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Profit Maximizing Farm Plans for Farms in Southeastern Nebraska: By Type and Size of Farm

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**Profit Maximizing
Farm Plans for
Farms in Southeastern
Nebraska: By Type and
Size of Farm**

**Research Bulletin
219**

April 1965

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United States Department of Agriculture

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SUMMARY

This study appraises adjustment opportunities for farms in south-eastern Nebraska. Nine farm classes are defined separating the farms on the basis of type and size since these and other related characteristics influence the adjustment opportunities for each class of farms. The most profitable adjustments are then determined for each class of farms at nine pork and beef price relationships.

The profit maximizing results for the nine farm classes indicate highly similar farm organizations for a given price situation. At the low pork-low beef price situation the hog production that occurs is primarily under portable farrowing systems. A common occurrence is to use the existing confinement facilities as well. Calves are fed under both low mechanization and high mechanization systems. The former dominates, however. There is an evident tendency to feed calves up to the limit of available pasture land.

The pork and beef activities require rotation meadow and alfalfa, respectively. Soybeans are produced up to the limit of the agronomic constraint imposed in the analyses. After accounting for land used for rotation meadow, alfalfa, wheat, and soybeans, the remaining available cropland is devoted to the production of feed grains.

With the medium pork-low beef price situation the beef producing enterprises generally disappear from the farm organizations. Hog production intensifies mainly by the addition of portable farrowing and finishing facilities. The alfalfa enterprise disappears with the beef enterprises, thus releasing land to be used for additional feed grain production. The level of soybean production is generally reduced below the amount permitted by the soybean land constraint. The cropland is allocated instead to feed production (feed grains and alfalfa).

The high pork-low beef price situation results in about the same profit maximizing plans as does the medium pork-low beef price combination. On the small and medium farms the shift out of soybean production is completed if that was not accomplished with the medium pork-low beef prices. On the large farms which have more land available, relative to labor, the shift away from soybeans is not so pronounced.

At the low pork-medium beef price combination there is a general shift away from pork and to beef when contrasted with the low pork-low beef prices. On the larger farms a tendency to invest in and use the high mechanized beef feeding system is apparent. Alfalfa production increases with the expanding beef feeding; soybeans are produced up to the limit of land available to them and calves are fed on silage rations, as is evidenced by the allocation of some land to silage production.

As the pork price increases relative to the beef price, beef feeding decreases. At the medium pork-medium beef price situation the available pasture land restricts the level of the beef feeding operations. Again, the high mechanization operations dominate on the larger farms. The farm organizations obtained at the high pork-medium beef price situation are identical in most cases to the organizations encountered with high pork-low beef prices.

At low pork-high beef prices pork producing activities are discontinued. Calves and yearlings are fed intensively; high mechanization beef feeding operations are the most common. Feed grains, alfalfa, and silage use all available cropland on the smaller farms. Soybeans are produced on the large farms.

With medium pork-high beef prices pork producing activities again appear. This causes a slight reduction in beef feeding operations. Both calves and yearlings are fed. The high pork-high beef price situation resembles the low pork-low beef and medium pork-medium beef farm organizations. Relatively more beef than pork is produced at the high pork-high beef price combination, however.

Land and capital are the most restrictive resources on the small and medium-sized farms. On the large farms, labor becomes the resource that most critically limits the enterprise levels.

The beef cow herd is not a competitive enterprise at any price combination studied. Calves are purchased rather than raised and pasture land, when used, is more profitably allocated to calves under a deferred feeding system. Our analyses indicate that introduction of a beef cow herd into the farm plan would cause a sizable reduction in resource returns and farm income. These same analyses show that the beef cow herd would not be a very competitive enterprise even at higher feeder calf prices or lower resource requirements for the beef herd.

Profit Maximizing Farm Plans For Farms in Southeastern Nebraska: By Type and Size of Farm

Melvin D. Skold, A. W. Epp, and Harlan G. Hughes¹

INTRODUCTION

There are many forces operating in today's agricultural economy which cause farmers to examine carefully their patterns of resource allocation. Rising production costs coupled with downward tendencies in product prices focuses attention on efficient patterns of resource allocation. Technical change and changing resource and product price relationships affect efficient resource allocation patterns.

This study considers possible efficient farm organizations available to farmers in southeastern Nebraska with given resources. The study determines profit maximizing farm plans for farm classes with different complements of resources and at alternative product price levels.

Both crop and livestock enterprises are considered. Investment activities that generate facilities to accommodate more of various types of livestock are included. Investments are limited by assumed levels of credit availability and the investment activities compete with all other capital using enterprises.

THE AREA

The area studied corresponds to Economic Area 7 of Nebraska as described in the 1954 Census of Agriculture, Figure 1.² The soils of the area are productive but sizeable portions of the land must be farmed carefully to avoid serious erosion.

In 1959, 41 percent of the value of all farm products sold from the area came from field crops other than vegetables and fruits. In the same year, the value of livestock and livestock products other than poultry and dairy accounted for about 48 percent of the value of all products sold. The importance of field crops and the beef and pork livestock enterprises to the agricultural economy of this area is evident.

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² U.S. Department of Commerce, Bureau of the Census, United States Census of Agriculture: 1954. Volume 1, Part 12. Washington, D.C. 1956.

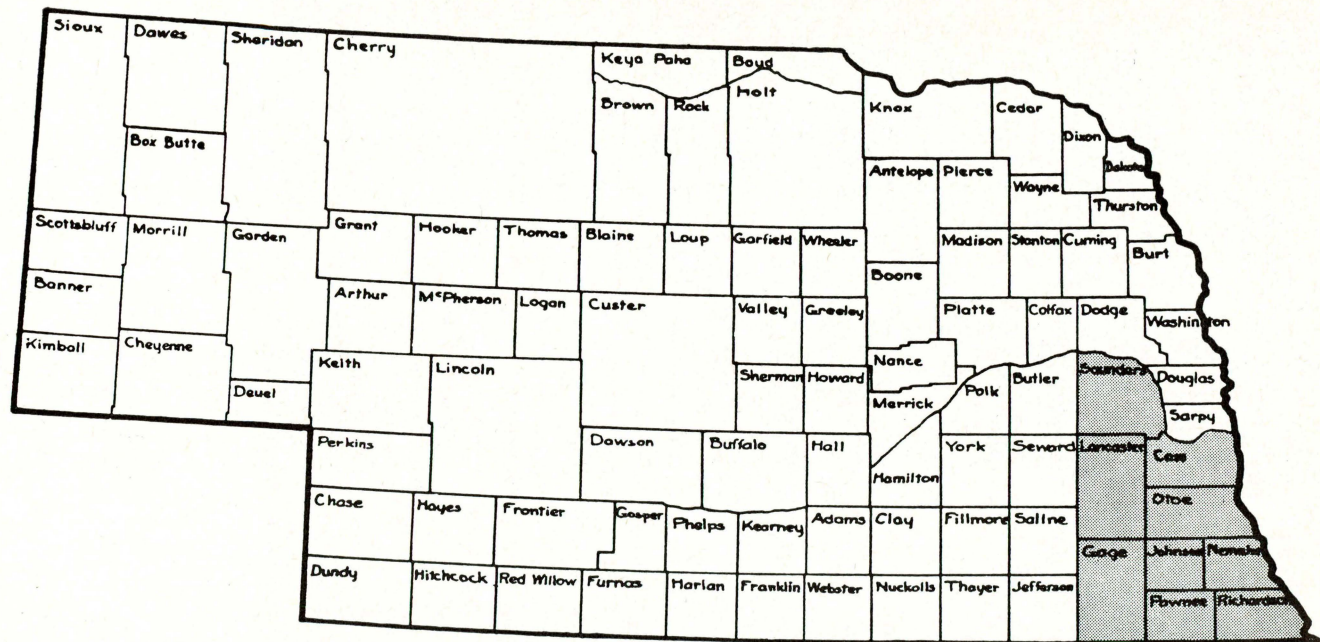


Figure 1. Shaded area represents Census Economic Area 7 of Nebraska, the study area of this report.

PROCEDURE

The adjustment opportunities depend on the amounts and types of resources available. The amounts and proportions of the various types of resources vary with size and type of farm. A current large producer of a particular type of livestock already has facilities which make that type of livestock a potentially more competitive enterprise than on a similar farm without these facilities. Also, the resource combinations (the relative amounts of land, labor, and capital) may vary on farms of a given type as the size of the farm changes. To recognize these factors that might influence adjustment possibilities, nine representative farm situations are included in the analysis. The nine classes of farms are included in one of three types: cash-grain, livestock, and general. Within each type of farm three size groups are defined.

All farms in the area were classified into one of the three types according to 1961 proportions of crop acres and livestock numbers. Farms falling within a particular type were then divided into three size classes. The size groups consist of small farms of 140-259 acres, medium farms of 260-499 acres, and large farms of more than 500 acres.

From each of the nine farm classes a sample of about 20 farms was selected. The operators of these farms were contacted and the answers to survey questionnaires were obtained. Survey results furnished data for estimating resource availabilities by farm class. Resources available serve as restraints on enterprise levels and organizational adjustments.

The farms are classified as:

Class 1. Cash grain farms of 140-259 acres, representing 40 percent of the farms in the sample.

Class 2. Cash grain farms of 260-499 acres, representing 32 percent of the sample.

Class 3. Cash grain farms of more than 500 acres, representing 6 percent of the sample.

Class 4. Livestock farms of 140-259 acres, representing 4 percent of the sample.

Class 5. Livestock farms of 260-499 acres, representing 3 percent of the sample.

Class 6. Livestock farms of more than 500 acres, representing 1 percent of the sample.

Class 7. General farms of 140-259 acres, representing 7 percent of the sample.

Class 8. General farms of 260-499 acres, representing 6 percent of the sample.

Class 9. General farms of more than 500 acres, representing 1 percent of the sample.

In the 1959 Census of Agriculture, farms of more than 140 acres accounted for 76 percent of farms in Economic Area 7, the study area.

Linear Programing

Given the quantities of resources available, the resource requirements of each activity considered and the direct costs and product contributions of each activity, profit maximizing farm organizations were established. The analysis is limited and involves the usual assumptions inherent to the linear programing procedure. The resource allocations or enterprise combinations obtained do not describe current farm organizations in the area. They are the profit maximizing organizations resulting from the allocation of the available resources among competing enterprises so as to maximize the net income of the farmer.

The solutions obtained show a much greater rate of resource allocation flexibility than is true on farms. If farmers had better knowledge about the profitability of the different enterprises, we believe there would be a greater tendency toward such farm organizations.

Resources Available

Resource levels derived from the survey schedules for each of the nine farm classes are summarized in Table 1. The estimates in Table 1 represent an average of amounts of resources available on all farms included in the class. Hence, the resulting resource combinations do not apply to any particular farm or to any modal type of farm in the class.

Livestock Facilities

Hog farrowing facilities were separated on the questionnaire into two broad types: confinement and portable. Hog feeding facilities are divided into the same two types.

Distinction was made between two types of beef feeding facilities: high-mechanization and low-mechanization. The high-mechanization operations refer to operations which use power feed wagons and other mechanized feed handling equipment. The low-mechanization operations use a wagon and shovel or baskets and tubs for feed distribution. Beef facilities are expressed in animal units to enable different types of livestock requiring different amounts of space to use the same facilities. Beef housing space is also expressed in animal units.

³ For discussions of the applications of linear programing to problems of the farm firms see: Heady, Earl O., and Candler, Wilfred, *Linear Programing Methods*, Iowa State College Press, Ames, Iowa, 1958, or Dorfman, Robert, Samuelson, Paul A., and Solow, Robert M., *Linear Programing and Economic Analysis*, McGraw-Hill Book Company, Inc., New York, 1958.

Table 1. Resources available by farm class.^a

Resource type	Unit	FARM CLASS								
		1	2	3	4	5	6	7	8	9
Central farrow	Sow	4	3	6	5	7	10	5	7	8
Portable farrow	Sow	2	1	1	1	3	2	1	2	4
Confinement feed	Head	0	0	0	0	0	0	0	0	0
Portable feed	Head	55	54	80	163	214	237	118	148	201
Beef housing	A.U.	32	34	64	54	74	81	45	44	74
Low-mech. beef feeding	A.U.	3	7	22	38	107	266	24	25	61
Hi-mech. beef feeding	A.U.	0	0	0	0	0	0	0	0	0
Labor period 1 ^b	Hour	823	851	1,143	937	1,191	1,100	1,063	1,014	1,467
Labor period 2	Hour	597	638	799	698	789	806	763	748	970
Labor period 3	Hour	881	879	1,126	949	1,210	936	1,286	1,169	1,519
Labor period 4	Hour	496	509	642	510	645	528	698	603	879
Total owner labor	Hour	2,797	2,877	3,710	3,094	3,835	3,370	3,810	3,534	4,835
Cropland	Ac.	102	172	342	109	166	333	127	181	401
Pasture	Ac.	20	63	134	35	73	228	38	94	198
Soybean land	Ac.	27	57	114	33	60	110	42	60	133
Corn allotment	Ac.	97	159	309	82	146	270	100	156	330
Cash account	\$100	53	82	162	53	51	156	76	109	217
Real estate mortgage	\$100	193	204	358	156	280	432	179	253	452
Chattel mortgage	\$100	15	26	43	0	6	0	14	14	30
Hired labor period 1	Hour	7	146	78	4	46	454	14	6	192
Hired labor period 2	Hour	50	112	91	32	43	302	4	25	133
Hired labor period 3	Hour	71	160	130	116	116	653	24	29	509
Hired labor period 4	Hour	7	139	66	43	58	392	30	6	170
Total hired labor	Hour	135	557	365	195	263	1,801	72	66	1,004

^a It should be understood that the resource supplies included in this table are not the total resources found on the farms. Labor is adjusted to account for overhead labor and labor expended on Government acres and the wheat enterprise since other resources used by these enterprises are not included. Cropland does not include land under Government contract in 1961 or land in wheat; hence, the cropland acres are less than what was found on the farms. Real estate mortgage and chattel mortgage availabilities represent 50 percent of the value of the assets less debt outstanding against the assets.

^b The labor periods are divided as: Period 1—December, January, February, and March; Period 2—April and May; Period 3—June, July, August; and Period 4—September, October, and November.

Labor

Labor is divided into operator-family labor and hired labor. Within each category, four labor periods are defined. Adjustments are made in total amounts of operator-family labor available to account for overhead labor, labor spent on keeping diverted acres maintained at the levels necessary to meet governmental requirements, and labor spent on the wheat enterprises, an activity not included in the programming analysis.

Hired labor, as is operator-family labor, is restricted to levels the farmers indicated as being used. Thus, the enterprise combinations obtained from the profit-maximizing solutions do not use more labor than has been historically available in the area.

Land

The amount of cropland available for allocation among the enterprises considered is adjusted to account for cropland diverted under all Government contracts and the amount of land in wheat. Pasture land available is the average amount of permanent pasture land in the surveyed farms.

Soybeans are restricted so that they cannot occupy more than 25 percent of the total amount of cropland on the farm, including land in wheat and under Government contract. A feed grain acreage restriction 10 percent greater than the 1961 allotment is assumed. Thus, we are assuming a lower rate of sign-up in a feed grain program than existed in 1961. For this area, such a procedure results in about 60 percent of total available tillable land being available for feed grain production.

Capital

The amount of capital available is divided into three types: cash, real estate mortgage credit, and chattel mortgage credit. The cash account is created by placing a value on all livestock, grain, silage, and hay on hand. It is assumed that these inventories can be readily liquidated and the cash obtained can be allocated to other enterprises.

The amount of real estate mortgage credit is calculated by taking 50 percent of the total value of land and buildings and subtracting from this figure the amount of real estate debt outstanding in the survey year, 1961. Chattel mortgage credit is estimated in a similar manner. The chattel mortgage estimates in Table 1 represent 50 percent of the value of machinery less the amount of chattel liability.

These resource combinations serve as limitations on the optimal farm organizations computed.

Enterprises Considered

Hog Activities

The enterprises include these types of hog farrowing-feeding operations:

1. Confinement farrow-confinement feed.
2. Confinement farrow-portable feed.
3. Portable farrow-portable feed.

Each system permits four farrowings per year, one litter in each quarter. The litter is assumed to be farrowed at the mid-point of the quarter, obtaining eight pigs per litter. Seven of the pigs are assumed to be fed and marketed along with 400 pounds of cull sow and one-fifteenth of a 450-pound boar. The eighth pig is kept as a replacement gilt.

Investment activities allow buying additional central hog farrowing, portable hog farrowing, central hog feeding, or portable hog feeding space.

Beef Activities

Several possible beef feeding operations are also considered, the systems varying as to type of animal fed and method of feeding. Yearling steers can be fed by one of eight methods: 1. high mechanization-silage feeding operation in the first half of the year, 2. high mechanization-silage fed in the second half of the year, 3. high mechanization without silage in the first half of the year, and 4. high mechanization without silage in the second half of the year. These four systems of feeding are repeated under low mechanization feeding conditions.

Eight possible calf feeding techniques are also considered. Calves, too, can be fed using either high or low mechanization feeding systems. Under each system of mechanization it is possible to feed calves by 1. pasture-silage feeding, 2. pasture-nonsilage feeding, 3. drylot-silage feeding, and 4. drylot-nonsilage feeding operation.

Yearlings are bought at 700 pounds and sold at 1,100 pounds. Calves can be bought at 430 pounds or can be produced through a beef cow herd enterprise. Calves are sold at 1,050 pounds under the drylot feeding operations and at 1,100 pounds under pasture feeding operations.

Cropping Activities

Six land-using crop enterprises are defined. A feed grain activity is a combination corn-grain sorghum enterprise. The two crops have nearly identical resource requirements, direct costs of production and feed unit outputs in this area; hence, corn and grain sorghum are

treated as one enterprise. Crop activities also include soybeans which have a special agronomic restriction to 25 percent of total cropland.

Alfalfa hay can be produced to supply roughage for the cattle feeding enterprises. Rotation hay meadow can be established for use as pasture in the portable hog feeding activities.

Corn silage can be produced for silage feeding-beef operations. Finally, oats serve as a source of feed grain supply.

Credit Activities

Real estate mortgage credit can be used to the limit of its availability (as shown in Table 1) if its use returns enough to pay a 5 percent rate of interest. Chattel mortgage credit is charged at a 7½ percent rate of interest.

Hired Labor

Hired labor activities correspond to the labor periods used as restrictions. Hiring 1 hour of labor involves a cost of \$1.27, the average hired labor wage rate for southeastern Nebraska in 1961.

Selling and Buying Activities

The model recognizes the feed products as either intermediate or final products. Feed grains and hay produced can serve as an input to a livestock enterprise or can be sold as cash crops. Feed grains can be bought but hay cannot be acquired except by production on the farm.

Soybeans are a cash crop and the soybean activity "sells" the soybeans as they are produced. Silage, like alfalfa hay, cannot be bought, but must be produced on the farm.

All beef and all pork produced is sold through single activities to simplify the variable price programming operation.

Technology and Price Assumptions

Profit maximizing farm organizations depend on factor and product prices as well as physical input-output transformation relationships assumed. For this analysis, factor prices are held constant regardless of the product price level assumed, because of the number of product price combinations considered.

The product price levels assumed are in Table 2. Three price levels for each of three products (feed grains, pork, and beef) result in 27 possible price combinations. The results to only nine of these price combinations are discussed in this publication. These include the pork and beef price combination associated with medium feed

prices. Since beef and pork prices are based on the original feed price assumptions all of the feed prices are presented in Table 2.

It is assumed that the 1961 feed grain price support level is the maximum that can be expected in the near future. With this assumption, the highest price of feed grain for southeastern Nebraska is \$1.14 per bushel. A price range of \$0.40 per bushel is considered; hence, the medium feed grain price is \$0.94 per bushel, and the low corn price is \$0.74 per bushel.

Pork prices are determined by considering the 1955-60 average hog-corn price ratio in Chicago. This ratio was found to be 14.8:1. The three pork prices to be used are then derived by multiplying the appropriate U.S. average 1961 corn price level by 14.8 as:

$$\begin{aligned} \$1.20 \times 14.8 &= \$17.76 \\ 1.00 \times 14.8 &= 14.80 \\ 0.80 \times 14.8 &= 11.84 \end{aligned}$$

Table 2. Price assumptions of the study.

Product	Level	Unit	Price
			(Dollars)
Corn	High	Bu.	1.14
	Medium	Bu.	.94
	Low	Bu.	.74
Pork	High	Cwt.	17.15
	Medium	Cwt.	14.28
	Low	Cwt.	11.40
Beef	High	Cwt.	24.18
	Medium	Cwt.	20.02
	Low	Cwt.	15.86
Soybeans		Bu.	2.05
Beef calves		Head	110.00
Sows		Head	52.00

Thus, \$17.76, \$14.80, and \$11.84 represent the high, medium, and low pork prices, respectively. These prices are then adjusted to show Nebraska rather than Chicago pork prices using the historical Omaha-Chicago price differential. Price levels for pork are further adjusted by averaging in cull sow and boar prices.⁴

Beef prices are determined similarly. The average beef-corn price ratio for the period 1950-60 was 20.8:1 and beef prices are derived from the corn prices. Beef prices in Table 2 have been adjusted for cull cow and bull prices and Omaha-Chicago price differentials.

The products of pork and beef producing activities appear at various times of the year and their prices show considerable seasonal variation. Since all beef and pork are marketed through one selling activity for each product, account must be taken for seasonal price variations. This is accomplished by adjusting the production of the relevant producing activity to show the appropriate value of product

⁴ This pricing procedure is as suggested by the regional committee on the project, NC-54.

supplied by that activity. Thus, production activities that put forth the product in seasons for which the seasonal price is below the yearly average have the product output reduced to show the appropriate seasonal price difference. The opposite adjustment is made for seasons with above average prices.

As mentioned, physical input-output relationships assumed influence the optimal enterprise combinations as well as prices. Physical production data are assumed to represent product transformations experienced by the top 25 percent of farm operators. Agronomists and animal scientists provided estimates of input-output data for the various enterprises at such management levels.

RESULTS

Results of nine programmed farm plans are presented in a series of three tables for each class of farm. The first table indicates the aggregate amounts of pork and beef sold, sales or purchases of feed grains, hay sold, and a summary of the enterprise levels and resource allocations at each of the price combinations. This table also contains estimates of returns above direct production expenses for a given farm at each price combination.

The second table presents information about the relative scarcity of the resources, imputed values to marginal units of scarce resources.⁵ If the resource is not limiting, the entry in the table is the amount of the resource remaining idle. These unused resources are identified by italics in the table.

The final table indicates the size of additional investments in various facilities for each price combination. The table also presents information about the scarcity of the two types of credit.

Small Farms

Small farms are those between 140 and 259 acres. Farm Classes 1, 4, and 7 are in this size group.

Class 1

First, Table 3 shows optimal enterprise combinations at each price combination. For the low pork-low beef price situation the optimum plan calls for farrowing 12 litters of pigs in confinement, 53 litters in portable facilities, feeding 20 calves under the low mechanization

⁵ Application of linear programming to similar resource allocation problems results in estimates of the value of resources allocated to the enterprises. These resource values are called imputed values because their level depends on technological and price assumptions of the analysis and are derived simultaneously with the solution of the optimum resource allocation problem. Only resources which are scarce or become limiting have positive imputed values.

Table 3. Optimal enterprise levels at alternative prices for small cash-grain farms, farm class 1.

Enterprise	Beef Prices								
	\$15.86			\$20.02			\$24.18		
	Pork prices			Pork prices			Pork prices		
	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15
Confinement litters	12	8	8	4	8	8	0	4	8
Portable litters	53	83	83	2	75	83	0	4	74
Calves fed (mech.)	0	0	0	27	17	0	127	120	20
Calves fed	20	0	0	101	3	0	55	54	3
Yearlings fed	0	0	0	0	0	0	69	56	0
Feed grain acres	52	75	75	14	71	75	0	4	70
Silage acres	0	0	0	21	0	0	42	40	0
Oats acres	0	0	0	0	0	0	0	0	0
Soybean acres	27	0	0	27	0	0	0	0	0
Wheat acres	30	30	30	30	30	30	30	30	30
Alfalfa acres	7	0	0	38	6	0	60	57	6
Rotation meadow acres	16	27	27	2	24	27	0	2	24
Pork sold cwt.	1,307	1,884	1,884	141	1,730	1,884	0	168	1,712
Beef sold cwt.	129	0	0	779	129	0	1,360	1,268	147
Grain purchased cwt.	4,093	3,304	3,304	2,983	3,618	3,304	6,278	6,160	3,860
Returns above direct expenses	4,947	10,047	15,484	6,914	10,060	15,484	11,981	12,275	15,599

Table 4. Resources not utilized or marginal resource values at optimal organizations, farm class I at alternative price combinations.^a

Price ^b combination	Cropland	Permanent pasture	Soybean land	Feed grain allotment	Credit	Operator labor				Hired labor			
						1	2	3	4	1	2	3	4
Pork Beef	(Acres or Dollars)				(Dollars)	(Hours or Dollars)							
L L	\$33.65	\$ 1.00	\$ 5.53	45 acres	\$ 6,560	273 hrs.	127 hrs.	209 hrs.	\$1.34	7 hrs.	50 hrs.	71 hrs.	7 hrs.
L M	34.20	\$18.69	\$ 4.74	62 acres	12,552	412 hrs.	140 hrs.	\$2.02	94 hrs.	7 hrs.	50 hrs.	\$.66	7 hrs.
L H	39.96	\$24.12	27 acres	55 acres	11.82	200 hrs.	\$.56	\$2.87	76 hrs.	7 hrs.	50 hrs.	\$1.36	7 hrs.
M L	33.26	20 acres	27 acres	22 acres	9.81	118 hrs.	25 hrs.	169 hrs.	\$5.67	7 hrs.	50 hrs.	71 hrs.	\$4.18
M M	33.26	\$.39	27 acres	26 acres	9.81	141 hrs.	38 hrs.	161 hrs.	\$5.67	7 hrs.	50 hrs.	71 hrs.	\$4.18
M H	37.98	\$23.91	27 acres	53 acres	12.37	189 hrs.	\$.58	\$2.91	59 hrs.	7 hrs.	50 hrs.	\$1.39	7 hrs.
H L	34.54	20 acres	27 acres	22 acres	0.47	118 hrs.	25 hrs.	169 hrs.	\$9.14	7 hrs.	50 hrs.	71 hrs.	\$7.48
H M	34.54	20 acres	27 acres	22 acres	22.85	118 hrs.	25 hrs.	169 hrs.	\$9.14	7 hrs.	50 hrs.	71 hrs.	\$7.48
H H	34.54	\$ 5.41	27 acres	27 acres	22.85	148 hrs.	42 hrs.	143 hrs.	\$9.14	7 hrs.	50 hrs.	71 hrs.	\$7.48

^a If the resource was found limiting the entry in the table is the value imputed to the marginal unit of the resource; hence, the tabular entry is as dollars and cents xx.xx. When the resource is not exhausted the quantity appearing in the table is the amount of the resources available.

^b Using the prices presented in Table 2, L = low, M = medium, and H = high.

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Table 5. Additional investments made to achieve optimal enterprise levels, farm class I at alternative price combinations.

Price combination		Hog farrowing		Hog finishing		Beef feeding		Beef housing	Calves purchased	Yearlings purchased	Credit limiting	
		Confine't	Portable	Confine't	Portable	High mech.	Low mech.				Real estate	Chattel
Pork	Beef	(Sow)	(Sow)	(Head)	(Head)	(A.U.)	(A.U.)	(A.U.)	(Head)	(Head)		
L	L	0	16	32	257	0	17	0	0	0	Yes	No
L	M	0	0	0	0	27	98	0	128	0	Yes	No
L	H	0	0	0	0	127	121	13	182	69	Yes	Yes
M	L	0	46	0	518	0	0	0	0	0	Yes	Yes
M	M	0	39	0	464	17	0	0	20	0	Yes	Yes
M	H	0	0	0	9	120	107	12	174	56	Yes	Yes
H	L	0	46	0	518	0	0	0	0	0	Yes	Yes
H	M	0	46	0	518	0	0	0	0	0	Yes	Yes
H	H	0	37	0	452	20	0	0	23	0	Yes	Yes

system, raising 59 acres of feed grains, 6 acres of silage, 27 acres of soybeans, 10 acres of alfalfa, and 16 acres of rotation meadow. Notice that for the price combinations in which no beef is produced (the medium pork-low beef, high pork-low beef, and high pork-medium beef price situations) there is no alfalfa in the farm plan.

Table 3 also contains a summary of pork and beef sales, feed grain purchases and sales, and hay sales for each of the nine price combinations. The optimal farm organizations are quite responsive to changes in beef and pork price relatives. Feed grains are bought under all price situations; the size of the purchase is subject to change, however.

Table 4 presents information about the relative scarcity of resources and the costs associated with the marginal unit of the feed grain allotment or soybean land restraints. The dollar and cents figures in Table 4 are the imputed value to the marginal unit of the restraint in question.

For the medium pork-high beef price situation a reduction of 1 acre of cropland would reduce revenue by \$37.98. The marginal unit of pasture land is worth \$23.91. There are 27 acres of unused soybean land; i.e., the value imputed to the marginal unit of this restraint is zero. Since cropland is limiting it is apparent that land is more profitably allocated to crops other than soybeans.

The feed grain allotment restriction is not effective because 53 acres are unused. A sizable amount of land is allocated to alfalfa since roughage cannot be purchased. Once the livestock roughage requirements are produced the remaining cropland is allocated to feed grains.

The marginal unit of capital is earning a return of 12.37 percent in excess of the acquisition cost of that capital. There are 189 hours of operator-family labor unused in period one and 59 hours unused in period four. Period two operator labor is earning only \$0.58 per hour at the margin but period three operator labor is earning \$2.91 at the margin. Hired labor is limiting only in period three with a marginal value of \$1.39 per hour.

Also, the values imputed to the different restraints provide estimates of the value of increased supplies of these resources. The figures under the cropland column in Table 4 indicate the amount total revenue would increase if another acre of cropland were available. For the low pork-high beef price situation this would amount to \$39.96 per acre; and, in most cases, the values imputed would apply to several additional acres.

The figures in the permanent pasture column indicate the possible additions to profit by adding more pasture land. At the medium pork-low beef, high pork-low beef, and high pork-medium beef price situations pasture land is idle and additional units of pasture would have no effect on the revenue of the farm. Scarce labor and capital

are best allocated to pork at these price situations rather than to beef enterprises using pasture.

The feed grain allotment restriction is not effective at any price situation for the Class 1 farms, Table 4. Due to the level of the live-stock enterprises, sizable amounts of land are needed to furnish rough-age requirements, thereby forcing feed grains to be produced on acres smaller than allotments.

The credit column in Table 4 shows the amount of credit remaining unused or the return on the last unit of credit used. At the high pork-high beef price situation an additional \$100 of capital would earn a return of \$22.85.

The operator labor and hired labor columns present the unused labor or the amount which the last unit of labor of a particular type contributed to total revenue. With high pork-low, medium, or high beef prices hiring additional units of period four (September–November) labor would earn the farmer a return of \$7.48 per hour above the hiring cost of \$1.27 per hour.

The final table for Class 1 farms, Table 5, relates to the added investments necessary to achieve the optimal farm organizations. The number of calves and yearlings purchased and scarcity of the two types of credit are also indicated.

Class 4

The summary of the profit maximizing plans for the small live-stock farms is in Tables 6 through 8. Class 4, as contrasted with Class 1 farms, possess slightly more labor and slightly less capital but about the same amount of land. The feed grain allotments on these farms are less than those found for the Class 1 farms. The more restricted capital availability is shown in the size of hog activities. In general, about the same patterns of enterprise organization are indicated for the two farm types, however. Farm Class 4 does not feed yearling steers under any price situation.

The similarity between the two classes of farms is also seen by comparing Tables 3 and 6. Cropland has imputed values of about the same magnitude on the two farm classes. The feed grain allotment is an effective restriction in three price situations for Class 4. More restrictive credit on the Class 4 farms is indicated through higher imputed values to marginal units of credit. Farm Class 4 has less additional investment than Class 1 because of lower levels of credit available and more initial livestock equipment.

Class 7

Class 7 farms are mixtures between Class 1 and Class 4 farms. This small general farm is larger than the other small farms with

Table 6. Optimal enterprise levels at alternative prices for small livestock farms, farm class 4.

Enterprise	Beef Prices								
	\$15.86			\$20.02			\$24.18		
	Pork prices			Pork prices			Pork prices		
	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15
Confinement litters	15	14	14	5	10	14	0	5	9
Portable litters	32	72	72	14	62	72	0	14	51
Calves fed (mech.)	0	0	0	51	0	0	118	74	20
Calves fed	35	0	0	103	35	0	81	92	38
Yearlings fed	0	0	0	0	0	0	0	0	0
Feed grain acres	53	82	82	24	77	82	17	27	68
Silage acres	0	0	0	0	0	0	33	26	5
Oats acres	0	0	0	0	0	0	0	0	0
Soybean acres	33	3	2	33	0	2	0	0	0
Wheat acres	5	5	5	5	5	5	5	5	5
Alfalfa acres	11	0	0	46	11	0	59	50	18
Rotation meadow acres	12	24	25	6	21	25	0	6	18
Pork sold cwt.	1,058	1,744	1,754	416	1,486	1,757	0	416	1,336
Beef sold cwt.	223	0	0	941	223	0	1,209	1,012	362
Grain purchased cwt.	2,708	2,791	2,838	5,297	3,221	2,845	4,725	4,816	3,661
Returns above direct expenses	5,484	10,250	15,303	7,727	10,400	15,319	12,366	13,015	15,663

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Table 7. Resources not used or marginal resource values at optimal organizations, farm class 4 at alternative price combinations.^a

Price ^b combination	Cropland	Permanent pasture	Soybean land	Feed grain allotment	Credit	Operator labor				Hired labor			
						1	2	3	4	1	2	3	4
Pork Beef			(Acres or Dollars)		(Dollars)				(Hours or Dollars)				
L L	\$35.96	\$ 2.89	\$ 4.69	29 acres	\$ 5,265	418 hrs.	251 hrs.	292 hrs.	\$.03	4 hrs.	32 hrs.	116 hrs.	43 hrs.
L M	35.65	18.94	3.29	58 acres	205	360 hrs.	126 hrs.	\$2.02	7 hrs.	4 hrs.	32 hrs.	116 hrs.	\$.66
L H	39.12	\$25.46	33 acres	33 acres	14.45	523 hrs.	226 hrs.	\$3.31	106 hrs.	4 hrs.	32 hrs.	\$1.76	43 hrs.
M L	36.05	35 acres	31 acres	\$ 4.97	16.49	299 hrs.	171 hrs.	197 hrs.	\$1.57	4 hrs.	32 hrs.	116 hrs.	14 hrs.
M M	33.26	\$ 2.30	33 acres	5 acres	9.81	245 hrs.	123 hrs.	179 hrs.	\$5.67	4 hrs.	32 hrs.	116 hrs.	\$4.18
M H	39.12	\$25.46	33 acres	29 acres	14.45	354 hrs.	131 hrs.	\$3.31	19 hrs.	4 hrs.	32 hrs.	\$1.76	43 hrs.
H L	31.49	35 acres	31 acres	\$14.96	33.55	294 hrs.	178 hrs.	193 hrs.	\$3.00	4 hrs.	32 hrs.	116 hrs.	\$1.21
H M	31.49	35 acres	31 acres	\$14.96	33.55	294 hrs.	176 hrs.	192 hrs.	\$3.00	4 hrs.	32 hrs.	116 hrs.	\$1.21
H H	36.40	\$ 4.15	33 acres	10 acres	24.39	294 hrs.	141 hrs.	51 hrs.	\$8.12	4 hrs.	32 hrs.	116 hrs.	\$6.45

^a If the resource was found limiting the entry in the table is the value imputed to the marginal unit of the resource; hence, the tabular entry is as dollars and cents xx.xx. When the resource is not exhausted the quantity in the table is the amount of the resources available.

^b Using the prices presented in Table 2, L=low, M=medium, and H=high.

Table 8. Additional investments made to achieve optimal enterprise levels, farm class 4 at alternative price combinations.

Price combination		Hog farrowing		Hog finishing		Beef feeding		Beef housing	Calves purchased	Yearlings purchased	Credit limiting	
		Confine't	Portable	Confine't	Portable	High mech.	Low mech.				Real estate	Chattel
Pork	Beef		(Sow)		(Head)		(A.U.)	(A.U.)	(Head)	(Head)		
L	L	0	10	45	47	0	0	0	35	0	Yes	No
L	M	0	6	0	0	51	65	0	154	0	Yes	No
L	H	0	0	0	0	118	43	0	198	0	Yes	Yes
M	L	0	23	0	296	0	0	0	0	0	Yes	Yes
M	M	0	30	0	270	0	0	0	35	0	Yes	Yes
M	H	0	6	0	0	74	54	0	166	0	Yes	Yes
H	L	0	22	0	284	0	0	0	0	0	Yes	Yes
H	M	0	22	0	286	0	0	0	0	0	Yes	Yes
H	H	0	16	0	189	20	0	0	58	0	Yes	Yes

Table 9. Optimal enterprise levels at alternative prices for small general farms, farm class 7.

Enterprise	Beef Prices								
	\$15.86			\$20.02			\$24.18		
	Pork prices			Pork prices			Pork prices		
	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15
Confinement litters	20	20	20	5	15	20	0	10	14
Portable litters	43	87	89	11	104	90	0	5	72
Calves fed (mech.)	0	0	0	34	0	0	96	85	38
Calves fed	38	0	0	143	38	0	119	117	19
Yearlings fed	0	0	0	0	0	0	68	44	0
Feed grain acres	52	97	96	0	88	96	11	19	81
Silage acres	0	0	0	28	0	0	46	40	4
Oats acres	0	0	0	0	0	0	0	0	0
Soybean acres	42	0	0	42	0	0	0	0	0
Wheat acres	16	16	16	16	16	16	16	16	16
Alfalfa acres	12	0	0	54	12	0	70	64	18
Rotation meadow acres	21	30	31	4	27	31	0	4	25
Pork sold cwt.	1,704	2,181	2,199	298	1,910	2,199	0	311	1,781
Beef sold cwt.	245	0	0	1,085	245	0	1,566	1,400	360
Grain purchased cwt.	4,742	3,701	3,808	5,576	4,289	3,808	6,850	6,684	4,604
Returns above direct expenses	6,293	12,267	18,585	9,253	12,607	18,585	15,045	15,587	19,183

about 15 to 20 percent more land and with more labor available. However, optimal plans are similar to those on the other small farms.

For all three of the small farms the optimizing plans result in complete withdrawal from pork production with high beef and low pork prices. Similarly, beef feeding is discontinued whenever pork prices are at least one level higher in the price ordering sequence.

The first two price combinations (low pork-low beef and low pork-medium beef) uses all available real estate mortgage credit. However, chattel mortgage credit used is less than the available supply because the earning rate for capital unused is less than the interest charge of $7\frac{1}{2}$ percent.

Medium-Sized Farms

Farms in this size grouping have between 260 and 499 acres. Resource data from the survey indicate these farms are currently operated somewhat less intensively than small farms. On the small farms there are about 30 hours of labor available for every cropland acre, on the medium-sized farms this figure drops to about 20 to 25 hours of available labor per acre. The capital-land ratios do not change appreciably between the two size groupings. Small farms do tend to have more labor available per unit of capital than the medium-sized farms, which may indicate under-employment of labor on small farms.

Class 2

Medium-sized cash grain farm plans are summarized in Tables 12 through 14. At low pork and low beef prices 48 litters of pigs are farrowed, 9 are farrowed in existing permanent facilities, and 12 portable farrowing sheds are added in which 39 litters are farrowed. Calves are fed on a pasture system to the limit of pasture land. Soybeans are produced to their limit, rotation meadow and alfalfa supply roughage for the livestock activities, and the remaining land is allocated to feed grains.

As the price of pork increases and beef prices remain at \$15.86 per hundredweight beef enterprises disappear from the profit maximizing plans. Additional portable farrowing and finishing facilities are added. Alfalfa production drops out with beef enterprises and rotation meadow acres increase with expanded hog production. Some soybeans are produced with \$14.28 pork but at \$17.15 pork soybean activity is forced out with expansion of feed grain production.

At medium beef and low pork prices the hog enterprise almost disappears. Calves are fed intensively, under the low mechanization system. Soybeans occupy all of their allotted acres, alfalfa and rotation meadow are produced at levels consistent with the beef and pork enterprises, respectively. Remaining land is placed in feed production,

Table 10. Resources not used or marginal resource values at optimal organizations, farm class 7 at alternative price combinations.^a

Price ^b combination	Cropland	Permanent pasture	Soybean land	Feed grain allotment	Credit	Operator labor				Hired labor				
						1	2	3	4	1	2	3	4	
Pork Beef		(Acres or Dollars)			(Dollars)					(Hours or Dollars)				
L L	\$35.96	\$ 1.50	\$4.70	48 acres	\$ 410	304 hrs.	136 hrs.	363 hrs.	\$.03	14 hrs.	4 hrs.	24 hrs.	30 hrs.	
L M	35.65	\$18.94	\$3.29	72 acres	6,114	437 hrs.	110 hrs.	\$2.02	121 hrs.	14 hrs.	4 hrs.	24 hrs.	30 hrs.	
L H	37.98	\$23.91	42 acres	43 acres	12.38	275 hrs.	\$.59	\$2.91	117 hrs.	14 hrs.	4 hrs.	\$1.39	30 hrs.	
M L	42.11	38 acres	42 acres	3 acres	17.08	263 hrs.	139 hrs.	360 hrs.	\$.88	14 hrs.	4 hrs.	24 hrs.	30 hrs.	
M M	40.84	\$ 6.75	42 acres	12 acres	16.03	216 hrs.	73 hrs.	289 hrs.	\$1.57	14 hrs.	4 hrs.	24 hrs.	7 hrs.	
M H	37.98	\$23.91	42 acres	41 acres	12.38	253 hrs.	\$.59	\$2.91	88 hrs.	14 hrs.	4 hrs.	\$1.39	30 hrs.	
H L	46.26	38 acres	42 acres	4 acres	32.47	253 hrs.	151 hrs.	352 hrs.	\$2.80	14 hrs.	4 hrs.	24 hrs.	\$1.02	
H M	46.26	38 acres	42 acres	4 acres	32.47	253 hrs.	151 hrs.	352 hrs.	\$2.80	14 hrs.	4 hrs.	24 hrs.	\$1.02	
H H	36.92	\$ 4.49	42 acres	16 acres	24.81	209 hrs.	51 hrs.	182 hrs.	\$7.85	14 hrs.	4 hrs.	24 hrs.	\$6.17	

^a If the resource was found limiting the entry in the table is the value imputed to the marginal unit of the resource; hence, the tabular entry is as dollars and cents xx.xx. When the resource is not exhausted the quantity in the table is the amount of the resources available.

^b Using the prices presented in Table 2, L=low, M=medium, and H=high.

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Table 11. Additional investments made to achieve optimal enterprise levels, farm class 7 at alternative price combinations.

Price combination		Hog farrowing		Hog finishing		Beef feeding		Beef housing	Calves purchased	Yearlings purchased	Credit limiting	
		Confine't	Portable	Confine't	Portable	High mech.	Low mech.				Real estate	Chattel
Pork	Beef		(Sow)		(Head)		(A.U.)	(A.U.)	(Head)	(Head)		
L	L	0	20	45	260	0	14	0	38	0	Yes	No
L	M	0	4	0	0	34	119	0	178	0	Yes	No
L	H	0	0	0	0	96	163	9	215	68	Yes	Yes
M	L	0	27	0	416	0	0	0	0	0	Yes	Yes
M	M	0	25	0	384	0	14	0	38	0	Yes	Yes
M	H	0	4	0	0	85	138	6	202	44	Yes	Yes
H	L	0	26	0	392	0	0	0	0	0	Yes	Yes
H	M	0	26	0	392	0	0	0	0	0	Yes	Yes
H	H	0	23	0	350	0	33	0	0	0	Yes	Yes

Table 12. Optimal enterprise levels at alternative prices for medium cash grain farms, farm class 2.

Enterprise	Beef Prices								
	\$15.86			\$20.02			\$24.18		
	Pork prices			Pork prices			Pork prices		
	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15
Confinement litters	9	6	8	4	9	8	0	3	9
Portable litters	39	102	102	1	80	102	0	4	80
Calves fed (mech.)	0	0	0	9	63	0	205	201	63
Calves fed	63	0	0	130	0	0	35	34	0
Yearlings fed	0	0	0	0	0	0	46	34	0
Feed grain acres	82	116	141	55	126	141	54	57	126
Silage acres	0	0	0	15	0	0	42	40	0
Oats acres	0	0	0	0	0	0	0	0	0
Soybean acres	57	24	0	57	0	0	0	0	0
Wheat acres	28	28	28	28	28	28	28	28	28
Alfalfa acres	30	0	0	42	21	0	75	75	21
Rotation meadow acres	13	32	31	2	26	31	0	2	26
Pork sold cwt.	994	2,236	2,285	139	1,821	2,285	0	129	1,824
Beef sold cwt.	406	0	0	869	406	0	1,640	1,569	406
Grain purchased cwt.	2,564	3,127	2,562	2,726	3,663	2,562	5,903	5,827	3,679
Returns above direct expenses	7,676	13,513	20,049	10,445	13,626	20,049	16,564	16,809	20,571

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Table 13. Resources not used or marginal resource values at optimal organizations, farm class 2 at alternative price combinations.^a

Price ^b combination	Cropland	Permanent pasture	Soybean land	Feed grain allotment	Credit	Operator labor				Hired labor			
						1	2	3	4	1	2	3	4
Pork Beef	(Acres or Dollars)				(Dollars)	(Hours or Dollars)							
L L	\$32.61	\$ 0.78	\$ 5.91	77 acres	\$13,154	230 hrs.	42 hrs.	71 hrs.	\$1.94	146 hrs.	112 hrs.	160 hrs.	\$0.60
L M	32.90	\$15.42	\$ 4.66	89 acres	18,159	322 hrs.	40 hrs.	\$1.56	\$1.36	146 hrs.	112 hrs.	\$0.20	66 hrs.
L H	34.53	\$20.22	57 acres	63 acres	8.94	251 hrs.	\$1.46	\$4.11	1 hr.	146 hrs.	112 hrs.	\$2.63	139 hrs.
M L	30.56	63 acres	33 acres	43 acres	7.08	\$34	\$1.46	20 hrs.	\$5.56	146 hrs.	11 hrs.	160 hrs.	\$4.11
M M	31.55	\$ 1.39	57 acres	33 acres	7.53	54 hrs.	\$1.46	\$0.97	\$4.28	146 hrs.	55 hrs.	160 hrs.	\$2.82
M H	34.75	\$18.88	57 acres	62 acres	10.21	243 hrs.	\$46	\$3.63	\$1.49	146 hrs.	112 hrs.	\$2.14	128 hrs.
H L	17.58	63 acres	57 acres	18 acres	6.49	\$1.45	\$9.53	16 hrs.	\$8.58	120 hrs.	\$8.08	160 hrs.	\$7.13
H M	17.58	63 acres	57 acres	18 acres	6.49	\$1.45	\$9.53	16 hrs.	\$8.58	120 hrs.	\$8.08	160 hrs.	\$7.13
H H	33.03	\$ 6.23	57 acres	33 acres	20.22	63 hrs.	\$1.62	\$1.62	\$6.83	146 hrs.	57 hrs.	141 hrs.	\$5.21

^a If the resource was found limiting the entry in the table is the value imputed to the marginal unit of the resource; hence, the tabular entry is as dollars and cents xx.xx. When the resource is not exhausted the quantity in the table is the amount of the resources available.

^b Using the prices presented in Table 2, L=low, M=medium, and H=high.

55 acres of grain and 15 acres of silage. Silage is used by calves on silage rations.

At medium beef and medium pork prices hog activities become more prominent. Calf feeding is forced back to the level of pasture availability: 63 head. Most litters farrowed are under portable systems: 41 portable farrowing units are added, and space is added to feed an additional 495 head of pigs. Soybean production is forced out by greater returns from land allocated to feed grains, alfalfa, and rotation meadow.

At high pork and medium beef prices there are no beef enterprises and the farm organization is identical to the one obtained with medium pork and low beef prices.

At \$24.18 beef and \$11.40 pork there are no resources allocated to pork production. Calves are fed under both high and low mechanization systems, the former more than the latter. The plan also calls for feeding 46 head of yearlings. Beef activities require 75 acres of alfalfa; the remaining land is devoted to feed grain and silage production.

With medium pork and high beef prices a few litters of pigs are farrowed. To make room for the hogs, calf and yearling feeding both decrease. More feed grain and less silage is grown, with the same amount of alfalfa. The hog enterprises require 2 acres of rotation meadow.

With high prices for both beef and pork, the resulting farm organization is the same as with medium prices for both pork and beef.

Class 5

Medium-sized livestock farms have more labor and capital available than do medium cash grain farms. Resulting profit maximizing plans are not greatly different from those for the cash grain farms, however.

Results for Class 5 farms are in Tables 15 through 17. With low pork and low beef prices the optimal plan indicates calf feeding with a pasture system to the extent of pasture availability. Hogs are farrowed under both permanent and portable facilities, with necessary investments being made in portable systems. Soybeans occupy all land available to them and alfalfa and rotation meadow require land at levels consistent with the pork and beef enterprises. The remaining available cropland is allocated to feed grains.

With medium or high pork prices and low beef prices the optimal plans are identical. Beef feeding is eliminated and 125 litters of hogs are farrowed. No soybeans are produced, 36 acres of rotation meadow is produced, and the remaining land is devoted to producing feed grains.

Table 14. Additional investments made to achieve optimal enterprise levels, farm class 2 at alternative price combinations.

Price combination		Hog farrowing		Hog finishing		Beef feeding		Beef housing	Calves purchased	Yearlings purchased	Credit limiting	
		Confine't	Portable	Confine't	Portable	High mech.	Low mech.				Real estate	Chattel
Pork	Beef											
L	L	0	12	24	185	0	56	0	0	0	No	No
L	M	0	0	0	0	9	123	1	140	0	Yes	No
L	H	0	0	0	0	205	74	26	240	46	Yes	Yes
M	L	0	63	0	646	0	0	0	0	0	Yes	Yes
M	M	0	41	0	495	63	0	0	63	0	Yes	Yes
M	H	0	1	0	0	0	62	25	235	34	Yes	Yes
H	L	0	67	16	656	0	0	0	0	0	Yes	Yes
H	M	0	63	16	656	0	0	0	0	0	Yes	Yes
H	H	0	42	0	485	63	0	0	63	0	Yes	Yes

Table 15. Optimal enterprise levels at alternative prices for medium livestock farms, farm class 5.

Enterprise	Beef Prices								
	\$15.86			\$20.02			\$24.18		
	Pork prices			Pork prices			Pork prices		
	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15
Confinement litters	14	14	14	12	14	14	0	7	14
Portable litters	35	111	111	14	84	111	0	20	73
Calves fed (mech.)	0	0	0	121	56	0	214	170	73
Calves fed	73	0	0	107	17	0	79	87	37
Yearlings fed	0	0	0	0	0	0	28	10	0
Feed grain acres	71	130	130	0	114	130	28	42	100
Silage acres	0	0	0	31	0	0	48	38	7
Oats acres	0	0	0	0	0	0	0	0	0
Soybean acres	60	0	0	60	0	0	0	0	0
Wheat acres	29	29	29	29	29	29	29	29	29
Alfalfa acres	24	0	0	23	24	0	91	79	35
Rotation meadow acres	12	36	36	7	28	36	0	7	25
Pork sold cwt.	1,136	2,599	2,599	550	2,035	2,607	0	879	1,791
Beef sold cwt.	471	0	0	1,403	471	0	1,897	1,617	693
Grain purchased cwt.	3,593	3,780	3,780	7,773	4,901	3,780	7,642	7,537	5,561
Returns above direct expenses	8,090	14,849	22,237	11,537	14,962	22,237	18,796	19,575	22,873

Table 16. Resources not used or marginal resource values at optimal organizations, farm class 5 at alternative price combinations.^a

Price ^b combination	Cropland	Permanent pasture	Soybean land	Feed grain allotment	Credit	Operator labor				Hired labor			
						1	2	3	4	1	2	3	4
Pork Beef	(Acres or Dollars)				(Dollars)	(Hours or Dollars)							
L L	\$32.60	\$ 1.98	\$ 5.90	75 acres	\$10,362	492 hrs.	141 hrs.	295 hrs.	\$1.93	46 hrs.	43 hrs.	116 hrs.	\$.60
L M	33.92	\$16.63	\$ 3.36	116 acres	2,589	425 hrs.	22 hrs.	\$1.84	\$1.36	46 hrs.	43 hrs.	\$.47	16 hrs.
L H	39.10	\$25.40	59 acres	71 acres	14.43	504 hrs.	72 hrs.	\$3.32	38 hrs.	46 hrs.	43 hrs.	\$1.77	58 hrs.
M L	30.86	73 acres	59 acres	17 acres	7.72	206 hrs.	\$1.46	225 hrs.	\$5.62	46 hrs.	8 hrs.	116 hrs.	\$4.16
M M	31.92	\$ 1.22	59 acres	32 acres	8.65	270 hrs.	\$.81	199 hrs.	\$5.64	46 hrs.	43 hrs.	116 hrs.	\$4.16
M H	36.78	\$23.21	59 acres	66 acres	13.87	360 hrs.	\$.30	\$3.20	\$1.54	46 hrs.	43 hrs.	\$1.66	7 hrs.
H L	31.87	73 acres	59 acres	17 acres	20.53	206 hrs.	\$1.62	225 hrs.	\$9.08	46 hrs.	8 hrs.	116 hrs.	\$7.46
H M	31.87	73 acres	59 acres	17 acres	20.53	205 hrs.	\$1.62	225 hrs.	\$9.08	46 hrs.	8 hrs.	116 hrs.	\$7.46
H H	31.94	\$ 7.03	59 acres	39 acres	20.51	304 hrs.	\$1.62	\$.09	\$8.95	46 hrs.	37 hrs.	116 hrs.	\$7.32

^a If the resource was found limiting the entry in the table is the value imputed to the marginal unit of the resource; hence, the tabular entry is as dollars and cents xx.xx. When the resource is not exhausted the quantity in the table is the amount of the resources available.

^b Using the prices presented in Table 2, L = low, M = medium, and H = high.

Table 17. Additional investments made to achieve optimal enterprise levels, farm class 5 at alternative price combinations.

Price combination	Hog farrowing		Hog finishing		Beef feeding		Beef housing	Calves purchased	Yearlings purchased	Credit limiting	
	Confine't	Portable	Confine't	Portable	High mech.	Low mech.				Real estate	Chattel
Pork	(Sow)		(Head)		(A.U.)		(A.U.)	(Head)	(Head)		
L	L	0	9	56	30	0	0	73	0	No	No
L	M	0	4	0	0	121	0	228	0	Yes	No
L	H	0	0	0	0	0	0	292	28	Yes	Yes
M	L	0	69	0	601	0	0	0	0	Yes	Yes
M	M	0	49	0	418	56	0	73	0	Yes	Yes
M	H	0	7	0	0	170	0	257	10	Yes	Yes
H	L	0	69	0	601	0	0	0	0	Yes	Yes
H	M	0	68	0	601	0	0	0	0	Yes	Yes
H	H	0	38	0	325	73	0	110	0	Yes	Yes

Medium beef and low pork prices result in the farrowing of 26 litters of pigs and the feeding of 228 head of calves. Soybeans, alfalfa, rotation meadow, and silage occupy all of the cropland. Thus, no feed grain is produced and all feed grain required is bought.

When pork increases in price from \$11.40 to \$14.28 per hundred-weight and beef remains at the medium price of \$20.02 per hundred-weight the organization changes considerably. In this case 98 litters of pigs are raised and 73 calves are fed. No soybeans are produced and all of the cropland is occupied by alfalfa, rotation meadow, and feed grains.

The high pork-medium beef price combination results in the same plan obtained for medium or high pork and low beef prices.

Low pork and high beef prices force pork production out of the farm plan. Both calves and yearlings are fed. Since hay cannot be bought, 91 acres of alfalfa are needed. Silage and feed grain production uses the remaining cropland.

As pork prices increase to medium and high levels, with beef prices remaining at the high level of \$24.18, more pork and less beef is produced. A few yearlings are fed at medium pork-high beef prices but none are fed at the high-high price combination. As the level of the beef enterprise declines with the increase in pork prices the amount of silage and alfalfa produced declines. Correspondingly, more feed grains and rotation meadow are produced.

Class 8

Class 8 farms are a hybrid of Class 2 and Class 5 farms. The optimal plans (as shown in Tables 18 through 20) for profit maximizing resource allocation resemble those obtained for the cash grain and livestock farms of the same size. About the same type of shift occurs between beef and pork production as the prices of these products vary relative to each other.

Soybeans are more consistently included in the farm plans in Class 8 farms. Only at high beef prices where the increased roughage requirements call for the use of more land does the soybean activity disappear.

As with Class 2 and Class 5 farms, whenever beef prices exceed pork prices in the price ordering sequence, significant amounts of silage are produced. Yearlings are fed only at high beef and low or medium pork prices.

On the smaller farms, the acreage of feed grain produced would be less than the acreage allocated for any price situation on any of the three types of medium-sized farms. A portion of the available capital is unused on each of the farms at the low beef and low or medium pork price combinations. Also, for Class 8 farms, some credit is unused with the medium pork-low beef, high pork-low beef, and high pork-medium beef price situations.

Table 18. Optimal enterprise levels at alternative prices for medium general farms, farm class 8.

Enterprise	Beef Prices								
	\$15.86			\$20.02			\$24.18		
	Pork prices			Pork prices			Pork prices		
	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15
Confinement litters	16	24	19	14	7	19	0	7	14
Portable litters	7	86	90	4	75	90	0	10	70
Calves fed (mech.)	0	0	0	180	0	0	238	235	113
Calves fed	94	0	0	63	94	0	47	40	0
Yearlings fed	0	0	0	0	0	0	57	16	0
Feed grain acres	85	94	94	13	101	94	43	53	117
Silage acres	0	0	0	30	0	0	47	38	4
Oats acres	0	0	0	0	0	0	0	0	0
Soybean acres	60	60	60	60	24	60	0	0	0
Wheat acres	40	40	40	40	40	40	40	40	40
Alfalfa acres	30	0	0	75	65	0	91	85	36
Rotation meadow acres	5	27	27	4	25	27	0	5	24
Pork sold cwt.	480	2,287	2,300	377	1,846	2,300	0	376	1,775
Beef sold cwt.	606	0	0	1,505	606	0	1,969	1,754	722
Grain purchased cwt.	1,911	3,803	3,859	7,429	5,319	3,859	7,800	7,444	5,152
Returns above direct expenses	8,532	14,836	21,445	12,212	15,361	21,445	19,569	20,191	23,349

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Table 19. Resources not used or marginal resource values at optimal organizations, farm class 8 at alternative price combinations.^a

Price ^b combination	Cropland	Permanent pasture	Soybean land	Feed grain allotment	Credit	Operator labor				Hired labor			
						1	2	3	4	1	2	3	4
Pork Beef	(Acres or Dollars)				(Dollars)	(Hours or Dollars)							
L L	\$32.35	\$.12	\$ 5.88	71 acres	\$26,067	444 hrs.	161 hrs.	410 hrs.	\$2.14	6 hrs.	25 hrs.	29 hrs.	\$.81
L M	31.75	\$12.54	\$ 4.42	114 acres	389	380 hrs.	68 hrs.	\$1.25	\$2.59	6 hrs.	25 hrs.	29 hrs.	\$1.23
L H	34.53	\$20.22	60 acres	66 acres	8.95	279 hrs.	\$1.46	\$4.11	5 hrs.	6 hrs.	25 hrs.	\$2.63	6 hrs.
M L	21.74	94 acres	\$ 3.67	62 acres	2,412	141 hrs.	\$6.68	368 hrs.	\$5.82	6 hrs.	\$5.32	29 hrs.	\$4.45
M M	29.82	\$ 2.56	36 acres	55 acres	6.82	157 hrs.	\$2.10	278 hrs.	\$5.61	6 hrs.	\$.64	29 hrs.	\$4.15
M H	34.85	\$18.26	60 acres	65 acres	10.79	307 hrs.	35 hrs.	\$3.41	\$2.19	6 hrs.	25 hrs.	\$1.91	\$.68
H L	6.81	94 acres	\$ 2.65	62 acres	1,983	127 hrs.	\$14.74	386 hrs.	\$10.97	6 hrs.	25 hrs.	29 hrs.	\$9.61
H M	6.81	94 acres	\$ 2.65	62 acres	1,983	127 hrs.	\$14.74	386 hrs.	\$10.97	6 hrs.	25 hrs.	29 hrs.	\$9.61
H H	25.80	\$10.91	60 acres	35 acres	15.26	158 hrs.	\$5.32	220 hrs.	\$8.98	6 hrs.	\$3.77	29 hrs.	\$7.42

^a If the resource was found limiting the entry in the table is the value imputed to the marginal unit of the resource; hence, the tabular entry is as dollars and cents xx.xx. When the resource is not exhausted the quantity in the table is the amount of the resources available.

^b Using the prices presented in Table 2, L = low, M = medium, and H = high.

Table 20. Additional investments made to achieve optimal enterprise levels, farm class 8 at alternative price combinations.

Price combination		Hog farrowing		Hog finishing		Beef feeding		Beef housing	Calves purchased	Yearlings purchased	Credit limiting	
		Confine't	Portable	Confine't	Portable	High mech.	Low mech.				Real estate	Chattel
Pork	Beef		(Sow)		(Head)		(A.U.)	(A.U.)	(Head)	(Head)		
L	L	0	6	5	0	0	69	94	0	0	No	No
L	M	0	0	0	0	181	38	17	243	0	Yes	No
L	H	0	0	0	0	238	79	27	285	57	Yes	Yes
M	L	0	83	76	573	0	0	0	0	0	Yes	No
M	M	0	65	0	501	94	9	0	94	0	Yes	Yes
M	H	0	3	0	0	235	31	25	274	16	Yes	Yes
H	L	0	88	74	581	0	0	0	0	0	Yes	No
H	M	0	88	74	581	0	0	0	0	0	Yes	No
H	H	0	60	0	470	113	0	0	113	0	Yes	Yes

Table 21. Optimal enterprise levels at alternative prices for large cash grain farms, farm class 3.

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Enterprise	Beef Prices								
	\$15.86			\$20.02			\$24.18		
	Pork prices			Pork prices			Pork prices		
	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15
Confinement litters	7	8	7	8	13	6	0	4	6
Portable litters	48	85	86	1	44	86	0	5	49
Calves fed (mech.)	45	0	0	230	134	0	311	301	245
Calves fed	24	0	0	26	0	0	0	0	0
Yearling fed	0	0	0	0	0	0	40	15	0
Feed grain acres	190	202	195	122	169	195	88	97	54
Silage acres	0	0	0	24	0	0	42	33	22
Oats acres	0	0	0	0	0	0	0	0	0
Soybean acres	114	114	114	114	114	114	114	114	114
Wheat acres	65	65	65	65	65	65	65	65	65
Alfalfa acres	22	0	0	79	43	0	99	95	76
Rotation meadow acres	16	26	27	2	16	27	0	3	16
Pork sold cwt.	1,154	1,944	1,978	198	1,193	1,978	0	197	1,175
Beef sold cwt.	446	0	0	1,599	864	0	2,080	1,928	1,533
Grain purchased cwt. ^a	0	-276	0	4,358	2,752	0	7,072	6,641	8,787
Returns above direct expenses	14,107	19,599	25,249	18,959	20,737	25,249	27,200	27,420	29,117

^a A negative feed grain purchase indicates feed grain sold.

Large Farms

Large farms are those with more than 500 acres. These are even more extensively farmed than the medium-sized farms, with about 12 to 15 hours of labor available per crop acre. The capital-land ratios are also lower than for the small or medium farms. The resource data also indicate less labor available per unit of capital.

Class 3

The different resource situations on the large farms result in no appreciable difference in profit maximizing plans compared with smaller farms although resource limitations change. See Tables 21 through 23 for the programmed results for Class 3 farms. In general, labor is the most restrictive resource on these large cash grain farms; period two (April, May) and period four (September, October, November) are of most critical supply. No beef is produced whenever the pork price ranks above the beef price in the ordering sequence. At high beef-low pork prices pork production disappears from the optimum plan. Yearlings come into the solution at high beef and low or medium pork prices. Silage is grown whenever the sequential ordering of beef prices exceeds that of pork prices.

The acreage of feed grain is not as large as the assumed allocation. Soybeans are produced at the maximum level permitted by the assumed soybean restriction at all price combinations. The labor-land ratio probably forces this extensification.

Capital is not restricting at any price situation. In two instances, high pork-low beef and high pork-medium beef, there is idle cropland. Feed grains are not bought to any great extent except when beef prices exceed pork prices in the ordering sequence. In one case (medium pork-low beef prices) 276 hundredweight of feed grains are sold. At the low pork-low beef, high pork-low beef, and high pork-medium beef price situations, feed grains are neither purchased nor sold.

Except for the instance of low pork and low beef prices, Class 3 farms produce more beef but less pork than do medium-sized cash grain farms in Class 2. Class 3 farms have more of all three resources (land, labor, and capital) but in different combinations. Less labor relative to other resources on the larger farms results in more of such labor extensive enterprises as soybeans and beef.

Class 6

Large livestock farms, due to past emphasis on livestock production, have more labor and capital available relative to land than do the large cash grain farms. The farms are of about the same size with respect to cropland acres, but the livestock farms have an additional \$15,200 of capital and an additional 1,196 hours of labor available. The labor-capital ratio is about the same for the two farms, Class 3 and Class 6.

Table 22. Resources not used or marginal resource values at optimal organizations, farm class 3 at alternative price combinations.^a

Price ^b combination	Cropland	Permanent pasture	Soybean land	Feed grain allotment	Credit	Operator labor				Hired labor			
						1	2	3	4	1	2	3	4
Pork Beef	(Acres or Dollars)		(Dollars)			(Hours or Dollars)							
L L	\$27.95	65 acres	\$ 8.58	119 acres	\$35,482	482 hrs.	\$.53	312 hrs.	\$2.98	78 hrs.	91 hrs.	130 hrs.	\$1.64
L M	\$31.79	\$12.76	4.43	162 acres	25,985	618 hrs.	43 hrs.	\$1.37	\$2.48	78 hrs.	91 hrs.	84 hrs.	\$1.11
L H	\$21.88	\$23.23	4.15	180 acres	15,187	535 hrs.	\$1.37	\$7.10	\$5.23	78 hrs.	63 hrs.	\$5.74	\$3.86
M L	\$ 8.69	134 acres	10.55	107 acres	29,212	339 hrs.	\$10.05	324 hrs.	\$7.88	78 hrs.	\$8.72	130 hrs.	\$6.55
M M	\$15.83	\$ 3.98	2.80	140 acres	23,234	443 hrs.	\$1.36	191 hrs.	\$15.44	78 hrs.	51 hrs.	130 hrs.	\$14.08
M H	\$19.18	\$21.68	3.80	179 acres	16,200	566 hrs.	\$.45	\$6.87	\$8.44	78 hrs.	91 hrs.	\$5.50	\$7.08
H L	6 acres	134 acres	5.53	114 acres	28,920	331 hrs.	\$16.54	318 hrs.	\$12.69	78 hrs.	\$15.21	130 hrs.	\$11.35
H M	6 acres	134 acres	5.53	114 acres	28,920	331 hrs.	\$16.54	318 hrs.	\$12.69	78 hrs.	\$15.21	130 hrs.	\$11.35
H H	60 acres	\$12.39	1.82	233 acres	5,865	350 hrs.	\$4.66	\$3.91	\$22.71	78 hrs.	\$3.30	\$2.54	\$21.35

^a If the resource was found limiting the entry in the table is the value imputed to the marginal unit of the resource; hence, the tabular entry is as dollars and cents xx.xx. When the resource is not exhausted the quantity appearing in the table is the amount of the resources available.

^b Using the prices presented in Table 2, L = low, M = medium, and H = high.

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Table 23. Additional investments made to achieve optimal enterprise levels, farm class 3 at alternative price combinations.

Price combination		Hog farrowing		Hog finishing		Beef feeding		Beef housing	Calves purchased	Yearlings purchased	Credit limiting	
		Confine't	Portable	Confine't	Portable	High mech.	Low mech.				Real estate	Chattel
Pork	Beef	(Sow)		(Head)		(A.U.)		(A.U.)	(Head)	(Head)		
L	L	0	47	0	351	45	2	0	69	0	No	No
L	M	0	0	0	0	230	4	0	256	0	Yes	No
L	H	0	0	0	0	311	18	14	311	40	Yes	No
M	L	0	84	10	641	0	0	0	0	0	No	No
M	M	7	43	0	376	134	0	0	134	0	Yes	No
M	H	0	4	0	0	301	0	11	301	15	Yes	No
H	L	0	85	10	654	0	0	0	0	0	No	No
H	M	0	85	10	654	0	0	0	0	0	No	No
H	H	0	49	0	369	245	0	0	245	0	Yes	No

Again for Class 6 farms, as has been observed on all of the preceding farms presented, resource allocation patterns are about the same at a given price situation. The size of the shift to pork production on the Class 6 farms when the price situations are favorable to pork is limited by the amount of labor available; labor is especially limiting in periods two and four. As a consequence these large livestock farms are only slightly more intensive pork producers than are the large cash grain farms or the medium livestock farms. When the pork price is equal to or exceeds the beef price in the price ordering sequence, there is some credit unused, except for the high pork-high beef price combination.

Calf feeding never exceeds the amount of pasture available; i.e., none of the calves are fed under a drylot system. Again, yearlings are fed only at high beef and low or medium pork prices.

Alfalfa and rotation meadow complement the beef and pork enterprises, respectively. Soybeans are produced at their limit in all price situations with low and medium beef prices. At high beef prices, available soybean land is used to produce alfalfa and feed grains for the more profitable livestock enterprises.

The operator-family labor supply is exhausted at all price situations for periods two, three, and four. At some price combinations all available hired labor is not employed and some credit is left unused.

On these large livestock farms investment in confinement hog feeding facilities is more common because of more capital relative to labor. Similarly, all investments in beef feeding facilities require the high mechanization system.

Class 9

These large general farms have a resource situation that shows their more extensive type of operation. The ratio of labor to land is slightly greater than for Class 3 farms but less than for Class 6 farms. The capital-land ratio is also intermediate between the two other classes. The labor-capital ratio is the smallest of the three large farm classes.

Class 9 farms include the first investments in central hog farrowing facilities. This investment occurs in each of the three cases in which the pork price exceeds the beef price in the ordering sequence.

Investment in additional beef feeding space tends toward the high mechanization systems. The confinement feeding of hogs is also more prominent, the result of the resource mix on the farm.

All available cropland is used at all price situations. Feed grain acreage is not as large as the assumed allocation. Soybeans are in all optimal farm plans; however, they are not produced to their maximum potential at the low pork-high beef and medium pork-high beef price combinations.

Table 24. Optimal enterprise levels at alternative prices for large livestock farms, farm class 6.

Enterprise	Beef Prices								
	\$15.86			\$20.02			\$24.18		
	Pork prices			Pork prices			Pork prices		
	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15
Confinement litters	20	27	27	10	17	27	0	10	22
Portable litters	10	116	116	2	76	116	0	20	56
Calves fed (mech.)	0	0	0	124	228	0	228	228	228
Calves fed	107	0	0	94	0	0	0	0	0
Yearlings fed	0	0	0	0	0	0	89	41	0
Feed grain acres	182	189	189	100	125	189	134	150	193
Silage acres	0	0	0	19	0	0	56	43	19
Oats acres	0	0	0	0	0	0	0	0	0
Soybean acres	110	110	110	110	110	110	0	0	0
Wheat acres	51	51	51	51	51	51	51	51	51
Alfalfa acres	35	0	0	102	74	0	143	132	102
Rotation meadow acres	7	35	35	3	25	37	0	8	20
Pork sold cwt.	637	2,991	2,991	254	1,943	2,991	0	610	1,574
Beef sold cwt.	690	0	0	2,049	1,471	0	3,079	2,744	2,044
Grain purchased cwt.	0	3,102	3,102	7,458	9,078	3,102	10,646	10,229	8,528
Returns above direct expenses	14,364	22,041	30,652	19,870	23,708	30,652	31,149	32,023	35,715

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Table 25. Resources not used or marginal resource values at optimal organizations, farm class 6 at alternative price combinations.^a

Price ^b combination	Cropland	Permanent pasture	Soybean land	Feed grain allotment	Credit	Operator labor				Hired labor				
						1	2	3	4	1	2	3	4	
Pork Beef			(Acres or Dollars)		(Dollars)					(Hours or Dollars)				
L L	\$26.65	121 acres	\$10.00	88 acres	\$47,946	352 hrs.	\$1.33	\$1.33	\$1.33	454 hrs.	266 hrs.	644 hrs.	48 hrs.	\$66
L M	30.86	\$13.03	\$ 4.42	152 acres	20,034	291 hrs.	\$1.37	\$1.37	\$2.02	454 hrs.	155 hrs.	127 hrs.		\$66
L H	33.09	\$19.18	110 acres	80 acres	9.16	96 hrs.	\$1.48	\$3.78	\$1.48	454 hrs.	27 hrs.	\$2.29	66 hrs.	
M L	20.79	228 acres	\$ 5.71	81 acres	14,172	\$1.33	\$6.07	\$1.33	\$4.94	381 hrs.	\$4.74	477 hrs.	\$3.61	
M M	23.18	\$ 6.30	\$ 4.05	145 acres	683	\$ 42	\$5.56	\$1.37	\$4.51	454 hrs.	\$4.20	280 hrs.	\$3.14	
M H	33.09	\$19.18	110 acres	77 acres	9.16	53 hrs.	\$1.48	\$3.78	\$1.48	454 hrs.	27 hrs.	\$2.29	7 hrs.	
H L	6.18	228 acres	\$ 4.74	81 acres	7,709	\$1.33	\$14.42	\$1.33	\$9.56	381 hrs.	\$13.09	477 hrs.	\$8.22	
H M	6.18	228 acres	\$ 4.74	81 acres	14,171	\$1.33	\$14.42	\$1.33	\$9.56	381 hrs.	\$13.09	477 hrs.	\$8.22	
H H	19.13	\$14.66	110 acres	59 acres	8.30	6 hrs.	\$9.73	\$1.70	\$6.88	454 hrs.	\$8.26	\$23	\$5.41	

^a If the resource was found limiting the entry in the table is the value imputed to the marginal unit of the resource; hence, the tabular entry is as dollars and cents xx.xx. When the resource is not exhausted the quantity in the table is the amount of the resources available.

^b Using the prices presented in Table 2, L = low, M = medium, and H = high.

Table 26. Additional investments made to achieve optimal enterprise levels, farm class 6 at alternative price combinations.

Price combination		Hog farrowing		Hog finishing		Beef feeding		Beef housing	Calves purchased	Yearlings purchased	Credit limiting	
		Confine't	Portable	Confine't	Portable	High mech.	Low mech.				Real estate	Chattel
Pork	Beef	(Sow)		(Head)		(A.U.)		(A.U.)	(Head)	(Head)		
L	L	0	3	0	5	0	0	0	107	0	No	No
L	M	0	0	0	0	230	0	0	324	0	Yes	No
L	H	0	0	0	0	440	0	29	440	89	Yes	Yes
M	L	0	114	111	688	0	0	0	0	0	No	No
M	M	0	74	33	441	228	0	0	228	0	Yes	No
M	H	0	8	0	0	414	0	23	414	41	Yes	Yes
H	L	0	114	111	688	0	0	0	0	0	Yes	No
H	M	0	114	111	688	0	0	0	0	0	No	No
H	H	0	54	20	299	323	0	0	323	0	Yes	Yes

Table 27. Optimal enterprise levels at alternative prices for large general farms, farm class 9.

Enterprise	Beef Prices								
	\$15.86			\$20.02			\$24.18		
	Pork prices			Pork prices			Pork prices		
	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15	\$11.40	\$14.28	\$17.15
Confinement litters	19	48	48	16	31	48	0	8	14
Portable litters	17	87	88	8	62	88	0	12	32
Calves fed (mech.)	7	0	0	210	198	0	531	514	436
Calves fed	122	0	0	93	0	0	0	0	0
Yearlings fed	0	0	0	0	0	0	32	0	0
Feed grain acres	217	242	242	146	185	242	100	111	76
Silage acres	0	0	0	21	0	0	71	63	47
Oats acres	0	0	0	0	0	0	0	0	0
Soybean acres	133	133	133	133	133	133	65	65	133
Wheat acres	65	65	65	65	65	65	65	65	65
Alfalfa acres	42	0	0	96	64	0	165	157	135
Rotation meadow acres	9	26	26	6	19	26	0	5	10
Pork sold cwt.	742	2,837	2,844	506	1,935	2,844	0	418	938
Beef sold cwt.	834	0	0	1,911	1,277	0	3,403	3,178	2,711
Grain purchased cwt.	0	1,225	1,246	6,149	6,469	1,246	12,457	12,210	12,798
Returns above direct expenses	17,516	25,218	33,393	23,695	27,232	33,393	36,833	37,472	39,516

Table 28. Resources not used or marginal resource values at optimal organizations, farm class 9 at alternative price combinations.^a

Price ^b combination	Cropland	Permanent pasture	Soybean land	Feed grain allotment	Credit	Operator labor				Hired labor				
						1	2	3	4	1	2	3	4	
Pork	Beef	(Acres or Dollars)			(Dollars)	(Hours or Dollars)								
L	L	\$27.71	69 acres	\$ 8.76	113 acres	\$56,680	648 hrs.	\$1.22	314 hrs.	\$2.44	192 hrs.	133 hrs.	509 hrs.	\$1.10
L	M	31.47	\$12.45	\$ 4.44	163 acres	33,326	559 hrs.	\$1.36	\$.97	\$1.81	192 hrs.	33 hrs.	509 hrs.	\$.45
L	H	31.83	\$19.95	68 acres	159 acres	7.86	613 hrs.	\$1.78	\$4.24	\$1.47	192 hrs.	\$.32	\$2.77	133 hrs.
M	L	18.46	198 acres	\$ 5.00	88 acres	29,406	368 hrs.	\$8.65	301 hrs.	\$5.91	192 hrs.	\$7.32	509 hrs.	\$4.57
M	M	21.74	\$ 7.37	\$ 3.67	145 acres	18,314	420 hrs.	\$6.68	167 hrs.	\$5.82	192 hrs.	\$5.32	509 hrs.	\$4.45
M	H	26.47	\$17.92	68 acres	157 acres	7.29	576 hrs.	\$7.81	\$2.69	\$1.46	192 hrs.	\$6.35	\$1.23	89 hrs.
H	L	3.54	198 acres	\$ 3.98	88 acres	29,159	362 hrs.	\$16.72	302 hrs.	\$11.03	192 hrs.	\$15.39	509 hrs.	\$9.70
H	M	3.54	198 acres	\$ 3.98	88 acres	29,159	362 hrs.	\$16.72	302 hrs.	\$11.03	192 hrs.	\$15.39	509 hrs.	\$9.70
H	H	7.76	\$14.62	\$ 2.20	206 acres	1.39	520 hrs.	\$17.64	\$1.38	\$7.05	192 hrs.	\$16.27	72 hrs.	\$5.67

^a If the resource was found limiting the entry in the table is the value imputed to the marginal unit of the resource; hence, the tabular entry is as dollars and cents xx.xx. When the resource is not exhausted the quantity in the table is the amount of the resources available.

^b Using the prices presented in Table 2, L = low, M = medium, and H = high.

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Table 29. Additional investments made to achieve optimal enterprise levels, farm class 9 at alternative price combinations.

Price combination		Hog farrowing		Hog finishing		Beef feeding		Beef housing	Calves purchased	Yearlings purchased	Credit limiting	
		Confine't	Portable	Confine't	Portable	High mech.	Low mech.				Real estate	Chattel
Pork	Beef	(Sow)		(Head)		(A.U.)		(A.U.)	(Head)	(Head)		
L	L	0	3	0	0	7	61	0	129	0	No	No
L	M	0	0	0	0	210	32	2	303	0	Yes	No
L	H	0	0	0	0	531	0	59	0	22	Yes	Yes
M	L	4	82	199	495	0	0	0	0	0	No	No
M	M	0	57	121	301	198	0	0	198	0	Yes	No
M	H	0	2	0	0	514	0	54	514	0	Yes	Yes
H	L	4	84	200	500	0	0	0	0	0	No	No
H	M	4	84	200	500	0	0	0	0	0	No	No
H	H	0	21	0	48	436	0	35	0	0	Yes	Yes

Labor periods two and four are those of most critical supply. Capital is limiting only in the high beef price situations.

CONCLUSIONS

Optimal enterprise combinations do not differ greatly among the nine farm classes. The nature of our model enabled optimal farm plans for various farm classes to converge, since investment activities permit similar patterns of resource allocation.

Some general guidelines can be found. In a model of this size, in addition to the number of solutions presented, it is difficult to find every "corner" in the linear programming framework. Knowledge of these "corners" is useful in making management recommendations. For example, at a given price situation, the ability to recommend to farmers that they buy and feed calves up to the limit of available pasture land or to farrow fall litters up to the limit of fall labor would be helpful.

The profit maximizing organizations tend to place all farms in the livestock type classification. Only in one instance, the medium pork-low beef price combination on Class 3 farms, are there any feed grains sold as a cash crop. At low beef prices, and in certain instances of low pork prices, soybeans are the only cash crop. Based on results of this study, this southeastern Nebraska area may find the incorporation of additional livestock in their farm plans to be profitable.

Under the optimizing conditions of this model, the cropping plan follows patterns of livestock production. This is in contradiction to the often postulated strategy for farmers that livestock enterprises should be designed around the cropping plans.

At the price levels considered, there are always livestock activities in the profit maximizing plans. Alfalfa and rotation meadow production follows the level of the beef and pork activities, respectively.

As land becomes more ample relative to the amount of labor available soybean activity is quite common in the profit maximizing plans. On the small-and medium-sized farms soybeans are not produced to any extent outside of the low pork-low beef and low pork-medium beef price situations. The medium-sized general farms are an exception to this generalization. Land needs directly associated with livestock activities (alfalfa and rotation meadow) preclude raising soybeans on these smaller farms with more limited amounts of land available relative to labor and capital. On larger farms where the labor-land ratio is smaller, soybeans are grown quite widely except at high beef prices. At high beef prices the land intensive alfalfa requirements force soybeans from the profit maximizing plans.

In general, feed grains occupy land not allocated to alfalfa, rotation meadow, and soybean activities. As a consequence feed grain acreage

allocation is not generally restrictive. Farm production of hay and forage is required but feed grains may be bought.

Pasture land is left idle whenever the price of pork is greater than the price of beef in the ordering sequence. In addition, on the three larger farms, pasture is only partially used at the low pork-low beef price combinations.

On small farms capital and land tend to be the most limiting resources. As farms get larger the capital constraint becomes less restricting as the labor supply (especially in certain periods) becomes exhausted. The dual solution of all standard linear programming problems provides information about the relative scarcity of the different resource restraints.⁶ The level of resource use multiplied by the values imputed to these resources in the dual is equal to the value of the objective function at the optimal solution. If a particular type of resource, say labor, is of a relatively more critical supply in one situation rather than another, the percentage of the total imputed value (value of the objective function) attributed to that resource would be greater.

Table 30 summarizes the relative shares of total imputed value for each of the farm classes at the medium pork-medium beef price combinations. One can see from this table that labor is of relatively more limited supply on large farms (Classes 3, 6, and 9) and that the capital limitation is not as serious at current resource combinations. Further analyses, perhaps with some variable resource programming, could provide added insights about increased revenue to be gained by making available increased amounts of various resources.

Table 30. Percent of total value imputed to the three major resource groups by farm class; medium pork-medium beef price combination.

Farm class	Labor	Capital	Land
1	28	32	34
2	32	23	40
3	57	4	30
4	30	25	36
5	30	29	36
6	47	5	40
7	9	39	43
8	33	23	37
9	48	4	39

⁶ The dual solution is the term applied to the imputation of returns to the resource restraints.

