THE FEASIBILITY OF COMMERCIAL DUCKLING PRODUCTION IN KANSAS

by 6771

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CHAPTER I

INTRODUCTION

Today's duckling business is growing. The duckling industry has adopted advanced methods to grow, process and market ducklings thereby making them more competitive with other types of poultry and meat.

During the past decade midwestern duckling production has experienced increased growth rates. Several reasons may explain this trend. First, climatic conditions in the midwest are ideal for growing ducklings. Second, midwestern states have a plentiful supply of clean, fresh water. Other reasons that may help explain this trend center around certain economic advantages. For example, midwestern duckling production is concentrated in the corn and soybean belts and, therefore, feed transportation costs are minimized relative to coastal production areas in the United States. In addition, many major population centers are within short trucking distance. The Long Island area, for centuries the historic center for duckling production, is facing problems of rising land costs, and increasing urban pressure concerning water pollution. Midwestern producers are not as pressured or subject to such problems. Some midwest producers even boast the production of a better quality duckling.[1]

Although information concerning the trend of increased midwest duckling production is generally lacking certain regions have been cited as areas of past or recent growth. The East North Centeral Region primarily has been the center of this increased duckling production. Of particular

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[1]H. E. Drews, "Long Island Duckling Story," Poultry Processing and Marketing, November, 1953, p. 81.

importance are Ohio, Indiana, and Wisconsin. In the West North Centeral Region, Missouri has shown the most growth. Although the number of farms producing ducklings decreased drastically in these states the number of duckling produced and sold in most cases doubled and even tripled during the four-year span from 1959 to 1964.[1] Nationally, total duckling production has increased since 1959. In that year the number of ducklings slaughtered under federal inspection totaled 9,064,000 birds. In 1969, this number had increased to 11,589,000 birds. The total increase in production was only 525,000 birds, or approximately 27.7 percent over a 10-year period. Taking into consideration that national duckling production is currently estimated at 11½ million and the U. S. population at 204 million this ratio would supply about 6 ducklings per 100 people or about 3/10 pound of duckling per person per year.

The trend towards midwest duckling production becomes more evident if we investigate specific states. During the period 1959 to 1964 Ohio increased production approximately 48 percent, Indiana experienced a 137 percent increase, followed by Wisconsin's 350 percent increase. Currently duckling growing operations in southeast Wisconsin consist of five farms which produce approximately two and one half million ducklings annually. One of these farms plus three subsidiary units account for 90 percent of Wisconsin's commercial duckling production.[2]

In 1963 the Midwest Duckling Council, a major promoter of midwest

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[1]U. S., Bureau of Census, "Livestock, Poultry, Livestock and Poultry Products," U. S. Census of Agriculture, 1964, U. S. Dept. of Commerce Publication, (Washington D. C.: Government Printing Office, 1967), p. 233.

[2]Based on personal correspondence between John L. Skinner, Extension Poultryman, University of Wisconsin, and the writer.

ducklings, was organized. The following year, duckling producers who were members of this organization processed and marketed 2 3/4 million ducklings and planned to double this figure in 1969.[1]

The Duckling Industry

Consumption

Annual duckling consumption is rising. In 1965 it was only 0.2 pound per person compared with over 30 pounds for chicken and 7 pounds for turkey. In 1969, however, this figure had risen to approximately 0.3 pound per person compared to 39 pounds for chicken and 8 pounds for turkey. This would mean that civilian per capita consumption of duckling had risen 50 percent compared to a 30 percent increase for chicken and a 14 percent increase for turkey.

Production of ducklings does not coincide with the pattern of annual consumption. Two peaks in production are reached in June and July.[2] In the past, 1932-48, annual consumption reached two distinct peaks in May and September. More recent figures for 1961-70 indicate that the peak in annual consumption is reached in June.

An index of average monthly consumption was calculated by taking the number of ducklings federally inspected per month minus monthly additions to U. S. storage stocks or the number of ducklings federally inspected per month plus monthly decreases in U. S. storage stocks.[2]

An index of average U. S. monthly consumption of ducklings was computed

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[1]J. V. Zemba, "Duckling Quality Gains as Techniques Improve," Food Engineering, January, 1965, p. 102-104.

[2]Ducklings federally inspected at processing plants in production areas.

for the years, 1932-48 (Figure 1).[1] Consumption rose rapidly from 76 in March to 140 in May. Using April as the base month equaling 100 on the index scale, consumption declined to slightly less than 100 during July and August. November through March remained below the 100 mark reaching an annual low of approximately 75 in February. More recent data have been gathered to compute an index of average monthly consumption for the years 1961 thru 1970 (Figure 1). This index also increased rapidly from 27 in February to 138 in June and then declined steadily to its low of 27 in February.

A meat consumption survey in Syracuse, New York, in 1948 showed that 5 out of 1,825 families purchased duckling over a one week period in March and June (Table 1).[2]

Table 1. Characteristics of purchasers of ducklings, 1,825 families, Syracuse, New York, March and June, 1948.

Purchaser	Day purchased	Who purchased	Income group	Country of birth	Religion
Number					
1	Saturday	Housewife	High	U.S.A.	Roman Catholic
2	Saturday	Housewife	High	Poland	Roman Catholic
3	Saturday	Husband	High	U.S.A.	Roman Catholic
4	Saturday	Housewife	High	U.S.A.	Protestant
5	Saturday	Housewife	High	U.S.A.	Protestant

Source: W. M. Simmons, unpublished data, Cornell University, 1948, cited by A. N. Mcleod, "Production and Marketing of Long Island Ducklings," (published PhD. Dissertation, Cornell University, 1950), p. 79.

[1] A. N. Mcleod, "Production and Marketing of Long Island Ducklings," (PhD. Dissertation, Cornell University, 1950), p. 78.

[2] W. M. Simmons, unpublished data, Cornell University, 1948, cited by A. N. Mcleod, "Production and Marketing of Long Island Ducklings," (PhD. Dissertation, Cornell University, 1950), p. 79.

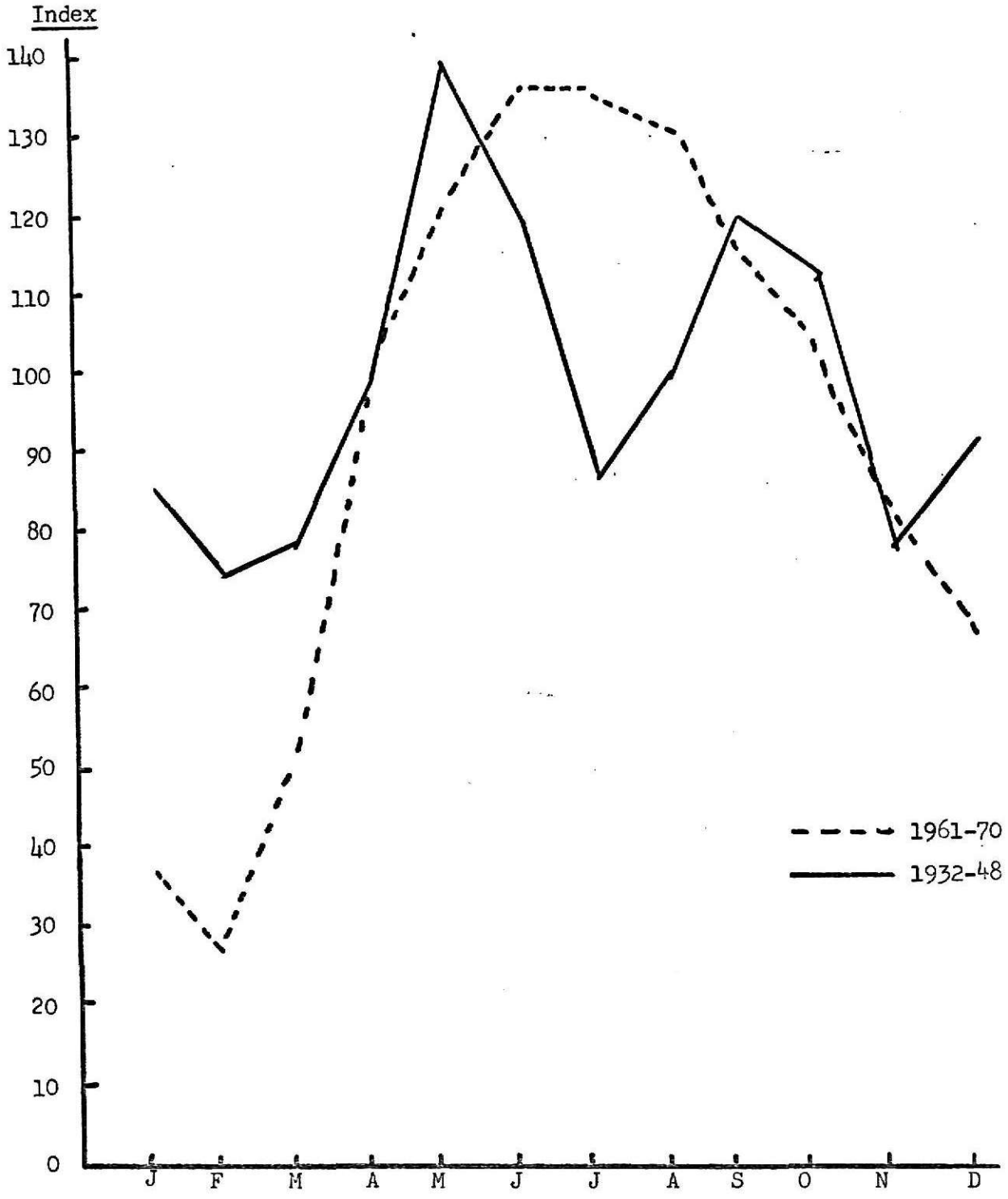

Figure 1. Index of average monthly consumption of duckling, United States, 1932-1948 and 1961-1970. April=100.

Sources: 1932-48 Index, A. N. Mcleod, "Production and Marketing of Long Island Ducklings," PhD Dissertation, Cornell University, 1950, and 1961-70 Index, USDA, Cold Storage Report, Monthly issues, 1961-70, ERS, Poultry and Egg Situation, Monthly issues, 1961-70.

All purchases of ducklings were made by people in the high income group. Saturday was the most important day for poultry purchases. Four out of 5 purchasers were American born and only 1 purchase out of 5 was made by the husband. Two purchasers were Protestant and three were Roman Catholic.

A household consumption survey for meat and poultry undertaken in the spring of 1965 concluded that as incomes increased poultry consumption also rose although moderately. For the country as a whole the data from this survey showed that a 10 percent increase in family income resulted in only a 0.1 percent increase in the quantity of poultry consumed per person. These figures, however, could vary with different classes of poultry and regions within the country. For example, chicken consumption was negatively associated with income since "higher income families buy more expensive meats."[1]

For the most part extensive and detailed data on the characteristics of the consumer of duckling are difficult to obtain. This is primarily because duck is an item of limited consumer demand and among those buying duckling it is likely to be an item of infrequent purchase. "Duck is generally regarded as a special item to be prepared by the homemaker for holidays or to be served in hotels and restaurants."[2] Although information on the topic of duckling consumption is limited and not current, information that is available may prove to be significant. Such consumer information is important in determining why people purchase ducklings in order to

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[1]U. S. Economic Research Service, Household Consumption Patterns for Meat and Poultry, (Washington D. C.: Government Printing Office, 1965), p. 81.

[2]W. J. Ash, Raising Ducks, USDA, Farmers Bulletin No. 2215; (Washington D.C.: Government Printing Office, 1969), p. 1.

properly determine market demand.

Some clues are evident. In 1962 a study was undertaken in the Syracuse, New York area aimed at broadening the market for Long Island Ducklings.[1] It covered 360 stores within a 75 mile radius of Syracuse. Frozen Long Island Ducklings were cut up in a way that would make it easier for the consumer to prepare and were tray packed for greater consumer appeal. Television, radio, and newspapers were used to help promotion during the test period. The results showed duckling sales increased five fold. It was hoped that in attempting to broaden the market for ducklings in this manner people would abandon the "gourmet image" for duckling and take one step towards establishing it as a "prestige item." A similar test conducted in close proximity with the previous study showed that after 15 weeks of test marketing 300 retail stores in the Syracuse area, sales of cut-up frozen Long Island Ducklings increased four times compared to frozen whole ducklings in the same market.[2]

National Production of Ducklings

Total duckling production in the United States since 1929 has not fluctuated greatly. Long run trends in the production of waterfowl have increased only slightly. In 1929 the total quantity of ducklings raised was slightly more than 11.3 million birds. In 1964 figures showed that only 12.5 million birds had been produced and sold. The increase over this period was not great, amounting to only about a 10 percent increase in

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[1] "Tray Packed Frozen Ducklings aimed at Broadening Market," Quick Frozen Foods, December, 1962, p. 124.

[2] "Frozen Tray Packed Duck Quadruples Sales After 15 Week Retail Market Test," Quick Frozen Foods, January, 1963, p. 67-68.

35 years. The average number of birds raised per farm, however, had changed in this 35 year period. In 1924, each farm had an average of 24 ducklings decreased 37 times from 470,418 in 1929 to 12,639 in 1964. These figures show increased farm size, larger production units and the trend towards specilization that has been characteristic of many other fields of agriculture. The traditional home flock of chickens, ducklings, or geese has, for the most part, disappeared only to be replaced by large scale commercial operations designed to produce thousands of birds within a few short months.

Current statistics indicate that the 1970 production of ducklings in the United States was above the year earlier figure by 244,000 birds.

The decade, 1959 to 1969, has also shown a trend toward slightly increased duckling production. From 9.0 million birds produced and slaughtered under federal inspection in 1959, the 1969 figure showed an increase in production of over 2.5 million ducklings. Even though long run figures indicate an increasing trend individual years have not always shown an increase (Table 2). The largest decrease in annual production occurred in 1961 when production dropped almost 5 percent. This was followed by a further decrease in production the next year of approximately 3 percent. These years of decrease production were largely offset by a 11 percent increase in 1963. Other decreases in production occurred throughout this 10-year period, yet most decreases were followed by years of increased production, which more than offset any previous decrease.

Within any given year duckling production increases most rapidly during March and April, reaching a peak in June or July.[1] The decline in

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[1]Based on number of ducklings federally inspected by months, citing Robert L. Brown, Cooperative Extension Agent, Suffolk County, Long Island, New York.

production beyond August is more gradual than the increase in the spring months.

Table 2. Number of ducklings inspected annually and percentage change from previous year, 1959-69.

Year	Number of Ducklings Inspected (000 Head)	Percentage Change
1959	9,064	-----
1960	10,086	+.113
1961	9,626	-.045
1962	9,344	-.029
1963	10,368	+.109
1964	10,714	+.033
1965	10,455	-.024
1966	10,496	-.039
1967	10,133	-.035
1968	10,257	+.012
1969	11,589	+.129

Source: U. S. Department of Agriculture, Agricultural Statistics, Annual issues, 1959-69, (Washington, D. C.: Government Printing Office).

Current data indicate that the 1970 production of ducklings in the United States was above the 1969 figure by 2.1 percent (Figure 2).

The Problem and Objectives

Economic redevelopment is a term receiving increased interest in recent years. It applies chiefly to underdeveloped, economically-depressed areas. The southeast corner of Kansas including the counties of Woodson, Allen, Bourbon, Wilson, Neosho, Crawford, Montgomery, Labette and Cherokee is considered one of the most underdeveloped, low income and economically-depressed areas in Kansas.[1] The socio-economic problems of Southeast

[1]"Mid America," Socio-Economic Report on Southeast Kansas, Mid-America, Inc., Parsons, Kansas, 1969, p. 35.

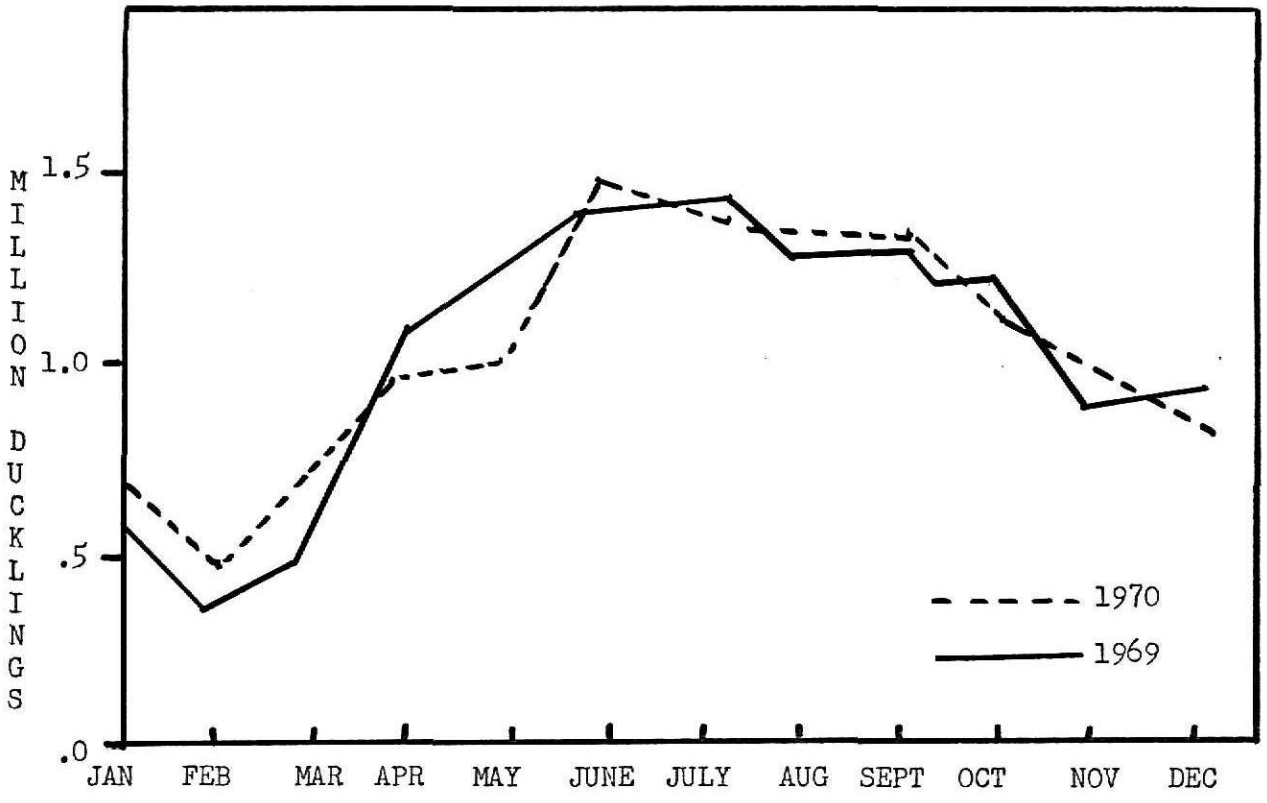

Figure 2. Federal inspection of ducklings in the United States, by months, 1969-70.

Source: Cooperative Extension Service
Suffolk County Extension Service
Robert L. Brown- Agent
Suffolk County, Long Island, New York

Kansas have largely resulted from the declining activities of its three principal industries; mining, railroads, and agriculture. In the spring of 1968, a Food Industry Task Group was planning for Southeast Kansas to identify specific opportunities and to test the feasibility of new ideas and concepts that would improve the economic situation in agriculture. One such opportunity was to expand the production of White Pekin Ducklings.

Southeast Kansas possesses some basic advantages for raising market ducklings in semi-confinement, for example: (1) favorable climatic conditions, (2) large local surplus of feed grains and feed ingredients,[1] (3) potential market outlets, and (4) many farm operators in need of additional income enterprise.

This study is intended to investigate the feasibility of raising ducklings in Kansas and determine probable costs and returns of raising ducklings in semi-confinement using the Kansas 36' x 72' pole-type brooder-rearing house.

Semi-confinement rearing, as defined in this study, is raising market ducklings on a limited land area. Ducklings started and raised in an enclosed building plus a fenced open area.

Specific objectives of this study are:

1. To estimate the capital investment in land, building, machinery, and equipment for duckling production by the semi-confinement method and using the 36' x 72' Kansas pole type brooding-rearing house based on 1969-1970 prices.

2. To estimate total annual costs and returns from the production of one, two, and three broods of ducklings per year.

3. To determine per unit costs of producing market ducklings in relation to number of broods per year.

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[1]D. Johnson, unpublished data, Kansas State University, 1971.

Theoretical Concepts

The production of a commodity will incur costs. C. E. Ferguson presents two concepts of costs: (1) the alternative cost doctrine and (2) explicit and implicit costs.[1] An alternative or opportunity cost is present when imputs used in the production of a particular commodity prevents the potential return from another commodity that cannot be produced due to prior use of inputs. Explicit cost of production are costs of purchasing resources with outlays of money. These costs are commonly thought of as expenses. Implicit costs are costs incurred by the entrepreneur such as labor and management.

Economic theory makes a distinction between costs and time periods. The short run time period may be defined in numerous ways, but in this study, it refers to a period of time in which certain inputs remain constant. In the short run the firm does not have time to vary such resources as land, buildings, heavy equipment and top management. In the short run output may be varied by employing various quantities of variable inputs although the size of plant will determine the upper limit of output per unit of time in which the firm is capable of producing. These variable inputs are those such as labor and raw materials.

The long run time period is a time period where all of the firm's inputs are variable. The firm may vary its size of plant from a very small to a very large quantity of output.

Inputs may be classified in the short run as variable or fixed. Thus their costs may also be designated as variable or fixed. The three concepts

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[1]C. E. Ferguson, Microeconomic Theory, (Illinois: Richard D. Irwin, Inc., 1969, Rev. Ed.), p. 186-98.

of costs thus presented are total variable costs, total fixed cost and total cost. Total cost may be determined by adding total variable and total fixed costs (Figure 3).

Total variable costs are the summation of the amounts spent for each of the variable inputs used by the firm. They increase as output increases since increased outputs demand more variable inputs. Figure 3 shows the total variable cost curve as a function of output per unit of time.

Total fixed costs refer to the cost for fixed resources incurred by the firm in the short run. Total fixed cost are not influenced by the firm's output level and remain constant during the short run. The fixed resources and costs associated with them include items such as taxes, depreciation, insurance, interest and are present even though the firm may remain idle.

An additional assumption must be made when analyzing total costs. It must be assumed the state of technology remains constant in the period of time during which output from one size of plant is being produced.

Average variable, average fixed and average total cost may be obtained by dividing total variable, total fixed and total costs by the quantity of output being produced.

Theoretically, the average variable cost curve begins at a high per unit cost and declines as output is increased. Average variable cost first declines, reaches a minimum, and rises as output is further increased (Figure 4). The reason for the curvature lies in the theory of production. That is, the size of plant is fixed and the use of a small amount of variable resources results in a very small output. As more inputs are added output increases at an increasing rate and as additional inputs are added output will increase at a decreasing rate.

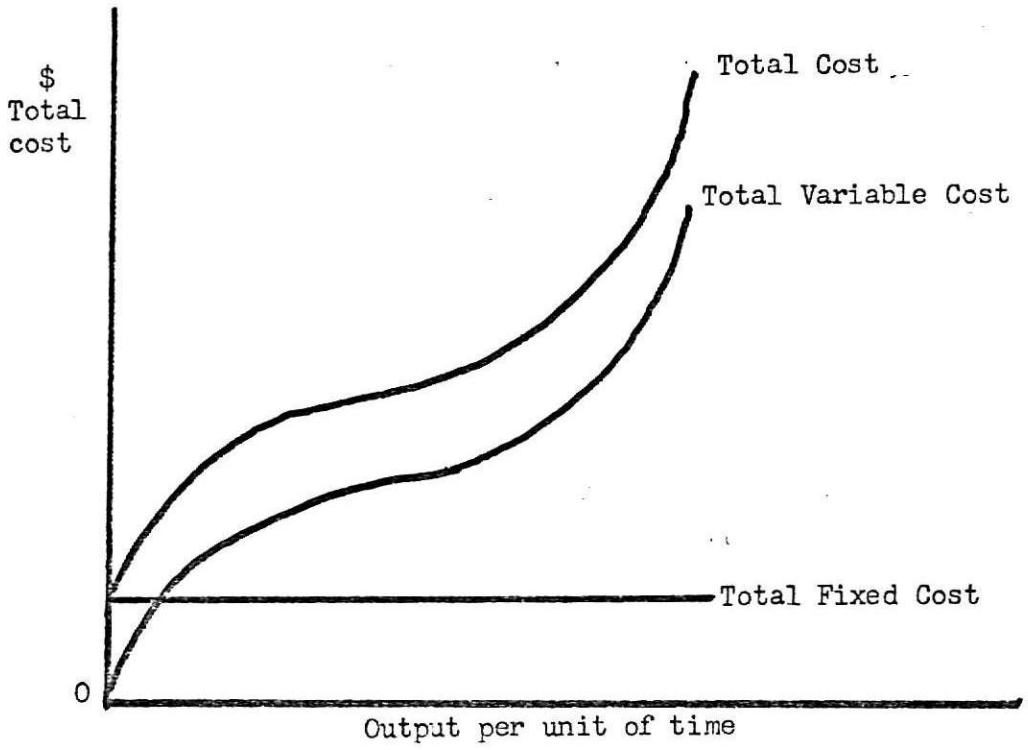

Figure 3. Theoretical total cost function.

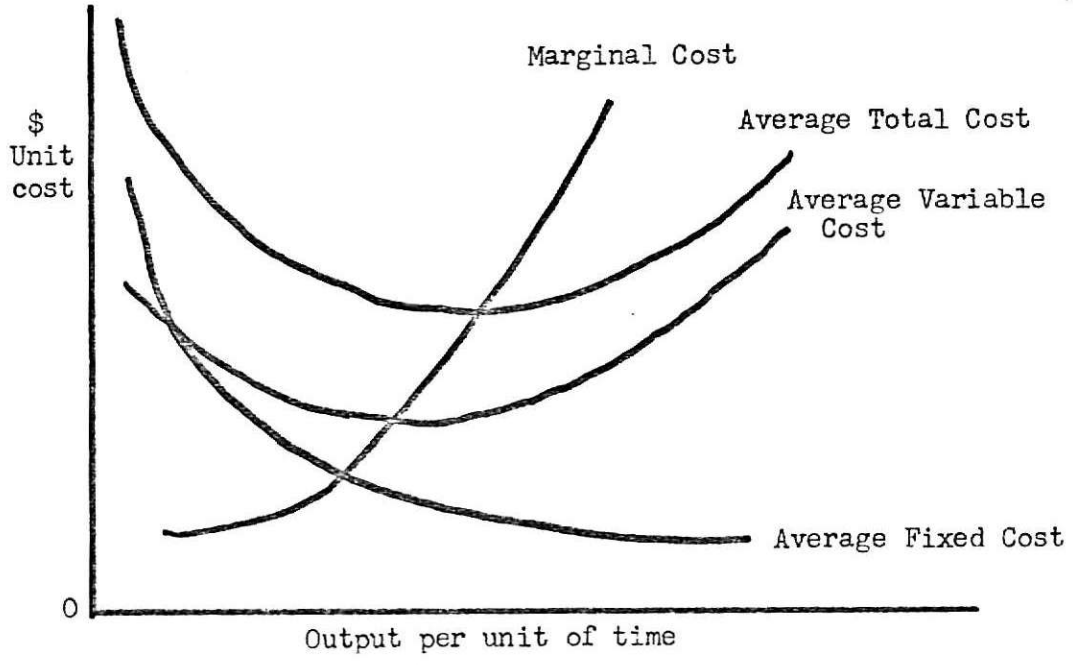

Figure 4. Theoretical unit cost functions.

Average fixed costs are obtained by dividing total fixed costs by the quantity of output at various levels of production. When plotted, average fixed costs is high at small levels of output then declines as output is increased (Figure 4). Average fixed cost will continually decline as output is increased since total fixed cost remains constant regardless of the quantity of output, thus spreading fixed costs over more units of output.

Average total cost is the summation of average variable and average fixed costs. Average total cost may also be divided total cost by the quantity of output. The average total cost curve, when plotted, lies above the average variable cost curve by the amount of the average fixed cost and is similar to the average variable cost curve (Figure 4).

An additional concept of cost is marginal cost. It implies a change in total cost resulting from a change in output. Since total fixed costs remain constant at any level of output, marginal cost may also be defined as the change in total variable cost resulting from a one unit change in output. When a production function gives a total cost curve like the curve shown in Figure 2, marginal cost will decrease when increasing returns are present as the production function dictates. As marginal cost rises, it equates average variable cost and average total cost at their minimum points (Figure 4).

Marginal cost determines the firm's optimum rate of output in the short run although it should not be confused with the most efficient size of plant (minimum average total cost). When marginal revenue, the addition of total revenue resulting from the sale of one additional unit of output, equates marginal cost, the firm is maximizing its profits or minimizing its losses.

Climatic and Topographical Conditions in Southeast Kansas

Climatic and topographical conditions in Southeast Kansas favor a potential duckling enterprise. Average annual precipitation is quite heavy. The area around Columbus in Southeast Kansas receives about 40 inches of rain annually. This amount compares favorably with the annual rainfall received in the "corn belt" of Iowa, Illinois and Indiana. The Gulf of Mexico is the principal source of moisture for Kansas, particularily Southeastern Kansas which is frequently favored by this flow of warm, moist air.[1]

Although Kansas droughts are legendary, Kansas is blessed with a very favorable distribution of precipitation within the year.[2] Most of the rain falls during the "growing season" from April to September. This contrasts with the West Coast where precipitation is evenly distributed throughout the year. In Eastern Kansas 65 to 80 percent of the annual total falls during the growing season, normally bringing with it cooling temperatures.

Most soils in Southeastern Kansas are, or can be, adapted to the production of feed grains, corn, alfalfa, etc. and thereby increase the availability of good feed supplies. Additionally, much land in this area is hilly, thereby providing adequate drainage for range-reared waterfowl.

Distances from producing areas to many major population areas located throughout the midwest are less, when compared to East, or West Coast-based duckling production firms. Eight major cities located in the midwest and south are within a 350 mile radius of Southeastern Kansas, a potential

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[1]D. Bark, Chances for Precipitation in Kansas, Bulletin No. 461, Kansas State University, 1963, p. 3.

[2]Ibid.

duckling production area.

Kansas's highway system is excellent. The system, ranking third in the United States for total miles in roads, affords excellent transportation to all boarders without congestion, or loss of time.[1]

Sales of Ducklings in Kansas

A mail survey was undertaken in August, 1970, to determine the number of ducklings being processed, or handled within Kansas. These data in turn provide some information about potential buyers of Kansas-produced ducklings.

Questionnaires concerning the number of ducklings processed, or handled, and sources of supplies were sent to ten processors (Table 3). Four of the ten questionnaires were returned.

Table 3. Number of ducklings handled by processors, season of demand and retail outlets for ducklings, Kansas, 1970.

Firm no.	Number handled	Season of demand	Type of retail outlet[a]
1	1,800	Oct.-Dec.	1, 2
2	18,000	Oct.-Dec.	1, 2
3	300	Oct.-Dec.	2, 3
4	8,000	Oct.-Dec.	1, 2, 4

[a]Key: 1 = Chain store
2 = Meat market
3 = Own retail store
4 = Restaurants, cafe

All four firms purchased ducklings from out-of-state sources. One

[1]Kansas, Secretary of State, Kansas Facts, (Topeka: Elwill M. Shanahan, 1969), p. 2-3.

firm indicated that its main source was the Long Island Duck Growers Cooperative. Another stated that the ducklings they handle were of the "Long Island variety." Other sources were from Tyson Company in Missouri. Total out-of-state sources for ducklings amount to 28,100 ducklings.

All four firms indicated the greatest demand for ducklings occurred during the fall months, particularily the Thanksgiving and Christmas holiday seasons. None of the firms reported any problems in obtaining ducklings for resale.

Two firms listed chain stores and meat markets as the most important retail outlets for ducklings. The third firm stated meat markets and their own retail stores were most important outlets. The fourth firm indicated restaurants, a cafe and chain stores were major outlets for ducklings.

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 production, receipts, and net income from an enterprise or a combination of enterprises with estimated yields, production and prices.[1]

Conventional budgeting consists of predicting the outcome of one or 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.[2] The farmer may estimate with reasonable accuracy

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

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

the average income which he may expect over a period of years from his present farm organization if the budget is carefully prepared.[1]

The budget method, however, is highly subjective and therefore results may vary widely when estimated by different investigators. The difficulty of forecasting yields and prices accurately are other disadvantages. 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 given period a set of budgets representing several possible combinations with varying yields and prices.[2]

The budget 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 assumptions underlying the budget and the study under consideration will largely determine the suitability of budgeting for solving farm management problems.[3] In this study basic assumptions covered such aspects as the brooder-rearing house, house and range equipment, management, labor, prices for machinery, equipment and feed, land requirements, mortality, market weights, costs of day-old ducklings, and other production costs.

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[1]Sheih, J. T., "Economics of the Kansas Egg Enterprise," (Master's Thesis, 1960), p. 3.

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

[3]Ibid., p. 7.

CHAPTER II

THE DUCKLING PRODUCTION ENTERPRISE

Enterprise Layout, Description, and Budget Standards of Production Facilities

Physical layouts of production facilities may vary in producing ducklings. Therefore, a hypothetical layout was designed consistent with recommendations of poultry scientists. It considered location of the building and brooding equipment along with the location of range waterers, feeders and shelters (see Appendix B, Figures 6 and 7).

The description and budget standards of land, building, machinery and equipment for duckling production are presented in Appendix B, Table 10.

Land for duckling production was assumed to be suitable for crop production and was valued as such. One acre was alloted for the brooder-rearing house and range. The building required 2,592 square feet leaving 40,968 square feet for range and access to the building.

The brooder-rearing house was 36 feet wide and 72 feet long with a 10' x 12' equipment room and accomodated 2,472 ducklings, based on 1.00 square foot per duckling. A brief description of the poultry house follows: (see Appendix B, Figure 5).

> The building is of simple pole-type construction with the posts set into the ground, resting in concrete. The roof is corrugated sheet steel with asphalt-impreginated vapor seal sheathing for insulation. Sides and ends are made from asphalt-ceated 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 screens sliding panels. Sliding double size doors on each end of the building afford easy access for cleaning and for air movement in warm weather.[1]

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

Six liquid petroleum gas brooders were placed in two rows on 12 foot centers and fastened to trusses with a pulley so they might be placed adjusted for height as the ducklings grew. Brooder guard shields enclosed each brooder to keep the young ducklings close to the brooder. Gallon water founts and starter feeders and one 8-foot automatic trough waterer was available in each brooder area. As the ducklings grew, automatic waterers were raised in height. For each brood 1.30 inches of water space per duckling was budgeted.

Fuel for gas brooders was stored in a 125 gallon tank. Ducklings were fed indoors for three weeks. Filling of feed hoppers and gallon water founts indoors was performed by hand. After three weeks, ducklings were allowed access to the range (weather permitting), where range feeders, shade shelters and trough waterers were available.

Ten range feeders were budgeted for the enterprise allowing 1.0 inch of feeding space per duckling. Feed was stored in a bulk feed bin which was located outside the fence at the northeast corner of the brooder-rearing house. Feed was transported from the bulk feed bin to the range feeders by means of a feed mix-transport wagon pulled by a tractor. Feeding was discontinued indoors after three weeks.

Water in the brooder-rearing house and on range was always available. Range trough waterers were 10 feet long each providing 20 linear feet of watering space. The combination of range waterers and automatic waterers located in the house provided .75 linear inches of watering space per duckling.

Extension of the water line from the brooder-rearing house was designed for the hypothetical layout (see Appendix B, Figure 6). A complete list of fittings and pipes is shown in Appendix B, Table 13.

The range was fenced with three-foot hog wire. Steel fence posts, five feet long, spaced 10 feet apart held the wire. Fencing was permanent, thus investment was higher than that required in temporary fencing.

A gas incinerator was budgeted for the enterprise to dispose of dead birds. This helped in disease and pollution control.

Other items necessary for duckling production included a seven foot rear-mounted blade, a tractor mounted, front-end scoop and a portable hand sprayer. A 2-3 plow tractor was budgeted for use in the duckling enterprise. A debeaker and range shelters were also included.

Additional details for the construction of the brooder-rearing house, electrical and gas systems, range feeders, shelters, waterers and bulk tank footings are shown in Appendix B, Figures 8-12).

Basic Assumptions Regarding the Production of Market Ducklings

Labor

The amount of labor required for duckling production varies greatly depending upon the degree of technology and automation. For this study, labor productivity was assumed constant regardless of the number of flocks produced per year.

Prices for Machinery and Equipment

It was assumed that all necessary machinery and equipment to properly take care of the ducklings was purchased. It was also assumed that quantity purchases would receive discounts, thus wholesale prices were obtained for items used strictly for the duckling production enterprise

plus 10 percent for freight, taxes and assembly.[1]

Prices for non-specialized equipment, such as feed buckets and items usable for other types of enterprises were obtained from local merchants in Manhattan, Kansas. The full retail price was applied to such items. Prices for all machinery and equipment were those in effect during 1970.

Land

Land budgeted for use in this study was for duckling production only, thus it was assumed the duckling enterprise should bear the entire cost of land. Land was valued at $196.00 per acre in southeast Kansas during 1969. Land cost was calculated by using the average assessed value per acre and the prevailing valuation rates. Interest on investment in land was also computed.

Mortality

Per unit production costs are affected by total and weekly mortality rates. It was assumed that all broods experienced the same mortality rate to insure no variation in costs due to this factor. All mortality occurred from day old ducklings to 4 weeks of age. Weekly mortality rates were estimated in consultation with poultry specialists at Kansas State University (see Table 15, Appendix C). All birds were assumed to die on the last day of each week, thereby somewhat overestimating feed consumption and increasing feed costs.

Feed Prices

The prices of non-medicated 22 percent starter and 20 percent grower

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[1]Based on prices quoted by Anderson Box Company, Indianapolis, Indiana.

rations were quoted by a local business firm at Manhattan, Kansas. Prices were on a per-ton bulk feed basis, delivered to farmers. It was assumed that quantity discounts were not given.

Market Weight

Per unit production costs can be greatly affected by different market weights and ages. It was assumed that birds were marketed at 8 weeks of age and averaged 7.5 pounds in weight.[1] No allowance was made for unsalable birds since the mortality rate was assumed to include these birds.

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[1]"Duck Rations," Extension Stencil No. 25, Revised June, 1969, Cornell University, Ithaca, New York.

CHAPTER III

COST DETERMINATION AND STRUCTURE OF DUCKLING PRODUCTION COSTS

Capital Investment in Land, Building, Machinery, and Equipment for the Duckling Production Enterprise

Investment in land, building, machinery and equipment was determined for the duckling production enterprise so that costs could be allocated properly. Total capital investment in these major items is important since sources of credit must be found and be knowledgeable as to the capital requirements of this type of production. Additionally, interest must be charged against investment expenditures as a cost since capital could be invested elsewhere.

Total capital investment in land, building, machinery and equipment in relation to the number of broods produced per year is shown in Table 4.

The duckling production enterprise required an investment of $12,721.16. Machinery and equipment accounted for 69 percent of the total investment, or $8,719.15. A list of all machinery and equipment for producing market ducklings is presented in Appendix B, Table 14. The building represented the second largest investment cost and accounted for 30 percent of the total investment, or $3,806.01. Land investment was the smallest item of investment amounting to $196.00, or one percent of the total investment.

Table 4 also shows capital investment per duckling in relation to the number of broods produced per year. Total investment per duckling ranged from $5.36 for one brood to $1.79 for three broods, a decrease of $3.57 per duckling or 66 percent. The largest decrease occurred between the one and two brood flocks amounting to $2.68 per duckling or 75 percent of the total decrease in capital investment per duckling.

Table 4. Total and per duckling capital investment in land, building, machinery and equipment to produce market ducklings, by number of broods per year, Kansas, 1970.

Item	Number of broods		
	1	2	3
	Dollars		
Land	196.00	196.00	196.00
Building	3,806.01	3,806.01	3,806.01
Machinery and equipment	8,719.15	8,719.15	8,719.15
Total	12,721.16	12,721.16	12,721.16
	Dollars per duckling		
Land	.083	.041	.028
Building	1.604	.802	.534
Machinery and equipment	3.674	1.837	1.225
Total	5.361	2.680	1.787

Sources: Appendix B, Tables 11-14, Appendix C, Table 18.

The largest investment per duckling occurred in machinery and equipment. Investment per duckling was $3.67 or 69 percent of the total for the first brood and then dropped to $1.22 or 60 percent of the total for three broods per year.

Investment in building on a per duckling basis amounted to $1.60 for the first brood. When production was increased to three broods investment was spread out over additional ducklings thereby decreasing per duckling investment to 53.0 cents (Table 4).

Land investment per duckling decreased 4.0 cents from 8.3 cents in brood one to 2.8 cents for three broods (Table 4).

Structure of Costs

The costs of market duckling production were divided into two catagories: (1) variable and (2) fixed. Variable costs are costs which

vary with the level of output.[1] Fixed costs are costs which in total do not vary with changes in output.[2]

Variable Costs

Variable costs in this study were day-old ducklings, feed, duckling insurance, litter, fuel, electricity, supplies, labor and interest on operating capital.

Day-old ducklings. Prices for day-old ducklings were obtained from Heart of Missouri Poultry Farm, Columbia, Missouri. Discounts for quantity purchases were available. Total cost for ducklings was based on a quoted price of 31 cents per duckling in lots of 500 or more. This price included postage and handling charges.

A common practice among hatcheries was to include more birds than the actual number ordered to compensate for losses due to death and injury. For budgeting pruposes in this study, it was assumed that two additional ducklings were included for each 100 ducklings ordered. For example, in each brood there were 2,472 ducklings placed of which 2,424 were ordered and 48 were extras. No charge was made for additional ducklings.

Feed. Factors such as management, weather conditions, feed quality, and feeding technique affect feed consumption, waste and feed costs. To reduce the effect of such factors it was assumed that conditions were nearly ideal and that pelleted rations were fed. Cornell University data were used to determine feed requirements and market weights attained each week.[3]

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[1] C. R. McConnell, Economics, (New York: McGraw-Hill Book Company, 1969). pp. 448-49.

[2] Ibid.

[3] "Duck Rations," Extension Stencil No. 25, Revised June, 1969, Cornell University, Ithaca, New York.

Total mortality and when it occurs throughout the production period influence feed costs. For example, if mortality occurs in later stages of production, feed consumption and costs would be higher. Since fewer birds are marketable this results in less pounds sold. If total mortality occurs relatively early, feed consumption and costs would not be as high thereby lowering production costs yet not greatly effect the number and pounds of fowl marketed.

The variation in feed costs for this study was removed by assuming all mortality had occurred by the end of the fourth week. Flock mortality was estimated at four percent and the percentage distribution of total mortality by weeks was estimated in consultation with the Poultry Science Department at Kansas State University (see Table 15, Appendix C).

It was assumed that chick starter and broiler grower rations were fed since duck starter and grower rations were not available. Although the stipulated protein levels for duck starter and chick starter rations differ, a chick starter ration is considered satisfactory.[1] Such feeds did not contain any drugs which may prove harmful to ducklings.[2]

Feed prices were obtained from a local feed dealer in Manhattan, Kansas in 1970. A charge for delivery and pelleting the rations was added to the initial price per ton to obtain the total price (see Table 15, Appendix C).

Feed consumption was calculated on the basis of 2,472 ducklings started per brood. Feed consumption per duckling was multiplied by the number of birds living at the beginning of each week to give weekly feed consumption. This in turn was multiplied by the price of the specific ration, depending

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[1]H. L. Orr, "Duck and Goose Raising," Ontario Agricultural College, Publication No. 532, Guelph, Canada, 1969, p. 31.

[2]Ibid.

upon age of the birds, to obtain total feed cost. Weekly feed costs were then summed to obtain total feed cost up to the time birds were marketed (see Table 15, Appendix C).

Duckling insurance. In this study market ducklings were insured at the rate of $4.30 per $1,000 of valuation. It was assumed that ducklings were valued at $2.00 per bird, giving adequate coverage.

Since the flock would not be on hand twelve months of the year, policies were adjusted to the number of months and actual enterprise was in operation. For example, if only one brood was raised 27 percent of the annual premium would be paid, for two broods 43 percent of the annual premium would be paid and for three broods 60 percent of the annual premium would be paid.[1]

Litter. Sand and wood shavings were used as litter in the brooding-rearing house. Sand was also used in the yard where ducklings were allowed access. One cubic yard of sand covered 162 square feet with a two inch layer and one bale of wood shavings for the brooder-rearing house covered 134 square feet with a three inch layer. Litter in the brooder-rearing house and sand in the yard were removed after every flock had been marketed. A total of 19 bales of wood shavings at the price of 90 cents per bale was budgeted for every brood in addition to 240 cubic yards of sand budgeted per brood for the brooder-rearing house and run. Sand was valued at $1.00 per cubic yard, delivered and dumped, in loads of eight yards or more. The total amount of litter required annually by number of broods was as follows: one brood, 240 cubic yards of sand, 19 bales of wood shavings; two broods annually, 480 cubic yards of sand, 28 bales of wood shavings; three broods

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[1]Rates and adjustments were quoted by Kansas Farm Bureau Insurance Company, Manhattan, Kansas, 1970.

annually, 720 cubic yards of sand and 57 bales of wood shavings.

Fuel and electiricity. Electricity costs were minor since ducklings need only a dim light during hours of darkness to prevent them from being frightened. The amount of electricity needed was calculated to be approximately 125 kilowatt-hours per brood (see Table 20, Appendix C). A charge of 1½ cents per kilowatt-hour was budgeted based on Rural Electric Administration rates effective in Kansas during 1970. Electricity was required for lighting, debeaking and 1½ h.p. motor requirements for auger feeding.

Fuel costs were calculated using .006 cents per duckling placed. This figure was based on pullet replacement cost studies in Southern California during 1965.[1]

Supplies. Supplies included minor expenses incurred during or after a production period yet necessary for production. Items included were cleaning agents, disinfectants and other items necessary for ducklings but not listed elsewhere. For budgeting purposes $15.00 per brood was included in total production costs.

Labor. Labor requirements to produce market ducklings under semi-confinement were not available thus labor requirements for commercial broiler production were substituted. Requirements included time spent caring for ducklings along with estimation on required clean-up time after the fowl were sold.

From broiler production data and estimates for clean-up the following equation was developed:[2]

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[1] "What it Costs To Grow Replacement Pullets," Pacific Poultryman, May, 1965, p. 14.

[2] Agrigultural Research Service, Commercial Broiler Production,

$$L = \frac{.031(p)(t)}{60} + 30 \text{ hrs.}$$

where: L = total number of hours required per brood,

p = average number of ducklings raised per brood,

t = number of days in the production period,

30 = hours of clean-up time required per brood.

Thus if the average number of ducklings raised per brood is 2,422 for 56 days, 100 hours of labor per brood would be required. It was assumed that the 100 hour labor requirement per brood remained constant regardless of the number of broods raised.

In computing labor cost, $2.00 per hour was the wage rate. This rate reflected a minimum opportunity cost to the producer for his time, but not necessarily his managerial ability.

Interest on operating capital. Interest was charged on operating capital for two reasons: (1) if the producer used his own capital, the interest charge represented interest foregone and (2) a cash cost would be incurred if the capital was borrowed and interest paid.

In this study six percent per annum was charged on 16 percent, 33 percent, and 50 percent respectively, of the total cost of the previously mentioned variable cost items. This method was employed because producing one, two and three broods of market ducklings required the use of capital for a time period of two months, four months and six months respectively.

Fixed Costs

The land, building, machinery and equipment used in producing market ducklings was considered fixed in the short run. These items were considered

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Agricultural Handbook No. 320, (Washington, D. C.: Government Printing Office, February, 1967), p. 7.

durable and therefore could be used for more than one year's production. The annual cost of using these fixed resources was the charge covering any year's use. Fixed costs included depreciation, insurance, taxes, interest on investment, and repairs and maintenance.

Depreciation. The straight-line method was used to determine depreciation on the building, machinery and equipment. No salvage value was assumed to exist at the end of any items "useful life." Each durable item was assigned a period of "useful life." This time period was divided into the new cost or value as estimated by pricing methods (see page 23) to obtain annual depreciation costs (see Table 16, Appendix C).

Each item's period of "useful life" was based upon previous survey data employing similar equipment and the advice of poultry specialists at Kansas State University. All items were used exclusively for market duckling production.

Insurance. Insurance costs were computed for the building, all machinery and equipment. Buildings were insured for 80 percent of their initial cost and had a rate of 99 cents per $100 of insurable value, of which 26 cents was for fire insurance and 73 cents was for extended coverage (see Table 17, Appendix C). Machinery and equipment were insured for 100 percent of initial cost and had a rate of 43 cents per $100 of insured value, of which 25 cents and 18 cents were for fire insurance and extended coverage respectively.[1]

Property taxes. Property taxes included items classed as personal property and real property upon which taxes were levied. All machinery and equipment were included in the former. The land and building were

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[1]Premium rates and insurable values were quoted by Kansas Farm Bureau Insurance Company, Manhattan, Kansas, 1970.

considered real estate and were assessed at 20 percent of current valuation. Machinery and equipment were assessed at 30 percent of current valuation. All property was taxed at the rate of $79.95 per $1,000 assessed value.[1]

Personal property taxes were also computed on the duckling flock. Ducklings were valued at $5.00 per dozen assessed valuation, based on the average number on hand (average inventory) throughout the year.[2] The tax rate mentioned above also applied to the duckling flock (see Table 18, Appendix C).

Repairs and maintenance. Repairs and maintenance were assumed to be a fixed cost whether the building, machinery and equipment were used or remained idle.

Estimated repairs for buildings were two percent of initial investment and three percent of initial investment for machinery and equipment. Field survey data for Kansas turkey producers revealed repairs on machinery and equipment were more frequent and, as a percentage of original investment, were more costly than on buildings.[3]

Interest on fixed investment. Interest on fixed investment for the market duckling enterprise was determined by the following equation:

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[1]Kansas Property Valuation Department, Real Estate Assessment Ratio Study, 1969, (Topeka: State Printing Office; and Kansas Property Valuation Department, Statistical Report of Property Assessment and Taxation for the Tax Year 1969, (Topeka: State Printing Office).

[2]Kansas Property Valuation Department, Kansas Personal Property Assessment Manual, 1970, (Topeka: State Printing Office), p. M-111.

[3]L. K. Martin, "An Economic Analysis of Producing Market Turkeys in Kansas Using Semi-confinement Rearing," unpublished Master's Thesis, Kansas State University, Manhattan, Kansas, 1970.

$$I_f = \frac{TIbme}{2} (r) + (TI_l)(r)$$

where: I_f = interest on fixed investment,

TIbme = total investment in the building, machinery and equipment,

TI_l = total investment in land,

r = rate of interest.

A rate of six percent per annum was used to calculate interest on fixed investment. The interest rate applied to one half of the total capital invested in the building, machinery and equipment since these items were depreciated annually and no salvage value was assumed. Since land was not depreciated the interest was not applied to all capital invested in land.

CHAPTER IV

PRODUCTION COSTS FOR THE MARKET DUCKLING ENTERPRISE

Cost data in this section were derived from budget standards previously mentioned. These data provided levels of cost for producing market ducklings for the number of broods produced. Costs per pound, cost per duckling, cost per brood and the percentage distribution of cost components were calculated by the number of broods produced per year.

Facilities were utilized at 100 percent capacity. Mortality rates and feed prices were assumed constant throughout the various production periods.

Costs to Produce Market Ducklings

Total fixed and variable costs were summed to obtain total costs (see Table 19, Appendix C). Average costs in cents per pound of duckling sold were computed by dividing total costs for all inputs by the quantity of output sold. In Table 5, estimated average variable, average fixed, and average total costs for market ducklings by number of broods produced per year are shown.

Average Costs of Production

Average costs to produce market ducklings depended upon the number of broods produced per year. As the number of broods increased from one to three broods, average cost per duckling decreased.

Estimated average total costs of producing market ducklings ranged from 34.9 cents per pound for one brood to 25.3 cents per pound for three broods produced anually. When two broods were produced annually total costs

were estimated at 27.6 cents per pound. Certain variable costs did not change significantly as the number of broods produced annually increased. However, average fixed costs were reduced as annual production increased because of more pounds of ducklings marketed, thus lowering costs per pound.

Table 5. Estimated average variable, fixed, and total costs of producing market ducklings, by number of broods per year, Kansas, 1970.

Item	Number of broods		
	1	2	3
	Cents per pound		
Duckling flock[a]			
Average variable costs	19.76	19.96	20.16
Average fixed costs	15.11	7.59	5.09
Average total costs	34.87	27.55	25.25

[a]Based on four percent mortality.

Source: Appendix C, Table 19.

Average total costs declined 7.32 cents per pound between the one and two brood flocks and 2.30 cents per pound between the two and three brood flocks. The decrease in average total costs between the one and three brood flocks amounted to 9.62 cents per pound or 27.6 percent. Of this reduction, approximately 21.0 percent (7.32 cents) occurred between the one and two brood flocks and an additional 6.6 percent reduction occurred between the two and three brood flocks.

Analysis of Variable and Fixed Cost Components

Average variable and average fixed costs, by components and number of broods, were estimated for the duckling enterprise. Total variable and

fixed costs for the duckling enterprise are shown in Table 19, Appendix C. Table 6 shows average variable and fixed costs, by components, of producing market ducklings in relation to number of broods per year.

Table 6. Estimated average variable and fixed costs, by components, of producing market ducklings[a], by number of broods, Kansas, 1970.

Item	Number of broods		
	1	2	3
	Cents per pound		
Average variable costs			
Day-old ducklings	4.22	4.22	4.22
Feed	12.60	12.60	12.60
Duckling insurance	.03	.03	.03
Litter	1.43	1.43	1.43
Brooder fuel	.08	.08	.08
Electricity	.01	.01	.01
Supplies	.08	.08	.08
Labor	1.12	1.12	1.12
Interest[b]	.19	.39	.59
Total	19.76	19.96	20.16
Average fixed costs			
Depreciation	5.62	2.81	1.87
Insurance	3.80	1.90	1.27
Property taxes	1.61	.84	.59
Repairs and maintenance	1.90	.95	.63
Interest[c]	2.18	1.09	.73
Total	15.11	7.59	5.09
Average total costs	34.87	27.55	25.25

[a]Based on four percent mortality.

[b]On operating capital.

[c]On fixed investment.

Source: Table 19, Appendix C.

Table 7 shows the percentage distribution of average variable and average fixed cost items. Average variable costs represented 56.6, 72.5, and 79.8 percent, respectively, of the total average costs for one, two, and

three broods.

Table 7. Percentage distribution of total costs, by components, of producing market ducklings[a], by number of broods, Kansas, 1970.

Item	Number of broods		
	1	2	3
	Percent of total costs		
Average variable costs			
Day-old ducklings	12.10	15.31	16.71
Feed	36.13	45.74	49.90
Duckling insurance	.09	.11	.12
Litter	4.10	5.19	5.66
Brooder fuel	.23	.29	.32
Electricity	.03	.04	.04
Supplies	.23	.29	.32
Labor	3.21	4.07	4.44
Interest[b]	.55	1.42	2.34
Total	56.67	72.46	79.85
Average fixed costs			
Depreciation	16.11	10.20	7.41
Insurance	10.90	6.89	5.03
Property taxes	4.62	3.05	2.33
Repairs and maintenance	5.44	3.44	2.49
Interest[c]	6.26	3.96	2.89
Total	43.33	27.54	20.15
Average total costs	100.00	100.00	100.00

[a]Based on four percent flock mortality.

[b]On operating capital.

[c]On fixed investment.

Source: Table 19, Appendix C.

Feed accounted for 12.60 cents per pound for each brood and formed the largest single cost item (Table 6). As percentage of total cost, feed cost increased from 36.1 percent for one brood to 49.9 percent for three broods (Table 7). Feed costs per duckling remained constant as production was increased from one to three broods annually thus average total costs

declined.

Cost of day-old ducklings ranked second among variable cost items amounting to 4.22 cents per pound for each brood (Table 6). The cost per pound did not decrease as production was increased since the cost of day-old ducklings was assumed constant throughout the production year. Discounts for large quantity purchases were available.

Cost of day-old ducklings was 12.1, 15.3, and 16.7 percent of total average costs for one, two, and three broods, respectively (Table 7).

All other variable cost items such as insurance, litter, brooder fuel, electricity, supplies, labor and interest on operating capital amounted to 2.94, 3.14, and 3.34 cents per pound for one, two and three broods, respectively (Table 6). Of this, 2.55 cents per pound was accounted for in litter and labor costs for each brood. As a percentage of total average costs, these variable cost items accounted for 8.4, 11.4 and 13.2 percent for the one, two and three broods, respectively (Table 7).

Total average fixed costs for market ducklings ranged from 15.1 cents per pound for the one brood to 5.1 cents per pound for the three broods, a decrease of 10.0 cents per pound (Table 6). The largest fixed cost item was depreciation regardless of the number of broods produced. For one brood it accounted for 16.1 percent of the average total costs and for the two and three broods it accounted for 10.2 and 7.4 percent, respectively, of average total costs (Table 7).

Insurance was the second largest fixed cost item. In terms of a percentage distribution of average total costs it accounted for 10.9, 6.8, and 5.0 percent, respectively, for the one, two, and three brood flocks (Table 7). Other fixed costs in order of importance were interest on fixed investment, repairs and maintenance, and property taxes.

Average fixed costs accounted for most of the decline in per unit costs as production was increased. This allowed for overhead costs to be spread over market ducklings thus decreasing production cost per duckling (see Tables 16 and 19, Appendix C).

Total Dollar Costs, Cost per Duckling, Cost Per Brood

Table 19, Appendix C shows total dollar costs, costs per duckling and cost per brood for the market duckling enterprise as production increased from one to three broods for a 12-month period. Total annual costs for one, two and three brood flocks were $6,206.34, $9,806.74 and $13,478.85, respectively.

A comparison, item by item, of the various cost components showed that as output was increased variable cost items such as day-old ducklings, feed, litter, fuel and labor increased proportionately. Electricity costs, however, did not increase proportionately. The factor mainly accounting for this was the increasing day length as the summer months approached thereby decreasing the amount of electricity required during the dark hours. Interest on operating capital increased at a faster rate as output increased compared to other variable cost items. Doubling of the variable costs as the number of broods increased along with the lengthened investment period accounted for this disparity. Insurance on ducklings also reflected costs that did not increase proportionately. This variation was mainly accounted for by differences in the percent of annual premium due on the duckling flock as the number of broods per year increased, (i.e., 1 brood, 27 percent of annual premium; 2 broods, 43 percent of annual premium; 3 broods, 60 percent of annual premium), (see Table 17, Appendix C).

Total fixed costs remained relatively constant as the number of broods

produced increased per year. Property taxes varied slightly due to the inclusion of personal property taxes on ducklings which increased as the average inventory increased.

The largest single cost item was feed. Feed costs totaled $2,241.78, $4,483.56 and $6,725.34 for the one, two and three broods, respectively.

Costs of day-old ducklings ranked second as the largest cost item for the three brood flocks and third for the one brood flock. Total costs for day-old ducklings amounted to $751.44, $1,502.88 and $2,254.32 for the one, two and three broods.

Depreciation costs ranked second among cost items for the one brood and third for the two and three broods. Depreciation costs remained constant throughout the 12-month period totaling $999.69.

Production cost per duckling decreased as output was increased. Production cost per duckling was computed by dividing the total cost of production by the number of ducklings marketed. Cost per duckling was $2.615 for the one brood flock. This cost decreased .549 cents to $2.066 when two broods were produced and an additional .173 cent decrease was realized when production expanded to three broods per year thus costing $1.893 per duckling (see Table 19, Appendix C). Likewise as production increased, cost per brood decreased. Cost to produce one brood of ducklings totaled $6,206.34. As production increased to two broods cost per brood declined $1,302.97 to $4,903.37 per brood. For three broods an additional $410.42 reduction in costs occurred lowering the cost per brood to $4,492.95, (see Table 19, Appendix C).

CHAPTER V

TOTAL RETURNS TO THE MARKET DUCKLING ENTERPRISE

One of the characteristics of the poultry industry is substantial year-to-year fluctuations in prices of both eggs and meat. This suggests that, to be successful, poultrymen should remain in business over a period of years rather than attempt to "play the market" by an "in and out" type of operation.[1]

Table 8 shows the estimated total returns per year to the duckling enterprise at various prices at the farm level. Expected returns to the duckling enterprise are important in decision making since opportunities may exist elsewhere for the farmer to invest his capital and realize an equal or greater return.

A selling price of 22.0 cents per pound liveweight at the farm was quoted in March, 1971, by a southwest Missouri commercial duckling producer who marketed 2,000 ducklings per week and had a highly intergrated operation.[2] This price provided a basis for computing total returns to the market duckling enterprise.

Price per pound of liveweight duckling was varied in three cent intervals from 22.0 cents per pound to 43.0 cents per pound. Returns per brood ranged from a loss of $2290.89 at 22.0 cents per pound to a profit of $1,446.59 at 43.0 cents per pound for the one brood flock (Table 8). When production expanded to two broods annually returns ranged from a loss

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[1]"New Hampshire Poultry Management Mannual," Extension Circular 386, University of New Hampshire, Durham, December, 1966, p. 10.

[2]Morrow Milling Company, Carthage, Missouri, March, 1971.

Table 8. Estimated returns per year[a] at various prices, by number of broods, to market duckling enterprise, Kansas, 1970.

Item	Price per pound[b]	Number of broods		
		1	2	3
	Cents		Dollars	
Total cost		6,206.34	9,806.74	13,478.85
Total returns	22.0	3,915.45	7,803.90	11,746.35
Profit or loss		-2,290.89	-1,975.84	-1,732.50
Total cost		6,206.34	9,806.74	13,478.85
Total returns	25.0	4,449.38	8,898.75	13,348.13
Profit or loss		-1,756.96	- 907.99	- 130.72
Total cost		6,206.34	9,806.74	13,478.85
Total returns	28.0	4,983.30	9,966.60	14,949.90
Profit or loss		-1,223.04	159.86	1,471.05
Total cost		6,206.34	9,806.74	13,478.85
Total returns	31.0	5,517.23	11,034.45	16,551.68
Profit or loss		- 689.11	1,227.71	3,072.85
Total cost		6,206.34	9,806.74	13,478.85
Total returns	34.0	6,051.49	12,102.30	18,153.45
Profit or loss		- 154.85	2,295.56	4,674.60
Total cost		6,206.34	9,806.74	13,478.85
Total returns	37.0	6,585.08	13,170.15	19,755.23
Profit or loss		378.74	3,363.41	6,276.38
Total cost		6,206.34	9,806.74	13,478.85
Total returns	40.0	7,119.00	14,238.00	21,357.00
Profit or loss		912.66	4,431.26	7,878.15
Total cost		6,206.34	9,806.74	13,478.85
Total returns	43.0	7,652.93	15,305.85	22,958.78
Profit or loss		1,446.59	5,499.11	9,479.93

[a]Based on 2,373 ducklings marketed per brood.

[b]At the farm level.

of $1,975.84 at 22.0 cents per pound to a profit of $9,479.93 at the 22.0 and 43.0 cents per pound prices respectively. Intermediate levels of returns are also shown in Table 8.

The cost per pound to produce market ducklings ranged from 34.8 cents per pound for the one brood flock to 27.5 and 25.2 cents per pound for the two and three brood flocks (Table 6). In order to realize a profit the farmer must receive a price in excess of cost. In Table 8 a price of 37.0 cents per pound showed a net profit of $378.74 if one brood was produced. As production increased to two broods per year a profit of $159.86 may be realized at 28.0 cents per pound and if three broods are produced a price of 28.0 cents per pound would provide a profit of $1,471.05. Thus as production increased the price needed to show a profit in the duckling enterprise declines due to the decrease in per unit production costs.

CHAPTER VI

MARKETING CONSIDERATIONS

Climate, topography and location favor in varying degrees, the potential Kansas duckling industry, yet the production side is only part of the picture. It would be folly to start production on a large scale only to encounter an unprofitable market for ducklings. Therefore, marketing considerations must be dealt with.

Poultry processing plants within this area are located at Parsons, Cherryvale and Iola. The Parsons plant is large and quite old. The future of this plant is uncertain. Local production of poultry does not supply adequate numbers for efficient utilization and full capacity. The Iola plant must import supplies of live broilers and fryers from Arkansas and Southwestern Missouri to operate efficiently. No information was available concerning the Cherryville plant. If out of state shipments were made, producer processors would be subject to stringent USDA regulations of the 1968 Poultry Products Inspection Act.

The Parsons Ice and Cold Storage Plant at Parsons, Kansas, also faces problems of under capacity. The plant is old, yet efficient. It is the largest cold storage capacity in the nine county area. It qualifies as a registered, refrigerated public warehouse and has a freezing capacity of 100,000 pounds of commodities per day.[1] The need for cold storage in this area has decreased. Expanded duckling production on a commercial basis could be handled by existing plants relatively efficiently, although a greatly expanded poultry industry in this area would necessitate the development of

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[1]"Mid-America," Socio-Economic Report on Southeast Kansas, Mid-America, Inc., Parsons, Kansas, 1969, p. 33.

a new poultry processing industry.

The characteristics of the product must also be considered. Compared to other classes of poultry, ducks are distinct in many respects. The percent of lean meat on ducks is low compared to chicken and turkey.

Duck conformation differs from chicken and turkey. The shallow fleshing and flat breast of duck does not lend itself to conventional carving. The hind quarter is smaller in proportion to the rest of the carcass than that afforded by chicken and turkey.[1]

Other considerations center around the high fat content of ducks. Some objections have occurred concerning cooking techniques. However, many midwestern producers have developed a duckling with less fat than east coast ducklings.[2]

Additionally, conditioning of the American palate to a combination of white and dark meat in chicken and turkey must be considered. Duck meat is all dark meat. Marketing and promotional aspects will have to combat, or change such preferences.

The two most important characteristics of ducklings are its flavor and succulence. The meat is of fine texture and the skin cooks up crisp and flavorable.

Marketing agencies and outlets must be developed. It has been assumed that the demand curve for ducklings is relatively in elastic.[3] Lowering the price for ducks would not increase gross income to the industry. A

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[1]A. N. McLeod, "Production and Marketing of Long Island Ducklings," (published Doctor's dissertation, Cornell University, 1950), p. 164.

[2]H. E. Drews, "Long Island Duckling Story," Poultry Processing and Marketing, 59: 81, November, 1953.

[3]McLeod, Op. cit., p. 165.

more probable method for the industry would be to attempt to increase demand through successful sales promotion programs, or through distributionships of major meat packers who have extensive distribution and promotional know-how.

CHAPTER VII

SUMMARY AND CONCLUSIONS

The duckling business in the United States is growing. Many states in the midwest have experienced increased growth rates during the past decade. The states of Ohio, Indiana, Wisconsin and Missouri account for most of this increased duckling production. Annual consumption of duckling is also rising. During the period 1965 to 1969, per capita consumption of duckling increased from .2 pound per person to .3 pound per person, or 50 percent. Nationally, duckling production increased only 10 percent from 1929 to 1964. However, the decade 1959 to 1969, has shown a trend towards slightly increased duckling production. From 9.0 million ducklings produced and slaughtered under federal inspection in 1959, the 1969 figure showed an increase in production of over 2.5 million ducklings, or 27 percent.

The southeast area of Kansas is considered one of the most economically depressed areas in Kansas. In the spring of 1968, a Food Industry Task Group was organized for southeast Kansas to identify specific opportunities and to test the feasibility of new ideas and concepts that would improve the economic situation in agriculture. One such opportunity was to expand the production of white pekin ducklings. Such proposals need to be analyzed so decisions can be made as to the economic feasibility.

This study focuses on raising market ducklings in semi-confinement using the Kansas 36' x 72' pole-type brooder-rearing house. Objectives of this study were: (1) to estimate the capital investment in land, building, machinery and equipment for duckling production based on 1969-70 prices; (2) to estimate total annual costs and returns from the production of one, two and three broods of ducklings per year; and (3) to determine per unit

costs of producing market ducklings in relation to number of broods per year.

Data were obtained from extension personnel and research publications. These data were used in developing land, building, machinery and equipment requirements in addition to costs of production and budget standards for the duckling production enterprise.

Budget standards for labor, fuel, electricity, litter, supplies and mortality rate were based on research publications and estimates by poultry scientists at Kansas State University. A mortality rate of four percent for each duckling flock was budgeted. Weekly feed consumption rates and average liveweight of ducklings at market age were based on feeding trials at Cornell University. Prices of feed, litter, duckling insurance and other variable cost items along with building material costs were obtained from local merchants in Manhattan, Kansas. The price of day-old ducklings was obtained from the Heart of Missouri Poultry Farm in Columbia, Missouri.

The limit on brooder-rearing house capacity was 2,472 ducklings placed at one time. Ducklings were reared during the warm months of April to October. This practice allowed ducklings access to range thus decreasing fuel requirements and increasing the number of ducklings produced within a given period of time.

Capital investment and production costs were determined for one, two and three broods produced annually. A maximum of 2,472 ducklings per brood was placed in the brooder-rearing houses. Capital investment for the duckling production enterprise was $12,721.16. Capital investment per duckling ranged from $5.36 per duckling for one brood to $1.78 per duckling for the three broods.

Variable costs included costs of day-old ducklings, feed, duckling

insurance, litter, fuel and electricity, supplies, labor and interest on operating capital. Fixed costs were based on capital investment and included depreciation on the building, machinery and equipment, property taxes on real and personal property, insurance on the building, machinery and equipment, repairs and maintenance on the building, machinery and equipment and interest on fixed investment.

Average total costs of producing market ducklings ranged from 34.87 cents per pound for one brood to 25.25 cents per pound for three broods per year.

Feed was the largest cost item for the one, two and three brood flocks. This cost was 12.60 cents per pound and remained constant as production increased from one to three broods per year. Feed accounted for 36.16 percent of total costs for one brood and increased to 49.9 percent of total costs for three broods.

Cost of day-old ducklings ranked second as a production expense item for two and three broods and ranked third for one brood. Cost of day-old ducklings was 4.22 cents per pound of duckling sold. This cost remained constant for the one, two and three broods.

Feed cost and the cost of day-old ducklings accounted for 48.23 percent (one brood), 61.05 percent (two broods) and 66.61 percent (three broods) of average total costs in producing market ducklings.

Average variable costs ranged from 19.76 cents per pound (one brood) to 20.16 cents per pound (three broods). As production increased from one to three broods variable costs accounted for a higher proportion of total costs.

Average fixed costs ranged from 15.11 cents per pound (one brood) to 5.09 cents per pound (three broods). Average fixed costs declined as

production expanded to three broods annually.

The largest fixed cost item for the one, two and three brood flocks was depreciation. Depreciation costs ranged from 5.62 cents per pound for one brood to 1.87 cents per pound for three broods. Depreciation decreased from 16.11 percent to 7.41 percent of average total costs as the number of broods expanded.

Remaining fixed cost items, in order of size, were: insurance on house and equipment, interest on fixed investment, repairs and maintenance and property taxes.

Total dollar costs to produce one, two and three broods of ducklings per year were $6,206.34, $9,806.74 and $13,478.85, respectively. On a per duckling basis, production cost was $2.615 for the one brood flock, $2.066 when two broods were produced and $1.893 when three broods were produced per year.

Total returns to the market duckling enterprise ranged from $378.74 (one brood), $159.86 (two broods) and $1,471.05 (three broods) when prices at the farm level were 37.0 cents and 28.0 cents per pound for two and three broods, respectively. At lower prices losses were incurred.

For a duckling production enterprise to be successful, proper processing and cold storage facilities must be readily available. Processing and cold storage plants located in southeast Kansas at Parsons, Cherryvale and Iola could provide these facilities. But marketing agencies and market outlets must be developed.

A selling price of 22.0 cents per pound liveweight at the farm was quoted in March, 1971, by a Southwest Missouri commercial duckling producer who marketed 2,000 ducklings per week and had a highly integrated operation. At this price level, returns would be far insufficient to cover average

total costs of 25.25 cents per pound incurred to produce three broods using the method of rearing and type of facilities explained in this study in southeast Kansas.

This study has certain limitations. First, and perhaps most important, other systems of rearing were not considered. Range rearing and total confinement systems may reduce per unit costs yet cost analyses are currently not available.

Range rearing of market ducklings would likely decrease the capital investment per duckling but additional losses from predators must also be considered. Feed conversion and feed efficiency may decrease more during the summer months than when using a semi-confinement rearing system. Additionally the use of ranges may reduce feed costs however ducks are not nearly as good foragers as geese or turkeys and recommendations state that it is quite economical to rear ducklings without access to pasture.[1]

Total confinement rearing systems for ducklings are being employed in areas where real estate values and property taxation are such that the duck producer must use a minimum amount of land. Under total confinement rearing land costs would be minimized yet capital investment in buildings would greatly increase.

Range rearing and total confinement systems may reduce costs in the long run; however, economic studies must be conducted to warrant their use in southeast Kansas before decisions can be made.

Facilities for duckling production in this study were not employed year round. Per unit costs may be lowered when rearing ducklings year round by raising two additional broods of approximately 1,240 ducklings

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[1]H. L. Orr, Op. Cit.

each in total confinement during the winter months, November through March.

One 36' x 72' Kansas pole-type brooder-rearing house was used in this study with an adjacent fenced in yard. Economies of scale may be realized if the size of the brooder-rearing house were increased.

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APPENDIX A

HYPOTHETICAL BROODING, GROWING AND MARKETING SCHEDULE FOR MARKET DUCKLINGS

Table 9. Hypothetical time schedule for brooding, growing and marketing ducklings, 1, 2, and 3 broods per year, Kansas, 1970.

Date	Number of ducklings placed	Phase of production
April 1, 1970	2,472	Place in brooder house (1st brood)
April 15		Shift from starter to grower ration
April 22		Allow access to range
May 27		Market birds (1st brood)
May 28		Clean range, disinfect house and equipment (allow two weeks)
June 12	2,472	Place in brooder house (2nd brood)
June 26		Shift from starter to grower ration
July 3		Allow access to range
August 7		Market birds (2nd brood)
August 8		Clean range, disinfect house and equipment (allow two weeks)
August 22	2,472	Place in brooder house (3rd brood)
September 5		Shift from starter to grower ration
September 12		Allow access to range
October 17		Market birds (3rd brood)
October 18		Clean range, disinfect house and equipment

APPENDIX B

DESCRIPTION AND BUDGET STANDARDS OF LAND, BUILDING, MACHINERY, AND EQUIPMENT; LAYOUT OF ENTERPRISE; AND CAPITAL INVESTMENT TO PRODUCE MARKET DUCKLINGS

Table 10. Description and budget of land, building, machinery, and equipment,[a] market duckling enterprise, Kansas, 1970.

Item	Description	Budget standard
Land		
For brooder house	Suitable for crop production and valued as such.	.2 acre per brood.
For range	Suitable for crop production and valued as such.	.8 acre per brood.
Building		
Brooder house	Pole type on 12 ft. centers, dirt floor, 36 ft. wide and 72 ft. long, complete with plumbing and electrical wiring.	1 square foot per bird.
Machinery and equipment		
Brooders	Triple jet, 30,000 BUT's, Gas.	1 brooder per 450 ducklings.
Brooder fuel tank	LP gas, 125 gallon capacity.	1 tank per enterprise.
Brooder waterers	Automatic, adjustable, float type, porcelain, floor type with 8 foot trough.	.25 linear inches per duckling.
Brooder founts	Plastic, 2 gallon capacity	1 per 60 ducklings.
Range waterers	Home construction, 10 foot angle iron trough.	.74 linear inches per duckling.
Bulk feed bin	Round metal bin with boot and double discharge auger.	One 6 ton bin.
Starter feeders	Trough type, floor feeders, 36 inches in length.	.48 linear inches per duckling.

Table 10. continued.

Item	Description	Budget standard
Feeders	Floor type, galvanized steel, 150 pound capacity.	1 per 75 ducklings.
Tractor	2-3 plow power, with PTO and 3-point hitch, gasoline	1 tractor per enterprise.
Range feeders	Home construction, wood, bulk feeders, 10 foot long, 20 foot of feeding space on skids.	1 per 250 ducklings.
Debeaker	Mechanical leavage, electrical.	1 per enterprise.
Draft guards	36 foot by 18 inches high, pressboard.	1 per brooder.
Water system	Polyethelene pipe, underground, with fittings and accessories.	1 per enterprise.
Fence	Hog wire, 3 foot high, 150 foot roll.	710 feet.
Fence posts	5 foot steel.	1 post per 10 ft. of fence.
Incinerator	LP gas, round single burner.	1 incinerator for enterprise.
Feed transport wagon	PTO drive, pull type, with 6 foot auger, 60 bushel capacity.	1 feed transport wagon per brood.
Front end loader	For tractor, 1,500 pound lifting capacity.	1 loader per enterprise.
Scraper blade	6 foot steel blade, mounted on 3 pount hitch.	1 per enterprise.
Sprayer	3½ gallon hand operated sprayer.	1 per enterprise.

[a]All budget standards on a per duckling basis assume 2472 birds were placed.

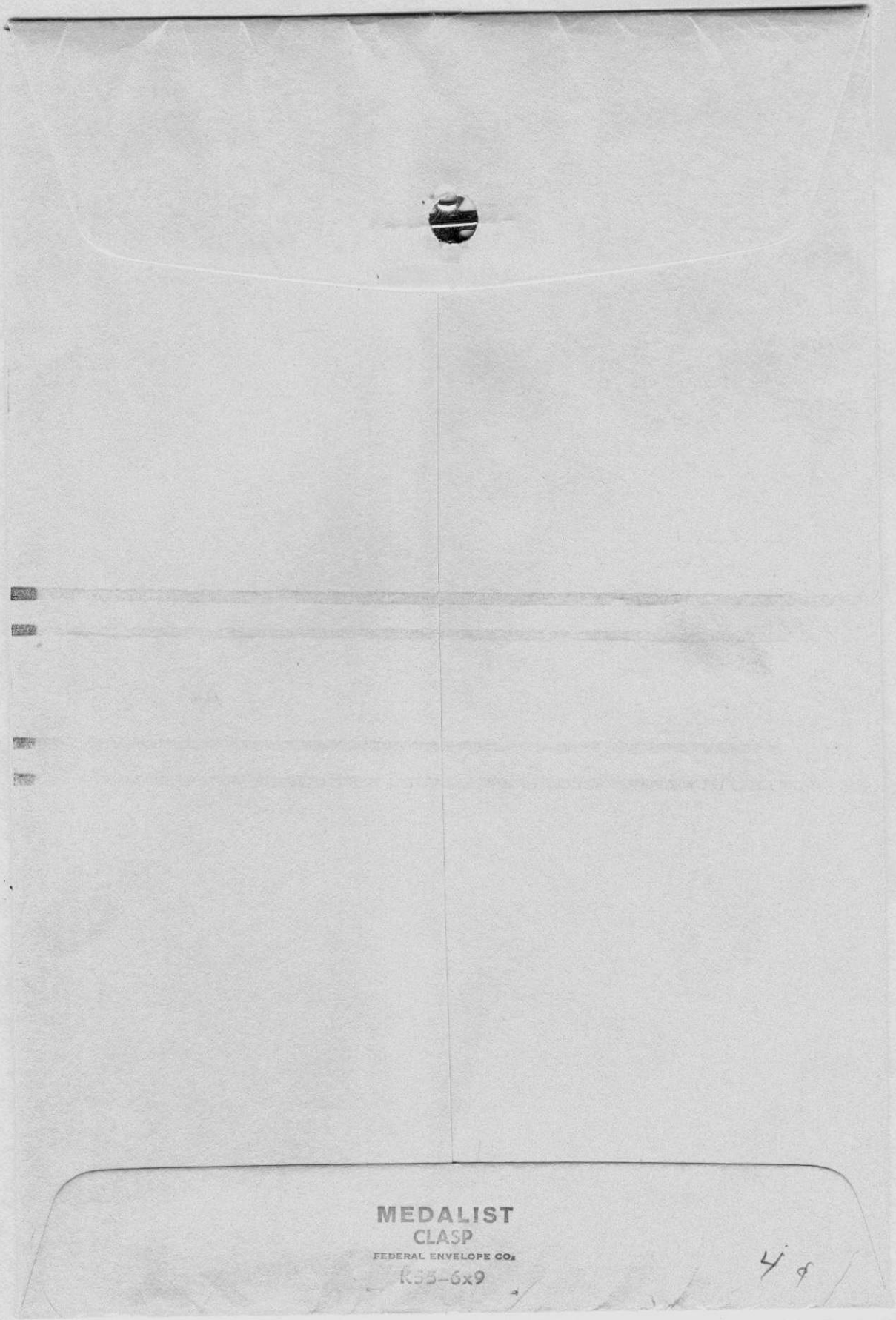
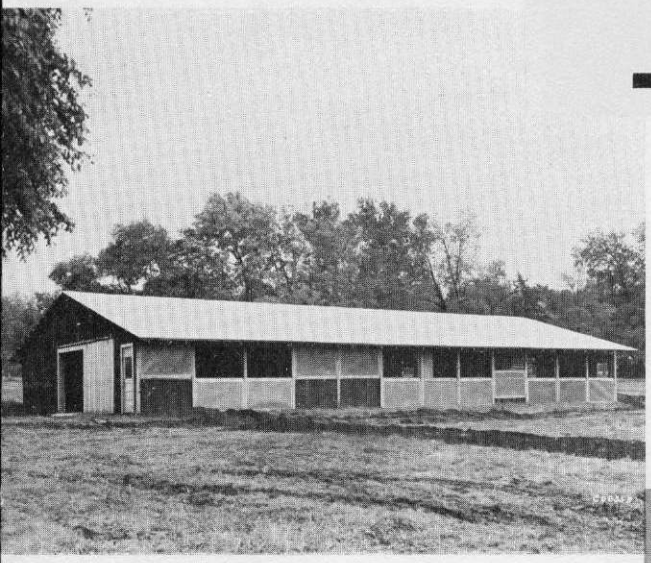


Figure 5. Experimental low-cost pole-type laying house.

Experimental Low-cost
Pole-type Laying House

- Plans
- Photos
- Explanation



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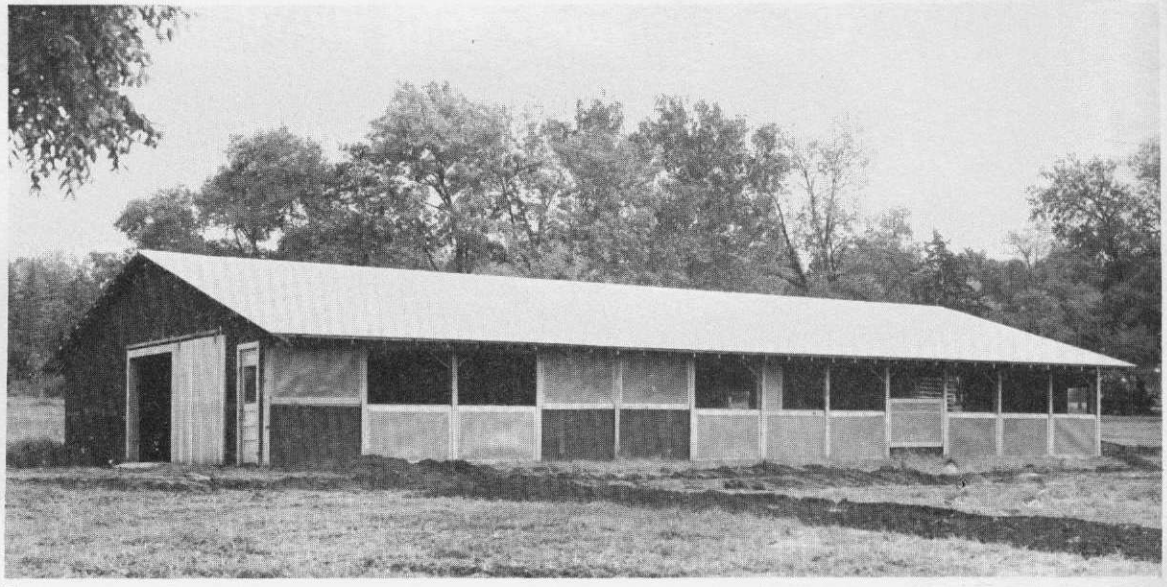
Low-Cost Building Key to New Poultry Research



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.

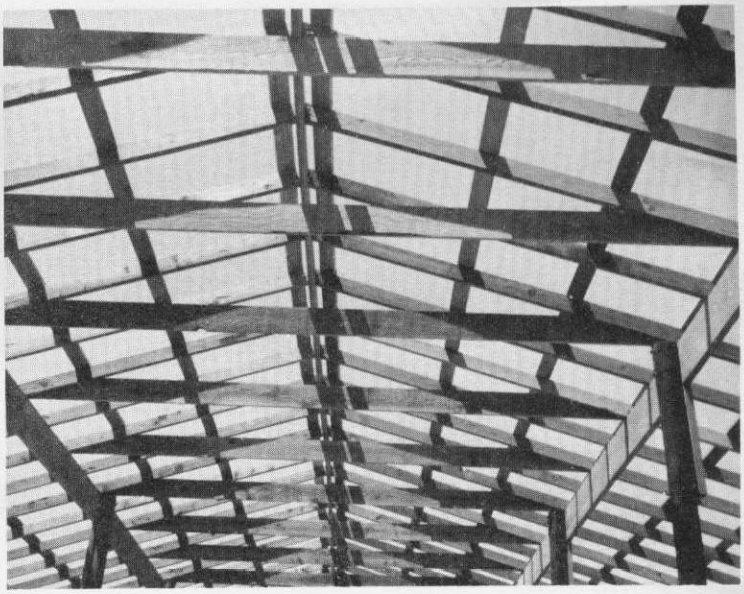
Approximately half the total floor area is slat floors (roosting racks). Hanging metal feeders and automatic trough waterers are all placed over the slat area. The balance of the floor area is litter. The building may be inspected by the public.

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

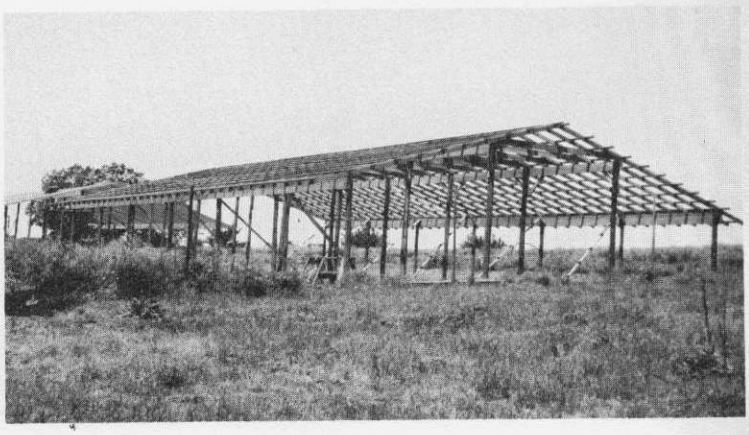
Quantity	*Item & Specifications*	*Price*	*Total Amt.*
14	12' penta treated poles, 4"	$2.45 ea.	$34.30
14	16' penta treated poles, 4"	3.96 ea.	55.44
72	2x4x22' rafters (Std.)	.115 bd. ft.	121.44
85	2x4x24' nailers, ridge, & panel	.115 bd. ft.	156.40
916 lin. ft.	2x4 nailers, storage racks, braces, & studs, 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

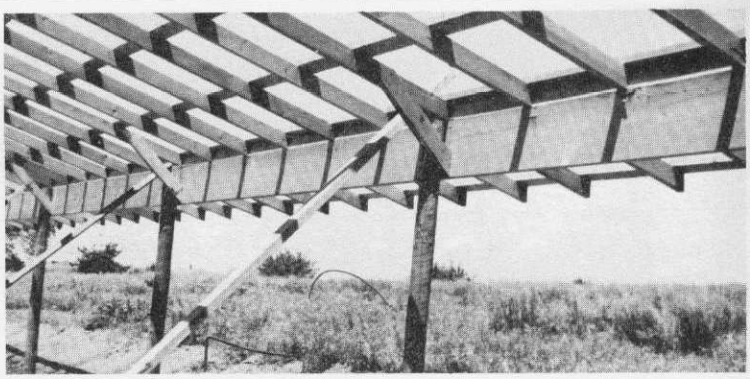
INSULATION

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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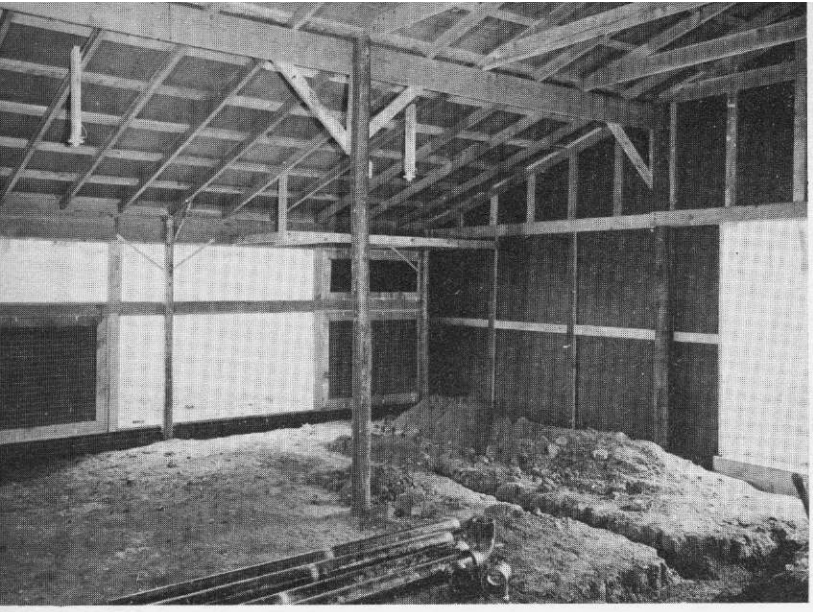
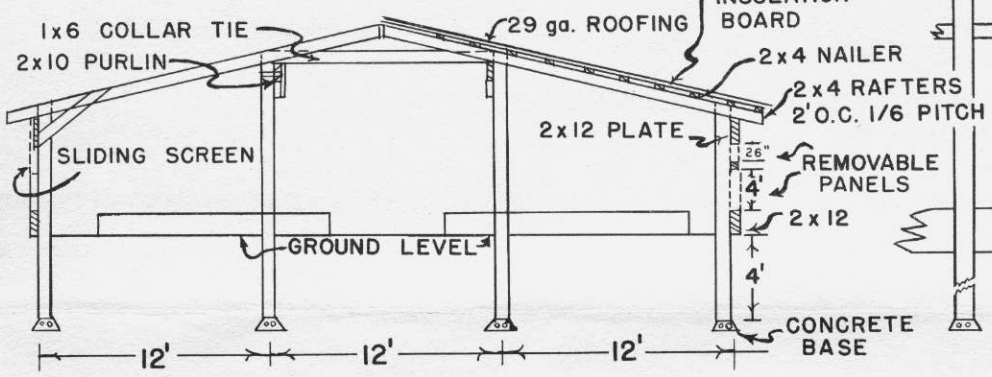


Construction Notes

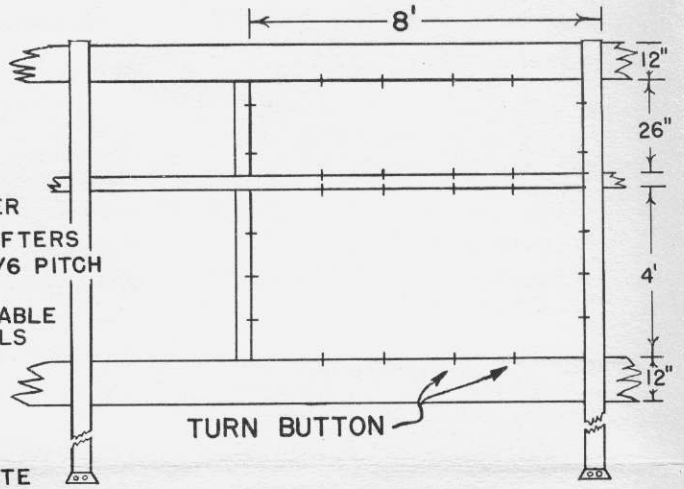
Poles provide the sole support for the structure. They should be set at least 4 feet into the ground resting on a concrete base. These poles should be penta or creosote treated and have a minimum 4" top diameter.

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.

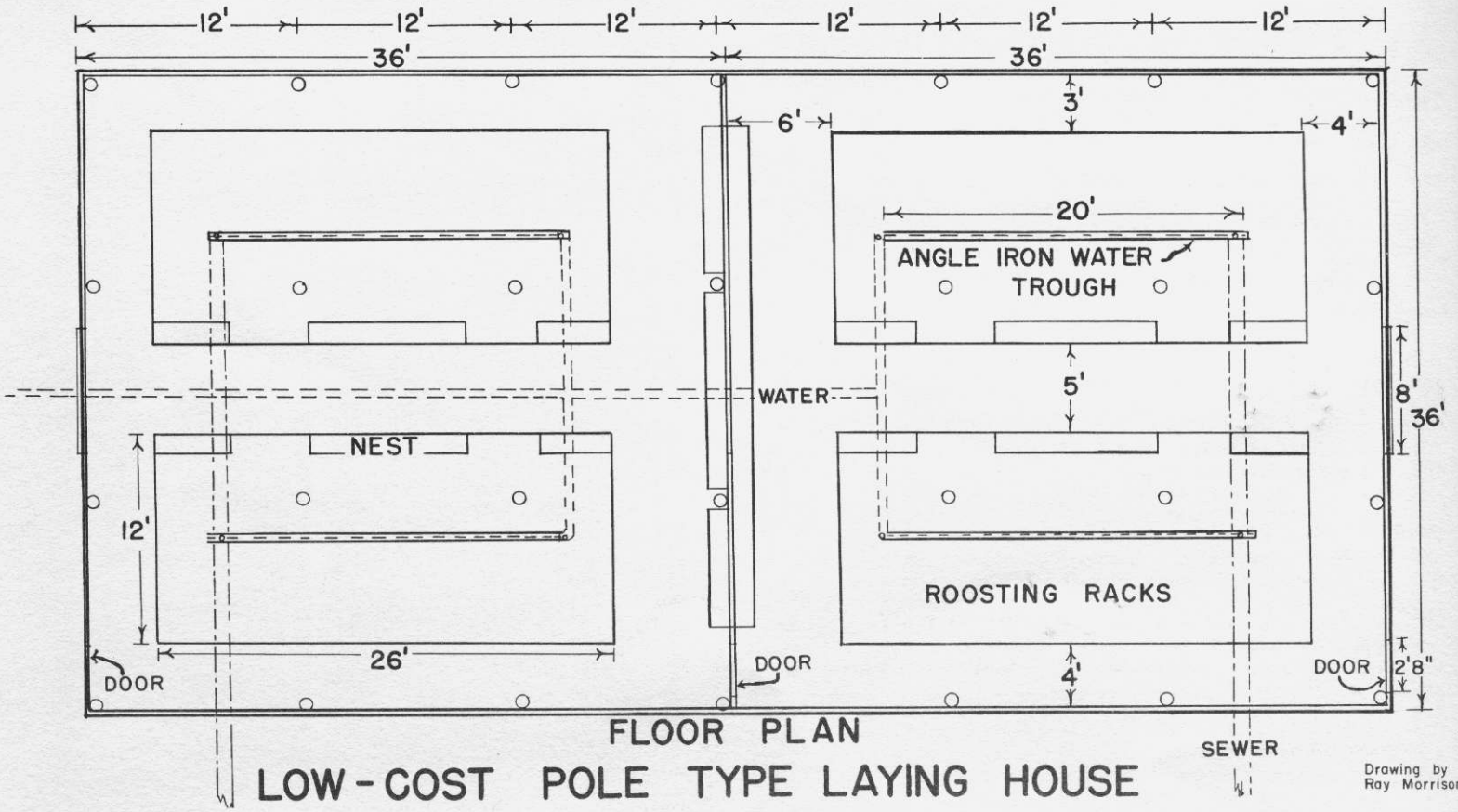
A unique feature of this house is the removable back. Any number of panels up to the entire back may be taken off for summer ventilation or closed for protection from the weather. A wire screen is necessary to keep birds from picking holes in the insulation board side walls.



CROSS SECTION



INSIDE VIEW OF
REMOVABLE PANEL



FLOOR PLAN

SEWER

LOW-COST POLE TYPE LAYING HOUSE

Drawing by Ray Morrison

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

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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.

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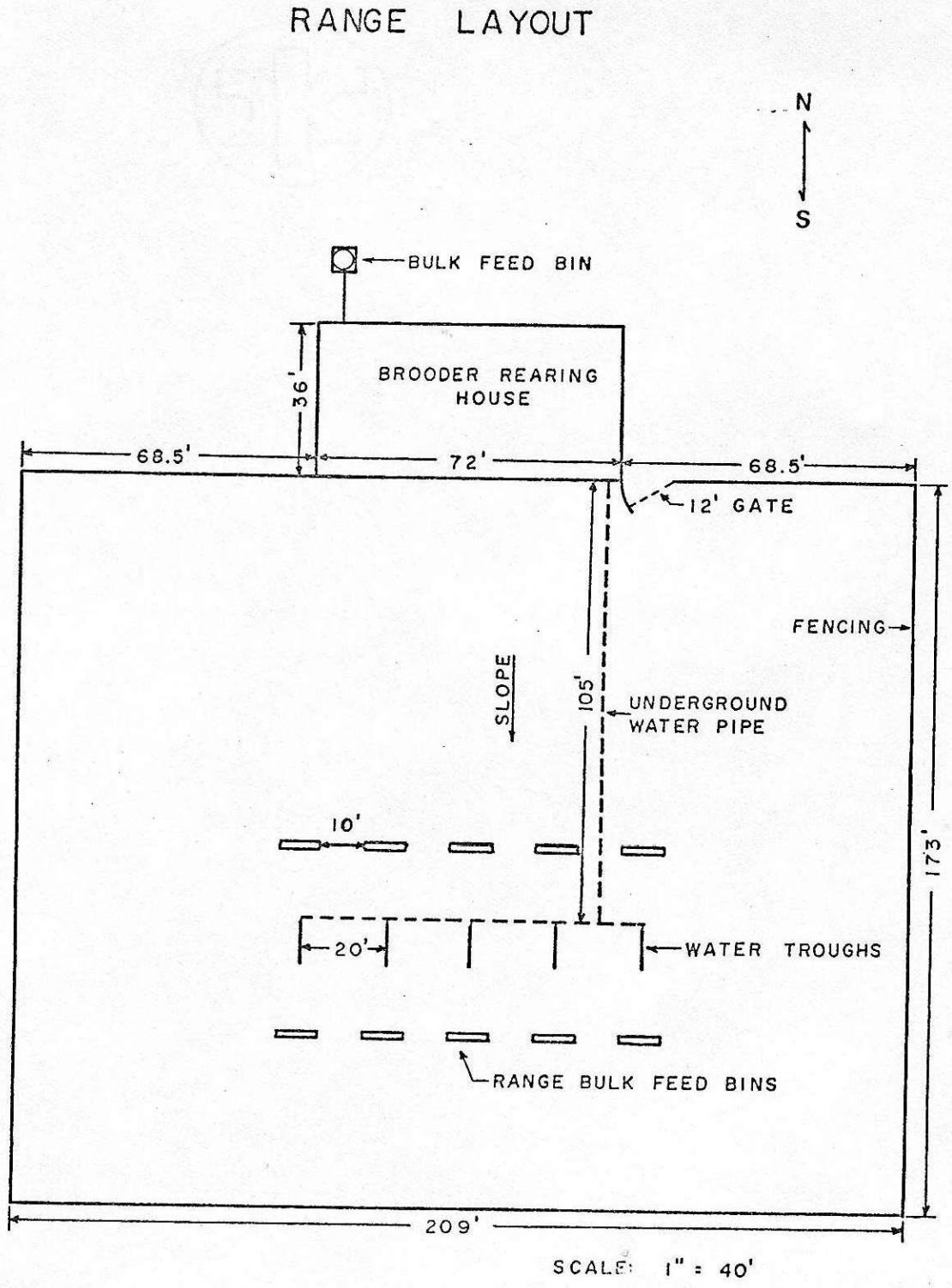


Figure 6. Layout of range and equipment for ducklings.

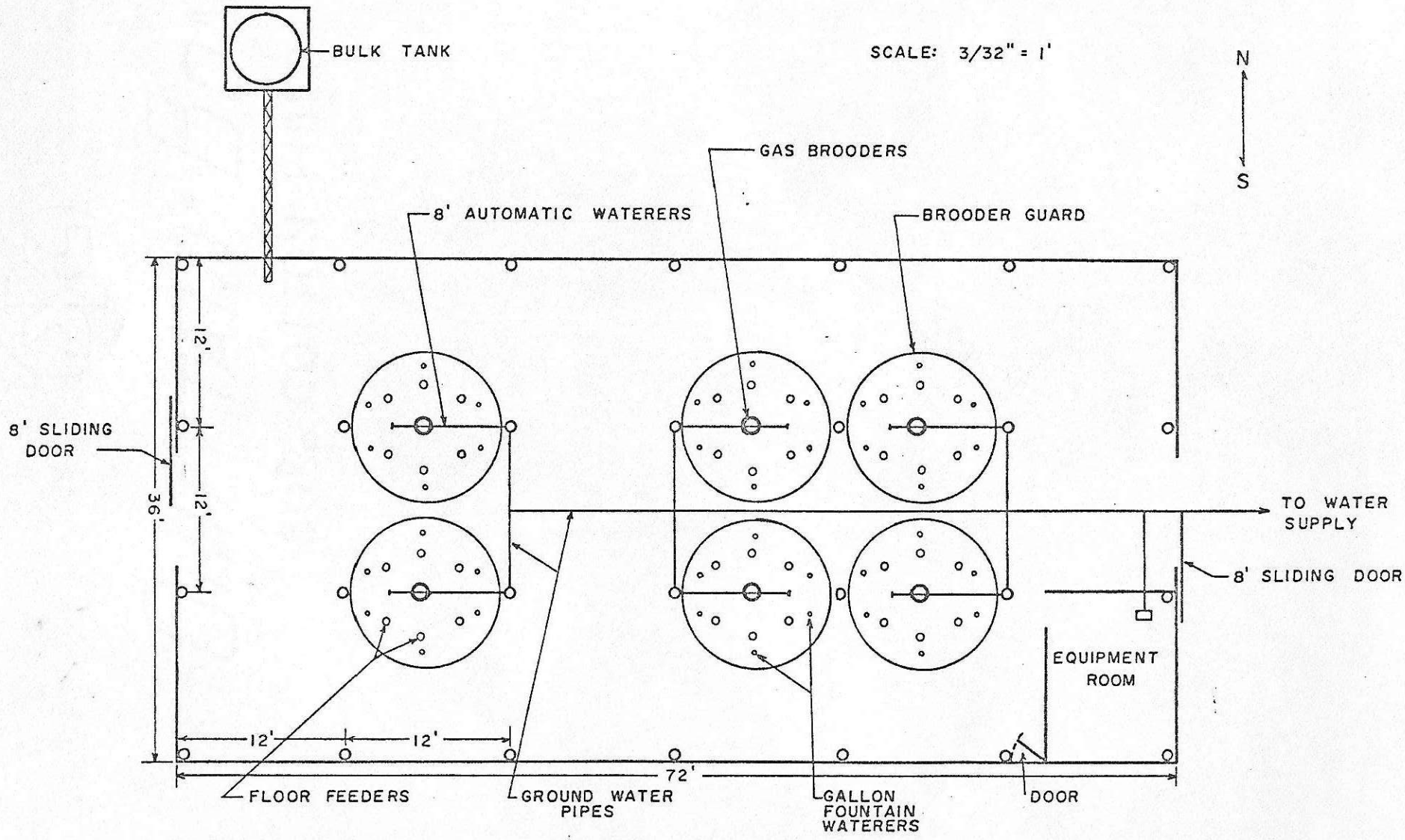


Figure 7. Layout of brooding equipment for ducklings.

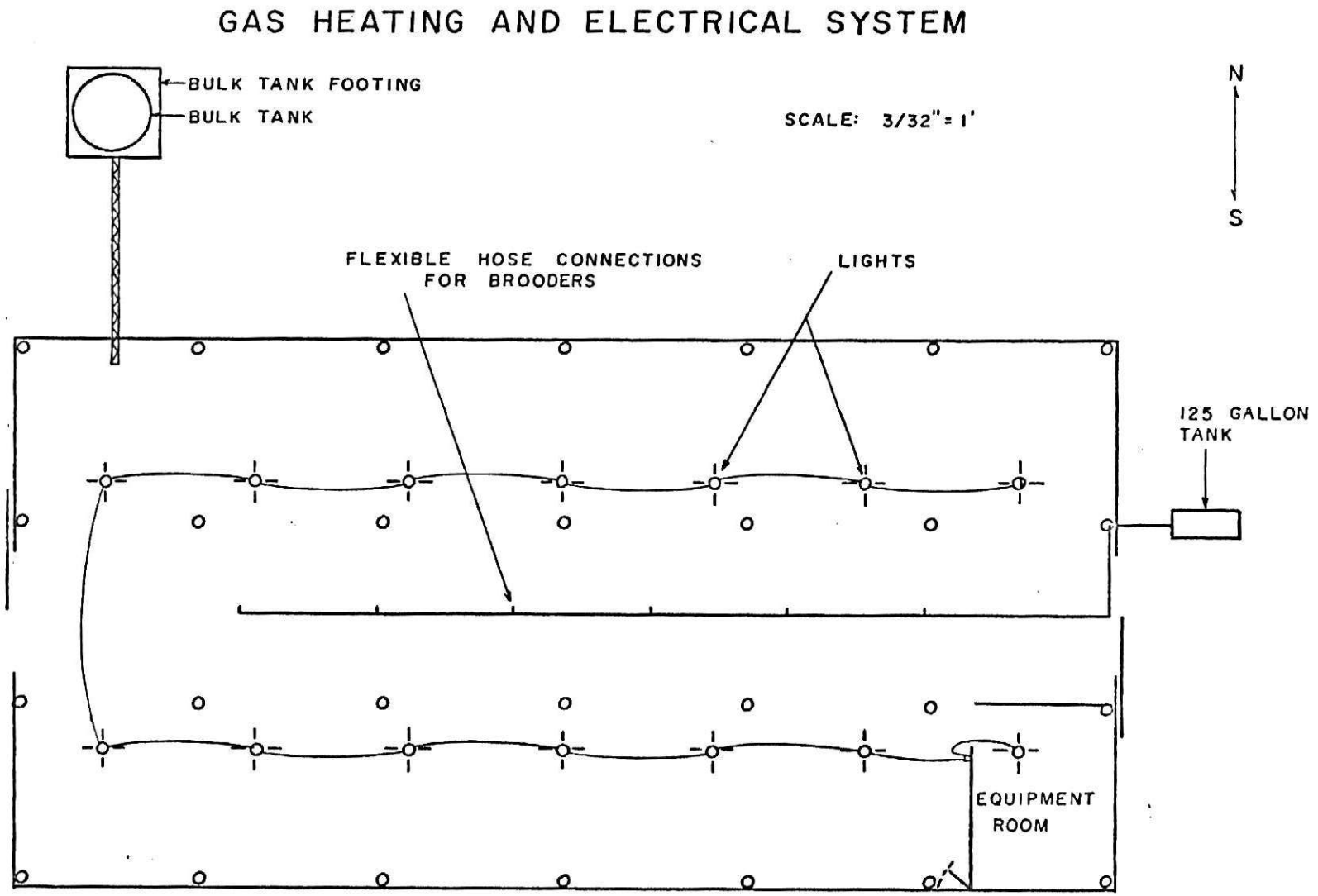


Figure 8. Gas heating and electrical system layout for 36' x 72' Kansas pole-type poultry house.

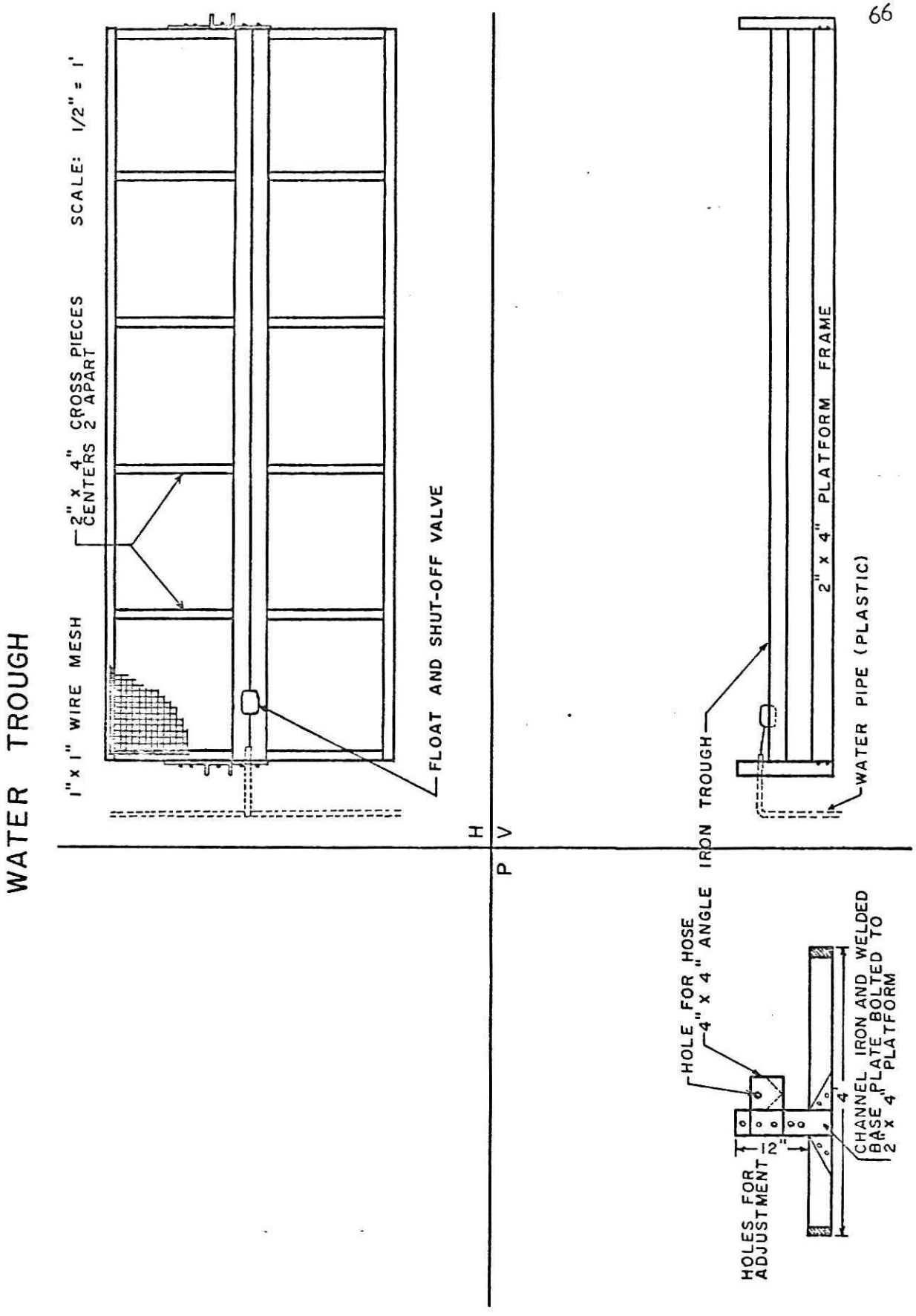


Figure 9. Plans for 10-foot range waterers for ducklings.

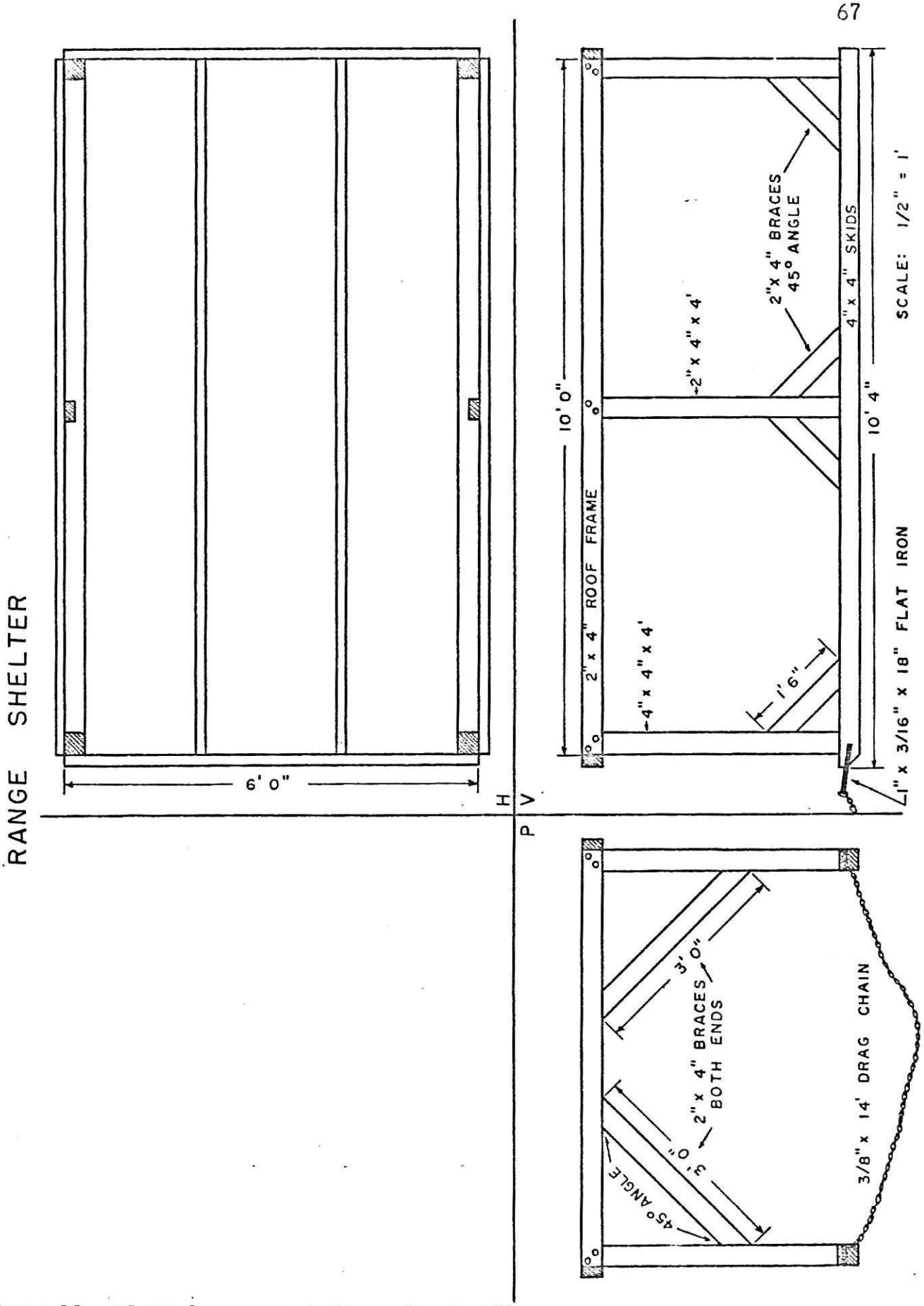
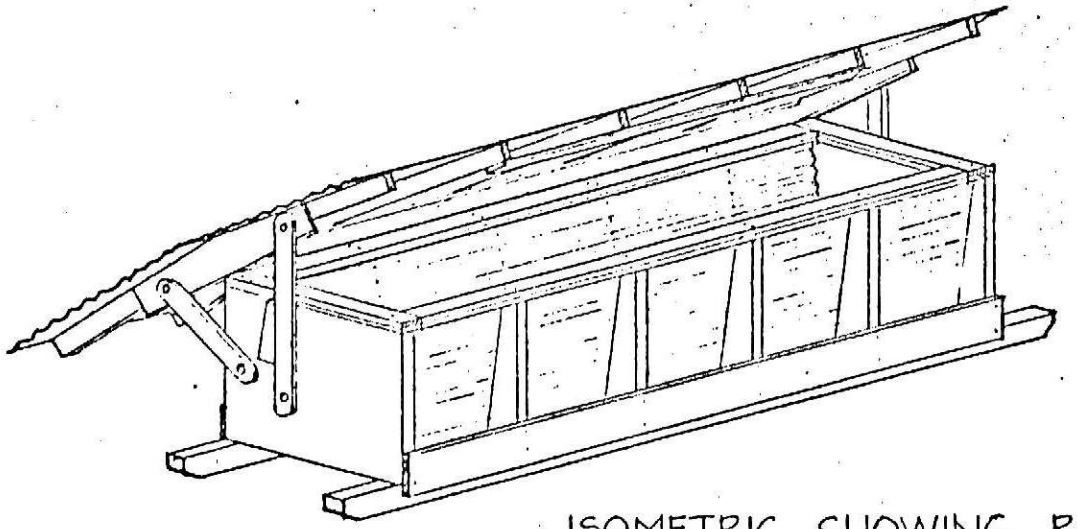
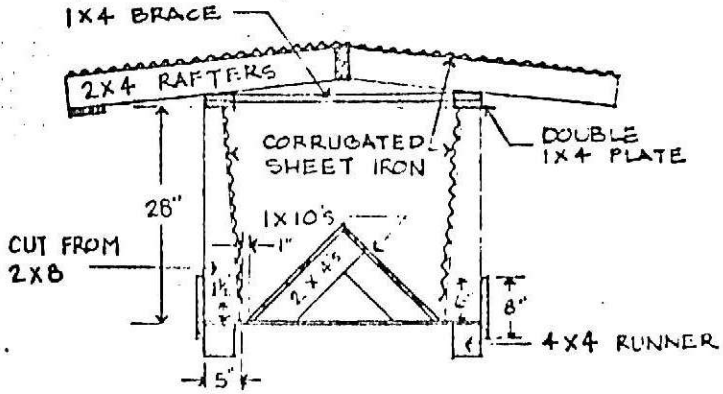


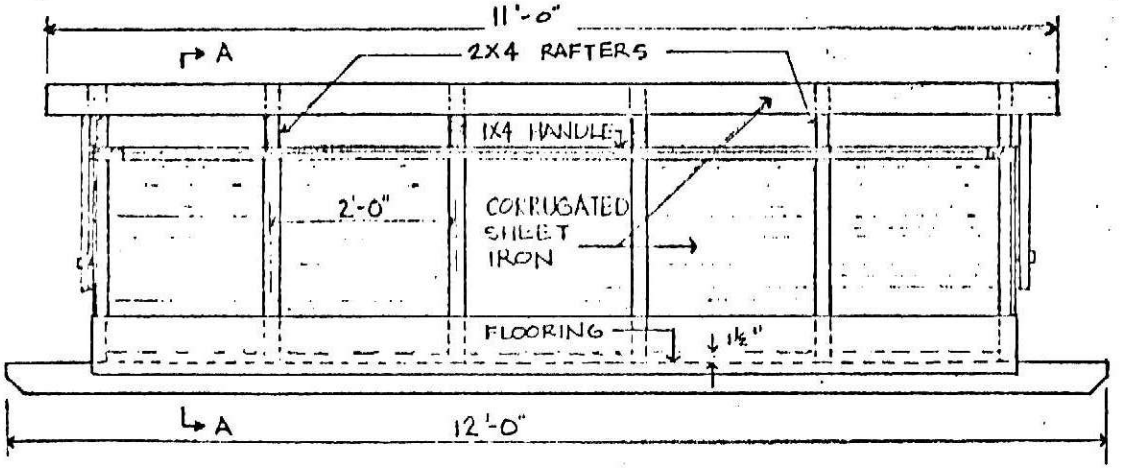
Figure 10. Plans for range shelters for ducklings.



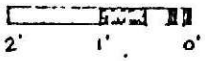
ISOMETRIC SHOWING ROOF OPEN FOR FILLING

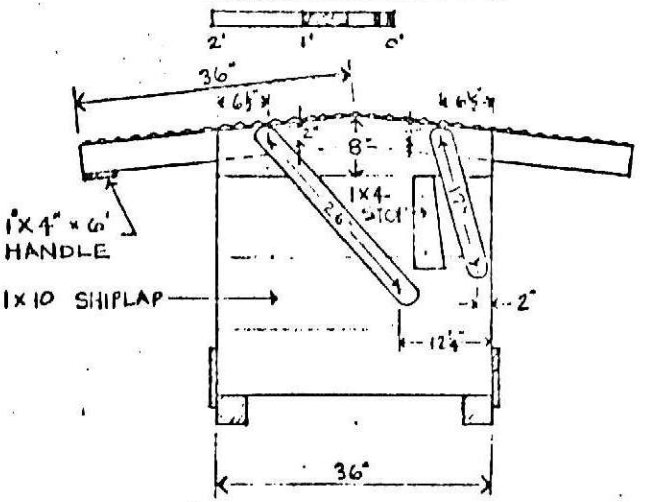


SECTION A-A



FRONT VIEW





END VIEW

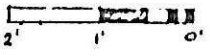


Figure 11. Plans for range bulk feeder for ducklings.

DRAWN BY MIKE KANDT

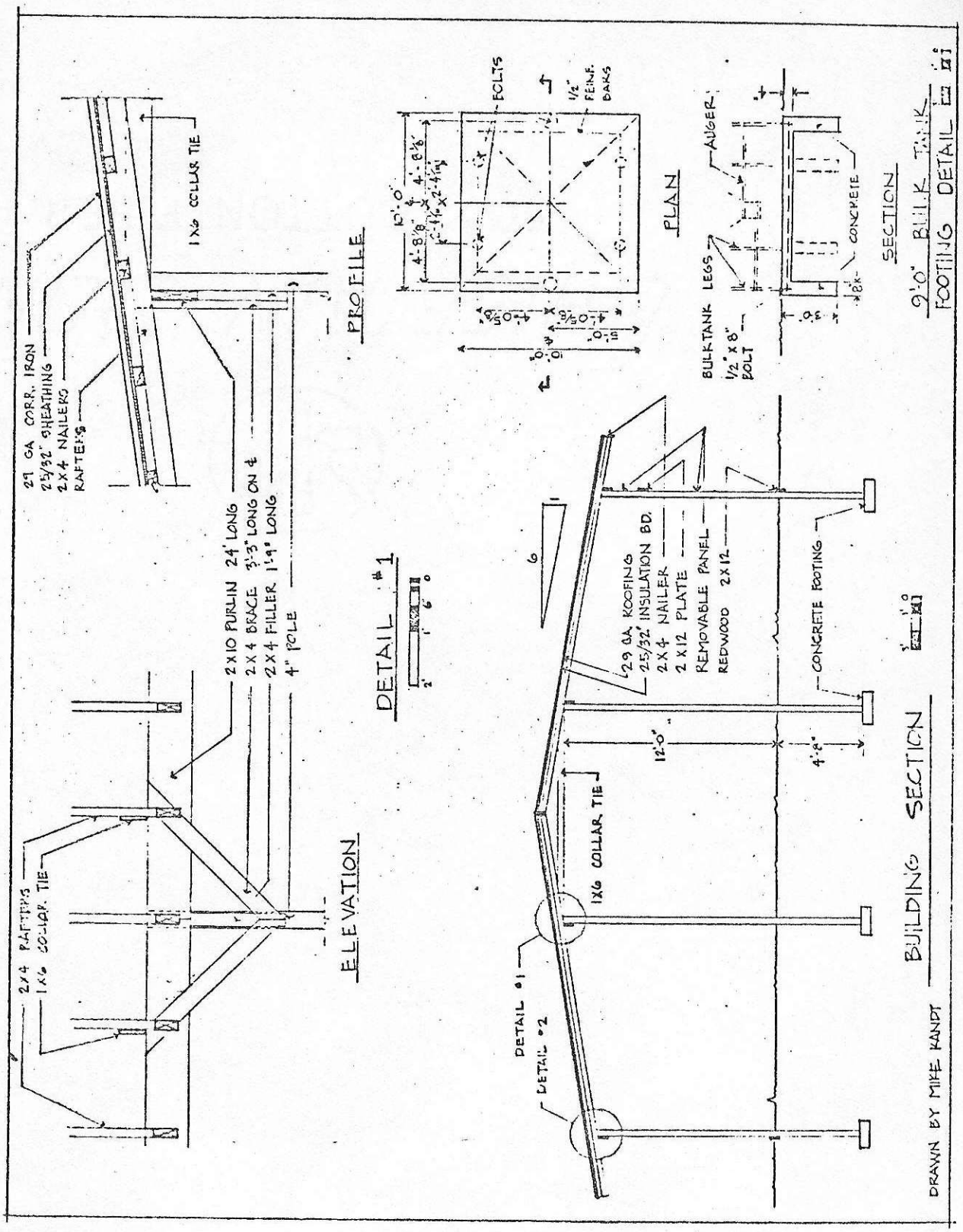


Figure 12a. Plans for the 36' x 72' Kansas pole-type poultry house and equipment.

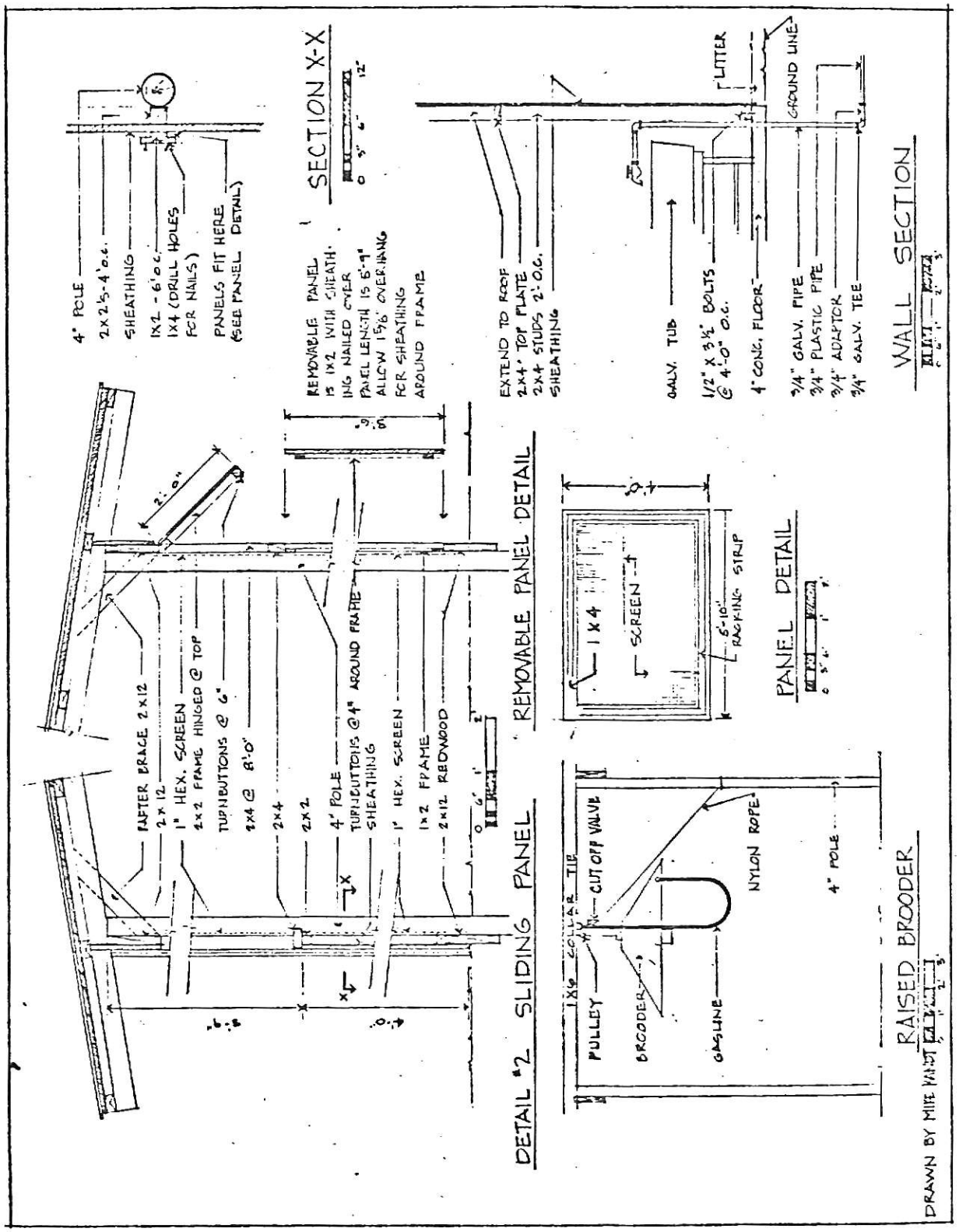


Figure 12b. Plans for the 36' x 72' Kansas pole-type poultry house and equipment.

Table 11. 36' x 72' Kansas pole-type brooder-rearing house[1]: Bill of materials and estimated costs at 1969-70 retail prices.

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Lumber[2] and Concrete:						
Penta treated poles	14	4" diam.	12'		$ 3.35 ea.	$ 46.90
Penta treated poles	14	4" diam.	16'		5.85 ea.	81.90
Rafters	72	2" x 4"	22'	1,056 bd.ft.	.20 bd.ft.	211.20
Nailers, ridge and panel	51	2" x 4"	24'	816 bd.ft.	.20 bd.ft.	163.20
Top plates (east and west wall)	4	2" x 4"	12'	32 bd.ft.	.18 bd.ft.	5.76
Studs (east and west walls including double 2 x 4's for door bulks, also equipment room)	48	2" x 4"	8'	256 bd.ft.	.18 bd.ft.	46.08
Barndoor mounting plates	4	2" x 6"	12'	48 bd.ft.	.18 bd.ft.	8.64
Purlins	6	2" x 10"	24'	240 bd.ft.	.20 bd.ft.	48.00
Top plates	6	2" x 12"	24'	288 bd.ft.	.22 bd.ft.	63.36
South wall panel spacers (redwood)	12	1" x 2"	8'	96 ft.	.07 bd.ft.	6.72
South wall panel holders	12	1" x 4"	8'	32 bd.ft.	.24 bd.ft.	7.68
Carsiding for barndoors	38	1" x 6"	8'	152 bd.ft.	.38 bd.ft.	57.76
Collar ties (rough)	19	1" x 6"	12'	114 bd.ft.	.19½bd.ft.	22.23
Barndoor jambs	4	1" x 6"	8'	16 bd.ft.	.24 bd.ft.	3.84
Barndoor track backing (No. 3)	2	1" x 6"	16'	16 bd.ft.	.17 bd.ft.	2.72
Bottom plates (bench redwood)	10	2" x 12"	20'	400 bd.ft.	.30 bd.ft.	120.00
Knee braces	234'	2" x 4"	-	156 bd.ft.	.18 bd.ft.	28.08
Knee braces, vertical member	74'	2" x 4"	-	50 bd.ft.	.18 bd.ft.	9.00
Knee braces, side	23'	2" x 4"	-	19 bd.ft.	.18 bd.ft.	3.42
North wall panel spacers	54'	2" x 4"	-	36 bd.ft.	.18 bd.ft.	6.48
Studs (east and west walls and equipment room above plates)	143'	2" x 4"	-	96 bd.ft.	.18 bd.ft.	17.28
Top and bottom plates for equipment room	36'	2" x 4"	-	24 bd.ft.	.18 bd.ft.	4.32
Hangers for lights	28'	2" x 4"	-	19 bd.ft.	.20 bd.ft.	3.80
Hinged panel frames	156'	2" x 2"	-		.08 ft.	12.48
Nailers (under south wall panels)	120'	2" x 2"	-		.08 ft.	9.60

Table 11. continued.

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Lumber[2] and Concrete:						
Frames (north wall) (No. 3)	180'	1" x 2"	-	———	.04 ft.	7.20
Frame catches (No. 3)	180'	1" x 2"	-	———	.04 ft.	7.20
Sliding panel frames	200'	1" x 4"	-	67 bd.ft.	.24 bd.ft.	16.08
2'8" and 2'6" door jambs (2)	34'	1" x 4"	-	12 bd.ft.	.24 bd.ft.	2.88
Door trim (two sides for equipment room)	51'	1" x 4"	-	17 bd.ft.	.24 bd.ft	4.08
Lattice molding for screens	155'	———	-	———	.03 ft.	4.65
25/32" vapor seal sheathing, asphalt coated	145	4' x 8'	-	4,640 sq.ft.	.11 sq.ft.	510.40
Corrugated iron, 29 gauge	72pes.	12'x2'-1¼"	-	1,872 sq.ft.	.14½ sq.ft.	271.44
Corrugated iron, 29 gauge	72pes.	11'x2'-1¼"	-	1,716 sq.ft.	.14½ sq.ft.	248.82
Concrete (equipment room floor, sills, post footings, and 6' bulk bin footings)	-	———	-	3 3/4 cu.yds.	15.10 cu.yd.	56.60
Total						2,121.72
Hardware, Nails, etc.:						
Sliding door track	32'	———	-	———	.66 ft.	21.12
Sliding door rollers	2pr.		-	———	7.47 pr.	14.94
Outside door--Kaw	1	13/8"x2'-8" x6'-8"	-	———	21.30 ea.	21.30
Inside door--Kaw	1	13/8"x2'-6" x6'-8"	-	———	21.30 ea.	21.30
Butt hinges (for doors)	2pr.	3"	-	———	.65 pr.	1.30
Butt hinges (for north panels)	12pr.	2"	-	———	.59 pr.	7.08
Carriage bolts (for plates and purlins)	112	3/8" x 7"	-	———	.15 ea.	16.80
Anchor bolts (for equipment room)	6	3/8" x 3½"	-	———	.10 ea.	.60
Door locksets	2	———	-	———	2.29 ea.	4.58

Table 11. continued.

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Hardware, Nails, etc.:						
Screen turnbuttons	200	—	—	—	.04½ea.	9.00
Roofing nails, lead head	50 lbs.	2"	—	—	.45 lb.	22.50
Screen tacks	5 lbs.	—	—	—	.60 lb.	3.00
Nails, common	58 lbs.	16d	—	—	.25 lb.	12.50
Nails, galvanized	28 lbs.	2"	—	—	.30 lb.	8.40
Corrugated fasteners	300	½"	—	—	.50 per 100	1.50
Poultry netting staples	10 lbs.	—	—	—	.33 lb.	3.30
Flex-o-screen	60'	4' wide	—	—	.54 ft.	32.40
1" hex, poultry netting	200'	4' wide	—	—	.06½ft.	13.00
1" hex, poultry netting	132'	3' wide	—	—	.098 ft.	12.95
Total						227.57
Electrical Materials:						
Racks, 3-wire, insulated (3 for power poles, including main power line).	4	—	—	—	6.34 ea.	25.36
Entrance head	1	—	—	—	3.33 ea.	3.33
Entrance switch, surface-type, 60 amperes, 4 circuits	1	—	—	—	17.20 ea.	17.20
Utility boxes, surface mounted (for switches and receptacles)	8	—	—	—	.42 ea.	3.36
3-prong wall receptacle, sincle, 230V (for bin motor)	1	—	—	—	1.48 ea.	1.48
3-prong armor plug cap (for bin motor)	1	—	—	—	2.02 ea.	2.02
Single outlet cover	1	—	—	—	.21 ea.	.21
Switch box covers	2	—	—	—	.19 ea.	.38
Single pole switches, brown	2	—	—	—	.69 ea.	1.38
Wall receptacles, duplex, 115V, brown	5	—	—	—	.54 ea.	2.70
Duplex receptacle covers	5	—	—	—	.19 ea.	.95

Table 11. continued.

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Electrical Materials:						
Octagon boxes, 4" with clamps (for lights)	14	—	—	—	.53 ea.	7.42
Receptacles, white porcelain, 4" (for lights)	14	—	—	—	.61 ea.	8.54
Light reflectors, indoor, 12' and holders	14	—	—	—	2.65 ea.	37.10
Bulbs, 40 watt	14	—	—	—	.27 ea.	3.78
#6 weather-proof outdoor wire	450'	—	—	—	.26 ea.	117.00
#6 3-wire service entrance cable, armored	10'	—	—	—	.71 ea.	7.10
#12 2-wire non-metallic sheathed cable (for lights)	175'	—	—	—	.09 ea.	15.75
#10 2-wire non-metallic sheathed cable (for outlets)	175'	—	—	—	.21 ea.	36.75
Copper ground wire, armored, 8 gauge.	15'	—	—	—	.22 ea.	3.30
8' ground rod, copper-covered	1	¼"	—	—	5.58 ea.	5.58
Ground clamp, ½"	1	—	—	—	.61 ea.	.61
Solderless connectors (#12 and #10 wire)	46	—	—	—	.07 ea.	3.22
Remex staples	90	—	—	—	.004 ea.	.36
Wood screws, (for outlet boxes)	48	3/4"	—	4 doz.	.10 doz.	.40
25' power pole, pressure treated, 5" top	1	—	—	—	13.50 ea.	13.50
Total						318.78
Plumbing Materials:						
Water supply -						
Ground key stop valve, "T" handle.	1	3/4"	—	—	10.53 ea.	10.53
Curb box, 30" (for ground valve) .	1	—	—	—	9.88 ea.	9.88

Table 11. continued.

Item	Number	Size	Length	Materials requirements	Unit price	Cost
Plumbing Materials:						
Plastic pipe	200'	3/4"	—	——	.16 ft.	32.00
Plastic pipe toes	7	3/4"	—	——	.36 ea.	2.52
Plastic pipe clamps	28	3/4"	—	——	.30 ea.	8.40
Galvanized adapters	7	3/4"	—	——	.39 ea.	2.73
90° elbows, galvanized	8	3/4"	—	——	.32 ea.	2.56
Galvanized pipe (up to waterers)	25'	3/4"	—	——	.31 ft.	7.75
Valves, brass (for waterers)	6	3/4"	—	——	1.71 ea.	10.26
Faucet, brass (for equipment room)	1	3/4"	—	——	1.50 ea.	1.50
Pipe straps	9	3/4"	—	——	.02 ea.	.18
Gas (black pipe) -						
Gas cock, brass (to fuel tank)	1	3/4"	—	——	1.91 ea.	1.91
Black pipe	63'	3/4"	—	——	.26 ft.	16.38
90° elbows	4	3/4"	—	——	.27 ea.	1.08
Tees	2	3/4"	—	——	.40 ea.	.80
Reducers (for automatic shut-off valves)	3	3/4" to ½"	—	——	.44 ea.	1.32
Nipples, 3" (for automatic shut-off valves)	3	3/4"	—	——	.24 ea.	.72
Pipe straps	12	3/4"	—	——	.02 ea.	.24
Total						110.76
Paint:						
Aluminum (for fuel tank)	1 qt.	——	—	——	1.99 qt.	1.99
Outside white (primer coat)	2 gals.	——	—	——	7.99 gal.	15.98
Outside white (1 finish coat)	2 gals.	——	—	——	7.99 gal.	15.98
Total						33.95

Table 11. continued.

Item	Number	Size	Length	Materials requirements	Unit price	Cost
GRAND TOTAL						2,812.78
Sales Tax (3%)						84.38
Grand Total including Tax						2,897.16

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

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

Source: J. T. Shieh, "Economics of the Kansas Egg Enterprise," (Master's Thesis, Kansas State University, 1960, pp. 45-50.

Table 12. 36' x 72' Kansas pole-type brooder-rearing house[1]: Estimated labor requirements and cost of carpentry, masonry, wiring, plumbing and painting.

Job	Man hours	Labor cost[2]
Carpentry and Masonry--36' x 72' poultry house (basic unit):		
Total	300	$600.00
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%[3]	1/2	
Total	5	$ 10.00
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 tomplate 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%[3]	3 1/2	
Total	38 3/4	$ 77.50

Table 12. continued.

Job	Man hours	Labor cost[2]
Carpentry--10' x 12' equipment room:		
1. Drill holws 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%[3]	3/4	
Total	8 1/4	$ 16.50
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 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%[3]	1 3/4	
Total	18 3/4	$ 37.50

Table 12. 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 @$.293/4 lin.ft.		$ 56.85
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%[3]	2	
Total	22 3/4	$ 45.50
		$102.35
Plumbing--gas:		
1. Set fuel tank (125 gal.) on rail ties	1/4	
2. Lay 10' of pipe	1/2	
3. Cut pipe to desired lengths (5 cuts @ 5 min.)	1/2	
4. Thread ends of black pipe (7 @ 15 min.) (assume ends of stock pipe are threaded)	1 3/4	
5. Join pipe connections, including automatic shut-off valves for brooders (29 @ 5 min.)	2 1/2	
6. Fasten pipe to collar ties and one pole with straps (15 @ 5 min.) (assume 10-12' apart)	1 1/4	
	6 3/4	
Add 10%[3]	3/4	
Total	7 1/2	$ 15.00

Table 12. continued.

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 125 gallon fuel tank (1 coat)	1/2	
	22 3/4	
Add 10%[3]	2 1/4	
Total	25	$ 50.00
GRAND TOTAL		$908.85

[1]Includes equipment room.

[2]At $3.00 per hour for skilled and unskilled labor.

[3]For possible underestimate on labor requirements.

Source: J. T. Shieh, "Economics of the Kansas Egg Enterprise," (Master's Thesis, Kansas State University, 1960), pp. 63-66.

Table 13. Range equipment: Bill of materials and estimated costs[1] at 1970 retail prices.

Item of equipment and material	Number	Size	Length	Material requirements	Unit price	Materials cost
10' Trough waters (5 on range):						
Angle iron (for water trough)	5	4"x4"x3/8"	10'	50 ft.	.861 ft.	$ 43.00
Iron (waterer ends)	10	4"x9"x¼"		8 ft.	.64 ft.	5.12
Channel iron (for supports)	10	4"x4"x3/8"	1"	10 ft.	.94 ft.	9.40
Frames	10	2"x4"	10"	66 bd.ft.	.18 bd.ft.	11.88
Frames	10	2"x4"	4"	80 bd.ft.	.18 bd.ft.	14.40
Wire mesh (1"x1")		4'wide	10'	50 ft.	.35 ft.	17.50
Float valves	5				2.00 ea.	10.00
Paint: rust proof	1	1 gal.			3.25 ea.	3.25
Wood preservative	1	1 gal.			3.95 gal.	3.95
Eye bolts	20				.19 ea.	3.80
Chain (for hauling)	5		6'	30 ft.	.35 ft.	10.50
Total						$132.80
Range shelter (5 on range):						
Frames (for roof)	20	2"x4"	10'	135 bd.ft.	.18 bd.ft.	24.30
Frames (for side supports)	15	2"x4"	12'	120 bd.ft.	.18 bd.ft.	21.60
Frames	10	4"x4"	12'	80 bd.ft.	.16 bd.ft.	12.80
Skids	10	4"x4"	10'	133 bd.ft.	.16 bd.ft.	21.28
Nails (med.)		3½"		5 lb.	.15 lb.	.75
Snow Fence	10	4'	10'	100'	.34 ft.	34.00
Eye bolts	10		5"		.20 ea.	2.00
Chain	5	2/0	8'	40'	.34	13.60
Paint (wood preservation)	5	gal.			3.95	19.75
Total						150.08
Range bulk feeders (10 on range):						
Frames	10	1"x4"	9'	30 bd.ft.	.24 bd.ft.	7.20
Frames (guard boards)	20	1"x8"	10'	132 bd.ft.	.25 bd.ft.	33.00
Frames	10	1"x4"	7'	24 bd.ft.	.24 bd.ft.	5.76
Frames	50	1"x4"	10'	165 bd.ft.	.24 bd.ft.	39.60
Shiplap (siding)	30	1"x10"	10'	249 bd.ft.	.25 bd.ft.	62.25

Table 13. continued.

Item of equipment and material	Number	Size	Length	Material requirements	Unit price	Materials cost
Range bulk feeders (10 on range):						
Shiplap (siding)	20	1"x10"	12'	200 bd.ft.	.25 bd.ft.	50.00
Frames (centermatch)	80	1"x8"	12'	634 bd.ft.	.25 bd.ft.	158.50
Frames	10	2"x4"	8'	53 bd.ft.	.18 bd.ft.	9.54
Frame (rafters)	10	2"x8"	12'	159 bd.ft.	.18 bd.ft.	28.62
Skids	20	4"x4"	12'	317 bd.ft.	.16 bd.ft.	50.72
Corrugated sheet iron	20	26"x10'	—	432 sq.ft.	.145 sq.ft.	62.64
Corrugated sheet iron	20	26"x11'	—	472 sq.ft.	.145 sq.ft.	68.44
Bolts	60	3/8"x5½	—	—	.12 ea.	7.20
Bolts	20	3/8"x3½	—	—	.09 ea.	1.80
Bolts	40	3/8"x4½	—	—	.11 ea.	4.40
Washers	240	3/8"	—	—	.02 ea.	4.80
Nails (10d common)	—	3"	—	2 lbs.	.25 lb.	.50
Nails (4d common)	—	1½"	—	2 lbs.	.25 lb.	.50
Nails (roofing)	—	1½"	—	2 lbs.	.45 lb.	.90
Paint (wood preservative)	5	gal.	—	—	3.95 gal.	19.75
Total						$616.12
Fencing:						
Fence posts (steel)	71		5'	—	.85 ea.	60.35
Fencing	710'	—	—	—	.53 ft.	37.63
Anchor shafts	3	—	—	—	1.32 ea.	3.96
Total						$101.94
Plumbing (water troughs):						
Plastic water pipe		3/4"	—	225 ft.	.18 ft.	40.50
Plastic tees	4	3/4"	—	—	.37 ea.	1.48
Elbows	5	3/4"	—	—	.30 ea.	1.50
Steel clamps	22	3/4"	—	—	.27 ea.	5.94
Total						$ 49.42

[1]Labor costs for home constructed equipment were estimated in consultation with Leo T. Wendling, Extension Agricultural Engineer at Kansas State University. Labor costs were assumed to represent 40 percent of the total cost of the item of equipment, allowing 60 percent for material costs.

Table 14. Capital investment and per unit costs of building, machinery and equipment, market duckling enterprise, Kansas, 1970.

Item	Cost per unit	Number required	Capital investment
	Dollars		Dollars
Building			
Brooder-rearing house	1.47/sq.ft.	2,592 sq.ft.	3,806.01
Machinery and equipment			
Gas brooders	45.68	6	274.08
Draft guards	1.06	6	6.36
Fuel storage tank	140.00	1	140.00
Gallon fount waterers	.91	42	38.22
Bulk feed bin and augers	440.00	1	440.00
Motor, 1.5 h.p.	77.55	1	77.55
Automatic waterers	12.12	6	72.30
Range waterers[a]	44.27	5	221.33
Range shelters[b]	50.04	5	250.18
Range feeders[c]	102.69	10	1,026.87
Floor feeders	13.46	36	484.70
Starter feeders	.99	36	35.64
Debeaker	41.25	1	41.25
Water system	65.92	--	65.92
Incinerator	240.10	1	240.10
Feedmix-transport wagon	590.00	1	590.00
Fencing (posts & rolls)	121.94	--	121.94
Blade	150.00	1	150.00
Front end loader	900.00	1	900.00
Wash tub	10.00	1	10.00
Tractor	3,500.00	1	3,500.00
Sprayer	20.34	1	20.34
Feed scoops	2.25	2	5.50
Coal buckets	3.10	2	6.20
Thermometer	.67	1	.67
Total			8,719.15

Table 14. continued.

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[a]For complete description and cost, see Appendix B, Table 10.

[b]For complete description and cost, see Appendix B, Table 10.

[c]For complete description and cost, see Appendix B, Table 10.

APPENDIX C

COSTS TO PRODUCE MARKET DUCKLINGS

Table 15. Feed consumption and costs per brood for market ducklings at four percent mortality, by weeks and total to 8 weeks of age, and average liveweight at market,[a] 2,472 fowl, Kansas, 1970.

Age	Mortality[c]	Birds		Feed consumption[b]		Feed cost[e]
		Living[d]	Dead	Per bird	Total	
Weeks	Percent	Number		Pounds		Dollars
1	1¼	2,472	30	.50	1,236	59.94
2	1¼	2,442	30	1.64	4,005	194.24
3	1	2,412	24	2.55	6,151	267.57
4	½	2,388	15	2.55	6,089	264.49
5	-	2,373	--	3.27	7,760	337.60
6	-	2,373	--	3.57	8,472	368.53
7	-	2,373	--	3.87	9,184	399.50
8	-	2,373	--	3.39	8,044	349.91
Total	4.0		99	21.34	50,941	2,241.78

[a]Average liveweight of ducklings at 8 weeks was 7.5 pounds. Total liveweight of ducklings sold was 17,797.5 pounds per brood.

[b]Based on the number of birds on hand at the beginning of each week.

[c]This percentage, by weeks, was estimated by poultry scientists at Kansas State University.

[d]At the beginning of the week.

[e]Based on prices quoted for starter and grower rations, per ton bulk feed basis, starter ration $97.00 per ton, grower ration $87.00 per ton, Manhattan, Kansas, 1970. Price includes $1.00 delivery charge per ton and a pelleting charge of 25 cents per cwt.

Source: "Duck Rations," Cornell University Extension Stencil No. 25, June, 1969, p. 8, for feed consumption and average liveweight data.

Table 16. Annual depreciation costs per brood on building, machinery, and equipment, by item and by number of broods, market duckling enterprise, Kansas, 1970.

Item	New cost	Years of life	Number of broods		
			1	2	3
	Dollars				
Building					
Brooder-rearing house	3,806.01	18	211.45	105.72	70.48
Machinery and equipment					
Gas brooders	274.08	10	27.40	13.70	9.13
Draft guards	6.36	2	3.18	1.59	1.06
Fuel storage tank	140.00	20	19.11	9.56	6.37
Gallon fount waterers	38.22	2	.54	.27	.18
Bulk feed bin and augers	440.00	15	29.33	14.67	9.77
Motor, 1½ h.p.	77.55	15	5.17	2.58	1.72
Automatic waterers	72.30	12	6.02	3.01	2.00
Range waterers	221.33	10	22.13	11.06	7.38
Starter feeders	35.64	.5	7.12	3.56	2.37
Floor feeders	484.70	5	9.69	4.84	3.23
Range feeders	1,026.87	15	68.46	34.23	22.82
Range shelters	250.18	10	25.02	12.51	8.34
Debeaker (electric)	41.25	10	4.13	2.06	1.37
Water system	65.92	18	3.66	1.83	1.22
Incinerator	240.00	10	24.01	12.01	8.00
Feedmix-transport wagon	590.00	10	59.00	29.50	19.67
Fencing (posts and rolls)	121.94	7	17.42	8.71	5.80
Blade	150.00	15	10.00	5.00	3.33
Front end loader	900.00	10	90.00	45.00	30.00
Washtub	10.00	10	1.00	.50	.33
Tractor	3,500.00	10	350.00	175.00	116.60
Sprayer	20.34	5	4.06	2.03	1.35
Feed scoops	5.50	5	1.10	.55	.36
Coal buckets	6.20	10	.62	.31	.21
Thermometer	.67	10	.07	.04	.03
Total			999.69	499.84	333.12

Table 17. Annual insurance costs, by number of broods, market duckling enterprise, Kansas, 1970.

Item	Number of broods		
	1	2	3
		Dollars	
Value of			
Building	3,806.01	3,806.01	3,806.01
Machinery and equipment	8,719.15	8,719.15	8,719.15
Ducklings	4,746.00	4,746.00	4,746.00
Insurable value[a]			
Building	3,044.81	3,044.81	3,044.81
Machinery and equipment	8,719.15	8,719.15	8,719.15
Ducklings	4,746.00	4,746.00	4,746.00
Annual insurance costs			
Building[b]	301.46	301.46	301.46
Machinery and equipment[c]	374.92	374.92	374.92
Ducklings[d]	5.52	8.78	12.27
Total	681.90	685.16	688.63

[a]Insurable value of buildings was 80 percent of the original cost; insurable value of machinery and equipment was 100 percent of the original cost; insurable value of ducklings was 100 percent of the estimated value of $2.00 per duckling which covered the majority of production costs.

[b]Insured at a rate of $0.99 per $100.00 of insurable value.

[c]Insured at a rate of $0.43 per $100.00 of insurable value.

[d]Insured at a rate of $0.43 per $100.00 of insurable value, adjusted for coverage by number of months. Premiums for 1, 2, or 3 broods per year were pro-rated at 27, 43 and 60 percent respectively of the annual premium.

Source: Insurable values and rates were quoted by Kansas Farm Bureau Insurance Company, Manhattan, Kansas, 1970.

Table 18. Property taxes, by number of broods, market duckling enterprise, Kansas, 1970.

Item	Number of broods		
	1	2	3
	Dollars		
Value of			
Land[a]	196.00	196.00	196.00
Building	3,806.01	3,806.01	3,806.01
Machinery and equipment	8,719.15	8,719.15	8,719.15
Duckling flock[b]	4,746.00	4,746.00	4,746.00
Assessed value[c]			
Land	39.20	39.20	39.20
Building	761.20	761.20	761.20
Machinery and equipment	2,615.75	2,615.75	2,615.75
Duckling flock	1,010.00	1,010.00	1,010.00
Total annual tax[d]	286.22	299.81	313.41

[a]At $196.00 per acre.

[b]At $2.00 per duckling.

[c]Land and building based on 20 percent of current valuation, machinery and equipment based on 30 percent of current valuation and ducklings assessed at $5.00 per dozen.

[d]Based on $79.95 per $1,000 of assessed value.

Sources: Kansas, Property Valuation Department, Real Estate Assessment Ratio Study: 1969, (Topeka: State Printing Office) and Kansas Property Valuation Department, Statistical Reporting of Property Assessment and Taxation for the Tax Year 1969, (Topeka: State Printing Office) and Kansas, Property Valuation Department, Kansas 1970, Personal Property Assessment Manual, (Topeka: State Printing Office), p. M-111.

Table 19. Total costs, costs per brood, and cost per duckling produced, four percent mortality, 100 percent capacity utilized, by number of broods per year, Kansas, 1970.

Item	Number of broods		
	1	2	3
		Dollars	
Variable costs			
Day-old ducklings	751.44	1,502.88	2,254.32
Feed	2,241.78	4,483.56	6,725.34
Duckling insurance	5.52	8.78	12.25
Litter	255.10	510.20	765.30
Brooder fuel	14.23	28.46	42.69
Electricity	2.32	3.82	5.75
Supplies	15.00	30.00	45.00
Labor	200.00	400.00	600.00
Interest[a]	33.46	137.96	313.52
Total	3,518.85	7,105.66	10,764.17
Fixed costs			
Depreciation	999.69	999.69	999.69
Insurance	676.38	676.38	676.38
Property taxes	286.22	299.81	313.41
Repairs and maintenance	337.69	337.69	337.69
Interest[b]	387.51	387.51	387.51
Total	2,687.49	2,701.08	2,714.68
Total costs	6,206.34	9,806.74	13,478.85
Costs per brood	6,206.34	4,903.37	4,492.95
Cost per duckling[c]	2.615	2.066	1.893
Total pounds of duckling sold[d]	17,797.50	35,595.00	53,392.5

[a]On operating capital.

[b]On fixed investment.

[c]Based on 2,373 ducklings marketed per brood.

[d]Ducklings were marketed at 8 weeks of age and averaged 7.5 pounds.

Table 20. Average daily lighting requirements[1] to maintain a 24-hour day in the brooder-rearing house, by months.

Month	Minimum time of artificial light (rounded off)	Days in month	Total hours
April	10 1/2	30	450
May	9 3/4	31	292 1/2
June	9	30	270
July	8 1/4	31	255 3/4
August	9	31	279
September	10 1/2	30	315
October[2]	12	15	204
Total for year			2,066 1/4

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

[2]Assuming the third brood of ducklings was marketed on October 17.

Source: Physics Department, Kansas State University, Manhattan, Kansas, 1970.

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THE FEASIBILITY OF COMMERCIAL DUCKLING PRODUCTION IN KANSAS

by

FREDERICK R. ROHS

B. S., Kansas State University, 1969

AN ABSTRACT OF A MASTER'S REPORT

submitted in partial fulfillment of the

requirements for the degree

MASTER OF SCIENCE

Department of Agricultural Economics

KANSAS STATE UNIVERSITY
Manhattan, Kansas

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Duckling production in the United States is growing and a few states in the midwest have experienced increased growth rates during the 1960's. Midwestern states possess certain economic advantages that would promote production. Per capita duckling consumption in the United States is also rising and increased 50 percent during 1965-69 but is still relatively small (0.3 pound).

The southeast area of Kansas was considered an economically depressed area in 1968 by a Food Industry Task Group for southeast Kansas. It identified some specific opportunities that would improve the economic situation in agriculture. One such opportunity was to expand the production of white pekin ducklings.

This study focuses on raising market ducklings on a commercial scale in semi-confinement using the Kansas 36' x 72' pole-type brooder-rearing house. Study objectives were: (1) to estimate the capital investment in land, building, machinery and equipment for duckling production based on 1969-70 prices; (2) to estimate total annual costs and returns from the production of one, two and three broods of ducklings per year; and (3) to determine per unit costs of producing market ducklings in relation to number of broods per year.

The budget method was used in this study. Basic assumptions and budget standards relating to specifications on housing, machinery and equipment, day-old ducklings, and economic costs were based on research publications and estimates by poultry scientists at Kansas State University.

One 36' x 72' Kansas pole-type brooder-rearing house was used and housed 2,472 ducklings per brood. Roughly one square foot per housed duckling was allowed. Ducklings also had access to a fenced yard.

One, two and three broods of ducklings were raised annually and were housed on April 1, June 12, and August 22, respectively.

Capital investment at 1969-70 prices in the building, machinery and equipment amounted to $12,721.16. Machinery and equipment accounted for 69 percent of total investment, or $8,719.15. The building accounted for 30 percent of total investment, or $3,806.01. Land accounted for one percent, or $196.00. On a per duckling basis total investment ranged from $5.36 for one brood to $2.68 and $1.79 for two and three broods, respectively.

Estimated average total costs to produce market ducklings to 8 weeks of age ranged from 34.8 cents per pound (one brood) to 25.25 cents (three broods). For two broods, average total costs were 27.55 cents per pound.

Feed was the largest single cost item and accounted for 12.60 cents per pound. Cost of day-old ducklings at 4.22 cents per pound was the second largest cost item for two and three broods annually but ranked third for one brood. Depreciation of 5.62 cents per pound ranked second as a cost item for one brood and ranked third for two and three broods at 2.81 and 1.87 cents per pound, respectively. Remaining cost items--insurance on house and equipment, property taxes, interest on operating capital and fixed investment, duckling insurance, repairs and maintenance, litter. Labor, supplies, brooder fuel and electricity accounted for 22.44 cents, 19.63 cents and 18.69 cents per pound for one, two and three broods, respectively.

Total dollar costs to produce one, two and three broods of ducklings per year were $6,206.34, $9,806.74 and $13,478.85, respectively. On a per duckling basis production cost was $2.615 (one brood), $2.615 (one brood), $2.066 (two broods) and $1.893 (three broods).

A selling price of 22.0 cents per pound liveweight at the farm was

quoted in March, 1971, by a southwest Missouri commercial duckling producer who marketed 2,000 ducklings per week and had a highly integrated operation. At this price level, returns would be far insufficient to cover average total costs of 25.25 cents per pound incurred to produce three broods in this study in southeast Kansas.