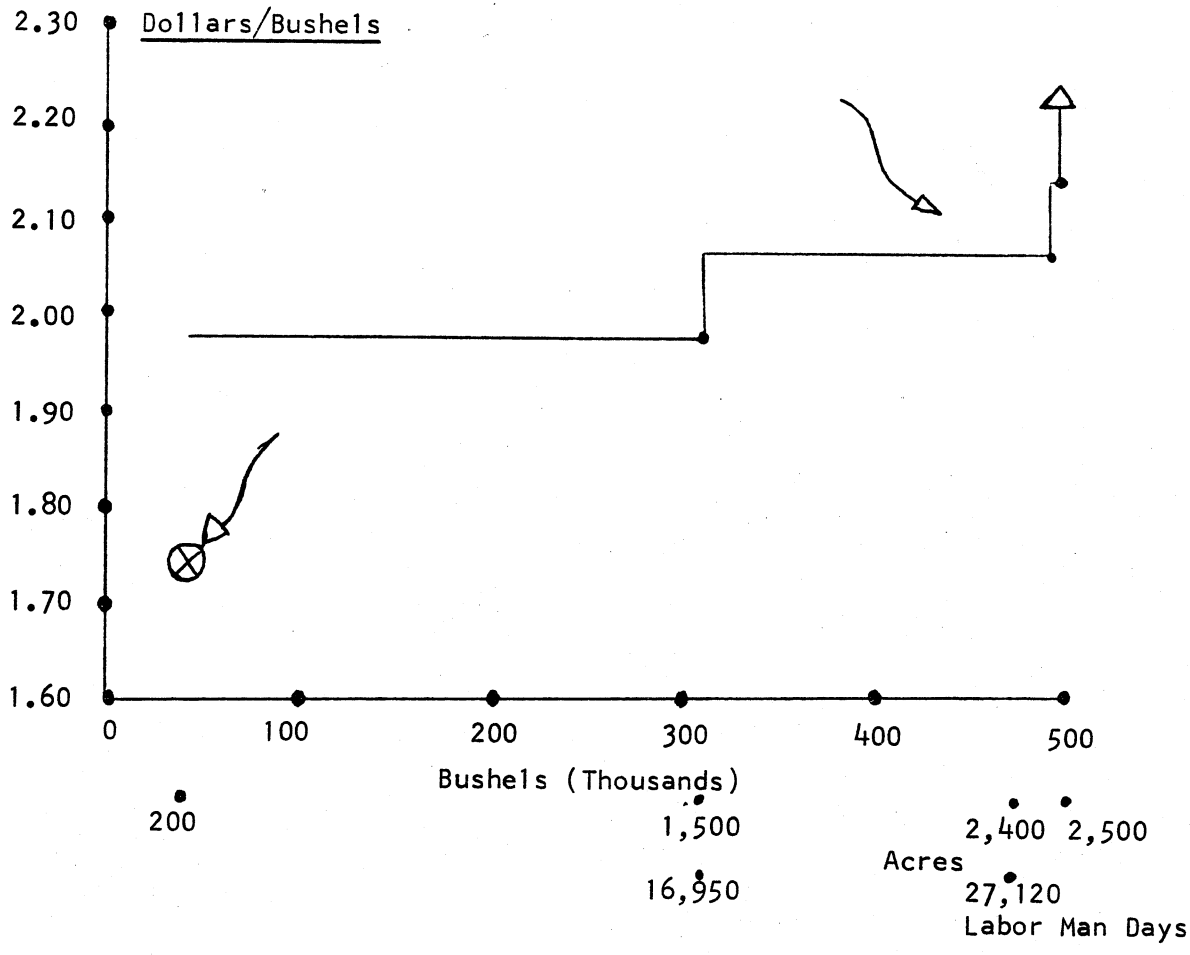


Figure 5. Sand Mountain Slice Cucumber Supply Present and Economically Feasible

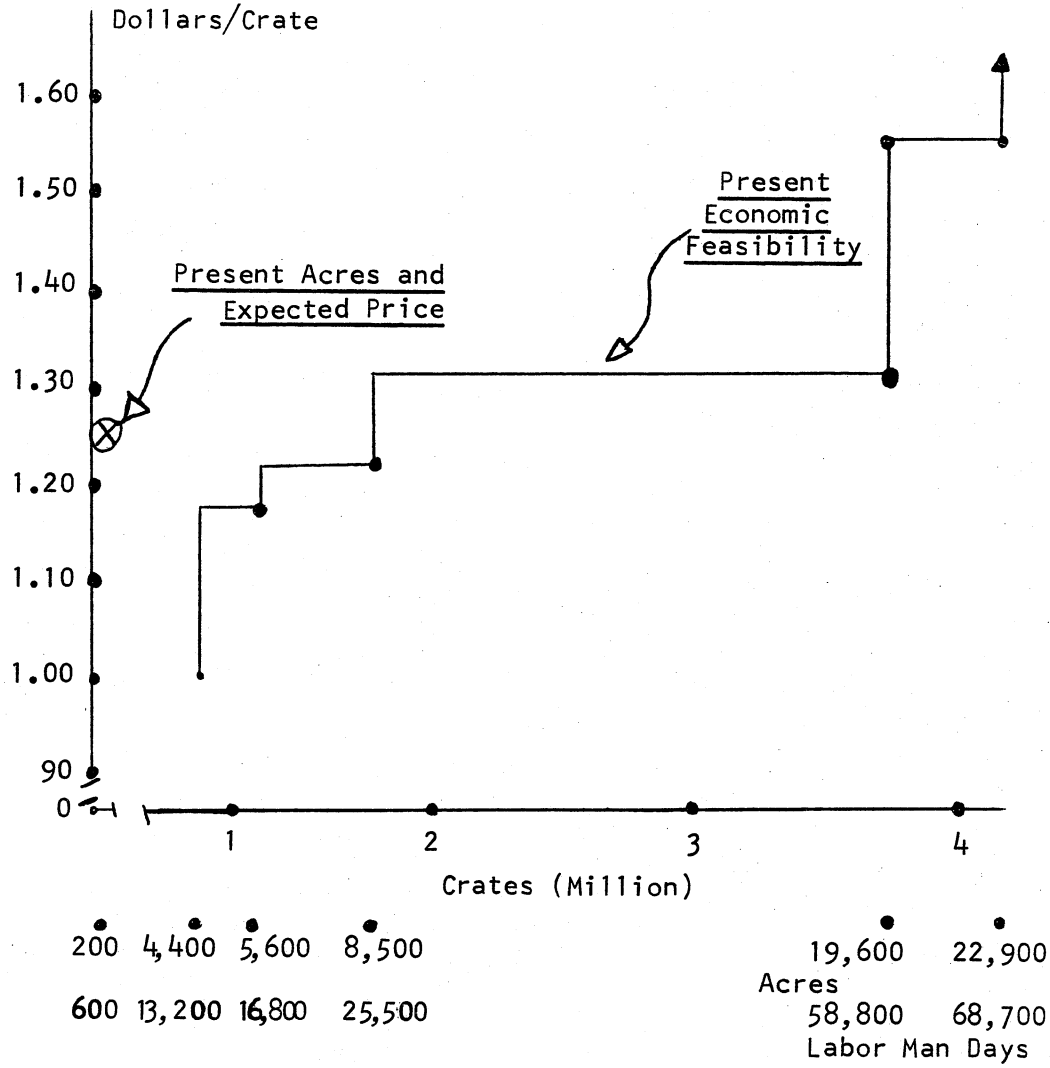


Figure 6. Sand Mountain Sweet Corn Supply Present and Economically Feasible

hired was price, where five prices were assumed for each of three types of labor. Prices assumed are given in Table 7. The broiler enterprise was restricted to a maximum of 80,000 birds, but vegetable crops were allowed to reach any level. Staked tomatoes and pole beans, labor intensive crops, dominated optimum plans when labor was available at the assumed rates.

Appendix Tables 1-3 reveal less than expected changes in farm organizations as labor prices increase. Pole beans, potatoes and snap beans double-cropped, and staked tomatoes were the only field crops included in any of the optimum plans. Timber, beef, feeder pigs, and broilers were other enterprises included. Potatoes and pole beans double-cropped, staked tomatoes, timber, feeder pigs, and broilers were included in all plans at all labor prices considered. Pole beans were included in all plans after labor prices reached the third highest level. Beginning with the third wage level, the number of feeder pigs began to decline as labor price increased, and beef cattle were introduced in the plans.

The total amount of labor hired decreased as expected as wages increased. Reductions in amount of field labor used were slight, but decreases in hired substitute operator labor utilized finally reached 70 per cent. The shifts in farm organization that occurred were because of wage differentials for field and operator labor and (the resulting) increase in relative profitability of land-using enterprises. As labor prices were increased, there were shifts to those enterprises requiring relatively less substitute operator labor.

Substitute operator labor is generally, especially in the context of this study, labor that cannot be replaced by a machine. Substitute family labor might on the other hand be replaced. The appendix tables

Table 7. Five Price Levels Assumed for Analyzing Effects of Changing Labor Cost

Type of labor	Price Level				
	1	2	3	4	5
	----------Dollars----------				
Substitute family field labor (per hour).	.7	.85	1.00	1.15	1.30
Substitute operator labor (per hour). . .	.87	1.06	1.25	1.44	1.62
Substitute family (annual rate.	3,150	3,825	4,500	5,175	5,850

indicate that broilers would continue to compete for operator labor in the area and some substitute operator labor would need to be hired to carry on an extensive vegetable operation even if mechanization completely replaced family field labor. The expected competition of broilers for operator labor is one of the most important long-run factors affecting vegetable production in the area. Furthermore, mechanization will increase the demand for good quality labor. The analysis, however, does show that in the long-run farmers could pay $1.60 per hour for substitute operator labor used in a profitable, well-managed vegetable enterprise. Family field labor or its equivalent in mechanization must be supplied in the quantities indicated, however, and this is substantial as indicated by labor man-day requirements.

Summary

In the short-run two of the three crops that are most widely grown in the Sand Mountain area, pimentos and tomatoes, have economic potential for becoming major crops of the area if farm managers can obtain yields and net returns approximating the data used in this study. Potatoes, another important vegetable crop of the area, can also become even more important if conditions are only slightly better than assumed in this

study. Under the most long-run assumption of the study, potatoes continue to be included in optimum farm plans.

Individual interest of managers is recognized as a major determinant of actual adjustments and it is anticipated that normative studies of this type will give confidence to those having a current interest and will stimulate interest among potential growers. Uncertainty of vegetable production profitability was not included as a variable affecting farm plans although uncertainty is recognized as a primary block to many potential growers. Introduction of irrigation and mechanical harvesting, however, will put vegetable production on a more consistent basis. Uncertainties of yield and labor supply will be greatly reduced. The effect of consistency may be as important as yield increases or cost savings that might occur. Further work is indicated in this area.

The final, and perhaps most important, set of variables excluded from this analysis were those concerning market demand. Inadequate level of demand could mean that the area would not become a major vegetable producing area under any condition of supply. However, where economic feasibility of supply can be shown, increased interest has been shown in recent years by buyers in both the fresh and processing markets.

Appendix Table 1. Optimum Combination of Farm Enterprises, Net Income, and Other Items for Five Prices for Labor, Farms with Gross Sales over $5,000

Item	Units	Price Level for Labor[1] 1	2	3	4	5
Crops						
Pole Beans	Acre	0	0	.6	1.2	1.7
Pot. and snap beans	Acre	61.0	61.0	60.4	60.0	59.3
Tomatoes[2]	Acre	2.0	2.0	2.0	2.0	2.0
Livestock and poultry						
Beef	25 cows	0	0	.2	.2	.2
Feeder pigs	10 sows	13.0	13.0	8.1	5.4	2.8
Broilers	40,000	2.0	2.0	2.0	2.0	2.0
Pine timber	Acre	8.0	8.0	.2	2.8	5.5
Net income	Dol.	33,577	29,907	26,384	23,084	19,906
Corn purchased	Bu.	7,475	7,475	4,654	3,137	1,582
Operating capital	Dol.	16,129	16,129	13,295	11,712	10,092
Investment capital	Dol.	30,695	30,695	23,370	18,691	13,897
Hired type I labor[3]	Hours	20,551	20,551	20,463	20,256	19,864
Hired type II labor[4]	Hours	3,090	3,090	1,761	1,163	805
Hired type III labor[5]	Hours	0	0	0	0	0
Total labor hired	Hours	23,641	23,641	22,224	21,419	20,669

1/ Five prices were assumed for three different types of labor. Initial prices for field labor and operator labor were $1 and $1.25 per hour, respectively. An annual rate of $4,500 was used for hiring an entire family. All labor prices were varied 15 and 30 per cent in both directior

2/ Tomatoes also would have reached high levels of production, but were restricted to two acres. The purpose of this analysis, however, was to show the demand for labor which would be similar for either tomatoes or pole beans double cropped with snap beans.

3/ Field labor.

4/ Operator labor.

5/ Whole family.

Appendix Table 2. Optimum Combination of Farm Enterprises, Net Income and Other Items for Five Prices for Labor, Farms with $2,500-5,000 Gross Sales, Sand Mountain Area, Alabama

Item	Units	Price Level for Labor[1]				
		1	2	3	4	5
Crops						
Pole beans	Acre	0	0	.9	1.2	1.7
Pot. and pole beans	Acre	39.0	39.0	38.1	37.8	37.3
Tomatoes[2]	Acre	2.0	2.0	2.0	2.0	2.0
Livestock and poultry						
Beef	25 cows	0	0	.1	.1	.1
Feeder pigs	10 sows	10.8	10.8	7.3	5.7	3.0
Broilers	40,000	2.0	2.0	2.0	2.0	2.0
Pine timber	Acre	5.2	5.2	5.2	5.6	8.3
Net income	Dol.	24,832	22,420	20,036	17,890	15,831
Corn purchased	Bu.	6,210	6,210	4,198	3,264	1,709
Operating capital	Dol.	12,017	12,017	9,935	8,970	7,350
Investment capital	Dol.	26,794	26,794	20,967	18,224	13,431
Hired type I labor[3]	Hours	13,577	13,577	13,434	13,280	12,851
Hired type II labor[4]	Hours	1,977	1,977	1,026	695	373
Hired type III labor[5]	Hours	0	0	0	0	0
Total labor hired	Hours	15,554	15,554	14,460	13,975	13,224

1/ Five prices were assumed for three different types of labor. Initial prices for field labor and operator labor were $1 and $1.25 per hour, respectively. An annual rate of $4,500 was used for hiring an entire family. All labor prices were varied 15 and 30 percent in both directions

2/ Tomatoes also would have reached high levels of production, but were restricted to two acres. The purpose of this analysis, however, was to show the demand for labor which would be similar for either tomatoes or pole beans double cropped with snap beans.

3/ Field labor.

4/ Operator labor.

5/ Whole family.

Appendix Table 3. Optimum Combination of Farm Enterprises, Net Income and Other Items for Five Prices for Labor, Farms with Less Than $2,500 Gross Sales, Sand Mountain Area, Alabama

Item	Units	Price Level for Labor[1] 1	2	3	4	5
Crops						
Pole beans	Acre	0	0	1.0	1.2	1.5
Pot. and snap beans	Acre	16.0	16.0	15.0	14.8	14.5
Tomatoes[2]	Acre	2.0	2.0	2.0	2.0	2.0
Livestock and poultry						
Beef	25 cows	0	0	0	.1	.1
Feeder pigs	10 sows	7.0	7.0	6.8	5.4	3.8
Broilers	40,000	2.0	2.0	2.0	2.0	2.0
Pine timber	Acre	3.0	3.0	2.7	.2	1.4
Net income	Dol.	15,496	14,468	13,447	12,504	11,618
Corn purchased	Bu.	4,025	4,025	3,933	3,078	2,199
Operating capital	Dol.	6,835	6,835	6,692	5,830	4,916
Investment capital	Dol.	20,057	20,057	19,820	17,617	14,942
Hired type I labor[3]	Hours	6,264	6,264	6,088	5,898	5,650
Hired type II labor[4]	Hours	467	467	416	188	14
Hired type III labor[5]	Hours	0	0	0	0	0
Total labor hired	Hours	6,731	6,731	6,504	6,086	5,664

1/ Five prices were assumed for three different types of labor. Initial prices for field labor and operator labor were $1 and $1.25 per hour, respectively. An annual rate of $4,500 was used for hiring an entire family. All labor prices were varied 15 and 30 percent in both directions

2/ Tomatoes also would have reached high levels of production, but were restricted to two acres. The purpose of this analysis, however, was to show the demand for labor which would be similar for either tomatoes or pole beans double cropped with snap beans.

3/ Field labor.

4/ Operator labor.

5/ Whole family.

Appendix Table 4. Budget for Tomatoes (on ground), Based on Best Management Practices, and Yields, Alabama.

Item	Description	Unit	Quantity	Rate	Amount
Receipts					
Tomatoes	One acre	Tons	15	$30.75	$461.25
Cash Expenses, per acre					
Planting	Plants	thous.	4	6.20	24.80
Lime	Custom application	(1 ton/4 yr. @ $7.75/ton)			1.94
Fertilizer	5-15-10	cwt.	8	2.04	16.32
	8-8-8	cwt.	5	2.04	10.20
	Ammonium Nitrate	cwt.	2.5	3.64	9.10
Insecticide	Malithion (57%)	qt.	12	2.50	30.00
	T.D.E. (50%)	lb.	24	.75	18.00
Fungicide	Maneb (80%)	lb.	24	.70	16.80
Herbicide	Diphenamide (50%)	lb.	2	2.70	5.40
Soil Fumigant	Nemagon (50%)	gal.	1	9.00	9.00
Transplant	Labor	hr.	45	.90	40.50
Tractor operating	Grease, oil, gas, repairs	hr.	7.5	.65	4.88
Equipment operating	Grease, oil, gas, repairs				1.20
Total cash expenses					188.14
Harvest, cash expense	Labor	hr.	100	.90	90.00
Non-cash Expenses					
Labor	Regular operator	hr.	8.0	.90	7.20
Interest on operating capital		dol.	94.07	.08	7.53
Equipment	Interest, taxes, housing, insurance				4.00
Total non-cash expenses					18.73
Total cash and non-cash expense					296.87
Net returns to land, management, and equipment investment.					164.38
Total labor cost		hr.	153	.90	137.70
Net return to land, management, family labor, and equipment investment					302.08