

Optimal Organizations for Representative Farms in North Central Missouri

DALE COLYER



(Publication authorized July, 1965)

COLUMBIA, MISSOURI

CONTENTS

Introduction	3
Area of Study	3
Procedures Used	3
Assumptions and Coefficients for the Model	5
Crop Production Activities and Coefficients	5
Hog Production Activities	7
Beef Cattle Activities	9
Dairying Alternatives	10
Capital and Labor Activities	10
Results of Optimality Calculations	11
Cash Grain Farms	11
Mixed Livestock Farms	14
Hog Farms	15
Beef Cattle Farms	19
Dairy Farms	22
Factors Influencing Optimal Organizations	23
Type of Farm	23
Size of Farm	25
Livestock and Feed Grain Prices	26
General Implications of Study Results	38

ACKNOWLEDGEMENT

This bulletin was prepared under the Missouri Agricultural Experiment Station Research Project 509, which is part of the North Central Regional Committee NC-54 project to study Supply Response and Adjustment on Beef Cattle and Hog Farms in the Corn Belt. Personnel from the Agricultural Engineering, Animal Husbandry, Field Crops, and Soils Departments contributed to the development of data used for the study and their cooperation is gratefully acknowledged.

Optimal Organizations for Representative Farms in North Central Missouri

DALE COLYER

INTRODUCTION

Output of agricultural products has increased tremendously in recent years, but potential output is even greater. If all farms were organized to produce as efficiently as possible, the increased supply that could result with the resources currently available would be overwhelming. In order to study the effects of such adjustments, the U.S.D.A. and the State Agricultural Experiment Stations are conducting studies of adjustment and response for various areas and products.

The Experiment Stations of the North Central Region are involved in a study of the supply of feed grains, hogs, and beef cattle with optimal farm plans and at various prices for those products. This bulletin reports on the results of one phase of that study and specifically on the adjustments that individual farmers in 16 counties in north central Missouri could profitably make. Results for a similar study in Northeast Missouri are reported on in Missouri Agricultural Experiment Station Research Bulletin 872.

AREA OF STUDY

The area used for this study consists of 16 counties in north central Missouri and is identical with Census economic area 2a (see Figure 1). It is a predominantly rural, farming area, but is one that is not rich in natural resources. Much of the land is rolling to hilly and is subject to severe erosion. The soil is shallow, low in natural fertility, and a large proportion is used only for hay and pasture. Although farms are about as large in total acreage per farm as for the rest of the nation, the low proportion of cropland results in relatively small farm businesses. Of the 4,466,000 acres in commercial farms in the area less than half were classified as cropland in the 1959 Census of Agriculture and land use data indicate that only about one half of the cropland should be in row crops at any one time.

Because of the low proportion of cropland, beef cow herds and small dairy operations are common in the area. General farming operations are more predominant than specialized types of operations, with livestock production accounting for the major portion of cash farm income. Livestock sales produced nearly three times as much in cash receipts as field crop sales in 1959. Thus, although other types of farming also existed, the base used for this study consisted principally of general farming operations.

PROCEDURES USED FOR THE STUDY

A random sample survey of commercial farms was made in the region in 1963. This was used to determine the types of farming operations and resource bases of the farms as they were operated in 1962. Completed schedules were obtained on 178 commercial farm operations.

ASSUMPTIONS AND COEFFICIENTS FOR THE MODEL

The programming model was based on expected 1970 relationships. The level of management assumed was that attained by the top ten percent of farm operators in the early 1960s. This level is expected to be only average during the 1970s and, thus, to be widely applicable for adjustment decisions during coming years.

It also was assumed that the types of government programs in operation in 1961-62 would continue. Thus, the feed grain acreage on a farm was limited to minimum compliance with the feed grain program, i.e., to the feed grain base minus 20 percent. The acreage of wheat allowed was limited to the acreage allotment or 15 acres, whichever was larger. Predicting what will occur in the legislative area is at best risky, but government agricultural programs can be expected to continue to affect farm management decisions considerably.

The resource bases of the representative farms were determined from the sample survey and were those existing in 1962. Land and labor were limited to the quantities available in 1962, although the hiring of a limited amount of seasonal labor was permitted. Capital was limited to that available at the time of the survey plus what the typical farm operator could profitably borrow with normal equity lending procedures. Each representative farm could borrow up to 50 percent of its unencumbered assets. Livestock purchase and the building of livestock facilities were assumed to be partially self-financing.

Prices also were based on expected 1970 relationships. Prices existing in the early 1960s were adjusted by trends where applicable. Corn, hog, and beef cattle prices were based on a national corn price level of \$1.00 per bushel with adjustments for local differentials. The corn price was varied with \$.80 and \$1.20 per bushel limits and these were used to vary livestock prices. Hog and beef cattle prices were based on their relationship to corn in the 1955-60 period. A 14.8:1 hog to corn ratio and a 20.8:1 steer to corn ratio were used to determine the livestock prices. Adjustments were made for quality of livestock and season when marketed. The prices of the major items used for the analysis are given in Table 1.

Crop Production Activities and Coefficients

Individual crop growing activities were used. These included corn for grain, corn for silage, alfalfa-grass mixture for rotation meadow, soybeans, wheat, and oats. Activities were also included to permit the harvest of rotation meadow as hay or to allow it to be pastured and to permit the fertilization of permanent pastureland to increase its yield. Row crops were limited to the maximum percentage of cropland that soils experts determined to be feasible for the area. Corn production was limited to the acreage allowed with minimum compliance with the feed grain program. Wheat was limited by the wheat acreage allotment (minimum of 15 acres) while oats and meadow were limited only by the acreage of cropland. Corn could be bought or sold but hay was limited to that grown

Table 1. Prices Used for Programming

Prices Paid for Production Items

Seasonal Labor (Per Hour)	\$ 1.10
Soybean Oil Meal (Per Cwt.)	3.70
Protein Supplement for Hogs (Per Cwt.)	4.80
Nitrogen Fertilizer (Per Lb. N)	0.118
Phosphate Fertilizer (Per Lb. P ₂ O ₅)	0.085
Potash Fertilizer (Per Lb. K ₂ O)	0.052

Prices Received for Farm Products

Soybeans (Per Bushel)	\$ 1.95
Wheat (Per Bushel)	1.85
Grade B Milk (Per Cwt.)	3.38
Corn ^a (Per Bushel) : Low	0.81
Medium	1.01
High	1.21
Hogs ^b (Per Cwt.) : Low	11.34
Medium	14.31
High	17.26
Beef Cattle ^c (Per Cwt.) : Low	15.72
Medium	19.88
High	24.04

^aThe purchase price for corn is ten cents per bushel above the selling price. Oat prices are based on their feed value equivalent of corn.

^bBarrow and gilts--annual averages.

^cChoice steers--annual average.

on the farm and could not be sold. Yields were based on a weighted average for the different classes of soil in the area. These along with other crop coefficients are given in Table 2. Ranges are given for the labor coefficients since the type of machinery varies for the representative farms and this affects the amount of labor required.

Table 2. Crop Production Requirements

<u>Corn for Grain</u>	
Yield (Bushels Per Acre)	74.0
Maintenance Fertilizer	
N (Pounds Per Acre)	82.6
P ₂ O ₅ (Pounds Per Acre)	27.9
K ₂ O (Pounds Per Acre)	19.8
Annual Labor (Man Hours Per Acre) ^a	2.74 - 5.85
Other Costs (Dollars Per Acre) ^a	5.70 - 10.42

Corn for Silage

Yield (Tons Per Acre)	13.32
Maintenance Fertilizer	
N (Pounds Per Acre)	126.03
P ₂ O ₅ (Pounds Per Acre)	40.85
K ₂ O (Pounds Per Acre)	81.70
Annual Labor (Man Hours Per Acre) ^a	5.84 - 9.45
Other Costs (Dollars Per Acre) ^a	6.68 - 13.38

Soybeans

Yield (Bushels Per Acre)	26.0
Maintenance Fertilizer	
P ₂ O ₅ (Pounds Per Acre)	46.8
K ₂ O (Pounds Per Acre)	52.0
Annual Labor (Man Hours Per Acre) ^a	2.34 - 4.80
Other Costs (Dollars Per Acre) ^a	5.34 - 10.78

Wheat

Yield (Bushels Per Acre)	35.0
Maintenance Fertilizer	
N (Pounds Per Acre)	47.0
P ₂ O ₅ (Pounds Per Acre)	17.9
K ₂ O (Pounds Per Acre)	8.4
Annual Labor (Man Hours Per Acre) ^a	1.62 - 3.15
Other Costs (Dollars Per Acre) ^a	4.54 - 8.77

Oats

Yield (Bushels Per Acre)	45.0
Maintenance Fertilizer	
N (Pounds Per Acre)	33.8
P ₂ O ₅ (Pounds Per Acre)	11.7
K ₂ O (Pounds Per Acre)	8.6
Annual Labor (Man Hours Per Acre) ^a	1.15 - 2.10
Other Costs (Dollars Per Acre) ^a	4.77 - 8.93

Alfalfa-Bromegrass

Yield (Tons Per Acre)	3.0
Maintenance Fertilizer	
P ₂ O ₅	34.5
K ₂ O	93.0
Annual Labor (Man Hours Per Acre) ^{a, b}	1.40 - 2.30
Other Costs (Dollars Per Acre) ^{a, b}	4.84 - 5.07

^aLabor and Machinery cost data

^bDoes not include harvest data.

Hog Production Activities

Hog production activities were set up on the basis of single litter systems with farrowing permitted in any one of four calendar year quarters. Pigs could

be centrally farrowed and fed in confinement quarters or on pasture or they could be farrowed with portable facilities and fed on pasture. Eight pigs would be produced per litter with seven sold and a replacement gilt kept. Feeder pigs could also be purchased and fed out, either in confinement or on pasture, in any of the four quarters. Additional farrowing and feeding facilities, central or portable, could be built to handle expanded hog enterprises. These, as for the purchase of hogs, would be partially self-financing. Hog purchases were assumed to be one third self-financing and facilities were two thirds self-financing. These activities are self-financing since they add to the equity of the farm when they are acquired. The coefficients for the programming model are given in Table 3.

Table 3. Resource Requirements for Hog Production Systems

Central Farrowing and Confinement Feeding System		(All Quarters)			
Corn Equivalents (Cwt. Per Litter)		59.25			
Protein Supplement (Cwt. Per Litter)		11.96			
Annual Labor (Man Hours)		13.33			
Miscellaneous Costs (\$ Per Litter)		21.00			
Central Farrowing and Portable Feeding System					
	QUARTER:	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Corn Equivalents (Cwt. Per Litter)		59.36	59.32	62.78	60.73
Protein Supplement (Cwt. Per Litter)		11.86	11.86	12.30	11.68
Pasture (Animal Unit Days)		20.0	19.0	13.0	15.0
Annual Labor (Man Hours)		14.38	14.68	13.63	13.33
Miscellaneous Costs (\$ Per Litter)		21.00	21.00	21.00	21.00
Portable Farrowing and Pasture Feeding System					
	QUARTER:	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Corn Equivalents (Cwt. Per Litter)		59.36	59.32	62.78	60.73
Protein Supplement (Cwt. Per Litter)		11.86	11.36	12.30	11.68
Pasture (Animal Unit Days)		20.0	25.0	19.0	15.0
Annual Labor (Man Hours)		14.73	15.02	13.97	13.67
Purchased Feeder Pigs, Confinement Feeding System		(All Quarters)			
Corn Equivalent (Cwt. Per Litter)		5.61			
Protein Supplement (Cwt. Per Litter)		1.09			
Annual Labor (Man Hours)		0.88			
Miscellaneous Costs (\$ Per Litter)		1.47			
Purchased Feeder Pigs, Pasture Feeding System					
	QUARTER:	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>
Corn Equivalent (Cwt. Per Litter)		5.63	5.61	5.95	5.76
Protein Supplement (Cwt. Per Litter)		1.05	1.05	1.05	1.05
Pasture (Animal Unit Days)		0.015	0.015	0.015	0.015
Annual Labor (Man Hours)		0.88	0.88	0.88	0.88
Miscellaneous Costs (\$ Per Litter)		1.47	1.47	1.47	1.47

Ranges for some of the data are due to differences in the quarters in which pigs are farrowed or purchased.

Beef Cattle Activities

A cow herd and feeder cattle activities were included in the beef cattle alternatives. The cow herd produced a 400 pound feeder calf which could be sold or used by one of the feeding systems. Labor coefficients for the cow herd were based on a 21-30 cow herd for the small farms, a 31-40 cow herd for the medium size farms, and a larger than 40 cow herd for the large farms. The cow herd

Table 4. Resource Requirements for Beef Cattle Systems

<u>Beef Cow Herds Producing Feeder Calves:</u>				
Corn Equivalents (Cwt. Per Cow)				2.69
Protein Supplement (Cwt. Per Cow)				0.98
Hay (Cwt. Per Cow)				30.0
Pasture (Cwt. Hay Equivalents Per Cow)				69.89
Annual Labor (Man Hours) - Small Farms				20.00
Medium Farms				16.00
Large Farms				14.00
Miscellaneous Costs (\$ Per Cow)				12.09
<u>Calf Feeding Systems:</u>				
	<u>Drylot</u>		<u>Pasture</u>	
	<u>With Silage</u>	<u>Without Silage</u>	<u>With Silage</u>	<u>Without Silage</u>
Corn Equivalents (Cwt. Per Head)	25.14	30.13	27.66	27.22
Protein Supplement (Cwt. Per Head)	3.62	3.22	2.8	2.5
Hay (Cwt. Per Head)	12.18	16.18	11.15	13.4
Pasture (Cwt. Hay Equivalent Per Head)	-	-	22.0	22.0
Silage (Tons Per Head)	1.5	-	1.1	-
Corn				
Annual Labor (Man Hours Per Head)				
Low Mechanization	12.05	12.05	10.42	10.42
High Mechanization	4.79	4.79	3.88	3.88
Miscellaneous Costs (\$ Per Head)				
Low Mechanization	2.41	2.41	2.84	2.84
High Mechanization	3.25	3.25	3.73	3.73
<u>Yearling Feeding Systems:</u>				
	<u>With Silage</u>		<u>Without Silage</u>	
Corn Equivalents (Cwt. Per Head)	22.40		27.22	
Protein Supplement (Cwt. Per Head)	2.88		1.60	
Hay (Cwt. Per Head)	3.20		7.20	
Corn Silage (Tons Per Head)	1.20		-	
Annual Labor (Man Hours)				
Low Mechanization	6.65		6.65	
High Mechanization	2.63		2.63	
Miscellaneous Costs (\$ Per Head)				
Low Mechanization	2.51		2.51	
High Mechanization	2.94		2.94	

was assumed to utilize a large quantity of roughages from crop residues and other sources that would tend to be otherwise unused.

Systems utilizing calves and yearlings were included in the feeder cattle alternatives. Calves could be fed in drylots or on pasture. They would be purchased in the fall and kept for a year when they would be sold as choice steers. Calves could be purchased or fed from those raised with a breeding herd. Yearlings could be purchased in either of two periods and fed for six months. For both the systems using calves and yearlings there were alternatives to feed rations with and without corn silage and for using equipment typical of low mechanization or high mechanization. Labor requirements were based on 50 head lots for low mechanization and 200 head lots for high mechanization. Beef housing facilities plus low and high mechanization feeding facilities could be built to enable expanded beef cattle enterprises. The basic input data for the beef cattle activities are given in Table 4. Beef cow purchases were assumed to be two-thirds self-financing while feeder cattle purchases were assumed to be 100 percent self-financing.

Dairying Alternatives

Dairying was not included as an alternative except on those farms where a dairy enterprise was already important. Dairy alternatives with and without corn silage in the ration were permitted. Typical dairy farms in the area were stanchion operations selling manufacturing (Grade B) milk so this method was retained for the analysis. An activity was included to permit additions to the dairy facilities. The input data for the dairy activities are given in Table 5. The purchase of dairy cows was assumed to be 50 percent self-financing.

Table 5. Resource Requirements for Dairy Systems

	<u>With Silage</u>	<u>Without Silage</u>
Corn Equivalents (Cwt. Per Cow)	17.19	30.52
Protein Supplement (Cwt. Per Cow)	4.44	2.84
Hay (Cwt. Per Cow)	68.06	94.73
Corn Silage (Tons Per Cow)	4.00	-
Pasture (Cwt. Hay Equivalents)	47.40	47.40
Annual Labor (Man Hours Per Cow)	88.92	87.11
Miscellaneous Costs (\$ Per Cow)	47.35	47.35

Capital and Labor Activities

Each activity requiring the use of capital could take funds from the cash equation which includes the cash available plus the value of the crop and livestock inventory of the representative farms. Cash could also be acquired by two

borrowing activities. Long term funds could be borrowed at 5.5 percent and short term funds at 7 percent. These amounts were limited by the real estate and chattel equities of the representative farms. In addition, each activity that was partially self-financing added to the borrowing limits. An item is self-financing if it serves as part of the security for a loan.

Labor that could be used was limited to the amounts available in 1962. Only direct labor requirements were included in the coefficients. Estimates of overhead labor were made and subtracted out of the amounts available. The available labor was subdivided into five periods—winter, early spring, late spring, summer, and fall. Seasonal labor could be hired for late spring, summer, and fall at \$1.10 per hour. The total amount that could be hired was limited by the amount hired by the representative farms in 1962.

RESULTS OF OPTIMALITY CALCULATIONS

The major adjustment that the computed optimal plans indicate would be profitable is a very large increase in livestock production. Increased labor efficiency and the availability of capital enable an expanded size of business and with land limited this would take the form of increased livestock output. Increased crop yields also enable larger livestock enterprises, but this would not be large enough to fully utilize the available resources and thus relatively large quantities of corn would be purchased to further expand the size of business.

The indicated adjustments for individual situations are analyzed by type of farm and other factors in the following sections. The results given below are for medium corn, hog, and beef cattle prices.

Cash Grain Farms

There were 32 farms in the survey sample of 178 farms which were classified as cash grain farms. Of those six were small farms, nine were medium size farms, and sixteen were large farms. They had an average of 67, 144, and 391 acres of cropland respectively. Except for the large farms the cash grain farms grew relatively small acreages of corn and grew considerably less than their acreage bases. Soybean production was the major crop enterprise on all three farms, but corn was also very important on the large farms. Although some hogs and beef cattle were raised on the typical cash grain farm, livestock sales accounted for only a very small proportion of total farm income. The farms were well equipped and had low debt to asset ratios, but the amount of capital available for the two smaller farms was relatively low. The major facets of the 1962 resource bases and farm organizations of the cash grain farms are presented in Table 6. These were used as the base from which optimal farm plans were computed and they serve as a point of reference for considering the impact of adjustment toward more profitable operations.

Under the optimal plans shown in Table 7, all three typical farms would grow the maximum corn acreages permitted which would result in an increase for the two smaller farms but a slight decrease for the large farm. The soybean

acreage would be reduced on all three farms with a very substantial reduction on the large farms. Wheat would be grown to the acreage allotment limit on all three farms. Hay and meadow would be grown on the remainder of the cropland except for the medium size farm where oats would also be grown.

Table 6. Resource Bases of Representative Cash Grain Farms in 1962

	Small	Medium	Large
Farms in Sample - Number	7	9	6
Total Land Operated - Acres	120.7	222.3	585.0
Cropland Operated - Acres	67.0	144.0	391.0
Permanent Pastureland - Acres	45.7	67.8	158.8
Average Acres of Land Owned	101.4	86.7	184.9
Average Acres of Land Rented	19.3	135.6	400.1
Feed Grain Base - Acres	20.1	37.1	110.6
Wheat Allotment - Acres	8.9	14.8	31.7
Dairy Cow Capacity - Head	2.0	3.4	3.7
Farrowing Capacity - Sows	3.0	2.5	8.7
Pig Feeding Capacity - Head	24.0	24.0	72.0
Beef Cow Housing Capacity - Head	11.6	15.0	53.8
Beef Feeding Capacity - Steers	15.4	19.1	72.7
Assets - \$	13,309	17,402	53,809
Debts - \$	3,586	3,670	12,494
Net Income - \$	813	1,779	4,617
Number of Tractors Per Farm	1.3	1.8	2.3
Largest Typical Size Tractor	3-plow	3-plow	4-plow
Corn Picker Owned or Type Owned	1-row	1-row	2-row
Combine Owned or Type Owned	6' PTO	6' PTO	12' SP
Baler Owned by Typical Farm?	No	No	Yes
Labor Available - Man Months	12.1	16.6	18.6
Seasonal Labor Hired - Days	-	3.0	16.0

The major adjustment for the cash grain farms would be toward highly intensive livestock systems. Beef cow herds from which the calves would be fed would be combined with a substantial hog enterprise on the two smaller farms. On the large farms, large feeder cattle and hog producing enterprises would be combined. The large farms have relatively abundant capital and could expand production by borrowing to purchase livestock, feed, and livestock facilities. With relatively small amounts of capital available, the expansion was severely limited for the small farms where relatively small amounts of corn were purchased in comparison to the nearly 10,000 hundredweights that would be purchased by the large farms. All three representative farms would be able to increase their incomes substantially by appropriate adjustments in their organizations and resource use.

Table 7. Organization of Cash Grain Farms in 1962 and With Optimal Plans

	Small		Medium		Large	
	1962	Optimum	1962	Optimum	1962	Optimum
Corn for Grain - Acres	11.3	16.0	22.3	30.0	93.0	89.0
Corn for Silage - Acres	-	-	-	-	6.7	-
Oats - Acres	1.1	-	4.3	30.9	6.2	-
Wheat - Acres	4.6	15.0	6.5	15.0	17.0	32.0
Soybeans - Acres	23.7	19.4	64.2	42.0	171.2	96.0
Meadow - Acres	10.0	12.6	21.7	19.1	37.2	54.0
Hay Harvested - Tons	17.0	36.1	45.0	53.3	61.0	151.0
Beef Cow Herd - Head	6.0	18	7.4	27	26.8	-
Feeder Calves Sold - Head	3.4	-	6.3	2	10.7	-
Feeder Calves Bought - Head	-	-	-	-	9.4	226
Calves Fed on Pasture - Head	0.4 ^a	14	-	19	7.8 ^a	226
Litters Farrowed - Number	1.0	19	2	42	6.0	111
Quarters in Which Farrowed	N. A.	1 & 4	N. A.	1 & 4	N. A.	1, 2, 3, & 4
Capital Borrowed - \$	3,856	9,483	3,670	17,640	12,494	74,490
Beef Housing Capacity Built - Cows	12.0 ^b	15	15.0	24	53.8	93
H. M. Beef Feeding Capacity Built - Steers	15.4 ^b	-	19.1 ^b	-	72.9 ^b	226
Farrowing Capacity Built - Sows	3.0 ^b	7	3.0 ^b	18	9.0 ^b	29
Pig Feeding Capacity Built - Head	24.0 ^b	127	24.0 ^b	316	92.0 ^b	538
Corn Purchased - Cwt.	-140	962	496	1,591	-3,410.0	9,237
Seasonal Labor Hired - Hours	-	-	30.0	-	160.0	160.0
Income Minus Variable Costs - \$ ^d	813 ^c	5,181	1,779 ^c	10,162	4,617 ^c	34,000

^aAll cattle fed in 1962.

^bActual capacity in 1962.

^cNet income in 1962.

^dVariable costs include cash expenses for feed, fertilizer, fuel, repairs, veterinarian, miscellaneous supplies, interest on borrowed funds, taxes on livestock, wages for seasonal labor, and custom work fees.

Mixed Livestock Farms

There were 52 farms in the sample survey that were classified as mixed livestock farms with about an equal number in each size group. More of the farms in economic area 2a were mixed livestock than any other type. The small, medium, and large size farms had averages of 95, 142, and 343 acres of cropland and 194, 253, and 524 total acres respectively. The feed grain bases of these farms were less than one third of their cropland acreage and the average acreages of feed grains planted were below the average acreage bases. Soybean acreages were about as large as the corn acreages on the representative farms. Other major crops grown were wheat, oats, and hay. There was a small surplus of corn on the larger farms, but the small farms purchased some corn in addition to that raised.

The typical farms had a few dairy cows, raised several litters of hogs, and had a beef cow herd. Calves, typically, were sold as feeder stock although some farms fed all or part of the calf crop and some also purchased feeder cattle. The larger farms generally had considerably larger hog and beef enterprises than the smaller size farms.

Table 8. Resource Bases of Representative Mixed Livestock Farms - 1962

	Small	Medium	Large
Farms in Sample - Number	18	17	17
Total Land Operated - Acres	194.1	252.7	524.1
Cropland Operated - Acres	95.0	142.0	343.0
Permanent Pastureland - Acres	105.9	90.0	149.8
Feed Grain Base - Acres	27.0	46.0	99.2
Wheat Allotment - Acres	5.2	11.8	24.3
Acres Owned	128.4	138.9	235.1
Acres Rented	65.7	113.8	289.3
Dairy Cow Capacity - Head	0.2	5.5	7.0
Farrowing Capacity - Sows	7.6	9.2	18.0
Pig Feeding Capacity - Head	64.0	72.0	144.0
Beef Cow Housing Capacity - Head	14.9	17.4	20.2
Beef Feeding Capacity - Head Steers	26.1	20.3	36.8
Assets - \$	22,864	39,886	56,052
Debts - \$	1,355	6,917	6,968
Net Income - \$	1,464	2,511	2,544
Number of Tractors Per Farm (Avg.)	1.1	2.0	2.2
Largest Typical Size Tractor	2-pow	3-pow	3-pow
Corn Picker Owned	No	1-row	2-row
Combine Owned	No	PTO	PTO
Baler Owned	No	No	Yes
Labor Available - Man Months	13.9	17.8	18.0
Seasonal Labor Hired - Days	9.2	9.0	28.0

The farms were relatively well equipped, but the small farms had little equipment except that needed for basic tillage operations. The small farms were operated with two-plow tractors while the larger farms typically had one tractor, out of an average of two per farm, that was at least three-plow size. Many of the larger farms also owned corn pickers and combines and the largest farms typically had balers, too. Average levels of assets, debts, and net incomes increased with size of farm, but the difference between debts and net income for the two larger size farms was relatively small. Debts were low relative to assets for all three representative farms. The resource bases of the representative farms are summarized in Table 8.

The optimal farm plans shown in Table 9 would result in the corn acreage being expanded to the maximum extent permitted by minimum compliance with the feed grain program and would result in a relatively large increase on the small farms but only small increases on the large farms. Soybeans would be grown on land that could be planted to row crops that exceeds the corn acreage restriction and wheat would be grown to the extent of the acreage allotment. Hay or meadow would be grown to the extent required by the livestock enterprises and oats would be grown on any remaining cropland.

The main change in livestock production would be a large increase in the quantity produced with hog production increasing substantially more than beef cattle production. Most of the hog production increase would utilize portable farrowing facilities and pasture feeding of the hogs. Beef cow herds would continue to be utilized on the two smaller representative farms, but most of the corn would be fed out. A few feeder calves would be sold by the medium size farms. On the large farms feeder calves would be purchased and fed out on pasture. Thus, on the larger farms beef cattle production would increase relatively more than hog production.

The adjustments that computations indicate as optimal require large quantities of capital to carry out. The typical farm would have to borrow this money using its equity to provide the security. Additional capital would be required for acquiring livestock, feed, and building facilities for the livestock.

Hog Farms

There were 27 of the 178 farms in the sample survey which produced hogs for their major income source. The small, medium, and large farms averaged about 139, 305, and 515 acres of land operated with 64, 149, and 327 acres of cropland, respectively. Except on the largest farms, the representative hog producers produced corn on only a relatively small fraction of their feed grain base acreage and all three typically purchased some corn in addition to that produced. Although hogs were the largest enterprise on each farm, they also had beef cow herds and the large farms purchased some feeder cattle. The calves, including those purchased, were sold as stockers or feeders instead of being finished for slaughter.

Table 9. Organization of Mixed Livestock Farms in 1962 and With Optimal Plans

	Small		Medium		Large	
	1962	Optimum	1962	Optimum	1962	Optimum
Corn for Grain - Acres	11.5	26.0	30.4	37.0	77.9	79.0
Corn for Silage - Acres	1.0	-	1.6	-	0.8	-
Oats - Acres	0.3	-	2.9	20.9	10.4	91.7
Wheat - Acres	0.7	15.0	4.8	15.0	15.0	24.0
Soybeans - Acres	11.0	22.0	39.0	34.0	59.3	92.0
Meadow - Acres	31.0	26.0	35.0	26.1	80.8	36.3
Hay Harvested - Tons	42.0	72.5	65.0	71.2	187.0	100.5
Beef Cow Herd - Head	10.8	36	16.5	39	34	-
Feeder Calves Sold - Head	7.7	-	6.2	10	19.0	-
Feeder Calves Bought - Head	5.2	-	0.1	-	6.7	150
Calves Fed on Pasture	2.1 ^a	28	5.4 ^a	20	11.4 ^a	150
Litters of Pigs Farrowed	6.1	57	10.4	76	26.2	74
Quarters in Which Farrowed	N. A.	1, 2, & 4	N. A.	1 & 4	N. A.	1 & 4
Capital Borrowed - \$	1,355	24,423	6,917	26,672	6,968	45,137
Beef Housing Built - Cows	14.9 ^b	39	17.4 ^b	35	20.2 ^b	64
L. M. Beef Feeding Capacity Built - Steers	26.1	2	20.3	-	36.8 ^b	-
H. M. Beef Feeding Capacity Built - Steers	-	-	-	-	-	150
Farrowing Capacity Built - Sows	7.0 ^b	20	9.0 ^b	29	18.0 ^b	19
Pig Feeding Capacity Built - Head	56.0 ^b	374	72.0 ^b	533	144.0 ^b	451
Corn Purchased - Cwt.	+114.2	3,315	-16.0	3,478	-506.0	5,644
Seasonal Labor Hired - Hours	92.0	-	90.0	-	280	280
Income Minus Variable Costs - \$	1,464 ^c	10,231	2,511 ^c	13,451	2,544 ^c	23,067

^aAll cattle fed out on farms in 1962.

^bCapacity in 1962.

^cNet income in 1962.

Debts were low relative to assets on each representative farm with the biggest debt to asset ratio at 14 percent for the large farms. The farms were relatively well equipped with the typical farm of all three size groups owning a combine and the two larger sizes owning corn pickers and balers as well. The characteristics of the resource bases of these farms are summarized in Table 10.

Table 10. Resource Bases of Representative Hog Producing Farms - 1962

	Small	Medium	Large
Farms in Sample - Number	9	10	8
Total Land Operated - Acres	139.0	305.0	515.2
Cropland Operated - Acres	64.0	149.0	327.0
Permanent Pastureland - Acres	63.8	140.0	172.1
Average Acreage Owned	97.8	171.0	276.9
Average Acreage Rented	41.2	134.0	238.3
Feed Grain Base - Acres	21.0	82.0	85.9
Wheat Allotment - Acres	4.0	21.0	17.9
Dairy Capacity - Cows	1.1	2.5	1.3
Farrowing Capacity - Sows	10.1	18.5	15.9
Pig Feeding Capacity - Head	80.0	152.0	120.0
Beef Housing Capacity - Cows	12.4	42.1	51.6
Beef Feeding Capacity - Steers	17.0	71.0	69.1
Assets - \$	23,399	40,186	63,320
Debts - \$	2,423	3,298	9,068
Net Income - \$	1,359	3,865	4,865
Average Number of Tractors	1.1	1.7	2.4
Largest Typical Size Tractor	3-plow	2-plow	4-plow
Type of Corn Picker Owned	None	1-row	2-row
Type of Combine Owned	PTO	PTO	S. P.
Baler Owned?	No	Yes	Yes
Labor Available - Man Months	13.0	16.5	22.0
Seasonal Labor Hired - Days	5.0	7.0	20.0

Under the plans computed as optimal the representative farms would continue to produce hogs as the major enterprise (Table 11). The size of the enterprise, however, would be expanded several times with the greatest increase occurring on the medium size farms. Multiple period farrowing would be used with farrowing in two quarters on the small farms and in three quarters on the two larger sizes. This would require an expansion in facilities with portable farrowing and pasture feeding facilities being used. The beef enterprise on the representative farms also would be enlarged. On the small farm the number of cows would be increased and the calves would be fed out on the farm. The medium and large farms would shift to feeding out purchased calves. All three farms would utilize pasture feeding systems and on the two larger farms the low

Table 11. Organization of Hog Farms in 1962 and Under Optimal Plans

	Small		Medium		Large	
	1962	Optimal	1962	Optimal	1962	Optimal
Corn for Grain - Acres	13.8	17.0	21.5	66.0	74.0	69.0
Corn for Silage - Acres	1.1	-	-	-	1.1	-
Oats - Acres	0.9	-	-	15.6	8.0	103.5
Wheat - Acres	1.0	15.0	5.3	21.0	10.4	18.0
Soybeans - Acres	5.5	9.9	14.5	9.0	69.3	95.0
Meadow - Acres	23.7	18.1	44.1	19.4	83.6	24.5
Hay Harvested - Tons	30.3	49.5	111.0	43.3	117.0	53.8
Beef Cow Herd - Head	10.6	24	25.2	-	33.8	-
Feeder Calves Sold - Head	6.1	-	13.9	-	6.4	-
Feeder Calves Bought - Head	0.2	-	-	65	27.5 ^a	79
Calves Fed on Pasture - Head	0.1 ^a	19	-	65	2.8 ^a	79
Litters Farrowed - Number	15.5	58	22.1	141	57.7	182
Quarters in Which Farrowed	N. A.	1 & 4	N. A.	1, 2 & 4	N. A.	1, 2 & 4
Capital Borrowed - \$	2,432	21,300	3,298	43,278	9,068	55,149
Beef Housing Capacity Built - Cows	-	25 ^c	-	-	-	-
H. M. Beef Feeding Capacity Built - Steers	-	2 ^c	-	62	-	79
Farrowing Capacity Built - Sows	-	19	-	32	-	49
Pig Feeding Capacity Built - Head	-	381	-	665	-	905
Corn Purchased - Cwt.	448	3,411	138	7,531	452	9,237
Seasonal Labor Hired - Hours	50 ^b	-	70 ^b	70	200 ^b	76
Income Minus Variable Costs - \$	1,359 ^b	8,567	3,865 ^b	18,427	4,865 ^b	26,550

^aAll cattle fed out in 1962.

^bNet income in 1962.

^cLow mechanization.

level mechanization feeding facilities would be replaced by high level mechanized facilities.

All three farms would grow the maximum amount of corn permitted by minimum compliance with the feed grain program. This would result in relatively large acreage increases on the small and medium farms, but a slight decrease on the large farms which were producing at close to the acreage base. Soybeans would be grown on all row cropland not used for corn. On the portion of cropland not permitted in row crops, wheat, meadow or hay, and oats would be grown. Wheat would be grown to acreage allotment limit on all three farms and meadow crops to the extent hay and pasture are required by the livestock enterprises. Oats would be grown on any residual land so that none would be produced on the small farms, a small acreage on the medium size farms, and a relatively large acreage on the large farms. Most of the pasture requirements could be met from the permanent pasture acreage with the rotation meadow being utilized primarily for hay.

The optimal plans require substantially increased investment in livestock, livestock facilities, feed, fertilizer, and other inputs. The typical farms could acquire needed capital only by borrowing from 6 to 13 times their 1962 debt level. These levels are feasible within the usual equity limits imposed by lending agencies but are larger than many farmers are willing to borrow.

Beef Cattle Farms

Beef cattle farms were the second largest number of farms in north central Missouri from the sample survey. There were 40 farms which received over one half of their income from beef cattle sales with 14 small, 19 medium, and 7 large farms in this category (Table 12). These farms had 48, 150, and 302 acres of cropland and 132.2, 163.7, and 246.2 acres of permanent pastureland respectively. The small farms had an average feed grain base of 32.9 acres and a wheat allotment of 18.6 acres. For the medium size farms the corresponding average acreages were 45.6 and 12.0 and for the large farms they were 98.5 and 29.1. The typical farms of all three sizes grew relatively small acreages of corn, other row crops, and small grains with much of their cropland in hay and pasture.

The main enterprise on the typical farms was a beef cow herd although many farms also purchased feeder cattle. Calves from the cow herd typically were sold as feeder stock. In addition to the beef enterprises, most farms also had relatively small swine enterprises and some had small dairy herds.

The average beef farm was in a very favorable capital position with debts low relative to assets and a relatively high value of assets because of their livestock inventory. Except for the small size farms the typical farm was well equipped with at least a three-plow tractor plus a combine, corn picker and baler as major pieces of owned machinery. The typical large and medium size farm had an average of about two tractors. The typical small farms, however, owned only one tractor and it was of two-plow size and they did not own other

Table 12. Resource Bases of Representative Beef Cattle Farms - 1962

	Small	Medium	Large
Farms in Sample - Number	14	19	7
Total Land Operated - Acres	183.3	329.0	584.3
Cropland Operated - Acres	48.0	150.0	302.0
Permanent Pastureland - Acres	132.2	163.7	246.2
Feed Grain Base - Acres	32.9	45.6	98.5
Wheat Allotment - Acres	18.6	12.0	29.1
Acres Owned	162.0	252.2	437.4
Acres Rented	21.3	76.8	146.9
Dairy Capacity - Cows	0.1	2.1	4.2
Farrowing Capacity - Sows	8.0	6.8	8.3
Pig Feeding Capacity - Head	64.0	56.0	64.0
Beef Housing Capacity - Cows	21.6	31.2	30.9
Beef Feeding Capacity - Steers	36.0	39.2	55.4
Assets - \$	30,068	59,458	63,484
Debts - \$	600	4,547	21,545
Net Income - \$	1,892	3,504	3,541
Number of Tractors Per Farm	1.0	1.9	2.8
Largest Tractor on Typical Farm	2-plow	3-plow	3-plow
Corn Picker	None	1-row	1-row
Combine	None	PTO	PTO
Baler Owned?	No	Yes	Yes
Labor Available - Man Months	13.6	18.3	17.9
Seasonal Labor Hired - Days	11.0	18.0	8.0

pieces of major equipment. The small farms had the equivalent of about one man-year of labor while the two larger size farms had about 1½ man-years available. Very few of the farms hired labor to any significant degree.

The computed optimal plans by the beef cattle farms are shown in Table 13. Under these plans, the cropping systems would be intensified with corn grown to the maximum extent permitted by compliance with the feed grain programs. The remainder of the row cropland would be used for soybean production except on the small farms. The small beef farms had the least cropland of any representative farms but had a relatively large feed grain base. Corn production therefore takes a large proportion of the row cropland with the remainder used for hay, pasture and a small amount of wheat. The small farms were the only ones where wheat would not be grown to the acreage allotment limit. This is the result of most of the small amount of cropland not in corn being used to meet the forage requirements of the livestock produced. On the two larger size farms, in addition to soybeans, wheat would be grown to maximum acreage permitted, hay and meadow to the extent required by the livestock, and oats grown on any residual cropland.

Livestock production would be increased sharply under the optimal plans. However, it would shift from beef cattle production toward hog production as

Table 13. Organization of Beef Farms in 1962 and Under Optimal Plans

	Small		Medium		Large	
	1962	Optimal	1962	Optimal	1962	Optimal
Corn for Grain - Acres	6	24.0	12.4	37.0	38.0	79.0
Corn for Silage - Acres	-	-	1.4	-	13.7	-
Oats - Acres	1.7	-	6.2	25.8	13.3	79.4
Wheat - Acres	-	5.3	2.0	15.0	9.2	29.0
Soybeans - Acres	1.7	-	8.5	38.0	25.4	72.0
Meadow - Acres	22.0	12.7	52.7	25.2	98.4	23.0
Hay Harvested - Tons	56.0	29.5	110.0	63.0	188.0	53.2
Beef Cow Herd - Head	15.9	15	32.2	26	40.3	-
Feeder Calves Sold - Head	8.6	-	16.4	-	19.3	-
Feeder Calves Bought - Head	7.8	-	7.7 ^a	15	31.4	79
Calves Fed on Pasture - Head	7.9 ^a	11	5.6 ^a	36	38.3 ^a	79
Litters Farrowed - Number	1.5	92	3.5	114	11.2	134
Quarters in Which Farrowed	N. A.	1 & 4	N. A.	1, 2, & 4	N. A.	1, 2, & 4
Capital Borrowed - \$	600	26,064	4,547	32,267	21,545	38,401
Beef Housing Capacity Built - Cows	-	-	-	18	-	12
H. M. Beef Feeding Capacity Built - Steers	-	-	-	-	-	79
Farrowing Capacity Built - Sows	-	38	-	32	-	37
Pig Feeding Capacity Built - Head	-	672	-	561	-	649
Corn Purchased - Cwt.	129	4,930	419	6,266	487	6,214
Seasonal Labor Hired - Hours	110	-	180	-	80	5
Income Minus Variable Costs	1,892 ^b	10,043	3,504 ^b	16,047	3,541 ^b	23,218

^aAll cattle fed out in 1962.

^bNet income in 1962.

the major enterprise. Multiple period farrowing using portable farrowing and pasture feeding facilities would be used for the hog enterprise. Beef cattle production would continue on all of the representative farms to use the forage produced. On the two smaller size farms beef cow herds would be used with the calves fed out on pasture. Some feeder calves would be purchased on the medium size farms, too. The beef enterprise on the large farms would consist only of purchased feeder cattle fed out on pasture. High mechanization feeding facilities would be built to handle the calves on the large farms, but the two smaller sizes would utilize existing low mechanization facilities.

The adjustments indicated as being profitable by the optimality calculations require substantial increases in investment and operating capital on all three representative farms. To accomplish these adjustments the small, medium, and large farms would have to borrow about \$26,000, \$32,000, and \$38,000 respectively. These levels would be required to build livestock facilities, buy livestock and feed, and to meet increased expenses from improved cropping practices.

Dairy Farms

There were 27 operations in north central Missouri classified as dairy farms in the sample survey taken in 1963 (Table 14). Fifteen of these were classed as

Table 14. Resource Bases of Representative Dairy Farms - 1962

	Small	Large
Farms in Sample - Number	15	12
Total Land Operated - Acres	239.8	405.0
Cropland Operated - Acres	116.0	240.7
Permanent Pastureland - Acres	106.3	145.7
Average Acreage Owned	183.0	260.6
Average Acreage Rented	56.8	144.4
Feed Grain Base - Acres	31.2	72.7
Wheat Allotment - Acres	8.4	14.4
Dairy Capacity - Cows	13.0	35.0
Farrowing Capacity - Sows	7.1	10.0
Pig Feeding Capacity - Head	56.0	80.0
Beef Housing Capacity - Cows	18.4	28.8
Beef Feeding Capacity - Steers	22.0	32.7
Assets - \$	28,826	63,271
Debts - \$	3,926	1,579
Net Income - \$	1,752	5,247
Tractors Per Farm - Number	1.7	1.9
Largest Typical Size Tractor	2-plow	4-plow
Type of Corn Picker Owned	1-row	2-row
Type of Combine Owned	PTO	PTO
Baler Owned?	Yes	Yes
Forage Chopper Owned?	No	Yes
Labor Available - Man Months	17.7	22.8
Seasonal Labor Hired - Days	5.0	7.2

small and twelve as large farms. The small farms were operated with about 240 total acres of land and the large farms with 405 acres and cropland operated averaged 116 and 240 acres for the two size groups. The feed grain base was 31.2 and 72.7 acres and the wheat allotment was 8.4 and 14.4 acres for the representative small and large farms respectively.

The small farms had building capacity to handle 13 dairy cows while the large farms had capacity for 35 cows. The representative small farm also had facilities for farrowing 7 sows and for 18 beef cows or 22 feeder cattle while the large farm had facilities for 10, 29, and 33 head of sows, beef cows, and steers respectively. Assets relative to debts were favorable for both farm size groups, but the large farms were in a much better position, both absolutely and relatively. The farms were well equipped with crop handling machinery since both typical farms had a corn picker, combine, and baler. The large farms also had forage choppers. There were about 18 man-months of labor available on the small farms and nearly 2 man-years on the large farms.

Under the plans computed as optimal the small dairy farms would continue to milk about the same number of cows as they milked in 1962 but would also increase the size of their hog enterprise and their beef cow herd (Table 15). The large farms, however, would not continue to produce milk but would shift to a large hog production enterprise along with a substantial cattle feeding operation. The cropping systems also would be intensified with larger acreages of corn and soybeans grown. The small farms would use some of their corn for silage. Wheat, oats, and meadow crops would be grown on the non-row cropland with wheat grown to acreage allotment limit and meadow crops to the extent required by the livestock enterprise with oats on any residual land.

Very substantial borrowing would be necessary to pay for the facilities, livestock, feed, and other inputs required by the expanded size of business. The debt level of the small farms would be increased to over \$21,000 and that of the large farms to more than \$80,000. Hog facilities would be increased on the small farms and both hog and beef facilities on the large farms. In addition, about 3,000 hundredweights of corn would have to be purchased for the livestock raised on the small farms and over 15,000 hundredweight would have to be purchased for the large farm operations.

FACTORS INFLUENCING OPTIMAL ORGANIZATIONS

Type of Farm

The type of farm organization that existed in 1962 did not have much influence on the computed optimal organizations. These were influenced more by the original land, labor, and capital resources than by the type of farm. The existing livestock facilities influenced the levels at which livestock could be handled, but since additional facilities could be built this was not a very important factor except where capital severely limited the expansion of facilities. In some instances, a class of livestock would enter the programs only to the limit

Table 15. Organization of Dairy Farms in 1962 and With Optimal Plans

	Small		Large	
	1962	Optimal	1962	Optimal
Corn for Grain - Acres	5.7	21.1	34.4	59.0
Corn for Silage - Acres	8.6	3.9	2.3	-
Oats - Acres	0.8	12.3	3.2	66.9
Wheat - Acres	6.6	15.0	8.3	15.0
Soybeans - Acres	32.1	33.0	21.3	62.0
Meadow - Acres	28.9	24.7	80.4	34.1
Hay Harvested - Tons	65.0	68.4	166.0	75.0
Beef Cow Herd - Head	5.7	12	15.3	-
Feeder Calves Sold - Head	4.5	-	9.2	-
Feeder Calves Bought - Head	-	-	-	112
Calves Fed on Pasture - Head	-	9	-	112
Litters Farrowed - Number	8.0	62	15.5	255
Quarters in Which Farrowed	N. A.	1 & 4	N. A.	1, 2, 3 & 4
Dairy Cows Milked - Head	13.1	13	32.2	-
Capital Borrowed - \$	3,926	21,739	1,579	80,894
Beef Housing Capacity Built - Cows	-	-	-	44
H. M. Beef Feeding Capacity Built - Steers	-	-	-	112
Farrowing Capacity Built - Sows	-	24	-	63
Pig Feeding Capacity Built - Head	-	437	-	1,083
Corn Purchased - Cwt.	41	3,222	526	15,630
Seasonal Labor Hired - Hours	50	-	72	72
Income Minus Variable Costs - \$	1,752 ^a	12,008	5,247 ^a	28,689

^aNet income, 1962.

of existing facilities because it could not compete for the limited capital available. The most common example of this was the beef cow herd which frequently entered the optimal plans up to the limit of beef housing facilities or until the carrying capacity of permanent pasture was exhausted.

The type of farm was related to the quantities of resources—notably capital—available. Thus, the beef cattle and hog farms had larger amounts of capital available than did the corresponding sizes of cash grain and mixed livestock farms. Those farms had smaller inventories of livestock and the mixed livestock farms also had less machinery and equipment. This resulted in a smaller equity base and did not permit the expansion to be as large and also resulted in beef cattle being relatively more important than on the hog and beef farms.

Size of Farm

The size of farm was a more important factor than type in determining the optimal organizations. Small farms always would have beef cow herds whereas the large farms would feed purchased cattle. The medium size farms usually would have beef cow herds, too, although one (the hog farm) would not. One of the medium size farms would purchase additional feeder cattle and two sell only part of the calves as feeders. On the small farms the calves from the beef cow herd would be fed out on the farm. Hog production, however, would tend to dominate all the optimal plans except those for the large cash grain and mixed livestock farms where feeder cattle would be dominant.

The extent of adjustment is limited by capital despite the large sums that typically could be financed by the equity of the representative farms. The amount of available capital increased with the increase in size of farm and therefore the larger farms could make greater adjustments in the size of their operations. The limited capital on the smaller farms is an important factor in cow herds being in the optimal plans. There are facilities and forages available that could not be otherwise used since the limited capital could be more effectively used for hog facilities and feed.

The amount of labor available also increases with the size of farm, but the relative size of business would increase more and hence labor would be more limitational on the large farms. There would be an excess of labor on the small farms even in the planting and harvest seasons. Highly efficient labor coefficients are assumed for this study. On small farms, labor use relative to capital is frequently high and the assumed levels of efficiency combined with relatively low amounts of available capital results in the excess labor. On the larger farms, as labor became limiting some adjustments would be made to better utilize it. Hogs would be farrowed in more than two quarters to spread the labor. Beef facilities would be built to utilize a highly mechanized system and reduce the labor requirements per head. Often, the old facilities would be abandoned to enable the whole enterprise to be more labor efficient. Because of this beef tends to be more important on the large than the smaller farms.

Although the larger farms would have larger acreages of feed grains they also would purchase larger quantities of feeds. This results from and permits very large livestock enterprises on the larger farms—as well as permitting relatively large enterprises on the smaller farms. Without the option of buying feed and with the acreage limited the farm business could not have been expanded sufficiently to utilize all of the available labor.

Livestock and Feed Grain Prices

The optimal organizations discussed in the preceding sections were all computed with livestock and feed prices at medium levels and at the ratios which have prevailed historically. Plans were also computed with prices of corn, hogs, and beef cattle varied above and below those levels. These indicate the kinds of adjustments that probably could be made if the historical ratios were altered and they give an indication of the types of organization that would be better for individuals who are more efficient with a particular enterprise. The results are less useful for this latter purpose since net income is not the only factor affected by efficiency but is the only factor altered in the cost change procedure. Labor, feed, and other input coefficients are different for efficient and inefficient producers. However, these also affect net income so that price changes can be expected to have a similar effect for indicating the direction and relative magnitude of adjustments for persons more or less efficient than assumed for the study.

Changes in the price ratios of two products can be expected to produce adjustments in the direction of the product whose relative price rises. In linear programming, the price changes may not be sufficient to produce any organizational change since many solutions are stable over a wide range of prices.

Generally when the prices of hogs or beef cattle were changed within the ratios used for this study they did produce significant organizational changes. Computed optimal plans are given by size of farm in separate tables for low and high corn, hog, and beef cattle prices. Plans with medium prices were given earlier and can be referred to for comparative purposes. These plans will be referred to with capital letters for the prices; e.g., MMM means medium, medium, medium with the first letter being the price of corn, the second the price of hogs, and the third the price of beef cattle.

Changes in Corn Prices—The major effect of lowering the price of corn relative to livestock prices would be to increase the amount of livestock and to increase farm income (see Tables 16-18). The increased income would result from an increased size of business as more corn is purchased and from the reduction in expenses due to the lower cost of buying corn. In addition, there would be a tendency to increase the amount of beef cattle relative to hogs produced. This would occur on the small and large farms, but hogs would be increased relative to beef cattle on the medium size farms. The small farms with beef cow herds would tend to shift toward the use of feeder cattle or the calves from the herd would be fed out instead of sold as feeder calves. On the larger farms, the feeder cattle enterprise would be increased substantially.

Table 16. Plans for Small Farms With Corn Prices Varied

	Cash Grain		Mixed Livestock		Beef Cattle		Hogs		Dairy	
	LMM	HMM	LMM	HMM	LMM	HMM	LMM	HMM	LMM	HMM
Corn for Grain - Acres	16.0	16.0	26.0	26.0	24.0	24.0	17.0	17.0	21.1	18.2
Corn for Silage - Acres	-	-	-	-	-	-	-	-	3.9	6.8
Oats - Acres	-	-	0.8	-	-	-	-	-	13.8	2.0
Wheat - Acres	15.0	15.0	15.0	15.0	7.0	2.5	15.0	15.0	15.0	15.0
Soybeans - Acres	22.0	18.6	22.0	22.0	-	-	12.6	8.8	33.0	33.0
Meadow - Acres	10.0	13.4	25.2	26.0	11.0	15.5	15.4	19.2	23.2	35.0
Hay Harvested - Tons	27.6	38.3	71.3	72.5	22.7	37.6	42.6	52.5	62.8	101.2
Beef Cow Herd - Cows	12	26	-	36	-	25	-	35	-	12
Feeder Calves Sold - Head	-	20	-	-	-	20	-	28	-	-
Feeder Calves Bought - Head	6	-	106	-	34	-	64	-	28	-
Calves Fed in Drylot - Head	-	-	-	-	-	-	-	-	-	-
Calves Fed in Pasture - Head	15	-	106	28	34	-	64	-	28	9
Hog Produced - Litters	22	21	41	57	94	92	52	61	62	41
Quarters in Which Farrowed	1, 2, & 4	1 & 4	1, 2, & 4	1, 2, & 4	1, 2, & 4	1 & 4	1, 2, & 4	1 & 4	1, 2, & 4	1 & 4
Dairy Cows - Head	-	-	-	-	-	-	-	-	13	23
Capital Borrowed - \$	8,509	12,406	27,925	24,423	24,858	27,748	22,249	23,011	21,085	25,329
Beef Housing Capacity Built - Cows	9	14	54	39	-	3	29	23	-	-
L. M. Feeding Capacity Built - Steers	-	-	80	2	-	-	47	-	-	-
Farrowing Capacity Built - Sows	4	8	7	20	23	38	7	21	14	14
Feeding Capacity Built - Pigs	94	147	165	374	438	675	198	408	278	272
Silo Capacity Built - Tons	-	-	-	-	-	-	-	-	39	77
Dairy Capacity Built - Stanchions	-	-	-	-	-	-	-	-	-	10
Corn Purchased - Cwt.	1,160	687	4,728	3,315	5,697	4,623	4,396	3,038	3,788	2,402
Income Less Variable Costs - \$	5,881	5,166	11,526	9,048	11,955	8,291	9,881	7,377	13,268	11,088

Table 17. Plans for Medium Size Farms With Corn Prices Varied

	Cash Grain		Mixed Livestock		Beef Cattle		Hog	
	LMM	HMM	LMM	HMM	LMM	HMM	LMM	HMM
Corn for Grain - Acres	30.0	30.0	37.0	37.0	37.0	37.0	66.0	60.3
Corn for Silage - Acres	-	-	-	-	-	-	-	5.7
Oats - Acres	32.0	29.8	26.8	19.8	25.6	15.1	15.6	-
Wheat - Acres	15.0	15.0	15.0	15.0	15.0	15.0	21.0	3.3
Soybeans - Acres	42.0	42.0	34.0	34.0	38.0	38.0	9.0	-
Meadow - Acres	18.0	20.2	20.2	27.2	25.4	35.9	19.4	61.7
Hay Harvested - Tons	48.8	56.3	51.4	74.2	63.6	96.7	43.2	181.9
Beef Cow Herd - Cows	24	38	25	50	25	48	-	-
Feeder Calves Sold - Head	-	30	-	39	-	-	-	-
Feeder Calves Bought - Head	-	-	-	-	19	-	65	280
Calves Fed in Drylot - Head	-	-	-	-	-	-	-	-
Calves Fed on Pasture - Head	19	-	20	-	39	38	65	280
Hogs Produced - Litters	47	46	86	79	115	102	147	35
Quarters in Which Farrowed	1, 2 & 4	1 & 4	1, 2 & 4	1 & 4	1, 2 & 4	1, 2 & 4	1, 2, 3 & 4	1 & 4
Capital Borrowed - \$	16,240		22,937	28,444	32,449	35,581	40,516	69,176
Beef Housing Capacity Built - Cows	21	23	21	33	19	41	-	140
H. M. Feeding Capacity Built - Steers	-	-	-	-	-	38	27	228
Farrowing Capacity Built - Sows	12	20	20	31	31	27	22	-
Feeding Capacity Built - Pigs	223	342	387	560	556	490	511	125
Seasonal Labor Hired - Hours	-	-	-	-	-	10	70	70
Corn Purchased - Cwt.	1,786	1,227	3,969	3,095	6,303	13,948	7,965	8,105
Income Less Variable Costs - \$	10,760	9,625	14,752	12,242	18,298	13,948	21,211	16,427

Table 18. Plans for Large Farms With Corn Prices Varied

	Cash Grain		Mixed Livestock		Beef Cattle		Hog		Dairy	
	LMM	HMM	LMM	HMM	LMM	HMM	LMM	HMM	LMM	HMM
Corn for Grain - Acres	89.0	89.0	79.0	79.0	79.0	79.0	69.0	69.0	59.0	59.0
Oats - Acres	-	-	-	107.1	79.4	83.1	103.5	103.5	66.9	73.3
Wheat - Acres	32.0	32.0	24.0	24.0	29.0	29.0	18.0	18.0	15.0	15.0
Soybeans - Acres	96.0	96.0	92.0	92.0	72.0	72.0	95.0	95.0	62.0	62.0
Meadow - Acres	57.3	40.2	37.0	20.9	22.6	18.9	24.5	24.5	34.1	27.7
Hay Harvested - Tons	162.1	106.6	100.5	50.8	53.2	41.2	53.6	53.8	75.0	54.0
Feeder Calves Bought - Head	242	159	150	76	79	62	80	79	112	81
Calves Fed on Pasture - Head	242	159	150	76	79	62	80	79	112	81
Hogs Produced - Litters	96	134	108	111	134	140	184	182	255	268
Quarters in Which Farrowed	1, 2, 3 & 4	1, 2, 3 & 4	1, 3 & 4	1, 2, 3 & 4	1, 2, & 4	1, 2, & 4	1, 2, & 4	1, 2, & 4	1, 2, 3 & 4	1, 2, 3 & 4
Capital Borrowed - \$	77,430	61,502	53,626	29,105	38,401	35,591	50,836	55,149	80,894	76,112
Beef Housing Capacity Built - Cows	103	49	63	15	12	-	-	-	44	23
H. M. Feeding Capacity Built - Steers	242	159	150	76	79	62	72	79	112	81
Farrowing Capacity Built - Sows	28	33	31	19	37	40	45	49	63	63
Hog Feeding Capacity Built - Pigs	526	691	632	451	649	702	853	905	1,083	1,092
Seasonal Labor Hired - Hours	160	160	280	280	5	-	133	76	72	72
Corn Purchased - Cwt.	10,251	9,364	7,971	4,388	6,214	5,983	9,344	9,237	15,630	15,239
Income Less Variable Costs - \$	29,297	22,277	25,895	21,102	25,438	21,004	29,865	23,252	34,273	23,125

Adjustments in the cropping system would correspond to the changes in the livestock systems, but forage production would be increased only on the large farms. On those farms the feeder cattle systems would be increased in size whereas on the smaller farms feeder cattle would tend to replace cow herds. The cow herds require more forage than do cattle feeding systems.

Capital use generally would decrease on the small and medium size farms because of the lower cost of purchasing corn. On the large farms, the use of capital would increase substantially because of the greater capital requirement for feeder cattle.

With corn prices increased, opposite trends would exist. That is, cattle production would decrease or shift toward cow herds with feeder calves sold and hog production would increase. On the medium size farms, hog production would tend to decrease slightly while beef production with the exception of the hog farms would shift toward cow herds with feeder calves sold. Forage production would be increased on the small and medium size farms but would be reduced on the large farms. The large farms would continue to utilize feeder cattle whereas the other sizes would tend to shift toward cow herds which have larger forage requirements. Capital requirements for the plans at high corn prices, except for the large farms, would be increased whereas income would be lowered. Both of these result from the added cost of purchasing corn for feed.

Changes in Hog Prices—Lowering the price of hogs relative to those for beef cattle and corn would, as could be expected, reduce the number of hogs produced while causing an increase in beef cattle enterprises (see Tables 19, 20, and 21). The increase in beef cattle operations would tend toward switching from beef cow herds into feeding purchased calves on pasture or increasing the size of the feeding enterprise if that type of operation existed at medium price levels. On some of the representative small and medium size farms the size of the beef herd would be increased, but the calves produced would always be fed out instead of being sold as feeder cattle. Beef cow herds would be included in the optimal plans on more of the medium size farms than on the small farms, but most of such enterprises would be supplemented by purchased feeder cattle, too. Capital appears to have been relatively more limited on the farms which would keep beef cow herds than on those utilizing purchased feeder cattle.

Raising the price of hogs relative to beef cattle and corn causes an increase in the hog enterprise relative to beef cattle. For most typical farm situations high hog prices relative to beef cause the beef enterprises to be eliminated from the optimal plans. When cattle do continue in the optimal plans the enterprise would consist of a cow herd with feeder calves sold. This contrasts to the plans where beef prices are relatively higher than hog prices since the hog enterprise would seldom be completely eliminated, attesting to the relatively strong competitive position of hogs on corn belt farms under historical relationships of *relative* prices and production coefficients. As a rule the hog enterprise would shift toward one where multiple period, or year around, farrowing practices are

Table 19. Plans for Small Farms With Hog Prices Varied

	Cash Grain		Mixed Livestock		Beef Cattle		Hogs		Dairy	
	MLM	MHM	MLM	MHM	MLM	MHM	MLM	MHM	MLM	MHM
Corn for Grain - Acres	16.0	16.0	26.0	26.0	-	24.0	17.0	17.0	17.3	21.1
Corn for Silage - Acres	-	-	-	-	-	-	-	-	7.7	3.9
Oats - Acres	-	8.8	-	15.6	-	-	-	5.0	-	19.6
Wheat - Acres	15.0	15.0	15.0	15.0	-	14.1	7.0	15.0	15.0	15.0
Soybeans - Acres	8.0	22.0	4.9	22.0	-	-	-	15.0	29.1	33.0
Meadow - Acres	24.0	1.2	43.1	10.4	42.0	3.9	36.0	8.0	40.9	17.4
Hay Harvested - Tons	71.9	-	129.1	22.4	124.2	-	107.7	18.0	121.5	44.2
Beef Cow Herd - Cows	35	-	-	15	-	-	-	12	-	-
Feeder Calves Sold - Head	-	-	-	12	-	-	-	9	-	-
Feeder Calves Bought - Head	-	-	193	-	185	-	155	-	51	-
Calves Fed in Drylot - Head	-	-	-	-	-	-	27	-	-	-
Calves Fed on Pasture - Head	28	-	193	-	185	-	128	-	51	-
Hogs Produced - Litters	5	33.0	1	81	19	105	11	74	14	72
Quarters in Which Farrowed	1 & 4	1, 2, & 4	1	1, 2, & 4	1 & 4	1, 2, & 4	1 & 4	1, 2, & 4	1 & 4	1, 2, & 4
Dairy Cows - Head	-	-	-	-	-	-	-	-	26	13
Capital Borrowed - \$	12,406	6,635	47,193	20,005	39,215	22,636	31,906	17,968	26,074	19,362
Beef Housing Capacity Built - Cows	42	-	110	-	98	-	89	-	15	-
L. M. Feeding Capacity Built - Steers	-	-	167	-	149	-	138	-	29	-
H. M. Feeding Capacity Built - Steers	13	-	-	-	-	-	-	-	-	-
Farrowing Capacity Built - Sows	-	8	-	20	2	27	-	15	-	17
Feeding Capacity Built - Pigs	-	150	-	375	91	497	9	315	60	329
Silo Capacity Built - Tons	-	-	-	-	-	-	-	-	89	39
Dairy Capacity Built - Stanchions	-	-	-	-	-	-	-	-	13	-
Seasonal Labor Hired - Hours	-	-	92	-	100	-	-	-	50	-
Corn Purchased - Cwt.	582	1,172	5,049	3,604	6,973	5,299	4,788	3,681	2,169	3,418
Income Less Variable Costs - \$	4,717	7,017	8,591	14,431	6,613	15,742	6,432	12,589	10,209	15,890

Table 20. Plans for Medium Size Farms With Hog Prices Varied

	Cash Grain		Mixed Livestock		Beef Cattle		Hog	
	MLM	MHM	MLM	MHM	MLM	MHM	MLM	MHM
Corn for Grain - Acres	30.0	30.0	33.2	37.0	37.0	37.0	60.3	66.0
Corn for Silage - Acres	-	-	3.8	-	-	-	5.7	-
Oats - Acres	-	47.7	-	43.3	-	30.9	-	29.1
Wheat - Acres	15.0	15.0	15.0	15.0	15.0	15.0	3.3	21.0
Soybeans - Acres	42.0	42.0	13.5	34.0	9.3	38.0	-	9.0
Meadow - Acres	50.0	2.3	67.5	3.7	79.7	20.1	61.7	5.9
Hay Harvested - Tons	149.6	-	200.6	-	238.1	46.5	181.9	-
Beef Cow Herd - Cows	70	-	91	-	66	31	-	-
Feeder Calves Sold - Head	-	-	-	-	-	25	-	-
Feeder Calves Bought - Head	-	-	20	-	155	-	280	-
Calves Fed in Drylot - Head	11	-	47	-	-	-	-	-
Calves Fed on Pasture - Head	45	-	44	-	207	-	280	-
Hogs Produced - Litters	4	64	18	104	10	128	35	171
Quarters in Which Farrowed	1 & 4	1, 2 & 4	1 & 4	1, 2 & 4	1 & 4	1, 2 & 4	1 & 4	1, 2, 3 & 4
Capital Borrowed - \$	24,924	12,052	37,905	19,636	57,764	31,547	69,176	35,823
Beef Housing Capacity Built - Cows	23	-	133	-	170	-	140	-
H. M. Feeding Capacity Built - Steers	-	-	71	-	168	-	228	-
Farrowing Capacity Built - Sows	-	18	-	26	-	36	-	33
Feeding Capacity Built - Pigs	5	317	72	484	26	629	125	682
Seasonal Labor Hired - Hours	-	-	-	-	73	-	70	41
Corn Purchased - Cwt.	850	1,976	2,542	4,160	5,768	5,847	8,105	7,200
Income Less Variable Costs - \$	8,850	13,297	10,287	18,793	13,229	23,176	13,531	27,893

Table 21. Plans for Large Farms With Hog Prices Varied

	Cash Grain		Mixed Livestock		Beef Cattle		Hog		Dairy	
	MLM	MHM	MLM	MHM	MLM	MHM	MLM	MHM	MLM	MHM
Corn for Grain - Acres	89.0	89.0	74.4	79.0	67.5	79.0	65.2	69.0	49.8	59.0
Corn for Silage - Acres	-	-	4.6	-	11.5	-	3.8	-	9.2	-
Oats - Acres	-	-	67.0	-	23.5	95.6	44.3	120.3	19.5	89.8
Wheat - Acres	32.0	32.0	24.0	24.0	29.0	29.0	18.0	18.0	15.0	15.0
Soybeans - Acres	96.0	96.0	92.0	92.0	72.0	72.0	95.0	95.0	62.0	62.0
Meadow - Acres	118.9	7.0	61.0	6.0	78.5	6.4	83.7	7.7	81.5	11.2
Hay Harvested - Tons	253.6	-	181.6	-	234.8	-	248.1	-	243.7	-
Beef Cow Herd - Cows	-	-	-	-	36	-	-	-	-	-
Feeder Calves Bought - Head	378	-	278	-	-	-	374	-	238	-
Calves Fed in Drylot	-	-	-	-	258	-	30	-	-	-
Calves Fed on Pasture	378	-	278	-	287	-	344	-	238	-
Hogs Produced - Litters	9	195	18	172	8	167	32	220	10	304
Quarters in Which Farrowed	4	1, 2, 3, & 4	4	1, 2, 2, & 4	4	1, 2, 3, & 4	1 & 4	1, 2, 3, & 4	4	1, 2, 3, & 4
Dairy Cows	-	-	-	-	-	-	-	-	25	-
Capital Borrowed - \$	87,288	39,873	60,508	30,870	68,083	30,909	90,676	45,989	57,192	70,065
Beef Housing Capacity Built - Cows	192	-	147	-	182	-	191	-	126	-
H. M. Feeding Capacity Built - Steers	378	-	278	-	287	-	326	-	238	-
Farrowing Capacity Built - Sows	-	52	-	38	-	53	-	51	-	104
Feeding Capacity Built - Pigs	-	902	-	758	-	915	128	937	-	1,228
Seasonal Labor Hired - Hours	160	160	280	280	80	43	200	61	72	72
Corn Purchased - Cwt.	8,730	8,031	5,670	7,082	5,966	5,521	10,172	8,833	6,123	14,739
Income Less Variable Costs - \$	22,052	34,000	19,685	32,015	20,520	31,937	21,110	38,679	21,799	45,130

followed. In general, portable farrowing and pasture feeding systems would be utilized, except where central facilities already existed on the farm. Even then new facilities would be the portable type with pasture feeding.

The cropping system would correspond to the livestock enterprises with meadow for pasture and hay replacing oats or soybeans when cattle numbers are increased and with oats and soybeans replacing meadow when hogs dominate the solutions. Generally, corn would be grown to the maximum extent possible with silage made on some typical farms. On the small beef cattle farms where the acreage of cropland is very small no corn or other crops except meadow would be grown with hog prices low relative to beef prices. By using the available land to produce forages and purchasing all grain a much larger cattle feeding enterprise could be handled on those farms.

All optimal plans use large amounts of capital, but those with relatively low hog prices use considerably more than with relatively high hog prices. This results from feeder cattle being more important in the former plans, since large amounts of corn would be used in both situations and either hog or beef facilities also would have to be built in order to handle the livestock. Incomes naturally would be higher with MHM prices than with MLM prices. However, if uniform prices were applied to the same organizations as exist with MHM and MLM prices the plans resulting from MHM would produce a larger net income. In addition to requiring more capital, the plans with beef dominant would require the hiring of more seasonal labor than would plans with hog production as the major enterprise.

Changes in Beef Cattle Prices—To a large extent the adjustments that would result from relative changes in beef cattle prices are the inverse of those resulting from changes in relative hog prices. When beef cattle prices are lowered relative to corn and hog prices, hogs tend to dominate the solutions with beef cattle production being lowered or eliminated. On the large farms, the beef enterprises generally would be eliminated, but on the small and medium size farms small beef cow herds from which feeder calves are sold would be maintained, indicating a strong supplementary relationship for beef cows where labor is plentiful. (See Tables 22, 23, 24).

With beef prices increased relative to hog prices the hog enterprises would be reduced in size and the beef enterprises would be expanded. Beef production also would tend to shift toward specialized feeder cattle operations although on some small and medium size farms cow herds from which the calves are fed out would be maintained. Nearly all cattle fattened would utilize the pasture feeding system.

The cropping system, again, would be dictated by the livestock enterprises which dominate the solutions. Pasture and hay production would be important when beef prices are high but not when beef prices are low. Capital requirements are considerably higher for plans with large cattle feeding enterprises than for those with large hog enterprises. With beef prices high income would be con-

Table 22. Plans for Small Farms With Beef Cattle Prices Varied

	Cash Grain		Mixed Livestock		Beef Cattle		Hog		Dairy	
	MML	MMH	MML	MMH	MML	MMH	MML	MMH	MML	MMH
Corn for Grain - Acres	16.0	16.0	26.0	26.0	24.0	-	17.0	17.0	21.1	21.1
Corn for Silage - Acres	-	-	-	-	-	-	-	-	3.9	3.9
Oats - Acres	3.2	-	16.1	-	-	-	5.0	-	20.1	-
Wheat - Acres	15.0	15.0	15.0	15.0	14.8	-	15.0	7.0	15.0	15.0
Soybeans - Acres	22.0	8.9	22.0	4.9	-	-	15.0	-	33.0	20.8
Meadow - Acres	6.8	23.1	9.9	43.1	3.2	42.0	8.0	36.0	16.9	49.2
Hay Harvested - Tons	18.0	68.6	22.5	129.1	-	29.5	18.0	107.7	44.2	146.9
Beef Cow Herd - Cows	12	34	15	-	-	-	12	-	-	-
Feeder Calves Sold - Head	10	-	12	-	-	-	9	-	-	-
Feeder Calves Bought - Head	-	-	-	193	-	185	-	155	-	154
Calves Fed in Drylot - Head	-	-	-	-	-	-	-	27	-	-
Calves Fed on Pasture - Head	-	25	-	193	11	183	-	128	-	154
Hogs Produced - Litters	27	6	77	1	99	21	70	11	68	7
Quarters in Which Farrowed	1 & 4	1 & 4	1 & 4	1	1 & 4	1 & 4	1 & 4	1 & 4	1 & 4	4
Dairy Cows - Head	-	-	-	-	-	-	-	-	13	13
Capital Borrowed - \$	8,586	12,173	21,668	37,193	24,780	39,787	19,491	31,906	20,744	34,976
Beef Housing Capacity Built - Cows	-	39	-	110	-	98	-	89	-	82
L. M. Feeding Capacity Built - Steers	-	-	-	167	-	146	-	138	-	134
H. M. Feeding Capacity Built - Steers	-	12	-	-	-	3	-	-	-	-
Farrowing Capacity Built - Sows	11	-	31	-	42	2	25	-	27	-
Feeding Capacity Built - Pigs	191	24	556	-	731	101	481	9	489	-
Silo Capacity Built - Tons	-	-	-	-	-	-	-	-	39	39
Seasonal Labor Hired - Hours	-	-	-	92	-	98	-	-	-	8
Corn Purchased - Cwt.	941	626	3,356	5,049	4,977	7,047	3,459	4,788	3,195	4,597
Income Less Variable Costs - \$	5,181	6,403	9,552	14,042	9,768	12,958	8,151	11,343	11,779	14,706

Table 23. Plans for Medium Size Farms With Beef Cattle Prices Varied

	Cash Grain		Mixed Livestock		Beef Cattle		Hog	
	MML	MMH	MML	MMH	MML	MMH	MML	MMH
Corn for Grain - Acres	30.0	30.0	37.0	37.0	37.0	37.0	66.0	60.3
Corn for Silage - Acres	-	-	-	-	-	-	-	5.7
Oats - Acres	40.7	8.7	35.6	-	31.0	-	29.1	-
Wheat - Acres	15.0	15.0	15.0	15.0	15.0	15.0	21.0	4.3
Soybeans - Acres	42.0	42.0	34.0	34.0	38.0	11.6	9.0	-
Meadow - Acres	9.3	41.3	11.5	47.0	20.0	77.4	5.9	60.7
Hay Harvested - Tons	22.5	123.4	25.5	139.3	46.5	231.8	-	178.7
Beef Cow Herd - Cows	15	52	17	30	31	55	-	-
Feeder Calves Sold - Head	12	-	13	-	25	-	-	-
Feeder Calves Bought - Head	-	-	-	102	-	180	-	275
Calves Fed in Drylot - Head	-	-	-	-	-	-	-	-
Calves Fed on Pasture - Head	-	41	-	125	-	225	-	275
Yearlings Fed - Head	-	49	-	29	-	-	-	-
Hogs Produced - Litters	55	6	93	18	127	7	171	37
Quarters in Which Farrowed	1 & 4	1 & 4	1 & 4	1 & 4	1, 2 & 4	4	1, 2, 3 & 4	1 & 4
Capital Borrowed - \$	15,968	26,918	23,599	40,048	31,277	58,866	35,823	68,517
Beef Housing Capacity Built - Cows	-	64	-	95	-	169	-	137
L. M. Feeding Capacity Built - Steers	-	49	-	29	-	-	-	-
H. M. Feeding Capacity Built - Steers	-	22	-	106	-	185	-	223
Farrowing Capacity Built - Sows	25	-	38	-	41	-	33	-
Feeding Capacity Built - Pigs	420	24	673	72	708	-	682	145
Seasonal Labor Hired - Hours	-	-	-	-	-	17	40	70
Corn Purchased - Cwt.	1,616	1,763	3,656	4,346	5,739	6,048	7,200	8,106
Income Less Variable Costs - \$	9,683	11,911	12,884	15,723	15,243	20,808	18,029	23,334

Table 24. Plans for Large Farms With Beef Cattle Prices Varied

	Cash Grain		-Mixed Livestock		Beef Cattle		Hog		Dairy	
	MML	MMH	MML	MMH	MML	MMH	MML	MMH	MML	MMH
Corn for Grain - Acres	89.0	84.8	79.0	79.0	79.0	67.5	69.0	65.2	59.0	49.8
Corn for Silage - Acres	-	4.2	-	-	-	11.5	-	3.8	-	9.2
Oats - Acres	-	-	67.8	-	95.9	32.5	120.3	49.9	90.4	21.5
Wheat - Acres	32.0	32.0	24.0	24.0	29.0	29.0	18.0	18.0	15.0	15.0
Soybeans - Acres	96.0	96.0	92.0	92.0	72.0	72.0	95.0	95.0	62.0	62.0
Meadow - Acres	6.6	105.9	-	66.7	6.1	64.5	7.7	78.1	10.6	79.5
Hay Harvested - Tons	-	247.5	-	198.1	-	207.8	-	230.1	-	226.5
Feeder Calves Bought - Head	-	358	-	296	-	327	-	349	-	345
Calves Fed in Drylot - Head	-	-	-	-	-	-	-	5	-	54
Calves Fed on Pasture - Head	-	358	-	296	-	327	-	344	-	291
Hogs Produced - Litters	177	27	164	23	162	8	220	46	292	126
Quarters in Which Farrowed	1, 2, 3, & 4	1 & 4	1, 2, 3, & 4	4	1, 2, 3, & 4	4	1, 2, 3, & 4	1 & 4	1, 2, 3, & 4	1 & 4
Capital Borrowed - \$	36,266	100,543	26,914	68,702	28,880	68,526	45,989	87,020	62,000	113,504
Beef Housing Capacity Built - Cows	-	209	-	158	-	173	-	175	-	195
H. M. Feeding Capacity Built - Steers	-	358	-	296	-	281	-	280	-	312
Farrowing Capacity Built - Sows	45	15	32	5	50	-	51	7	71	53
Feeding Capacity Built - Pigs	798	146	660	41	856	-	937	238	1,212	925
Seasonal Labor Hired - Hours	97	160	280	280	-	80	61	200	-	72
Corn Purchased - Cwt.	7,536	10,424	5,851	7,407	5,243	7,029	8,833	10,175	14,067	15,577
Income Less Variable Costs - \$	24,053	34,000	22,259	28,682	22,378	29,976	26,036	33,386	27,788	35,943

siderably higher than for plans with low beef prices when other prices are held constant. The substitution of hogs for beef, however, prevents the income level from falling by as much as it would have had the organization not been altered in response to the changes in prices.

GENERAL IMPLICATIONS OF STUDY RESULTS

Several general conclusions of importance to understanding and evaluating the farm adjustment process and the possibilities for Missouri agriculture can be made from the results of this study. Foremost among these is the great potential for increased output and income for an individual farm. Even with prices somewhat lower than recent levels it would be possible for an efficient producer to achieve improved income levels. This could be done within the framework provided by the resource base of the typical farm, provided the operator is willing to utilize the credit which his resources will support. Because of the low debt to asset ratios typically found on farms in the study area the potential for increased borrowing is relatively great when typical equity lending practices are followed.

The type of adjustments investigated do not include the alternative of expanding the land base of the individual farm. Rather the adjustments studied are those which any individual farm operator could make whether he has a large or small farm and even if no land is available for purchase. The most important single factor in these adjustments appears to be the amount of capital available. Thus small farms with their smaller resource bases would be limited in the extent of adjustment much sooner than large farms. These generally are the ones with the lowest income at present and also would be lowest after the adjustment.

The basic adjustment would be toward farms with large livestock enterprises—either hogs, beef cattle, or both. Although an increased size of farm business within a limited acreage may be achieved by increasing the yields and acreages of grain crops that alternative does not possess the potential for increasing the size of business and income that is attainable with livestock enterprises. Substantial improvements in labor efficiency are required to enable the handling of the livestock numbers indicated to be optimal.

There are several other features of this type of study which require that care must be exercised in applying the results too generally. First very efficient levels in feed conversion and labor rates for the livestock systems are used. If an individual cannot achieve such levels then expansion of livestock may not be advisable. Furthermore, the greatly expanded size of livestock enterprises require more exact handling since the potential loss associated with poor management is so large. Risk or uncertainty factors were not considered in the analysis, but they can be very important in the decision making of many individuals.

Another factor that must be considered by an individual is the relative size of his capital supply. Although the typical farm was in a very favorable capital position the same is not true for each individual. Some farms have relatively

high debt to asset ratios and, hence, those farmers are unable to borrow the required funds. Others may not be able to borrow the funds they desire because of lending practices and limitations outside of their control. Many, of course, may be unwilling to borrow because of bias against debt or because of the risk associated with the use of borrowed funds.

Finally, although the adjustments described above appear profitable from the individual farmer's viewpoint, when a large number adopt such plans the aggregate supply of the product is increased greatly. If all commercial farms in North Central Missouri adopted the type of plans indicated to be optimal there would be an increased output of livestock several times greater than the 1962 levels produced in the area. Such an increase in output would result in lower prices and might make the production of livestock unprofitable. However, even at the price levels 20 percent lower than the medium prices used it would still be profitable for the efficient farmer to increase his size of business substantially.