ECONOMICS OF THE KANSAS EGG ENTERPRISE

by

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B. S., Taiwan Provincial College
of Agriculture, Taiwan, China, 1956

A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics and Sociology

KANSAS STATE UNIVERSITY
OF AGRICULTURE AND APPLIED SCIENCE

1960

TABLE OF CONTENTS

INTRODUCTION

The Problem and Reasons for the Study

An experimental pole-type poultry house, adaptable for brooding and rearing chicks to laying age and for use as a laying house, was built in the summer of 1959 at the poultry farm of Kansas State University. This house is similar in design and construction materials to several in use by a large commercial poultry farm in south central Kansas.

The house features numerous panels which may be opened for better ventilation and emphasizes economy in its construction. A modified floor plan (slatted floors and dirt floors) system of management is used.

Building plans for the experimental house were published in the November, 1959, Kansas Agricultural Situation and the house has received widespread publicity in Kansas and other midwestern areas.

Based on preliminary favorable production results from layers housed in the new experimental house, its use by farmers has been recommended by the Department of Poultry Husbandry at Kansas State University. However, an economic analysis of the profit potentialities of the Kansas egg enterprise using this particular house would be most valuable to farmers. This is especially true under the adverse conditions of 1958-59 when egg prices were relatively low and many poultrymen were forced out of business.

In view of the continuing trend toward commercialization involving fewer but larger farm laying flocks, many farmers have to decide whether to continue the egg enterprise or shift their limited resources to some other farm enterprise competing for capital and labor. As a basis for sound decision making, farmers need information on the capital requirements, and

probable costs and returns from a commercial-size laying flock using this new house. A previous study[1] provided similar information for cages and floor plan systems of management with other types of housing.

Objectives of the Study

The objectives of this study were:

(1) To develop, in cooperation with agricultural engineers and poultry husbandmen, complete plans for brooding-rearing facilities for replacement pullets and laying house facilities for a 2,600-bird laying flock. Plans will be based on an "experimental low-cost pole-type laying house" built by the Departments of Poultry Husbandry and Agricultural Engineering of Kansas State University (Figure 1, Appendix A).

(2) To estimate the capital requirements in land, housing and equipment, at 1959-60 prices, to brood and rear 1,400 replacement pullets and house 2,600 layers using the 36' x 72' Kansas pole-type poultry house.

(3) To estimate the costs to raise pullets to 22 weeks using the 36' x 72' Kansas pole-type brooder-rearing house.

(4) To estimate the annual costs and returns to the egg enterprise for superior and good laying flocks of 2,600 pullets using the 36' x 72' Kansas pole-type laying house.

RESEARCH PROCEDURE

The Budget Method

The farm budget is a method of analyzing plans for the use of agricultural resources. More precisely, it is a plan which shows the probable

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[1] J. W. Koudele and N. R. Sheets, Estimated Capital Requirements, Costs, and Returns of the Egg Enterprise in Kansas, Kansas Agricultural Experiment Station, Technical Bulletin 103, November, 1959.

production, receipts, expenses, and net income from an enterprise or a combination of several enterprises with estimated yields, production and prices.[1] Use of the budget method has held an important place in the research program since the early twenties. More recently, it has been used in extension work.[2]

Conventional budgeting consists of predicting the outcome of one or of several different systems of operation by (1) estimating physical outputs on the basis of given resource inputs and (2) applying prices to these products and factors.[3] A carefully prepared budget enables a farmer to estimate with reasonable accuracy the average income which he may expect over a period of years from his present farm organization. From an extension standpoint, a good budget form will provide sufficient detail to make the resulting plan valuable to the farm operator and yet simple enough for its general application among farmers.[4]

One of the disadvantages of the budget method is that of being highly subjective and therefore results may vary widely when estimated by different investigators. Another weakness is the difficulty of forecasting yields and price accurately. This often causes a great discrepancy between advanced estimates and actual receipts. However, the weakness due to uncertainty of price and yields could be overcome to a certain extent by preparing for a

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[1] A. E. Anderson, "The Farm Budget," Journal of Farm Economics, January, 1931, p. 65.

[2] Heady, et al., editors, Resource Productivity, Returns to Scale, and Farm Size. The Iowa State College Press, Ames, 1956, p. 32.

[3] North Central Farm Management Research Committee, Budget in Farm Management, Mimeographed report, December, 1954, p. 7.

[4] A. E. Anderson, op. cit., pp. 69-70.

given period a set of budgets representing several possible combinations with varying prices and yields.[1]

The budgetary method was used in this study because it appeared to be best suited to provide quickly the type of information needed by farmers and others.

The suitability of budgeting for solving farm management problems depends largely upon the assumptions underlying the budget and the problem being considered.[2] In this study, assumptions and budget standards were established in consultation with a group of poultry husbandmen, extention agricultural engineers and poultry farm operators. Basic assumptions and/or budget standards covered such aspects as poultry houses and equipment, the laying flock, the technology of egg production, returns to the egg enterprise, prices of feed, eggs, and fowl, and miscellaneous economic costs.

Basic Assumptions and Sources of Data

Poultry Houses. The new experimental poultry house at the Kansas State University poultry farm was adapted, with minor changes, for use as both a brooder-rearing house and a laying house (see Figure 1, Appendix A).

This poultry house, with dirt floor, had a recommended capacity of 1,400 pullet chicks or 1,300 layers based on an allowance of approximately 2 square feet per bird.

A brief description of the experimental poultry house follows:

> The building is of simple pole-type construction with the posts set into the ground, resting on concrete. The roof is corrugated sheet steel with asphalt-impregnated vapor seal sheathing for insulation. Sides and ends are made from asphalt-coated vapor seal

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[1] North Central Farm Management Research Committee, op. cit., p. 68.
[2] Ibid., p. 7.

> sheathing. The entire north side is constructed so that the side panels are removable. Window openings on the south may be closed with clear-covered-screen sliding panels. Sliding double size doors on each end of the building afford easy access for cleaning and for added air movement in warm weather.
>
> Approximately half the total floor area is slat floors (roosting racks). Hanging metal feeders and automatic trough waterers are all placed over the slat area. The balance of the floor area is litter.[1]

In this study three poultry houses (one brooder-rearing house and two laying houses) were assumed to be built end-to-end in a row running east and west with the brooder-rearing house located 100 feet west of laying house No. 1. The laying houses were 30 feet apart (Figure 2A, Appendix A).

A 10' x 12' equipment room with concrete floor was included at the southeast corner of the brooder-rearing house. A 10' x 12' egg room with concrete floor was attached to the east end of laying house No. 1 and served both laying houses (Figure 2A, Appendix A).

Detailed diagrams for water supply (plumbing) and drainage systems, electrical systems and gas lines (brooder) for the 36' x 72' Kansas pole-type poultry houses and plans for a poultry disposal pit are shown in Figure 2A, Appendix A.

Certain construction details for the poultry houses and plans for continuous flow waterers for the laying houses are shown in Figure 2B, Appendix A.

Additional construction details for the poultry houses, for slatted-floor roosts, for a 9' diameter bulk-tank slab and footings, and the location of slatted roosts and nests in the laying houses are shown in Figure 2C, Appendix A.

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[1]T. Avery, "Low-Cost Building Key to New Poultry Research," Kansas Agricultural Situation, November, 1959, p. 6.

Additional construction details for the poultry houses, for chick roosts, a 6' diameter bulk-tank slab and footings, and the location of brooders and automatic waterers in the brooder-rearing house are shown in Figure 2D, Appendix A.

Prices of lumber, concrete, hardware, electrical and plumbing materials and paint were quoted by firms at Manhattan, Kansas, based on 1959-60 retail prices. Hourly labor requirements for carpentry, wiring and plumbing of the houses were estimated in consultation with poultry husbandmen and extension agricultural engineers of Kansas State University. An hourly wage rate of $1.50 for both skilled and unskilled labor was used.

Material requirements for wiring and plumbing of the houses were computed based on working diagrams prepared for each house (Figure 2A, Appendix A).

The requirements of building materials (lumber, concrete, hardware, electrical materials, plumbing materials, and paint) and estimated costs to construct the three poultry houses are shown in Tables 1-3, Appendix B. Estimated labor requirements and costs of carpentry, masonry, wiring, plumbing and painting are shown in Table 1-4, Appendix C.

Further assumptions regarding the poultry houses were as follows: Smooth lumber, unless specified otherwise, was used in construction of the poultry houses and certain equipment. The soil condition surrounding the houses was stable. Taps for both the water supply and power (electricity) were 50' north of the poultry houses.

Equipment. It was assumed that all necessary equipment to properly take care of the chicks, the laying stock and to handle market eggs was provided. Certain specialized equipment manufactured by commercial firms

was used. Retail prices of most specialized poultry equipment purchased from various equipment companies were discounted by 10 percent, except the bulk-feed tanks which were discounted by 20 percent, plus 10 percent. This policy was justified on the assumption that fairly large operators would be able to secure certain price concessions. Freight charges and sales taxes were ignored.

Prices of nonspecialized equipment, such as feed buckets, and shovels were obtained from local business establishments in Manhattan, Kansas.

Costs of constructing certain equipment such as roosts in the brooder-rearing house, continuous flow waterers, slatted floors in the laying house and the poultry disposal pit were estimated. Estimated costs of construction for both materials and labor were computed. Tables 1 and 2, Appendix D present the requirements and costs of materials and labor, respectively, for the equipment stated above.

Appendix E, "Budget Standards for Laying Houses and Equipment, and Computational Procedures," covers equipment, depreciation, interest on investment, repairs and maintenance, real estate taxes, insurance and electricity costs.

Replacement Pullets. It was assumed that day-old baby pullet chicks were bought and reared in the brooder-rearing house to age 22 weeks before they were moved to the laying house. Two broods of chicks were raised annually for two adjacent laying houses each with a capacity of 1,300 layers. One brood was housed March 1 and the second, on September 1.

Two 2,600-bird laying flocks, "superior" and "good," each with different rates of egg production, mortality, and feed conversion efficiency, were studied.

As a partial basis in estimating certain costs to raise pullets, data from 13 Kansas poultrymen were used (Table 1, Appendix G). Other costs, based on use of the 36' x 72' Kansas pole-type brooder-rearing house were estimated.

Appendix F, "Budget Standards for the Laying Flock and Computational Procedures," covers feed consumption and costs, flock depreciation, medications, interest on investment, property taxes, insurance and litter and nesting materials.

The Technology of Egg Production. Technological factors affecting egg production such as rates of lay, culling, mortality and feed consumption per layer are particularly important to costs and returns.[1] Technological data of the Fifth Random Sample Egg-Laying Test at the Missouri State Poultry Experiment Station, Mountain Grove, were used for the "superior laying flock." Table 1, Appendix H, shows size of flock, mortality, egg production and rate of lay, by months, for a "superior laying flock" of 2,600 pullets housed based on the Missouri egg-laying test.

Test A, Third Random Sample Egg-Laying Test at the Missouri State Poultry Experiment Station, was taken as a basis in determining technological factors for the "good laying flock" in this study (Table 2, Appendix H). Size of flock, mortality, and egg production for 1,218 pullets housed in that test were multiplied by the factor, 1.06732, to obtain comparable data for budgeting for 1,300 pullets housed as the good flock. Table 3, Appendix H, provides information on the size of flock, mortality, egg production and rate of lay, by months, for the good laying flock of 1,300 pullets housed.

During any month, rate of lay and the number of layers on hand were the principal factors affecting total egg production. In this study, it was assumed that there were 1,300 pullets housed in the laying house at the beginning of the 12-month period. It was also assumed that layers would not be culled from

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[1]Moudele, J. W. and N. R. Sheets, op. cit., p. 14.

the flock during the whole period. Therefore, the number of layers in the flock during succeeding months depended primarily on the death loss. In other words, mortality was the only factor causing the size of flock to decline throughout the period. Flock mortality was 4.73 percent for the superior flock and 12 percent for the good flock.

It was assumed that eggs were sold on a graded basis. Therefore, it was necessary to convert total monthly egg production to various grades and sizes. Table 4, Appendix H, shows the seasonal grade and size distributions of eggs produced by layers of various ages. These data[1] were obtained from the Kidwell Poultry Farm and Hatchery, Enterprise, Kansas. Data represented actual gradings of eggs from one floor plan operation for the period, October, 1956, through September, 1957. It was assumed that the size and grade distributions of eggs produced by the superior flock were the same as for the good flock.

Monthly size and grade distributions of eggs, in numbers and dozens, for 1,300 pullets housed are shown in Tables 5 and 6, Appendix H, for the "superior flock" and in Tables 7 and 8, Appendix H, for the "good flock."

All layers received medications, a low level antibiotic. It was assumed that a modified floor-plan method of management was used for the laying flock. Under this system, approximately half the total area of the laying house was slatted floors. The balance of the floor area was covered by deep litter. Layers were free to move about the entire house.

A complete 17 percent protein laying mash was fed to layers. Monthly mash consumption was computed based on a feed conversion ratio of 4.73 for

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[1]The original grading data obtained from this producer were "broken" into many grades and sizes of eggs. For example, the distributions recorded separately both AA large and A large, both AA medium and A medium, etc. For budgeting purposes, certain grades were combined whenever possible without affecting the research results. This was done to conform to the grades and sizes on the Kansas City graded egg market, from which price quotations were taken for budgeting.

the superior flock and 4.92 for the good flock. In addition, commercial shell and grit were used.

Returns to the Egg Enterprise. Monthly sales of eggs and the sale of fowl at the end of a 12-month laying period were the assumed sources of returns to the egg enterprise. Returns from the sale of fowl were credited in the computation of flock depreciation and reduced this cost item. No credit was allowed for the manure produced by the laying flock. On the other hand, no charge was made for the use of a tractor with power manure loader and for a manure spreader.

Eggs were sold on a graded basis with returns based on seasonal grade and size distributions, case return basis. No cost for transporting the eggs to market was charged against the egg enterprise.

Prices of Feed, Eggs and Fowl. The price of 17 percent protein laying mash was quoted by a local business firm at Manhattan, Kansas. In March, 1960, it was approximately $67.40 per ton on a bulk-feed basis, delivered to farmers. This price was then adjusted seasonally. The laying mash contained a nitrofuran compound at the level of ½ pound per ton of feed. Table 1, Appendix I, shows the price of laying mash, by months, used in this study. Shell and grit consumption was estimated at 4/10 pound per layer per month. Total annual consumption was based on the average number of layers for 12 months. A price of 1½ cents per pound for shell and grit was used for budgeting.

Seasonal prices of eggs, by grades and sizes, were obtained from the Kansas City Daily Drovers Telegram. Market quotations represented prices paid to producers at country points in the Kansas City market area with returns based on actual gradings, cases returned. The 1955-59 averages of

monthly means of daily prices for A large, A medium and B large were computed. The prices of grade C eggs were based on the 1955-57 average of monthly means of daily prices, because prices for this grade were not reported after June, 1958. Table 2, Appendix I, shows the seasonal prices of eggs used in budgeting. Simple averages of seasonal egg prices were: A large, 33.8 cents; A medium, 28.3 cents; B large, 27.7 cents; and grade C, 17.7 cents per dozen.

The value of fowl was figured based on an average weight of 4 pounds per bird. A market price of 7½ cents per pound for light hens was used.

Miscellaneous Costs. A labor requirement of one hour per year for each layer was based on results of several studies[1] as well as accurate records kept by one large Kansas poultry farm.[2]

Insurance was computed at rates in effect at the Kansas Farm Bureau Mutual Insurance Company, Manhattan. Rates on which real estate and personal property taxes were figured were obtained from the county treasurer, Riley County, Kansas.

Allowance of 5 percent for interest on investment in land, buildings and equipment was in accordance with common usage. This rate was considered comparable to the return expected on other investments involving similar risk.

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[1]J. G. Hawthorne and L. F. Miller, An Economic Analysis of 32 Poultry Cost Accounts, Pennsylvania 1946-47. Pennsylvania State College Agricultural Experiment Station, Bulletin No. 511, April 1949, pp. 13-14.

A. Shultis and W. E. Newlon, The Chicken Business in California. University of California, Extension Service Circular No. 147, September, 1951, p. 6.

M. H. Becker, Egg Production Costs and Returns in Western Oregon. Oregon State College Agricultural Experiment Station, Bulletin No. 559, May, 1957 p. 16.

[2]Kidwell Poultry Farm and Hatchery, Enterprise, Kansas.

Daily time requirements for the use of laying house lights were determined based on average daily requirements of morning lights to maintain a 14-hour day. Time requirements for the use of egg room lights, the egg washer, egg cooler unit and bulk-tank motors were estimated based on experiences of the Departments of Poultry Husbandry and Engineering Extension of Kansas State University. Hourly consumption of electricity was based on specifications for lights and other equipment. Rates applying to rural areas in Riley County, Kansas, were used in computing costs.

CAPITAL REQUIREMENTS OF THE EGG ENTERPRISE

For greater ease in comparing total costs of construction, equipment, and investment these costs will be discussed in terms of the nearest whole dollars. Table 1 summarizes the estimated construction costs of the 36' x 72' Kansas pole-type brooder-rearing house and laying houses. Costs of building materials (lumber, concrete, hardware, electrical and plumbing materials, and paint) and of labor for carpentry, masonry, wiring, plumbing and painting are shown separately, to point out more easily any significant differences. While construction cost per layer housed is the significant comparison, many poultrymen are interested in knowing the cost per square foot of floor space so this computation was also made.

Brooder-rearing House and Equipment

Total estimated construction costs of the brooder-rearing house including an equipment room amounted to $3,195.

The cost of materials totaled $2,519, or 79% of total costs of construction. Among items of construction materials, lumber and concrete were

Table 1. Summary of estimated construction costs of the 36' x 72' Kansas pole-type brooder-rearing house and laying houses.

Item	Brooder-rearing house, including 10' x 12' equipment room	Laying house and attached 10' x 12' egg room	Laying house (basic unit)
Cost of materials[1]:			
Lumber and concrete	$1,970.71	$2,208.79	$1,903.46
Hardware, nails, etc.	184.26	317.89	188.36
Electrical	257.10	257.68	196.79
Plumbing	80.47	117.32	85.37
Paint	26.81	32.59	32.59
Total	$2,519.35	$2,934.27	$2,406.57
Cost of labor[2]:			
Carpentry and masonry	$528.01[3]	$569.63[3]	$450.00
Wiring	28.13	28.50	24.00
Plumbing	81.71	86.15	60.17
Painting	37.50	39.75	37.50
Total	$675.35	$724.03	$571.67
Construction costs:			
Total	$3,194.70	$3,658.30	$2,978.24
Per square foot	$1.233	$1.349	$1.149

[1]At 1959-60 retail prices, Manhattan, Kansas.
[2]At $1.50 per hour for skilled and unskilled labor.
[3]Includes masonry for concrete slab and footings of a bulk tank and tank assembly.

the major expenditures and accounted for $1,971, or 77% of total material costs. Estimated cost of labor was $675, or 450 man-hour, for constructing the brooder-rearing house and equipment room. A rather large portion of labor, about 78% consisted of carpentry and masonry. Estimated construction cost per square foot for the brooder-rearing house was $1.233.

All essential equipment for the brooder-rearing house was provided and charged to the enterprise. Standard equipment included brooders, chick guards, fuel storage tank, bulk-feed tank (with a motor), chick founts, waterers, starter and hanging feeders, roosts, beak trimmer, feed buckets, scoops, sprayer, thermometer, and wash tub.

Specifications of required equipment and its cost are presented in Table 2. The relative importance of a few major items of equipment to total equipment cost are clearly indicated. Total investment in equipment for the brooder-rearing house amounted to $1,308. The major items of equipment for the brooder-rearing house were the fuel storage tank, bulk-feed tank, gas brooders and hanging feeders totaling $749, or 57% of total costs of equipment. Miscellaneous items of equipment took the other 43% of total costs of equipment.

Laying Houses and Equipment

Total estimated construction costs, as shown in Table 1, were $3,658 for the laying house with egg room compared to $2,978 for the basic-unit laying house. Additional building materials and labor for constructing the attached 10' x 12' egg room amounted to $680, or 23% more than the total construction costs of the basic-unit laying house.

Table 2. 36' x 72' Kansas pole-type brooder-rearing house[1] for 1,400 pullets: Inventory and estimated costs of equipment at 1959-60 prices[2].

Equipment and specifications	Equipment required	Number	Unit price	Cost
Gas brooders (84" drum-type) and automatic shut-off valves	500 chick capacity	3	$ 59.80[3]	$179.40
Chick draft guards (36' x 18")	1 per brooder	3	1.28	3.84
Fuel storage tank (250 gallon) (for brooders)	———	1	202.50[3]	202.50
Bulk-feed tank (6' diameter), 3½" x 10' auger and side ladder	3.2 ton capacity	1	192.96[4]	192.96
Motor for bulk tank, 1725 rpm	1½ H. P.	1	120.47	120.47
Chick founts, double wall, vacuum-type, heavy steel (2 gallon)	1 per 100 chicks	14	3.59	50.26
Adjustable automatic waterers, porcelain, floor-type (8')	1 per 250 chicks	6	20.84[3]	125.04
Heating tapes, automatic, 9' (for waterers)	1 per 8' waterer	6	6.64	39.84
Starter feeders (grill-type)	48" per 100 chicks	14	2.59[3]	36.26
Hanging feeders, heavy-galvanized steel, (40 pound)	3 per 100 chicks	42	4.14[3]	173.88
Roosts, wire-covered	5" per bird	—	—	130.22
Beak trimmer	———	1	27.40	27.40
Coal buckets (for feed)	———	2	1.59	3.18
Feed scoops, 5-quart capacity	———	2	1.44	2.88
Sprayer, 3½ gallon	———	1	11.30	11.30
Thermometer	———	1	.67	.67
Wash tub (15½ gallon) on casters (for equipment room)	———	1	7.81	7.81
Total				$1,307.91

[1]Including 10' x 12' equipment room.

[2]List retail price unless specified otherwise.

[3]List price less 10% discount.

[4]List price less 20%, plus 10% discounts.

The cost of materials amounted to $2,934 for the laying house with egg room compared with $2,407 for the basic-unit laying house, or $527 more for the laying house with egg room. The ratio of the cost of materials to total construction costs was about 80%, the same for both houses. The major difference in cost of materials was in lumber and hardware, the most important items causing the higher cost of the laying house with an egg room.

Estimated cost of labor was $724, or 483 man-hours, for the laying house with egg room and $572, or 381 man-hours, for the basic-unit laying house. The cost of carpentry and masonry was by far the most important item among all items of labor cost and totaled $570 for the laying house with egg room compared to $450 for the basic-unit laying house (Table 1).

Construction cost per square foot was $1.349 for the laying house with egg room, compared to $1.149 for the basic-unit laying house. The relatively higher cost per square foot of the laying house with egg room reflects the use of more construction materials (concrete, insulation materials, etc.) than for the basic-unit laying house.

All essential equipment for the laying house was provided. Standard equipment for the laying house contained hanging feeders, waterers, nest, egg baskets, slatted floors, bulk-feed tank (with a motor), feed scoops, feed buckets, egg washer, egg cooler unit, poultry shipping coops, and disposal pit.

Specifications of required equipment and estimated costs for the laying houses are shown in Table 3. For the purpose of showing the itemized units, the equipment was classified into three categories, namely the laying house (basic unit), egg room, and miscellaneous. Costs of a bulk-feed tank, egg room, and miscellaneous equipment used for both houses were included in total

Table 3. 36' x 72' Kansas pole-type 1,300-bird laying house[1] and egg room: Inventory and estimated costs of equipment at 1959-60 prices[2].

Equipment and specifications	Equipment required	Number	Unit price	Cost
Laying house (basic unit):				
Hanging feeders, heavy-galvanized steel, (40 pound)	4 per 100 layers	52	$ 4.14[3]	$215.28
Continuous-flow waterers, angle iron	1½" per layer	80'	—	67.23
14-hole nests, 2 tiers, aisle-gathering type	1 nest per 5 layers	18	21.60[3]	388.80
Egg baskets, square handle, plastic coated.	12-dozen capacity	12	2.90[3]	34.80
Slatted floors (roosts), sawhorses, and wire panels	——	—	—	686.25
Bulk-feed tank (9' diameter), two 6" x 18' augers, 1 boot, and side ladder	8.3 ton capacity	1	467.64[4]	467.64
Motor for bulk tank, 1725 rpm	2 H. P.	1	154.77	154.77
Feed scoops, 5-quart capacity	——	2	1.44	2.88
Coal buckets (for feed)	——	2	1.59	3.18
Total				$2.020.83
Egg room:				
Egg washer, automatic, 220 volts, 4,000 watts	——	1	215.00[3]	215.00
Egg cooler unit, mechanical, 115 volts	½ H. P.	1	287.00[3]	287.00
Total				$502.00
Miscellaneous:				
Poultry shipping coops	——	2	4.61	9.22
Disposal pit (5' x 6' x 5' deep)	——	1	—	43.10
Total				$52.32
GRAND TOTAL				$2,575.15

[1]A combination floor-plan and slatted-floor (roosts) system of management is used.

[2]List retail price unless specified otherwise.

[3]List price less 10% discount.

[4]List price less 20%, plus 10% discounts.

costs of equipment for the laying house with attached egg room. Thus, the cost of equipment for a complete laying house unit was $2,575 compared to $1,553 for the basic-unit laying house, or $1,022 more. The most important components of equipment cost were slatted floors, egg washer, egg cooler unit, bulk-feed tank, and nest, which totaled $2,045. (Table 3).

Total and Per Layer Investment

Table 4 summarizes the initial capital investment in land, housing and equipment for 2,600 layers and for raising necessary pullet replacements. An estimated cost for the use of land, amounting to $20 for each house, was considered as a part of the initial investment.

Total capital investment for the egg enterprise amounted to $15,327. Initial investment in housing, the major factor, was $9,831, or 64% of total initial investment. The $5,436 in equipment accounted for 35% of total initial investment.

Total investment of $6,253 for the laying house with egg room compares with $4,551 for the basic-unit laying house. A total of $4,523 was invested in the brooder-rearing house (Table 4).

For the 2,600 layer egg enterprise, estimated investment in three poultry houses and all necessary equipment totaled $5.89 per layer. Total investment per layer in land and housing was $3.80 and in equipment $2.09 per layer.

PULLET REPLACEMENT COSTS

The costs of raising pullets recorded by 13 Kansas poultry farms in 1958 were taken as background information to estimate certain costs to raise pullets to 22 weeks in this study. Cost items included in the original

Table 4. Summary of initial estimated investment in land, housing and equipment for 2,600 layers and for raising pullet replacements, at 1959-60 prices, Kansas egg enterprise.

Item	Brooder-rearing house, including 10' x 12' equipment room	Laying house and attached 10' x 12' egg room	Laying house (basic unit)	Total for egg enterprise
Initial investment in:				
Land	$ 20.00	$ 20.00	$ 20.00	$ 60.00
Housing[1]	3,194.70	3,658.30	2,978.24	9,831.24
Equipment	1,307.91	2,575.15	1,553.19	5,436.24
Total	$4,522.61	$6,253.45	$4,551.43	$15,327.49
Investment per layer[2] in:				
Land and housing[1]	$1.24	$2.83	$2.31	$3.80
Equipment	.50	1.98	1.19	2.09
Total	$1.74	$4.81	$3.50	$5.89

[1]36' x 72' Kansas pole-type poultry house for brooding and rearing all pullet replacements and housing 1,300 layers.

[2]Per 22-week pullet housed.

data were chicks, feed, shell and grit, vaccinations, medications, disinfectants, litter, brooder fuel, chick insurance, electricity, and labor. Weighted average cost per pullet sold was calculated for each cost component mentioned above (Table 1, Appendix G).

Costs Per 22-Week Pullet Housed

In this study, an attempt was made to include all economic costs of raising pullets. Those items being considered were the costs of chicks, feed, vaccination, medications, disinfectants, litter, brooder fuel, electricity, chick insurance, use of brooder-rearing house and equipment, real estate taxes, interest on investment in chicks, and labor.

The estimated costs per 22-week pullet to raise 2,600 pullets annually using the 36' x 72' Kansas pole-type brooder-rearing house are shown in Table 5.

Poultrymen and others are interested in the costs per pullet; therefore, all cost items were expressed in cents. The total estimated cost to raise a 22-week pullet was $1.82. Of the various costs that entered into raising pullets, the largest single item was for feed, including starter, grower and grit, totaling 79.323 cents. The original cost of a day-old baby chick amounting to 58.8 cents was the next most important item. Costs of using the brooder-rearing house and equipment totaling 16.948 cents ranked third in relative importance. The estimated cost of labor was 14 cents. Miscellaneous costs, including vaccinations, medications, disinfectants, litter, brooder fuel, electricity, chick insurance, real estate taxes, and interest on investment in chicks, totaled 12 cents.

Percentage Distribution of Cost Items

A detailed breakdown of the percentage distribution of estimated total costs among costs items for raising a 22-week pullet replacement is also shown in Table 5.

The cost of feed consumed was 43.7 percent of total costs. The cost for a day-old chick was second highest item and amounted to 32.4 percent of total costs. The cost of using the brooder-rearing house and equipment represented 9.7 percent of total costs while the fourth most important item, labor, was 7.7 percent of total costs. These four items of cost accounted for 93.5 percent of total costs to raise a 22-week pullet. Miscellaneous costs, including vaccinations, medications, disinfectants, litter, brooder fuel, electricity, chick insurance, real estate taxes, and interest on investment in chicks, represented the remaining 6.5 percent.

Table 5. Estimated costs to raise 2,600 pullets[1] annually to 22 weeks using the 36' x 72' Kansas pole-type brooder-rearing house, and percentage distribution of costs.

Cost item	Cost per 22-week pullet	Distribution of total cost
	Cents	Percent
Chick	58.800[2]	32.4
Feed[3]:		
Starter, 3 pounds @ 3.9 cents	12.285[4])	
Grower, 19 pounds @ 3.4 cents	66.538[5])	43.7
Grit	.500[6])	
Vaccinations, medications, disinfectants, etc.	4.781[7]	2.6
Litter	1.806[7]	1.0
Brooder fuel	.848[7]	0.5
Electricity	1.130[7]	0.6
Chick insurance	.595[7]	0.3
Use of brooder-rearing house and equipment:		
Depreciation on house	6.826	3.8
Depreciation on equipment	5.195	2.9
Interest on investment (land, house and equipment)	4.349	2.4
Insurance (house and equipment)	.578	0.3
Repairs and maintenance	.614	0.3
Real estate taxes (land, house and equipment).	1.202	0.7
Interest on investment in chicks[8]	1.470	0.8
Labor[6]	14.000	7.7
Total	181.517	100.0

[1]Two broods of 1,365 pullet chicks were started each year.

[2]Based on 56 cents per day-old pullet. This was an average of prices paid on March 1, 1959, and September 1, 1959, by Kansas farmers to commercial hatcheries for an egg-type pullet, incross breeds (hybrids). The price includes one cent per chick for debeaking and allows 5% for mortality and culling.

[3]Prices of chick starter and grower were on a bulk-feed basis.

[4]Includes 5% for mortality and culling.

[5]Includes 3% for mortality and culling. It was assumed that chick mortality during the first six weeks was 2%. Grower is normally fed after chicks reach six weeks of age.

[6]Estimated.

[7]Based on the average cost of raising pullets by 13 Kansas poultrymen during 1958. See Table 1 , Appendix G .

[8]Based on the value of 2,730 day-old pullet chicks with returns to capital at 5% per annum or 2.5% to 22 weeks.

ANNUAL COSTS AND RETURNS TO THE EGG ENTERPRISE FOR SUPERIOR AND GOOD LAYING FLOCKS

One purpose of this study was to provide a detailed breakdown of the costs and returns from the production of eggs for a 12-month period by comparing the superior and good laying flocks. In computing costs and returns to the egg enterprise, most poultrymen probably consider only their out-of-pocket or variable cost expenditures such as feed, medications, electricity, and the like. It is even doubted that many producers consider one of the major cost items, flock depreciation. Certain fixed costs including depreciation on buildings and equipment, as well as returns on the capital investment, usually are ignored.[1] In this study an attempt was made to include all legitimate costs chargeable to the egg enterprise in computing the net returns to labor and management.

Total Dollar Costs and Returns

Table 6 shows the costs and returns to the egg enterprise for a 12-month period for superior and good flocks using a floor-plan system of management.

Estimated annual egg sales amounted to $16,937 for the superior flock and $14,599 for the good flock. With respect to annual costs, the superior flock had estimated costs totaling $14,758 compared with $13,732 for the good flock.

A comparison, item by item, of the various components of enterprise costs for the superior and good flocks was made. Those items differing were feed, flock depreciation, property taxes, medications, interest on investment on laying stock, and electricity. The factor mainly accounting for the disparity

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[1] J. W. Koudele and N. R. Sheets, op. cit., p. 23.

Table 6. Estimated annual costs and returns to the Kansas egg enterprise, 2,600 layers housed[1] at 22 weeks, floor-plan system, superior and good laying flocks compared.

Item	Superior flock[2]	Good flock[3]
Average size of flock (layers)	2,550	2,466
Returns from egg sales	$16,937.25	$14,599.26
Egg production costs:		
Feed[4]:	9,116.02	8,061.79
Flock depreciation[5]	3,988.90	4,045.60
Use of laying houses and equipment[6]:		
Depreciation on houses	368.70	368.70
Depreciation on equipment	387.79	387.79
Interest on investment	270.13	270.13
Insurance	33.93	33.93
Repairs and maintenance	33.18	33.18
Taxes, real estate	74.64	74.64
Taxes, personal property (laying stock)	29.29	28.18
Medications	172.28	152.00
Insurance on laying stock	22.71	22.71
Interest on investment (laying stock) .	135.74	132.52
Electricity	67.26	63.49
Litter	57.78	57.78
Total	$14,758.35	$13,732.44
Net returns to labor and management	$2,178.90	$866.82

[1]1,300 pullets housed March 1 and September 1, respectively.

[2]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

[3]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

[4]Based on seasonally-adjusted prices of laying mash at $67.40 per ton delivered, bulk-feed basis, and shell (or grit) at 1½ cents per pound.

[5]Flock depreciation is the loss in the laying flock due to martality and loss in value of remaining layers sold at the end of a 12-month laying period. It was based on 22-week pullets housed worth $1.82 each and light hens selling for $.30 each.

[6]Two 36' x 72' Kansas pole-type laying houses and required equipment.

was difference in the average size of flock, reflecting mortality. The cost of using the laying houses and equipment, real estate taxes, insurance on laying stock, and litter were the same for both flocks.

The item showing the greatest variation between "superior" and "good" laying flocks was feed consumption. Feed was the largest single cost item totaling $9,116 for the superior flock and $8,062 for the good flock. Total feed consumption was calculated based on annual egg production and the feed conversion ratio. The higher feed conversion ratio for the good flock, 4.92, compared to 4.73 for the superior flock, accounted for higher consumption of feed per layer. However, a higher mortality for the good flock, 12 percent, compared to 4.73 percent for the superior flock, reduced the size of flock and tended to reduce total feed costs.

Depreciation of laying stock was the second largest cost item and was estimated to be $57 higher for the good flock than for the superior flock. The higher depreciation charge for the good flock was due to the higher mortality which resulted in fewer light hens on hand for sale at the end of the 12-month period.

Total cost of using the laying houses and equipment, which amounted to $1,094 per year, was the same for both flocks. Depreciation on laying houses amounted to $369 while depreciation on equipment was estimated to be $388. Interest on investment accounted for $270. These three major items of cost are usually ignored by farmers in considering enterprise costs. Insurance and repairs and maintenance totaled $67. Cost of repairs and maintenance was figured at one-half of 1 percent of the initial investment in housing. Farmers usually tend to allow costs for necessary repairs

to buildings but do not consider the depreciation.[1] However, depreciation is considered as a fixed cost and should be included in the cost analysis. Cost of repairs and maintenance is quite variable and depends on such factors as the quality and endurance of the materials used.

Cost of medications was $172 for the superior flock compared with $152 for the good flock. This variation was due to different amounts of feed consumption. Based on the average size of flock, interest on investment on the laying flock was $136 for the superior flock compared with $133 for the good flock. Greater electricity cost for the superior flock than for the good flock was due to the additional time requirements of using the egg washer. There was a light difference of personal property tax between these two flocks. Costs of real estate taxes, insurance on laying stock, and litter were the same for both flocks.

Estimated net returns to labor and management varied greatly between these two flocks. Net returns for a 12-month period amounted to only $867 for the good flock compared with $2,179 for the superior flock (Table 6).

Percentage Distribution of Cost Items

A detailed breakdown of the percentage distribution of estimated annual egg production costs among cost items for the superior and good flocks is presented in Table 7. This will help point out the relative importance of different cost items.

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[1] H. Embleton. The Cost of Production of Eggs and Pullets in Southern Arizona. University of Arizona Agricultural Experiment Station, Bulletin 208, September, 1947, p. 28.

Table 7. Percentage distribution of estimated annual egg production costs[1] among cost items, 2,600 layers housed[2] at 22 weeks, floor-plan system, superior and good laying flocks compared, Kansas egg enterprise.

Item	Superior flock[3]	Good flock[4]
Average size of flock (layers)	2,550	2,466
	Percent of total costs[5]	
Feed	61.77	58.71
Flock depreciation	27.03	29.46
Use of laying houses and equipment[6]:		
Depreciation on houses	2.50	2.68
Depreciation on equipment	2.63	2.82
Interest on investment	1.83	1.97
Insurance	.23	.25
Repairs and maintenance	.22	.24
Taxes, real estate	.50	.54
Taxes, personal property (laying stock)	.20	.21
Medications	1.17	1.11
Insurance (laying stock)	.15	.17
Interest on investment (laying stock)	.92	.96
Electricity	.46	.46
Litter	.39	.42
Total	100.00	100.00

[1]Excluding labor.

[2]1,300 pullets housed March 1 and September 1, respectively.

[3]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

[4]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

[5]Based on dollar costs.

[6]Two 36' x 72' Kansas pole-type laying houses and required equipment.

The cost of feed was 61.8 percent of the total cost for the superior flock compared with 58.7 percent for the good flock, or 3.1 percent higher. This reflected a larger average size of flock for the superior flock which caused more feed consumption. Flock depreciation was the next highest item of costs and amounted to 27.0 percent of total costs for the superior flock and 29.5 percent for the good flock. It was higher for the good flock reflecting greater mortality. The cost of using laying houses and equipment represented 7.4 percent of total costs for the superior flock and 8.0 percent for the good flock. The three most important cost items: Feed, flock depreciation, and the cost of using houses and equipment accounted for 96.2 percent of total enterprise costs for the superior flock as well as for the good flock.

Cost of medications represented 1.17 percent of total costs for the superior flock compared with 1.11 percent for the good flock. It was higher for the superior flock because of higher feed consumption. Interest on investment on laying flock was 0.92 percent for the superior flock and 0.96 percent for the good flock. Miscellaneous costs, including real estate taxes, personal property taxes, insurance on laying stock, electricity, and litter, totaled the remaining 1.70 percent of total enterprise costs for the superior flock and 1.80 percent for the good flock.

Costs Per Dozen Eggs

Estimated annual costs to produce one dozen eggs were 26.3 cents for the superior flock and 28.9 cents for the good flock (Table 8).

The cost of feed amounted to 16.27 cents for the superior flock compared to 16.96 cents for the good flock, or 0.69 cent lower. This was due to a

Table 8. Estimated annual costs[1] to produce one dozen eggs, 2,600 layers housed[2] at 22 weeks, floor-plan system, superior and good laying flocks compared, Kansas egg enterprise.

Item	Superior flock[3]	Good flock[4]
Average size of flock (layers)	2,550	2,466
	Cents per dozen	
Feed[5]	16.27	16.96
Flock depreciation[6]	7.12	8.51
Use of laying houses and equipment[7]:		
Depreciation on houses	.66	.78
Depreciation on equipment	.69	.82
Interest on investment	.48	.57
Insurance	.06	.07
Repairs and maintenance	.06	.07
Taxes, real estate	.13	.16
Taxes, personal property (laying stock)	.05	.06
Medications	.31	.32
Insurance (laying stock)	.04	.05
Interest on investment (laying stock)	.24	.28
Electricity	.12	.13
Litter	.10	.12
Total	26.33	28.90

[1]Excluding labor.

[2]1,300 pullets housed March 1 and September 1, respectively.

[3]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

[4]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

[5]Based on seasonally-adjusted prices of laying mash at $67.40 per ton delivered, bulk-feed basis, and shell (or grit) at 1½ cents per pound.

[6]Flock depreciation is the loss in the laying flock due to mortality and loss in value of remaining layers sold at the end of a 12-month laying period. It was based on 22-week pullets housed worth $1.82 each and light hens selling for $.30 each.

[7]Two 36' x 72' Kansas pole-type laying houses and required equipment.

better feed conversion ratio for the superior flock. Flock depreciation accounted for 7.12 cents for the superior flock and 8.51 cents for the good flock. Higher rate of mortality caused higher flock depreciation for the good flock. Due to a smaller average size of flock, the cost of using the laying houses and equipment for the good flock amounting to 2.31 cents was 0.36 cent higher than for the superior flock. Cost of medications accounted for 0.31 cent for the superior flock compared to 0.32 cent for the good flock.

Slight differences were found in such items as real estate taxes, personal property taxes, insurance on laying stock, interest on investment on the laying flock, electricity, and litter, which totaled 6.8 cents for the superior flock and 8.0 cents for the good flock.

Costs and Returns Per Layer

Technological factors in relation to estimated annual costs and returns per layer for the superior flock and good flocks are shown in Table 9. The value of eggs produced per layer per year was $6.64 for the superior flock, and $5.92 for the good flock, or $0.72 more per layer for the superior flock. This difference was due to greater production of eggs per layer for the superior flock. Annual egg production costs per layer were $5.78 for the superior flock compared to $5.57 for the good flock, or $0.21 more. The items showing the greatest variation between the superior and good flocks were feed and flock depreciation. The average cost of feed used per superior layer for the year was $3.57, while the feed cost for a good layer for the same period was $3.27, or 30 cents less. The greater amount of mortality for the good flock was reflected in a cost per layer of $1.64 for flock depreciation compared to $1.56 per layer for the superior flock.

Table 9. Technological factors in relation to estimated annual costs and returns per layer, 2,600 layers housed[1], Kansas egg enterprise.

Item	Superior flock	Good flock
Average size of flock (layers)	2,550	2,466
Flock mortality (percent)	4.73	12.00
Average annual egg production (eggs per layer)	263.70	231.40
Average annual rate of lay (percent)	72.20	65.90
Feed conversion ratio[2]	4.73	4.92
Annual egg sales per layer[3]	$6.64	$5.92
Annual egg production costs per layer[3]:		
Feed[4]	3.57	3.27
Flock depreciation[5]	1.56	1.64
Use of laying houses and equipment[6]	.43	.44
Miscellaneous[7]	.22	.22
Total	$5.78	$5.57
Annual net returns:		
Per layer to labor and management	$0.854	$0.352
Per hour of labor[8]	.854	.352
Per dozen eggs	.0389	.0182

[1]1,300 pullets housed March 1 and September 1, respectively.

[2]Pounds of feed per dozen eggs.

[3]Based on the average size of flock.

[4]Based on seasonally-adjusted prices of laying mash at $67.40 per ton delivered, bulk-feed basis, and shell (or grit) at 1½ cents per pound.

[5]Flock depreciation is the loss in the laying flock due to mortality and loss in value of remaining layers sold at the end of a 12-month laying period. It was based on 22-week pullets housed worth $1.82 each and light hens selling for $.30 each.

[6]Two 36' x 72' Kansas pole-type laying houses and equipment. Includes depreciation, insurance, interest on investment, and repairs and maintenance on the houses and equipment.

[7]Includes real estate taxes, personal property taxes on laying stock, medications, insurance on laying stock, electricity and litter.

[8]Based on one hour of labor per layer for a year and the average size of flock.

Annual net returns per layer to labor and management amounted to 85 cents for the superior flock and 35 cents for the good flock, or 50 cents more for the superior flock. The effect of laying flock efficiency and perhaps managerial ability on the returns to the egg enterprise are indicated by this difference.

Since one hour of labor per layer for a year was assumed, annual net returns per hour of labor was also 85 cents for the superior flock and 35 cents for the good flock.

Annual net returns per dozen eggs produced was 3.9 cents for the superior flock compared to 1.8 cents for the good flock, about two cents greater for the superior flock. This was due to a higher rate of lay for the superior flock.

SUMMARY AND CONCLUSIONS

Construction costs of the 36' x 72' Kansas pole-type poultry house, adapted for use as a brooder-rearing house or laying house, consisted of building materials and labor for carpentry, masonry, wiring, plumbing, and painting. Total estimated construction costs of the 1,400-chick brooder-rearing house, including an equipment room, amounted to $3,195. Total estimated construction costs of the 1,300-bird laying house with egg room were $3,658 compared with $2,978 for the 1,300-bird basic-unit laying house without egg room. Costs per square foot of floor space were $1.233 for the brooder-rearing house, $1,349 for the laying house with egg room, and $1.149 for the basic-unit laying house.

Estimated equipment costs for the brooder-rearing house totaled $1,308. Equipment costs were $2,575 for the laying house with egg room, and $1,553 for the basic-unit laying house. Most of the equipment investment in the laying houses was for slatted floors (roosts), a bulk-feed tank, nest, an egg cooler unit, an egg washer, and hanging feeders.

Total estimated capital investment at 1959-60 prices for a 2,600-layer egg enterprise, including brooder-rearing facilities for pullets and two equipped laying houses, amounted to $15,327. Estimated investment in housing totaled $9,831, or 64 percent of the total. Investment in equipment was $5,436, or 35 percent of the total, and investment in land accounted for 1 percent of total investment in the egg enterprise. Total investment per layer in land, housing, and equipment was $1.74 for the brooder-rearing house, $4.81 for the laying house with egg room, and $3.50 for the basic-unit laying house.

The estimated cost to raise a light-breed pullet to 22 weeks of age, using the 36' x 72' pole-type brooder-rearing house, was $1.82. Major costs items, in order of importance, were as follows: Feed, 79.3 cents; chicks, 58.8 cents; use of the brooder-rearing house and equipment, 16.9 cents; labor, 14.0 cents; and vaccinations, medications and disinfectants, 4.8 cents per pullet.

Annual costs and returns to the Kansas egg enterprise were estimated for 2,600 layers housed at 22 weeks in two 36' x 72' Kansas pole-type laying houses for a 12-month period. Two laying flocks with different productivity, mortality, and feed conversion efficiency were compared. For a "superior flock" average rate of lay was 263.7 eggs, flock mortality was 4.73 percent, and feed conversion ratio was 4.73. For a "good flock" average rate of lay was 231.4 eggs, flock mortality was 12 percent, and the feed conversion ratio was 4.92.

Laying mash was charged to the enterprise at $67.40 per ton delivered, bulk-feed basis. Prices were seasonally adjusted. Shell and grit cost 1½ cent per pound. Flock depreciation was based on 22-week pullets worth $1.82 each and light fowl selling for $0.30 each at the end of 12 months of lay. Other egg production costs included use of laying houses and equipment (depreciation, interest on investment, insurance, repairs and maintenance), real estate taxes, personal property taxes on layers, medications, insurance on layers, interest on investment on layers, electricity, and litter. Monthly sales of eggs, on a graded basis, and sales of fowl constituted the returns. Annual averages of monthly egg prices used in budgeting were: Grade A large, 33.8 cents; Grade A medium, 28.3 cents; Grade B, large, 27.7 cents; and Grade C, 17.7 cents per dozen.

Annual net returns to labor and management were $2,179 for the "superior flock" and $867 for the "good flock." Annual egg sales per layer were $6.64 and $5.92 for the superior flock and good flock, respectively.

Feed cost per layer was $3.57 for the superior flock compared with $3.27 for the good flock while flock depreciation was $1.56 and $1.64 for the superior and good flock, respectively. Other cost items were practically the same for both flocks. Annual net returns per hour of labor was $0.85 for the superior flock and $0.35 for the good flock.

Estimated annual costs to produce one dozen eggs were 26.3 cents for the superior flock and 28.9 cents for the good flock.

Feed costs were 61.9 percent of annual egg production costs for the superior flock compared with 58.7 percent for the good flock. Flock depreciation accounted for 27 percent and 29.5 percent of total costs and use of laying houses and equipment, 7.4 percent and 8.0 percent of costs for the superior and good laying flocks, respectively.

Conditions of relatively low prices for eggs and fowl are likely to prevail in the future if current economic trends in the poultry and egg industry continue. However, Kansas farmers can earn a fair return for labor and management from the egg enterprise if a superior strain of egg-type layers is kept and efficiently managed as this study indicates.

ACKNOWLEDGMENTS

The author wishes to express his gratitude to Dr. Joe W. Koudele of the Department of Agricultural Economics who served as major instructor, for his suggestion of this problem and enthusiastic guidance and help.

Special acknowledgment is made to Professor Ray Morrison, Department of Poultry Husbandry whose plans for houses and equipment were used, and for his generous assistance and advice as the study progressed.

Sincere appreciation is expressed to Dr. George Montgomery, Head of the Department of Economics and Sociology, and Dr. J. A. Hodges, Acting Head, for the graduate assistantship which enabled me to undertake graduate study at Kansas State University.

Credit is due to Mr. Gilbert Veconi for drawing blueprints for the poultry houses and certain equipment.

The author extends thanks also to Professors Amos Kahr, Paul Sanford, James Craig, Tom B. Avery, Leo T. Wendling, Harold Stover, M. E. Jackson, and Gaynor McDaniel for helpful suggestions.

Basic data on the technology of egg production provided by the Missouri State Poultry Experiment Station, Mountain Grove, Missouri, was of great value to this study. The author also wishes to thank the Manhattan business firms that furnished pricing information. Clerical assistance by Miss Sharon Brabec was greatly appreciated.

The author bears full responsibility for all possible errors that may have crept in throughout the manuscript.

LITERATURE CITED

Anderson, A. E. The Farm Budget. Journal of Farm Economics, January, 1931.

Avery, T. Low-Cost Building, Key to New Poultry Research. The Kansas Agricultural Situation, Kansas State University, November, 1959.

Becker, M. H. Egg Production Costs and Returns in Western Oregon. Oregon State College Agricultural Experiment Station, Bulletin No. 559, May, 1957.

Embleton, H. The Cost of Production of Eggs and Pullets in Southern Arizona. University of Arizona Agricultural Experiment Station, Bulletin 208, September, 1947.

Hawthorne, J. G. and L. F. Miller. An Economic Analysis of 32 Poultry Cost Accounts, Pennsylvania, 1946-47. Pennsylvania State College Agricultural Experiment Station, Bulletin 511, April, 1949.

Heady, E. O., G. L. Johnson and L. S. Hardin, editors. Resource Productivity, Returns to Scale, and Farm Size. The Iowa State College Press, Ames, Iowa, 1956.

Koudele, J. W. and N. R. Sheets. Estimated Capital Requirements, Costs, and Returns of the Egg Enterprise in Kansas. Kansas State University Agricultural Experiment Station, Bulletin 103, November, 1959.

North Central Farm Management Research Committee. Budget in Farm Management Research, Mimeographed report, December, 1954.

Shultis, A. and W. E. Newlon. The Chicken Business in California. University of California Agricultural Extension Service, Circular 147, September, 1951.

APPENDICES

Appendix A

Plans for the 36' x 72' Kansas Pole-type Poultry Houses and Equipment

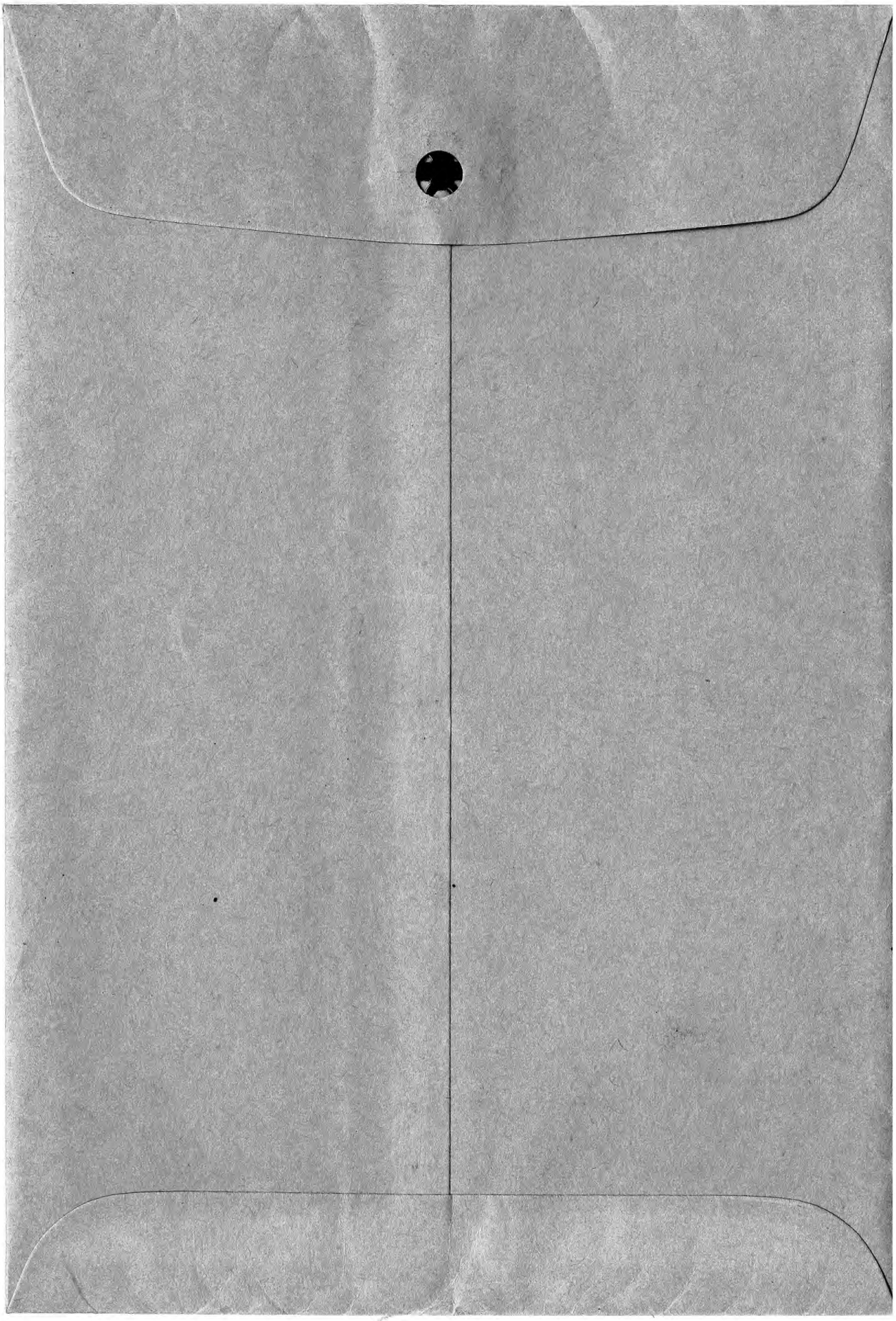

Figure 1. Experimental low-cost pole-type laying house.

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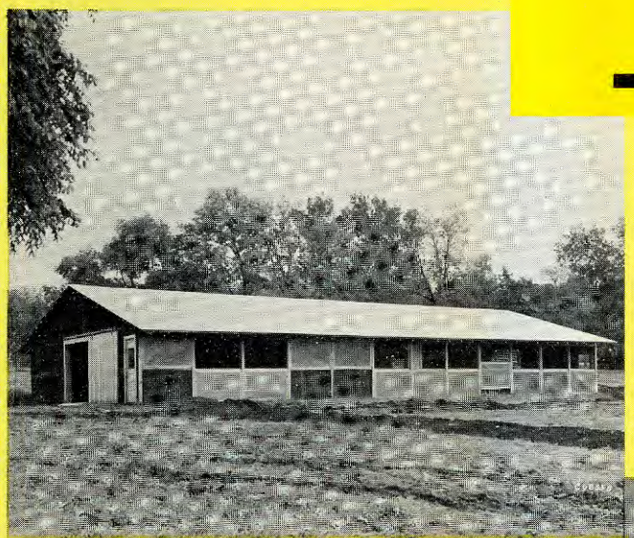
INSIDE: Thomas B. Avery tells ot a newly-developed low-cost poultry house being tested at Kansas State University. Avery, born and reared on a farm near Coldwater, is head of the KSU poultry husbandry department. Plans and building information were prepared by Ray Morrison, instructor. Photos: Page 7, Ralph Lipper; others, Floyd Hanna.

KANSAS STATE PRINTING PLANT, TOPEKA, KANSAS

Experimental Low-cost

Pole-type Laying House

- Plans
- Photos
- Explanation



Kansas Agricultural Situation

Reprint No. 2

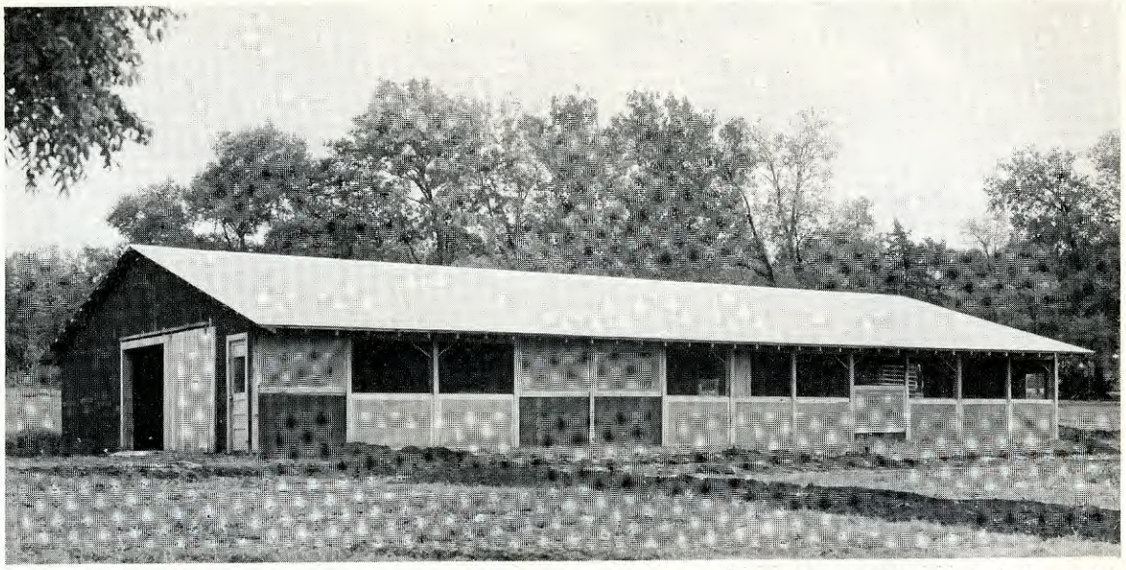
(Revised)

Kansas Agri. Expt. Sta.
Glenn H. Beck, *Director*

Kansas Extension Service
Harold E. Jones, *Director*
Manhattan, Kansas

Co-operative Extension Work in Agriculture and Home Economics, Kansas State University of Agriculture and Applied Science and United States Department of Agriculture, Acts of May 8 and June 30, 1914.
12-59—5M.

Low-Cost Building Key to New Poultry Research



Contr. No. 250, Dept. Poult. Husb., KAES.

By Tom Avery

EFFICIENT POULTRY housing and low cost of production are essential to Kansas egg producers if they are to meet competition from other areas. As with the poultry industry in general, trends in poultry housing have made striking changes during the past few years. Today efforts are toward large, low cost housing that takes advantage of as much natural ventilation as possible, is labor saving, and makes maximum use of every square foot of floor space.

To help answer some of the questions on low cost housing and production of market eggs the departments of Poultry Husbandry and Agricultural Engineering at K-State have built a new experimental poultry house on the K-State poultry farm and will cooperate in research concerning the house. The 36′ x 72′ dirt floor structure is divided into two pens, each 36′ x 36′. The cost of the materials was 67¢ per square foot of floor space (such equipment costs as for nests, feeders, waterers, and roosts are not included). Construction of the house required 272 man-hours of labor.

The building is of simple pole type construction with the posts set into the ground, resting on concrete. The roof is corrugated sheet steel with asphalt-impregnated vapor seal sheathing for insulation. Sides and ends are made from asphalt-coated vapor seal sheathing. The entire north side is constructed so that the side panels are removable. Window openings on the south may be closed with clear-covered-screen sliding panels. Sliding double size doors on each end of the building afford easy access for cleaning and for added air movement in warm weather.

Approximately half the total floor area is slat floors (roosting racks). Hanging metal feeders and automatic trough waterers are all placed over the slat area. The balance of the floor area is litter. The building may be inspected by the public.

A research program has been planned to cover all aspects of this new poultry house. Pullets of a good commercial strain are being used. In the end we hope to be able to tell just how much crowding our modern day chickens can tolerate in a low cost house without harmful loss of efficiency. According to recommendations of 15 years ago we would allow 4 square feet per hen and only 324 layers would be placed in each of the new pens. In contrast to this, one pen in the experimental house was started with 648 birds. This allows 2 square feet of floor space per hen. The other pen houses 1,036 hens, leaving only 1¼ square feet of floor space per hen.

Comparisons are being made between the two pens. Plans call for studies of egg production, pounds of feed to produce a dozen eggs, mortality, labor in caring for birds and gathering eggs, percentage of eggs falling into the different grades as graded by a commercial grader, egg size, incidence of blood and meat spots, inside and outside temperature and humidity, litter moisture, ammonia in the air, possible social stress, and the cost of producing a dozen eggs.

In a future project one section of an identical poultry house will be closed and forced ventilation used to compare the new, open-type house with the closed type. Plans call for mechanical cooling in the latter in summer.

The Kansas Extension Service and the Kansas Poultry Association plan to publish monthly progress reports on this research in the *Kansas Poultry News*. To get the *Kansas Poultry News* free, write Kansas Poultry Assn., P. O. Box 663, Manhattan. A complete summary and comparisons will be made after one full season of study. A portion of the cost of the buildings was borne by the Kansas CREA (Committee on Relation of Electricity to Agriculture).

Bill of Material for 36'x72' Laying House

LUMBER

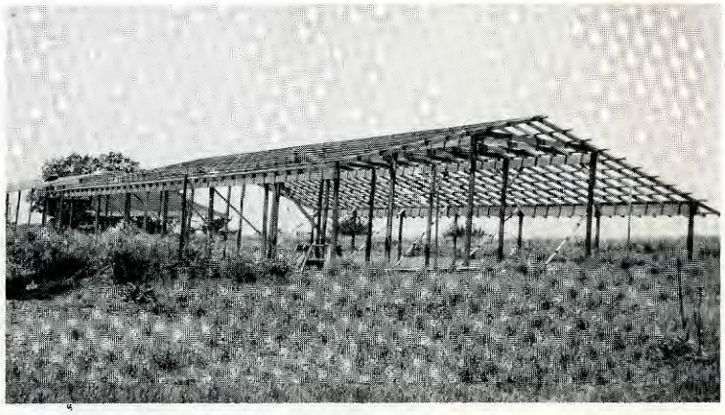
Quantity	*Item & Specifications*	*Price*	*Total Amt.*
14	12' penta treated poles, 4"	$2.45 ea.	$34.30
14	16' penta treated poles, 4"	3.96 ea.	55.44
72	2x4x22' rafters (Std.)	.115 bd. ft.	121.44
85	2x4x24' nailers, ridge, & panel	.115 bd. ft.	156.40
916 lin. ft.	2x4 nailers, storage racks, braces, & studs, etc. (Std.)	.115 bd. ft.	70.23
5	2x6x12' bottom plates (Std.)	.115 bd. ft.	6.90
3	2x6x24' door mounting & horizontal plate (Std.)	.115 bd. ft.	8.28
4	2x8x8' door jams (Std.)	.115 bd. ft.	4.91
6	2x10x24' purlins (Std.)	.115 bd. ft.	27.60
4	2x12x14' bottom plates (creo.) (Std.)	.135 bd. ft.	15.12
6	2x12x24' bottom plates (creo.) (Std.)	.135 bd. ft.	38.88
6	2x12x24' top plates (Std.)	.115 bd. ft.	33.12
72 lin. ft.	2x2 front nailers under wd. (Std.)	.05 ft.	3.60
500 lin. ft.	1x2 stops (No. 2)	.04 ft.	20.00
910 lin. ft.	1x4 window frames, etc. (No. 2)	.168 bd. ft.	50.96
9	1x6x16' door nailers (No. 3)	.1175 bd. ft.	8.46
19	1x6x12' (rough) collar ties (No. 2)	.1175 bd. ft.	13.39
40	1x6x8' car siding (No. 2) for end doors	.14 bd. ft.	22.40
216 lin. ft.	Lattice molding for screens	.04 ft.	8.64

INSULATION

134 pcs.	25/32 vapor seal sheeting, asphalt coated (4x8 sheets)	.101 sq. ft.	433.09
384 sq. ft.	¼" armor board center partition galv. iron	.10 sq. ft.	38.40
74 lin. ft.	12" ridge roll, 1¼ corr.	.115 ft.	8.51
72 pcs.	12'x2'-1¼" corr. iron 29 gauge	.099 sq. ft.	171.07
72 pcs.	11'x2'-1¼" corr. iron 29 gauge	.099 sq. ft.	156.82
½ yd.	Concrete for post bases	12.10 cu. yd.	6.05

DOORS—HDW.—NAILS, ETC.

32 lin. ft.	Barndoor track	.40 ft.	12.80
2 pr.	Door rollers	4.50 pr.	9.00
2	Outside doors 1⅜"x2'-8"x6'-8"	14.00 ea.	28.00
1	Inside door 1⅜"x2'-6"x6'-8"	8.50 ea.	8.50
112	⅜"-7" carriage bolts	.09 ea.	10.08
3 pr.	3" butt hinges	.60 pr.	1.80
3	Door locksets	2.00 ea.	6.00
200	Screen turn buttons	.03 ea.	6.00
50 lbs.	2" lead head roofing nails	.38 lb.	19.00
5	Boxes screen tacks	.15 box	.75
50 lbs.	16 d nails	.13 lb.	6.50
25 lbs.	2" galv. nails	.20 lb.	5.00
300	Corrugated fasteners at .38 per 100	.0038 ea.	1.14
10 lbs.	Poultry netting staples	.27 lb.	2.70
72 lin. ft.	4' wide Flex-o-Screen for windows	.50 ft.	36.00
88 lin. ft.	60" wide, ½ weld wire	.343 ft.	30.18
100 lin. ft.	4' wide, ½ weld wire	.2772 ft.	27.72
88 lin. ft.	3' wide, 1" hex poultry netting	.056 ft.	4.93
200 lin. ft.	4' wide, 1" hex poultry netting	.0917 ft.	18.34
	Total without labor		$1,748.45
272 hrs.	Labor (skilled and unskilled)	average 1.47 hr.	$399.84
	Total cost incl. labor		$2,148.29



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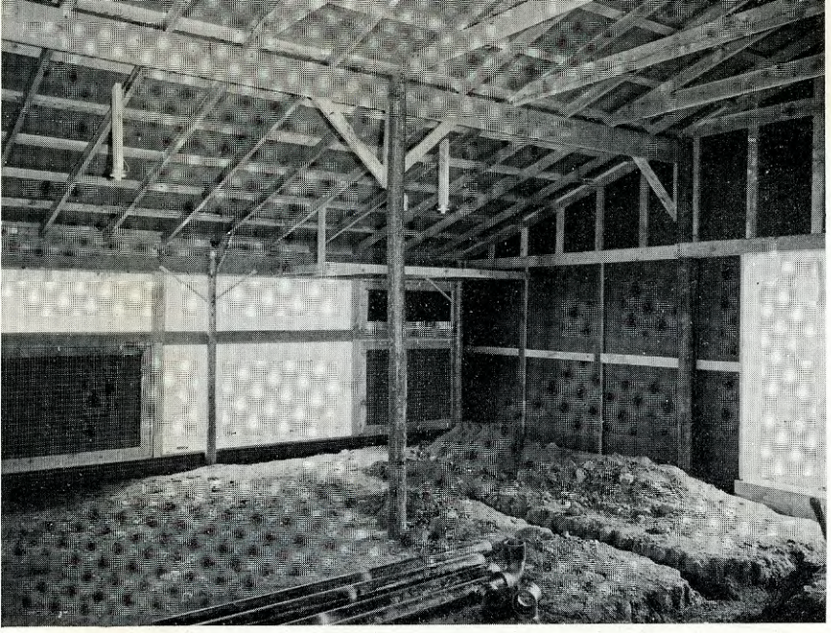
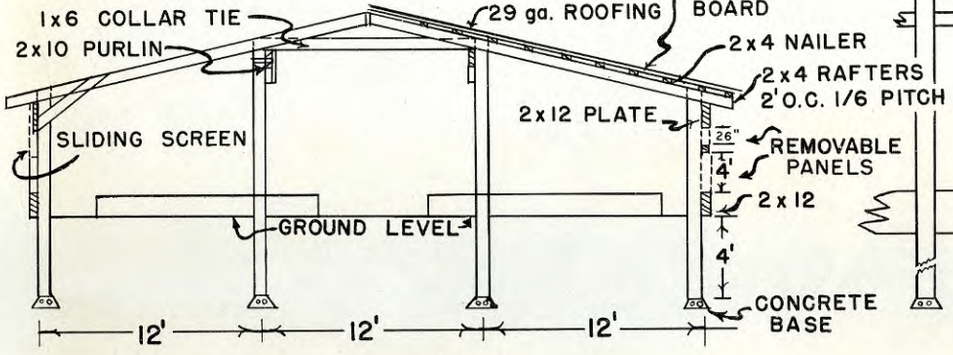


Construction Notes

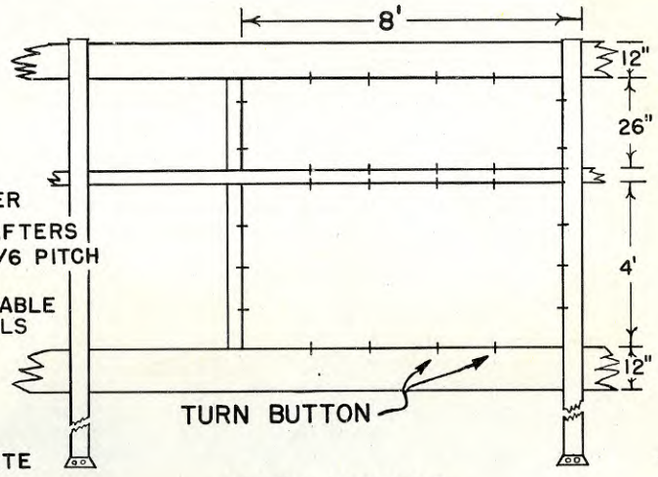
Poles provide the sole support for the structure. They should be set at least 4 feet into the ground resting on a concrete base. These poles should be penta or creosote treated and have a minimum 4" top diameter.

All structural framing material should be of standard grade or better. The siding is 25/32" asphalt-coated insulation board. The roofing is 29 ga. galvanized, corrugated iron underlaid with 25/32" asphalt-impregnated insulite board for insulation.

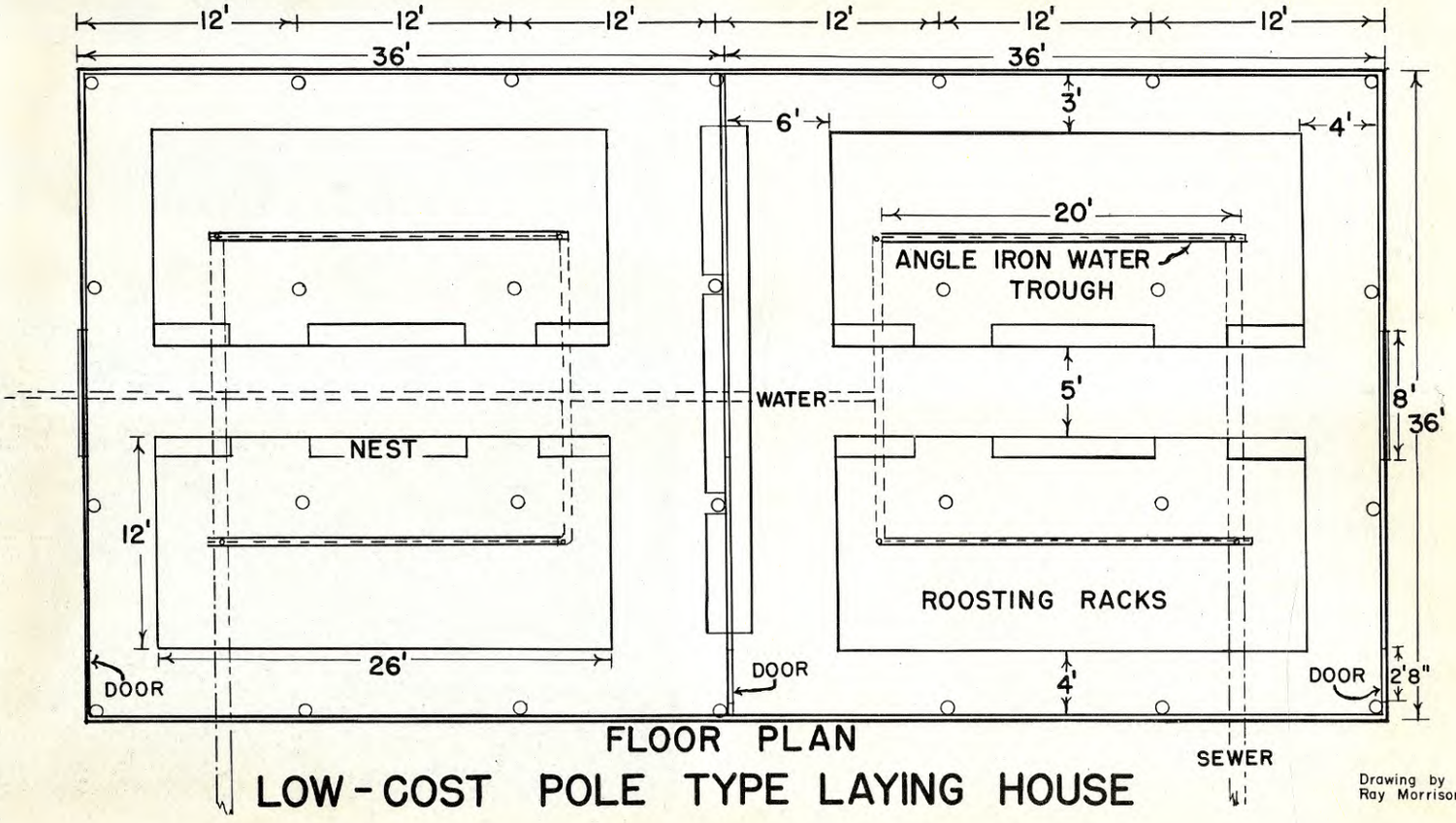
A unique feature of this house is the removable back. Any number of panels up to the entire back may be taken off for summer ventilation or closed for protection from the weather. A wire screen is necessary to keep birds from picking holes in the insulation board side walls.



CROSS SECTION



INSIDE VIEW OF
REMOVABLE PANEL



FLOOR PLAN

LOW-COST POLE TYPE LAYING HOUSE

Drawing by Ray Morrison

Reprinted from the *Kansas Agricultural Situation*, Dec. 1959.

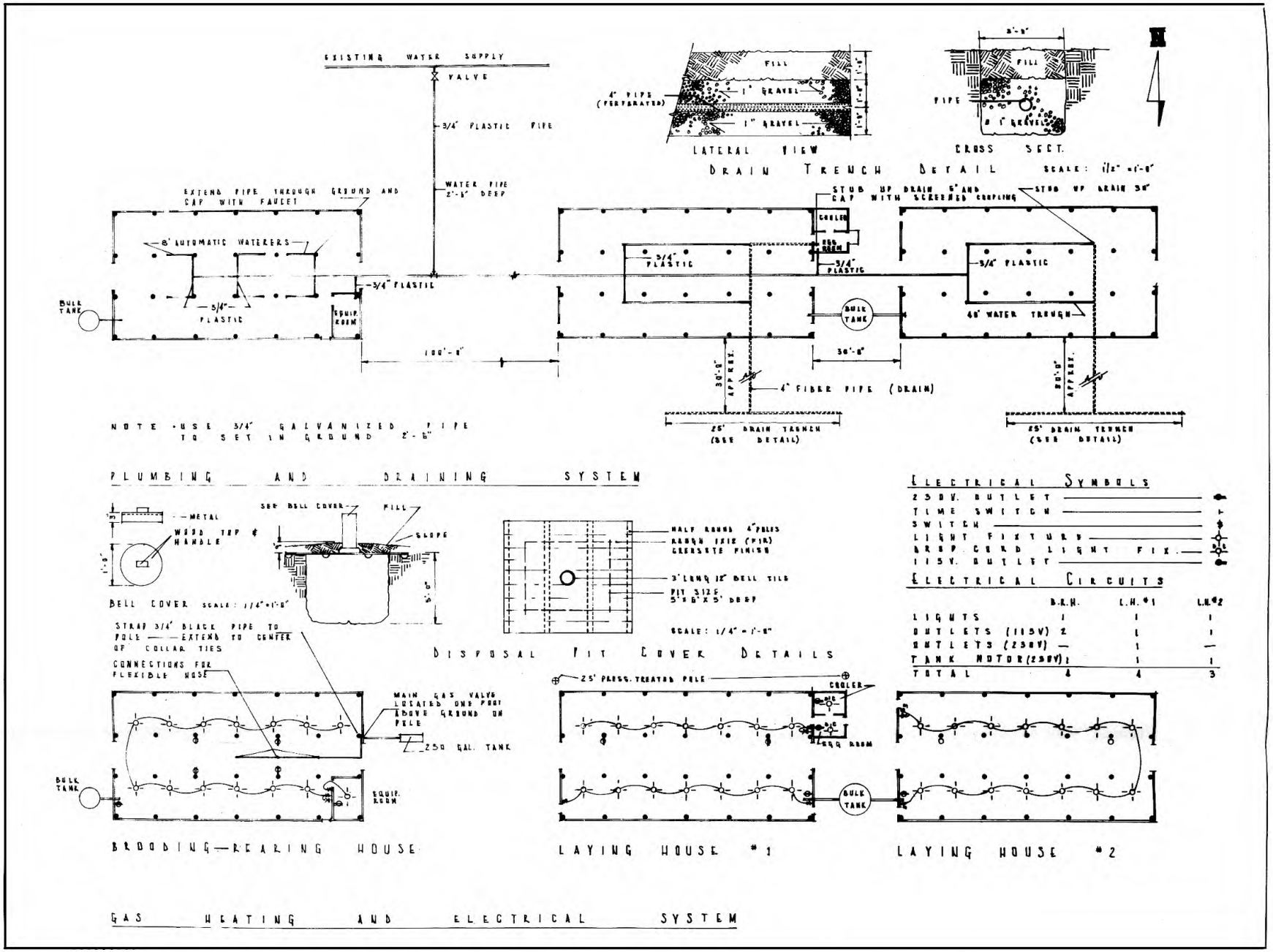


Figure 2A. Plans for the 36' x 72' Kansas pole-type poultry houses and equipment.

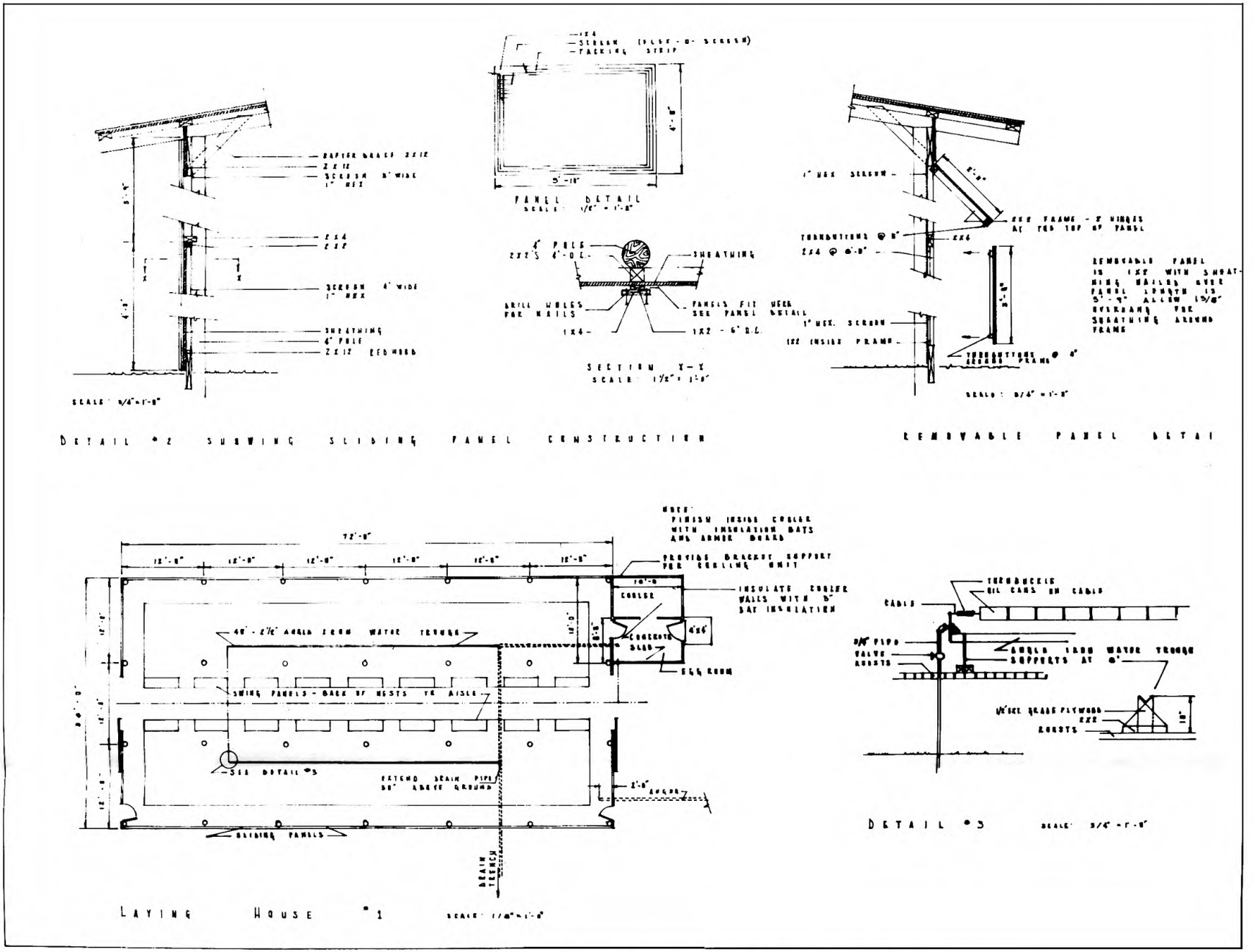


Figure 2B. Plans for the 36' x 72' Kansas pole-type poultry houses and equipment.

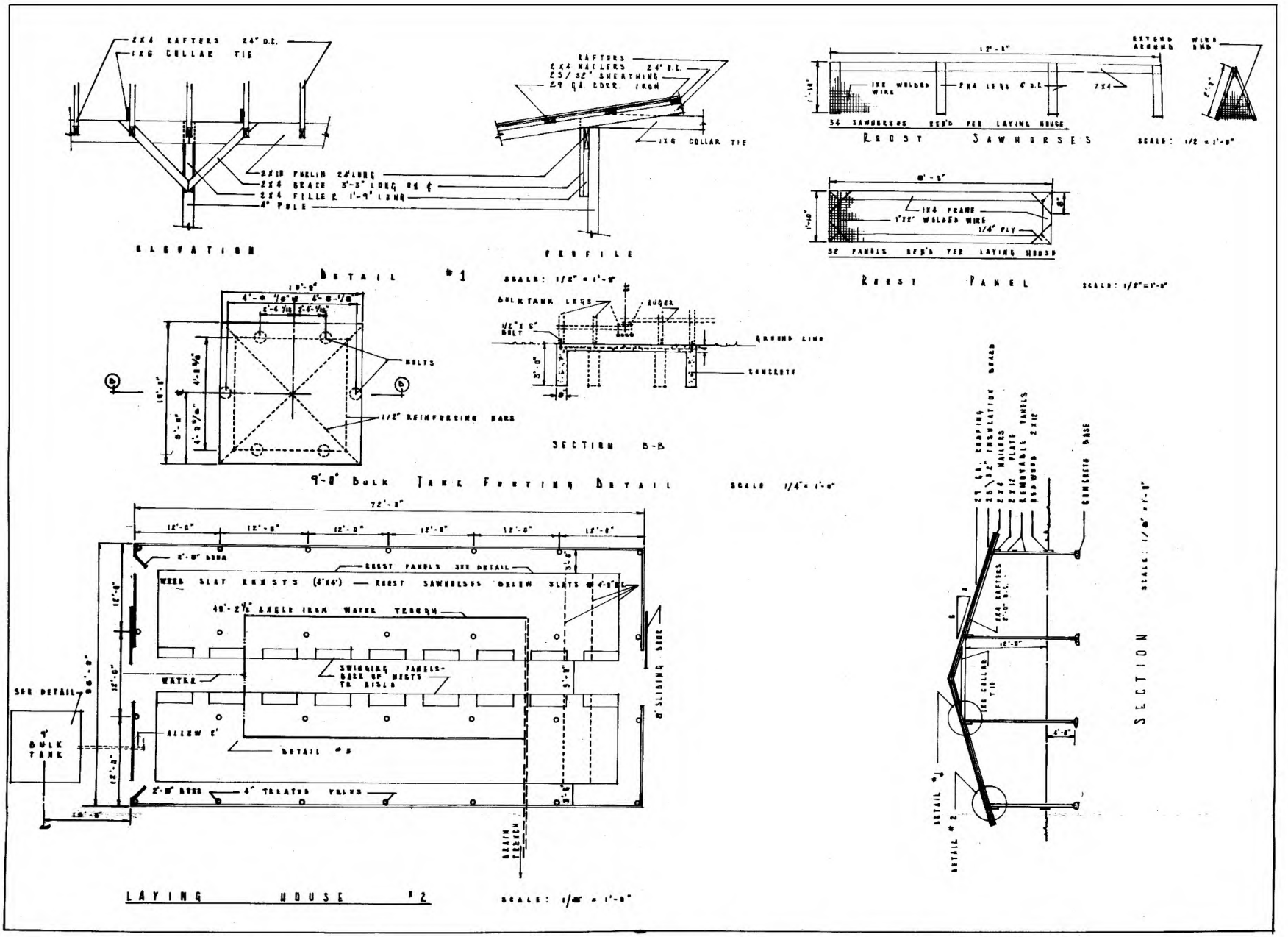


Figure 2C. Plans for the 36' x 72' Kansas pole-type poultry houses and equipment.

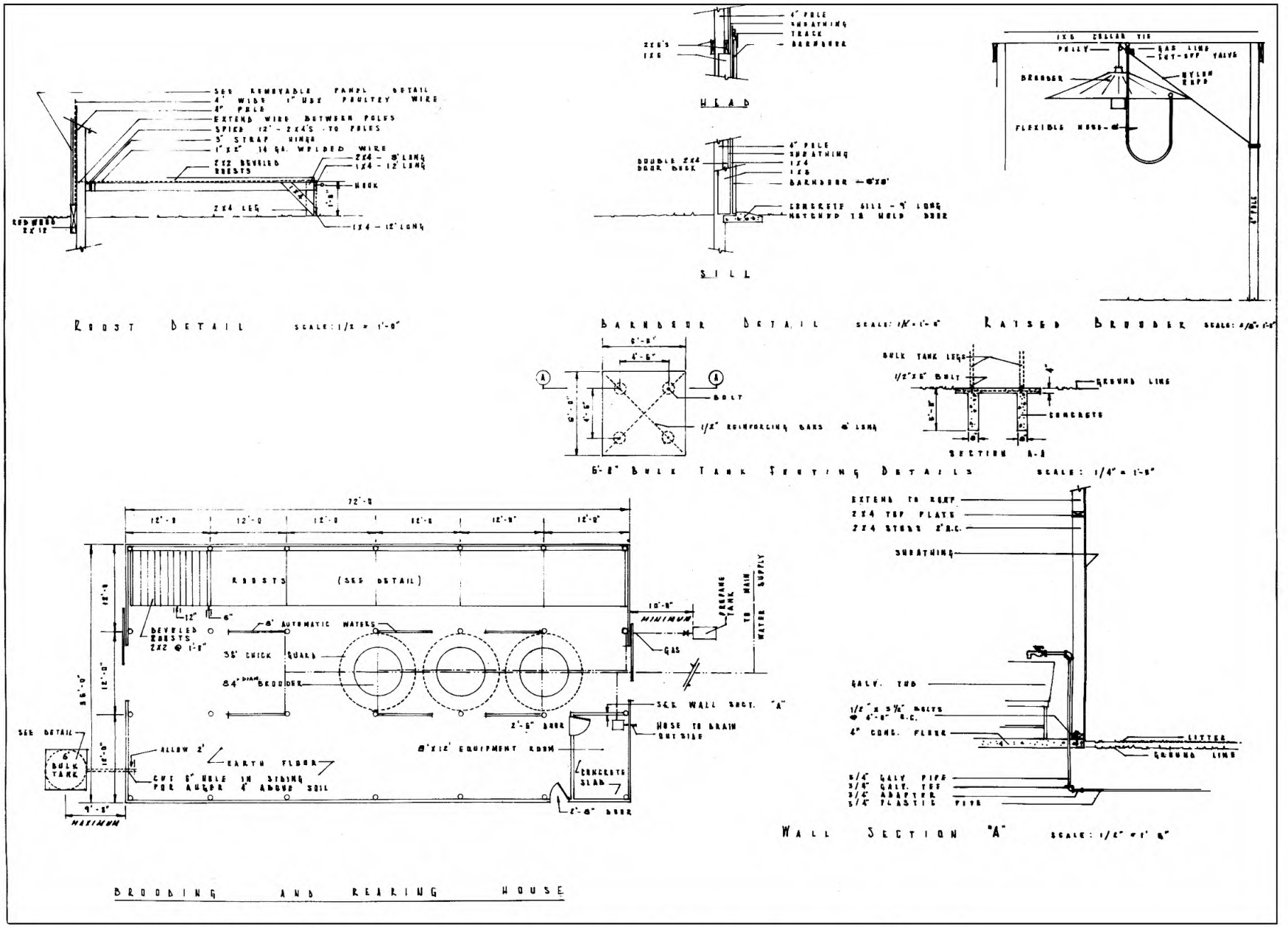


Figure 20. Plans for the 36' x 72' Kansas pole-type poultry houses and equipment.

Appendix B

Poultry Houses: Bill of Materials and Costs

Table 1. 36' x 72' Kansas pole-type brooder-rearing house[1]: Bill of materials and estimated costs at 1959-60 retail prices.

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Lumber[2] and Concrete:						
Penta treated poles	14	4" diam.	12'	——	$2.95 ea.	$ 41.30
Penta treated poles	14	4" diam.	16'	——	5.05 ea.	70.70
Rafters	72	2" x 4"	22'	1,056 bd.ft.	.15 bd.ft.	158.40
Nailers, ridge and panel	51	2" x 4"	24'	816 bd.ft.	.15 bd.ft.	122.40
Top plates (east and west wall)	4	2" x 4"	12'	32 bd.ft.	.14 bd.ft.	4.48
Studs (east and west walls including double 2x4's for door bulks, also equipment room)	48	2" x 4"	8'	256 bd.ft.	.14 bd.ft.	35.84
Barndoor mounting plates	4	2" x 6"	12'	48 bd.ft.	.14 bd.ft.	6.72
Purlins	6	2" x 10"	24'	240 bd.ft.	.15 bd.ft.	36.00
Top plates	6	2" x 12"	24'	288 bd.ft.	.15 bd.ft.	43.20
South wall panel spacers (redwood)	12	1" x 2"	8'	96 ft.	.05 ft.	4.80
South wall panel holders	12	1" x 4"	8'	32 bd.ft.	.21 bd.ft.	6.72
Carsiding for barndoors	38	1" x 6"	8'	152 bd.ft.	.15 bd.ft.	22.80
Collar ties (rough)	19	1" x 6"	12'	114 bd.ft.	.15 bd.ft.	17.10
Barndoor jambs	4	1" x 6"	8'	16 bd.ft.	.15 bd.ft.	2.40
Barndoor track backing (No. 3)	2	1" x 6"	16'	16 bd.ft.	.15 bd.ft.	2.40
Bottom plates (bench redwood)	10	2" x 12"	20'	400 bd.ft.	.54 bd.ft.	216.00
Knee braces	234'	2" x 4"	-	156 bd.ft.	.14 bd.ft.	21.84
Knee braces, vertical member	74'	2" x 4"	-	50 bd.ft.	.14 bd.ft.	7.00
Knee braces, side	28'	2" x 4"	-	19 bd.ft.	.14 bd.ft.	2.66
North wall panel spacers	54'	2" x 4"	-	36 bd.ft.	.14 bd.ft.	5.04
Studs (east and west walls and equipment room above plates)	143'	2" x 4"	-	96 bd.ft.	.14 bd.ft.	13.44
Top and bottom plates for equipment room	36'	2" x 4"	-	24 bd.ft.	.14 bd.ft.	3.36

Table 1 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Lumber[2] and Concrete:						
Hangers for lights	28'	2" x 4"	-	19 bd.ft.	.14 bd.ft.	2.66
Hinged panel frames	156'	2" x 2"	-	——	.06 ft.	9.36
Nailers (under south wall panels)	120'	2" x 2"	-	——	.06 ft.	7.20
Frames (north wall) (No. 3)	180'	1" x 2"	-	——	.03 ft.	5.40
Frame catches (No. 3)	180'	1" x 2"	-	——	.03 ft.	5.40
Sliding panel frames	200'	1" x 4"	-	67 bd.ft.	.21 bd.ft.	14.07
2'8" and 2'6" door jambs (2)	34'	1" x 4"	-	12 bd.ft.	.21 bd.ft.	2.52
Door trim (two sides for equipment room)	51'	1" x 4"	-	17 bd.ft.	.21 bd.ft.	3.57
Lattice molding for screens	155'	—	-	——	.02 ft.	3.10
25/32" vapor seal sheathing, asphalt coated	145	4' x 8'	-	4,640 sq.ft.	.135 sq.ft.	626.40
Corrugated iron, 29 gauge	72pcs	12'x2'-1¼"	-	1,872 sq.ft.	.11 sq.ft.	205.92
Corrugated iron, 29 gauge	72pcs	11'x2'-1¼"	-	1,716 sq.ft.	.11 sq.ft.	188.76
Reinforcing bars (bulk bin footings)	2	8' x ½"	-	16 ft.	.07 ft.	1.12
Concrete (equipment room floor, sills, post footings, and 6' bulk bin footings)	-	—	-	3 3/4 cu.yds.	13.50 cu.yd.	50.63
Total						1,970.71
Hardware, Nails, etc.:						
Sliding door track	32'	—	-	——	.55 ft.	17.60
Sliding door rollers	2 pr.	—	-	——	5.60 pr.	11.20
Outside door	1	13/8"x2'-8" x6'-8"	-	——	14.50 ea.	14.50
Inside door	1	13/8"x2'-6" x6'-8"	-	——	14.00 ea.	14.00

Table 1 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Hardware, Nails, etc.:						
Butt hinges (for doors)	2 pr.	3"	-	——	.60 pr.	1.20
Butt hinges (for north panels)	12 pr.	2"	-	——	.33 pr.	3.96
Carriage bolts (for plates and purlins)	112	3/8" x 7"	-	——	.15 ea.	16.60
Anchor bolts (for equipment room)	6	3/8" x 3½"	-	——	.15 ea.	.90
Door locksets	2	—	-	——	1.75 ea.	3.50
Screen turnbuttons	200	—	-	——	.02 ea.	4.00
Roofing nails, lead head	50 lbs.	2"	-	——	.38 lb.	19.00
Screen tacks	5 lbs.	—	-	——	.50 lb.	2.50
Nails, common	50 lbs.	16d	-	——	.14 lb.	7.00
Nails, galvanized	28 lbs.	2"	-	——	.22 lb.	6.16
Corrugated fasteners	300	½"	-	——	.38 per 100	1.14
Poultry netting staples	10 lbs.	—	-	——	.30 lb.	3.00
Flex-o-screen	60'	4' wide	-	——	.33 ft.	19.80
1" hex, poultry netting	200'	4' wide	-	——	.125 ft.	25.00
1" hex, poultry netting	132'	3' wide	-	——	.10 ft.	13.20
Total						184.26
Electrical Materials:						
Racks, 3-wire, insulated (3 for power poles, including main power line)	4	—	-	——	2.69 ea.	10.76
Entrance head	1	—	-	——	9.98 ea.	9.98
Entrance switch, surface-type, 60 amperes, 4 circuits	1	—	-	——	10.98 ea.	10.98
Utility boxes, surface mounted (for switches and receptacles)	8	—	-	——	.35 ea.	2.80
3-prong wall receptacle, single, 230V (for bin motor)	1	—	-	——	1.49 ea.	1.49

Table 1 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Electrical Materials:						
3-prong armor plug cap (for bin motor).	1	—	-	—	.98 ea.	.98
Single outlet cover	1	—	-	—	.15 ea.	.15
Single pole switches, brown	2	—	-	—	.39 ea.	.78
Switch box covers	2	—	-	—	.15 ea.	.30
Time switch, automatic	1	—	-	—	9.00 ea.	9.00
Wall receptacles, duplex, 115V, brown	5	—	-	—	.39 ea.	1.95
Duplex receptacle covers	5	—	-	—	.15 ea.	.75
Octagon boxes, 4" with clamps (for lights)	14	—	-	—	.39 ea.	5.46
Receptacles, white porcelain, 4" (for lights)	14	—	-	—	.29 ea.	4.06
Light reflectors, indoor, 12" and holders	14	—	-	—	1.19 ea.	16.66
Bulbs, 40 watt	14	—	-	—	.21 ea.	2.94
#6 weather-proof outdoor wire	450'	—	-	—	.09 ft.	40.50
#6 3-wire service entrance cable, armored	10'	—	-	—	.49 ft.	4.90
#12 2-wire non-metallic sheathed cable (for lights)	175'	—	-	—	.53 ft.	92.75
#10 2-wire non-metallic sheathed cable (for outlets)	175'	—	-	—	.11 ft.	19.25
Copper ground wire, armored, 8 gauge	15'	—	-	—	.15 ft.	2.25
8' ground rod, copper-covered	1	½"	-	—	2.98 ea.	2.98
Ground clamp, ½"	1	—	-	—	.29 ea.	.29
Solderless connectors (#12 and #10 wire)	46	—	-	—	.03 ea.	1.38
Romex staples	90	—	-	—	.01 ea.	.90
Wood screws, (for outlet boxes)	44	3/4"	-	3 2/3 doz.	.07 doz.	.26
25' power pole, pressure treated, 5" top.	1	—	-	—	12.60 ea.	12.60
Total						257.10

Table 1 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Plumbing Materials:						
Water supply -						
Ground key stop valve, "T" handle	1	3/4"	-	——	2.19 ea.	2.19
Curb box, 30" (for ground valve)	1	——	-	——	5.75 ea.	5.75
Plastic pipe	200'	3/4"	-	——	.12 ft.	24.00
Plastic pipe tees	7	3/4"	-	——	.49 ea.	3.43
Plastic pipe clamps	28	3/4"	-	——	.25 ea.	7.00
Galvanized adapters	7	3/4"	-	——	.33 ea.	2.31
90° elbows, galvanized	8	3/4"	-	——	.25 ea.	2.00
Galvanized pipe (up to waterers)	25'	3/4"	-	——	.24 ft.	6.00
Valves, brass (for waterers)	6	3/4"	-	——	1.29 ea.	7.74
Faucet, brass (for equipment room)	1	3/4"	-	——	1.59 ea.	1.59
Pipe straps	9	3/4"	-	——	.02 ea.	.18
Gas (black pipe) -						
Gas cock, brass (to fuel tank)	1	3/4"	-	——	1.79 ea.	1.79
Black pipe	63'	3/4"	-	——	.22 ft.	13.86
90° elbows	4	3/4"	-	——	.19 ea.	.76
Tees	2	3/4"	-	——	.29 ea.	.58
Reducers (for automatic shut-off valves)	3	3/4" to $\frac{1}{8}$"	-	——	.25 ea.	.75
Nipples, 3" (for automatic shut-off valves)	3	3/4"	-	——	.10 ea.	.30
Pipe straps	12	3/4"	-	——	.02 ea.	.24
Total						80.47

Table 1 (concluded).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Paint:						
Aluminum (for fuel tank)	1 qt.	——	-	——	2.89 qt.	2.89
Outside white (primer coat)	2 gals.	——	-	——	5.98 gal.	11.96
Outside white (1 finish coat)	2 gals.	——	-	——	5.98 gal.	11.96
Total						26.81
GRAND TOTAL						2,519.35

[1]Includes a 10' x 12' equipment room.

[2]Lumber was standard grade (No. 2) unless specified otherwise.

Table 2. 36' x 72' Kansas pole-type laying house[1] and attached 10' x 12' egg room: Bill of materials and estimated costs at 1959-60 retail prices.

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Lumber[2] and Concrete:						
Penta treated poles	14	4" diam.	12'	——	$2.95 ea.	$ 41.30
Penta treated poles	14	4" diam.	16'	——	5.05 ea.	70.70
Rafters	72	2" x 4"	22'	1,056 bd.ft.	.15 bd.ft.	158.40
Nailers, ridge and panel	51	2" x 4"	24'	816 bd.ft.	.15 bd.ft.	122.40
Nailers & egg room bottom plate	9	2" x 4"	12'	72 bd.ft.	.14 bd.ft.	10.08
Rafters (egg room)	10	2" x 4"	16'	107 bd.ft.	.14 bd.ft.	14.98
Top plates (east and west wall)	4	2" x 4"	12'	32 bd.ft.	.14 bd.ft.	4.48
Top and bottom plates in egg room	4	2" x 4"	10'	27 bd.ft.	.14 bd.ft.	3.78
Studs (egg room and west wall including double 2x4's for door bucks)	60	2" x 4"	8'	320 bd.ft.	.14 bd.ft.	44.80
Barndoor mounting plates	4	2" x 6"	12'	48 bd.ft.	.14 bd.ft.	6.72
Purlins	6	2" x 10"	24'	240 bd.ft.	.15 bd.ft.	36.00
Top plates	6	2" x 12"	24'	288 bd.ft.	.15 bd.ft.	43.20
South wall panel spacers (redwood)	13	1" x 2"	8'	104 ft.	.05 ft.	5.20
South wall panel holders	13	1" x 4"	8'	35 bd.ft.	.21 bd.ft.	7.35
Carsiding for barndoors	38	1" x 6"	8'	152 bd.ft.	.15 bd.ft.	22.80
Collar ties (rough)	19	1" x 6"	12'	114 bd.ft.	.15 bd.ft.	17.10
Barndoor jambs	4	1" x 6"	8'	16 bd.ft.	.15 bd.ft.	2.40
Barndoor track backing (No. 3)	2	1" x 6"	16'	16 bd.ft.	.15 bd.ft.	2.40
Bottom plates (bench redwood)	10	2" x 12"	20'	400 bd.ft.	.54 bd.ft.	216.00
Knee braces	234'	2" x 4"	-	156 bd.ft.	.14 bd.ft.	21.84
Knee braces, vertical member	74'	2" x 4"	-	50 bd.ft.	.14 bd.ft.	7.00
Knee braces, side	28'	2" x 4"	-	19 bd.ft.	.14 bd.ft.	2.66
North wall panel spacers	54'	2" x 4"	-	36 bd.ft.	.14 bd.ft.	5.04
Studs (east and west walls and laying house above plates)	165'	2" x 4"	-	110 bd.ft.	.14 bd.ft.	15.40

Table 2 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Lumber[2] and Concrete:						
Hangers for lights	34'	2" x 4"	-	23 bd.ft.	.14 bd.ft.	3.22
Hinged panel frames	156'	2" x 2"	-	——	.06 ft.	9.36
Nailers (under south wall panels)	144'	2" x 2"	-	——	.06 ft.	8.64
Frames (north wall) (No. 3)	180'	1" x 2"	-	——	.03 ft.	5.40
Frame catches (No. 3)	180'	1" x 2"	-	——	.03 ft.	5.40
Sliding panel frames	240'	1" x 4"	-	80 bd.ft.	.21 bd.ft.	16.80
2'8" and 2'6" door jambs (4)	68'	1" x 4"	-	23 bd.ft.	.21 bd.ft.	4.83
Outside door trim	68'	1" x 4"	-	23 bd.ft.	.21 bd.ft.	4.83
Lattice molding for screens	190'	——	-	——	.02 ft.	3.80
2' wide aluminum faced batt insulation (for egg cooler)	205'	3"	-	410 sq.ft.	.12 sq.ft.	49.20
25/32" vapor seal sheathing, asphalt coated	157 pcs.	4' x 8'	-	5,024 sq.ft.	.135 sq.ft.	678.24
Armor board, ¼"	12 pcs.	4' x 8'	-	384 sq.ft.	.11 sq.ft.	42.24
Corrugated iron, 29 gauge	82 pcs.	12'x2'-1¼"	-	2,132 sq.ft.	.11 sq.ft.	234.52
Corrugated iron, 29 gauge	72 pcs.	11'x2'-1¼"	-	1,716 sq.ft.	.11 sq.ft.	188.76
Bolts	6	½" x 6"	-	——	.19 ea.	1.14
Reinforcing bars (bulk bin footings)	24	3' x ½"	-	72 ft.	.04 ft.	2.88
Concrete (slab floor, sills, post footings and 9' bulk bin footings)	-	——	-	5 cu.yds.	13.50 cu.yd.	67.50
Total						2,208.79
Hardware, Nails, etc:						
Sliding door track	32'	——	-	——	.55 ft.	17.60
Sliding door rollers	2 pr.	——	-	——	5.60 pr.	11.20
Outside doors (one for egg room)	3	1 3/8"x2'-8" x6'-8"	-	——	14.50 ea.	43.50

Table 2 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Hardware, Nails, etc.:						
Door (egg room)	1	1 3/8"x2'-6" x6'-8"	-	——	14.00 ea.	14.00
Insulated door, hinges, latch and safety set for egg cooler	1	6'-2½"x2'-8½"	-	——	88.75 ea.	88.75
Butt hinges (for doors)	4pr	3"	-	——	.60 pr.	2.40
Butt hinges (for north panels)	12pr	2"	-	——	.33 pr.	3.96
Carriage bolts (for plates and purlins)	112	3/8" x 7"	-	——	.15 ea.	16.60
Anchor bolts (for egg room)	8	3/8" x3½"	-	——	.15 ea.	1.20
Door locksets	4	——	-	——	1.75 ea.	7.00
Screen turnbuttons	200	——	-	——	.02 ea.	4.00
Roofing nails, lead head	54 lbs.	2"	-	——	.38 lb.	20.52
Screen tacks	5 lbs.	——	-	——	.50 lb.	2.50
Nails, common	52 lbs.	16d	-	——	.14 lb.	7.28
Nails, galvanized	28 lbs.	2"	-	——	.22 lb.	6.16
Corrugated fasteners	300	½"	-	——	.38 per 100	1.14
Poultry netting staples	10 lbs.	——	-	——	.30 lb.	3.00
Flex-o-screen	72'	4' wide	-	——	.33 ft.	23.76
1" hex, poultry netting	200'	4' wide	-	——	.125 ft.	25.00
1" hex, poultry netting	144'	3' wide	-	——	.10 ft.	14.40
Reinforcing bars	2	12'x½"	-	24 ft.	.07 ft.	1.68
Reinforcing bars	4	8'x½"	-	32 ft.	.07 ft.	2.24
Total						317.89
Electrical Materials:						
Racks, 3-wire, insulated (2 for power poles)	3	——	-	——	2.69 ea.	8.07
Entrance head	1	——	-	——	9.98 ea.	9.98

Table 2 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Electrical Materials:						
Entrance switch, surface-type, 60 amperes, 4 circuits	1	—	-	——	10.98 ea.	10.98
Utility boxes, surface mounted (for switches and receptacles)	8	—	-	——	.35 ea.	2.80
3-prong wall receptacles, single, 230V (for bin motor, cooler unit and washer)	3	—	-	——	1.49 ea.	4.47
3-prong armor plug caps (for bin motor, cooler unit and egg washer)	3	—	-	——	.98 ea.	2.94
Single outlet covers	3	—	-	——	.15 ea.	.45
Single pole switch, brown	1	—	-	——	.39 ea.	.39
Switch box covers	3	—	-	——	.15 ea.	.45
Time switch, automatic	1	—	-	——	9.00 ea.	9.00
3-pole toggle switches, brown	2	—	-	——	.50 ea.	1.00
Wall receptacles, duplex, 115V, brown	2	—	-	——	.39 ea.	.78
Duplex receptacle covers	2	—	-	——	.15 ea.	.30
Octagon boxes, 4" with clamps (for lights)	16	—	-	——	.39 ea.	6.24
Receptacles, white porcelain, 4" (for lights)	14	—	-	——	.29 ea.	4.06
Receptacles, white porcelain, 4" pull-chain switch	2	—	-	——	.47 ea.	.94
Light reflectors, indoor, 12" and holders	16	—	-	——	1.19 ea.	19.04
Bulbs, 40 watt	16	—	-	——	.21 ea.	3.36
#6 weather-proof outdoor wire	300'	—	-	——	.09 ft.	27.00
#6 3-wire service entrance cable, armored	10'	—	-	——	.49 ft.	4.90

Table 2 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Electrical Materials:						
#12 2-wire non-metallic sheathed cable (for lights)	200'	—	-	——	.53 ft.	106.00
#10 2-wire non-metallic sheathed cable (for lights)	125'	—	-	——	.11 ft.	13.75
Copper ground wires, armored, 8 gauage.	15'	—	-	——	.15 ft.	2.25
8' ground rod, copper covered	1	½"	-	——	2.98 ea.	2.98
Ground clamp, ⅛"	1	—	-	——	.29 ea.	.29
Solderless connectors (#12 and #10 wire)	50	—	-	——	.03 ea.	1.50
Romex staples	90	—	-	——	.01 ea.	.90
Wood screws, (for outlet boxes)	44	3/4"	-	3 2/3 doz.	.07 doz.	.26
25' power pole, pressure treated, 5" top	1	—	-	——	12.60 ea.	12.60
Total						257.68
Plumbing Materials:						
Water supply -						
Plastic pipe	148'	3/4"	-	——	.12 ft.	17.76
Plastic pipe tees	3	3/4"	-	——	.49 ea.	1.47
Plastic pipe clamps	12	3/4"	-	——	.25 ea.	3.00
Galvanized adapters	3	3/4"	-	——	.33 ea.	.99
90° elbows, galvanized	8	3/4"	-	——	.25 ea.	2.00
Galvanized pipe (up to waterers and faucet)	16'	3/4"	-	——	.24 ft.	3.84
Stop valves, brass (for waterers)	2	3/4"	-	——	1.49 ea.	2.98

Table 2 (concluded).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Plumbing Materials:						
Water supply -						
Nipples-3" (for waterers)	2	3/4"	-	——	.12 ea.	.24
Nipples-6" (for waterers and egg room)	3	3/4"	-	——	.25 ea.	.75
Faucet brass (for egg room)	1	3/4"	-	——	1.59 ea.	1.59
Drainage system -						
Fiber pipe	82'	4"	-	——	.48 ft.	39.36
Fiber 90° elbows (for egg room)	2	4"	-	——	3.03 ea.	6.06
Coupling, wire-mesh top (for egg room drain)	1	4"	-	——	.39 ea.	.39
Fiber tees (for waterers and drain trench)	3	4"	-	——	3.24 ea.	9.72
Perforated fiber pipe (for drain trench)	24'	4"	-	——	.33 ft.	7.92
Gravel (for drain trench)	150 cu.ft.	1"	-	5½ ton	3.50 ton(del.)	19.25
Total						117.32
Paint:						
Rust-proof, metal primer (for waterers, 1 coat)	1 qt.	—	-	——	2.89 qt.	2.89
Aluminum (for waterers, 2 coats)	2 qts.	—	-	——	2.89 qt.	5.78
Outside white (primer coat)	2 gals.	—	-	——	5.98 gal.	11.96
Outside white (1 finish coat)	2 gals.	—	-	——	5.98 gal.	11.96
Total						32.59
GRAND TOTAL						2,934.27

[1] For 1,300 layers allowing approximately 2 square feet per bird.
[2] Lumber was standard grade (No. 2) unless specified otherwise.

Table 3. 36' x 72' Kansas pole-type laying house[1]: Bill of materials and estimated costs at 1959-60 retail prices.

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Lumber[2] and Concrete:						
Penta treated poles	14	4" diam.	12'	——	$2.95 ea.	$ 41.30
Penta treated poles	14	4" diam.	16'	——	5.05 ea.	70.70
Rafters	72	2" x 4"	22'	1,056 bd.ft.	.15 bd.ft.	158.40
Nailers, ridge and panel	51	2" x 4"	24'	816 bd.ft.	.15 bd.ft.	122.40
Top plates (east and west wall)	4	2" x 4"	12'	32 bd.ft.	.14 bd.ft.	4.48
Studs (east and west walls including double 2x4's for door bucks)	28	2" x 4"	8'	150 bd.ft.	.14 bd.ft.	21.00
Barndoor mounting plates	4	2" x 6"	12'	48 bd.ft.	.14 bd.ft.	6.72
Purlins	6	2" x 10"	24'	240 bd.ft.	.15 bd.ft.	36.00
Top plates	6	2" x 12"	24'	288 bd.ft.	.15 bd.ft.	43.20
South wall panel spacers (redwood)	13	1" x 2"	8'	104 ft.	.05 ft.	5.20
South wall panel holders	13	1" x 4"	8'	35 bd.ft.	.21 bd.ft.	7.35
Carsiding for barndoors	38	1" x 6"	8'	152 bd.ft.	.15 bd.ft.	22.80
Collar ties (rough)	19	1" x 6"	12'	114 bd.ft.	.15 bd.ft.	17.10
Barndoor jambs	4	1" x 6"	8'	16 bd.ft.	.15 bd.ft.	2.40
Barndoor track backing	2	1" x 6"	16'	16 bd.ft.	.15 bd.ft.	2.40
Bottom plates (bench redwood)	10	2" x 12"	20'	400 bd.ft.	.54 bd.ft.	216.00
Knee braces	234'	2" x 4"	-	156 bd.ft.	.14 bd.ft.	21.84
Knee braces, vertical member	74'	2" x 4"	-	50 bd.ft.	.14 bd.ft.	7.00
Knee braces, side	28'	2" x 4"	-	19 bd.ft.	.14 bd.ft.	2.66
North wall panel spacers	54'	2" x 4"	-	36 bd.ft.	.14 bd.ft.	5.04
Studs (east and west walls above plates)	105'	2" x 4"	-	70 bd.ft.	.14 bd.ft.	9.80
Hangers for lights	28'	2" x 4"	-	19 bd.ft.	.14 bd.ft.	2.66
Hinged panel frames	156'	2" x 2"	-	——	.06 ft.	9.36
Nailers (under south wall panels)	144'	2" x 2"	-	——	.06 ft.	8.64
Frames (north wall) (No. 3)	180'	1" x 2"	-	——	.03 ft.	5.40

Table 3 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Lumber[2] and Concrete:						
Frame catches (No. 3)	180'	1" x 2"	-	——	.03 ft.	5.40
Sliding panel frames	240'	1" x 4"	-	80 bd.ft.	.21 bd.ft.	16.80
2'-8" door jambs (2)	34'	1" x 4"	-	12 bd.ft.	.21 bd.ft.	2.52
Outside door trim	34'	1" x 4"	-	12 bd.ft.	.21 bd.ft.	2.52
Lattice molding for screens	190'	—	-	——	.02 ft.	3.80
25/32" vapor seal sheathing, asphalt coated	143pcs	4' x 8'	-	4,576 sq.ft.	.135 sq.ft.	617.76
Corrugated iron, 29 gauge	72pcs.	12"x2'-1½"	-	1,872 sq.ft.	.11 sq.ft.	205.92
Corrugated iron, 29 gauge	72pcs.	11"x2'-1½"	-	1,716 sq.ft.	.11 sq.ft.	188.76
Concrete (sills and post holes)	-	—	-	3/4 cu.yd.	13.50 cu.yd.	10.13
Total						1,903.46
Hardware, Nails, etc.:						
Sliding door track	32'	—	-	——	.55 ft.	17.60
Sliding door rollers	2 pr.	—	-	——	5.60 pr.	11.20
Outside doors	2	1 3/8"x2'-8" x6'-8"	-	——	14.50 ea.	29.00
Butt hinges (for doors)	2 pr.	3"	-	——	.60 pr.	1.20
Butt hinges (for north panels)	12 pr.	2"	-	——	.33 pr.	3.96
Carriage bolts (for plates and pumlins).	112	3/8"x7"	-	——	.15 ea.	16.60
Door locksets	2	—	-	——	1.75 ea.	3.50
Screen turnbuttons	200	—	-	——	.02 ea.	4.00
Roofing nails, lead head	50 lbs.	2"	-	——	.38 lb.	19.00
Screen tacks	5 lbs.	—	-	——	.50 lb.	2.50
Nails, common	50 lbs.	16d	-	——	.14 lb.	7.00
Nails, galvanized	25 lbs.	2"	-	——	.22 lb.	5.50

Table 3 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Hardware, Nails, etc.:						
Corrugated fasteners	300	½"	-	——	.38 per 100	1.14
Poultry netting staples	10 lbs	—	-	——	.30 lb.	3.00
Flex-o-screen	72'	4' wide	-	——	.33 ft.	23.76
1" hex poultry netting	200'	4' wide	-	——	.125 ft.	25.00
1" hex poultry netting	144'	3' wide	-	——	.10 ft.	14.40
Total						188.36
Electrical Materials:						
Racks, 3-wire, insulated (one for power pole)	2	—	-	——	2.69 ea.	5.38
Entrance head	1	—	-	——	9.98 ea.	9.98
Entrance switch, surface-type, 60 amperes, 4 circuits	1	—	-	——	10.98 ea.	10.98
Utility boxes, surface mounted (for switches and receptacles)	5	—	-	——	.35 ea.	1.75
3-prong wall receptacle, single, 230V (for bin motor)	1	—	-	——	1.49 ea.	1.49
3-prong armor plug cap (for bin motor).	1	—	-	——	.98 ea.	.98
Single outlet cover	1	—	-	——	.15 ea.	.15
Switch box covers	2	—	-	——	.15 ea.	.30
Time switch, automatic	1	—	-	——	9.00 ea.	9.00
3-pole toggle switches, brown	2	—	-	——	.50 ea.	1.00
Wall receptacles, duplex, 115 V, brown	2	—	-	——	.39 ea.	.78
Duplex receptacle covers	2	—	-	——	.15 ea.	.30
Octagon boxes, 4" with clamps (for lights)	14	—	-	——	.39 ea.	5.46

Table 3 (continued).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Electrical Materials:						
Receptacles, white porcelain, 4" (for lights)	14	—	-	——	.29 ea.	4.06
Light reflectors, indoor, 12" and holders	14	—	-	——	1.19 ea.	16.66
Bulbs, 40 watt	14	—	-	——	.21 ea.	2.94
#6 weather-proof outdoor wire	100'	—	-	——	.09 ft.	9.00
#6 3-wire service entrance cable, armored	10'	—	-	——	.49 ft.	4.90
#12 2-wire non-metallic sheathed cable (for lights)	175'	—	-	——	.53 ft.	92.75
#10 2-wire non-metallic sheathed cable (for outlets)	100'	—	-	——	.11 ft.	11.00
Copper ground wire, armored, 8 gauge	15'	—	-	——	.15 ft.	2.25
8' ground rod, copper-covered	1	½"	-	——	2.98 ea.	2.98
Ground clamp, ½"	1	—	-	——	.29 ea.	.29
Solderless connectors (#12 and #10 wire)	43	—	-	——	.03 ea.	1.29
Romex staples	90	—	-	——	.01 ea.	.90
Wood screws, (for outlet boxes)	38	3/4"	-	3 1/6 doz.	.07 doz.	.22
Total						196.79
Plumbing Materials:						
Water supply -						
Plastic pipe	62'	3/4"	-	——	.12 ft.	7.44
Plastic pipe tees	1	3/4"	-	——	.49 ea.	.49
Plastic pipe clamps	8	3/4"	-	——	.25 ea.	2.00
Galvanized adapters	2	3/4"	-	——	.33 ea.	.66

Table 3 (concluded).

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Plumbing Materials:						
Water supply -						
90° elbows, galvanized	6	3/4"	-	——	.25 ea.	1.50
Galvanized pipe (up to waterers)	9'	3/4"	-	——	.24 ft.	2.16
Stop valves, brass (for waterers)	2	3/4"	-	——	1.49 ea.	2.98
Nipples-3" (for waterers)	2	3/4"	-	——	.12 ea.	.24
Nipples-6" (for waterers)	2	3/4"	-	——	.25 ea.	.50
Drainage system -						
Fiber pipe	64'	4"	-	——	.48 ft.	30.72
Fiber 90° elbow (for waterer)	1	4"	-	——	3.03 ea.	3.03
Fiber tees (for waterer and drain trench)	2	4"	-	——	3.24 ea.	6.48
Perforated fiber pipe (for drain trench)	24'	4"	-	——	.33 ft.	7.92
Gravel (for drain trench)	150 cu.ft.	1"	-	5½ ton	3.50 ton (del.)	19.25
Total						85.37
Paint:						
Rust-proof, metal primer (for waterers, 1 coat)	1 qt.	——	-	——	2.89 qt.	2.89
Aluminum (for waterers, 2 coats)	2 qts.	——	-	——	2.89 qt.	5.78
Outside white (primer coat)	2 gals.	——	-	——	5.98 gal.	11.96
Outside white (1 finish coat)	2 gals.	——	-	——	5.98 gal.	11.96
Total						32.59
GRAND TOTAL						2,406.57

[1]For 1,300 layers allowing approximately 2 square feet per bird.

[2]Lumber was standard grade (No. 2) unless specified otherwise.

Appendix C

Poultry Houses: Labor Requirements and Costs

Table 1. 36' x 72' Kansas pole-type brooder-rearing house[1]: Estimated labor requirements and costs of carpentry, masonry, wiring, plumbing and painting.

Job	Man hours	Labor cost[2]
Carpentry and Masonry—36' x 72' poultry house (basic unit)[3]:		
Total	300	$450.00
Masonry—floor for 8' x 12' equipment room:		
1. Level the ground	1/2	
2. Lay out, make forms, and put in sand fill	1	
3. Pour, float, rough trowel, and edge 4" concrete slab; insert anchor bolts (use readi-mix concrete)	3	
	4 1/2	
Add 10%[4]	1/2	
Total	5	$7.50
Masonry—bulk tank footings and slab (7' x 7') for 6' diameter tank and assembly of tank:		
1. Grade and level the ground	1/2	
2. Lay out	1/2	
3. Dig holes for 4 piers (use tractor with auger)	1/2	
4. Make forms for slab	1/2	
5. Set reinforcing rods in holes, for slab, and tie rods	1	
6. Make template for anchor bolts	3/4	
7. Pour 4 piers; pour, float, rough trowel, and edge 4" slab and insert anchor bolts (use readi-mix concrete)	1 1/2	
8. Assemble bulk tank	30	
	35 1/4	
Add 10%[4]	3 1/2	
Total	38 3/4	$58.13

Table 1 (continued).

Job	Man hours	Labor cost[2]
Carpentry—10' x 12' equipment room:		
1. Drill holes in bottom plates for anchor bolts	1/2	
2. Fasten bottom plates and nail studs	2	
3. Nail top plates and studs above top plates	1 1/2	
4. Nail asphalt sheets (4' x 8') on studs (2 inside walls)	1	
5. Rough framing, jambs and trim of door (1)	1 1/2	
6. Hang 1 door and install lockset	1	
	7 1/2	
Add 10%[4]	3/4	
Total	8 1/4	$12.38
Wiring:		
1. Dig post hole for 1 power pole near laying house #1 (use tractor with auger); set pole and tamp	3/4	
2. Fasten 3-wire racks to poles and house (3@ 15 min.)	3/4	
3. Wire circuit to farm power line (assume 50' away)	1	
4. Locate entrance head and entrance switch (2@ 15 min.)	1/2	
5. Run wires and attach to 3-wire racks, entrance head, and entrance switch	1	
6. Locate utility boxes (8), octagon boxes (14), and time switch (1) (@ 8 min.)	3	
7. Wire circuits:		
a. Switches (2@ 15 min.)	1/2	
b. Time switch	1/2	
c. Duplex and single receptacles (6@ 15 min.)	1 1/2	
d. 1½ H.P. motor	1/2	
e. House lights (14@ 20 min.)	4 3/4	
8. Attach light reflectors and bulbs (14@ 6 min.)	1 1/2	
9. Wire grounding system	3/4	
	17	
Add 10%	1 3/4	
Total	18 3/4	$28.13

Table 1 (continued).

Job	Man hours	Labor cost[2]
Plumbing—water supply:		
1. Lay out lines (191')	1/2	
2. Dig 191' of trench (30" deep x 6-8" wide) (hire trenching machine @ $.20 lin. ft.		$38.20
3. Tap main farm water supply (assume 50' away)	4	
4. Lay 191' of plastic pipe from main farm water supply; join plastic couplings and tighten steel clamps (28 @ 10 min.)	4 3/4	
5. Cut pipe to desired lengths (6 cuts @ 5 min.)	1/2	
6. Thread ends of galvanized pipe (14 @ 15 min.) (assume ends of stock pipe are threaded)	3 1/2	
7. Join galvanized pipe connections (29 @ 5 min.)	2 1/2	
8. Fill dirt in 191' of trench and pack (use tractor and scoop)	5	
	20 3/4	
Add 10%	2	
Total	22 3/4	34.13
		$72.33
Plumbing—gas:		
1. Set fuel tank (250 gal.) on rail ties	1/4	
2. Lay 10' of pipe	1/2	
3. Cut pipe to desired lengths (4 cuts @ 5 min.)	1/2	
4. Thread ends of black pipe (6 @ 15 min.) (assume ends of stock pipe are threaded)	1 1/2	
5. Join pipe connections, including automatic shut-off valves for brooders (23 @ 5 min.)	2	
6. Fasten pipe to collar ties and one pole with straps (12 @ 5 min.) (assume 10-12' apart)	1	
	5 3/4	
Add 10%	1/2	
Total	6 1/4	$9.38

Table 1 (concluded).

Job	Man hours	Labor cost[2]
Painting of house: (assume 1 primer coat and 1 finish coat)		
1. Paint 8' x 8' sliding doors and frames (inside and out) (2 @ 30 min.)	1	
2. Paint regular doors and frames (inside and out) (2 @ 20 min.)	3/4	
3. Paint eaves, 2' overhang (sides and ends)		
72 roof rafters and outside nailers (on sides) (6 hr./coat)	12	
30 nailers (on ends) (3 hr./coat)	6	
4. Paint 4' x 6' sliding panel frames and panel holders (outside only) (10 @ 15 min.)	2 1/2	
5. Paint 250 gallon fuel tank (1 coat)	1/2	
	22 3/4	
Add 10%[4]	2 1/4	
Total	25	$37.50

[1]Includes equipment room.

[2]At $1.50 per hour for skilled and unskilled labor.

[3]For details see Table 2, this Appendix.

[4]For possible underestimate on labor requirements.

Table 2. 36' x 72' Kansas pole-type laying house (basic unit): Estimated labor requirements and costs of carpentry and masonry.

Job	Number of men	Man hours
1. Lay out 36' x 72' building	2	4
2. Dig 28 post holes (use tractor with auger)	1	4
3. Mix and pour concrete bases in 28 post holes	1	3
4. Set and tamp 28 poles	2	16
5. Fasten top plates and purlins	2	16
6. Dig out for bottom plates and fasten plates	2	8
7. Frame the building:		
a. Rafters	2	24
b. Roof nailers	2	8
c. Side nailers	2	16
d. Braces	1	4
e. Collar ties	1	4
8. Rough frame doors (2 sliding, 2 entrance)	1	4
9. Frame windows (for panels)	1	8
10. Nail asphalt sheathing (4' x 8' sheets) on roof	2	8
11. Nail galvanized iron (sheets) on roof	2	24
12. Nail asphalt sheathing (4' x 8' sheets) on sides	2	24
13. Nail door jambs and trim (2 sliding, 2 entrance)	1	3
14. Construct 2 sliding doors and hang doors	2	16
15. Hang regular doors and install locksets	1	2
16. Construct window panels for front (south) and nail panel holders	2	32
17. Construct removable insulated panels for back (north)	2	32
18. Nail welded wire to nailers and bottom plates (inside of house)	2	8
19. Masonry, including forms for sliding door sills (use readi-mix concrete)	1	4
		272
Add 10%[1]		28
Total hours		300
Labor cost[2]		$450

[1]For possible underestimate on labor requirements.

[2]At $1.50 per hour for skilled and unskilled labor.

Table 3. 36' x 72' Kansas pole-type laying house (basic unit): Estimated labor requirements and costs of wiring, plumbing and painting.

Job	Man hours	Labor cost[1]
Wiring:		
1. Fasten 3-wire racks to pole and house (2 @ 15 min.)	1/2	
2. Wire circuit to power line	1/2	
3. Locate entrance head and entrance switch (2 @ 15 min.)	1 1/2	
4. Run wires and attache to 3-wire racks, entrance head, and entrance switch.	1	
5. Locate utility boxes (5), octagon boxes (14), and time switch (1) (@ 8 min.)	2 3/4	
6. Wire circuits:		
a. Switches (2 @ 15 min.)	1/2	
b. Time switch	1/2	
c. Duplex and single receptacles (3 @ 15 min.)	3/4	
d. 2 H. P. motor	1/2	
e. House lights (14 @ 20 min.)	4 3/4	
7. Attach light reflectors and bulbs (14 @ 6 min.)	1 1/2	
8. Wire grounding system	3/4	
	14 1/2	
Add 10%[2]	1 1/2	
Total	16	$24.00
Plumbing--water supply:		
1. Lay out lines (60')	1/2	
2. Dig 60' of trench (30" deep x 6-8" wide) (use trenching machine $.20 lin. ft.		$12.00
3. Lay 60' of 3/4" plastic pipe; join plastic couplings and tighten steel clamps (8 @ 10 min.)	1 1/4	
4. Cut pipe to desired length (1 cut @ 5 min.)	1/4	
5. Thread ends of galvanized pipe (3 @ 15 min.)	3/4	

Table 3 (continued).

Job	Man hours	Labor cost[1]
Plumbing—water supply:		
6. Join galvanized pipe connections, including valves for 2 continuous flow waterers (14 @ 5 min.)	1 1/4	
7. Fill dirt in 60' of trench and pack (use tractor and scoop)	1 1/4	
	5 1/4	
Add 10%[2]	1/2	
Total	5 3/4	8.62
		$20.62
Plumbing—fiber pipe drainage system and drain trench:		
1. Lay out lines (64')	1/2	
2. Dig 64' of trench (30" deep x 8-12" wide sloped to drain trench) (assume drain trench is 30' from house) (hire trenching machine @ $.20 lin.ft.)		$12.80
3. Dig drain trench (hire back hoe) (8 1/2 cu.yds. @ $2.00)		17.00
4. Establish proper grade for drain trench with instrument (2 men)	2	
5. Lay and join 64' of fiber pipe and 5 couplings (10' @ 15 min.)	1 1/2	
6. Fill dirt in 64' of trench and pack (use tractor and scoop)	1 1/4	
7. Fill 2' of drain trench with crushed gravel or rock	1/2	
8. Fill top 1' of drain trench with dirt and pack (use tractor and scoop)	1/4	
	6	
Add 10%[2]	1/2	
Total	6 1/2	9.75
		$39.55

Table 3 (concluded).

Job	Man hours	Labor cost[1]
Painting of house (assume 1 primer coat and 1 finish coat):		
1. Paint 8' x 8' sliding doors and frames (inside and out) (2 @ 30 min.)	1	
2. Paint regular doors and frames (inside and out) (2 @ 20 min.)	3/4	
3. Paint eaves, 2' overhang (sides and ends)		
a. 72 roof rafters and outside nailers (on sides) (6 hr./coat)	12	
b. 30 nailers (on ends) (3 hr./coat)	6	
4. Paint 4' x 6' sliding panel frames and panel holders (outside only) (12 @ 15 min.)	3	
	22 3/4	
Add 10%[2]	2 1/4	
Total	25	$37.50

[1]At $1.50 per hour for skilled and unskilled labor.
[2]For possible underestimate on labor requirements.

Table 4. 36' x 72' Kansas pole-type laying house and attached egg room: Estimated labor requirements and costs of carpentry, masonry, wiring, plumbing and painting.

Job	Man hours	Labor cost[1]
Carpentry and masonry—36' x 72' poultry house (basic unit)[2]:		
Total	300	$450.00
Masonry—floor and door slab for 10' x 12' egg room:		
1. Level the ground	1/2	
2. Lay out, make forms, and put in sand fill	1	
3. Pour, float, rough trowel and edge 4" concrete slab; insert anchor bolts (use readi-mix concrete)	3	
4. Make form for outside door slab (4' x 4'). Pour, float, rough trowel, and edge 4" slab (use readi-mix concrete)	1/2	
	5	
Add 10%[3]	1/2	
Total	5 1/2	$8.25
Masonry—bulk tank footings and slab (10' x 10') for 9' diameter tank and assembly of tank:		
1. Grade and level the ground	3/4	
2. Lay out	3/4	
3. Dig holes for 6 piers (use tractor with auger)	1 1/2	
4. Make forms for slab	1/2	
5. Set reinforcing rods in holes, for slab, and tie rods	1 1/2	
6. Make template for anchor bolts	1	
7. Pour 6 piers; pour, float, rough trowel, and edge 4" slab and insert anchor bolts (use readi-mix concrete)	2	
8. Assemble bulk tank	30	
	38	
Add 10%[3]	3 3/4	
Total	41 3/4	$62.63

Table 4 (continued).

Job	Man hours	Labor cost[1]
Carpentry—10' x 12' egg room:		
1. Drill holes in bottom plates for anchor bolts	1/2	
2. Fasten bottom plates and nail studs	2 1/2	
3. Nail top plates and studs above top plates	2	
4. Nail roof rafters and nailers	8	
5. Nail asphalt sheathing (4' x 8' sheets) on 3 outside walls and roof	1 1/2	
6. Fasten galvanized iron (sheets) on roof	3	
7. Fasten insulation batts (walls and ceiling of cooler room)	1 1/2	
8. Cover inside walls and ceiling of cooler room with $\frac{1}{4}$" armor board	2	
9. Rough framing, jambs and trim of doors (3)	4 1/2	
10. Hang 2 regular doors and install locksets	2	
11. Hang egg cooler door	2	
	29 1/2	
Add 10%[3]	3	
Total	32 1/2	$48.75
Wiring:		
1. Dig post hole for 1 power pole (use tractor with auger); set pole and tamp	3/4	
2. Fasten 3-wire racks to pole and house (3 @ 15 min.)	3/4	
3. Wire circuit to power line	1/2	
4. Locate entrance head and entrance switch (2 @ 15 min.)	1/2	
5. Run wires and attach to 3-wire racks, entrance head, and entrance switch	1	
6. Locate utility boxes (8), octagon boxes (16), and time switch (1) (@ 8 min.)	3 1/4	

Table 4 (continued).

Job	Man hours	Labor cost[1]
Wiring:		
7. Wire circuits:		
a. Switches (3 @ 15 min.)	3/4	
b. Time switch	1/2	
c. Duplex and single receptacles (5 @ 15 min.)	1 1/4	
d. 2 H.P. motor	1/2	
e. House lights (16 @ 20 min.)	5 1/4	
8. Attach light reflectors and bulbs (16 @ 6 min.)	1 1/2	
9. Wire grounding system	3/4	
	17 1/4	
Add 10%[3]	1 3/4	
Total	19	$28.50
Plumbing—water supply (includes egg room):		
1. Lay out lines (146')	1/2	
2. Dig 148' of trench (30" deep x 6-8" wide) (hire trenching machine @ $.20 lin.ft.)		$29.60
3. Lay 148' of 3/4" plastic pipe; join plastic couplings and tighten steel clamps (12 @ 10 min.)	2	
4. Join galvanized pipe connections to egg room (5 @ 5 min.)	1/2	
5. Cut pipe to desired lengths (3 cuts @ 5 min.)	1/4	
6. Thread ends of galvanized pipe (assume ends of stock pipe are threaded) (3 @ 15 min.)	3/4	
7. Join galvanized pipe connections, including faucets and valves for 2 continuous flow waterers (14 @ 5 min.)	1 1/4	

Table 4 (continued).

Job	Man hours	Labor cost[1]
Plumbing—water supply (includes egg room):		
8. Fill dirt in 148' of trench and pack (use tractor and scoop)	3	
	8 1/4	
Add 10%[3]	3/4	
Total	9	$13.50
		$43.10
Plumbing—fiber pipe drainage system and drain trench:		
1. Lay out lines (74')	1/2	
2. Dig 74' of trench (30" deep x 8-12" wide sloped to drain trench) (assume drain trench is 30' from house) (hire trenching machine @ $.20 lin.ft.)		$14.80
3. Dig drain trench (hire back hoe) (8 1/2 cu.yds. @ $2.00)		17.00
4. Establish proper grade for drain with instrument (2 men)	2	
5. Lay and join 82' of fiber pipe and 10 couplings (10' @ 15 min.)	2	
6. Fill dirt in 74' of trench and pack (use tractor and scoop)	1 1/2	
7. Fill 2' of drain trench with crushed gravel or rock	1/2	
8. Fill top 1' of drain trench with dirt and pack (use tractor and scoop)	1/4	
	6 3/4	
Add 10%[3]	3/4	
Total	7 1/2	11.25
		$43.05

Table 4 (concluded).

Job	Man hours	Labor cost[1]
Painting of house (assume 1 primer coat and 1 finish coat):		
1. Paint 8' x 8' sliding doors and frames (inside and out) (2 @ 30 min.)	1	
2. Paint regular doors and frames (inside and out) (4 @ 20 min.)	1 1/4	
3. Paint eaves, 2' overhang (sides and ends)		
a. 72 roof rafters and outside nailers (on sides) (6 hr./coat)	12 1/2	
b. 30 nailers (on ends) (3 hr./coat)	6 1/4	
4. Paint 4' x 6' sliding panel frames and panel holders (outside only) (12 @ 15 min.)	3	
	24	
Add 10%[3]	2 1/2	
Total	26 1/2	$39.75

[1]At $1.50 per hour for skilled and unskilled labor.

[2]For details see Table 2, this Appendix.

[3]For possible underestimate on labor requirements.

Appendix D

Poultry House Equipment: Bill of Materials, Labor Requirements and Costs

Table 1. Poultry house equipment: Bill of materials and estimated costs at 1959-60 retail prices.

Item of equipment and material	Number	Size	Length	Materials requirements	Unit price	Materials cost
Roosts in brooding-rearing house:						
Nailers and frames	18	2" x 4"	12'	144 bd.ft.	.15 bd.ft.	$21.60
Frames	12	2" x 4"	8'	64 bd.ft.	.15 bd.ft.	9.60
Frames	12	1" x 4"	8'	32 bd.ft.	.21 bd.ft.	6.72
Beveled roosts	12	2" x 2"	8'	96 ft.	.06 ft.	5.76
Legs	1	2" x 4"	8'	6 bd.ft.	.15 bd.ft.	.90
Leg braces	18	1" x 4"	18'	108 bd.ft.	.21 bd.ft.	22.68
Welded wire, 4'	180'	1" x 2"	-	——	.05 ft.	9.00
Poultry netting staples	6 lbs.	——	-	——	.30 lb.	1.80
Nails, galvanized, 2"	2 lbs.	6d	-	——	.22 lb.	.44
Nails, galvanized, 3"	3 lbs.	10d	-	——	.22 lb.	.66
T hinges, extra-heavy	6 pr.	6"	-	——	1.00 pr.	6.00
Wood screws, steel, flathead	84	1½"	-	7 doz.	.15 doz.	1.05
Hooks, heavy	12	4"	-	——	.15 ea.	1.80
Eye screws, #2	12	——	-	——	.08 ea.	.96
Total						$88.97
Continuous flow waterers (2 per laying house):						
Angle iron (for water trough)	4	2½"x2½"x 3/16"	20'	80 ft.	.615 ft.	49.20
Iron (waterer ends)	4pcs.	3½"x2½"x 3/16"	-	1 lb.	.60 lb.	.60
Steel bars (for reel)	10	3/8"	12"	10 ft.	.05 ft.	.50
Wire, galvanized (for reel)	80'	#9	-	——	.01ft.	.80
Turnbuckles (for reel)	2	¼" x 5"	-	——	.20 ea.	.40
Oil cans, empty (for reel)	156 est.	qt.	-	——	——	——
Wood supports (for waterer) (10)	20'	2" x 2"	-	——	.06 ft.	1.20
AC grade plywood (for supports).	10 triangular pcs.	½"	-	5 sq.ft.	.28 sq.ft.	1.40
Total						$54.10

Table 1.(concluded).

Item of equipment and material	Number	Size	Length	Materials requirements	Unit price	Materials cost
Slatted floors (roosts) in laying house:						
Slatted floors, hardwood (factory made, unassembled)	96 sections	4' x 4'	-	1,536 sq.ft.	$.30[1] sq.ft.	$460.80
12' roost sawhorses (34):						
Top member	34	2" x 4"	12'	272 bd.ft.	.14 bd.ft.	38.08
Legs	272 pcs.	2" x 4"	2'	363 bd.ft.	.14 bd.ft.	50.82
Roost Panel frames (32)	640'	1" x 4"	-	214 bd.ft.	.21 bd.ft.	44.94
4' welded wire (for panels)	160'	1" x 2"	-	——	.05 ft.	8.00
Poultry netting staples	4 lbs.	——	-	——	.30 lb.	1.20
Nails, galvanized, 1½"	4 lbs.	——	-	——	.22 lb.	.88
Nails, galvanized, 1"	3 lbs.	——	-	——	.22 lb.	.66
AC grade plywood (for braces)	1 pc.	4'x8'x¼"	-	32 sq.ft.	.16 sq.ft.	5.12
Total						$610.50
Disposal pit:						
Split posts (creosote)	4	4" top	7'	——	.75 ea.	3.00
Bell tile	1	12"	3'	——	6.75 ea.	6.75
Pit cover (rough fir)	8	1" x 12"	9'	72 bd.ft.	.155 bd.ft.	11.16
Creosote	2 gals	——	-	——	1.50 gal.	3.00
Nails, galvanized, 2"	2 lbs.	6d	-	——	.22 lb.	.44
Total						$24.35

[1]Discount of $.05 per square foot.

Table 2. *Poultry house equipment:* Estimated requirements and costs of labor for construction.

Item of equipment and job	Number of men	Man hours	Labor cost[1]
Roosts in brooding-rearing house:			
1. Nail 72' of 2 x 4's to posts for fastening hinged sections	2	1	
2. Construct frames of one 8' x 12' section (6 @ 1½ hr.)	2	9	
3. Fasten 2 hinges and 2 hooks per section (6 @ ½ hr.)	1	3	
4. Nail welded wire to frames (one section) (6 @ 1 hr.)	2	6	
5. Bevel (use power saw) and nail on 12 roosts (2" x 2") per section (6 @ 1 hr.)	1	6	
		25	
Add 10%[2]		2 1/2	
Total		27 1/2	$41.25
40' continuous flow waterers (2 per laying house)[3]:			
1. Lap weld joints (2 @ ¼ hr.)	1	1/2	
2. Weld ends (4 @ ¼ hr.)	1	1	
3. Cut, bend and weld 10 steel bars to waterers for reel supports ...	1	1 1/2	
4. Make 2 reels using tin cans (2 @ 3/4 hr.)	1	1 1/2	
5. Construct 10 wood supports for waterers	1	2	
6. Paint waterers: 1 coat rust-proof paint (2 @ ¼ hr.)	1	1/2	
Aluminum paint (4 @ ¼ hr.)	1	1	
		8	
Add 10%[2]		3/4	
Total		8 3/4	$13.13
Slatted floors (roosts) in laying house:			
1. Construct 12' sawhorses (34 @ ½ hr.)	2	17	
2. Assemble and lay 4' x 4' slatted floor sections (96 @ ¼ hr.)	2	24	

Table 2 (concluded).

Item of equipment	Number of men	Man hours	Labor cost[1]
Slatted floors (roosts) in laying house:			
3. Construct wood-wire panels (16 @ ¼ hr.)	2	4	
4. Fasten panels to sawhorses	2	1	
		46	
Add 10%[2]		4 1/2	
Total		50 1/2	$75.75
Disposal pit: (5' x 6' x 5' deep)			
1. Dig hole (hire back hoe) (6 cu. yds. @ $2.00)	-		$12.00
2. Hand labor (digging pit)	1	3/4	
3. Carpentry to construct pit cover	1	1 1/2	
4. Painting pit cover (2 coats creosote)	1	3/4	
5. Fill dirt over pit cover and level	1	1	
		4	
Add 10%[2]		1/2	
Total		4 1/2	6.75
			$18.75

[1]At $1.50 per hour for skilled and unskilled labor.

[2]For possible underestimate on labor requirements.

[3]Plumbing for waterers was included under plumbing of water supply for laying house.

APPENDIX E

Budget Standards for Poultry Houses and Equipment, and Computational Procedures

I. Equipment Specifications and Requirements

Specifications and requirements of equipment needed for a 36' x 72' Kansas pole-type poultry house, adapted to brooding and rearing chicks or housing layers, are shown in Tables 2 and 3 of the text.

II. Depreciation

The straight line method of computing annual depreciation was used. The original construction cost of laying houses and certain equipment or the purchase price of equipment was divided by the expected useful life in years. (See Table 1, this Appendix).

III. Interest on Investment

Average investment in land, poultry houses, and equipment was considered to be 50 percent of the initial cost of buildings and equipment and the value of land. Land was valued at $100 per acre. Each poultry house, including access, was allowed two-tenths of an acre. The return on this investment was five percent per annum.

IV. Insurance

The poultry houses and equipment were insured for 80 percent of initial cost. The premium rate was 98 cents per $100 of insured value of the house, of which 38 cents was for fire insurance and 60 cents for extended coverage. On equipment, the premium rate was 48 cents per $100 of insured value, of which 32 cents and 16 cents was for fire insurance

and extended coverage, respectively. For insurance purposes, it was assumed that both the house and equipment had depreciated by 50 percent of their original cost.

V. Repairs and Maintenance

One-half of 1% of the total investment in the poultry house.

VI. Real Estate Taxes

For taxation purposes, the average value of real estate was considered to be 50 percent of the initial cost of buildings and equipment and the value of land. Land was valued at $100 per acre, with each house, including access, allowed two-tenths of an acre. Land, houses, and equipment were then assessed at 30% of average value. Taxes were paid at the rate of $46.05 per $1,000 of assessed valuation.

VII. Electricity Costs

All electricity costs were computed at 2 cents per kilowatt hour.

The following time requirements were allowed: Laying house lights, 704 3/4 hours per house annually (see Table 2, this Appendix); egg room lights, 1 3/4 hours daily; egg washer, 4 minutes per 12 dozen eggs; egg cooler, 6 hours daily; bulk-tank motors, 30 minutes per motor, twice per week.

Hourly consumption of electricity was based on the following wattage: Laying house lights, 560 watts per hour; egg room lights, 40 watts per hour; egg washer, 4 kilowatts per hour; egg cooler, 500 watts per hour; bulk-tank motor, 2 kilowatts per hour.

Three hundred sixty-five days were used to obtain annual costs of electricity.

Table 1. 36' x 72' Kansas pole-type poultry houses and equipment: New cost, estimated life and annual depreciation charge.

Houses and equipment[1]	New cost	Estimated life (years)	Annual depreciation charge
Poultry houses:			
Brooder-rearing house	$3,194.70	18	$177.48
Laying house and egg room	3,658.30	18	203.24
Laying house basic unit	2,978.24	18	165.46
Brooder-rearing house equipment:			
Gas brooders	$179.40	12	$ 14.95
Chick draft guards	3.84	1	3.84
Fuel storage tank	202.50	18	11.25
Bulk feed tank and auger	192.96	15	12.86
Motor, 1½ H.P.	120.47	20	6.02
Chick founts	50.26	5	10.05
Automatic waterers	125.04	12	10.42
Heating tapes	39.84	3	13.28
Starter feeders	36.26	10	3.63
Hanging feeders	173.88	5	34.78
Roosts, wire-covered	130.22	18	7.23
Beak trimmer	27.40	10	2.74
Coal buckets (for feed)	3.18	10	.32
Feed scoops	2.88	5	.58
Sprayer	11.30	5	2.26
Thermometer	.67	10	.07
Wash tub	7.81	10	.78
Total			$135.06
Laying house equipment:			
Hanging feeders	215.28	5	43.06
Continuous-flow waterers	67.23	18	3.74
Nests	388.80	12	32.40
Egg baskets	34.80	10	3.48
Slatted floors (roosts)	686.25	12	57.19
Bulk feed tank and augers	467.64	15	31.18
Motor, 2 H.P.	154.77	20	7.74
Feed scoops	2.88	5	.58
Coal buckets (for feed)	3.18	10	.32
Total			$179.69
Egg room equipment:			
Egg washer	215.00	10	21.50
Egg cooler unit	287.00	10	28.70
Total			$50.20
Miscellaneous equipment:			
Poultry shipping coops	9.22	12	.77
Disposal pit	43.10	5	8.62
Total			$9.39

[1]For specifications of equipment, see Tables 2 and 3 of the text.

Table 2. Average daily requirements[1] of morning lights to maintain a 14-hour day in laying house, by months.

Month	Minimum time of artificial lights		Days in month	Total hours
	Actual	Rounded-off		
		(hours)		
September	1 hr. 31 min.	1 1/2	30	45
October	2 hrs. 47 min.	2 3/4	31	85 1/4
November	3 hrs. 57 min.	4	30	120
December	4 hrs. 35 min.	4 1/2	31	139 1/2
January	4 hrs. 17 min.	4 1/4	31	131 3/4
February	3 hrs. 16 min.	3 1/4	28	91
March	2 hrs. 6 min.	2	31	62
April	0 hrs. 47 min.	3/4	30	22 1/2
May	None	0	31	0
June	None	0	30	0
July	None	0	31	0
August	0 hrs. 16 min.	1/4	31	7 3/4
Total for year				704 3/4

[1]Based on sunrise and sunset (C. S. T.) at Manhattan, Kansas, for the 15th day of each month.

Source: Physics Department, Kansas State University, Manhattan.

APPENDIX F

Budget Standards for the Laying Flock, and Computational Procedures

I. Feed Consumption and Costs

Feed cost included laying mash, shell and grit.

The amount of laying mash consumed was based on a feed conversion ratio of 4.73 for the "superior" laying flock and 4.92 for the "good" laying flock. Monthly consumption of laying mash in pounds was obtained by multiplying monthly egg production (in dozen eggs) by the feed conversion ratio. The product was converted to tons and multiplied by the seasonal price of mash. A price of $67.40 per ton, seasonally adjusted, was used for laying mash delivered on a bulk-feed basis. Shell and grit consumption was estimated at 4/10 pound per layer per month and based on the average number of layers for 12 months. A price of 1 1/2 cents per pound was used for shell and grit.

II. Flock Depreciation

To determine depreciation for a 12-month period, the value of layers on hand at the end of the period was subtracted from the beginning inventory value of layers. Layers housed were worth $1.32 each, based on estimated costs to raise pullets to 22 weeks. The ending inventory value was based on a market price of 7 1/2 cents per pound for light hens (fowl) averaging four pounds. (See Table 1, this Appendix).

III. Medications

It was assumed that a preventive medication, an antibiotic, was fed continuously at the level of 9 grams (5 pounds) per ton of laying mash. The price was 26 cents per pound. Pullets were wormed before housing.

IV. Interest on Investment

The annual charge was 5 percent of the average monthly investment. Average investment was based on the size of flock for each month of lay and its market value. (See Table 1, this Appendix).

V. Property Taxes

Layers were valued at $3.00 per dozen assessed valuation, based on the average number of layers on hand as of January 1. The tax rate was $46.05 per $1,000 of assessed valuation.

VI. Insurance

The insured value of layers was based on the number of pullets initially housed and a value of $1.82 per pullet. The premium rate for layers in a non-heated house was 48 cents per $100 of insured value, of which 32 cents was for fire insurance and 16 cents for extended coverage.

VII. Litter and Nesting Material

Baled wheat straw was used for both nesting material and floor litter in the laying houses. It was assumed that a 55-pound bale of straw covered an area 10 feet square to a depth of 1 1/2 inches. Straw was valued at $15 per ton, delivered at harvest time. A deep litter system (1 inch of sand followed by straw up to 6-8 inches) was used on 1,056 square feet of floor space not covered by slatted floors. Sand was valued at $2 per cubic yard, delivered.

Initially 2 inches of straw was put in each nest (252 nests per laying house) with 1/2 to 1 inch of straw added monthly.

Table 1. Superior and good laying flocks: Estimated value of layers, by month of lay.

Month of lay	Size of flock: Superior flock	Size of flock: Good flock	Value of layer[1]	Value of laying flock: Superior flock	Value of laying flock: Good flock
1	2,600	2,600	$1.82[2]	$4,732.00	$4,732.00
2	2,594	2,588	1.69	4,383.86	4,373.72
3	2,587	2,554	1.57	4,072.58	4,009.78
4	2,581	2,536	1.44	3,716.64	3,651.84
5	2,571	2,508	1.31	3,368.01	3,285.48
6	2,562	2,484	1.18	3,023.16	2,931.12
7	2,556	2,472	1.06	2,709.36	2,620.32
8	2,547	2,462	.93	2,368.71	2,289.66
9	2,537	2,430	.80	2,029.60	1,944.00
10	2,525	2,406	.68	1,717.00	1,636.08
11	2,511	2,374	.55	1,381.05	1,305.70
12	2,494	2,352	.42	1,047.48	987.84
—	2,477[3]	2,288[3]	.30[4]	743.10	686.40
Average				$2,714.81	$2,650.30

[1]A straight line connecting the points $1.82 at one month and $0.30 at 13 months was plotted on a plane with month of lay as the abscissa and value of layers as the ordinate. Values of layers at other months were then determined from the graph.

[2]The estimated cost to raise a 22-week pullet.

[3]Ending inventory.

[4]The meat value of a light hen (fowl) sold on the live poultry market. This value reflects the relatively low price per pound paid to farmers in 1958-59. This low price level probably will continue in the future for this class of poultry.

Appendix G

Costs to Raise Pullets in Kansas

Table 1. Costs of raising pullets, 13 Kansas poultrymen, 1958.

Farm no.	Month of hatch	Age of pullets sold (weeks)	Number of pullets sold[1]	Feed per pullet sold (pounds)	Average cost per pullet sold: Chick	Feed	Shell and grit	Vaccinations, medications, disinfectants, etc.	Litter	Brooder fuel	Chick insurance	Electricity	Labor[2]	Total cost
					Cents									
1	June	16.0	7,200	18.14	62.500	79.415	.597	4.615	.361	.084	.719	——	1.944	150.235[3]
2	May	16.0	8,000	17.91	63.000	77.009	.515	3.666	2.900	.625	.725	——	3.295	151.735
3	June	17.0	6,050	20.03	62.400	81.868	.395	6.922	.628	.826	.812	.492	1.901	156.244
4	May	18.1[4]	1,400	18.15	60.000	77.923	—	4.236	—	—	.536	——	—	142.695
5	Aug.	16.0[4]	1,168	14.08	62.300	66.672	—	5.020	1.712	.428	.557	——	—	136.689
6	Mar.	21.2[4]	2,916	21.56	63.200	93.888	.240	2.995	2.572	.514	.526	.497	.412	164.844
7	Mar.	23.6[4]	3,893	27.54	61.000	112.773	.250	6.732	1.279	.733	.524	4.714	—	188.005
8	Oct.	22.0	2,435	31.49	57.000	123.149	.458	8.357	3.717	—	.513	4.354	—	197.548
9	Dec.	16.0	3,364	15.13	65.400	72.584	—	3.762	.765	4.195	1.080	——	.807	148.593[6]
10	Dec.	——[5]	6,475	17.04	57.900	81.359	—	4.419	1.050	1.259	1.242	.271	.525	148.025[6]
11	Nov.	——[5]	1,482	18.96	59.500	89.381	—	3.436	1.518	2.362	—	.337	.607	157.141[6]
12	Sept.	16.3[4]	1,172	12.90	60.100	56.105	—	2.845	2.986	—	—	.640	1.152	123.828
13	Nov.	23+	1,255	25.64	56.200	107.973	1.267	5.154	3.984	—	.502	3.391	—	178.471[6]
Average				19.89	57.846	86.161	.286	4.781	1.806	.848	.595	1.130	.819	157.234

[1]Loss from mortality and culling by all poultrymen was 5.35% based on 54,737 chicks bought and 51,810 sold.

[2]Labor only for vaccinations, etc.

[3]Includes 1.042 cents per chick for debeaking.

[4]Weighted average of birds of several ages.

[5]Ages were not indicated.

[6]The value of a few cockerels or cull pullets was not credited against total costs.

Source: Coombs Poultry Farm, Sedgwick, Kansas.

Appendix H

The Technology of Egg Production for Budgeting

Table 1. Superior laying flock[1]: Size of flock, mortality, egg production and rate of lay, by months, 2,600 pullets housed, Missouri egg-laying test[2].

Test period	Days in period	Age of layers (days)	Month of lay	Size of flock[3] (layers)	Flock mortality (number of layers) Per month	Flock mortality (number of layers) Cumulative	Egg production (number of eggs)	Average rate of lay[4] (percent)
Sept. 1, 1958 - Oct. 4, 1958	34	163[5] - 196	1st	2,600	6	6	50,255	56.9
Oct. 5, 1958 - Nov. 4, 1958	31	197 - 227	2nd	2,594	7	13[6]	63,954	79.6
Nov. 5, 1958 - Dec. 4, 1958	30	228 - 257	3rd	2,587	6	19	63,686	82.2
Dec. 5, 1958 - Jan. 4, 1959	31	258 - 288	4th	2,581	10	29	61,473	77.0
Jan. 5, 1959 - Feb. 4, 1959	31	289 - 319	5th	2,571	9	38	58,816	73.9
Feb. 5, 1959 - Mar. 4, 1959	28	320 - 347	6th	2,562	6	44	54,918	76.6
Mar. 5, 1959 - Apr. 4, 1959	31	348 - 378	7th	2,556	9	53	59,614	75.4
Apr. 5, 1959 - May 4, 1959	30	379 - 408	8th	2,547	10	63	57,193	75.0
May 5, 1959 - June 4, 1959	31	409 - 439	9th	2,537	12	75	58,668	74.8
June 5, 1959 - July 4, 1959	30	440 - 469	10th	2,525	14	89	54,269	71.8
July 5, 1959 - Aug. 4, 1959[7]	31	470 - 500	11th	2,511	17	106	50,610	65.2
Aug. 5, 1959 - Aug. 31, 1959[8]	27	501 - 527	12th	2,494 2,477[11]	17[9]	123	38.923	58.0[10]

[1]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

[2]Fifth Random Sample Egg Laying Test, Missouri State Poultry Experiment Station, Mountain Grove, Missouri.

[3]Beginning inventory unless otherwise specified.

[4]Average rate of lay = $\frac{\text{Monthly egg production}}{\text{Average size of flock x days in month}}$

[5]Approximately 22 weeks of age when housed.

[6]Mortality was not shown separately for September and October in the Missouri Test. It was assumed that cumulative mortality for September-October was distributed approximately equally between the two months.

[7]End of test period.

[8]These dates were assumed for budgeting purposes to complete a 12-month period.

[9]The test period was 11 months and 4 days. For budgeting purposes, it was assumed that mortality for the 12th month was the same as the 11th month.

[10]Estimated for budgeting purposes.

[11]Ending inventory.

Table 2. Good laying flock[1]: Size of flock, mortality, egg production and rate of lay, by months, 1,218 pullets housed, Missouri egg-laying test[2].

Test period	Days in period	Age of layers (days)	Month of lay	Size of flock[3] (layers)	Flock mortality (number of layers) Per month	Flock mortality (number of layers) Cumulative	Egg production (number of eggs)	Average rate of lay[4] (percent)
Sept. 3, 1956 - Sept. 19, 1956	17	164[5] - 180	1st	1,218	6	6	4,218	20.4
Sept. 20, 1956 - Oct. 19, 1956	30	181 - 210	2nd	1,212	15	21	19,635	54.3
Oct. 20, 1956 - Nov. 19, 1956	31	211 - 241	3rd	1,197	9	30	28,129	76.1
Nov. 20, 1956 - Dec. 19, 1956	30	242 - 271	4th	1,188	13	43	27,358	77.2
Dec. 20, 1956 - Jan. 19, 1957	31	272 - 302	5th	1,175	11	54	26,683	73.6
Jan. 20, 1957 - Feb. 19, 1957	31	303 - 333	6th	1,164	6	60	26,836	74.6
Feb. 20, 1957 - Mar. 19, 1957	28	334 - 361	7th	1,158	5	65	23,170	71.6
Mar. 20, 1957 - Apr. 19, 1957	31	362 - 392	8th	1,153	15	80	24,943	70.2
Apr. 20, 1957 - May 19, 1957	30	393 - 422	9th	1,138	11	91	23,225	68.4
May 20, 1957 - June 19, 1957	31	423 - 453	10th	1,127	15	106	22,200	64.0
June 20, 1957 - July 19, 1957	30	454 - 483	11th	1,112	10	116	20,786	62.6
July 20, 1957 - Aug. 5, 1957[6]	17	484 - 500	12th	1,102	18	134	11,315[7]	60.9
Aug. 6, 1957 - Aug. 19, 1957[8]	14	501 - 514	12th	1,084 1,072[11]	12	146[9]	8,753	58.0[10]

[1]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

[2]Test A, Third Random Sample Egg-Laying Test, Missouri State Poultry Experiment Station, Mountain Grove, Missouri.

[3]Beginning inventory unless otherwise specified.

[4]Average rate of lay = $\frac{\text{Monthly egg production}}{\text{Average size of flock x days in month}}$

[5]Approximately 22 weeks of age when housed.

[6]End of test period.

[7]Computed from test data based on the difference in eggs per pullet housed at 483 and 500 days.

[8]These dates were assumed for budgeting purposes to complete 31 days in the 12th month.

[9]12 percent annual mortality was assumed; mortality for the test was 11 percent.

[10]Estimated for budgeting purposes.

[11]Ending inventory.

Table 3. Good laying flock[1]: Size of flock, mortality, egg production and rate of lay, by months, 1,300[2] pullets housed.

Month of lay	Size of flock[3] (layers)	Flock mortality (layers)	Egg production (number of eggs)	Average rate of lay (percent)
1st	1,300	6	4,502	20.4
2nd	1,294	17	20,957	54.3
3rd	1,277	9	30,023	76.1
4th	1,268	14	29,200	77.2
5th	1,254	12	28,479	73.6
6th	1,242	6	28,643	74.6
7th	1,236	5	24,730	71.6
8th	1,231	16	26,622	70.2
9th	1,215	12	24,788	68.4
10th	1,203	16	23,694	64.0
11th	1,187	11	22,185	62.6
12th	1,176	32	21,419	59.6
	1,144[4]			
Total	—	156	285,242	—

[1]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

[2]Data of Table 2, Appendix H, for 1,218 pullets were multiplied by the factor, 1.06732, to obtain comparable data for 1,300 pullets for budgeting.

[3]Beginning inventory unless otherwise specified.

[4]Ending inventory.

Table 4. Seasonal grade and size distributions of eggs, floor-plan laying flock.

Month of lay	Age of layers[1] (months)	Percentage distribution						
		A large[2]	A medium[2]	B large	C[3]		Inedibles	Total
					A small	Undergrades		
1st	6	2.5	40.0	5.3	45.0	7.0	.2	100.0
2nd	7	6.0	63.0	3.8	26.0	1.0	.2	100.0
3rd	8	49.0	40.8	1.8	3.2	5.0	.2	100.0
4th	9	51.6	43.0	1.0	.8	3.0	.6	100.0
5th	10	76.8	16.2	1.0	.5	4.8	.7	100.0
6th	11	80.8	12.0	1.1	-	5.0	1.1	100.0
7th	12	82.5	12.0	1.1	-	3.0	1.4	100.0
8th	13	85.6	6.8	1.6	-	5.0	1.0	100.0
9th	14	84.5	7.5	1.5	-	5.5	1.0	100.0
10th	15	77.8	12.0	3.1	-	6.0	1.1	100.0
11th	16	76.2	13.8	5.0	-	4.0	1.0	100.0
12th	17	77.2	10.0	6.0	-	5.5	1.3	100.0

[1]At the beginning of the month.

[2]Included grades AA and A.

[3]Grade C, for budgeting purposes, was the sum of A small and undergrades.

Sources: 12-month data for the percentages of A large, A medium and A small were obtained from the Kidwell Poultry Farm and Hatchery, Enterprise, Kansas. Data represented actual gradings of eggs from one floor plan operation for the period, October, 1956, through September, 1957. Data representing 10-months actual gradings of eggs from another flock at the same poultry farm were the basis for estimating the percentages of B large, undergrades and inedibles.

Table 5. Superior laying flock[1]: Estimated production of eggs, by grades and sizes, by months, 1,300 pullets housed.

Month of lay	Age of layers[2] (months)	Distribution, by grades and sizes					
		A large	A medium	B large	C	Inedible	Total[3]
		Number of eggs					
1st[4]	6	628	10,051	1,332	13,067	50	25,128
2nd	7	1,919	20,145	1,215	8,634	64	31,977
3rd	8	15,603	12,992	573	2,611	64	31,843
4th	9	15,860	13,217	308	1,168	184	30,737
5th	10	22,585	4,764	294	1,559	206	29,408
6th	11	22,187	3,295	302	1,373	302	27,459
7th	12	24,591	3,577	328	894	417	29,807
8th	13	24,478	1,945	458	1,430	286	28,597
9th	14	24,788	2,200	440	1,613	293	29,334
10th	15	21,111	3,256	841	1,628	299	27,135
11th	16	19,283	3,492	1,265	1,012	253	25,305
12th	17	15,025	1,946	1,168	1,070	253	19,462
Year		208,058	80,380	8,524	36,059	2,671	336,192

[1]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

[2]Pullets were housed at 22 weeks; therefore, age is an average for the month.

[3]Monthly totals are 50% of the egg production for comparable months for 2,600 pullets (see Table 1, Appendix H).

[4]That month when pullets were housed--September (laying house No. 1) and March (laying house No. 2).

Table 6. Superior laying flock[1]: Estimated production of eggs, by grades and sizes, by months, 1,300 pullets housed.

Month of lay	Age of layers[2] (months)	Distribution, by grades and sizes					
		A large	A medium	B large	C	Inedible	Total[3]
		Dozen eggs					
1st[4]	6	52	838	111	1,089	4	2,094
2nd	7	160	1,679	101	720	5	2,665
3rd	8	1,300	1,083	48	218	5	2,654
4th	9	1,322	1,101	26	97	15	2,561
5th	10	1,882	397	25	130	17	2,451
6th	11	1,849	275	25	114	25	2,288
7th	12	2,049	298	27	75	35	2,484
8th	13	2,040	162	38	119	24	2,383
9th	14	2,066	183	37	134	25	2,445
10th	15	1,759	271	70	136	25	2,261
11th	16	1,607	291	106	84	21	2,109
12th	17	1,252	162	97	89	21	1,621
Year		17,338	6,740	711	3,005	222	28,016

[1]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

[2]Pullets were housed at 22 weeks; therefore, age is an average for the month.

[3]Monthly totals are 50% of the egg production for comparable months for 2,600 pullets (see Table 1, Appendix II).

[4]That month when pullets were housed—September (laying house No. 1) and March (laying house No. 2).

Table 7. Good laying flock[1]: Estimated production of eggs, by grades and sizes, by months, 1,300 pullets housed.

Month of lay	Age of layers[2] (months)	Distribution, by grades and sizes					
		A large	A medium	B large	C	Inedible	Total[3]
		Number of eggs					
1st	6	112	1,801	239	2,341	9	4,502
2nd	7	1,257	13,203	797	5,658	42	20,957
3rd	8	14,711	12,249	541	2,462	60	30,023
4th	9	15,067	12,556	292	1,110	175	29,200
5th	10	21,871	4,614	285	1,510	199	28,479
6th	11	23,144	3,437	315	1,432	315	28,643
7th	12	20,402	2,968	272	742	346	24,730
8th	13	22,788	1,811	426	1,331	266	26,622
9th	14	20,946	1,859	372	1,363	248	24,788
10th	15	18,434	2,843	734	1,422	261	23,694
11th	16	16,905	3,062	1,109	887	222	22,185
12th	17	16,536	2,142	1,285	1,178	278	21,419
Year		192,173	62,545	6,667	21,436	2,421	285,242

[1]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

[2]Pullets were housed at 22 weeks; therefore, age is an average for the month.

[3]Monthly totals of egg production for 1,218 pullets (see Table 2, Appendix H) were multiplied by the factor, 1.06732, to obtain comparable data for 1,300 pullets for budgeting.

[4]That month when pullets were housed—September (laying house No. 1) and March (laying house No. 2).

Table 8. Good laying flock[1]: Estimated production of eggs, by grades and sizes, by months, 1,300 pullets housed.

Month of lay	Age of layers[2] (months)	Distribution, by grades and sizes					
		A large	A medium	B large	C	Inedible	Total[3]
		Dozen eggs					
1st[4]	6	9	150	20	195	1	375
2nd	7	105	1,100	67	471	3	1,746
3rd	8	1,226	1,921	45	205	5	2,502
4th	9	1,255	1,047	24	92	15	2,433
5th	10	1,822	364	24	126	17	2,373
6th	11	1,929	286	26	119	26	2,386
7th	12	1,700	247	23	62	29	2,061
8th	13	1,900	151	36	111	21	2,219
9th	14	1,746	155	31	113	21	2,066
10th	15	1,536	237	61	119	22	1,975
11th	16	1,409	255	92	74	19	1,849
12th	17	1,378	179	107	98	23	1,785
Year		16,015	5,212	556	1,785	202	23,770

[1]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

[2]Pullets were housed at 22 weeks; therefore, age is an average for the month.

[3]Monthly totals of egg production for 1,218 pullets (see Table 2, Appendix H) were multiplied by the factor, 1.06732, to obtain comparable data for 1,300 pullets for budgeting.

[4]That month when pullets were housed—September (laying house No. 1) and March (laying house No. 2).

Appendix I

Seasonal Prices of Laying Mash and Eggs for Budgeting

Table 1. Seasonal prices of laying mash.

Month	Seasonal Index[1]	Price[2] (per ton)
January	99.4	$67.00
February	99.5	67.06
March	100.0	67.40
April	101.2	68.21
May	102.4	69.02
June	101.2	68.21
July	101.1	68.14
August	100.5	67.74
September	99.8	67.27
October	98.6	66.46
November	98.2	66.19
December	98.1	66.12

[1]Average seasonal indexes were calculated by expressing actual mid-month prices paid by Kansas farmers for laying mash during 1953-59 as a percentage of a 12-month centered moving average. The resulting percentages for individual months were averaged to arrive at the seasonal index for each month. The twelve monthly average indexes were totaled and adjusted so as to average 100 percent for the year. The adjusted averages constitute the index of seasonal variation.

[2]Seasonally adjusted, based on a price of $67.40 per ton delivered, bulk feed basis, Manhattan, Kansas, in March, 1960. The mash contained a nitrofuran compound at the level of ½ pound per ton of feed.

Table 2. Seasonal prices of eggs, by grades and sizes.

Month	Price			
	A large[1]	A medium[1]	B large[1]	C[2]
	Cents per dozen			
January	32.5	28.8	27.2	17.3
February	32.8	29.7	29.7	21.0
March	32.8	30.4	29.9	21.9
April	30.4	28.1	27.2	22.0
May	29.9	27.3	27.0	21.6
June	29.9	26.7	25.9	19.6
July	30.9	27.2	25.3	16.3
August	33.7	27.2	26.3	14.4
September	39.8	29.6	28.5	14.1
October	38.8	27.8	29.5	14.3
November	38.2	27.4	26.9	14.6
December	35.7	29.5	28.5	15.6
Average	33.8	28.3	27.7	17.7

[1]The 1955-59 average of monthly means of daily prices paid to producers at country points in the Kansas City market area with returns based on actual gradings, cases returned.

[2]The 1955-57 average of monthly means of daily prices paid to producers at country points in the Kansas City market area with returns based on actual gradings, cases returned. Prices were not reported after June, 1958.

Source: Kansas City Daily Drovers Telegram.

Appendix J

Egg Sales and Feed Cost for Superior and Good Laying Flocks

Table 1. Superior laying flock[1]: Estimated egg sales, by months, 1,300 pullets housed March 1.

Month of lay	Grades and sizes of eggs	Monthly egg production (dozens)	Price (cents per dozen)	Value of eggs
1st (March)	A large	52	32.8	$ 17.06
	A medium	838	30.4	254.75
	B large	111	29.9	53.19
	C	1,089	21.9	238.49
2nd (April)	A large	160	30.4	48.64
	A medium	1,679	28.1	471.80
	B large	101	27.2	27.47
	C	720	22.0	158.40
3rd (May)	A large	1,300	29.9	388.70
	A medium	1,083	27.3	295.66
	B large	48	27.0	12.96
	C	218	21.6	47.09
4th (June)	A large	1,322	29.9	395.28
	A medium	1,101	26.7	293.97
	B large	26	25.9	6.73
	C	97	19.6	19.01
5th (July)	A large	1,882	30.9	581.54
	A medium	397	27.2	107.98
	B large	25	25.3	6.33
	C	130	16.3	21.19
6th (August)	A large	1,849	33.7	623.11
	A medium	275	27.2	74.80
	B large	25	26.3	6.58
	C	114	14.4	16.42

Table 1 (concluded).

Month of lay	Grades and sizes of eggs	Monthly egg production (dozens)	Price (cents per dozen)	Value of eggs
7th (September)	A large	2,049	39.8	$815.50
	A medium	298	29.6	88.21
	B large	27	28.5	7.70
	C	75	14.3	10.73
8th (October)	A large	2,040	38.8	791.52
	A medium	162	27.8	45.04
	B large	38	29.5	11.21
	C	119	14.3	17.02
9th (November)	A large	2,066	38.2	789.21
	A medium	183	27.4	50.14
	B large	37	26.9	9.95
	C	134	14.6	19.56
10th (December)	A large	1,759	35.7	627.96
	A medium	271	29.5	79.95
	B large	70	28.5	19.95
	C	136	15.6	21.22
11th (January)	A large	1,607	32.5	522.28
	A medium	291	28.8	83.81
	B large	106	27.2	28.83
	C	84	17.3	14.53
12th (February)	A large	1,252	32.8	410.66
	A medium	162	29.7	48.11
	B large	97	29.7	28.81
	C	89	21.0	18.69
Year				$8,727.74

[1]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

Table 2. Superior laying flock[1]: Estimated egg sales, by months, 1,300 pullets housed September 1.

Month of lay	Grades and sizes of eggs	Monthly egg production (dozens)	Price (cents per dozen)	Value of eggs
1st (September)	A large	52	39.8	$ 20.70
	A medium	838	29.6	248.05
	B large	111	28.5	31.64
	C	1,089	14.3	155.73
2nd (October)	A large	160	38.8	62.08
	A medium	1,679	27.8	466.76
	B large	101	29.5	29.80
	C	720	14.3	102.96
3rd (November)	A large	1,300	38.2	496.60
	A medium	1,083	27.4	296.74
	B large	48	26.9	12.91
	C	218	14.6	31.83
4th (December)	A large	1,322	35.7	471.95
	A medium	1,101	29.5	324.80
	B large	26	28.5	7.41
	C	97	15.6	15.13
5th (January)	A large	1,882	32.5	611.65
	A medium	397	28.8	114.34
	B large	25	27.2	6.80
	C	130	17.3	22.49
6th (February)	A large	1,849	32.8	606.47
	A medium	275	29.7	81.68
	B large	25	29.7	7.43
	C	114	21.0	23.94

Table 2 (concluded).

Month of lay	Grades and sizes of eggs	Monthly egg production (dozens)	Price (cents per dozen)	Value of eggs
7th (March)	A large	2,049	32.8	$672.07
	A medium	298	30.4	90.59
	B large	27	29.9	3.07
	C	75	21.9	16.43
8th (April)	A large	2,040	30.4	620.16
	A medium	162	28.1	45.52
	B large	38	27.2	10.34
	C	119	22.0	26.18
9th (May)	A large	2,066	29.9	617.73
	A medium	183	27.3	49.96
	B large	37	27.0	9.99
	C	134	21.6	28.94
10th (June)	A large	1,759	29.9	525.94
	A medium	271	26.7	72.36
	B large	70	25.9	18.15
	C	136	19.6	26.66
11th (July)	A large	1,607	30.9	496.56
	A medium	291	27.2	79.15
	B large	106	25.3	26.82
	C	84	16.3	13.69
12th (August)	A large	1,252	33.7	421.92
	A medium	162	27.2	44.06
	B large	97	26.3	25.51
	C	89	14.4	12.80
Year				$8,209.51

[1]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

Table 3. Good laying flock[1]: Estimated egg sales, by months, 1,300 pullets housed March 1.

Month of lay	Grades and sizes of eggs	Monthly egg production (dozens)	Price (cents per dozen)	Value of eggs
1st (March)	A large	9	32.8	$ 2.95
	A medium	150	30.4	45.60
	B large	20	29.9	5.98
	C	195	21.9	42.71
2nd (April)	A large	105	30.4	31.92
	A medium	1,100	28.1	309.10
	B large	67	27.2	18.22
	C	471	22.0	103.62
3rd (May)	A large	1,226	29.9	366.57
	A medium	1,021	27.3	278.73
	B large	45	27.0	12.15
	C	205	21.6	44.28
4th (June)	A large	1,255	29.9	375.25
	A medium	1,047	26.7	279.55
	B large	24	25.9	6.22
	C	92	19.6	18.03
5th (July)	A large	1,822	30.9	563.00
	A medium	384	27.2	104.45
	B large	24	25.3	6.07
	C	126	16.3	20.54
6th (August)	A large	1,929	33.7	650.07
	A medium	286	27.2	77.79
	B large	26	26.3	6.84
	C	119	14.4	17.14

Table 3 (concluded).

Month of lay	Grades and sizes of eggs	Monthly egg production (dozens)	Price (cents per dozen)	Value of eggs
7th (September)	A large	1,700	39.8	$676.60
	A medium	247	29.6	73.11
	B large	23	28.5	6.56
	C	62	14.3	8.87
8th (October)	A large	1,900	38.8	737.20
	A medium	151	27.8	41.98
	B large	36	29.5	19.62
	C	111	14.3	15.87
9th (November)	A large	1,746	38.2	666.97
	A medium	155	27.4	42.47
	B large	31	26.9	8.34
	C	113	14.6	16.50
10th (December)	A large	1,536	35.7	548.35
	A medium	237	29.5	69.92
	B large	61	28.5	17.39
	C	119	15.6	18.56
11th (January)	A large	1,409	32.5	457.93
	A medium	255	28.8	73.44
	B large	92	27.2	25.02
	C	74	17.3	12.80
12th (February)	A large	1,378	32.8	451.98
	A medium	179	29.7	53.16
	B large	107	29.7	31.78
	C	98	21.0	20.58
Total				$7,472.78

[1]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

Table 4. Good laying flock[1]: Estimated egg sales, by months, 1,300 pullets housed September 1.

Month of lay	Grades and sizes of eggs	Monthly egg production (dozens)	Price (cents per dozen)	Value of eggs
1st (September)	A large	9	39.8	$ 3.58
	A medium	150	29.6	44.40
	B large	20	28.5	5.70
	C	195	14.3	27.89
2nd (October)	A large	105	38.8	40.74
	A medium	1,100	27.8	305.80
	B large	67	29.5	19.77
	C	471	14.3	67.35
3rd (November)	A large	1,226	38.2	468.33
	A medium	1,021	27.4	279.75
	B large	45	26.9	12.11
	C	205	14.6	29.93
4th (December)	A large	1,255	35.7	448.04
	A medium	1,047	29.5	308.87
	B large	24	28.5	6.84
	C	92	15.6	14.35
5th (January)	A large	1,822	32.5	592.15
	A medium	384	28.8	110.59
	B large	24	27.2	6.53
	C	126	17.3	21.80
6th (February)	A large	1,929	32.8	632.71
	A medium	286	29.7	84.94
	B large	26	29.7	7.72
	C	119	21.0	24.99

Table 4 (concluded).

Month of lay	Grades and sizes of eggs	Monthly egg production (dozens)	Price (cents per dozen)	Value of eggs
7th (March)	A large	1,700	32.8	$557.60
	A medium	247	30.4	75.09
	B large	23	29.9	6.88
	C	62	21.9	13.58
8th (April)	A large	1,900	30.4	577.60
	A medium	151	28.1	42.43
	B large	36	27.2	9.79
	C	111	22.0	24.42
9th (May)	A large	1,746	29.9	522.05
	A medium	155	27.3	42.32
	B large	31	27.0	8.37
	C	113	21.6	24.40
10th (June)	A large	1,536	29.9	459.26
	A medium	237	26.7	63.28
	B large	61	25.9	15.80
	C	119	19.6	23.32
11th (July)	A large	1,409	30.9	435.38
	A medium	255	27.2	69.36
	B large	92	25.3	23.28
	C	74	16.3	12.06
12th (August)	A large	1,378	33.7	464.39
	A medium	179	27.2	48.69
	B large	107	26.3	28.14
	C	98	14.4	14.11
Total				$7,126.48

[1]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

Table 5. Superior laying flock[1]: Egg production, mash consumption, price and cost of laying mash, by months, and annual feed cost, 1,300 pullets housed March 1.

Month of lay	Egg production (dozens)	Mash consumption[2]		Price of mash[3] (per ton)	Cost of mash
		Pounds	Tons		
1st (March)	2,094	9,905	4.953	$67.40	$333.83
2nd (April)	2,665	12,606	6.303	68.21	429.93
3rd (May)	2,654	12,553	6.277	69.02	433.24
4th (June)	2,561	12,114	6.057	68.21	413.15
5th (July)	2,451	11,593	5.797	68.14	395.01
6th (August)	2,288	10,822	5.411	67.74	366.54
7th (September)	2,484	11,749	5.875	67.27	395.21
8th (October)	2,383	11,272	5.636	66.46	374.57
9th (November)	2,445	11,565	5.783	66.19	382.78
10th (December)	2,261	10,695	5.348	66.12	353.61
11th (January)	2,109	9,976	4.988	67.00	334.20
12th (February)	1,621	7,667	3.834	67.06	257.11
Total					$4,469.18
Shell and grit[4]					91.80
Total feed cost					$4,560.98

[1]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

[2]Based on a feed conversion ratio of 4.73.

[3]A price of $67.40 per ton, bulk-feed basis, adjusted seasonally, was used for budgeting.

[4]Shell and grit consumption was estimated at 4/10 pound per layer per month. Total annual consumption was based on the average number of layers (1,275) for 12 months. A price of 1½ cents per pound for shell and grit was used for budgeting.

Table 6. Superior laying flock[1]: Egg production, mash consumption, price and cost of laying mash, by months, and annual feed cost, 1,300 pullets housed September 1.

Month of lay	Egg production (dozens)	Mash consumption[2]		Price of mash[3] (per ton)	Cost of mash
		Pounds	Tons		
1st (September)	2,094	9,905	4.953	$67.27	$333.19
2nd (October)	2,665	12,606	6.303	66.46	418.89
3rd (November)	2,654	12,553	6.277	66.19	415.47
4th (December)	2,561	12,114	6.057	66.12	400.49
5th (January)	2,451	11,593	5.797	67.00	388.40
6th (February)	2,288	10,822	5.411	67.06	362.86
7th (March)	2,484	11,749	5.875	67.40	395.98
8th (April)	2,383	11,272	5.636	68.21	384.43
9th (May)	2,445	11,565	5.783	69.02	399.14
10th (June)	2,261	10,695	5.348	68.21	364.79
11th (July)	2,109	9,976	4.988	68.14	339.88
12th (August)	1,621	7,667	3.834	67.74	259.72
Total					$4,463.24
Shell and grit[4]					91.80
Total feed cost					$4,555.04

[1]Reflects 263.7 eggs per average number of layers, 258.6 eggs per pullet housed, 4.73% flock mortality, and 4.73 feed conversion ratio for a 12-month period.

[2]Based on a feed conversion ratio of 4.73.

[3]A price of $67.40 per ton, bulk-feed basis, adjusted seasonally, was used for budgeting.

[4]Shell and grit consumption was estimated at 4/10 pound per layer per month. Total annual consumption was based on the average number of layers (1,275) for 12 months. A price of 1½ cents per pound for shell and grit was used for budgeting.

Table 7. Good laying flock[1]: Egg production, mash consumption, price and cost of laying mash, by months, and annual feed cost, 1,300 pullets housed March 1.

Month of lay	Egg production (dozens)	Mash consumption[2]		Price of mash[3] (per ton)	Cost of mash
		Pounds	Tons		
1st (March)	375	1,845	.923	$67.40	$ 62.21
2nd (April)	1,746	8,591	4.296	68.21	293.03
3rd (May)	2,502	12,310	6.155	69.02	424.82
4th (June)	2,433	11,971	5.986	68.21	408.31
5th (July)	2,373	11,675	5.838	68.14	397.80
6th (August)	2,386	11,739	5.870	67.74	397.63
7th (September)	2,061	10,140	5.070	67.27	341.06
8th (October)	2,219	10,918	5.459	66.46	362.81
9th (November)	2,066	10,165	5.083	66.19	336.44
10th (December)	1,975	9,717	4.860	66.12	321.34
11th (January)	1,849	9,097	4.549	67.00	304.78
12th (February)	1,785	8,783	4.392	67.06	294.53
Total					$3,944.76
Shell and grit[4]					88.78
Total feed cost					$4,033.54

[1]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

[2]Based on a feed conversion ratio of 4.92.

[3]A price of $67.40 per ton, bulk-feed basis, adjusted seasonally, was used for budgeting.

[4]Shell and grit consumption was estimated at 4/10 pound per layer per month. Total annual consumption was based on the average number of layers (1,233) for 12 months. A price of 1½ cents per pound for shell and grit was used for budgeting.

Table 8. Good laying flock[1]: Egg production, mash consumption, price and cost of laying mash, by months, and annual feed cost, 1,300 pullets housed September 1.

Month of lay	Egg production (dozens)	Mash consumption[2]		Price of mash[3] (per ton)	Cost of mash
		Pounds	Tons		
1st (September)	375	1,845	.923	$67.27	$ 62.09
2nd (October)	1,746	8,591	4.296	66.46	285.51
3rd (November)	2,502	12,310	6.155	66.19	407.40
4th (December)	2,433	11,971	5.986	66.12	395.79
5th (January)	2,373	11,675	5.838	67.00	391.15
6th (February)	2,386	11,739	5.870	67.06	393.64
7th (March)	2,061	10,140	5.070	67.40	341.72
8th (April)	2,219	10,918	5.459	68.21	372.36
9th (May)	2,066	10,165	5.083	69.02	350.83
10th (June)	1,975	9,717	4.860	68.21	331.50
11th (July)	1,849	9,097	4.549	68.14	309.97
12th (August)	1,785	8,783	4.392	67.74	297.51
Total					$3,939.47
Shell and grit[4]					88.78
Total feed cost					$4,028.25

[1]Reflects 231.4 eggs per average number of layers, 219.4 eggs per pullet housed, 12% flock mortality, and 4.92 feed conversion ratio for a 12-month period.

[2]Based on a feed conversion ratio of 4.92.

[3]A price of $67.40 per ton, bulk-feed basis, adjusted seasonally, was used for budgeting.

[4]Shell and grit consumption was estimated at 4/10 pound per layer per month. Total annual consumption was based on the average number of layers (1,233) for 12 months. A price of 1½ cents per pound for shell and grit was used for budgeting.

ECONOMICS OF THE KANSAS EGG ENTERPRISE

by

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AN ABSTRACT OF A THESIS

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Economics and Sociology

KANSAS STATE UNIVERSITY
OF AGRICULTURE AND APPLIED SCIENCE

1960

The objectives of this study were: (1) To develop complete plans for brooding-rearing facilities for replacement pullets and laying house facilities for a 2,600-bird laying flock based on an "experimental low-cost pole-type laying house" built by the Departments of Poultry Husbandry and Agricultural Engineering of Kansas State University; (2) to estimate the capital investment in land, housing and equipment, at 1959-60 prices, needed to brood and rear 1,400 replacement pullets and house 2,600 layers using the 36' x 72' Kansas pole-type poultry house; (3) to estimate the costs to raise pullets to 22 weeks using the 36' x 72' Kansas pole-type brooder-rearing house; and (4) to estimate the annual costs and returns to the egg enterprise for "superior" and "good" laying flocks of 2,600 pullets using the 36' x 72' Kansas pole-type laying house.

The budgetary approach was used in this study. Basic assumptions and budget standards relating to specifications on housing and equipment, replacement pullets, the technology of egg production, and economic costs were established in consultation with poultry husbandmen, extension agricultural engineers, agricultural economists, and poultrymen.

Three poultry houses, one brooder-rearing house and two laying houses, were used for the 2,600-layer commercial egg enterprise. A modified floor-plan (slatted floors and dirt floors) system of management was in use. Roughly 2 square feet per pullet housed was allowed.

Two broods of pullet chicks were raised annually for the two 1,300-bird laying houses. One brood was housed March 1 and the second, on September 1.

Superior and good laying flocks were differentiated on the basis of productivity, mortality, and feed conversion efficiency.

Construction costs of the poultry houses consisted of building materials and labor for carpentry, masonry, wiring, plumbing, and painting. Total estimated construction costs of the 1,400-chick brooder-rearing house, including an equipment room, amounted to $3,195. Total estimated construction costs of the 1,300-bird laying house with egg room were $3,658 compared with $2,978 for the 1,300-bird basic-unit laying house without egg room. Costs per square foot of floor space were $1.233 for the brooder-rearing house, $1.349 for the laying house with egg room, and $1.149 for the basic-unit laying house.

Estimated equipment costs for the brooder-rearing house totaled $1,308. Equipment costs were $2,575 for the laying house with egg room, and $1,553 for the basic-unit laying house. Most of the equipment investment in the laying houses was for slatted floors (roosts), a bulk-feed tank, nest, an egg cooler unit, an egg washer, and hanging feeders.

Total estimated capital investment at 1959-60 prices for the 2,600-layer egg enterprise amounted to $15,327. Estimated investment in housing totaled $9,831, or 64 percent of the total. Investment in equipment was $5,436, or 35 percent of the total, and investment in land, 1 percent of total investment in the egg enterprise. Total investment per layer in land, housing and equipment was $1.74 for the brooder-rearing house, $4,81 for the laying house with egg room, and $3.50 for the basic-unit laying house.

The estimated cost to raise a light-breed pullet to 22 weeks of age was $1.82. Major cost items, in order of importance, were as follows: Feed, 79.3 cents; chicks, 58.8 cents; use of the brooder-rearing house and equipment, 16.9 cents; labor, 14.0 cents; and vaccinations, medications, and disinfectants, 4.8 cents per pullet.

Annual egg production costs included feed, flock depreciation, use of laying houses and equipment, real estate taxes, personal property taxes on layers, medications, insurance on layers, interest on investment on layers, electricity, and litter.

Annual net returns to labor and management were $2,179 for the "superior flock" and $867 for the "good flock." Annual egg sales per layer were $6.64 and $5.92 for the superior flock and good flock, respectively.

Estimated annual costs to produce one dozen eggs were 26.3 cents for the superior flock and 28.9 cents for the good flock.

Three items (feed, flock depreciation, and the use of buildings and equipment) accounted for roughly 96 percent of total annual costs to produce eggs.