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The overall purposes of this project are: (1) to provide guides to farmers choosing among alternative production opportunities, especially as those opportunities are affected by changes in prices and technology, and (2) to provide guides to farmers and other persons engaged in developing and administering public agricultural programs.

Oklahoma State University
Oklahoma Agricultural Experiment Station
in cooperation with the
Farm Production Economics Division
Economic Research Service
U. S. Department of Agriculture

Income Potentials from Beef Cattle Farming, Eastern Prairies of Oklahoma

by

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Much of the land in Eastern Oklahoma formerly devoted to crops has been converted to native and improved pastures. As a result, livestock are of increasing importance in that area. This study was made to determine the nature and magnitude of potential adjustments for livestock producers in East Central and South Central Oklahoma.

The adjustment possibilities were limited to strictly livestock related activities. All crops requiring acreage allotments and all livestock except beef production were excluded from consideration. The crop activities included for this study were soybeans, oats, alfalfa, grain sorghum, small grain grazing and bermuda grass pasture. Various cow-calf and feeder calf systems were considered. Prices for products and inputs were based on current estimates for the area.

Linear programming techniques were used to determine the minimum land and the optimum farm organizations required to obtain a $3,000 and a $5,000 income with various assumptions.

The Study Area

The study area consists of all or part of the 30 east-central and south-central counties as shown on the map. The area contains approximately 10 million acres of farmlands divided into 34,450 farm units. Selected items of interest for the area and the relative importance of each to State totals are shown in Table 1. In general, the area contains a high proportion of the population and farm units of the State; however, farm size, annual farm income, cropland per farm, and value of land and buildings per farm are below the State average.

The proximity of the study area to the urban centers in the State may be an important factor in agricultural adjustments. The cities of

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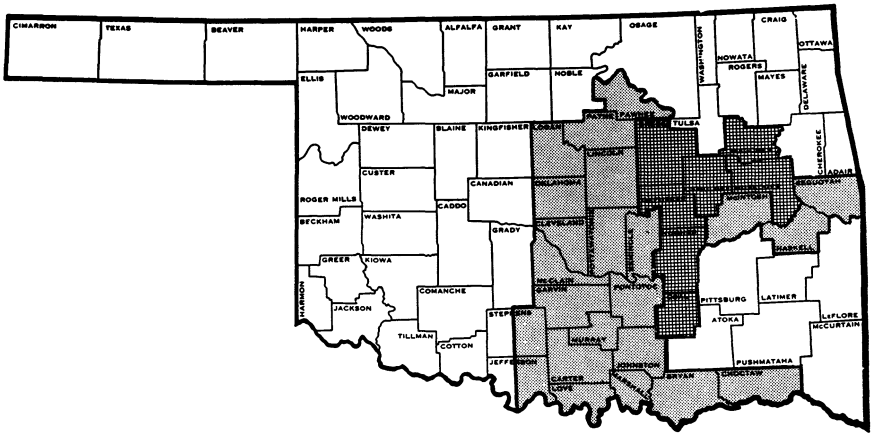

The shaded areas are the area of study. The checked counties have a predominance of Eastern Prairie soils.

Ada, Ardmore, Norman, Oklahoma City, Okmulgee, Muskogee, Sapulpa, Seminole, Shawnee, and Stillwater are located in the study area; while Tulsa, Duncan, McAlester, and Fort Smith, Arkansas are near the area. Therefore, residents have access to a high percentage of the nonfarm employment centers.

Climate

Climatically, the area is adapted to the production of a large variety of crops and livestock enterprises. Average annual rainfall varies from 30 inches in the west to 42 inches in the east, with an average of 225 frost-free days during the year.

Soils

The soils are rather heterogeneous with large acreages of cross-timber soils interspersed with prairie soils throughout the area. Soil resources also include the bottomlands and associated terrace soils along the Arkansas, Red, Cimarron, and Canadian Rivers and the lesser streams of the area. Three major prairie soil types are found within the area. The central reddish prairie soils are primarily along the western edge of the area from Pawnee south to Pauls Valley. The Eastern or Cherokee prairie soils are concentrated in the Wagoner, Muskogee, Okmulgee area and extend south to Johnson County. The Grand Prairie soils are in and along the southern part of the area from Carter County east to Choctaw County.

Table 1—Statistical Data for Selected Items, East Central and South Central Oklahoma Compared to the State, 1959

Item	Unit	State Totals	Area Totals	Area as Percent of State
Land in farms	Acre	35,801,000	10,164,000	28
Cropland	Acre	14,044,000	2,841,000	20
Farms	Number	94,678	34,450	36
Size of farms	Acre	378	295	78
Value of land and buildings	Dollar	31,155	20,016	64
Cotton harvested	Bales	364,833	55,918	15
Wheat harvested	Bu.	84,737,000	4,879,000	6
Peanuts harvested	Cwt.	1,103,000	425,000	39
Value of livestock and livestock products	Dollar	330,121,000	103,805,000	31
Population	Number	2,328,000	1,103,000	47
Net farm income	Dollar	212,000,000	54,587,000	26
Income per farm	Dollar	2,239	1,585	71

Types of Farms Studied

About 70 percent, or 7,000,000 acres, of the total farmland in the area was classified as in either livestock farms or livestock ranches. This classification makes a rather heterogeneous population. To provide the homogeneity of institutions, soil type, and type of farming that are desirable for economic analysis, the following groupings were excluded from consideration in this study: (1) livestock farms and ranches on bottomland, terrace, and cross-timber soils; (2) livestock farms and ranches with acreage allotments of cotton, wheat, or peanuts, and (3) livestock ranches where farm size and method of operation are distinctly different than livestock farms.

The remaining group of livestock farms represents approximately 16 percent, or 1,600,000 acres, of the total farm area shown on the map. The farms are not necessarily contiguous but are concentrated in Creek, Okmulgee, Muskogee, Okfuskee, Wagoner, Hughes, and Coal Counties, those with large acreages of eastern prairie soils. The study area can be visualized as consisting of livestock farms that are located between the good prairie crop soils and the rougher cross-timber soils, and actually shading over into each.

Since the study area does not conform to any census or political subdivision, descriptive information for these farms (such as average farm size and annual farm income) is limited. For example, the 1959 Census of Agriculture reported 16,325 livestock farms (average size of 205 acres) and 7,893 livestock ranches (average size of 550 acres) for the entire area. The study area, as defined above, includes some farms in each

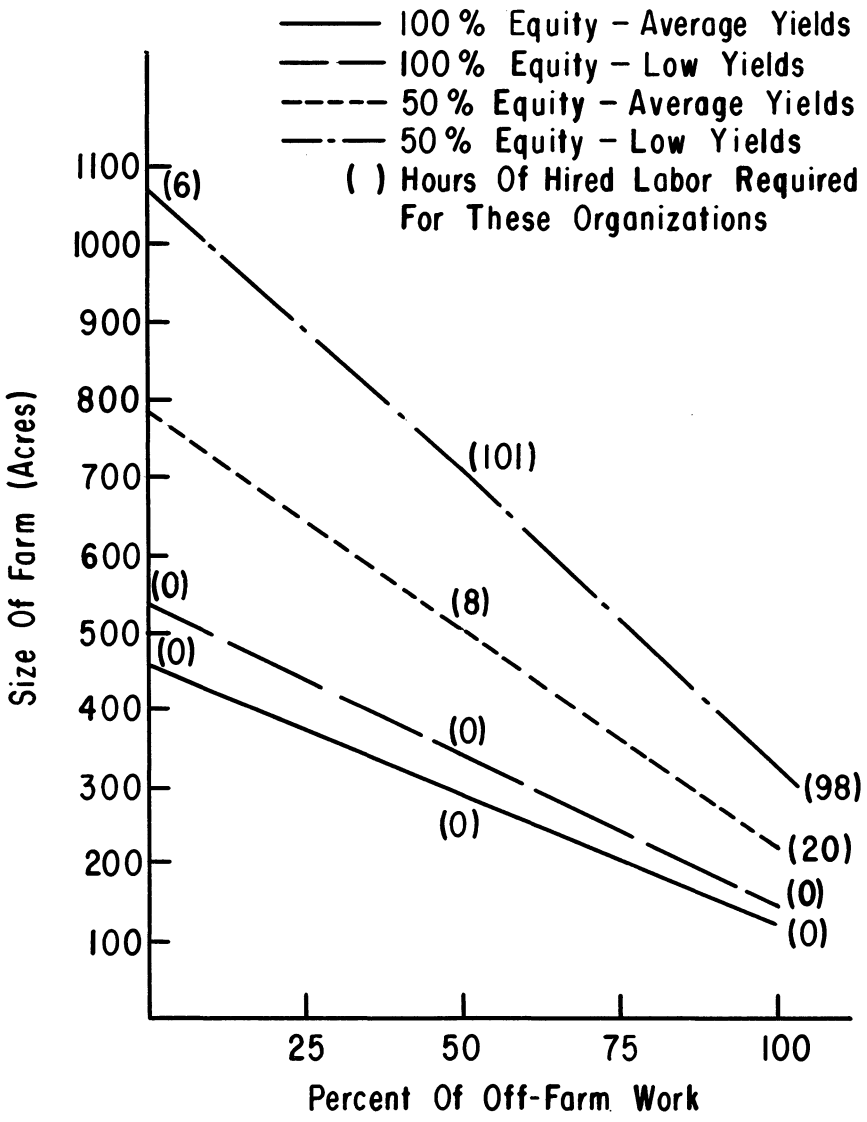

Figure 1. Combinations of off-farm work and acres of land (average quality) which will provide a $3,000 return, specified operator equity and yield situations.

classification, but how many and what size would involve a more intensive sampling. Where such specific information for the study area is needed for comparison—the average for the entire area as given in Table I will be used.

Summary of Results

The income targets could not be met when 5 percent return to land capital and 6 percent return to annual operating capital were required except with above average yields. Even then the minimum acreage requirement was very high. Therefore the potential adjustments must be analyzed in light of a less than "opportunity cost" return to capital. Within this framework, the minimum land required for any specified income varied widely, depending on the assumption about equity, yields, land quality and off-farm employment level (Table 2).

Three levels of off-farm employment were considered: (1) full-time on farm (no off-farm income), (2) half-time off-farm ($1,500 off-farm income) and (3) full-time off-farm ($3,000 off-farm income with farm work done after working hours, weekends and holidays). The off-farm income was permitted to satisfy the income target. Thus, the results at the $3,000 income level assuming full-time off-farm employment indicate the minimum size farm that could sustain itself (paying operating and overhead cost, but no return to operator labor). With average yields and average land quality, land requirements for this farm ranged from 124 acres at 100 percent equity level to 224 acres at 50 percent equity. With low yields, the corresponding sizes were 146 acres and 318 acres. For a full-time farm operator with average yields on average land the land required for a $3,000-return was 459 acres at the 100 percent equity level and 787 acres at the 50 percent equity level. With the same conditions, land requirements for a $5,000-return were 682 acres with 100 percent equity and 1,268 acres with 50 percent equity.

Three yield levels were considered in the study. These can be analyzed as possible risk aversion alternatives or as effects of different management abilities. These levels were (1) average yield, (2) 10 percent above average, and (3) 10 percent below average. With a full-time farm operator having 100 percent equity in average quality land, requirements for a $5,000-return were 592 acres with high yields, 682 acres with average yields and 807 acres with low yields. The corresponding estimates for a $3,000-return were 398 acres, 459 acres, and 541 acres. For risk aversion, an operator could base his farming plans on the low-yield estimates to be relatively certain of making at least the $3,000-income. If the operator were able to gamble, he might base his strategy on average or high-yield estimates accepting the higher probability of not making at least $3,000 every year but gaining the ability to farm a smaller acreage or to own less equity.

In making comparisons between full-time farm and some off-farm employment, working off-farm would likely decrease management time-

Table 2.—Acres of Land and Equity Capital Required for Selected Levels of Income Under Alternrative Farm Equity, Land Quality, Yield and Off-Farm Work Conditions, Eastern Prairies of Oklahoma.

Farm Income	Total Income[1]	Yield	Percent Equity:	100			50			33		25		0	
			Land Quality:	Good	Average	Poor	Good	Average	Poor	Good	Average	Good	Average	Good	Avg.
Full-Time	Farm Work														
5,000	5,000	High	Acres		592			980							
			Equity Cap.		84,051			63,631							
5,000	5,000	Average	Acres	541	682	947	1,111	1,268	1,673						
			Equity Cap.	101,095	93,495	91,941	94,349	79,686	76,443						
5,000	5,000	Low	Acres		807			1,806							
			Equity Cap.		106,647			110,844							
3,000	3,000	High	Acres	312	398		520	636						4,719	2,148
			Equity Cap.	60,379	56,517		48,961	44,064							
3,000	3,000	Average	Acres	363	459	637	674	787	1,070	1,109	1,163	1,423	1,332	N	N
			Equity Cap.	67,856	62,906	61,841	59,732	52,664	51,951	62,767	48,697	60,467	41,851	S	S
3,000	3,000	Low	Acres	434	541		1,016	1,070		2,723	1,848			N	N
			Equity Cap.	78,264	71,520		83,664	66,328		132,623	71,356			S	S
Half-Time	Off-Farm														
3,500[2]	5,000	Average	Acres		527			1,038							
			Equity Cap.		72,271			65,321							
3,500[2]	5,000	Low	Acres		631			1,570							
			Equity Cap.		83,494			98,236							
1,500[2]	3,000	High	Acres		253			404							
			Equity Cap.		35,906			27,974							
1,500[2]	3,000	Average	Acres	231	291	404	441	508	681						
			Equity Cap.	43,139	39,905	39,236	37,466	33,205	32,807						
1,500[2]	3,000	Low	Acres		344			714							
			Equity Cap.		45,449			43,471							
Full-Time	Off-Farm														
2,000[2]	5,000	Average	Acres		393			818							
			Equity Cap.		52,780			51,601							
2,000[2]	5,000	Low	Acres		477			1,237							
			Equity Cap.		61,973			77,528							
0	3,000	High	Acres		107			174							
			Equity Cap.		15,216			11,741							
0	3,000	Average	Acres	98	124	172	197	224	296						
			Equity Cap.	18,312	16,983	16,691	16,706	14,076	13,719						
0	3,000	Low	Acres		146			318							
			Equity Cap.		19,297			19,378							

[1] Full-time off-farm work pays $3,000 per year and half time pays $1,500.
[2] Solutions for $3,500; $2,000 and $1,500 *farm* income can be interpreted as full-time operations with total income of these amounts. The estimate is a good approximation, except for labor effects and costs.

liness. Therefore, it may be more realistic to compare average yield estimates for full-time farm operation with low yields for part-time farm operations.

Five operator equity levels were analyzed. These equity levels correspond to the amount of the capital resource (land and operating capital) owned by the operator. The return becomes a return not only to operator labor and management but to all operator owned resources. The equity levels can also be viewed as different levels of returns to the capital resource. (Table 3).

Only with high yield estimates was a solution possible that would give a full return to both operator labor and management and to the capital investment. Using average land, the requirement for a $3,000-return was 2,148 acres. The corresponding requirements were 636 acres at 50 percent equity and 398 acres at 100 percent equity. With average yield and average land quality, no solution was possible at the zero equity position. The requirements ranged from 1,332 acres with 25 percent equity to 459 acres with 100 percent equity.

No solutions at the zero equity levels mean that the stated "opportunity return" of 5 percent to land and 6 percent to capital cannot be obtained strictly from the farming operation. Another possibility of longrun return is through asset appreciation, especially land. With the 100 percent equity solutions (all programmed return to labor and management) land would have to appreciate at an annual rate of 9.3 percent to give a full opportunity return to all resources. With 25 percent equity solutions, programmed returns were to labor, management and 75 percent of capital, this annual appreciation rate could be reduced to 2.1 percent.

Three land quality levels were considered. These were: good, average and poor. They were differentiated on the basis of the percentage of cropland, pastureland and wasteland in each typical acre. For a full-time operator with 100 percent equity and average yields, the minimum land for a $5,000-return was 541 acres with good land, 682 acres with average land, and 947 acres with poor land. For a $3,000-return, the corresponding requirements were 363 acres, 459 acres, and 637 acres. With a 50-percent equity, the relationships were about the same.

Although the minimum land required at any income level was less for good land than for poor land, the capital requirements were reversed. This is possible because of the higher land price and because of the increased need for operating capital to establish and maintain improved pasture on a higher percentage of cropland as compared to operations

on the poorer land with less cropland. With no solutions at the zero equity level, the return to the capital resource is less than the specified opportunity return in any of the solutions. With this in mind, it seems that if land is available *in quantities at the land prices used in the study,* it would be more economical for an individual to utilize the poorer quality land requiring less total capital and therefore less loss of op-equity level, the return to the capital resource is less than the specified

Implications for Farm Management Decisions

The results obtained from this study provide information helpful to farm managers in making operating and ownership decisions. For example, a prime problem involves deciding whether to add land (increase the farm size) or get a part-time job. If the decision is to add land, is it more economical to obtain good quality land or poorer quality land? What are potential income effects of increasing land rather than maintaining a high equity position? What effect do yield risks have on optimum farm organizations and income levels?

Farm Size And Off-Farm Employment

From the results, iso-income lines were constructed showing the combinations of farm size and off-farm work which will give a specific return to operator equity, labor and management (Figures 1 & 2). In each instance, as off-farm work increases, (consequently, the proportion of total income coming from off-farm sources) the number of acres decreases. Where the farm size and organizations required no outside labor the iso-income line is a straight line. In the situations where the loss of operator labor necessitated the hiring of some outside labor to perform farm operations, the iso-income line becomes kinked. This is because the farm size must remain large enough to meet the income target and to pay the additional hired labor. Therefore, the net value of the off-farm income which replaces the acreages specified by the iso-income line would be the net off-farm income minus the value of the hired labor to replace that going off-farm.

Hired labor in hours for full-time farm, 50 percent off-farm, and 100 percent off-farm employment at each point is given in parentheses in Figures 1 and 2. With 50 percent equity and average yields, to obtain a $5,000-income with part-time farming and half-time off-farm work rather than a 1,280-acre farm and full-time farm-work, a net off-farm value of ($1,500-$336 hired labor) $1,164 is realized to offset the decrease of

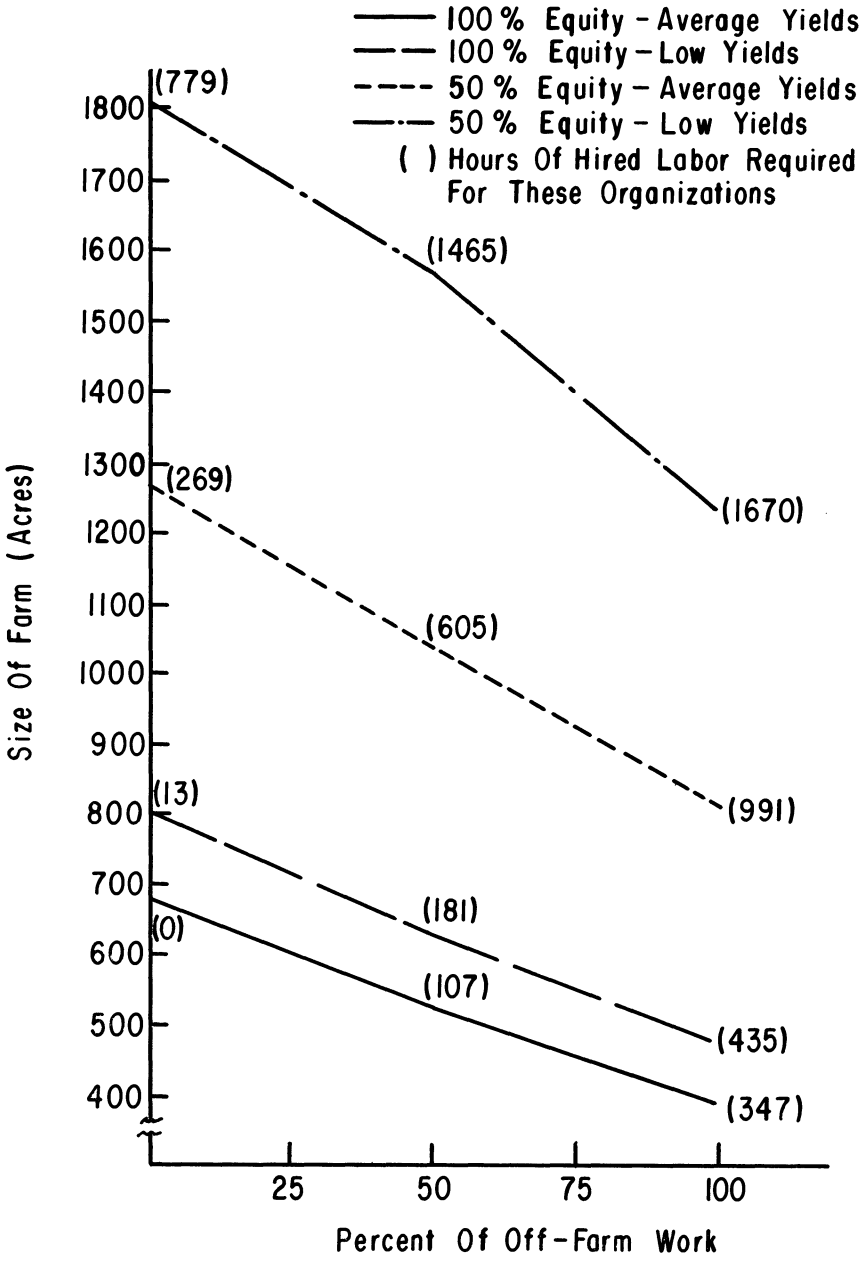

Figure 2. Combinations of off-farm work and acres of land (average quality) which will provide a $5,000 return, specified operator equity and yield situations.

280 acres. Yields and equity also affect the rate of substitution between farm size and off-farm work. Low equities and yields require larger farms which in turn require more hired labor for off-farm work arrangements.

Yields also might be assumed to decrease with increases in off-farm work as less attention is given to the farm operation. Using the $3,000-income-100 percent equity lines in Figure 1, the portion of off-farm income sacrificed through yields 10 percent lower than average can be estimated. A 460-acre farm with no off-farm work provides a $3,000-income. A $3,000-income also can be obtained with a 460-acre farm and 23 percent of the income from non-farm sources. Thus, the loss due to lower yields is $690. Similar comparisons for a $5,000-income can be made from Figure 2.

The larger the farm size, the greater the loss due to lower yields. At a farm size of 150 acres the loss would be about 8 percent of a full-time off-farm job. A farmer with 1,268 acres would give up 95 of the value of an off-farm job if he works off-farm and such work causes general farm yields to be lower. One conclusion is that operators of small farms could be relatively unconcerned about yield sacrifices associated with off-farm work. Operators of large farms might make almost as much income by careful attention to factors affecting overall farm yields as could be received from off-farm work.

Yield Level Implications

UNCERTAINTY

For some firms, uncertainty is closely associated with firm survival. If firms have a normal distribution for the programmed results of this study, then the actual income would be expected to be less than that specified 50 percent of the time. If firm survival requires a minimum income obtainable at least 80 percent of the time, a need is implied for larger farms than indicated by average yields. For example, an operator with a 50-percent equity needs a farm size of 1,070 acres with low yields to obtain a $3,000-income, but only 787 acres are needed with average yields. He could expect to obtain the $3,000-income a much higher percentage of the time if his plans were based on low-yield expectations than if his plans were based on average yields.

Another aspect of uncertainty is the variability of income about the mean, the range or standard deviation. Figure 3 shows a range of incomes for different farm sizes with three yield levels. The income

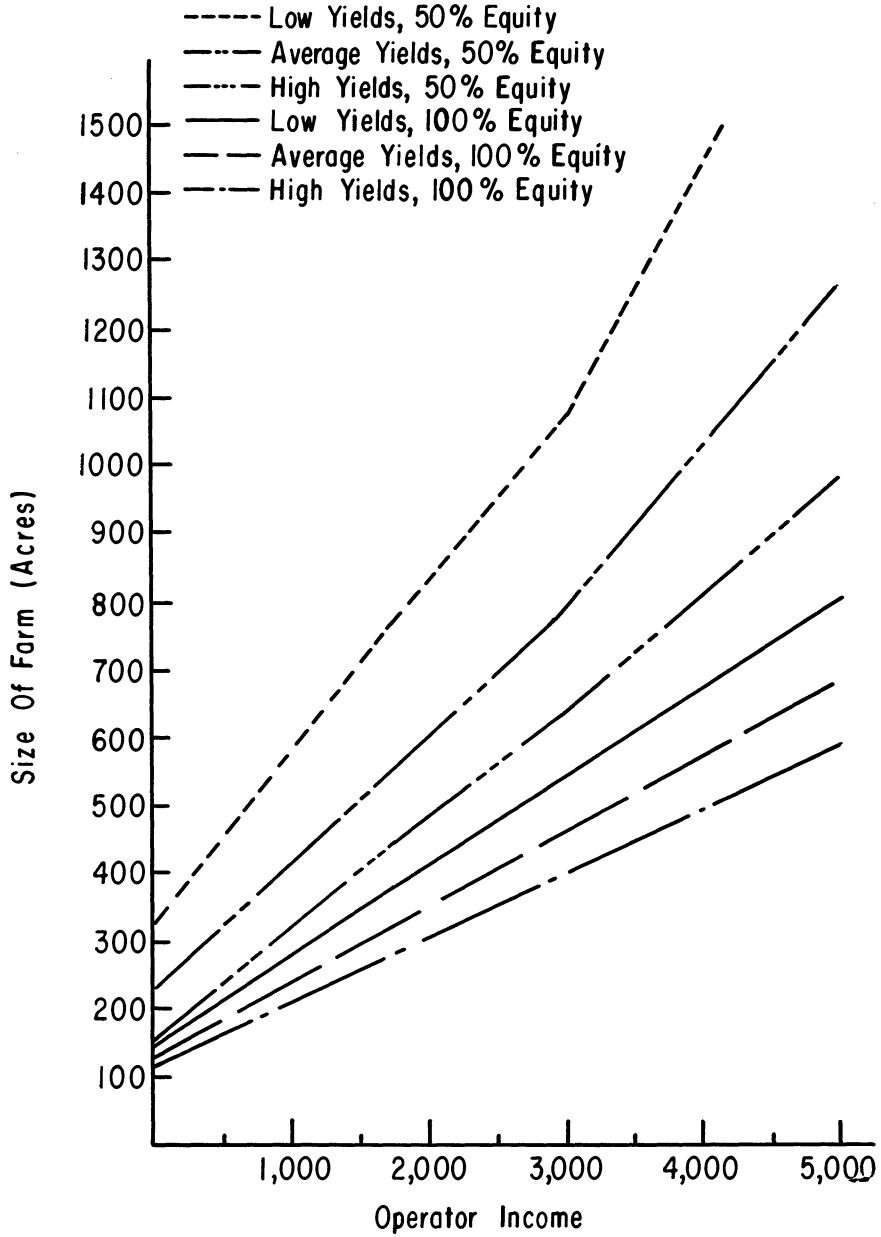

Figure 3. Acres of land required to obtain specified income levels with high, average and low yields for average land quality and two equity levels.

range increases as farm size increases, which means that uncertainty may influence farm enlargements, especially when enlargements are made with borrowed capital. Except for one difference, the results presented in Figure 3 are comparable to "the principle of increasing risk."

A farm manager with a 100-percent equity in a 400-acre farm can expect a mean income of $2,400 with a range from $1,900 to $3,000 (Figure 3). An 800-acre farm would provide a mean income of $3,050 with a range from $1,900 to $4,000. If farm enlargement from 400 acres to 800 acres is accomplished with borrowed capital, the equity position on the larger farm would approximate 50 percent. Farm enlargement with borrowed funds would (1) increase the expected mean income, (2) increase the range of expected incomes, (3) increase the expected income in good years, and (4) have no effect on expected income in adverse years (about $1,900 in both cases).

The same operator income in adverse years for both equity positions does not correspond to the theory of "increasing risk". Examples of this theory assume a plus or minus 20 percent rate of return on investment regardless of size of plant or equity position. The results presented in Figure 3 show higher rates of return to capital on larger farms because operator labor is handled as a fixed cost. As programmed, the rate of return on investment at 100 percent equity was 4.8 percent (farm size 459 acres), and 5.6 percent at 50 percent equity (farm size 787 acres), with average yields and full-time farm labor.

The implication is that operators have much to gain and little to lose by farm enlargement even with borrowed capital once operator labor is committed to farm use. This analysis would be valid for farm sizes up to about 1,100 acres or the farm size that would completely utilize all operator labor available.

MANAGEMENT ABILITY

Individual farm managers have different "average" returns from sets of production conditions that appear the same. This difference in returns (from seemingly identical conditions) is often attributed to either a difference in managerial skills or a difference in production techniques used. The "average" for some operators may be represented by the "high yields," and the "average" for others may approximate the "low yields."

If the programmed results cover the practical range of variability of management skills in the area, the results presented in Figure 3 may be used to compute probable gains and losses from different levels

of management employed on different farm sizes. In the short run, the farm size is fixed, and any increase in farm income must come from increased production (or decreased cost, etc.). Increasing yields from "average" to "high" on a 250-acre farm will increase income about $300. Under the same conditions, farm income can be increased about $1,200 on a farm of 1,000 acres.

The low opportunity cost of mediocre management on small farms is probably one reason that alternatives such as off-farm employment are more advantageous to the managers of these units. The handicap associated with accumulating the necessary resources plus the additional management skills required results in farm enlargement becoming a formidable obstacle for most small operators.

Programmed results of high, average and low yields imply that an increase in farm size (if labor is fixed to the farm) will help overcome the problem of an uncertain production environment, and will also provide greater returns to superior management skills.

Opportunity Costs of Resources

No solutions with average yields and zero equity imply that opportunity returns to all inputs can only be secured under exceptionally "good conditions." "Good Conditions" mean higher yields or a combination of higher yields, higher prices, lower costs, better management or better technology than those defined as average for this study. The specific reason why opportunity returns cannot be obtained with average yields is not obvious from the programmed solutions.

Assuming that land prices are higher than can be justified for use in livestock production, it is still possible for an operator to achieve an opportunity return on all resources via an increase in land values. However, this income can only be realized in absolute terms when the farm is sold. Since land prices have been increasing for over 25 years, to expect some return in the form of land appreciation may not be entirely irrational. If land appreciation is necessary to achieve opportunity returns, what are the implications of different equity levels for managerial decisions?

The programmed results for a $3,000-return at average yields and land quality for different operator equity positions show the land and operating capital requirements. At the 100 percent equity level, it is assumed the farmer owns all the capital and the $3,000 return is for both labor and capital. If the goal of the operator is a $3,000 labor

and management return, then the entire opportunity return to land and operating capital must come from land appreciation. With the 459 acres and $62,906 of capital required at the 100-percent equity level, land prices would have to increase over $7.00 per acre per year or about 9.3 percent to provide an opportunity return of 5 percent to land investment and 6 percent to operating capital (Table 3).

At the 50 percent equity level, the operator was assumed to own only half of the capital. Thus, he obtained an average return of 2.7 percent on the land investment and operating capital requirement from the farming operation. It would take only an additional 4.5 percent annual land appreciation rate to give the opportunity return of 5 percent on land investment and 6 percent on operating capital.

Similarly, at the 33 percent and 25 percent equity levels, the operator was assumed to own less of the resources or the programmed results forced higher return to the capital (an average of 3.7 percent at the 33 percent equity level and 4.02 percent at the 25-percent equity level). Consequently, with the higher return coming from the farm operation itself, an annual land appreciation rate of 2.6 percent at the 33-percent equity level and 2.1 percent at the 25-percent equity level would be required to yield the opportunity return of 5 percent to land and 6 percent to operating capital.

A decreasing equity position corresponds to an increasing farm size. If the income goal is the same, the larger the farm size, the less the operator would have to depend on land appreciation for part of his return to capital. However, when the farm size becomes large enough

Table 3—Programmed Farm Sizes for $3,000 Operator Income at Different Operator Equity Levels, the Average Rate of Return on Investment for Each, and Required Rate of Land Appreciation Opportunity Return to All Capital Invested[1]

Operator equity	Farm size	Annual capital required	Average rate of return on all capital[1]	Required growth rate of land value[2]
(Percent)	*(Acre)*		*(Percent)*	*(Percent)*
Zero	NS		NS	NS
25	1,332	167,405	4.02	2.1
33	1,163	146,107	3.77	2.6
50	787	105,328	2.70	4.5
100	459	62,906	0.00	9.3

[1] Average rate of return on capital is calculated by using a 5-percent return to land capital and 6-percent to nonland capital for the non-owned portion of the total capital.

[2] This column gives the annual rate of increases in land values that would be required to provide the operator with a return of 5 percent on all land capital and 6 percent on all nonland capital used in the farm business.

to receive extensive use of hired labor, this diseconomy of scale along with land price levels used prohibits the farmer from ever reaching the point where an opportunity return to capital can be obtained without some land appreciation.

Land Quality Differentials

An analysis of land quality differentials requires consideration of opportunity returns to the resources. Since no results were obtainable that gave a full return of 5 percent to land investment and 6 percent to operating capital, under average conditions there is some loss of "opportunity return" to these resources with all solutions. The solutions with the land quality which required the least capital would minimize the loss of "opportunity returns." At each specific income and equity level, the poor quality land provided the desired income with the least capital investment. Therefore, poor quality land would represent the most economical buy if the land qualities are available at the prices assumed.

The programmed difference in capital requirements for the three land qualities may be due to errors in specifying land prices. However, prices for resources are determined by the best alternative use and some land qualities may be priced too high for livestock production costs on these lands to be competitive with costs on lower quality land. If the land prices (and other costs) used in this study are fairly representative of the area, the more land extensive feed production methods associated with low quality land will produce beef cheaper than the capital and labor intensive methods required to maintain good pasture on good land.

To use poorer quality land to produce the desired income would require more acres. This land may not be available for purchase or rent in a convenient location. Costs of inconvenient location were not included in the study. Therefore even though poor quality land appeared the most economical here, inclusion of other costs may force intensive use of higher quality land. Second, land appreciation is necessary to produce the full opportunity return to all capital resources. The rate of appreciation on poorer quality land may be less than on good quality land. If so, owning and holding better quality land for appreciation purposes could be more economical over time.

Implications for Area Adjustments

Results of this study indicate that farm returns are practically a linear function of the number of acres in the farm, up to farm sizes that

require hired labor. Therefore, how livestock farms in the area are organized at different income levels has little effect on total farm income of the area. If all the farms in the area were organized to give a per farm return of $1,500, total farm income for the area would be comparable to that of a per farm return of $3,000. Under some conditions, farms organized for a per farm income of $5,000 would reduce total area income as compared to other area organization. (Returns per acre are less with some organizations.) The amount of the reduction is relatively small compared to the reduction in income caused by lower yields.

A 10 percent increase or decrease in yields can have a large impact on the economy of an area. An increase of 10 percent in yields can increase farm incomes of the area by approximately $2 million. Total economic activity of the area will be increased by $2 million times the multiplier effect. It is apparent that nonfarm businesses, as well as farmers, have an economic interest in farm technology such as new crop varieties and livestock feeding and breeding information which would increase yields. On the other hand, the area's economy can lose $2 million times the multiplier if output increasing technologies are adopted by other areas—thereby reducing output prices—and are not adopted by the particular area.

Although the specific income level to which farmers of the area adjust does not materially affect the total farm income of the area, it does have a direct effect on the number of farms that can exist in the area. The number of farmers and farm level are important for decisions concerning schools, social institutions, and non-farm firms.

Adjustment Hypotheses

Information is included on the magnitude of adjustment to off-farm and/or nonfarm employment needed under alternative adjustment hypotheses for the area studied. The programmed size of farm and the projected number of farms of this size that could exist on the fixed resource base for all of the various assumptions are shown in Table 4. Four alternative adjustment hypotheses will be discussed. These are: (1) All farms adjust to a farm size that provides a $5,000-income to an operator who owns 50 percent of the investment required, (2) all farms adjust to a farm size that utilizes all operator labor available, (3) all farms adjust to a farm size that provides a $3,000-income to an operator who owns 50 percent of the investment required, and (4) all farms adjust to a farm size and utilizes half-time operator labor.

Table 4—Summary of Estimated Resource Requirements to Obtain $3,000 or $5,000 Operator Income With Two Equity Levels, Three Yield Levels, Three-Off-Farm Employment Levels and Average Land Quality, and the Maximum Number of Adjusted Farms of the Specified Size That Could Exist in the Area, Eastern Prairie Livestock Situation, East Central and South Central Oklahoma

Item	Unit	100 Percent Equity			50 Percent Equity		
		High Yields	Average Yields	Low Yields	High Yields	Average Yields	Low Yields
Group 5 $5,000 Income — Full Time Farm Labor							
Average Quality Land	Acres	592	682	807	980	1,268	1,806
Capital	Dollars	84,051	93,495	106,647	127,263	159,373	221,678
Labor	Hours	1,328	1,415	1,536	1,846	2,221	2,985
Number of Area Farms[1]	Farms	2,703	2,346	1,983	1,633	1,262	886
Group 4 $5,000 Income — Full Time Off-Farm Employment[2]							
Average Quality Land	Acres		393	477	[3]	818	1,237
Capital	Dollars	[3]	52,780	61,973		103,202	155,056
Labor	Hours		780	876		1,433	2,111
Number of Area Farms[1]	Farms		4,071	3,354		1,956	1,293
Group 3 $3,000 Income — Full Time Farm Labor							
Average Quality Land	Acres	398	459	541	636	787	1,070
Capital	Dollars	56,517	62,906	71,520	88,128	106,328	132,656
Labor	Hours	893	952	1,031	1,373	1,571	1,816
Number of Area Farms[1]	Farms	4,020	3,486	2,957	2,516	2,033	1,495
Group 2 $3,000 Income — Half-Time Off-Farm Employment[4]							
Average Quality Land	Acres	253	291	344	404	508	714
Capital	Dollars	35,906	39,905	45,449	55,949	71,998	86,941
Labor	Hours	567	604	654	404	970	1,166
Number of Area Farms[1]	Farms	6,324	5,498	4,651	3,960	3,150	2,241
Group 1 $3,000 Income — Full Time Off-Farm Employment[2]							
Average Quality Land	Acres	107	124	146	174	224	318
Capital	Dollars	15,216	16,983	19,297	23,481	30,389	38,756
Labor	Hours	241	257	278	357	393	520
Number of Area Farms[1]	Farms	14,953	12,903	10,959	9,195	7,143	5,031

[1] Number of area farms was determined from the resource base of 1,600,000 acres and the programmed average farm size.
[2] Full-time off-farm employment assumed an annual off-farm income of $3,000 and required 40 hours of labor per week.
[3] High yields were not programmed for this level of income and off-farm employment.
[4] Half-time off-farm employment assumed an annual income of $1,500 and required 20 hours of labor per week. This group can include farmers who have only a $1,500-farm income and do not work off-farm.

$5,000 Income to Operator Labor and 50 Percent Equity

For each operator to make a $5,000-return to labor and 50 percent equity, the estimated minimum farm size should be 1,268 acres. He would have to hire a small amount of outside labor. For this size the present 5,000 farms would need to be reorganized into only 1,262 farm units. This criterion would release approximately 3,740 farmers for nonfarm jobs in the area.

Full Utilization of Operator Labor

Interpolation of programmed results indicate that to fully utilize operator labor on the farm without hiring additional labor, a minimum farm size of about 1,100 acres is needed. The income for a 1,100-acre farm would be slightly less than $5,000 with 50 percent operator equity. This would mean that the present 5,000 farms (assuming 320-acre farm size and 1,600,000-acre study area) would need to be reorganized into about 1,450 farm units. The total nonfarm labor adjustment would be about 3,550 farm operators.

If reorganization does not take place, underemployment of farm operators with resulting lower incomes is implied. In fact, underemployment becomes more severe in time as a result of developing technology. Farm incomes for the area in recent years verify that a 70-percent underemployment is a valid estimate. In 1959, per farm incomes in the area averaged $1,585 (see Table 1). The median family income for the United States in 1959 was $5,550. If farm operators productively employed 30 percent of the time have incomes of $1,585, then 100 percent employed would provide an income near the median family income for the United States. Although the two incomes are not strictly comparable, the estimated farm size of 1,100 acres approaches the 1,268-acre farm size indicated by this study that would give a $5,000-operator income if a 50-percent equity were owned in the operation. If the adjustment criterion of fully utilized operator labor is used, nonfarm employment must be secured for about 70 percent or 3,550 present farm operators or the equivalent in off-farmwork.

$3,000 Income and 50 Percent Equity

To provide an income of $3,000 to operator labor and 50 percent equity, the programmed results indicate that a minimum farm size of 787 acres is needed. If farms in the area are organized according to this criterion, approximately 2,033 farms would replace the 5,000 farm units. This implies that almost 3,000 nonfarm jobs would be needed to absorb the farm labor excess caused by the farm reorganization.

Half-Time Farm Labor

If the agricultural adjustment criterion is to utilize farm operator labor one-half time on the farm and one-half time at off-farmwork (20 hours per week off-farm), interpolation of programmed results indicate a minimum farm size of about 600 acres is needed. This is slightly smaller than the size required for a $3,000-income to operator labor and 50 per-

cent equity. In terms of agricultural adjustments this means that the present 5,000 farms would need to be reorganized into 2,667 farm units. Approximately 2,333 full-time off-farm jobs would be needed, plus 2,667 half-time off-farm jobs for the entire area.

Motivational Groupings for Adjustment Potential

The motives and objectives of managers, their resource position, and efficient resource use all must be considered in evaluating the potential adjustments of an area. For the particular area of this study, it is unlikely that adjustments will be made by all producers to any one single objective. The adjusted number of farms for the study area as given in Table 4 actually has no meaning unless a single adjustment criterion is hypothesized. The minimum resource requirements presented in this study will probably be more useful for evaluating the nature and magnitude of adjustments within the study area if consideration is given to characteristics of producer groups with different adjustment potentials. The proportion of each group will vary with different localities within the study area. Characteristics of five groups that are typical of some of the minimum resource requirement situations summarized in Table 4 are presented.

Group 1 — The Retired or Hobby Farmer

This grouping is made to describe individual livestock producers who have an independent source of income other than from farming. The emphasis is on off-farm income, not restricted to off-farm employment income. These farms are operated by businessmen and professional and retired people who evidently secure nonmonetary benefits—and perhaps some tax advantage—from the operation of a livestock farm and from land appreciation. Minimum resource requirements representative of the group are a $3,000-income with full-time off-farm employment. Off-farm income may be considerably higher than the $3,000 assumed for this study. It may be high enough to maintain a $3,000-income even with farm losses. Some farm returns above costs are possible depending on farm size and yields. In all cases, speculative returns from increased land values or high product prices may be realized. Depending on yields and operator equity levels, minimum farm sizes range from about 100 acres to 300 acres, capital requirements from $15,000 to $40,000 and annual labor from 241 to 520 hours.

Farm adjustments of this group are not of major significance because they can be considered as adjusted farms. However, considerable

land resources may be controlled by the group, thereby limiting the potential adjustments of other farmers in the area. Livestock prices may have very little effect on the amounts of livestock produced by the group. However, the total amount supplied may be relatively small. The most significant effect on adjustment is probably via the demand and price of land in a given locality.

Group 2 — The Semi-Retired, Tired, or Trapped Farmer

This grouping actually includes three categories of farmers, differentiated by resource position and motivation. Minimum resource requirements for all the above groups can be represented as the $3,000-income level with half-time off-farm employment. Farm returns are low in each case and may not represent a satisfactory income level. One group has sources of income other than farming, such as retirement, business, or off-farm employment income. Another classification includes those who are trapped with small farm incomes ($1,500) because of a lack of resources to enlarge the farming operations and a lack of skills or opportunities for full off-farm employment. The third group includes those farmers who prefer to accept a small farm income rather than work off-farm or take the risks (and work) involved in farm enlargement. Their total income would be only the $1,500 farm income. The effect is the same as if they were unqualified for off-farm work.

Depending on yields and equity levels, farm sizes range from 250 acres to 700 acres, capital requirements from $36,000 to $87,000, and labor from 570 hours to 1,170 hours. Equity requirements in this category range from about $28,000 to $45,000. This group may supplement annual income by consuming capital previously accumulated in the form of machinery or land. The annual returns to operator labor, land, and operating capital depend on farm size and vary from about $2,600 ($1,500 plus overhead costs) to $4,500.

The above grouping probably includes the average livestock situation for the study area at the present time, i.e. farm size about 320 acres, equity levels between 50 and 100 percent, and farm incomes to operator resources of about $1,500.

Group 3 — The Commercial Farmer

Included in this group are the farmers in the area that devote full time to farming and realize an income that is considered adequate or satisfactory for the area. If a single adjustment criterion were to be established for the area, it would be to adjust at least to this level or get

out of farming. The minimum resource requirements representative of this group are the $3,000-income, full-time farm labor results. Those farmers with farm sizes in the 50 percent equity group can pay interest on debts up to 50 percent of the capital requirements and still maintain a $3,000 income for their labor and owned resources. If principal payments were also involved then the equity position would have to be higher to maintain income or the income would be reduced below $3,000 by the amount of the payment. Depending on equity position and yield level, farm size may vary from about 400 to 1,100 acres, capital requirements from $57,000 to $133,000, and labor from 893 hours to 1,816 hours. Farm sizes (at least in the 600 to 1,100 acre range) are large enough that any land appreciation could be an important source of income.

Some individuals in this group can adjust to higher income levels and be the commercial farmers of the future if so motivated. However, a $3,000-income leaves little for growth and many operators will not be able to accumulate the necessary equity, at least from farming.

Group 4 — The Adjustable Farmer

This grouping was made to depict farmers with the resource potential to adjust in any one of several ways. Individuals in the group may be visualized as young farmers who have considerable equity in a farming operation but have a desire for a higher income level than their farm resources will support, and who have the skills and opportunity for off-farm employment. They can (1) move completely out of farming into nonfarm employment, (2) supplement farm incomes with off-farm income in the short run while accumulating the necessary equity to increase farm size and be a full-time farmer of the future, or (3) emphasize off-farm work and operate a farm as a hobby.

The minimum resource requirements for this group are represented by the $5,000-income with full-time off-farm employment. Minimum farm size varies from about 400 acres to 1,200 acres, capital requirements from $53,000 to $155,000, and labor from 780 hours to 2,100 hours. An equity of about $55,000 in the farm business is needed. The quantity of resources controlled by this group at any one time is probably quite limited; however, these farmers play an important role in the agricultural adjustment process.

Group 5 — The Commercial Farmer of the Future

The commercial livestock farming operation of the future is expected to be large and more efficient than those of the present time. In-

come levels that are considered satisfactory will probably increase, requiring larger amounts of resources per farm. The minimum resource requirements for a $5,000-income with full-time farm labor are most nearly representative of this group. If a single representative farm of the future were to be established, it probably should be for average yields, average land quality and 50 percent operator equity. This means a farm size of 1,268 acres, capital requirements of $159,373 (equity requirements one-half this amount), and labor requirements of 2,221 hours.

Depending on yields and equity levels, individuals may secure the $5,000 income level under present conditions with farm sizes ranging from 600 acres to 1,800 acres, capital requirements from about $84,000 to $220,000, and labor from 1,328 hours to 2,985 hours. The amount of operator equity required ranges from about $64,000 to $111,000.

Equity Limits on Adjustments

Some limits on the adjustments operators can make over time are implied by the equity requirements. The amount of operator equity required with 50 percent equity and average yields is $15,000 for Group 1, $35,000 for Group 2, $53,000 for Group 3, $52,000 for Group 4, and $80,000 for Group 5. Annual incomes of less than $3,000 (Groups 1 and 2) leave little for capital accumulation. Operators with less than $53,000 of equity and no other source of income would be expected to supplement annual incomes from equity capital as they adjust toward retirement. Operators with over $53,000 of equity or with outside sources of income may be able to accumulate equity and adjust to larger farms and higher income levels.

The implications of the results for area adjustments are quite numerous. It is obvious that with the relatively low return possibilities, adjustment towards larger farms will continue. It is also obvious that part-time farming will continue to be a major activity in the area. Some of these part-time farmers will be working off the farm to gain assets with which to purchase larger farms. Others will be working off-farm part-time to gain skills for adjustment to full-time non-farmwork.

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