Corn

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PRODUCTION SYSTEMS CONSIDERED IN THE ANALYSIS

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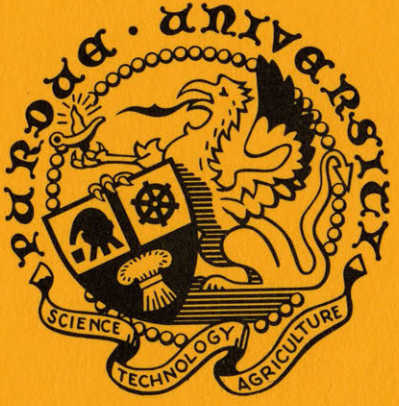

DEPARTMENT OF AGRICULTURAL ECONOMICS

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PRODUCTION SYSTEMS CONSIDERED IN THE ANALYSIS

Various methods of producing corn, hogs and cattle were considered in the linear programming analysis. These methods are described and resource requirements and production are presented for each system.

Corn Production Systems

The different corn production systems involved various - Field Operations - Machinery Systems - Seed Varieties - Planting Periods and - Harvesting Periods.

A. Field Operations and Tillage Systems

The various operations involved in corn production are defined as follows:

1. Preplant operations: These include all spring operations prior to planting. The nature of these depends on the tillage system chosen.
2. Planting
3. Mid Season: midseason operations are the same for all tillage systems and involve one cultivation and the application of anhydrous ammonia in June.
4. Harvesting
5. Fall operations: again these depend on the tillage system chosen.

The relationship of these operations to each other is illustrated diagrammatically in Figure C.1.

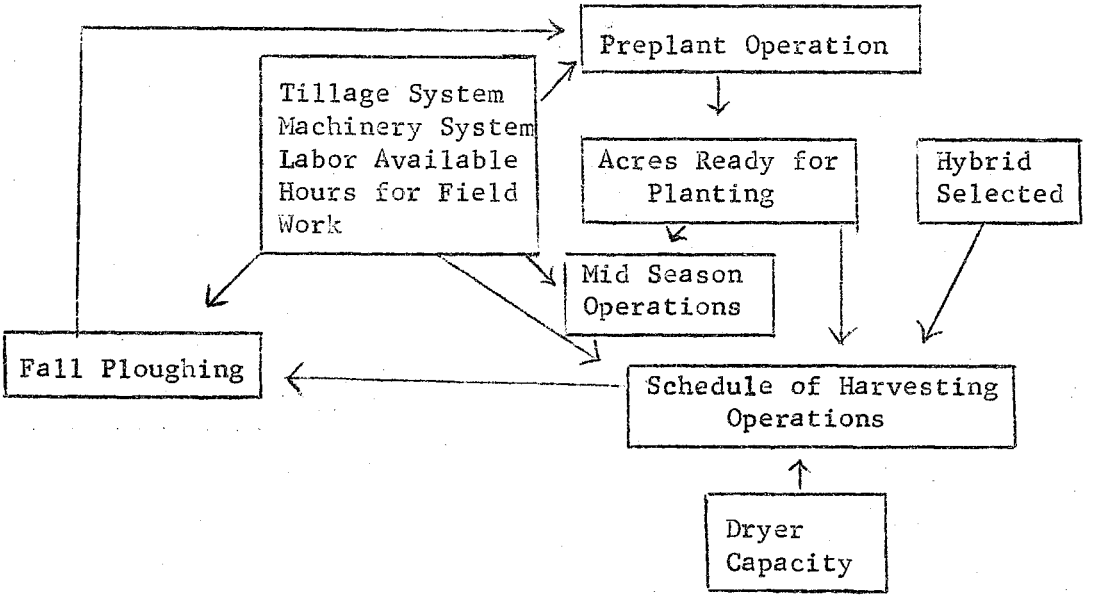

Figure C.1 Corn Sub-system.

In Figure C.1, the acres that can be planted in any particular week in April - May depend on the number of acres ready for planting at this time. This is turn depends on the number of days in the early spring in which field work can be carried out, the tillage - machine - labor force combination, and the number of acres that were plowed in the fall. The number of acres prepared in the Fall depends on the time available after harvest and before winter, which in turn depends on the planting schedule and the hybrids chosen.

All shell corn is dried and stored at a total cost of 10 cents per bushel (excluding dryer fixed cost). Corn may be sold or fed to livestock.

The corn silage production activities produce feed for

cattle production. The preplant, planting, and midseason operations are the same as for shelled corn. The chopping and silo filling are custom hired at a fixed charge per acre.

Three tillage systems considered in the analysis include:

(1) Conventional tillage:

Spring preplanting: a. with fall plowing; plow, 1 disc, 1 harrow

b. with spring plowing; plow, 1 disc, 1 harrow

Planting: 40" rows with fertilizer, herbicide

Midseason operations: one cultivation and application of anhydrous ammonia

Harvesting: 40" row combine. Harvesting for shell corn begins when corn is mature (30% moisture).

Fall operations: a. stalk chopping, plowing

b. stalk chopping

(2) Till Planting:

Preplant: stalk chopping

Planting: 40" rows with fertilizer, weedicide

Midseason and Harvesting: as for (1)

Fall operations: stalk chopping

(3) Minimum tillage:

Preplant: stalk chopping, plowing

Planting: 40" rows with fertilizer,

Midseason and Harvesting: as for 1 and 2

Fall operations: stalk chopping, plowing

The tillage system is not considered to affect yield except when it affects timeliners or the variety of seed selected.

The machinery system affects mainly machinery and labor costs. (See Table A-2 for costs of various operations with different machine systems).

B. Machinery Systems

The three machinery systems shown in table 1 were considered. Costs and investment for these different systems are presented in appendix tables A-1 and A-2.

C. Seed Varieties

(1) Hybrid A - Maturity period, 18 weeks

(2) Hybrid B - Maturity period, 22 weeks

(3) Silage Hybrid - Maturity period, 20 weeks

The yields for seed varieties by planting and harvesting dates are shown in Table 2 and 3.

D. Planting Dates

(1) Period 1, Week beginning April 19

(2) Period 2, Week beginning April 26

(3) Period 3, Week beginning May 3

(4) Period 4, Week beginning May 10

E. Harvesting Periods

(1) Month of September

(2) Month of October

(3) Month of November

Table 1. Three Corn Machinery Combinations[1/]

	Machinery System	Tillage System: Till Plant	Minimum Tillage	Conventional
System #1	Tractors	2, 35 DBHP, Gasoline	2, 35 DBHP Gasoline	2, 35 DBHP Gasoline
	Plows	--	1, 3 bottom	1, 3 bottom
	Discs	--	--	1, 12'
	Harrows	--	--	1, 35'
	Planters	1, 4 row	1, 4 row	1, 4 row
	Cultivators	1, 4 row	1, 4 row	1, 4 row
	Combines	1, 4 row	1, 4 row	1, 4 row
	Auger Wagons	2,	2,	2,
	Dryers	1, 500 bushel	1, 500 bushel	1, 500 bushel
	Stalk Choppers	1, 4 row	1, 4 row	1, 4 row
System #2	Tractors	2, 70 DBHP Diesel	2, 70 DBHP Diesel	2, 70 DBHP Diesel
	Plows	--	1, 6 bottom	1, 6 bottom
	Discs	--	--	1, 20'
	Harrows	--	--	1, 35'
	Planters	1, 8 row	1, 8 row	1, 8 row
	Cultivators	1, 8 row	1, 8 row	1, 8 row
	Combines	1, 6 row	1, 6 row	1, 6 row
	Auger Wagons	2,	2,	2,
	Dryers	1, 750 bushel	1, 750 bushel	1, 750 bushel
	Stalk Choppers	1, 6 row	1, 6 row	1 6 row
System # 3	Tractors	2, 95 DBHP	2, 95 DBHP	2, 95 DBHP
	Plows	--	1, 7 bottom	1, 7 bottom
	Discs	--	--	1, 22'
	Harrows	--	--	1, 35'
	Planters	2, 8 row	2, 8 row	2, 8 row
	Cultivators	1, 8 row	1, 8 row	1, 8 row
	Combines	2, 6 row	2, 6 row	2, 6 row
	Auger Wagons	3,	3,	3,

1/ Costs for various machinery and tillage systems are shown in Table A-2, A-3.

Table 2. Hybrid Yields and Returns for Various Planting and Harvesting Dates.[1/]

Plant	Harvest	Yield (bushels) ** Hybrid A	Hybrid B
Week beginning: April 19 (42)*	September (332)*	120.21	--
	October (304)	118.10	146.06
	November (150)	--	142.62
April 26 (44)	September (332)	147.53	--
	October (304)	144.62	128.57
	November (150)	--	125.67
May 3 (47)	September (332)	150.08	--
	October (304)	146.69	116.28
	November (150)	--	114.24
May 10 (61)	September (332)	140.06	--
	October (304)	137.32	111.51
	November (150)	135.47	110.00

*Numbers in parentheses refer to hours available for field work in the given period

**Yields represent the average yield if harvesting was spread over the month.

1/ Unless otherwise stated, all data for the corn sub-system is taken from Groenwald, J. A., "Selection of Optimum Processes and Machinery Combinations in Crop Production on Corn Belt Farms," unpublished Ph. D. Thesis, Purdue University, 1957.

Table 3. Corn Silage Yields.

Week of Planting	Tons of Silage Per Acre
April 19	24.9
April 26	23.8
May 3	21.5
May 10	20.6

F. Resources Required

(1) Labor (man hours), monthly and annual

(2) Land

(3) Machinery

(4) Hours available for field work in preplanting, planting, harvesting and post-harvesting periods.

G. Operating Costs and Prices

Operating costs for machinery are shown in appendix Tables A-1 and A-2. Costs of seed, feritlizer and herbicide by variety are shown in table 4.

Table 4. Seed, Fertilizer and Herbicide Variable Costs Per Acre.

	Hybrid A	Hybrid B (Planted Periods 2, 3)	Hybrid B (Planted Periods 4, 5)
Total Cost	37.74	36.03	34.17

All shelled corn is dried and stored at a total charge of 10 cents per bushel (excluding dryer fixed cost). This corn may then be sold at a price of $1.15 per bushel or fed to livestock.

The preplant, planting, and midseason operations for corn silage production are the same as for shelled corn. The corn silage is custom harvested in September at a rate of $1.30 per ton (one man, two wagons, tractor, chopper, and blower). Other variable costs amount to $39.95 per acre of corn silage planted before May 3 and $37.49 per acre after that date. Hauling the silage and silo filling requires 1.82 man-hours of labor in September. The silage harvesting operation also requires .91 field hours per acre in September.

Swine Production Systems

Over the past five years, various facilities for the farrowing, nursery, finishing and gestation stages of hog production have been evaluated experimentally at Purdue University. These experiments, were used to provide the necessary data for the swine production system.[1/]

A. Three Farrowing Houses

(1) F_1; Crates, slotted floor, sows fed inside.

(2) F_2; Crates, concrete floor, sows fed outside.

(3) F_3; Individual outside houses.

B. Two Nursery Houses

(1) N_1; Total slats, 4 week weaning.

(2) N_2; Pole nursery, 3 week weaning

1/ The results of these studies are available in the following publications: Daniel, R., "An Economic Evaluation of Swine Farrowing and Nursery Systems," Unpublished M. S. Thesis, Purdue University, June 1967; Jones, H. W. et al., "Studies of Farrowing and Nursery Systems," Research Progress Report 237, Purdue University Agr. Expt. Sta., Sept. 1966; Bache, D.H., "An Economic Evaluation of Swine Growing-Finishing Facilities." unpublished M.S. Thesis, Purdue University, 1965; Crawford, R.W. "An Economic Analysis of Swine Growing-Finishing Housing Systems" unpublished M.S. Thesis, Purdue University, June 1965; Kadlec et al., "Comparison of Swine Growing-Finishing Building Systems," Purdue University Agr. Expt. Sta. Bull. 815, August 1966.

C. Five Finishing Houses

(1) FI_1; Open front, pole building

(2) FI_2; Enclosed partially slotted floor, 4¼' x 14' pens.

(3) FI_3; Enclosed concrete floor, 18' x 18' pens.

(4) FI_4; Enclosed slotted floor, 18' x 18' pens, 4" slats.

(5) FI_5; Pasture, portable houses.

D. Three Farrowing Intensities

(1) Farrow four times per year: December, February, June, August.

(2) Farrow six times per year: December, January, February, June, July, August.

(3) Farrow every month.

E. Two Hog Marketing Systems

(1) Sell as feeder pigs (40 pounds)

(2) Sell as market hogs (210 pounds)

One type of gestation house is used. This is an open front partially slotted house where sows are kept in groups of about 15 sows.

The following assumptions are made:

1. Under farrowing intensity (1) above, which does not require farrowing in consecutive months, the farrowing house is used as a nursery facility. The pigs are transferred from the farrowing house directly to the finishing facility when they weigh 40 pounds. They may also be sold as feeder pigs at this stage.
2. Under farrowing intensities (2) and (3), it is assumed that a nursery facility must be used.

3. Pigs weaned at 4 weeks can use only N_1 while those weaned at 5 weeks can use only N_2. This assumption is required to use the experimental results.

4. Facilities may already exist on the farm or be purchased. Which of the alternatives is followed depends on the particular case being studied.

F. Resources Required

(1) Labor (man-hours) monthly and annual

(2) Corn raised

(3) Land (required only by pasture finishing system, FI_5)

(4) Building capital (required for the purchase of new building capacity)

G. Costs, Output and Prices

A summary of costs and labor requirements for the various systems is presented in appendix Tables A-3 to A-7. More detailed information about costs and production rates of various systems can be obtained from Purdue A.E.S. bulletin 810 and Purdue Progress report 267.

Annual average hog price was considered to be $17.00.

RESOURCE ACQUISITION

The resource acquisition alternatives allow for the purchase or rental of additional land and for the hiring of seasonal labor.

The upper limits on the amounts of these resources which can be acquired depends on the case under consideration.

A. Land acquisition:
    1. Purchase
    2. Rent

B. Seasonal Labor Acquisition
    1. Hire in January
    2. Hire in February
    3. Hire in March
    4. Hire in April
    5. Hire in May
    6. Hire in June
    7. Hire in July
    8. Hire in August
    9. Hire in September
    10. Hire in October
    11. Hire in November
    12. Hire in December

Beef Production Systems

The beef feeding alternatives include the purchase of steer calves, heifer calves, yearling steers, or any combination of these animal types. In each case they are fed rations consisting of corn, corn silage, and supplement.

The animals can be fed in either of three types of housing and mechanization. The first is a conventional paved feedlot with auger bunks and concrete silos. The second is also a conventional feedlot but with fence-line bunks and bunker silos. The third is a confinement feeding setup with slotted floors, augar bunks, and concrete silos. The labor, variable costs, and fixed costs per head vary depending on the housing and mechanization used. Feed requirements are assumed to be the same for each type.

In addition, three alternative size capacities are considered for each type of housing and mechanization. Labor, variable costs, and fixed costs per head are influenced by size, but feed requirements per head do not change.

A. Type of Animal Purchased

(1) Steer calf (a 450 lb calf is purchased in October, fed 11 months and sold as a 1050 lb choice steer).

(2) Heifer calf (a 400 lb. calf is purchased in October, fed 10 months, and sold as a 900 lb choice heifer)

(3) Yearling steers (the 700 lb steers are purchased in October and April, fed 6 months, and sold as 1050 lb choice steers--two groups of cattle are finished per year).

B. Type of Housing and Mechanization

(1) Auger bunk (open-front cattle sheds with paved lots, auger bunks, concrete silos, and conventional manure handling equipment).

(2) Fence-line bunk (same as above except for fence-line bunks and bunker silos).

(3) Confinement (enclosed cattle sheds with slotted floors, auger bunks, concrete silos, and liquid manure handling equipment).

C. Size of Capacity

(1) 250 head

(2) 500 head

(3) 1000 head

D. Resources required

(1) Labor, monthly and annual

(2) Feed, corn and corn silage

(3) Housing capacity (one head per unit of capacity for steer and heifer calves and two head per unit for yearling steers).

E. Costs and Prices

A summary of costs (variable and fixed), prices, and feed and labor requirements is presented in appendix Tables A-10 through A-15.

APPENDIX
BACKGROUND DATA

CORN

Table A-I. Machinery Fixed Costs.

Machinery System Number	Machine Description	Number of Machines	Cost New (Per Machine)	Annual Use Charge* Till Plant	Minimum Tillage	Conventional
1	35 DBHP Gasoline Tractor	2	3980	880	880	880
	3 bottom plow	1	920	--	154	154
	12' tandem discs	1	990	--	--	165
	35' harrows	1	660	--	--	110
	4 row planter	1	1000	235	235	235
	4 row cultivator	1	3700	619	619	619
	4 row stalk cutter	1	1730	289	289	289
	4 row Combine	1	10550	2479	2479	2479
	500 bushel dryer	1	5820	1298	1298	1298
	Wagon	2	600	138	138	138
		Total		5938	6092	6367
2	70 DBHP Diesel Tractor	2	6690	1572	1572	1572
	6 bottom plow	1	1810	--	304	304
	20' tandem discs	1	1850	--	--	310
	35' harrows	1	660	--	--	110
	8 row planter	1	2370	557	557	557
	8 row cultivator	1	4500	753	753	753
	6 row stalk cutter	1	2700	451	451	451
	6 row combine	1	17700	3944	3944	3944
	750 bushel dryer	1	7300	1829	1629	1629
	Wagon	2	600	138	138	138
		Total		9044	9348	9768
3	95 DBHP Diesel Tractor	2	9090	2136	2136	2136
	7 bottom plow	1	2620	--	438	438
	22' tandem discs	1	1970	--	--	330
	35' harrows	1	660	--	--	110
	8 row planter	2	2370	1113	1113	1113
	8 row cultivator	1	4500	753	753	753
	6 row stalk cutter	1	2700	451	451	451
	6 row combine	2	17700	8140	8140	8140
	750 bushel dryer	2	7300	4200	4200	4200
	Wagon	3	600	207	207	207
		Total		17000	17438	17879

* Taxes, Interest, Housing: 10% of average value of machine over its life. Straight line depreciation assuming a salvage value 10% of new price. Estimated equipment life: Tractors, 10 years; Tillage, 8 years; Planting and Harvesting, 5 years.

Table A-2. Performance and Variable Costs of Various Machines (Per Acre)*.

	Activity							
	Cut Stalks	Plow	Disc	Harrow	Plant	Cultivate, Fertilize	Transport Grain	Combine
35 DBHP Tractor: (Gasoline)								
Hours/Acre	.28	.61	.28	.11	.16	.21	.32	
Labor/Acre	.31	.67	.31	.12	.19	.31	.71	
Fuel Cost	.24	.52	.24	.09	.11	.15	.23	
Repairs**	.10	.36	.10	.03	.08	.19	.40	
Total Cost	.34	.88	.34	.11	.19	.34	.63	
70 DBHP Tractor:								
Hours/Acre	.14	.31	.16	.09	.09	.10	.32	
Labor/Acre	.15	.34	.18	.10	.11	.15	.71	
Fuel Cost	.10	.23	.12	.05	.03	.06	.19	
Repairs **	.11	.34	.10	.04	.09	.12	.42	
Total Cost***	.21	.57	.22	.09	.14	.18	.61	
95 DBHP Tractor:								
Hours/Acre	.14	.26	.14	.09	.09	.10	.20	
Labor/Acre	.15	.29	.16	.10	.11	.15	1.00	
Fuel Cost	.13	.24	.13	.07	.07	.07	.32	
Repairs**	.13	.40	.11	.05	.10	.13	.60	
Total Cost	.26	.64	.24	.12	.17	.20	.92	
4 Row Combine:								
Hours/Acre								.44
Labor/Acre								.66
Total Cost								1.61
6 Row Combine:								
Hours/Acre								.32
Labor/Acre								.48
Total Cost								1165

* Source Greenwald, op. cit. and Davis, V. W., "Economic Considerations in Choosing a Corn Harvesting Method," Illinois University AERR-63, 1963.

** Repairs on both tractor and associated equipment.

*** Fuel and repairs.

Hogs[2/]

The hog sub-system is based on the following schedule of operations:

1. Sows farrow on the first of each month in which farrowing occurs and the sow, plus her litter, is kept in the farrowing facility for one month.
2. Under M4, pigs are kept in the farrowing house for 8 weeks. Under M6 and M12, they are transferred to the Nursery building at 4 weeks where they are kept until they are 8 weeks old and weigh approximately 40 pounds.
3. At 8 weeks the pigs may be sold as feeders or transferred to the finishing facility. The time taken for finishing depends on the house used and the season. Market hogs are sold at 210 pounds liveweight.

The costs and feed requirements for the house management systems studied are given in Table B-5. Note that all coefficients are expressed in terms of units of building capacity. For example, M4 involves farrowing 4 times per year and thus the costs, feed requirements, etc. represent 4 farrowings.

2/ Based on the publications referred to above. For full details see: Schroder, W. R., "Application of Systems Models in the Analysis of Selected Swine Management Decisions," unpublished Ph.D. Thesis, Purdue University, 1967.

Table A-3. Costs and Feed Requirements Associated with Various Housing-Management Systems (Per Unit of Building Capacity Per Year).

House	Management System								
	M4			M6			M12		
	Variable Cost*	Building Cost**	Corn Required***	Variable Cost*	Building Cost**	Corn Required***	Variable Cost*	Building Cost**	Corn Required***
F1	134.48	48.48	45.44	91.26	48.48	22.02	182.51	48.48	44.04
F2	134.61	40.32	45.00	91.76	40.32	21.42	183.49	40.32	42.84
F3	139.08	37.16	46.04	87.26	37.16	27.3	174.53	37.16	54.6
N1	--	--	--	11.96	3.08	10.62	23.93	3.08	21.24
N2	--	--	--	7.66	2.20	10.62	15.33	2.20	21.24
FI1	41.40	2.32	19.36	41.40	2.32	19.36	49.68	2.32	23.23
FI2	39.18	6.20	18.88	39.18	6.20	18.88	47.02	6.20	22.66
FI3	42.94	5.39	19.26	42.94	5.39	19.26	51.53	5.39	23.11
FI4	39.92	6.32	18.92	39.92	6.32	18.92	47.90	6.32	22.70
FI5****	41.58	2.57	20.02	41.58	2.57	20.02	49.90	2.57	24.0

* Includes all feed costs except corn, veterinary costs, electricity bedding, discounts and removals, interest and taxes on hogs, sow weight loss (nursery houses only), marketing charge (finishing houses only). Farrowing cost based on 4 weeks use of facility for M6 and M12; 8 weeks for M4.

** Includes depreciation, taxes, interest on investment.

*** Corn component of ration fed in bushels.

**** Pasture finishing house also has land requirements as follows: M4, 0.048 acres per unit capacity; M6, 0.048 acres; M12, 0.058 acres.

Table A-4. Monthly and Annual Labor Requirements for Various Housing-Management Systems (Per Unit Capacity).

House		Management System Hours		
		M4	M6	M12
F1	Month	2.56	2.56	2.56
	Annual	15.08	15.36	30.72
F2	Month	4.38	4.38	4.38
	Annual	30.32	26.28	52.56
F3	Month	4.29	4.29	4.29
	Annual	25.88	25.74	51.48
N1	Month	--	.095	.095
	Annual	--	.57	1.14
N2	Month	--	.16	.16
	Annual	--	.96	1.92
FI1**	Month:			
	Summer	.26	.26	.26
	Winter	.24	.24	.24
	Annual	2.04	2.11	2.41
FI2	Month:			
	Summer	.13	.13	.13
	Winter	.15	.15	.15
	Annual	1.28	1.15	1.38
FI3	Month:			
	Summer	.25	.25	.25
	Winter	.17	.17	.17
	Annual	1.92	1.88	2.25
FI4	Month:			
	Summer	.12	.12	.12
	Winter	.14	.14	.14
	Annual	1.11	1.15	1.32
FI5	Month:			
	Summer	.21	.21	.21
	Winter	.24	.24	.24
	Annual	1.84	1.82	2.17

* Labor requirements for 8 weeks use of facility under M4.

** Average month's labor requirement for the finishing stage depends on the rate of gain which, in turn, depends on the season and the house used. The labor requirements in any particular month depend on the farrowing distribution.

Table A-5. Gestation Building Costs (Per Unit Sow Capacity).

Building Annual Use Cost	$8.92
Equipment Cost	3.60
Repairs	3.00
Total Building Cost (Per Unit Sow Capacity)	15.52

Building Investment $80 per sow.

Table A-6. Gestation Variable Costs (Per Sow Per Day).

Feed	0.1674
Death Loss	0.0039
Veterinary	0.0033
Electricity	0.0033
Interest, Taxes	0.0049
Total	0.1795

Table A-7 Budgeted Costs and Returns for 6 Types of Farrowing Systems, Farrowing to 21 days After Farrowing (projected to 32-sow units based on fall and spring experiments, 1965-66) 1/

Cost per Sow and Litter Farrowing to 21 days after Farrowing Item:	Systems Crates Concrete Floor Sows Fed Inside	Crates Slotted Floor Sows Fed Inside	Crates Concrete Floor Sows Fed Outside	Pens Concrete Floor Sows Fed Outside	Portable Houses with slotted Outside Pens
		F 1	F 2		F 3
Building and Equipment (assumes 4 farrowings per year)	$10.31	$12.12	$10.08	$10.26	$ 9.29
Feed	5.03	5.03	5.03	5.03	6.30
Labor:					
Cleaning and bedding	2.76	.49	1.42	1.31	.08
Feeding	.92	.92	3.22	3.37	2.80
Cleaning between farrowings	2.00	2.50	1.83	1.50	4.00
Miscellaneous	.59	.58	.59	.61	.61
Bedding	.05	--------	.03	.65	.63
Veterinary and Drugs	3.60	3.60	3.60	3.60	2.81
Sow and Death Loss	.80	.80	.80	.80	.80
Electricity	3.65	3.65	3.65	3.65	2.80
All other costs	1.86	1.86	1.86	1.86	1.90
Total Cost per Sow and Litter (Other than sow depreciation)	$31.57	$31.55	$32.11	$32.64	$32.02
Cost other than labor	25.30	27.06	25.05	25.85	24.53
Investment per sow capacity	338.15	391.49	294.33	319.35	202.65
Hours of Labor per sow and litter	3.13	2.24	3.53	3.40	3.75
Per cent Pigs Saved Per litter	90	90	90	81	81
Average Pig weights per litter at 21 days	11.76	11.76	11.76	11.76	12.87

1/ For a complete description of systems and methods used in determining costs, see Purdue A.E.S. Research Progress Report 267, "Studies of Farrowing and Nursery Systems" September, 196 .

Table A-8 Budgeted Costs and Returns, Four Types of Nursery Systems 21 to 56 Days (Projected to a 32-sow herd based on fall and spring experiments, 1965-66). 1/

Cost per pig 21 to 56 days	SYSTEMS			
Item:	Total Slats Weaned 3 wks.	Partial Slats Weaned 3 wks.	Pole Nursery Weaned 6 wks.	Portable Houses Weaned 6 wks.
	N 1		N 2	
Building and Equipment (Assumes 4 groups per year)	$ .80	$ .77	$ .55	$ 1.05
Feed	2.47	2.47	1.80	1.82
Labor:				
Cleaning and bedding	.05	.12	.21	.04
Feeding	.06	.06	.09	.38
Cleaning between groups	.11	.11	.08	.44
Bedding	---	---	.06	.06
Veterinary and Drugs	1.15	1.15	1.15	1.13
Pig death loss	.31	.31	.74	.31
Electricity	.93	.93	.13	.37
Sow weight loss	---	---	.12	.44
Other cost	.42	.42	.57	.57
Total Cost per pig	6.30	6.34	5.56	6.59
Cost other than labor	6.08	6.34	5.20	5.28
Investment per pig capacity	26.64	25.41	15.39	22.52
Minutes of labor per pig	6.33	8.25	11.48	26.07
Average weight at 56 days	33.40	33.48	35.76	34.24

1/ For a complete description of systems and methods used in determining costs, see Purdue A.E.S. Research Progress Report 267, "Studies of Farrowing and Nursery Systems" September, 1966.

Table A-9 Budgeted costs and returns per pig, seven types of growing-finishing facilities.[1/]

Item	FI 1	FI 2	FI 4		FI 5
	A	B	D 1	D 2	E
	Conventional pens 18'x20' inside & 18'x20' outside	Enclosed Partially slotted floor 4½'x14" pens	Enclosed slotted floor 1½" slats 18'x18' Pens	Enclosed slotted floor 4' slats 18'x18' pens	Pasture portable houses
Building & equipment	$ .72	$ 2.04	$ 2.58	$ 2.11	$ .82
Feed (150 lb. of gain)	15.85	15.17	16.73	15.17	15.42
Labor for cleaning and bedding	1.15	.17	.10	.10	.80
Other labor	.80	1.00	1.20	1.00	1.00
Bedding	.42	.00	.00	.00	.60
Death loss and injury	.51	.43	1.97	1.55	.84
Veterinary & medicine	.15	.14	.40	.29	.19
Electricity	.09	.35	.35	.35	.09
Interest, taxes & insurance on hogs	.60	.60	.60	.60	.60
Marketing	1.20	1.20	1.20	1.20	1.20
Sub total	21.49	21.10	25.13	22.37	21.56
Feeder pig cost	14.50	14.50	14.50	14.50	14.50
TOTAL COST	35.99	35.60	39.63	36.87	36.06
Cost per cwt. hog produced	17.14	16.95	18.87	17.56	17.17
Hours of labor & management per hog fed	.98	.59	.65	.55	.90
Investment per 200 lb. hog capacity-- Housing feeders, waterers	18.00	45.89	47.50	46.25	16.45

1/ For detailed information about the systems compared and methods of computing cost, see Purdue A.E.S. Research Bulletin 816, Comparison of Swine Growing-Finishing Building Systems, August 1966.

BEEF

Table A-10. Total Annual Direct Labor Requirements per Unit of Feedlot Capacity

Type and Size of Feedlot	Steer	Heifer	Yearlings[a/]
	(manhours per year)		
Auger			
250	2.98	2.58	3.31
500	2.48	2.15	2.75
1000	2.23	1.93	2.48
Fence-line			
250	3.48	3.02	3.87
500	2.71	2.35	3.01
1000	2.33	2.02	2.59
Confinement[b/]			
250	2.09	1.81	2.32
500	1.74	1.51	1.93
1000	1.56	1.36	1.74

[a/] Two head finished per year per unit of feedlot capacity.

[b/] It is assumed that the confinement feedlot requires one-half the labor to haul manure and no bedding labor as compared to the auger system.

Source: Data collected by Tom Irrer for unpublished M.S. thesis, Purdue University, 1967, and data adapted from Roy N. VanArsdall, "Resource Requirements, Investments, Costs and Expected Returns from Selected Beef-Feeding and Beef-Raising Enterprises in Illinois--1965," AE-4075, University of Illinois, p. 24.

Table A-11. Distribution of Total Annual Direct Labor Requirements Among Months.

Month	Steer	Heifer	Yearlings[a/]
		(percent)	
January	9.7	11.4	8.4
February	8.7	9.1	7.5
March	9.8	10.4	8.8
April	9.0	10.1	8.3
May	8.9	10.6	8.8
June	8.2	9.9	8.2
July	8.1	5.1	8.0
August	8.9	2.0	8.8
September	5.4	2.2	9.0
October	5.3	6.8	7.8
November	8.3	10.4	8.0
December	9.7	12.0	8.4
	100.0	100.0	100.0

[a/] Two head finished per year per unit of feedlot capacity.

Source: Adapted from Van Arsdall, p. 24.

Table A-12. Annual Feed Requirements per Unit of Feedlot Capacity[a/]

Feed	Steer	Heifer	Yearlings
Corn (bu.)	32	26	46
Supplement (lb.)	500	450	540
Corn Silage (t.)	4.2	3.6	6

[a/] It is assumed initially that the feed required is the same under each size and type of housing and mechanization system.

Table A-13. Budget of Variable Costs and Returns for Steers, Heifers, and Yearlings.

Item	Steer	Heifer	Yearlings[a/]
I. Return			
A. 1050 lb. choice steer ($26.00/cwt.)	$273.00		$546.00
B. 900 lb. choice heifer ($25.10/cwt.)		$225.90	
C. Less death loss	2.11	1.81	2.20
D. Manure credit	4.50	4.00	5.00
II. Costs			
A. Livestock purchase			
1. 450 lb. steer calf ($26.50/cwt.)	119.25		
2. 400 lb. heifer calf ($23.80/cwt.)		95.20	
3. 700 lb. yearling steer ($23.90/cwt.)			334.60
B. Feed costs			
1. Supplement ($4.20/cwt.)	21.00	18.90	22.68
C. Other Costs			
1. Purchase expense	4.38	4.19	12.12
2. Marketing expense	7.11	6.03	13.96
3. Vet and medical	1.50	1.25	1.50
4. Feed storage and processing		(See Table	
5. Fuel, Lubricant, and repair	1.50	1.20	1.80
6. Taxes on cattle	1.20	1.10	1.60
7. Bedding[b/]	(5.50)	(5.00)	(6.00)
8. Interest on operating capital (6%)	6.96	4.54	10.63
9. Miscellaneous	.60	.50	1.00

[a/] Two head per year.

[b/] There is no bedding cost in confinement housing.

Source: Adapted from VanArsdall; Robert C. Suter, "Farm Planning Props," Advanced Farm Management Class, Purdue University, 1967; and "Farm Planning Discussion Outlines for Farm and Home Management," ID.68, Cooperative Extension Service, Purdue University, 1966.

Table A-14. Annual charge per head for storing silage and handling processing feed[a/]

Size and Type of Housing	Steer	Heifer	Yearlings[a/]
		(dollars)	
Auger			
250	6.74	6.10	8.69
500	5.88	5.24	7.83
1000	5.65	5.01	7.60
Fence-Line			
250	3.61	3.28	4.60
500	2.69	2.43	3.49
1000	3.08	2.89	3.68
Confinement			
250	6.74	6.10	8.69
500	5.88	5.24	7.83
1000	5.65	5.01	7.60

[a/] It is assumed that the silos, supplement bins, and feed houses have an annual use cost of 11 percent of new cost and that the annual use cost for silo unloaders and processing equipment is 18 percent of new cost.

[b/] Two head per year.

Source: Adapted from Tom Irrer's data.

Table A-15. Annual Fixed Cost for Buildings and Equipment. [a/]

Type of Housing	CAPACITY		
	250	500	1000
Conventional Auger[b/]	4,141	6,094	9,979
Conventional Fence-Line[c/]	4,876	6,657	11,202
Confinement Auger[d/]	6,110	9,057	16,603

[a/] Annual fixed cost is assumed to be 11 percent of the new cost for buildings, concrete lots, fences, and bunks. For equipment the annual fixed cost is 18 percent of new cost.

[b/] The conventional auger feedlot system consists of open-front pole barns and concrete lots. The feed is delivered from the concrete silos to the cattle with augers. Manure is handled with a loader, scraper and spreaders.

[c/] The conventional fence-line feedlot system also utilizes pole barns and concrete lots, and the manure is handled in the same way as in the auger system. However, the feed is delivered from a bunker silo in a forage box.

[d/] The confinement system utilizes auger feeding and consists of completely enclosed buildings on slotted floors. Manure is handled with a tank wagon and pump.

Source: Data collected by Tom Irrer for unpublished M.S. thesis, Purdue University, 1967.