AN ECONOMIC ANALYSIS OF PRODUCING MARKET TURKEYS IN KANSAS USING SEMICONFINEMENT REARING

by

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CHAPTER I

INTRODUCTION

Problem Statement and Objectives

Change is a key word in today's world and it affects everything around man. Turkey meat production has not been spared and a completely different system of production is being tried in Kansas. Production costs are associated with a given technique and this study is intended to investigate costs of semiconfinement rearing.

Semiconfinement rearing, as defined in this study, is raising market turkeys on limited land area. Turkeys are brooded and raised in an enclosed building with a fenced open area equal in size to the building. Until this breakthrough, Kansas turkey producers were prohibited from raising turkeys throughout the year because of severe winter weather. However, semiconfinement rearing and some adjustments in size of flock permit specialized turkey production facilities to be used more frequently.

Production of market turkeys previous to semiconfinement rearing started by placing day-old poults in the brooder house during the spring. After eight weeks, birds would be put on range until marketed before the winter weather set in and before the heavy seasonal demand for turkey meat. Usually only one flock per year was raised.

Although semiconfinement rearing requires some new production equipment and facilities, much of the needed equipment and facilities used in range-rearing can be used.[1] This in itself poses a hypothesis that needs to be

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[1] In this study, range-rearing was defined as growing birds on range from eight weeks to market age.

accepted or rejected. Will the increased investment justify raising turkeys in semiconfinement?

Raising more turkeys per year with a given level of assets allows spreading of overhead costs over more operating and investment capital. Hence, the producer is not the only interested party. The creditor must also be knowledgable as to the requirements of a new production technique.

After all available information has been gathered, producers, hatcheries, feed companies, equipment suppliers, creditors, processors, and other interested parties can make valid decisions regarding the feasibility of rearing market turkeys under semiconfinement.

Kansas possesses the basic raw inputs needed in market turkey production, for example: (1) large local supplies of feed grains and other feed ingredients, (2) nearby sources of day-old poults, (3) available turkey meat processors (market outlets), and (4) many farm operations in need of additional income enterprise.

Objectives of this study were:

1. To estimate the capital investment in land, buildings, machinery, and equipment for market turkey production in relation to size of operations.
2. To estimate per unit costs of producing market turkeys in relation to size of operation, flock sex, and degree of utilization of production facilities.
3. To analyze variable and fixed cost items of producing market turkeys.
4. To identify cost factors and their relative importance in contributing to economies of scale, if any.
5. To analyze the influence of feed prices and flock mortality upon costs of production.

Theoretical Concepts

Any form of production will incur costs. R. H. Leftwich presented two concepts of costs: (1) the alternative cost doctrine and (2) explicit and implicit costs.[2] An alternative cost is present when production of particular products prevents the possible return from another product that cannot be produced due to prior use of inputs. Explicit costs of production are outlays of money, commonly thought of as expenses. Implicit costs of production are costs of self-owned resources such as entrepreneur labor and management.

In economic theory a distinction is made between costs and time periods. The short-run time period may be defined numerous ways, but in this analysis, it refers to a period of time in which some factors or inputs of production are not variable. Different classes of inputs generally require various lengths of time to permit variations in their use. However, in the short run the firm does not have time to vary such resources as land, buildings, heavy equipment and top management. The quantity of fixed resources determines the firm's size of plant, or its scale of plant. The scale of plant sets the upper limit to the amount of production per unit of time which the firm is capable of producing. Yet, output may be varied by using various quantities of resources that are variable in the unit of time known as the short-run. These inputs are those such as labor and raw materials.

The long run time period presents no definitional problems such as those incurred with the short run. The long run is a time period where all of the firm's inputs are variable. The firm has sufficient time to vary its scale of plant from a very small to a very large quantity of output.

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[2] R. H. Leftwich, The Price System and Resource Allocation (New York: Holt, Rinehart and Winston, 1966, 3rd Ed.) p. 126.

Classification of inputs in the short run as variable and fixed allows their costs to be designated as variable and fixed costs. Thus, three concepts of total cost are presented. These are total variable cost, total fixed cost, and total cost. Total cost may also be determined by adding total variable and total fixed costs (see Figure 1).

Total variable costs are the summation of expenditures made for all variable inputs. They increase as the firm's output increases since larger outputs require more variable inputs. When plotted, total variable costs resemble an inverted production function when applied to a given set of fixed resources per unit of time (see Figure 1). The shape of the total variable cost curve is determined by the production function.

Total fixed costs refer to the entire obligation for fixed resources in the short-run incurred by the firm. Total fixed costs will remain at a constant level since these resources are not varied at different rates of output during the short run. Since these resources have been committed and costs associated with them such as taxes, depreciation, insurance, and interest, they are present even though no output is being produced (see Figure 1).

Another important assumption is necessary 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.

Dividing the three costs by the quantity of output being produced provides a per unit cost of average cost concept. Thus, there are three such concepts: (1) average variable cost, (2) average fixed cost, and (3) average total cost.

Theoretically, the average variable cost curve begins at a high per unit cost and then declines as output is expanded. Average variable cost

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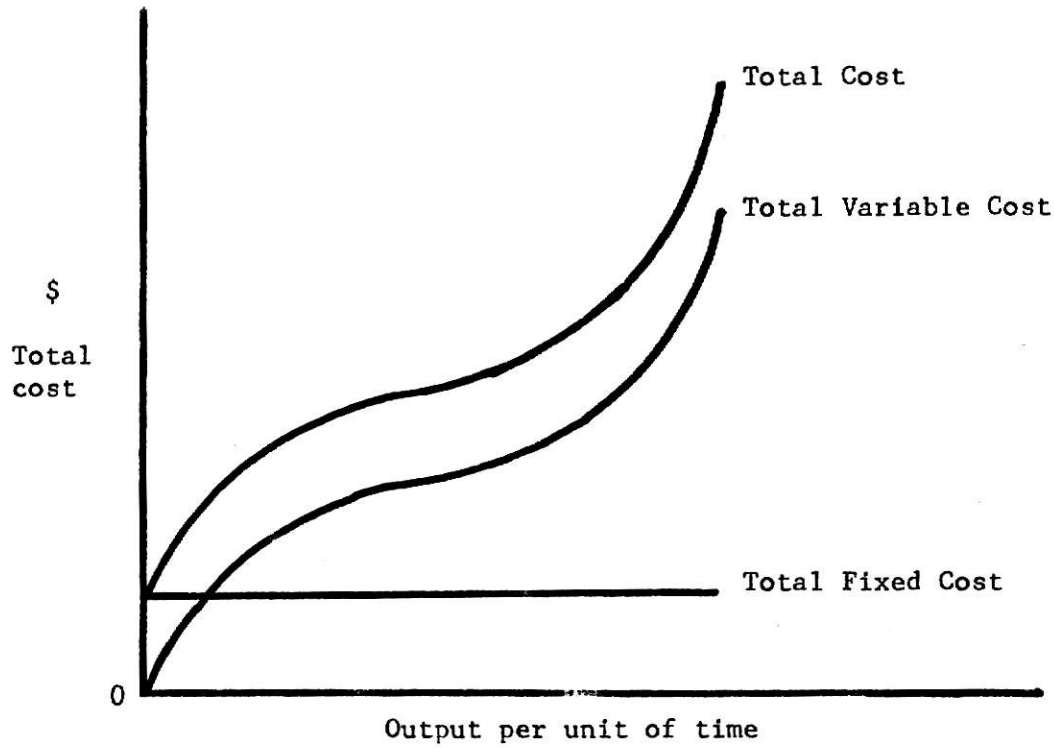

Figure 1.--Theoretical total cost function.

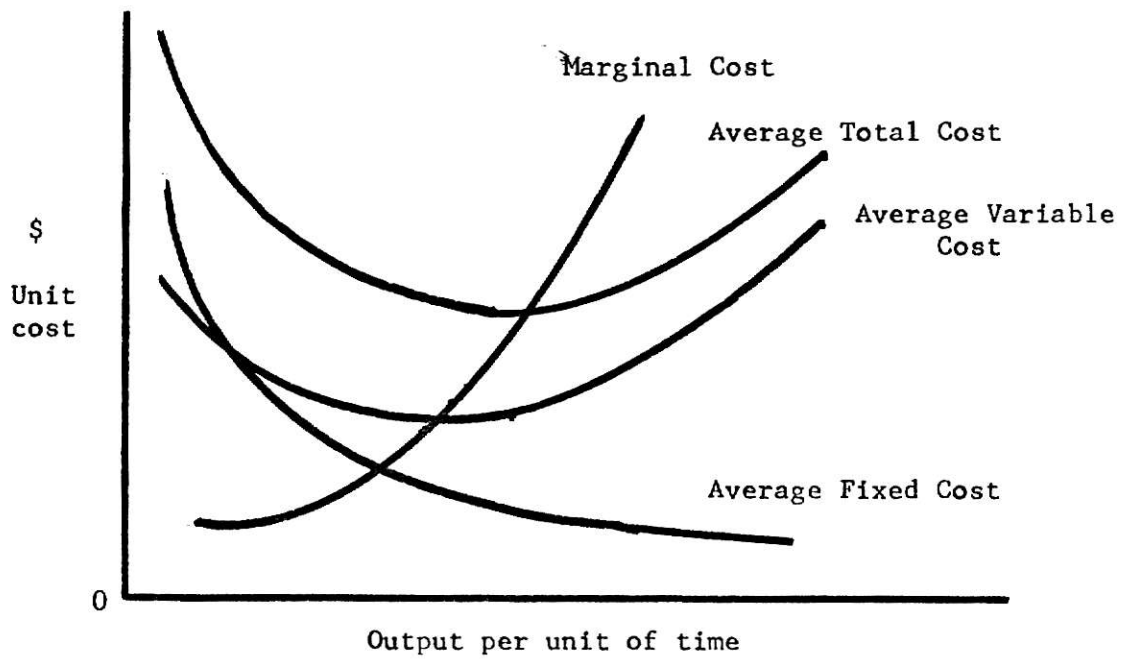

Figure 2.--Theoretical unit cost functions.

continues to decline until a minimum is reached. Once this minimum point has been reached, it begins to increase as more output is produced (see Figure 2). The U-shape of the average variable cost curve when plotted can be explained by the principles of production. That is, the scale of plant is fixed and use of a small amount of variable resources results in a very small output. Adding more inputs results in increasing the output at an increasing rate and finally increasing the quantity of inputs results in increasing output at a decreasing rate.

Average fixed costs or fixed costs per unit of output at various levels of production are obtained by dividing total fixed cost by those outputs. When average fixed cost is plotted it is high at small levels of output then declines as output is increased (see Figure 2). Since total fixed cost remains constant regardless of the quantity of output, average fixed cost continually declines as fixed costs are spread over more units of output.

Average total cost can be derived by two methods, first by adding average variable and average fixed costs together or by dividing total cost by the quantity of output associated with that amount of total cost. Shape of the average total cost curve when plotted is similar to the average variable cost curve (see Figure 2). It lies above the average variable cost by the amount of the average fixed cost.

A seventh concept of cost is somewhat different than the previously-mentioned six concepts. Marginal cost implies a change in total cost resulting from a change in output. Since total fixed costs do not change at any level of output, marginal cost could be defined just as accurately as the change in total variable cost resulting from a one unit change in output. When the production function gives a total cost curve like the curve shown in

Figure 1, marginal cost decreases when increasing returns are present due to the production function. It will reach a minimum and begin to rise as decreasing returns set in as the production function dictates. As marginal cost is rising, it equates average variable cost and average total cost at their minimum points (see Figure 2).

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

In the long run the firm can build any desired scale of plant as all resources are variable. There are no average fixed costs in the long run. When fixed factors are variable, a new set of input-output schedules arises which gives a new set of cost curves. The possible combinations of plant sizes is equated by the same number of sets of cost curves.

When several short-run average cost curves exist, a new curve can be shown which is just tangent to all possible short-run average cost curves, SRAC, (see Figure 3). Such a curve, the long-run average cost curve, has been referred to as an envelope or planning curve. All possible plant sizes are included because it allows the entrepreneur to plan his size of plant to achieve desired goals.

In Figure 3, the low points of the short-run average cost curves show the least cost combinations for specific sizes of plant. However, the tangency points lie to the left or right of this point except for one possible size of plant.

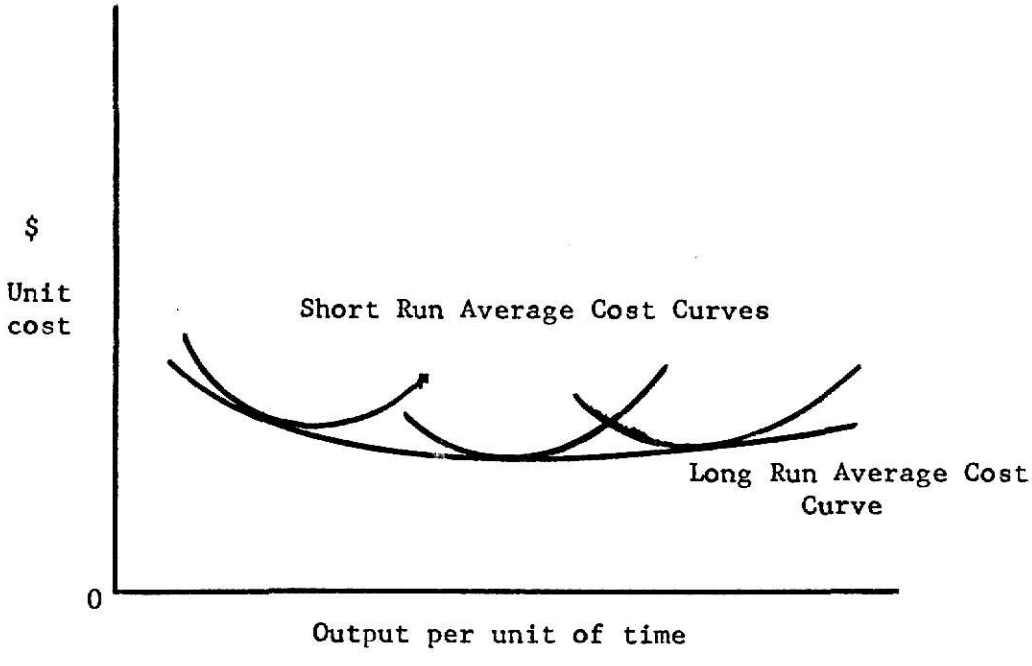

Figure 3.--Theoretical short-run average cost curves and long-run average cost curve.

The long-run average cost curve may be called the economies of scale curve when it is declining as savings in production costs are gained when output is increased. Diseconomies of scale result when per unit production costs begin to rise when output is increased.

Marshall distinguished two distinct types of economies possible, "internal" and "external".[3] Internal economies of scale come about within the firm as a result of action taken by management of the firm. External economies are largely a result of factors outside the operation of the individual firm.

Viner points out that both of these economies may be either technological or percuniary in nature.[4] Technological internal economies commonly are brought about by division and specialization of labor and increased mechanization. Pecuniary internal economies also occur as the firm becomes large enough to purchase large quantities of resources at discounts. External economies that may be classified as technological result from improved transportation facilities, efficient communications between large firms, and joint efforts by firms in an industry. A firm by itself could not have brought about these developments.

Diseconomies of scale also result from internal and external factors. One most common factor of internal diseconomies is the limit on management efficiency in controlling the firm or unavailable qualified labor. External diseconomies, over which the firm has no control, are brought about by an

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[3] Alfred Marshall, Principles of Economics (London: Macmillan and Co., Ltd., 9th Ed. Vol I, 1961) p. 314.

[4] Jacob Viner, Cost Curves and Supply Curves: AEA Readings in Price Theory (Chicago: Richard D. Irwin, Inc., 1952) VI, p. 218.

increased demand for resources by the industry and are characterized as pecuniary in nature.

Review of Literature

The concept of economies of scale as an economic tool originated in writings of earlier economists, notably Marshall. Yet, it was some years later before economists developed an effective technique for utilizing this concept in their work. R. G. Bressler, Jr. was one of the early pioneers in research dealing with economics of scale in the New England milk industry.[5] Since this time there have been a number of studies on economies of scale in other agricultural and non-agricultural industries.

A recent study of growing market turkeys and brooding poults in Kansas was conducted during 1965-66 in Kansas.[6] Range-rearing market turkeys after they became eight weeks old was the method of production. Champney synthesized five models ranging from 5,000 to 50,000-bird capacity. These models referred to size of flock "placed" and marketed per year. One and two flocks per year were placed. In synthesizing these models, data were gathered from producers, poultry scientists at Kansas State University, contract settlement sheets, and industry trade papers.

Capital investment in land, buildings, machinery, and equipment was determined on a total and per poult basis for one and two flocks per year. Total capital investment for one flock per year ranged from $24,735 for the

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[5] R. G. Bressler, Jr., Economies of Scale in the Operations of Country Milk Plants, New England Research Council on Marketing and Food Supply in cooperation with the Storrs Agricultural Experiment Stations and the U.S. Department of Agriculture, Boston: June, 1942).

[6] William O. Champney, "The Economics of Market Turkey Production and Specialized Brooding of Poults in Kansas" (Ph.D. dissertation, Department of Economics, Kansas State University, Manhattan, 1969).

5,000-bird flock to $190,006 for the 50,000-bird flock or $4.95 and $3.80 per poult, respectively. Two flocks per year required a total capital investment of $32,193 for the 5,000-bird flock and $259,580 for the 50,000-bird flock. On a per poult basis it amounted to $3.22 and $2.60, respectively.[7] Total capital investment increased for two flocks per year but not in a linear relationship as investment per poult did not increase twofold.

Champney estimated costs of production by number of flocks per year, flock sex, and total flock mortality. He found the economies of scale curve to be relatively small, especially in flocks larger than 10,000 birds. Per unit costs to produce one mixed flock per year ranged from $.2053 per pound (5,000 birds) to $.1958 per pound (50,000 birds). For two mixed flocks per year per unit costs ranged from $.1958 per pound (10,000-birds total) to $.1894 per pound (100,000-birds total).[8]

In this study, flock sex had considerable influence on production cost per pound of turkey sold. Production of tom turkeys resulted in a lower per unit cost than for hen turkeys. Toms of a 5,000-bird, two flocks per year, model had a cost of $.1844 per pound while the cost to produce hens was $.2190 per pound, or $.0296 per pound more. Similarly, for the 50,000-bird model at two flocks per year, toms had a production cost of $.1795 per pound while hens were produced at $.2099 per pound, or $.0304 per pound more.[9]

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[7] Ibid., pp. 65 and 67.

[8] Ibid., p. 84.

[9] Ibid., p. 84.

A study of growing market turkeys in California was made in 1963.[10] The primary objective of this study was to find the economies of scale in California turkey meat production and how per unit cost was affected by the number of broods grown, the rate of feed conversion, and mortality rate.

Eidman synthesized eight models ranging from 5,000 to 200,000-bird capacity with two flocks per year. Data used in estimating per unit cost were obtained from turkey growers, feed manufacturers, extension specialists, turkey growers' records, and published materials. Synthesized short-run average cost curves were found and then a long-run average cost curve was drawn to show economies of scale.

The economies of scale curve was found to have a sharp decline at lower levels of output and became relatively flat over a wide range. Per unit cost of production for two flocks of 5,000 turkeys was $0.229 per pound and $0.218 per pound for two flocks of 100,000 birds per year at an average feed conversion rate. This amounted to a decline of five percent in per unit costs of production. Approximately four percent of this decline occurred between two 5,000 and two 20,000-bird size flocks.[11]

Production costs of Missouri turkey growers were analyzed in 1967 by Russell.[12] His analysis included: (1) the effect of hatching date on brooding costs, (2) a comparison of costs to grow turkeys in confinement and

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[10] V. R. Eidman, G. W. Dean, H. O. Carter, Economies of Scale in California Turkey Production, California Agricultural Experiment Station and Giannini Foundation of Agricultural Economics Report No. 298 (Davis: University of California, August, 1968).

[11] Ibid., p. 46.

[12] W. Russell, Missouri Turkey Record Analysis, 1967 (Columbia University of Missouri, Extension Division, 1967).

on range after poults were 8 weeks, and (3) returns expected under various contractual arrangements. A total of 105 separate grower's records were used in this analysis. Items such as poults, feed, poult insurance, medications, and other items commonly supplied by contractors were not included in this analysis.

Russell found the cost of brooding poults varied according to the time of year they were hatched. This cost variation was traced to fuel and litter (variable cost items). Average total cost per poult raised ranged from $.1606 in December and January to $.1110 in June and July.[13] As expected, more fuel and litter were used during the winter months, thus resulting in higher costs.

Performance and cost data revealed considerable spread in producer's cost between confinement and range-reared turkeys for both toms and hens. Costs of production from eight weeks to market age ranged from $.3253 per tom (confinement-reared) to $.1266 per tom (range-reared). Likewise for hens, costs ranged from $.2176 per hen in confinement to $.1013 per hen marketed that was range grown.[14] Major reasons for higher costs of confinement rearing were traced to a higher capital investment which permitted fixed costs such as depreciation, insurance, taxes, repairs, and interest to be considerably higher than those associated with range-rearing.

Russell's analysis was not related to size of flock or brood thereby limiting its usefulness in comparision with other economies of scale studies. All sizes were grouped together and then an average cost per bird was computed. As other studies indicate, it could be expected that growers with larger size flocks would experience lower average total costs.

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[13] Ibid., p. 3.

[14] Ibid., pp. 8-12.

Research Method

Selection of methodology always enters any study. A variety of analytical procedures may be employed in analyzing economies of scale. No single procedure is best. The method used depends on the specific case involved which relies on the nature of the production process and the types of questions the study is supposed to answer.

Production of a single product, market turkeys, and a new state of technology dictated selection of the economic-engineering or synthetic-firm approach. This method is appropriate when finding the average cost per unit of output or profits that firms of various sizes could achieve or the differences in average cost of output solely due to differences in size of plants.[15] Moreover, there are no differences due to use of obsolete technology and quality of management is the same for each size of plant.

In this approach, budgets were developed for hypothetical plants, using the best information possible to estimate resource requirements and expected yields and based on changing market prices or opportunity costs for inputs. In this study, a list of inputs contributing to cost of production was compiled. Budget standards for each input were determined by various methods (see Chapter II) and then used to determine amounts of inputs required for each size model and at various levels of capacity utilized. Current market prices of inputs times quantities used provided cost data.

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[15] U.S. Department of Agriculture, Economic Research Service, Economies of Size in Farming--Theory, Analytical Procedures, and a Review of Selected Studies, by J. P. Madden, Agricultural Economic Report No. 107 (Washington, D.C.: Government Printing Office, 1967), p. 29.

Capital investment in land, buildings, machinery, and equipment was determined based on quantities required for each model. Then fixed costs (depreciation, taxes, interest, insurance, repairs and maintenance) were computed for each model based on this investment. Fixed costs added to variable costs gave total costs for each model constructed.

After per unit costs of production were estimated under normal production conditions by turkey growers, mortality and feed prices were varied and results observed. The intention was to see if fundamental assumptions would change average total costs.

CHAPTER II

THE TURKEY PRODUCTION ENTERPRISE

Definition of Terms Used in This Study

Poult--a young turkey from one day-old through the brooding phase (usually eight weeks).

Market turkeys--turkeys raised from day-old poults to market age for meat processing.

Size of model--number of turkeys placed in the brooder house and raised to market age for a period of one year.

Size of flock--number of poults placed in the brooder house at one time.

Semi-confinement rearing--poults are placed in the brooder house until eight weeks of age then transferred to a growing house which has an adjacent, fenced rearing area usually the same size as the growing house.

Confinement rearing--poults are placed in a brooder house until eight weeks of age then transferred to a growing house with no open fenced area and are confined to the growing house until market age.

Hen flock--female birds only.

Tom flock--male birds only.

Mortality--number of poults or birds that die between time of placement in the brooder house and sale as market turkeys.

Birds per year--total number of turkeys placed and marketed during a period of one year. In this study a continuous operation was assumed and once a production cycle was started the number of birds, represented by a model size, could be placed and marketed in 365 days.

Hypothetical Turkey Production Models

Four hypothetical turkey production models were synthesized for this study. These models represented the best combination of brooding and growing buildings which could be utilized efficiently in relation to size of flock. The systems were synthesized in a manner which would allow an individual to combine this enterprise with a general farming operation.

Model sizes were 20,000; 35,000; 70,000; and 105,000 birds per year. These sizes represented 100 percent of capacity utilized in terms of day-old poults placed in the brooder house.

Brooding schedules were based on 5,000 poults placed during the months of August, September, and October and 7,500 poults placed during remaining months of the year. This management decision was necessary to allow total confinement of birds in the growing house during the winter months. By reducing the number of poults placed, the square feet per bird was kept at a recommended level for confinement rearing. All schedules were planned so facilities could remain idle at least two weeks for clean-up and other duties necessary in preparing for a new flock of birds (see Appendix A, Tables 13, 14, and 15 for hypothetical brooding, growing and marketing schedules).

The 20,000 birds per year model required one brooder and one growing house. Two 7,500-bird and one 5,000-bird flocks were placed per year in this model. One brooder and two growing houses were used in the 35,000 birds per year model and four 7,500-bird and one 5,000-bird flocks were placed annually. The 70,000 birds per year model simply doubled the 35,000 birds per year model. A combination of 35,000 and 70,000 birds per year made up the 105,000 birds per year model.

Enterprise Layout, Description, and Budget Standards of Production Facilities

Physical layouts of production facilities vary widely in producing turkeys, therefore a hypothetical layout was designed to allow recommended areas for location of buildings. Figures 9, 10, 11, and 12, Appendix B, show the layouts for each model. These are considered to be ideal with respect to efficiency and minimizing investment if drainage and terrain permit such layouts.

Equipment used by market turkey producers was quite similar in all operations. However, larger operations oftentimes require higher capacity equipment.

The description and budget standards of land, buildings, machinery, and equipment for market turkey production are presented in Appendix B, Table 17.

Land used for market turkey production was assumed to be suitable for crop production and was valued as such. One acre was allotted for each brooder house. Each building required 10,000 square feet leaving 33,560 square feet surrounding the building. This excess land area was needed for disease control, storage of equipment, and adequate ventilation.

Brooder houses were 40 feet wide and 250 feet long and would accommodate 7,500 poults thereby allowing 1.33 square feet per poult. When only 5,000 poults were placed two square feet per poult was allowed.

Construction design and materials used were quite similar to those in a producing area. However, climate extremes vary and thus some adjustments in construction were necessary. The design used in this study was an open wood-truss construction with trusses supported by a concrete foundation. A concrete floor was used because producers and poultry specialists felt it was

necessary when turkeys are produced throughout the year. Roofing and siding was corrugated sheet metal with insulation on the inside. On each wall, side curtains were used so ventilation during the summer would be adequate. These curtains were plastic and could be rolled up or down depending on weather conditions. A large ventilating fan was located at each end of the building. One corner of the brooder house was converted into a storage area for small items. Large doors at each end of the building permitted cleanup with mechanized power. Tractors with rear-mount blades and front-end loaders could easily move about in the building.

One brooder house was used in the 20,000 and 35,000-bird models. Two brooder houses were used in the 70,000-bird model and three brooder houses were used in the 105,000-bird model.

Liquified petroleum gas brooders were placed in two rows on 10-foot centers and fastened to trusses with a pulley so they might be adjusted for height as poults grew. Pressboard brooder guard shields enclosed two brooders to keep young poults close to the brooders. All brooders except one on each end of the two rows were enclosed in this arrangement since 23 brooders were in a row.

Water founts and small starter feeders were not used in observed operations. Instead, eight-foot automatic hanging waterers were placed at floor level. As poults grew, automatic waterers were adjusted upward from the floor by a chain hoist assembly. When 7,500 poults were placed, 1.10 linear inches of water space per poult was budgeted.

Cardboard paper egg flats were used to get day-old poults started on feed and after several days the automatic feed system was used. This system was composed of an eight-ton bulk feed bin, bin unloading auger, two feed hoppers

connected to auger delivery lines, and feed pans. Bulk feed was delivered to the enterprise and was stored in the bulk feed bin. A timer which was controlled by the amount of feed in a feed pan would automatically start the system. Feed was moved from the storage bin to two 250-pound feed hoppers by a flexible auger. A feed line was connected to each hopper which laid lengthwise in the brooder house. An electric motor and gearhead on the opposite end would move feed from the hoppers to the feed pans along the feed line. There were 93 pans on each line and the pans were 15 inches in diameter. This allowed adequate feeding space for 7,500 poults. Each brooder house had one of the described systems.

Fuel for gas brooders was stored in a 1,000 gallon propane tank. One tank was budgeted for each house.

Three acres were allotted for each growing house (40 feet by 500 feet) and a fenced growing area of equal size was needed adjacent to the building. Extra land was needed for ventilation, disease control, and storage area.

Growing houses were used after poults reached eight weeks of age. Construction was basically the same as the brooder houses but dimensions were 500 feet long and 40 feet wide. This house also used open steel-truss construction with trusses supported on a concrete foundation. Trusses were on 10 foot centers with 2 x 4's laid perpendicular for strength. No insulation was needed in the growing house. Side curtains which would roll up or down depending on weather conditions were on both sides of the building. These curtains started four feet off the foundation and extended upward to where the wall adjoined the roof. Large ventilating fans at each end of the house provided adequate air movement. At each end of the house, sliding doors which allowed tractors and trucks to enter were installed.

Six propane gas brooders were placed equidistant from one another in the growing house to prevent winter freeze-ups. A 125 gallon propane, fuel storage tank was budgeted for each house.

An automatic feed system was designed and used in the growing house. Feed was stored in a 21.4 ton bin which was located outside, in the middle along the 500 foot side of the building. A flex auger fed directly from the bin to a feed hopper located in the center of the growing house. Two overhead feed conveyors, running in opposite directions, filled 48 700-pound capacity, round, range-type self feeders. In order to allow sufficient feeding space per bird, 20 similar feeders were placed in the fenced growing area adjacent to the building. Feeders were spaced along the fence line in a manner that allowed filling by a bulk delivery feed truck without entering the fenced area.

Water in the growing house was supplied by adjustable, hanging, automatic waterers. Waterers were 20 feet long and provided 1.28 linear inches per bird when 7,500 birds were placed.

A water system consisting of one well, necessary PVC pipe, and fittings was designed for each model size (see Appendix B, Table 20 for a complete list of items used). Design followed the hypothetical layout of buildings (see Appendix B, Figure 9 for a typical system). Extension of water lines was necessary since larger models required more buildings and greater distances between buildings. Water was piped to each building from the pump and well with a hydrant located at the point where water enters the building.

Each growing area was fenced with four foot poultry wire. Steel fence posts, seven feet long, spaced 10 feet apart held the wire. Fencing was permanent, so investment was higher than that required in temporary fencing.

A portable turkey loader was budgeted for each model and facilitated loading market birds into trucks. The loader could be adjusted to match the height of various levels of cages on the truck. Height adjustment was provided by a hydraulic cylinder powered by the hydraulic pump on the tractor. A large slatted conveyor moved turkeys from ground level to the pre-adjusted height making loading easier and reducing the amount of labor needed. Power to drive the conveyor was supplied by the power-take-off on the tractor.

Movement of poults from the brooder house to the growing house necessitated use of a trailer to haul birds. A 12 by 60 foot wire-enclosed platform mounted on a mobile home-chassis was budgeted for each model. The trailer was pulled by a farm tractor. Movement of birds by this method prevented scattering and reduced time required to move a brood. Poults were crowded into one end of the brooder house, then caught and placed in the trailer.

A gas incinerator was budgeted for each model to dispose of dead birds. The incinerator helped in disease and pollution control.

Each model required two farm tractors. Each tractor was in a 2-3 plow power classification and burned LP gas, thereby eliminating any other type of gas storage tanks not already in use. Tractors were equipped with a three-point hitch, power-take-off and hydraulics. This enabled tractors to be used for any operation requiring mechanized power.

Other items necessary for market turkey production included a seven foot rear-mount blade, tractor-mounted, front-end loader, manure spreader, and a power-take-off driven portable sprayer. One of each of these items was budgeted for each model. A medicator for each building and a debeaker for each model were also budgeted.

Fundamental Assumptions Regarding Production and Marketing for the Turkey Enterprise

For sake of homogeneity, certain basic assumptions were made and underlie all synthesized production models. This was done to reduce cost variations between various size production units and to assure a constant state of technology.

Management

Levels of management differed between the four synthesized models simply due to the size of the operation. However, management was assumed equally competent and no differences in capability were present regardless of size.

Labor

The amount of labor required varied with size of models. Larger sizes required more labor for proper care of birds than smaller model sizes. However, labor productivity was assumed to nearly constant for all model sizes. This reduced variations in costs due to quality of labor.

Prices for Machinery and Equipment

Prices for machinery and equipment varied between firms supplying necessary items used in turkey production. Discounting of retail prices was widespread but all growers were not given equal discounts. Large quantity purchases generally received larger percentage discounts.

Prices of items for strictly market turkey production were discounted 20 percent from retail prices and then 10 percent was added for freight, taxes, and assembly. Items usuable for other types of enterprises were not discounted and full retail price was applied. Prices for all machinery and equipment were those in effect during 1969.

Land

Land budgeted for use in this study was for turkey production only, thus it was assumed the turkey enterprise would bear the entire cost of land. The price for land was $233 per acre in Northeast Kansas during 1968 and this price applied to all models. Cost of land was calculated by computing taxes using the same tax and valuation rate. Also interest on investment in land was computed.

Mortality

Various total and weekly mortality rates affect per unit production costs. Hence, it was assumed that each model experienced the same mortality rate to insure no variation in costs due to this factor. All mortality occurred from day-old poults to 16 weeks of age. Weekly mortality rates were estimated in consultation with poultry specialists at Kansas State University and growers in Northeast Kansas (see Appendix C, Tables 26, 27, 28, 29 and 30). All birds were assumed to die on the last day of each week, thereby somewhat overestimating feed consumption and increasing feed costs.

Feed Prices

Complete turkey feed rations formulated at Kansas State University were assumed to be fed. Major ingredients were priced based on Agricultural Prices, Annual Summary, 1968, and micro-ingredients reflect current prices charged by Northeast Kansas feed dealers during 1969. Services performed by feed dealers were also added to the total feed price. It was assumed quantity discounts were not given for large purchases.

Market Weights

Per unit costs of production can be greatly affected by different market weights and ages. It was assumed that all models marketed birds at equal age

and weight. Toms were marketed at 24 weeks of age and averaged 26.2 pounds while hens were marketed at 20 weeks and averaged 14.8 pounds. No allowance was made for a certain percentage of unsalable birds since the mortality rate was assumed to include these birds.

CHAPTER III

COST DETERMINATION AND STRUCTURE OF TURKEY PRODUCTION COSTS

Capital Investment in Land, Buildings, Machinery, and Equipment for Turkey Production Models

Production of market turkeys under semiconfinement had a capital investment reflecting model size. Investment in land, buildings, machinery, and equipment was determined so costs could be allocated properly. Capital invested created three points of concern for turkey growers, creditors, and contractors: (1) total investment might restrict firm size if sufficient capital is not available, (2) sources of credit must be available and knowledgeable as to the requirements of this type of production, and (3) interest must be charged against investment as a cost since capital could be invested elsewhere.

Total capital investment in land, buildings, machinery, and equipment in relation to size of model is shown in Table 1.

The 20,000-bird model required an investment of $62,135 while the 105,000-bird model required $240,324. Total investment increased $178,189, or 387 percent, as size of model increased 85,000 birds per year, or 425 percent. Thus, total investment did not rise in the same proportion as did size of model. Intermediate-size models fell within this investment range (see Table 1).

Buildings were the largest investment for any model size. Machinery and equipment accounted for the second largest investment. A list of all machinery and equipment for producing turkeys is presented in Appendix B, Table 17. Land investment was the smallest item for all model sizes.

TABLE 1. Total and per poult capital investment in land, buildings, machinery, and equipment to produce market turkeys, by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Dollars			
Land	932	1,631	3,262	4,893
Buildings	35,000	55,000	110,000	165,000
Machinery and equipment	26,203	33,359	51,906	70,431
Total	62,135	89,990	165,168	240,324
	Dollars per poult			
Land	0.0466	0.0466	0.0466	0.0466
Buildings	1.7500	1.5714	1.5714	1.5714
Machinery and equipment	1.3102	0.9531	0.7415	0.6708
Total	3.1068	2.5711	2.3595	2.2888

Sources: Appendix B, Table 23 and Appendix C, Table 36.

Table 1 also shows capital investment per poult in relation to size of model. Total investment per poult was $3.11 for 20,000 birds and $2.29 for 105,000 birds, a decrease of $.82 per poult or 28.4 percent. Intermediate sizes fell within this range of investment (see Table 1). The largest decrease occurred between the 20,000 and 35,000-bird models. It amounted to about $.54 per poult or 17.2 percent.

The largest investment per poult occurred in buildings. Investment per poult in buildings was $1.75, or 58.3 percent of the total, for the 20,000-bird model. Investment then dropped to $1.5714 per poult for all other model sizes. This resulted from a non-proportional increase in buildings (see Appendix B, Table 22). Investment in buildings in other synthesized models was simply a multiple of the 35,000-bird model. Per poult investment in buildings ranged from 68.7 percent for the 35,000-bird model to 61.1 percent for the 105,000-bird model.

Machinery and equipment investment per poult indicated economies of scale as model size increased. Per poult investment for the 20,000-bird model amounted to $1.31 while the 105,000-bird model required only $0.67 (see Table 1).

Land investment per poult remained constant for all models. Land investment was approximately five cents per poult (see Table 1). Constant land investment per poult resulted from a fixed budget standard of space per bird.

Structure of Costs

Costs of market turkey production were divided into two categories: (1) variable and (2) fixed. Variable costs varied directly with the amount of resources employed and the amount of output. Fixed costs remained constant regardless of the quantity of output produced by each model.

Variable Costs

Variable costs in this study were poults, feed, grit, medications, poult insurance, litter, fuel and electricity, supplies, labor, and interest on operating capital.

Poults

Poult prices were obtained from Agricultural Prices, Annual Summary, 1968, and represent a simple average of prices paid for a 12-month period. Tom poults were priced ten cents above this average and hens were priced ten cents below the computed average. Discounts for quantity purchases were available in the industry and discounting was assumed in this study. The 20,000-bird model was assigned the computed poult price of 72.5 cents for toms and 52.5 cents for hens at 100 percent of capacity. For each additional 10,000 poults purchased annually, price was discounted one-half cent per poult (see Appendix C, Table 24).

A common practice among hatcheries was to include more poults than actually ordered to compensate for dead or injured poults. However, for budgeting purchases, it was assumed there were no additional poults placed. For example, a 20,000-bird model assumed 20,000 poults were placed. Also, hatcheries inject day-old poults with antibiotics to insure a more healthy poult. Cost of this injection was usually one cent per poult. However, in this study this cost was included in the poult price.

Feed

Field survey data revealed great variability in feed costs due to such factors as weather conditions, management, quality of feed and feeding technique. An attempt to reduce this variation resulted in formulating feed costs in this study under conditions which were nearly ideal. Scott's feed tables were used to determine feed requirements and market weights attained each week.[16]

Total mortality and when it occurs in the production of turkeys has a large influence on feed costs. For example, if mortality occurred in later stages of production, feed consumption and costs would be higher and since fewer birds are marketable would result in less pounds sold. If mortality occurred very early, feed consumption would not be as high and lower production costs would occur when the same number of pounds were marketed as in the previously-mentioned example.

Variation in feed costs for the various models was removed in this study by assuming all mortality had occurred by the end of the 16th week. The percentage of total mortality by weeks was estimated in consultation with producers and poultry scientists at Kansas State University (see Appendix C,

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[16] M. L. Scott, "1969 Growth Rate and Feed Conversion Standards," Turkey World, January, 1969, p. 33.

Tables 26, 27, 28, 29 and 30). Flock mortality for toms was estimated at 12 percent, and for hens at five percent.

It was assumed that complete turkey feed rations were fed. Rations were formulated by poultry scientists at Kansas State University. Stipulated protein levels, services included, and form of feed for all models were similar (see Appendix C, Table 25).

Feed prices were obtained from two sources. Prices of ingredients used in major quantities of the rations were obtained from Agricultural Prices, Annual Summary, 1968, and micro-ingredients reflected current prices charged by Northeast Kansas feed dealers during 1969. A charge for delivery services performed (grind, pellet, or crumble) was added to ingredient cost to obtain total price.

Feed cost for any model size was computed on the basis of 5,000 birds. A multiple of this provided total cost for each size model. Feed consumption per bird 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 a specific ration, depending upon age of the birds, to obtain weekly feed cost. Weekly feed costs were summed to obtain total feed cost up to the time birds were shipped to a processor (see Appendix C, Tables 26, 27, 28, 29 and 30).

Grit

Grit was fed in the synthesized models since turkeys require a minimum amount of insoluble mineral matter to properly digest feed. Levels of recommended grit consumption vary with age of bird and feed consumed (see Appendix C, Table 32).

A commercial insoluble grit was fed to birds from day-old poults to eight weeks of age. Coarse sand and gravel were fed from nine weeks to market age. Prices of $1.80 per hundredweight for commercial grit and $0.08 per hundredweight for coarse sand and gravel were used in budgeting. These prices were currently charged by feed dealers in Northeast Kansas during 1969.

Medications

Expenditures for medications were computed using data from field surveys and previous research.[17] This cost item was highly variable because of such factors as weather, disease control by management and general health of new poults. Expenditures varied from flock to flock and from year to year, therefore a simple average of $1,000 per 7,500 birds placed was used for budgeting purposes. This averaged $0.1333 per bird.

Poult insurance

Poult insurance varied according to prices paid for day-old poults, type of rearing system (range-rearing, total confinement, or semi-confinement) and season of year.

Toms were insured at a rate of $0.067 per poult for a maximum coverage of $5.00 per bird. Hens were insured at $0.05 per poult for a maximum coverage of $3.50 per bird. However, poult discounts resulted in lower premiums when 105,000 poults were placed. Rates used for this model were $0.065 and $0.048 for tom and hen poults, respectively.[18]

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[17] Field survey data were obtained from market turkey producers in Northeast Kansas. Analysis of grower records and interviews with producers was the method used in obtaining data.

[18] Rates, coverages, and deductibles were quoted by Farmers Mutual Hail Insurance Company of Iowa, Turkey Department, 1563 University Avenue, St. Paul, Minnesota.

Litter

Peat moss was used as litter in the brooding house. One bale of approximately 75 pounds covered 100 square feet with a two-inch layer. Litter in the brooding house was removed after every flock had been removed. A total of 100 bales at the price of $4.50 per bale was budgeted for every brood placed in the brooder house. The 20,000-bird model placed three broods per year; 35,000-bird model placed five broods per year; 70,000-bird model placed ten broods per year; and the 105,000-bird model placed 15 broods per year for an annual requirement of 300, 500, 1,000, and 1,500 bales, respectively.

Rice hulls were used as litter in the growing house. One bale of 75 pounds covered 100 square feet. Hence 200 bales were needed each time the litter was changed. New litter was put down only during summer months and only wet spots were removed during winter months and replaced with dry hulls. Hypothetical time schedules of brooding, growing, and marketing (see Appendix A, Tables 13, 14, and 15) were used to determine when these practices occurred. The total amount of litter required annually, by synthesized model, was as follows: 20,000 birds, 420 bales; 35,000 birds, 820 bales; 70,000 birds, 1640 bales; and 105,000 birds, 2460 bales. Rice hulls used in budgeting were priced at $30.00 per ton, the charge made by firms in Northeast Kansas during 1969.

Fuel and electricity

Fuel and electricity costs varied among producers depending on the season in which poults were brooded. Costs were highest during winter months and lowest during the summer. A yearly average was computed and $0.05 per poult placed was used for fuel and $0.0025 per poult for electricity.

Supplies

Supplies included minor expenses which are expendable during a production cycle yet necessary for production. Items included were disinfectants, cleaning agents, and other items necessary for turkeys but not listed elsewhere. For budgeting purposes, $20.00 per 1,000 poults placed was used for all synthesized models.

Labor

Labor requirements to produce market turkeys under semiconfinement were obtained by interviewing growers and extension personnel. Time was broken down into two types: (1) actual time caring for birds and (2) cleanup time after birds were moved or sold. This method of allocating time was followed because actual time spent caring for birds varied directly with the number of birds raised and cleanup time remained relatively constant regardless of the number of birds raised since entire buildings required cleaning.

Analysis of collected data provided the following equation:[19]

$$H = 0.0488p + 72b$$

where;

H = total number of hours required per year,

p = number of poults placed per year,

b = number of broods placed per year.

Thus, if 7,500 poults were placed, 0.0584 hours per poult would be required and if 5,000 poults were placed, 0.0632 hours per poult would be required. It

[19] Data used were obtained from actual growers' records and it was assumed labor requirements would not vary in hypothetical layouts of synthesized market turkey production models. Time spent on caring for birds and clean-up after movement should remain relatively constant regardless of physical plant layout.

was assumed labor requirements were nearly constant in relation to size of operation.

In computing labor cost, $1.60 per hour was the wage rate. This rate reflected a minimum opportunity cost to a 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 all capital was borrowed, the interest paid was a cash cost and (2) if a grower used his own capital, the interest charge represented interest foregone on his own capital and was therefore an opportunity cost.

For budget purposes, 7.5 percent per annum was charged on one-half of the total cost of the previously-mentioned variable cost items. This method was employed because producing one flock of market turkeys required the use of capital for a time period of six months.

Fixed Costs

The complement of land, buildings, machinery, and equipment used in producing a given number of turkeys was considered fixed in the short run. All of these items were regarded as durable items in the sense that they may be used for more than one year's production. Thus, the annual cost of using these fixed resources was the charge covering any year's employment. Fixed costs included depreciation, insurance, taxes, interest, and repairs and maintenance.

Depreciation

Depreciation on buildings, machinery, and equipment was determined by the straight-line method. No salvage value was assumed to exist at the end of an item's "useful life". A period of "useful life" was assigned to each durable

item used in production. This time period was divided into the assigned price or value as established by pricing methods (see page 23) to obtain annual depreciation costs (see Appendix C, Table 34).

"Useful life" for each item was based upon field survey data and advice of poultry specialists at Kansas State University. All items, except farm tractors used in the 20,000 and 35,000-bird models, were used exclusively in market turkey production. Tractors used in the 20,000 and 35,000-bird models were also used in other farm enterprises. Therefore, only 60 and 80 percent of their annual depreciation costs, respectively, were assigned to production costs.

Insurance

Insurance cost was computed for all buildings, machinery, and equipment for all models. Buildings had an insurable rate of 80 percent of their replacement value (in this case acquisitional cost) and had a premium rate of $9.90 per $1,000 of insurable value (see Appendix C, Table 35). Machinery and equipment had an insurable rate of 100 percent of replacement value and a premium rate of $4.30 per $1,000 of insurable value was used. General farm liability insurance was charged to the turkey enterprise. A rate of $57.60 was used in all models and provided adequate coverage for any possible claim.[20]

Property taxes

Property taxes included personal property and real estate taxes. All machinery and equipment were included in the former. Land and buildings were considered real estate. However, all property tax was assessed at the same

[20] Premium rates and insurable values used were quoted by Kansas Farm Bureau Insurance Company, Manhattan, Kansas, during 1969.

rate, 17 percent of current valuation, and taxed at 60 mills per dollar of assessed value.[21] Mill levies and assessment rates were those in effect for rural areas of Northeast Kansas during 1968 (see Appendix C, Table 36).

Repairs and maintenance

Repairs and maintenance on buildings, machinery, and equipment were considered a function of time and not use. That is, repairs and maintenance were assumed to be a fixed cost whether buildings, machinery, and equipment were occupied, used or idle.

For buildings, estimated repairs were two percent of initial investment. Repairs for machinery and equipment were estimated at three percent of initial investment. Field survey data revealed repairs on machinery and equipment were more frequent and, as a percentage of original investment, more costly than on buildings.

Interest on fixed investment

Interest on fixed investment for the synthesized models was determined by the following equation:

$$I = (\frac{TIbme}{2})(r) + (TIl)(r)$$

where;

I = Interest,

TIbme = total investment in buildings, machinery and equipment,

TIl = total investment in land,

r = rate of interest.

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[21] Kansas, Property Valuation Department, Real Estate Assessment Ratio Study: 1968, (Topeka: State Printing Office), p. 10; and Kansas, Property Valuation Department, Statistical Report of Property Assessment and Taxation for the Tax Year 1968, Topeka: State Printing Office), p. 2.

A rate of 6.5 percent per annum was used to calculate interest on fixed investment. The interest rate applied to one-half of the total capital invested in buildings, machinery, and equipment since these items were depreciated annually and had no salvage value. However, the interest rate was applied to all capital invested in land since land was not depreciated.

CHAPTER IV

PRODUCTION COSTS AND COST RELATIONSHIPS

Cost data used in this chapter were generated from budget standards described in Chapter III. These data provided levels of cost for producing market turkeys for each model size and also indicated the relative importance of factors which accounted for economies of scale. Per unit cost, percentage distribution of cost components, and factors which contributed to economies of scale were calculated by model size and flock sex.

Facilities were utilized at 100 percent of budgeted capacity and various percentages of utilization less than 100 percent.. The degree of utilization was related to production costs. Mortality rates and feed prices were varied to show effects on production costs of tom turkeys.

Costs to Produce Market Turkeys

Total variable and fixed costs were summed to obtain total costs (see Appendix C, Tables 39, 40, 41, 42 and 43). Average costs in cents per pound of turkey sold were obtained by dividing total costs for all inputs used by the quantity of output sold. In Table 2, estimated average variable, average fixed, and average total costs for toms (based on 12 percent mortality) and hens (based on five percent mortality) are shown for each synthesized model.

Average Costs of Production

Average costs to produce market turkeys depended upon sex and model size. Toms had lower production costs than did hens. Size of model also influenced production costs but to a lesser degree than sex as shown in Figure 4.

Estimated average total costs of producing toms ranged from 20.31 cents per pound for the 20,000-bird model to 19.53 cents for the 105,000-bird model. For hens, average total costs ranged from 23.87 cents to 22.59 cents per pound

TABLE 2. Estimated average variable, fixed, and total costs of producing market turkeys, by flock sex and size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Cents per pound			
Tom flock[a]				
Average variable costs	18.26	18.22	18.15	18.05
Average fixed costs	2.05	1.70	1.53	1.48
Average total costs	20.31	19.92	19.68	19.53
Hen flock[b]				
Average variable costs	20.50	20.43	20.31	20.15
Average fixed costs	3.37	2.79	2.53	2.44
Average total costs	23.87	23.22	22.84	22.59

[a]Based on 12 percent total flock mortality.

[b]Based on five percent total flock mortality.

Sources: Appendix C, Tables 41 and 43.

as size increased from 20,000 birds to 105,000 birds (see Table 2). Costs for intermediate-size models fell within this range.

At the 20,000-bird level, toms were produced for 3.56 cents per pound less than hens and at the 105,000-bird model, the difference amounted to 3.06 cents per pound of meat produced. Lower average total costs in producing toms can be explained by two facts. First, certain variable inputs did not change due to sex of bird and more pounds of meat were marketed when toms were raised. Second, fixed costs were lower for toms than hens because of more pounds marketed from toms.

Increased model size also reduced per unit costs of production for both hens and toms. Average total costs declined 0.78 cent per pound for toms and 1.28 cents for hens as size increased from 20,000 to 105,000 birds. For toms, 50 percent (0.39 cent) of the reduction in average total costs occurred

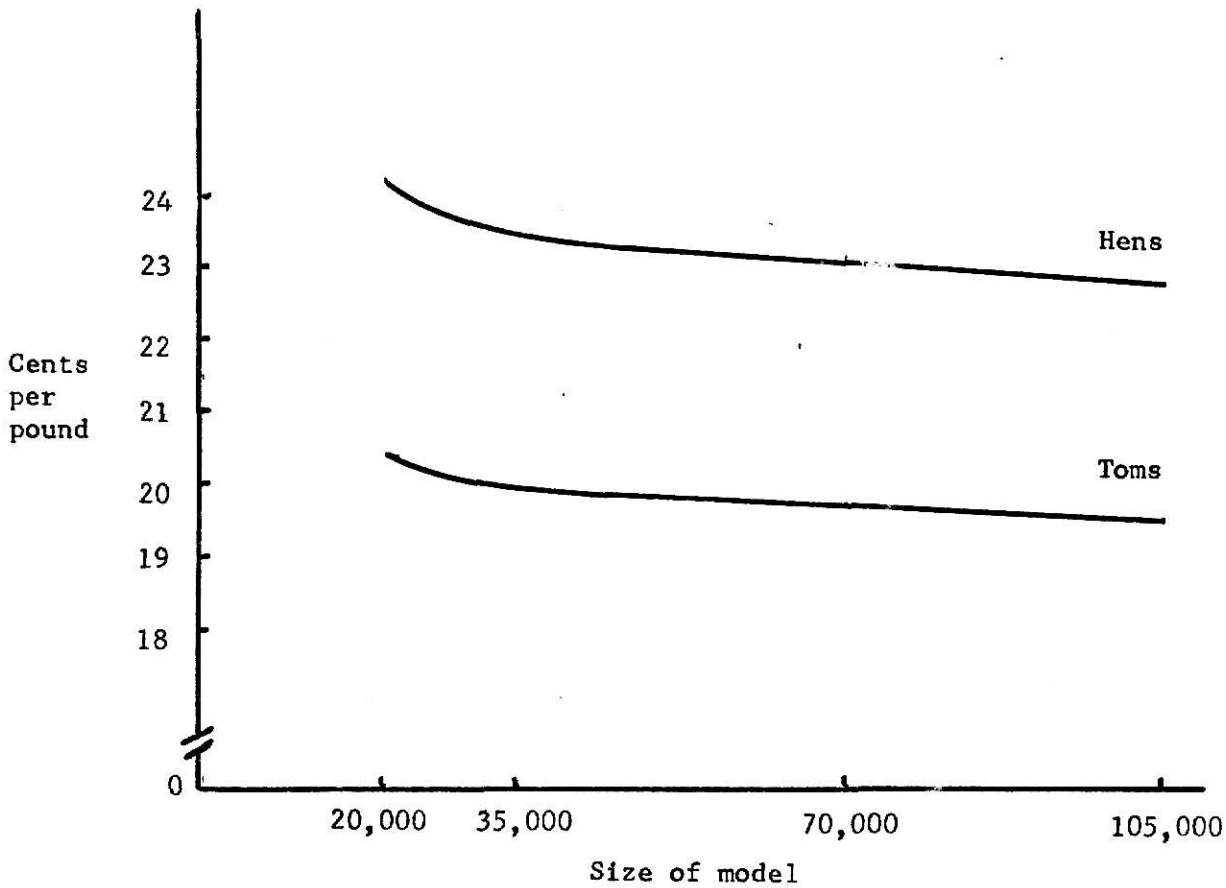


Figure 4.--Estimated average total costs of producing market turkeys, by flock sex and size of model, Kansas, 1968-69.

Source: Table 2.

between the 20,000 and 35,000-bird model. Approximately 31 percent (0.24 cent) reduction occurred between 35,000 and 70,000-birds and approximately 19 percent (0.15 cent) reduction occurred between 70,000 and 105,000 birds per year. Likewise, for hens 51 percent (0.65 cent) of the total per unit cost decrease occurred between 20,000 and 35,000 birds, 30 percent occurred between 35,000 and 70,000 birds, and 20 percent occurred between 70,000 and 105,000 birds per year.

Analysis of Variable and Fixed Cost Components

Average variable and fixed costs, by components and size of model, were estimated for tom and hen turkeys. Total variable and fixed costs for hens and toms are shown in Appendix C, Tables 41 and 43.

Tom turkeys

Table 3 shows average variable and fixed costs, by components, of producing tom turkeys in relation to model size. Average variable costs ranged from 18.26 cents for 20,000 birds to 18.05 cents per pound for 105,000 birds. Hence, a 0.21 cent per pound reduction occurred as size of model increased.

Table 4 shows the percentage distribution of average variable cost items. Variable costs were 89.90 percent of total average cost for 20,000 birds, and 92.43 percent for 105,000 birds.

Feed formed the largest expense item for any model size. It was 12.44 cents per pound for each model (see Table 3). As a percentage of total costs, feed cost increased from 61.25 percent (20,000 birds) to 63.70 percent (105,000 birds) (see Table 4). This occurred since feed costs held constant while average total costs declined with the increase in model size.

Poults ranked second among production expenses. Cost per pound ranged from 3.14 cents for 20,000 birds to 2.96 cents for 105,000 birds (see Table

TABLE 3. Estimated average variable and fixed costs, by components, of producing tom turkeys[a], by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Cents per pound			
Average variable costs				
Poults	3.14	3.11	3.04	2.96
Feed	12.44	12.44	12.44	12.44
Grit	0.02	0.02	0.02	0.02
Medications	0.58	0.58	0.58	0.58
Poult insurance	0.29	0.29	0.29	0.28
Litter	0.40	0.39	0.39	0.39
Fuel and electricity	0.23	0.23	0.23	0.23
Supplies	0.09	0.09	0.09	0.09
Labor	0.41	0.41	0.41	0.41
Interest[b]	0.66	0.66	0.66	0.65
Total	18.26	18.22	18.15	18.05
Average fixed costs				
Depreciation	1.05	0.88	0.79	0.76
Insurance	0.10	0.08	0.07	0.07
Property taxes	0.14	0.11	0.10	0.10
Repairs and maintenance	0.32	0.26	0.23	0.22
Interest[c]	0.44	0.37	0.34	0.33
Total	2.05	1.70	1.53	1.48
Average total costs	20.31	19.92	19.68	19.53

[a]Based on 12 percent total flock mortality.

[b]On operating capital.

[c]On fixed investment.

Source: Appendix C, Table 41.

TABLE 4. Percentage distribution of total costs, by components, of producing tom turkeys[a], by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Percent of total costs			
Average variable costs				
Poults	15.46	15.61	15.48	15.16
Feed	61.25	62.45	63.21	63.20
Grit	0.10	0.10	0.10	0.10
Medications	2.85	2.91	2.94	2.97
Poult insurance	1.43	1.46	1.47	1.43
Litter	1.97	1.96	1.98	2.00
Fuel and electricity	1.13	1.15	1.17	1.18
Supplies	0.44	0.45	0.45	0.46
Labor	2.02	2.06	2.08	2.10
Interest[b]	3.25	3.31	3.35	3.33
Total	89.90	91.46	92.23	92.43
Average fixed costs				
Depreciation	5.17	4.42	4.01	3.89
Insurance	0.49	0.40	0.35	0.35
Property taxes	0.69	0.55	0.51	0.51
Repairs and maintenance	1.58	1.31	1.17	1.13
Interest[c]	2.17	1.86	1.73	1.69
Total	10.10	8.54	7.77	7.57
Average total costs	100.00	100.00	100.00	100.00

[a]Based on 12 percent total flock mortality.

[b]On operating capital.

[c]On fixed investment.

Source: Appendix C, Table 41.

3). Since total pounds marketed was proportional to all model sizes, this reduction reflects economies of scale due to discount buying of large quantities of poults.

Poult cost was 15.46 percent of total average costs for 20,000 birds and increased slightly to 15.61 percent for the 35,000-bird model. This change can be explained by noting the decrease in per unit poult cost was not as great as the decrease in total per unit cost between the 20,000 and 35,000-bird models. In the 70,000 and 105,000 model sizes, poult cost as a percent of average total costs decreased.

All other variable cost items amounted to 2.68 cents per pound for 20,000 birds and 2.65 cents for 105,000 birds (see Table 3). This fact denotes nearly constant proportionality of cost items such as; grit, medications, poult insurance, litter, fuel and electricity, supplies, labor, and interest on operating capital. In relation to percentage distribution of total average costs, these costs ranged from 13.19 percent (20,000 birds) to 13.57 percent (105,000 birds) (see Table 4). The explanation for feed costs also applies here.

Total average fixed costs for toms ranged from 2.05 cents for 20,000 birds to 1.48 cents per pound for 105,000 birds, a decrease of 0.57 cent (see Table 3). Depreciation was the largest fixed cost item for all sizes. It accounted for 5.17 percent of average total cost for the 20,000-bird model and declined to 3.89 percent for 105,000 birds (see Table 4). This component accounted for slightly over half of fixed costs. Other fixed costs in order of importance, were interest on fixed investment, repairs and maintenance, property taxes, and insurance.

Hen turkeys

Table 5 shows average variable and fixed costs, by components, of producing hen turkeys in relation to model size. Average variable costs ranged from 20.50 cents per pound for 20,000 birds to 20.15 cents for 105,000 birds. Average fixed costs were 3.37 cents and 2.44 cents per pound for respective model sizes.

Table 6 shows the percentage distribution of total costs, by components, by size of model.

Again, feed was the largest cost component of all models synthesized. Feed amounted to 12.86 cents per pound for all models. As a percentage of the total feed costs ranged from 53.88 percent for 20,000 birds to 56.93 percent for 105,000 birds. As before, feed cost was a greater percentage as model size increased since feed cost per pound remained constant while average total cost decreased.

Poult cost for hens followed the same pattern established by toms. Cost per pound ranged from 3.73 cents to 3.43 cents as size increased from 20,000 to 105,000 birds.

All other variable cost components made up 3.91 cents per pound at the 20,000-bird size and 3.86 cents per pound at the 105,000-bird size. Average variable costs accounted for 85.89 percent of average total costs. Grit, medications, poult insurance, litter, fuel and electricity, supplies, labor, and interest on operating capital were 16.08 percent of total costs for 20,000 birds. Likewise, of the 89.20 percent comprising average variable costs for 105,000 birds, 17.09 percent was due to "other" variable cost items.

TABLE 5. Estimated average variable and fixed costs, by components, of producing hen turkeys[a], by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Cents per pound			
Average variable costs				
Poults	3.73	3.68	3.57	3.43
Feed	12.86	12.86	12.86	12.86
Grit	0.02	0.02	0.02	0.02
Medications	0.95	0.95	0.95	0.95
Poult insurance	0.36	0.36	0.36	0.34
Litter	0.65	0.64	0.64	0.64
Fuel and electricity	0.37	0.37	0.37	0.37
Supplies	0.14	0.14	0.14	0.14
Labor [b]	0.68	0.67	0.67	0.67
Interest	0.74	0.74	0.73	0.73
Total	20.50	20.43	20.31	20.15
Average fixed costs				
Depreciation	1.72	1.43	1.30	1.25
Insurance	0.16	0.13	0.12	0.11
Property taxes	0.23	0.19	0.17	0.17
Repairs and maintenance	0.53	0.43	0.38	0.37
Interest[c]	0.73	0.61	0.56	0.54
Total	3.37	2.79	2.53	2.44
Average total costs	23.87	23.22	22.84	22.59

[a] Based on five percent total flock mortality.

[b] On operating capital.

[c] On fixed investment.

Sources: Appendix C, Table 43.

TABLE 6. Percentage distribution of total costs, by components, of producing hen turkeys[a], by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
		Percent of total costs		
Average variable costs				
Poults	15.63	15.85	15.64	15.18
Feed	53.88	55.38	56.30	56.93
Grit	0.08	0.09	0.09	0.09
Medications	3.98	4.09	4.16	4.21
Poult insurance	1.51	1.55	1.58	1.51
Litter	2.72	2.76	2.80	2.83
Fuel and electricity	1.55	1.59	1.62	1.64
Supplies	0.59	0.60	0.61	0.62
Labor	2.85	2.88	2.93	2.97
Interest[b]	3.10	3.19	3.20	3.23
Total	85.89	87.98	88.93	89.20
Average fixed costs				
Depreciation	7.20	6.16	5.69	5.53
Insurance	0.67	0.56	0.53	0.49
Property taxes	0.96	0.82	0.74	0.75
Repairs and maintenance	2.22	1.85	1.66	1.64
Interest[c]	3.06	2.63	2.45	2.39
Total	14.11	12.02	11.07	10.80
Average total costs	100.00	100.00	100.00	100.00

[a]Based on five percent total flock mortality.

[b]On operating capital.

[c]On fixed investment.

Source: Appendix C, Table 43.

Total average fixed costs for hens ranged from 3.37 cents to 2.44 cents per pound as size increased from 20,000 to 105,000 birds (see Table 5). Again, depreciation accounted for slightly over half of fixed costs and ranged from 7.20 percent (20,000 birds) to 5.53 percent (105,000 birds) of average total costs (see Table 6).

Average fixed costs in producing hens were greater than those incurred in producing toms. This can be explained in relation to total fixed costs. The total dollar amount of fixed costs was the same in producing toms and hens. Hence with fewer pounds of hens marketed it automatically follows that average fixed costs were higher. As Table 6 shows, average fixed costs as a percentage of total costs were higher than the corresponding percentage for toms, irregardless of model size.

Factors Accounting for Economies of Scale

Table 7 shows cost differences and the percentage distribution of cost items that account for economies of scale between the 20,000 and 105,000-bird models, by flock sex. Figures 5 and 6 illustrate the relative importance of items contributing to cost differences between the smallest and largest model.

Cost components which accounted for cost differences in producing toms included all fixed costs and four variable cost items--poults, interest on operating capital, poult insurance, and litter. The total difference amounted to 0.78 cent per pound. For hens, all fixed costs and the previously-mentioned four variable cost items plus labor, accounted for the cost difference of 1.28 cents per pound between sizes (see Table 7).

Depreciation was the largest cost item that contributed to economies of scale for both toms and hens. It accounted for 37.18 and 36.72 percent of

total economies, respectively (see Table 7). Additional pieces of machinery and equipment such as the manure spreader, tractor blade and loader, sprayers, turkey loaders, turkey trailer, incinerator, debeaker and tractors were not required when model size increased. Some items which did require a larger investment were provided at a rate that was not proportional to the increase in model size.

Poults ranked second in cost items affecting economies of scale in producing hens and toms. Depreciation and poults together accounted for approximately 60 percent of total economies. Interest on fixed investment and repairs and maintenance were nearly equal in relative importance, 14 percent and 12 percent, respectively. Again, investment did not increase proportionally to size of model. The remaining two fixed cost items, property taxes and insurance, accounted for 8.98 percent of the economies in producing toms and 8.60 percent in producing hens. In total, these six items accounted for 96.16 percent and 96.88 percent of economies of scale for toms and hens, respectively (see Table 7).

Feed Conversion Efficiency and Feed Costs to Produce Market Turkeys as Related to Sex

As shown previously, feed cost was the largest expense incurred in market turkey production. An important aspect of production is feed conversion efficiency. It may be defined as the total quantity of feed required to produce one pound of turkey, liveweight. Thus, if feed conversion can be improved (that is, less feed and more pounds of turkey) costs of production will decrease more rapidly than if any other cost item is reduced because feed cost is a large proportion of total costs.

TABLE 7. Cost differences and percentage distribution of cost items that account for economies of scale between the 20,000 and 105,000 bird models, by flock sex[a], Kansas, 1968-69.

Item	Sex of flock			
	Toms		Hens	
	Cents per pound	Percent	Cents per pound	Percent
Depreciation	0.29	37.18	0.47	36.72
Poults[b]	0.18	23.08	0.30	23.44
Interest[b]	0.11	14.10	0.19	14.84
Repairs and maintenance	0.10	12.82	0.16	12.50
Property taxes	0.04	5.13	0.06	4.69
Insurance[c]	0.03	3.85	0.05	3.91
Interest[c]	0.01	1.28	0.01	0.78
Poult insurance	0.01	1.28	0.02	1.56
Litter	0.01	1.28	0.01	0.78
Labor	-	-	0.01	0.78
Total	0.78	100.00	1.28	100.00

[a]Total flock mortality was 12 percent for toms and five percent for hens.

[b]On fixed investment.

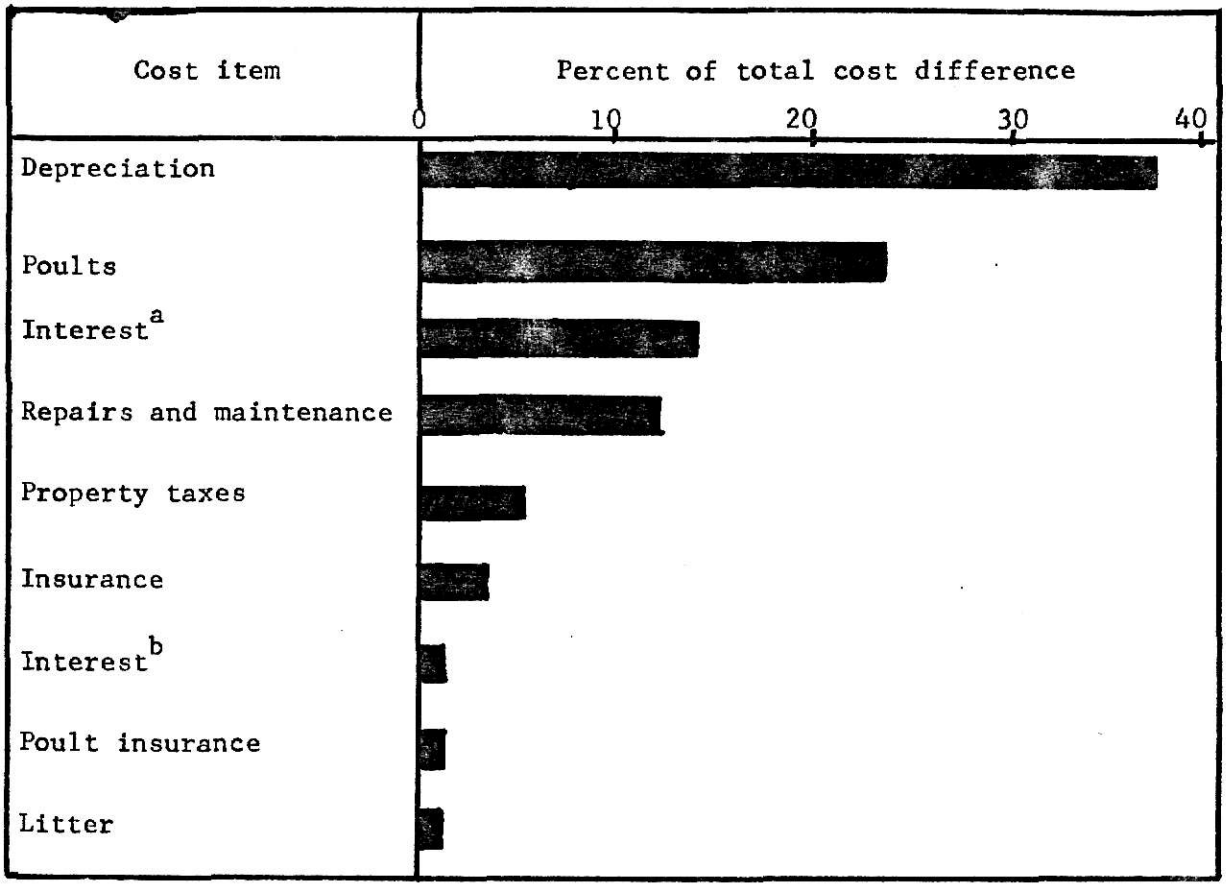
[c]On operating capital.

Sources: Tables 3 and 5.

Feed conversion efficiency and total feed required per market turkey were affected by three interrelated variables besides sex of bird. These variables were age when birds were marketed, average weight of birds, total flock mortality and its distribution over the growing period.

Table 8 shows feed conversion efficiency and feed costs of producing tom and hen turkeys under semiconfinement. Toms were marketed at 24 weeks of age, averaged 26.2 liveweight pounds, and total flock mortality was 12 percent. Under these assumptions, 3.39 pounds of feed were required per pound of gain. A total of 88.88 pounds of feed were required per turkey sold. Feed cost per

Figure 5.--Percentage distribution of cost items in producing tom turkeys that account for economies of scale between the 20,000 and 105,000-bird models, Kansas, 1968-69.

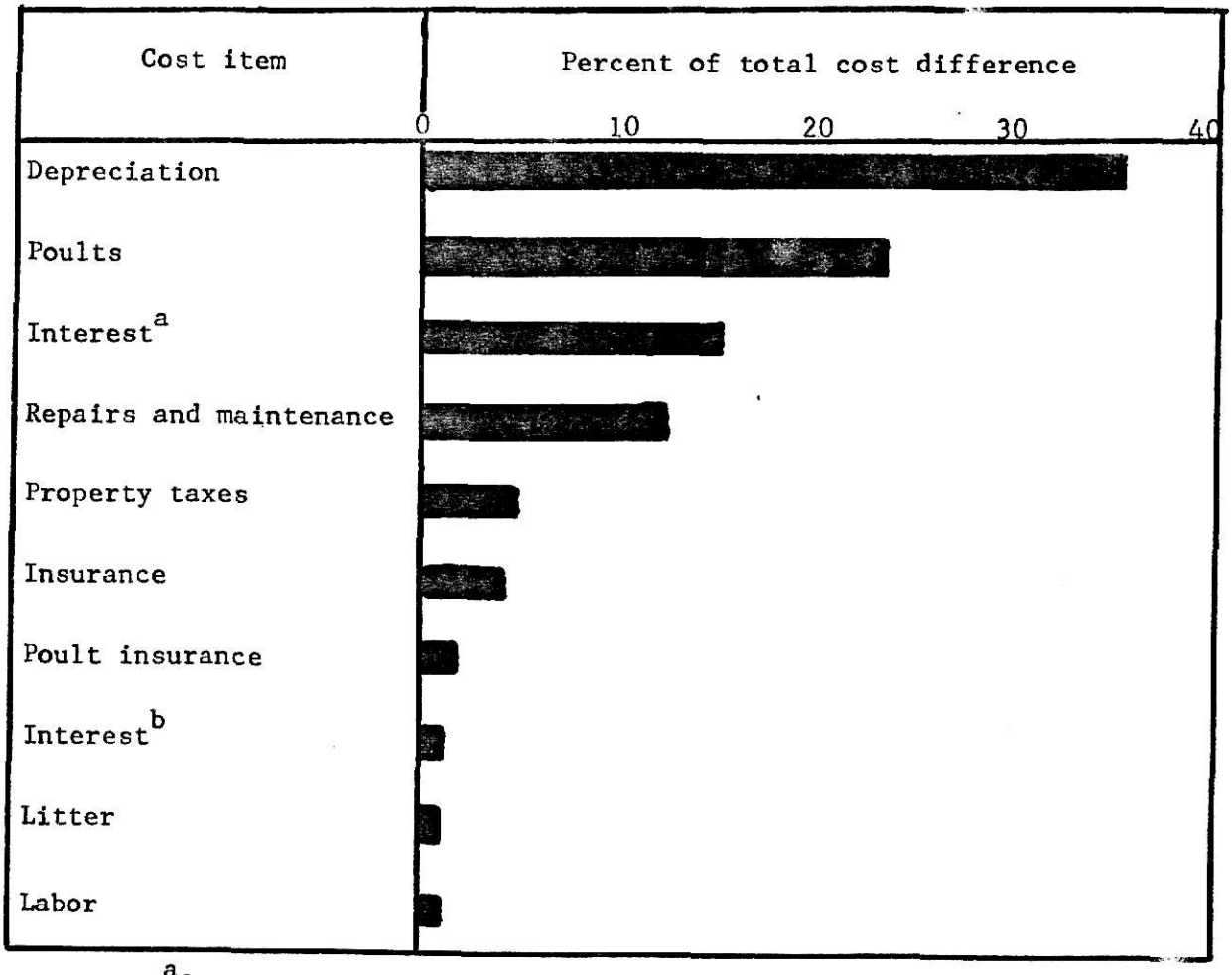


[a]On fixed investment.

[b]On operating capital.

Source: Table 7.

Figure 6.--Percentage distribution of cost items in producing hen turkeys that account for economies of scale between the 20,000 and 105,000-bird models, Kansas, 1968-69.



[a]On fixed investment.

[b]On operating capital.

Source: Table 7.

TABLE 8. Feed conversion efficiency and feed costs of producing market turkeys[a], 20,000 birds per year, by flock sex, Kansas, 1968-69.

Flock sex	Feed required		Feed cost	
	Per pound of gain	Per turkey sold	Per ton	Per pound of turkey sold
	Pounds	Pounds	Dollars	Cents
Toms[b]	3.39	88.88	73.34	12.44
Hens[c]	3.34	49.42	77.01	12.86

[a]Toms were marketed at 24 weeks and averaged 26.2 pounds; hens were marketed at 20 weeks and averaged 14.8 pounds.

[b]Total flock mortality was 12 percent.

[c]Total flock mortality was five percent.

Sources: Appendix C, Tables 28, 30, 41, and 43.

ton was $73.34 and was computed by dividing total feed cost by tons of feed consumed. This was a "true" cost per ton because it reflected the amount of feed lost through flock mortality. Feed cost per pound of turkey sold was obtained by dividing total feed expenditures by total pounds of turkey produced. For toms, cost per pound of turkey sold was 12.44 cents.

Hens were marketed at 20 weeks of age and averaged 14.8 pounds, liveweight. Table 8 also shows feed conversion efficiency and feed costs for hens. Feed required per pound of gain was 3.34 pounds and 49.42 pounds of feed were required per turkey sold. True feed cost per ton was $77.01 since a greater proportion of total feed consisted of more protein because hens were marketed at an earlier age than toms. Feed prices for higher protein rations were greater than rations with lower protein levels (see Appendix C, Table 25). Cost per pound of hen turkeys sold was 12.86 cents.

Feed Conversion and Feed Costs as Influenced by Mortality

The effect of mortality rate on feed conversion efficiency and feed costs of producing 20,000 tom turkeys per year is shown in Table 9. Four levels of mortality were assumed: 8, 10, 12, and 14 percent with age marketed and average market weight remaining constant.

As mortality rose from 8 to 14 percent, feed required per pound of gain increased 0.04 pound. Pounds of feed per turkey sold increased 0.95 pound.

True feed cost increased five cents per ton for each two percent increase in flock mortality. Likewise, for each two percent increase in mortality, cost per pound of turkey sold increased 0.05 cent, or .15 cent over the entire six percent range in mortality.

TABLE 9. Feed conversion efficiency and feed costs of producing tom turkeys[a], 20,000-birds per year, by mortality rate, Kansas, 1968-69.

Mortality rate	Feed required		Feed cost	
	Per pound of gain	Per turkey sold	Per ton	Per pound of turkey sold
Percent	Pounds	Pounds	Dollars	Cents
8	3.37	88.26	73.24	12.34
10	3.38	88.57	73.29	12.39
12	3.39	88.88	73.34	12.44
14	3.41	89.21	73.39	12.49

[a] Toms were marketed at 24 weeks and averaged 26.2 pounds.

Sources: Appendix C, Tables 26, 27, 28, and 29.

The difference of 0.15 cent per pound of turkey sold was larger than every item associated with economies of scale except depreciation and poults (see Table 7). Hence, management efforts to hold down mortality can affect production costs to a greater degree than increasing firm size within a given range of mortality.

An analysis of Table 10 and Figure 7 brings out the point just mentioned. At eight percent flock mortality for 20,000 tom turkeys per year, per unit production costs were lower than those of 35,000 birds at 12 and 14 percent mortality. Similarly, at eight percent flock mortality production costs for 35,000 birds were lower than those at 12 and 14 percent mortality for both the 70,000-bird and the 105,000-bird models. Finally, costs per pound to produce 70,000 birds at eight percent mortality were lower than costs for 105,000 birds at 10, 12, and 14 percent mortality.

As mortality increased from eight to 14 percent, average total costs of production for each model increased slightly more than three percent. Per unit costs ranged from 19.88 cents to 20.54 cents per pound as mortality increased from eight to 14 percent for 20,000 birds. A range of 19.14 cents to 19.74 cents per pound occurred under similar conditions for 105,000 birds. Intermediate sizes fell within this range (see Table 10).

As mentioned on page 54, costs per pound of turkey sold decreased 0.05 cent as mortality decreased two percent. For all model sizes, reduction of cost per pound was attributable to other factors of production. Most of this reduction came from reduced average fixed costs since more pounds of turkey were sold when mortality declined.

TABLE 10. Estimated average total costs of producing tom turkeys[a], by mortality rate and size of model, Kansas, 1968-69.

Mortality rate	Size of model			
	20,000	35,000	70,000	105,000
Percent	Cents per pound			
8	19.88	19.50	19.28	19.14
10	20.09	19.70	19.47	19.33
12	20.31	19.92	19.68	19.53
14	20.54	20.13	19.89	19.74

[a]Toms were marketed at 24 weeks and averaged 26.2 pounds.

Sources: Appendix C, Tables 39, 40, 41, and 42.

Costs to Produce Turkeys as Influenced by Feed Prices

The effect on production costs of varying feed prices 10 percent above or below the computed price is shown in Table 11.[22] In this analysis, regardless of feed price, mortality was 12 percent and no adjustments were made in market age because feed cost could influence length of time birds were fed.

For 20,000 birds when the base feed price was used, average cost to produce tom turkeys was 20.31 cents per pound. A 10 percent drop in feed price reduced production cost 1.29 cent per pound to 19.02 cents. When the price of feed increased 10 percent, average production cost increased 1.29 cent per pound to 21.60 cents. Thus, average cost of production varied 6.35 percent as feed price varied 10 percent up or down from the base price. The 105,000-bird model had the same cents per pound difference but average production cost varied 6.60 percent.

[22]The computed price for feed was determined in a manner described in Chapter II, page 23. No attempt was made to identify ingredients that contributed to an increase or decrease. For each ration a price was formulated, (see Appendix C, Table 21) and then each ration was adjusted to make a 10 percent up or down variation in price.

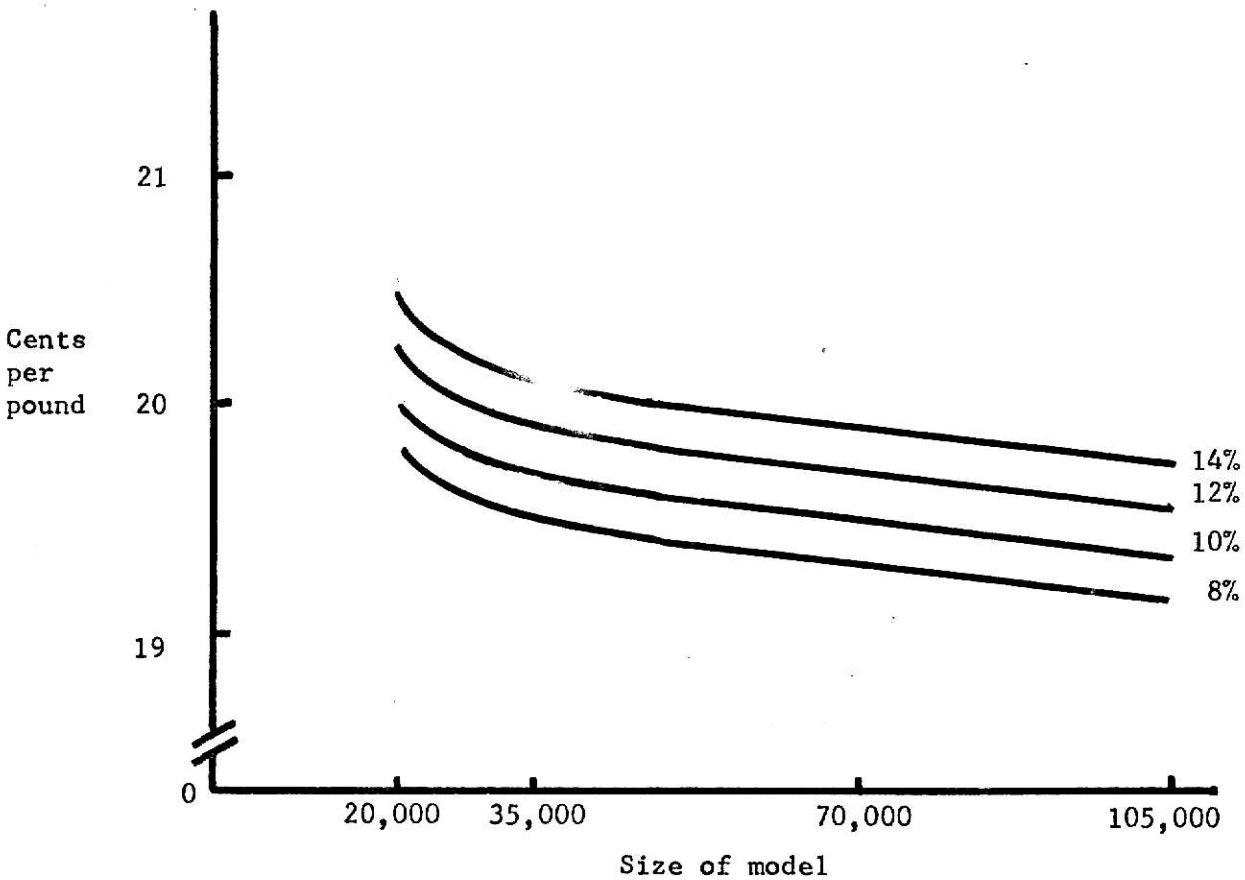


Figure 7.--Estimated average total costs of producing tom turkeys, by mortality rate and size of model, Kansas, 1968-69.

Source: Table 10.

Costs of Production as Related to Percentage of Capacity Utilized

Average costs of producing tom turkeys were related to utilization of annual production capacity for each model size (see Table 12). Average total costs were budgeted for 25, 50, 75, and 100 percent of annual capacity. Because different size broods were placed for each model, a hypothetical system of placing various sizes of broods was formulated. The combination and size of broods were designed to reduce the number of broods placed per year and still not exceed any recommended budget standards. For example, the 20,000-bird model at 25 percent capacity was 5,000 birds. In this case only one 5,000-bird brood was placed annually. For a complete description of the number and sizes of broods placed annually to obtain the proper percentage of capacity for each model, see Appendix A, Table 16.

Connecting the average total costs that represented each level of capacity for each model size provided short-run average cost curves (see Figure 8). These curves are short-run cost curves since the time period in which they occur is too short to allow management to adjust scale of plant. However, within this time period, the number of poults placed can be changed.

Figure 8 shows the shape of the short-run average total cost curves for the four production models. Short run costs declined sharply as utilization of annual capacity for any model increased from 25 to 100 percent.

The average cost of producing turkeys at 25 percent of capacity in the 20,000-bird model, or raising 5,000 birds, was 25.75 cents per pound. Average total costs decreased 5.44 cents per pound as capacity utilized increased to 100 percent. The cost difference between 25 and 100 percent of capacity for 35,000 birds was 4.69 cents per pound. As model size increased the difference

TABLE 11. Estimated average total costs of producing tom turkeys[a], by feed price and size of model, Kansas, 1968-69.

Feed price	Size of model			
	20,000	35,000	70,000	105,000
	Cents per pound			
10 percent below	19.02	18.62	18.39	18.24
Computed (base price)	20.31	19.92	19.68	19.53
10 percent above	21.60	21.20	20.97	20.82

[a]Toms were marketed at 24 weeks and averaged 26.2 pounds; total flock mortality was 12 percent.

Sources: Appendix C, Tables 41, 44, and 45.

TABLE 12. Estimated average total costs of producing tom turkeys[a], percentage of capacity utilized and size of model, Kansas, 1968-69.

Capacity utilized	Size of model			
	20,000	35,000	70,000	105,000
Percent	Cents per pound			
25	25.75	24.61	23.85	23.55
50	22.28	21.52	21.09	20.91
75	20.88	20.47	20.16	20.02
100	20.31	19.92	19.68	19.53

[a]Total flock mortality was 12 percent.

Sources: Appendix C, Tables 41, 46, 47, 48, and 49.

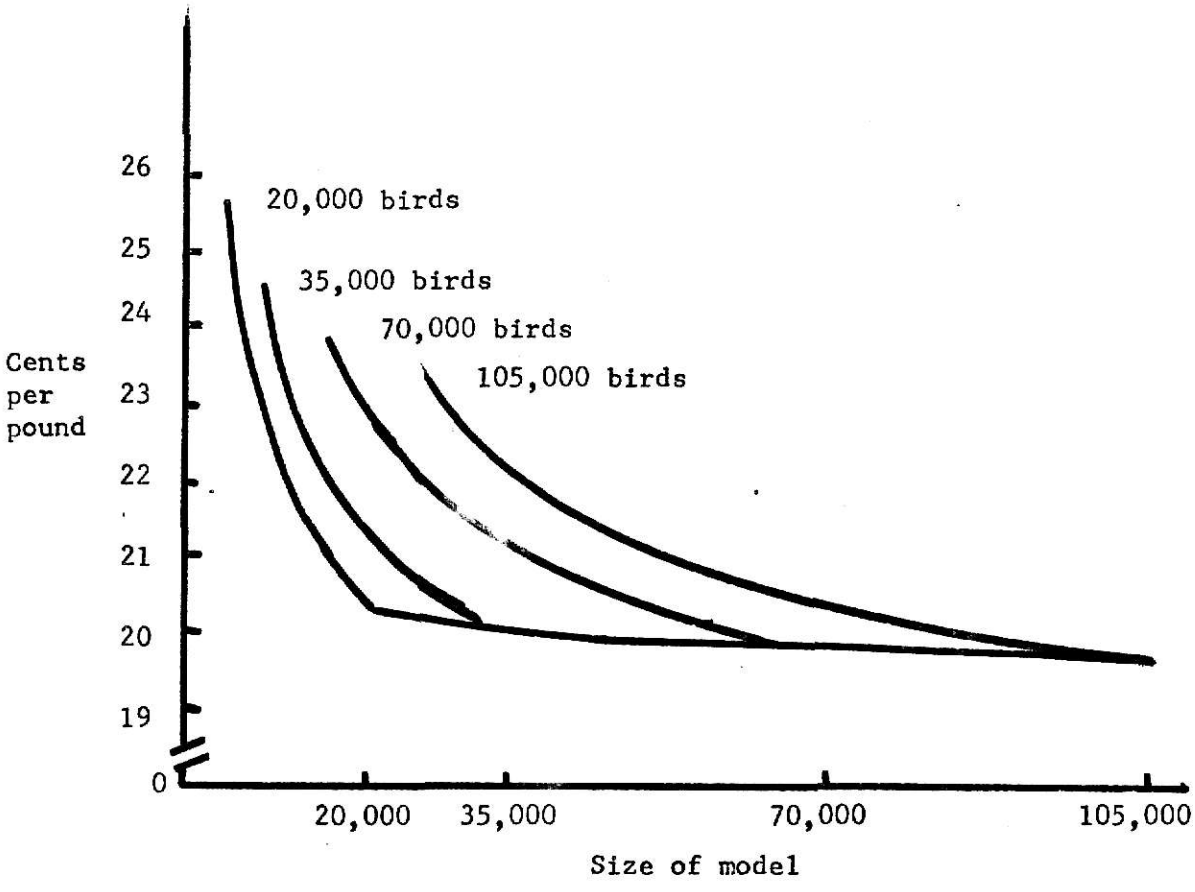


Figure 8.--Estimated average total costs of producing tom turkeys, by size of model, and percentage of capacity utilized, Kansas, 1968-69.

Source: Table 12.

gradually decreased and was 4.02 cents per pound for 105,000 birds (see Table 12).

As the steepness of the short run average cost curves in Figure 8 shows, the most substantial cost decline for each model occurred when utilization of capacity increased from 25 to 50 percent. Curves were characterized by a smaller slope as degree of utilization increased. Also, short-run average cost curves showed less slope as size of model increased. This fact can be explained in the relation of fixed costs to total costs. Total fixed costs do not increase proportionally with size of model; thus average fixed costs make up a smaller percentage of average total costs at larger sizes.

The long-run average total cost curve is represented by the horizontal smooth line drawn tangent to the short-run average cost curves at points of 100 percent capacity. Theoretically this relationship can be derived by a curve tangent to the lower portion of an infinite number of short-run average cost curves. However, with the limited number of short run average cost curves, as in this analysis, the economies of scale curve was approximated.

This envelope curve represented the minimum cost of production in the long run after a firm has had time to build any desired size of plant. Average total costs dropped 0.78 cent per pound as size of model increased from 20,000 to 105,000 birds and 50 percent (0.39 cent) of the decrease occurred between the 20,000 and 35,000-bird models.

CHAPTER V

SUMMARY AND CONCLUSIONS

If market turkey production is to expand in Kansas, entrepreneurs will need sound, up-to-date information concerning economics of production. Many small producers left the industry when profit margins became very low and small volumes of output provided insufficient income. In this age of specialization, firm size has increased resulting in a larger volume of output at lower costs. Any new production technique, such as semiconfinement rearing, needs to be analyzed so decisions can be made as to its economic feasibility. This study focuses on the semiconfinement method of rearing market turkeys.

Objectives of this study were: (1) to estimate total capital investment in land, buildings, machinery, and equipment to produce market turkeys in relation to size of operation; (2) to estimate per unit costs of producing market turkeys in relation to size of operation, flock sex, and degree of utilization of production facilities; (3) to analyze variable and fixed cost items of producing market turkeys; (4) to identify and determine the relative importance of factors contributing to economies of scale; and (5) to analyze the influence of feed prices and flock mortality upon costs of production.

Data were obtained from producers, industry trade journals, extension personnel, and research publications. These data were used in synthesizing various model sizes and costs of production. Capital investment in land, buildings, machinery, and equipment was calculated using recommended budget standards.

Budget coefficients for medications, labor, fuel and electricity, litter, supplies, and mortality rates were based on empirical data reported by producers. A mortality rate of 12 percent for toms and five percent for hens was

used in budgeting. Feed consumption rates, weekly gain in weight by birds, and average liveweight of birds at market age were based on annual feeding trials at Cornell University. The source of prices of feed ingredients was Agricultural Prices, Annual Summary, 1968 (U.S.D.A.) and commercial feed dealers in Northeast Kansas during 1969. Prices for other variable cost items (litter, poult insurance, and grit) were based on current market prices effective during 1969. The price of mixed poults was a simple average of monthly prices reported in Agricultural Prices, Annual Summary, 1968. Toms were 10 cents higher than the computed price for mixed poults while hens were priced 10 cents lower.

The size of each synthesized model was determined by the number of broods which were placed, grown, and marketed annually using a predetermined complement of brooding and growing houses. The limit on brooder house capacity was 7,500 poults placed at one time. During the months of August, September, and October only 5,000 poults were placed. This practice was necessary to allow total confinement of birds in the growing house during winter months.

Four model sizes were synthesized: 20,000, 35,000, 70,000, and 105,000 birds annually. Capital investment and production costs were determined for these models.

Capital investment for the 20,000-bird model was $62,135, or $3.11 per poult. A total of $240,324, or $2.29 per poult was required for 105,000 birds.

Variable costs were estimated for all models and included poults, feed, grit, medications, poult insurance, litter, fuel and electricity, supplies, labor, and interest on operating capital. Fixed costs were based on capital investment and included depreciation on buildings, machinery, and equipment;

property taxes on real and personal property; insurance on buildings, machinery, and equipment plus general farm liability; repairs and maintenance on buildings, machinery, and equipment; and interest on fixed investment.

Average total costs of producing tom turkeys ranged from 20.31 cents per pound for 20,000 birds to 19.53 cents for 105,000 birds. For hens, costs ranged from 23.87 cents to 22.59 cents for corresponding sizes.

Feed formed the largest cost item for any model size in the production of both toms and hens. For 20,000 toms feed cost was 12.44 cents per pound, or 61.25 percent of total costs. This cost remained constant for all models. Feed cost as a percentage of total costs increased with model size. For hens, cost per pound for feed amounted to 12.86 cents with feed comprising 53.88 percent of total costs.

Poults ranked second as a production expense item for toms and hens. Poult cost per pound of turkey sold ranged from 3.14 cents to 2.96 cents for toms as size of model increased from 20,000 to 105,000 birds. Hens followed a similar pattern. Poult cost per pound amounted to 3.73 cents (20,000 hens) and decreased to 3.43 cents (105,000 hens).

Feed and poults together accounted for 76.71 percent (toms) and 69.46 percent (hens) of average total costs in producing 20,000 birds per year. For 105,000 birds, the percentages amounted to 78.86 percent (toms) and 72.11 percent (hens).

Average variable costs to produce tom turkeys ranged from 18.26 cents per pound (20,000 birds) to 18.05 cents (105,000 birds). Average variable costs for hens were higher than for toms and ranged from 20.50 cents per pound (20,000 birds) to 20.15 cents (105,000 birds). As size of model increased, variable costs accounted for a higher proportion of total costs for both toms and hens.

Average fixed costs for toms ranged from 2.05 cents per pound (20,000 birds) to 1.48 cents (105,000 birds). For hens, average fixed costs of production were higher than for toms and ranged from 3.37 cents per pound (20,000 birds) to 2.44 cents (105,000 birds).

The largest fixed cost item for both sexes was depreciation at all model sizes. Costs ranged from 1.05 cents per pound to 0.76 cent for 20,000 and 105,000 tom turkeys, respectively. Depreciation decreased from 5.17 percent to 3.89 percent of average total costs as model size increased from 20,000 to 105,000 birds.

The remaining fixed cost items, in order of size, were: interest on fixed investment, repairs and maintenance, property taxes, and insurance for both toms and hens at all model sizes.

A decline in per unit production cost from the smallest to the largest model indicated certain economies of scale existed for both toms and hens. For toms, 50 percent of the cost decrease of 0.78 cent per pound occurred between 20,000 and 35,000 birds. For hens, average total costs decreased 1.28 cents per pound, and 50.78 percent of this decrease likewise occurred between the same size of models. Greater economies were associated with the production of hens than toms. This reflected primarily the greater pounds of tom turkeys sold in relation to fixed costs.

Items contributing to economies of scale were identified in both tom and hen turkey production. Depreciation was the largest item contributing to total economies. This item accounted for approximately 37 percent of the total in producing both hens and toms. Poults ranked second for both sexes with interest on fixed investment, repairs, and maintenance following in that order. Other items, in order of importance, were: taxes, insurance, interest

on operating capital, poult insurance and labor (hens only).

Feed conversion efficiency for toms was related to mortality level. As flock mortality increased from eight to 14 percent, feed required per pound of gain increased 0.04 pound, or 0.95 pound of feed per turkey sold. Feed cost per pound of turkey sold increased 0.15 cent as mortality rose from eight to 14 percent.

Average total costs per pound of toms marketed were affected by mortality. No analysis was made of the effect of mortality on costs of producing hens. Interest on operating capital varied in direct proportion to total feed cost. Total pounds of turkey sold directly influenced fixed cost items since these were unaffected by mortality. Also many variable cost items were a function of poults placed and not of pounds sold.

Average total costs increased 0.66 cent per pound when mortality increased from eight to 14 percent for the 20,000-bird model. Likewise, costs increased 0.60 cent per pound for 105,000 toms.

Costs of production were related to different feed prices in producing toms. Prices were allowed to vary 10 percent above and below a computed "base" feed price for each protein level. As a result, average total costs varied directly 1.29 cents per pound for all models.

For each model in producing tom turkeys per unit costs were estimated for 25, 50, 75, and 100 percent of capacity and represented short-run average cost curves. Average total costs declined 5.44 cents per pound as capacity utilized increased from 25 to 100 percent for the 20,000-bird model. A decrease of 4.05 cents per pound was noted for 105,000 birds. On the average, for all models, 65 percent of the decrease occurred between 25 and 50 percent of capacity utilized. And between 50 and 75 percent of capacity utilized,

over 20 percent of the decrease in average total costs occurred for all models.

Major conclusions of the study are: (1) economies of scale were slight for models larger than 35,000 market turkeys produced under semiconfinement; (2) sex of flock had considerable influence upon per unit production costs; (3) by controlling flock mortality through good management, smaller scale producers may achieve some economies comparable to those obtained by expansion in firm particularly when higher mortality offsets the advantage of larger size; and (4) variations in feed prices had considerable influence on production costs.

Estimated average costs to produce 20,000 tom turkeys in this study were 2.13 cents per pound higher than those in an earlier Kansas study (1965-66 price level) in producing two 10,000-bird flocks per year. In producing 100,000 toms or more annually, this cost difference dropped to 1.58 cent per pound. Production of hens under semiconfinement was also higher by approximately the same amounts as for toms. Two factors mainly accounted for the observed differences in costs: (1) the earlier study marketed more pounds of turkey reflecting one percent lower mortality, marketed a heavier breed of turkey, and had a two week longer feeding period. Toms averaged 30 pounds, 3.8 pounds more per bird than in this study, and (2) price levels in effect during 1968-69 were considerably higher than those of 1965-66.

Comparing total and per poult investment, semiconfinement rearing appeared to have an advantage over brooding and range-rearing from day-old poults at larger sizes. For example, at capacities of 100,000 or more birds, total investment was $240,324 ($2.29 per poult) while $259,580 ($2.60 per poult) was invested for brooding and range-rearing birds. However, at 20,000

birds per year, investment in semiconfinement rearing exceeded that of two 10,000-bird flocks which were brooded and range-reared. Total investment under semiconfinement rearing was $62,135 (or $3.11 per poult) as compared to $56,461 (or $2.82 per poult) for two 10,000-bird flocks which were brooded and range-reared.

Average variable and average fixed costs were higher in producing tom turkeys under semiconfinement for all models compared with similar size models under brooding and range-rearing day-old poults. However, total variable costs were lower for seniconfinement rearing. Total fixed costs were higher under semiconfinement but not by an amount equal to the difference in total variable costs of the two studies. Hence, total costs were lower for semi-confinement rearing. This method appears to have an advantage in per unit production costs over brooding and range-rearing day-old poults if equal pounds of turkey are sold.

The level of feed costs influenced by feed price could mean the difference between profit and loss in a low margin industry such as market turkey production. A 1.29 cent per pound reduction in average total costs amounts to 33.80 cents per bird. If 105,000 toms were raised, given 12 percent flock mortality, a total cost reduction of $31,231.20 was possible.

Expansion of market turkey production under semiconfinement rearing to 105,000 birds per year, other things being equal, can be justified in order to reduce costs of production.

Other factors should be considered in accepting semiconfinement rearing as a system of raising market turkeys. As land prices move upward, less land is required to produce an equal number of turkeys under semiconfinement. Labor requirements are reduced, as a result of automation allowed by concentration of a large number of birds into a smaller area.

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APPENDIX A

HYPOTHETICAL BROODING, GROWING, AND MARKETING SCHEDULES FOR MARKET TURKEYS

TABLE 13. Hypothetical time schedule for brooding, growing, and marketing tom turkeys, 20,000 birds per year[a], Kansas, 1969-72.

Date	Number of poults placed	Phase of production
Jan 6, 1969	7,500	Place in brooder house (1st brood)
Mar 3		Move poults to growing house (1st brood)
May 12	7,500	Place in brooder house (2nd brood)
June 23		Market birds (1st brood)
July 7		Move poults to growing house (2nd brood)
Sept 15	5,000	Place in brooder house (3rd brood)
Oct 27		Market birds (2nd brood)
Nov 10		Move poults to growing house (3rd brood)
Jan 19, 1970	7,500	Place in brooder house (4th brood)
Mar 2		Market birds (3rd brood)
Mar 16		Move poults to growing house (4th brood)
May 25	7,500	Place in brooder house (5th brood)
July 6		Market birds (4th brood)
July 20		Move poults to growing house (5th brood)
Sept 28	5,000	Place in brooder house (6th brood)
Nov 9		Market birds (5th brood)
Nov 23		Move poults to growing house (6th brood)
Feb 1, 1971	7,500	Place in brooder house (7th brood)
Mar 15		Market birds (6th brood)
Mar 29		Move poults to growing house (7th brood)
June 7	7,500	Place in brooder house (8th brood)
July 19		Market birds (7th brood)

TABLE 13. Continued.

Date	Number of poults placed	Phase of production
Aug 2		Move poults to growing house (8th brood)
Oct 11	5,000	Place in brooder house (9th brood)
Nov 22		Market birds (8th brood)
Dec 6		Move poults to growing house (9th brood)
Feb 14, 1972	7,500	Place in brooder house (10th brood)
Mar 27		Market birds (9th brood)
Apr 10		Move poults to growing house (10th brood)
June 19	7,500	Place in brooder house (11th brood)
July 31		Market birds (10th brood)
Aug 14		Move poults to growing house (11th brood)
Oct 23	5,000	Place in brooder house (12th brood)
Dec 4		Market birds (11th brood)
Dec 18		Move poults to growing house (12th brood)

[a]Brooding period of eight weeks with birds marketed at 24 weeks of age. This schedule allows for buildings to be empty at least two weeks so cleaning and other preparations for new birds can be accomplished.

TABLE 14. Hypothetical time schedule for brooding, growing, and marketing tom turkeys[a], 35,000 birds per year, Kansas, 1969-72.

Date	Number of poults placed	Phase of production
Jan 6, 1969	7,500	Place in brooder house (1st brood)
Mar 3		Move poults to growing house #1 (1st brood)
Mar 17	7,500	Place in brooder house (2nd brood)
May 12		Move poults to growing house #2 (2nd brood)
May 26	7,500	Place in brooder house (3rd brood)
June 23		Market birds (1st brood)
July 21		Move poults to growing house #1 (3rd brood)
Aug 4	5,000	Place in brooder house (4th brood)
Sept 1		Market birds (2nd brood)
Sept 29		Move poults to growing house #2 (4th brood)
Oct 13	5,000	Place in brooder house (5th brood)
Nov 10		Market birds (3rd brood)
Dec 8		Move poults to growing house #1 (5th brood)
Dec 22	7,500	Place in brooder house (6th brood)
Jan 19, 1970		Market birds (4th brood)
Feb 16		Move poults to growing house #2 (6th brood)
Mar 2	7,500	Place in brooder house (7th brood)
Mar 30		Market birds (5th brood)
Apr 27		Move poults to growing house #1 (7th brood)
May 11	7,500	Place in brooder house (8th brood)
June 8		Market birds (6th brood)
July 6		Move poults to growing house #2 (8th brood)

TABLE 14. Continued.

Date	Number of poults placed	Phase of production
July 20	7,500	Place in brooder house (9th brood)
Aug 17		Market birds (7th brood)
Aug 31		Move poults to growing house #1 (9th brood)
Sept 14	5,000	Place in brooder house (10th brood)
Oct 26		Market birds (8th brood)
Nov 9		Move poults to growing house #2 (10th brood)
Nov 23	7,500	Place in brooder house (11th brood)
Dec 21		Market birds (9th brood)
Jan 18, 1971		Move poults to growing house #1 (11th brood)
Feb 1	7,500	Place in brooder house (12th brood)
Mar 1		Market birds (10th brood)
Mar 29		Move poults to growing house #2 (12th brood)
Apr 12	7,500	Place in brooder house (13th brood)
May 10		Market birds (11th brood)
June 7		Move poults to growing house #1 (13th brood)
June 21	7,500	Place in brooder house (14th brood)
July 19		Market birds (12th brood)
Aug 16		Move poults to growing house #2 (14th brood)
Aug 30	5,000	Place in brooder house (15th brood)
Sept 27		Market birds (13th brood)
Oct 25		Move poults to growing house #1 (15th brood)
Nov 8	7,500	Place in brooder house (16th brood)
Dec 6		Market birds (14th brood)

TABLE 14. Continued.

Date	Number of poults placed	Phase of production
Jan 3, 1972		Move poults to growing house #2 (16th brood)
Jan 17	7,500	Place in brooder house (17th brood)
Feb 14		Market birds (15th brood)
Mar 13		Move poults to growing house #1 (17th brood)
Mar 27	7,500	Place in brooder house (18th brood)
Apr 24		Market birds (16th brood)
May 22		Move poults to growing house #2 (18th brood)
June 5	7,500	Place in brooder house (19th brood)
July 3		Market birds (17th brood)
July 31		Move poults to growing house #1 (19th brood)
Aug 14	5,000	Place in brooder house (20th brood)
Sept 11		Market birds (18th brood)
Oct 9		Move poults to growing house #2 (20th brood)
Oct 23	5,000	Place in brooder house (21st brood)
Nov 20		Market birds (19th brood)
Dec 18		Move poults to growing house #1 (21st brood)

[a]Brooding period of eight weeks with birds marketed at 24 weeks of age. This schedule allows for buildings to be empty at least two weeks so cleaning and other preparations for new birds can be accomplished.

TABLE 15. Hypothetical time schedule for brooding, growing, and marketing tom turkeys[a], 70,000 birds per year, Kansas, 1969-72.

Date	Number of poults placed	Phase of production
Jan 6, 1969	7,500	Place in brooder house #1 (1st brood)
Jan 13	7,500	Place in brooder house #2 (2nd brood)
Mar 3		Move poults to growing house #1 (1st brood)
Mar 10		Move poults to growing house #2 (2nd brood)
Mar 17	7,500	Place in brooder house #1 (3rd brood)
Mar 24	7,500	Place in brooder house #2 (4th brood)
May 12		Move poults to growing house #3 (3rd brood)
May 19		Move poults to growing house #4 (4th brood)
May 26	7,500	Place in brooder house #1 (5th brood)
June 2	7,500	Place in brooder house #2 (6th brood)
June 23		Market birds (1st brood)
June 30		Market birds (2nd brood)
July 21		Move poults to growing house #1 (5th brood)
July 28		Move poults to growing house #2 (6th brood)
Aug 4	5,000	Place in brooder house #1 (7th brood)
Aug 11	5,000	Place in brooder house #2 (8th brood)
Sept 1		Market birds (3rd brood)
Sept 8		Market birds (4th brood)
Sept 29		Move poults to growing house #3 (7th brood)
Oct 6		Move poults to growing house #4 (8th brood)
Oct 13	5,000	Place in brooder house #1 (9th brood)
Oct 20	5,000	Place in brooder house #2 (10th brood)

TABLE 15. Continued.

Date	Number of poults placed	Phase of production
Nov 10		Market birds (5th brood)
Nov 17		Market birds (6th brood)
Dec 8		Move poults to growing house #1 (9th brood)
Dec 15		Move poults to growing house #2 (10th brood)
Dec 22	7,500	Place in brooder house #1 (11th brood)
Dec 29	7,500	Place in brooder house #2 (12th brood)
Jan 19, 1970		Market birds (7th brood)
Jan 26		Market birds (8th brood)
Feb 16		Move poults to growing house #3 (11th brood)
Feb 23		Move poults to growing house #4 (12th brood)
Mar 2	7,500	Place in brooder house #1 (13th brood)
Mar 9	7,500	Place in brooder house #2 (14th brood)
Mar 30		Market birds (9th brood)
Apr 6		Market birds (10th brood)
Apr 27		Move poults to growing house #1 (13th brood)
May 4		Move poults to growing house #2 (14th brood)
May 11	7,500	Place in brooder house #1 (15th brood)
May 18	7,500	Place in brooder house #2 (16th brood)
June 8		Market birds (11th brood)
June 15		Market birds (12th brood)
July 6		Move poults to growing house #3 (15th brood)
July 13		Move poults to growing house #4 (16th brood)
July 20	7,500	Place in brooder house #1 (17th brood)

TABLE 15. Continued.

Date	Number of poults placed	Phase of production
July 27	7,500	Place in brooder house #2 (18th brood)
May 24		Market birds (21st brood)
May 31		Market birds (22nd brood)
June 21		Move poults to growing house #1 (25th brood)
June 28		Move poults to growing house #2 (26th brood)
July 5	7,500	Place in brooder house #1 (27th brood)
July 12	7,500	Place in brooder house #2 (28th brood)
Aug 2		Market birds (23rd brood)
Aug 9		Market birds (24th brood)
Aug 30		Move poults to growing house #3 (27th brood)
Sept 6		Move poults to growing house #4 (28th brood)
Sept 13	5,000	Place in brooder house #1 (29th brood)
Sept 20	5,000	Place in brooder house #2 (30th brood)
Oct 11		Market birds (25th brood)
Oct 18		Market birds (26th brood)
Nov 8		Move poults to growing house #1 (29th brood)
Nov 15		Move poults to growing house #2 (30th brood)
Nov 22	7,500	Place in brooder house #1 (31st brood)
Nov 29	7,500	Place in brooder house #2 (32nd brood)
Dec 20		Market birds (27th brood)
Dec 27		Market birds (28th brood)
Jan 17, 1972		Move poults to growing house #3 (31st brood)
Jan 24		Move poults to growing house #4 (32nd brood)

TABLE 15. Continued.

Date	Number of poults placed	Phase of production
Jan 31	7,500	Place in brooder house #1 (33rd brood)
Feb 7	7,500	Place in brooder house #2 (34th brood)
Aug 17		Market birds (13th brood)
Aug 24		Market birds (14th brood)
Sept 14		Move poults to growing house #1 (17th brood)
Sept 21		Move poults to growing house #2 (18th brood)
Sept 28	5,000	Place in brooder house #1 (19th brood)
Oct 5	5,000	Place in brooder house #2 (20th brood)
Oct 26		Market birds (15th brood)
Nov 2		Market birds (16th brood)
Nov 23		Move poults to growing house #3 (19th brood)
Nov 30		Move poults to growing house #4 (20th brood)
Dec 7	7,500	Place in brooder house #1 (21st brood)
Dec 14	7,500	Place in brooder house #2 (22nd brood)
Jan 4, 1971		Market birds (17th brood)
Jan 11		Market birds (18th brood)
Feb 1		Move poults to growing house #1 (21st brood)
Feb 8		Move poults to growing house #2 (22nd brood)
Feb 15	7,500	Place in brooder house #1 (23rd brood)
Feb 22	7,500	Place in brooder house #2 (24th brood)
Mar 15		Market birds (19th brood)
Mar 22		Market birds (20th brood)
Apr 12		Move poults to growing house #3 (23rd brood)

TABLE 15. Continued.

Date	Number of poults placed	Phase of production
Apr 19		Move poults to growing house #4 (24th brood)
Apr 26	7,500	Place in brooder house (25th brood)
Mar 3	7,500	Place in brooder house #2 (26th brood)
Feb 28		Market birds (29th brood)
Mar 6		Market birds (30th brood)
Mar 27		Move poults to growing house #1 (33rd brood)
Apr 3		Move poults to growing house #2 (34th brood)
Apr 10	7,500	Place in brooder house #1 (35th brood)
Apr 17	7,500	Place in brooder house #2 (36th brood)
May 8		Market birds (31st brood)
May 15		Market birds (32nd brood)
June 5		Move poults to growing house #3 (35th brood)
June 12		Move poults to growing house #4 (36th brood)
June 19	7,500	Place in brooder house #1 (37th brood)
June 26	7,500	Place in brooder house #2 (38th brood)
July 17		Market birds (33rd brood)
July 24		Market birds (34th brood)
Aug 14		Move poults to growing house #1 (37th brood)
Aug 21		Move poults to growing house #2 (38th brood)
Aug 28	5,000	Place in brooder house #1 (39th brood)
Sept 4	5,000	Place in brooder house #2 (40th brood)
Sept 25		Market birds (35th brood)

TABLE 15. Continued.

Date	Number of poults placed	Phase of production
Oct 2		Market birds (36th brood)
Oct 23		Move poults to growing house #3 (39th brood)
Oct 30		Move poults to growing house #4 (40th brood)
Nov 6	7,500	Place in brooder house #1 (41st brood)
Nov 13	7,500	Place in brooder house #2 (42nd brood)
Dec 4		Market birds (37th brood)
Dec 11		Market birds (38th brood)

[a]Brooding period of eight weeks with birds marketed at 24 weeks of age. This schedule allows for buildings to be empty at least two weeks so cleaning and other preparations for new birds can be accomplished.

TABLE 16. Number of broods placed and number of poults per brood at 25, 50, and 75 percent of capacity utilized, by model size, market turkey enterprise, Kansas, 1968-69.

Model size and percentage of capacity utilized	Number and size of broods	Total number of birds
20,000 birds		
25	1 - 5,000-bird brood	5,000
50	2 - 5,000-bird broods	10,000
75	3 - 7,500-bird broods	15,000
35,000 birds		
25	1 - 7,500 and 1 - 1,250-bird broods	8,750
50	2 - 7,500 and 1 - 1,250-bird broods	17,500
75	3 - 7,500 and 1 - 3,750-bird broods	26,250
70,000 birds		
25	2 - 7,500 and 1 - 2,500-bird broods	17,500
50	4 - 7,500 and 1 - 5,000-bird broods	32,000
75	7 - 7,500-bird broods	52,500
100,000 birds		
25	3 - 7,500 and 1 - 3,750-bird broods	26,250
50	7 - 7,500-bird broods	52,500
75	10 - 7,500 and 1 - 3,750-bird broods	78,750

APPENDIX B

DESCRIPTION AND BUDGET STANDARDS OF LAND, BUILDINGS, MACHINERY, AND EQUIPMENT: LAYOUT OF ENTERPRISE: AND CAPITAL INVESTMENT TO PRODUCE MARKET TURKEYS

TABLE 17. Description and budget standards of land, buildings, machinery, and equipment[a], market turkey enterprise, Kansas, 1968-69.

Item	Description	Budget standard
Land		
For brooder house	Suitable for crop production and valued as such.	1 acre per house.
For growing house	Suitable for crop production and valued as such.	3 acres per house.
Buildings		
Brooder house	Wood-truss on 10-foot centers, concrete floor, side curtains, 40 feet wide and 250 feet long, complete with plumbing and electrical wiring.	1 1/3 square feet per poult.
Growing house	Steel-truss on 10-foot centers, dirt floors, side curtains, 40 feet wide and 500 feet long, complete with plumbing and electrical wiring.	2 2/3 square feet per bird.
Machinery and equipment		
Brooders	47-inch round canopy, hanging type with chain, 27,500 B.T.U. rating, LP gas.	1 brooder per 163 poults and 6 brooders placed equidistance in growing house.
Brooder fuel tank (s)	LP gas, 1,000 gallon capacity.	1 tank per brooder house.
Brooder waterers	Automatic, float type, hanging, with 8-foot trough.	1.10 linear inches per poult.
Medicator	Meter, pressure-piston type.	1 medicator per building.

TABLE 17. Continued.

Item	Description	Budget standard
Feed system for brooder house[b]	Automatic, ceiling suspended, overhead delivery auger from bulk feed bin to feed hoppers, with auger delivery tube to feed pans, 2 feed lines per system, 93 feed pans per feed line.	Two 234-foot feed lines per brooder house.
Bulk feed bin(s)	Round metal bin with boot and discharge auger.	One 8-ton bin per brooder house.
Debeaker	Mechanical leverage, electrical.	1 per each size of model.
Guard shields	18-inches high, pressboard.	1 for each 2 brooders, except for the last brooder, which is enclosed by 1 shield.
Fuel tank(s) for growing house(s)	LP gas, 125-gallon capacity.	1 tank per growing house.
Growing waterers	Automatic, float type, with 20-foot trough.	1.28 linear inches per bird.
Feed system for growing house[c]	Round metal feeders, 700-pound capacity, overhead feed conveyor suspended from ceiling, with drop spouts to feeders, overhead fill system from bulk feed bin to feed hopper.	48 feeders in growing house, filled by overhead conveyor. 20 feeders in growing area adjacent to house. 0.87 linear inches per bird.
Bulk feed bin(s)	Round metal bin with boot and discharge auger.	One 21.4-ton bin per growing house.

TABLE 17. Continued.

Item	Description	Budget standard
Water system[d]	Submersible pump with PVC pipe and necessary accessories.	1 system per size of model.
Fence	Poultry wire, 4-foot high, 10 rod roll.	580 feet per growing house.
Fence posts	7-foot, steel.	1 post per 10 feet of fence.
Turkey loader	Mechanical, tractor powered.	1 loader per size of model.
Turkey trailer	12 x 60', trailer house running gear, wire enclosed.	1 trailer per size of model.
Incinerator	Oval single burner, LP gas.	1 incinerator per size of model.
Tractor	2-3 plow power, with PTO and 3-point hitch, LP gas.	2 tractors per size of model.
Front end loader	For tractor, 1,600-pound lifting capacity.	1 loader per size of model.
Manure spreader	PTO drive, 110-bushel capacity.	1 spreader per size of model.
Sprayer	PTO drive pump, 50-gallon capacity, mounted on 3-point hitch.	1 sprayer per size of model.

[a]All budget standards on a per poult or bird basis assume 7,500 poults were placed.
[b]See Appendix A, Table 18, for a complete description.
[c]See Appendix A, Table 19, for a complete description.
[d]See Appendix A, Tables 20 and 21, for a complete description.

TABLE 18. Description and cost of feed system for the brooder house[a], market turkey enterprise, Kansas, 1968-69.

Item	Cost per unit	Units	Total cost
	Dollars	Number	Dollars
Automatic, winch [b]			
Suspension feeder	776.00	1	776.00
Time clock	23.00	1	23.00
Feed hopper	20.00	2	40.00
Electric motor, 1/3 H.P.	45.00	3	135.00
Flex-auger fill line	3.50/ft	44 ft	154.00
Drop outlet	3.50	1	3.50
Plastic drop tube	1.00	1	1.00
Boost assembly	48.00	1	48.00
Collar kit	14.50	1	14.50
Total			1,195.00

[a]Based on a 40' x 250' brooder house.

[b]Two feed lines, 234 feet in length with 93 feed pans on each line.

TABLE 19. Description and cost of feed system for the growing house[a], market turkey enterprise, Kansas, 1968-69.

Item	Cost per unit	Units	Total cost
	Dollars	Number	Dollars
Round range feeder[b]	54.00	68	3,672.00
Overhead feed conveyor	2.00/ft	480 ft	960.00
Flex-auger fill line	3.50/ft	30 ft	105.00
Boost assembly	48.00	1	48.00
Collar kit	14.50	1	14.50
Feed hopper, twin outlet	30.00	1	30.00
Electric motor, 1/3 H.P.	45.00	3	135.00
Drop outlet	3.50	1	3.50
Plastic drop tube	1.00	48	48.00
Total			5,016.00

[a] Based on a 40' x 500' growing house.

[b] 48 feeders are in the house, filled by the overhead feed conveyor. 20 feeders are in the growing area adjacent to the growing house, filled by feed truck.

TABLE 20. Description and per unit costs of items for water system[a], by size of model, market turkey enterprise, Kansas, 1968-69.

Item	Cost per unit	Units, by size of model			
		20,000	35,000	70,000	105,000
	Dollars		Number		
Pump and accessories					
Submersible, 1½ H.P. pump	300.00	1	1	1	1
Well seal	6.00	1	1	1	1
Connecting cable	0.65/ft	100 ft	100 ft	100 ft	100 ft
Synthetic rope	0.20/ft	100 ft	100 ft	100 ft	100 ft
1" plastic pipe	0.25/ft	100 ft	100 ft	100 ft	100 ft
Pressure tank	65.00	1	1	1	1
3/4 x 3" nipple	0.10	1	1	1	1
1 x 1 x 3/4" tee	0.70	1	1	1	1
1 x 3" nipple	0.15	2	2	2	2
1" gate valve	4.00	2	2	2	2
Clamps, stainless steel	0.20	4	4	4	4
Water line and accessories					
1" rigid PVC pipe, 10 ft joints	0.14/ft	15	36	102	163
1" coupling	0.40	15	36	102	163
1" 90 degree elbow	0.70	2	2	2	2
1" tee	0.90	4	6	12	18
1" male adapter	0.40	2	3	6	9
1 x 3/4" reducing coupling (galv.)	0.40	4	6	12	18
Hydrants	15.00	2	3	6	9
PVC solvent	2.00/pint	2	4	10	17
1" plug	0.20	2	2	2	2
Trenching	0.10/ft	150 ft	360 ft	1,020 ft	1,630 ft

[a]Based on layout of buildings, see Appendix A, Figures 9, 10, 11, and 12.

TABLE 21. Description and costs of water system, by size of model, market turkey enterprise, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
			Dollars	
Pump and accessories				
Submersible, 1½ H.P. pump	300.00	300.00	300.00	300.00
Well seal	6.00	6.00	6.00	6.00
Connecting cable	65.00	65.00	65.00	65.00
Synthetic rope	20.00	20.00	20.00	20.00
1" plastic pipe	25.00	25.00	25.00	25.00
Pressure tank	65.00	65.00	65.00	65.00
3/4 x 3" nipple	0.10	0.10	0.10	0.10
1 x 1 x 3/4" tee	0.70	0.70	0.70	0.70
1 x 3" nipple	0.30	0.30	0.30	0.30
1" gate valve	8.00	8.00	8.00	8.00
Clamps, stainless steel	0.80	0.80	0.80	0.80
Water line and accessories				
1" rigid PVC pipe, 10 ft joints	21.00	50.40	142.80	228.20
1" coupling	6.00	14.40	40.80	55.20
1" 90 degree elbow	1.40	1.40	1.40	1.40
1" tee	3.60	5.40	10.80	16.20
1" male adapter	0.80	1.20	2.40	3.60
1 x 3/4" reducing coupling (galv.)	1.60	2.40	4.80	7.20
Hydrants	30.00	45.00	90.00	135.00
PVC solvent	4.00	8.00	20.00	34.00
1" plug	0.40	0.40	0.40	0.40
Trenching	15.00	36.00	102.00	163.00
Totals	574.70	655.50	906.30	1,135.10

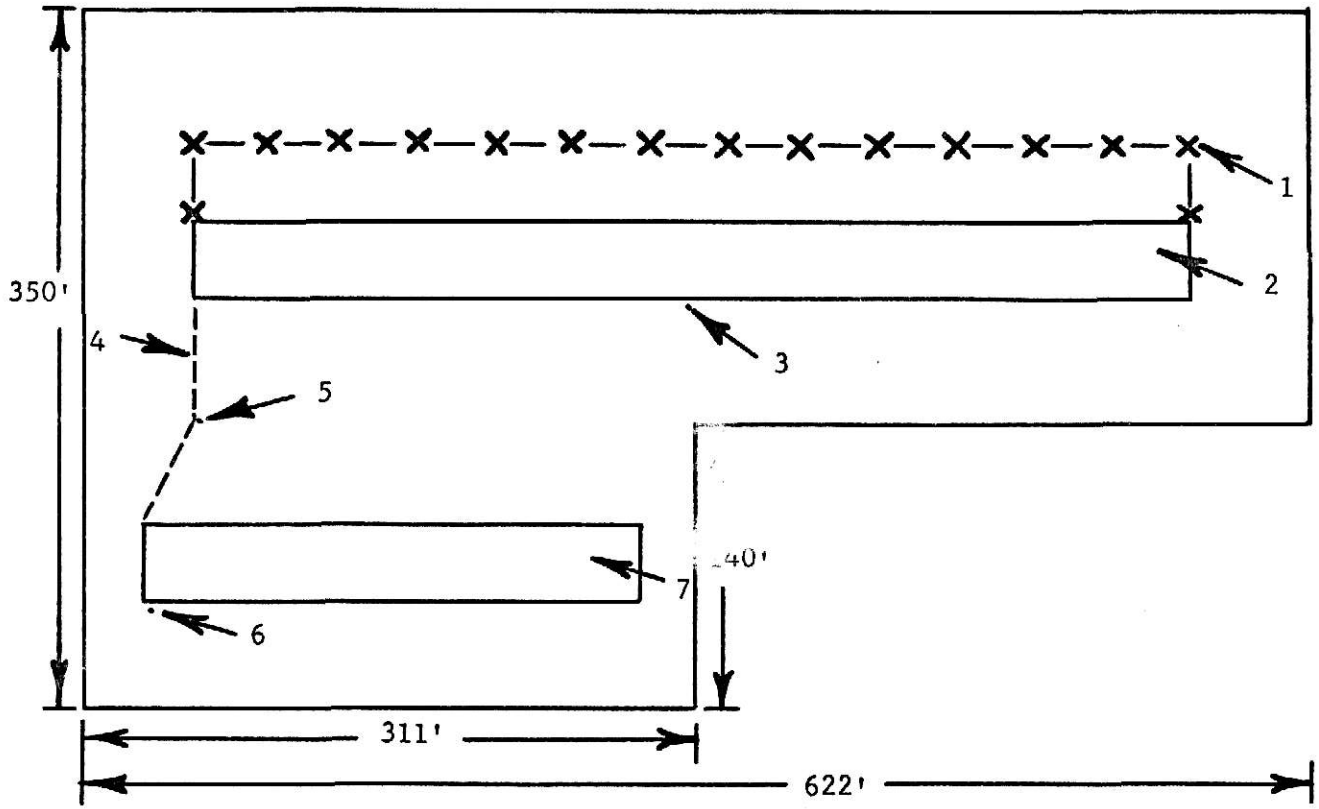

Figure 9.--Hypothetical layout of production facilities, 20,000 birds.

Legend

1 Fenced area adjacent to growing house, 40' x 500'
2 Growing house, 40' x 500'
3 Bulk feed bin for growing house
4 1" water pipe with hydrants next to buildings
5 Water well and pump
6 Bulk feed bin for brooder house
7 Brooder house, 40' x 250'

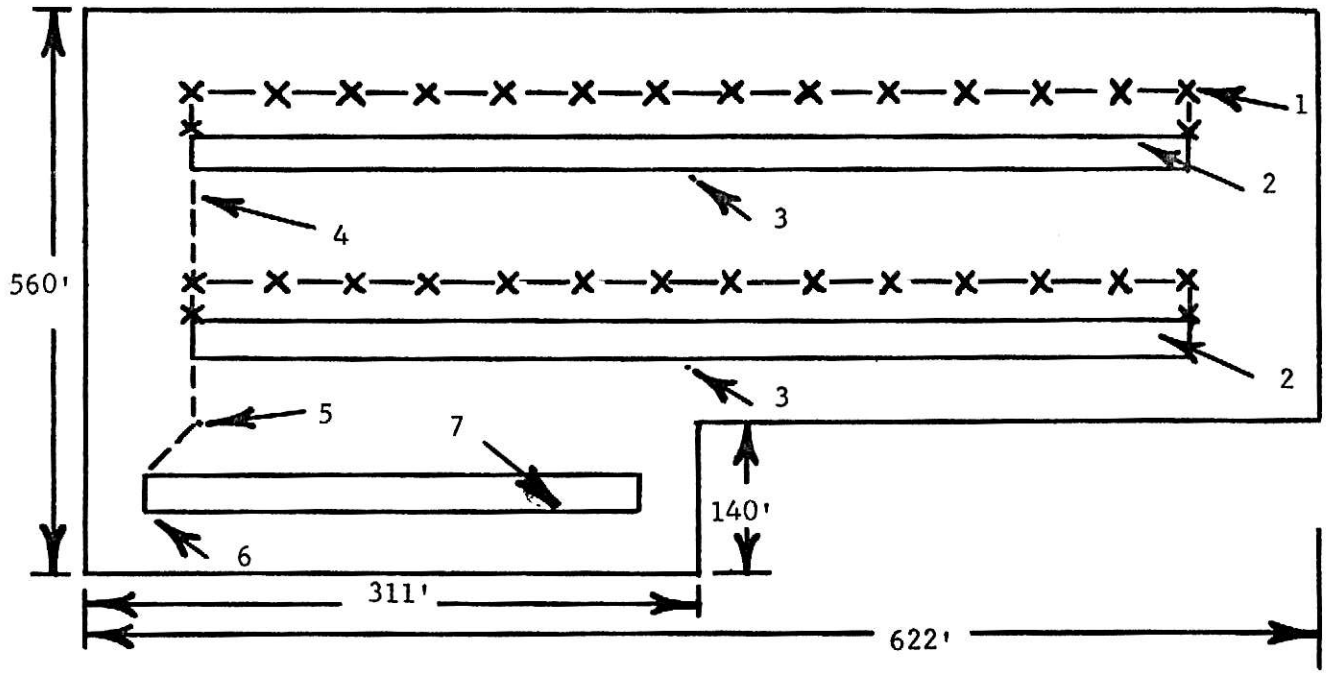

Figure 10.--Hypothetical layout of production facilities, 35,000 birds.

Legend

1 Fenced area adjacent to growing house, 40' x 500'
2 Growing house, 40' x 500'
3 Bulk feed bin for growing house
4 1" water pipe with hydrants next to buildings
5 Water well and pump
6 Bulk feed bin for brooder house
7 Brooder house, 40' x 250'

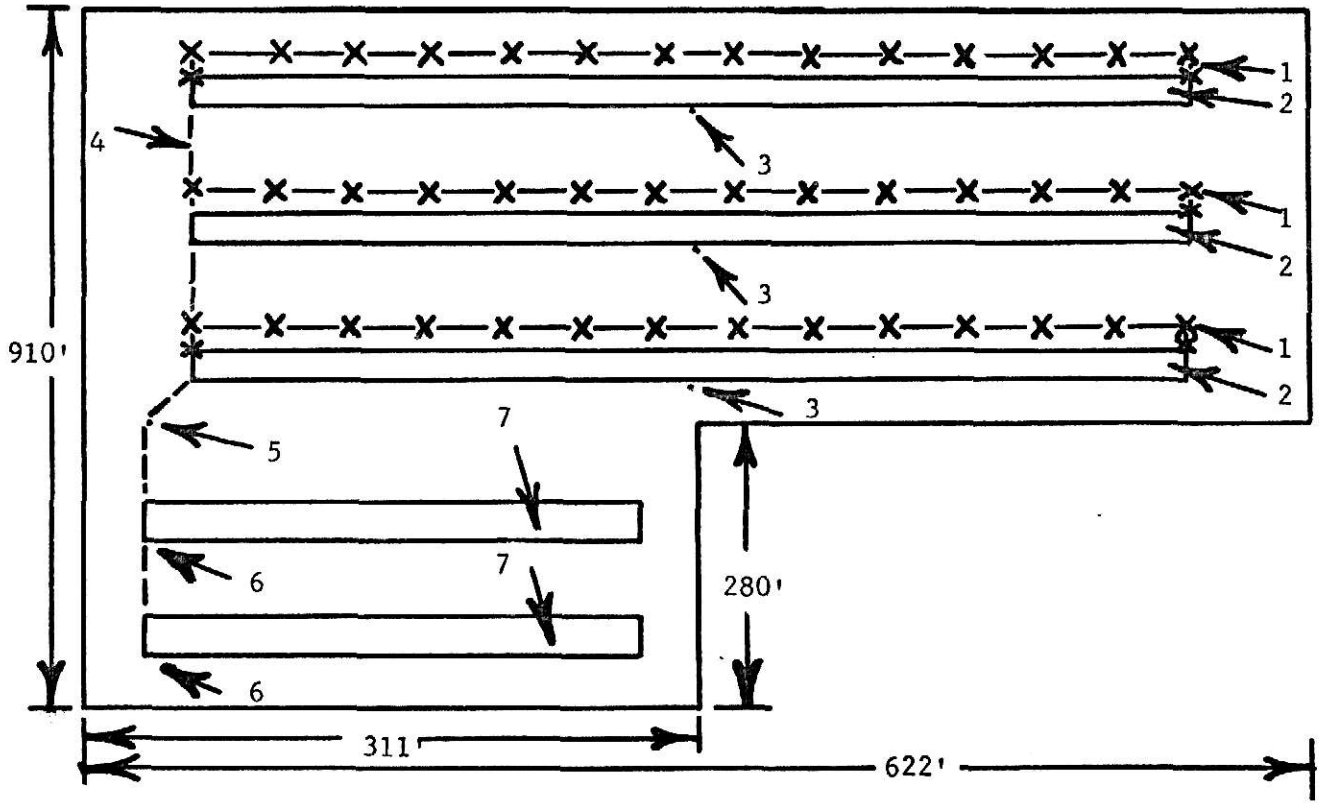

Figure 11.--Hypothetical layout of production facilities, 70,000 birds.

Legend

1 Fenced area adjacent to growing house, 40' x 500'
2 Growing house, 40' x 500'
3 Bulk feed bin for growing house
4 1" water pipe with hydrants next to buildings
5 Water well and pump
6 Bulk feed bin for brooder house
7 Brooder house, 40' x 250'

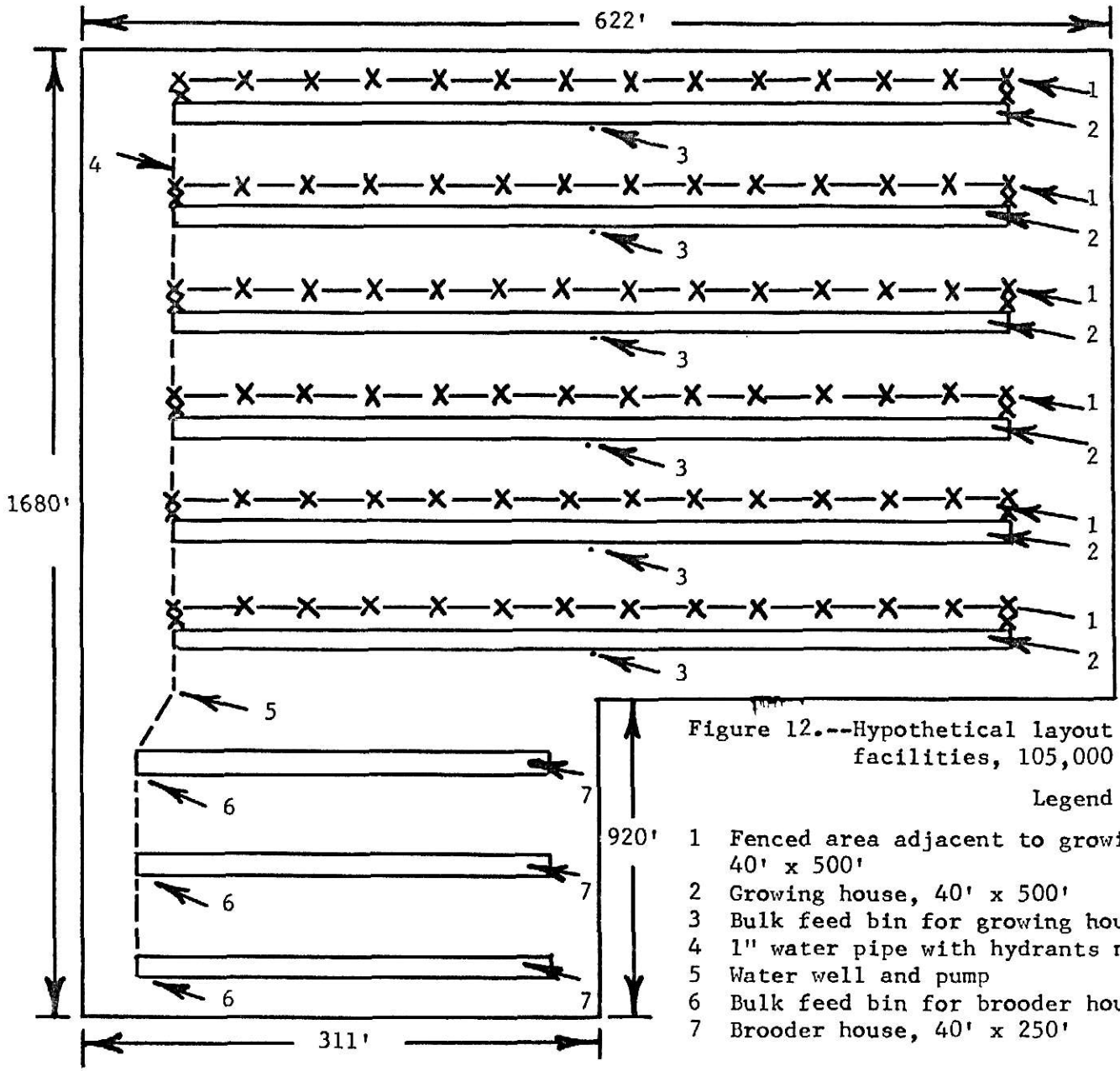

Figure 12.--Hypothetical layout of production facilities, 105,000 birds.

Legend

1 Fenced area adjacent to growing house, 40' x 500'
2 Growing house, 40' x 500'
3 Bulk feed bin for growing house
4 1" water pipe with hydrants next to buildings
5 Water well and pump
6 Bulk feed bin for brooder house
7 Brooder house, 40' x 250'

TABLE 22. Description and per unit costs of buildings, machinery, and equipment for producing market turkeys under semiconfinement, by size of model, Kansas, 1968-69.

Item	Cost per unit	Units, by size of model			
		20,000	35,000	70,000	105,000
	Dollars	Square feet			
Buildings					
Brooder house(s)	1.50/sq.ft.	10,000	10,000	20,000	30,000
Growing house(s)	1.00/sq.ft.	20,000	40,000	80,000	120,000
		Number			
Machinery and equipment					
Brooders	39.00	52	58	116	174
Brooder fuel tank(s)	400.00	1	1	2	3
Brooder waterers	9.00	46	46	92	138
Medicators	62.00	2	3	6	9
Feed system for brooder house[a]	1,195.00	1	1	2	3
Bulk feed bin(s)	245.00	1	1	2	3
Debeaker	54.00	1	1	1	1
Guard shields	1.44	25	25	50	75
Fuel tank(s) for growing house(s)	125.00	1	2	4	6
Growing waterers	48.00	20	40	80	120
Feed system for growing house[b]	5,016.00	1	2	4	6
Bulk feed bin(s)	550.00	1	2	4	6
Water system[c]	-	1	1	1	1
Fence rolls	14.00	4	8	16	24
Fence posts	1.20	60	120	240	360
Turkey loader	3,400.00	1	1	1	1
Turkey trailer	400.00	1	1	1	1
Incinerator	380.00	1	1	1	1
Tractors	4,000.00	2	2	2	2
Blade	113.00	1	1	1	1
Front end loader	900.00	1	1	1	1
Manure spreader	1,000.00	1	1	1	1
Sprayer	160.00	1	1	1	1

[a]For a complete description and cost, see Appendix A, Table 18.
[b]For a complete description and cost, see Appendix A, Table 19.
[c]For a complete description and cost, see Appendix A, Tables 20 and 21.

TABLE 23. Capital investment in buildings, machinery, and equipment for producing market turkeys under semiconfinement, by size of model, Kansas, 1968-69.

Item	Investment, by size of model			
	20,000	35,000	70,000	105,000
	Dollars			
Buildings				
Brooder house(s)	15,000	15,000	30,000	45,000
Growing house(s)	20,000	40,000	80,000	120,000
Totals	35,000	55,000	110,000	165,000
Machinery and equipment				
Brooders	2,028	2,262	4,524	6,786
Brooder fuel tank(s)	400	400	800	1,200
Brooder waterers	414	414	828	1,242
Medicators	124	186	372	558
Feed system for brooder house	1,195	1,195	2,390	3,585
Bulk feed bin(s)	245	245	490	735
Debeaker	54	54	54	54
Guard shields	36	36	72	108
Fuel tank(s) for growing house(s)	125	250	500	750
Growing waterers	960	1,920	3,840	5,760
Feed system for growing house	5,016	10,032	20,064	30,096
Bulk feed bin(s)	550	1,100	2,200	3,300
Water system	575	656	907	1,135
Fence rolls	56	112	224	336
Fence posts	72	144	288	432
Turkey loader	3,400	3,400	3,400	3,400
Turkey trailer	400	400	400	400
Incinerator	380	380	380	380
Tractors	8,000	8,000	8,000	8,000
Blade	113	113	113	113
Front end loader	900	900	900	900
Manure spreader	1,000	1,000	1,000	1,000
Sprayer	160	160	160	160
Totals	26,203	33,359	51,906	70,431

APPENDIX C

COSTS TO PRODUCE MARKET TURKEYS

TABLE 24. Poult prices, by sex, percentage of capacity utilized, and size of model, Kansas, 1968-69.

Sex	Capacity utilized	Size of model			
		20,000	35,000	70,000	105,000
		Cents per poult			
Toms	100	72.5000	71.7500	70.0000	68.2500
	75	72.7500	72.1875	70.8750	69.5625
	50	73.0000	72.6250	71.7500	70.8750
	25	73.2500	73.0625	72.6250	72.1875
Hens	100	52.5000	51.7500	50.0000	48.2500

TABLE 25. Complete turkey feed rations[a]: Costs of ingredients and services and cost per ton, by protein level, Kansas, 1968-69.

Item	Cost per unit[b]	Percent protein							
		32[c]		26[d]		20[e]		16[f]	
Ingredients:	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
Corn	1.05/bu.	300	5.63	400	7.50	500	9.38	600	11.25
Milo	1.59/cwt.	300	4.77	380	6.04	600	9.54	800	12.72
Oats	0.73/bu.	-	-	-	-	100	2.28	-	-
Alfalfa meal 17%	2.50/cwt.	100	2.50	100	2.50	100	2.50	80	2.00
Soybean meal 44%	4.93/cwt.	970	47.82	600	29.58	500	24.65	300	14.79
Wheat mids	2.95/cwt.	-	-	50	1.48	-	-	-	-
Fish meal	10.80/cwt.	200	21.60	200	21.60	40	4.32	-	-
Fish solubles	3.00/cwt.	-	-	50	1.50	-	-	-	-
Meat & bone scraps	6.00/cwt.	-	-	100	6.00	40	2.40	100	6.00
Fermentation sol.	4.20/cwt.	60	2.52	50	2.10	20	0.84	20	0.84
Calcium carbonate	1.20/cwt.	40	0.48	40	0.48	50	0.60	50	0.60
Dicalcium phosphate	5.50/cwt.	20	1.10	20	1.10	40	2.20	40	2.20
Salt	1.50/cwt.	10	0.15	10	0.15	10	0.15	10	0.15
Trace minerals and additives	0.40/lb.	38	15.20	34	13.60	22	8.80	12	4.80
Services:									
Grind	0.15/cwt.		0.90		1.17		1.80		2.10
Crumble	6.00/ton		6.00		6.00		-		-
Pellet	6.00/ton		-		-		6.00		6.00
Delivery	1.00/ton		1.00		1.00		1.00		1.00
Total per ton			109.67		101.80		76.46		64.45

TABLE 25. Continued.

[a]Rations were formulated by poultry scientists at Kansas State University.

[b]Prices for corn, milo, oats, soybean meal, and middlings were obtained from Agricultural Prices, Annual Summary, 1968. Prices for other items and services were charges by feed dealers in Northeast Kansas during 1969.

[c]To be fed from day-old poults to two weeks of age.

[d]To be fed from three to eight weeks of age.

[e]To be fed from nine to 16 weeks of age.

[f]To be fed from 17 weeks to market age.

TABLE 26. Feed consumption and costs for tom turkeys at eight percent mortality, by weeks and total to 24 weeks of age, and average live market weight[a], 5,000 birds, Kansas, 1968-69.

Age	Mortality[c]	Birds		Feed consumption[b]		Feed cost[e]
		Living[d]	Dead	Per bird	Total	
Weeks	Percent	Number		Pounds		Dollars
1	1.0	5,000	50	0.2	1,000	54.84
2	1.0	4,950	50	0.2	1,980	108.57
3	1.0	4,900	50	0.6	2,940	149.65
4	0.8	4,850	40	0.9	4,365	222.18
5	0.4	4,810	20	1.3	6,253	318.28
6	0.2	4,790	10	1.4	6,706	341.34
7	0.2	4,780	10	1.9	9,082	462.27
8	0.2	4,770	10	2.1	10,017	509.87
9	0.6	4,760	30	3.3	15,708	600.52
10	0.5	4,730	25	4.1	19,393	741.39
11	0.5	4,705	25	4.4	20,702	791.44
12	0.4	4,680	20	4.4	20,592	787.23
13	0.3	4,660	15	4.5	20,970	801.68
14	0.3	4,645	15	4.8	22,296	852.38
15	0.3	4,630	15	4.7	21,761	831.92
16	0.3	4,615	15	4.8	22,152	846.87
17	-	4,600	-	4.7	21,620	696.70
18	-	4,600	-	4.4	20,240	652.23
19	-	4,600	-	4.6	21,160	681.88
20	-	4,600	-	5.0	23,000	741.18
21	-	4,600	-	5.2	23,920	770.80
22	-	4,600	-	6.3	28,980	933.88
23	-	4,600	-	6.5	29,900	963.53
24	-	4,600	-	6.8	31,280	1,008.00
Totals:	8.0		400	87.3	406,017	14,868.63

[a]Average liveweight of toms at 24 weeks was 26.2 pounds. Total liveweight of turkeys sold was 120,520 pounds.

[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]For cost of a complete feed ration, including ingredients and services, by protein level, see Appendix C, Table 25.

Source: M. L. Scott, "1969 Growth Rate and Feed Consumption Standards," Turkey World, January 1969, p. 33, for feed consumption and average liveweight data.

TABLE 27. Feed consumption and costs for tom turkeys at ten percent mortality, by weeks and total to 24 weeks of age, and average live weight[a], 5,000 birds, Kansas, 1968-69.

Age	Mortality[c]	Birds		Feed consumption[b]		Feed cost[e]
		Living[d]	Dead	Per bird	Total	
Weeks	Percent	Number		Pounds		Dollars
1	1.2	5,000	60	0.3	1,000	54.84
2	1.2	4,940	60	0.4	1,976	108.35
3	1.2	4,880	60	0.6	2,928	149.04
4	1.0	4,820	50	0.9	4,338	220.80
5	0.5	4,770	25	1.3	6,201	315.63
6	0.3	4,745	15	1.4	6,643	338.13
7	0.3	4,730	15	1.9	8,987	457.44
8	0.3	4,715	15	2.1	9,902	504.01
9	0.7	4,700	35	3.3	15,510	592.95
10	0.6	4,665	30	4.1	19,127	731.23
11	0.6	5,635	30	4.4	20,394	779.66
12	0.5	4,605	25	4.4	20,262	774.62
13	0.4	4,580	20	4.5	20,610	787.92
14	0.4	4,560	20	4.8	21,888	836.78
15	0.4	4,540	20	4.7	21,338	815.75
16	0.4	4,520	20	4.8	21,696	829.44
17	-	4,500	-	4.7	21,150	681.56
18	-	4,500	-	4.4	19,800	638.06
19	-	4,500	-	4.6	20,700	667.06
20	-	4,500	-	5.0	22,500	725.06
21	-	4,500	-	5.2	23,400	754.07
22	-	4,500	-	6.3	28,350	913.58
23	-	4,500	-	6.5	29,250	942.58
24	-	4,500	-	6.8	30,600	986.09
Totals:	10.0		500	87.3	398,550	14,604.65

[a]Average liveweight of toms at 24 weeks was 26.2 pounds. Total liveweight of turkeys sold was 117,900 pounds.

[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]For cost of a complete feed ration, including ingredients and services, by protein level, see Appendix C, Table 25.

Sources: M. L. Scott, "1969 Growth Rate and Feed Consumption Standards," Turkey World, January 1969, p. 33, for feed consumption and average liveweight data.

TABLE 28. Feed consumption and costs for tom turkeys at twelve percent mortality, by weeks and total to 24 weeks of age, and average live market weight[a], 5,000 birds, Kansas, 1968-69.

Age	Mortality[c]	Birds		Feed consumption[b]		
		Living[d]	Dead	Per bird	Total	Feed cost[e]
Weeks	Percent	Number		Pounds		Dollars
1	1.4	5,000	70	0.2	1,000	54.84
2	1.4	4,930	70	0.4	1,972	108.13
3	1.4	4,860	70	0.6	2,916	148.42
4	1.2	4,790	60	0.9	4,311	219.43
5	0.6	4,730	30	1.3	6,149	312.98
6	0.4	4,680	20	1.9	8,892	452.60
8	0.4	4,660	20	2.1	9,786	498.11
9	0.8	4,640	40	3.3	15,312	585.38
10	0.7	4,600	35	4.1	18,860	721.02
11	0.7	4,565	35	4.4	20,086	767.89
12	0.6	4,530	30	4.4	19,932	762.00
13	0.5	4,500	25	4.5	20,250	774.16
14	0.5	4,475	25	4.8	21,480	821.18
15	0.5	4,450	25	4.7	20,915	799.58
16	0.5	4,425	25	4.8	21,240	812.01
17	-	4,400	-	4.7	20,680	666.41
18	-	4,400	-	4.4	19,360	623.88
19	-	4,400	-	4.6	20,240	652.23
20	-	4,400	-	5.0	22,000	708.95
21	-	4,400	-	5.2	22,880	737.31
22	-	4,400	-	6.3	27,720	893.28
23	-	4,400	-	6.5	28,600	921.64
24	-	4,400	-	6.8	29,920	964.17
Totals:	12.0		600	87.3	391,081	14,340.52

[a]Average liveweight of toms at 24 weeks was 26.2 pounds. Total liveweight of turkeys sold was 115,280 pounds.

[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 each week.

[e]For cost of a complete feed ration, including ingredients and services, by protein level, see Appendix C, Table 25.

Source: M. L. Scott, "1969 Growth Rate and Feed Consumption Standards," Turkey World, January 1969, p. 33, for feed consumption and average liveweight data.

TABLE 29. Feed consumption and costs for tom turkeys at fourteen percent mortality, by weeks and total to 24 weeks of age, and average live market weight[a], 5,000 birds, Kansas, 1968-69.

Age	Mortality[c]	Birds		Feed consumption[b]		
		Living[d]	Dead	Per bird	Total	Feed cost[e]
Weeks	Percent	Number		Pounds		Dollars
1	1.6	5,000	80	0.2	1,000	54.84
2	1.6	4,920	80	0.4	1,968	107.92
3	1.6	4,840	80	0.6	2,904	147.81
4	1.4	4,760	70	0.9	4,284	218.06
5	0.7	4,690	35	1.3	6,097	310.34
6	0.5	4,655	25	1.4	6,517	331.72
7	0.5	4,630	25	1.9	8,797	447.77
8	0.5	4,605	25	2.1	9,670	492.20
9	0.9	4,580	45	3.3	15,114	577.81
10	0.8	4,535	40	4.1	18,594	710.85
11	0.8	4,495	40	4.4	19,778	756.11
12	0.7	4,455	35	4.4	19,602	749.38
13	0.6	4,420	30	4.5	19,890	760.39
14	0.6	4,390	30	4.8	21,072	805.58
15	0.6	4,360	30	4.7	20,492	783.41
16	0.6	4,330	30	4.8	20,784	794.57
17	-	4,300	-	4.7	20,210	651.27
18	-	4,300	-	4.4	18,920	609.70
19	-	4,300	-	4.6	19,780	637.41
20	-	4,300	-	5.0	21,500	692.84
21	-	4,300	-	5.2	22,360	720.55
22	-	4,300	-	6.3	27,090	872.98
23	-	4,300	-	6.5	27,950	900.69
24	-	4,300	-	6.8	29,240	942.26
Totals:	14.0		700	87.3	383,613	14,076.46

[a]Average liveweight of toms at 24 weeks was 26.2 pounds. Total liveweight of turkeys sold was 112,660 pounds.

[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 each week.

[e]For cost of a complete feed ration, including ingredients and services, by protein level, see Appendix C, Table 25.

Source: M. L. Scott, "1969 Growth Rate and Feed Consumption Standards," Turkey World, January 1969, p. 33, for feed consumption and average liveweight data.

TABLE 30. Feed consumption and costs for hen turkeys at five percent mortality, by weeks and total to 20 weeks of age, and average live market weight[a], 5,000 birds, Kansas, 1968-69.

Age	Mortality[c]	Birds		Feed consumption[b]		
		Living[d]	Dead	Per bird	Total	Feed cost[e]
Weeks	Percent	Number		Pounds		Dollars
1	0.7	5,000	35	0.18	900	49.35
2	0.7	4,965	35	0.35	1,738	95.30
3	0.7	4,930	35	0.57	2,810	143.03
4	0.4	4,895	20	0.70	3,427	174.43
5	0.2	4,875	10	1.10	5,363	272.98
6	0.1	4,865	5	0.90	4,379	222.89
7	0.1	4,860	5	1.80	8,748	445.27
8	0.1	4,855	5	2.10	10,196	518.98
9	0.5	4,850	25	2.60	12,610	482.08
10	0.4	4,825	20	3.80	18,335	700.95
11	0.4	4,805	20	3.60	17,298	661.30
12	0.3	4,785	15	3.30	15,791	603.69
13	0.1	4,770	5	3.80	18,126	692.96
14	0.1	4,765	5	3.20	15,248	582.93
15	0.1	4,760	5	3.00	14,280	545.92
16	0.1	4,755	5	3.20	15,216	581.71
17	-	4,750	-	3.00	14,250	459.21
18	-	4,750	-	3.10	14,725	474.51
19	-	4,750	-	4.20	19,950	642.89
20	-	4,750	-	4.50	21,375	688.81
Totals:	5.0		250	49.00	234,765	9,039.19

[a]Average liveweight of hens at 20 weeks was 14,8 pounds. Total liveweight of turkeys sold was 70,300 pounds.

[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]For cost of a complete feed ration, including ingredients and services, by protein level, see Appendix C, Table 25.

Source: M. L. Scott, "1969 Growth Rate and Feed Consumption Standards," Turkey World, January 1969, p. 33, for feed consumption and average liveweight data.

TABLE 31. Feed consumption and costs for tom turkeys to 24 weeks of age[a], by feed price level and type of ration, 5,000 birds, Kansas, 1968-69.

Feed price level and ration[b]	Feed consumption[c]	Feed cost	
		Per ton	Total
	Pounds	Dollars	
10 percent below			
32% protein, pre-starter	2,972	98.70	146.67
26% protein, starter	38,634	91.62	1,769.82
20% protein, grower	158,075	68.81	5,438.57
16% protein, finisher	191,400	58.00	5,550.60
Total	391,081		12,905.66
10 percent above			
32% protein, pre-starter	2,972	120.64	179.27
26% protein, starter	38,634	111.98	2,163.18
20% protein, grower	158,075	84.11	6,647.84
16% protein, finisher	191,400	70.90	6,785.13
Total			

[a]Based on 12 percent flock mortality and toms averaging 26.2 pounds at 24 weeks of age.

[b]Price level was 10 percent below or above the feed price, by ration, computed and used in Appendix C, Table 25.

[c]Feed consumption corresponding to age of toms with recommended protein level was obtained from Appendix C, Table 28.

TABLE 32. Grit consumption and costs for tom turkeys, by weeks and total to market age, by flock mortality, 5,000 birds, Kansas, 1968-69.

Mortality rate	Age	Feed consumed	Grit consumption[a]		Grit cost[b]
Percent	Weeks	Pounds	Percent[c]	Pounds[d]	Dollars
8	0-2	2,980	1.00	30	0.54
	3-6	20,264	1.50	304	5.47
	7-8	19,097	1.75	335	6.03
	9-24	363,674	3.50	12,729	10.18
	Total	406,015		13,398	22.22
10	0-2	2,976	1.00	30	0.54
	3-6	20,110	1.50	302	5.44
	7-8	18,889	1.75	331	5.96
	9-24	356,575	3.50	12,480	9.98
	Total	398,550		13,143	21.92
12	0-2	2,972	1.00	30	0.54
	3-6	19,956	1.50	299	5.38
	7-8	18,678	1.75	327	5.89
	9-24	349,475	3.50	12,232	9.79
	Total	391,081		12,888	21.60
14	0-2	2,968	1.00	30	0.54
	3-6	19,802	1.50	297	5.35
	7-8	18,467	1.75	323	5.81
	9-24	342,376	3.50	11,983	9.59
	Total	383,613		12,633	21.29

[a]Insoluble grit was fed from day-old poults to eight weeks of age; coarse sand and gravel were fed from nine to 24 weeks of age.

[b]$1.80 per hundredweight for insoluble grit and $0.08 per hundredweight for coarse sand and gravel; prices charged by firms in Northeast Kansas during 1969.

[c]As a percentage of feed consumed.

[d]Rounded to the nearest pound.

TABLE 33. Grit consumption and costs for hen turkeys, by weeks and total to market age[a], 5,000 birds, Kansas, 1968-69.

Age	Feed consumed	Grit consumption[b]		Grit cost[c]
Weeks	Pounds	Percent[d]	Pounds[c]	Dollars
0-2	2,638	1.00	26	0.47
3-6	15,979	1.50	240	4.32
7-8	18,944	1.75	332	5.98
9-20	197,204	3.50	6,902	5.52
Total	234,765		7,500	16.29

[a]Total flock mortality was five percent.

[b]Insoluble grit was fed from day-old poults to eight weeks of age; coarse sand and gravel were fed from nine to 20 weeks of age.

[c]$1.80 per hundredweight for insoluble grit and $0.08 per hundredweight for coarse sand and gravel; prices charged by firms in Northeast Kansas during 1969.

[d]As a percentage of feed consumed.

[e]Rounded to the nearest pound.

TABLE 34. Annual depreciation costs on buildings, machinery, and equipment, by item, and by size of model, market turkey enterprise, Kansas, 1968-69.

Item	Years of life	Size of model			
		20,000	35,000	70,000	105,000
	Number	Dollars			
Buildings					
Brooder house(s)	15	1,000.00	1,000.00	2,000.00	3,000.00
Growing house(s)	15	1,333.33	2,666.67	5.333.33	8,000.00
Total		2,333.33	3,666.67	7,333.33	11,000.00
Machinery and equipment					
Brooders	10	202.80	226.20	452.40	678.60
Brooder fuel tank(s)	20	20.00	20.00	40.00	60.00
Brooder waterers	7	59.14	59.14	118.29	177.43
Medicators	8	15.50	23.25	46.50	69.75
Feed system for brooder house	7	170.71	170.71	341.43	512.14
Bulk feed bin(s)	20	12.25	12.25	24.50	36.75
Debeaker	3	18.00	18.00	18.00	18.00
Guard shields	2	18.00	18.00	36.00	54.00
Fuel tank(s) for growing house(s)	20	6.25	12.50	25.00	37.50
Growing waterers	7	137.14	274.29	548.57	822.86
Feed system for growing house	10	501.60	1,003.20	2,006.40	3,009.60
Bulk feed bin(s)	15	38.33	43.73	60.46	75.73
Fence rolls	10	5.60	11.20	22.40	33.60
Fence posts	10	7.20	14.40	28.80	43.20
Turkey loader	7	485.71	485.71	485.71	485.71
Turkey trailer	15	26.67	26.67	26.67	26.67
Incinerator	10	38.00	38.00	38.00	38.00
Tractors	10	480.00[a]	640.00[b]	800.00	800.00
Blade	15	7.53	7.53	7.53	7.53
Front end loader	10	90.00	90.00	90.00	90.00
Manure spreader	8	125.00	125.00	125.00	125.00
Sprayer	8	20.00	20.00	20.00	20.00
Total		2,512.93	3,394.78	5,471.66	7,387.07

[a] 60 percent of depreciation was charged to the turkey enterprise.

[b] 80 percent of depreciation was charged to the turkey enterprise.

TABLE 35. Annual insurance costs, by size of model, market turkey enterprise, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Dollars			
Value of				
Buildings	35,000	55,000	110,000	165,000
Machinery and equipment	26,203	33,359	51,906	70,431
Insurable value[a]				
Buildings	28,000	44,000	88,000	132,000
Machinery and equipment	26,203	33,359	51,906	70,431
Annual insurance costs				
Buildings[b]	277.20	435.60	871.20	1,306.80
Machinery and equipment[c]	112.67	143.44	223.20	302.85
General farm liability[d]	57.60	57.60	57.60	57.60
Total	447.47	636.64	1,152.00	1,667.25

[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.

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

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

[d]Entire farm liability was charged to the turkey enterprise.

Source: Insurable values and rates for 1968-69 were quoted by Kansas Farm Bureau Insurance Company, Manhattan, Kansas.

TABLE 36. Property taxes, by size of model, market turkey enterprise, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Dollars			
Value of				
Land[a]	932	1,631	3,262	4,893
Personal property	61,203	88,359	161,906	235,431
Total	62,135	89,990	165,168	240,324
Assessed value[b]	10,562.95	15,298.30	28,078.56	40,855.08
Total annual tax[c]	633.78	917.90	1,684.71	2,451.30

[a]At $233 per acre.

[b]Based on 17 percent of current valuation.

[c]Based on 60 mills per dollar of assessed value.

Sources: Kansas, Property Valuation Department, Real Estate Assessment Ratio Study: 1968, (Topeka: State Printing Office), p. 10; and Kansas Property Valuation Department, Statistical Report of Property Assessment and Taxation for the Tax Year 1968, Topeka: State Printing Office) p. 2.

TABLE 37. Repairs and maintenance on buildings, machinery, and equipment, by size of model, market turkey enterprise, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
			Dollars	
Investment				
Buildings	35,000	55,000	110,000	165,000
Machinery and equipment	26,203	33,359	51,906	70,431
Repairs				
Buildings[a]	700.00	1,100.00	2,200.00	3,300.00
Machinery and equipment[b]	786.09	1,000.77	1,557.18	2,112.93
Total	1,486.09	2,100.77	3,757.18	5,412.93

[a]Estimated repairs were two percent of initial investment.

[b]Estimated repairs were three percent of initial investment.

TABLE 38. Interest on fixed investment, by size of model, market turkey enterprise, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
			Dollars	
Investment				
Buildings	35,000	55,000	110,000	165,000
Machinery and equipment	26,203	33,359	51,906	70,431
Total	61,203	88,359	161,906	235,431
Land	932	1,631	3,262	4,893
Interest on investment[a]	2,049.68	2,977.68	5,474.08	7,969.55

[a]Based on 50 percent of total investment in buildings, machinery, and equipment and 100 percent of total investment in land at 6.5 percent per annum.

TABLE 39. Costs of producing tom turkeys, eight percent flock mortality, 100 percent of capacity utilized, by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
			Dollars	
Variable costs				
Poults	14,500.00	25,112.50	49,000.00	71,662.50
Feed	59,474.52	104,080.41	208,160.82	312,241.23
Grit	88.88	155.54	311.08	466.62
Medications	2,667.00	4,667.00	9,333.00	14,000.00
Poult insurance	1,340.00	2,345.00	4,690.00	6,825.00
Litter	1,822.50	3,172.50	6,345.00	9,517.50
Fuel and electricity	1,050.00	1,837.50	3,675.00	5,512.50
Supplies	400.00	700.00	1,400.00	2,100.00
Labor [a]	1,907.20	3,308.80	6,617.60	9,926.40
Interest [a]	3,121.88	5,451.72	10,857.47	16,209.44
Total	86,371.98	150,830.97	300,389.97	448,461.19
Fixed costs				
Depreciation	4,846.26	7,061.45	12,804.99	18,387.07
Insurance	447.47	636.64	1,152.00	1,667.25
Property taxes	633.78	917.90	1,684.71	2,451.30
Repairs and maintenance	1,486.09	2,100.77	3,757.18	5,412.93
Interest [b]	2,049.68	2,977.68	5,474.08	7,969.55
Total	9,463.28	13,694.44	24,872.96	35,888.10
Total costs	95,835.26	164,525.41	325,262.93	484,349.29
Total pounds of turkey sold [c]	482,080	843,640	1,687,280	2,530,920

[a] On operating capital.

[b] On fixed investment.

[c] Toms were marketed at 24 weeks and averaged 26.2 pounds.

TABLE 40. Costs of producing tom turkeys, ten percent flock mortality, 100 percent of capacity utilized, by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
			Dollars	
Variable costs				
Poults	14,500.00	25,112.50	49,000.00	71,662.50
Feed	58,418.60	102,232.55	204,465.10	306,697.65
Grit	87.68	153.44	306.88	460.32
Medications	2,667.00	4,667.00	9,333.00	14,000.00
Poult insurance	1,340.00	2,345.00	4,690.00	6,825.00
Litter	1,822.50	3,172.50	6,345.00	9,517.50
Fuel and electricity	1,050.00	1,837.50	3,675.00	5,512.50
Supplies	400.00	700.00	1,400.00	2,100.00
Labor	1,907.20	3,308.80	6,617.60	9,926.40
Interest[a]	3,082.24	5,382.35	10,718.72	16,001.32
Total	85,275.22	148,911.64	296,551.30	442,703.19
Fixed costs				
Depreciation	4,846.26	7,061.45	12,804.99	18,387.07
Insurance	447.47	636.64	1,152.00	1,667.25
Property taxes	633.78	917.90	1,684.71	2,451.30
Repairs and maintenance	1,486.09	2,100.77	3,757.18	5,412.93
Interest[b]	2,049.68	2,977.68	5,474.08	7,969.55
Total	9,463.28	13,694.44	24,872.96	35,888.10
Total costs	94,738.50	162,606.08	321,424.26	478,591.29
Total pounds of turkey sold[c]	471,600	825,300	1,650,600	2,475,900

[a]On operating capital.

[b]On fixed investment.

[c]Toms were marketed at 24 weeks and averaged 26.2 pounds.

TABLE 41. Costs of producing tom turkeys, 12 percent flock mortality, 100 percent of capacity utilized, by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Dollars			
Variable costs				
Poults	14,500.00	25,112.50	49,000.00	71,662.50
Feed	57,362.08	100,383.64	200,767.28	301,150.92
Grit	86.40	151.20	302.40	453.60
Medications	2,667.00	4,667.00	9,333.00	14,000.00
Poult insurance	1,340.00	2,345.00	4,690.00	6,825.00
Litter	1,822.50	3,172.50	6,345.00	9,517.50
Fuel and electricity	1,050.00	1,837.50	3,675.00	5,512.50
Supplies	400.00	700.00	1,400.00	2,100.00
Labor	1,907.20	3,308.80	6,617.60	9,926.40
Interest[a]	3,042.57	5,312.93	10,579.89	15,793.06
Total	84,177.75	146,991.07	292,710.17	436,941.48
Fixed costs				
Depreciation	4,846.26	7,061.45	12,804.99	18,387.07
Insurance	447.47	636.64	1,152.00	1,667.25
Property taxes	633.78	917.90	1,684.71	2,451.30
Repairs and maintenance	1,486.09	2,100.77	3,757.18	5,412.93
Interest[b]	2,049.68	2,977.68	5,474.08	7,969.55
Total	9,463.28	13,694.44	24,872.96	35,888.10
Total costs	93,641.03	160,685.51	317,583.13	472,829.58
Total pounds of turkey sold[c]	461,120	806,960	1,613,920	2,420,880

[a] On operating capital.

[b] On fixed investment.

[c] Toms were marketed at 24 weeks and averaged 26.2 pounds.

TABLE 42. Costs of producing tom turkeys, 14 percent flock mortality, 100 percent of capacity utilized, by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
			Dollars	
Variable costs				
Poults	14,500.00	25,112.50	49,000.00	71,662.50
Feed	56,305.84	98,535.22	197,070.44	295,605.66
Grit	85.16	149.03	298.08	447.09
Medications	2,667.00	4,667.00	9,333.00	14,000.00
Poult insurance	1,340.00	2,345.00	4,690.00	6,825.00
Litter	1,822.50	3,172.50	6,345.00	9,517.50
Fuel and electricity	1,050.00	1,837.50	3,675.00	5,512.50
Supplies	400.00	700.00	1,400.00	2,100.00
Labor	1,907.20	3,308.80	6,617.60	9,926.40
Interest[a]	3,002.91	5,243.53	10,441.09	15,584.87
Total	83,080.61	145,071.08	288,870.21	431,181.52
Fixed costs				
Depreciation	4,846.26	7,061.45	12,804.99	18,387.07
Insurance	447.47	636.64	1,152.00	1,667.25
Property taxes	633.78	917.90	1,684.71	2,451.30
Repairs and maintenance	1,486.09	2,100.77	3,757.18	5,412.93
Interest[b]	2,049.68	2,977.68	5,474.08	7,969.55
Total	9,463.28	13,694.44	24,872.96	35,888.10
Total costs	92,543.89	158,765.52	313,743.17	467,069.62
Total pounds of turkey sold[c]	450,640	788,620	1,577,240	2,365,860

[a]On operating capital.

[b]On fixed investment.

[c]Toms were marketed at 24 weeks and averaged 26.2 pounds.

TABLE 43. Costs of producing hen turkeys, five percent flock mortality, 100 percent of capacity utilized, by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
			Dollars	
Variable costs				
Poults	10,500.00	18,112.50	35,000.00	50,662.50
Feed	36,156.76	63,274.33	126,548.66	189,822.99
Grit	65.16	114.03	228.06	342.09
Medications	2,667.00	4,667.00	9,333.00	14,000.00
Poult insurance	1,000.00	1,750.00	3,500.00	5,040.00
Litter	1,822.50	3,172.50	6,345.00	9,517.50
Fuel and electricity	1,050.00	1,837.50	3,675.00	5,512.50
Supplies	400.00	700.00	1,400.00	2,100.00
Labor [a]	1,907.20	3,308.80	6,617.60	9,926.40
Interest [a]	2,083.82	3,635.12	7,224.27	10,759.65
Total	57,652.44	100,571.78	199,871.59	297,683.63
Fixed costs				
Depreciation	4,846.26	7,061.45	12,804.99	18,387.07
Insurance	447.47	636.64	1,152.00	1,667.25
Property taxes	633.78	917.90	1,684.71	2,451.30
Repairs and maintenance	1,486.09	2,100.77	3,757.18	5,412.93
Interest [b]	2,049.68	2,977.68	5,474.08	7,969.55
Total	9,463.28	13,694.44	24,872.96	35,888.10
Total costs	67,115.72	114,266.22	224,744.55	333,571.73
Total pounds of turkey sold [c]	281,200	492,100	984,200	1,476,300

[a] On operating capital.

[b] On fixed investment.

[c] Hens were marketed at 20 weeks at 14.8 pounds.

TABLE 44. Costs of producing tom turkeys at feed price 10 percent below computed price, 12 percent flock mortality, 100 percent of capacity utilized, by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Dollars			
Variable costs				
Feed	51,622.64	90,339.62	180,679.24	271,018.86
Other variable costs[a]	23,773.10	41,294.50	81,363.00	119,997.50
Interest[b]	2,827.34	4,936.28	9,826.58	14,663.11
Total	78,223.08	136,570.40	271,868.82	405,679.47
Total fixed costs[c]	9,463.28	13,694.44	24,872.96	35,888.10
Total costs	87,686.36	150,264.84	296,741.78	441,567.57
Total pounds of turkey sold[d]	461,120	806,960	1,613,920	2,420,880

[a] Other variable costs include: poults, grit, medications, poult insurance, fuel and electricity, supplies, and labor. These items correspond to items in Appendix C, Table 41.

[b] On operating capital.

[c] See Appendix C, Table 41.

[d] Toms were marketed at 24 weeks and averaged 26.2 pounds.

TABLE 45. Costs of producing tom turkeys at feed price 10 percent above computed price, 12 percent flock mortality, 100 percent of capacity utilized, by size of model, Kansas, 1968-69.

Item	Size of model			
	20,000	35,000	70,000	105,000
	Dollars			
Variable costs				
Feed	63,101.68	110,427.94	220,855.88	331,283.82
Other variable costs[a]	23,773.10	41,294.50	81,363.00	119,997.50
Interest[b]	3,257.80	5,689.59	11,333.21	16,923.05
Total	90,132.58	157,412.03	313,552.09	468,204.37
Total fixed costs[c]	9,463.28	13,694.44	24,872.96	35,888.10
Total costs	99,595.86	171,106.47	338,425.05	504,092.47
Total pounds of turkey sold[d]	461,120	806,960	1,613,920	2,420,880

[a]Other variable costs include: poults, grit, medications, poult insurance, litter, fuel and electricity, supplies, and labor. These items correspond to items in Appendix C, Table 41.

[b]On operating capital.

[c]See Appendix C, Table 41.

[d]Toms were marketed at 24 weeks and averaged 26.2 pounds.

TABLE 46. Costs of producing tom turkeys, 12 percent flock mortality, at 25, 50, and 75 percent of capacity utilized, 20,000-bird model, Kansas, 1968-69.

Item	Percent of capacity utilized		
	25	50	75
		Dollars	
Variable costs[a]			
Poults	3,662.50	7,300.00	10,912.50
Feed	14,340.52	28,681.04	43,021.56
Grit	21.60	43.20	64.80
Medications	666.75	1,333.50	2,000.25
Poult insurance	335.00	670.00	1,005.00
Litter	675.00	1,350.00	1,350.00
Fuel and electricity	262.50	525.00	787.50
Supplies	100.00	200.00	300.00
Labor[c]	505.60	1,011.20	1,401.60
Interest	771.36	1,541.77	2,281.62
Repairs and maintenance	371.52	743.05	1,114.57
	21,712.35	43,398.76	64,239.40
Total fixed costs[d]	7,977.19	7,977.19	7,977.19
Total costs	29,689.54	51,375.95	72,216.59
Total pounds of turkey sold[e]	115,280	230,560	345,840

[a] For the various percentages of capacity utilized, each cost item, except poults, was simply 25, 50, and 75 percent of the corresponding cost for the production of tom turkeys when 100 percent of capacity was utilized (see Appendix C, Table 41).

[b] For poult prices, by percentage of capacity utilized and model size, see Appendix C, Table 24.

[c] On operating capital.

[d] These costs, excluding repairs and maintenance, were the same as for the corresponding model size when 100 percent of capacity was utilized.

[e] Toms were marketed at 24 weeks and averaged 26.2 pounds.

TABLE 47. Costs of producing tom turkeys, 12 percent flock mortality, at 25, 50, and 75 percent of capacity utilized, 35,000-bird model, Kansas, 1968-69.

Item	Percent of capacity utilized		
	25	50	75
		Dollars	
Variable costs[a]			
Poults[b]	6,392.97	12,709.38	18,949.22
Feed	25,095.91	50,191.82	75,287.73
Grit	37.80	75.60	113.40
Medications	1,166.75	2,333.50	3,500.25
Poult insurance	586.25	1,172.50	1,758.75
Litter	1,350.00	2,025.00	2,700.00
Fuel and electricity	459.38	918.75	1,378.13
Supplies	175.00	350.00	525.00
Labor	913.60	1,712.00	2,510.40
Interest[c]	1,356.66	2,680.82	4,002.11
Repairs and maintenance	525.19	1,050.39	1,575.58
Total	38,059.51	75,219.76	112,300.57
Total fixed costs[d]	11,593.67	11,593.67	11,593.67
Total costs	49,653.18	86,813.43	123,894.24
Total pounds of turkey sold[e]	201,740	403,480	605,220

[a]For the various percentages of capacity utilized, each cost item, except poults, was simply 25, 50, or 75 percent of the corresponding cost for the production of tom turkeys when 100 percent of capacity was utilized (see Appendix C, Table 41).

[b]For poult prices, by percentage of capacity utilized and model size (see Appendix C, Table 24).

[c]On operating capital.

[d]These costs, excluding repairs and maintenance, were the same as for the corresponding model size when 100 percent of capacity was utilized.

[e]Toms were marketed at 24 weeks and averaged 26.2 pounds.

TABLE 48. Costs of producing tom turkeys, 12 percent flock mortality, at 25, 50, and 75 percent of capacity utilized, 70,000-bird model, Kansas, 1968-69.

Item	Percent of capacity utilized		
	25	50	75
		Dollars	
Variable costs[a]			
Poults[b]	12,709.38	25,112.50	37,209.38
Feed	50,191.82	100,383.64	150,575.46
Grit	75.60	151.20	226.80
Medications	2,333.50	4,667.00	7,000.50
Poult insurance	1,172.50	2,345.00	3,517.50
Litter	2,025.00	3,375.00	4,725.00
Fuel and electricity	918.75	1,837.50	2,756.25
Supplies	350.00	700.00	1,050.00
Labor	1,712.00	3,308.80	4,905.60
Interest[c]	2,680.82	5,320.52	7,948.74
Repairs and maintenance	939.30	1,878.59	2,817.89
Total	75,108.67	149,079.75	222,733.12
Total fixed costs[d]	21,115.78	21,115.78	21,115.78
Total costs	96,224.45	170,195.53	243,848.90
Total pounds of turkey sold[e]	403,480	806,960	1,210,440

[a] For the various percentage of capacity utilized, each cost item, except poults, was simply 25, 50, or 75 percent of the correspondong cost for the production of tom turkeys when 100 percent of capacity was utilized (see Appendix C, Table 41).

[b] For poult prices, by percentage of capacity utilized and model size (see Appendix C, Table 24).

[c] On operating capital.

[d] These costs, excluding repairs and maintenance, were the same as for the corresponding model size when 100 percent of capacity was utilized.

[e] Toms were marketed at 24 weeks and averaged 26.2 pounds.

TABLE 49. Costs of producing tom turkeys, 12 percent flock mortality at 25, 50, and 75 percent of capacity utilized, 105,000-bird model, Kansas, 1968-69.

Item	Percent of capacity utilized		
	25	50	75
		Dollars	
Variable costs[a]			
Poults[b]	18,949.22	37,209.38	54,780.47
Feed	75,287.73	150,575.46	225,863.19
Grit	113.40	226.80	340.20
Medications	3,500.00	7,000.00	10,500.00
Poult insurance	1,758.75	3,517.50	5,118.75
Litter	2,700.00	4,725.00	7,312.50
Fuel and electricity	1,378.13	2,756.25	4,134.38
Supplies	525.00	1,050.00	1,575.00
Labor	2,510.40	4,905.60	7,416.00
Interest[c]	4,002.10	7,948.72	11,889.02
Repairs and maintenance	1,353.23	2,706.47	4,059.70
Total	112,077.96	222,621.18	332,989.21
Total fixed costs[d]	30,475.17	30,475.17	30,475.17
Total costs	142,553.13	253,096.35	363,464.38
Total *pounds of turkey sold*[e]	605,220	1,210,440	1,815,660

[a]For the various percentages of capacity utilized, each cost item, except poults, was simply 25, 50, and 75 percent of the corresponding cost for the production of tom turkeys when 100 percent of capacity was utilized (see Appendix C, Table 41).

[b]For poult prices, by percentage of capacity utilized and model size (see Appendix C, Table 20).

[c]On operating capital.

[d]These costs, excluding repairs and maintenance, were the same as for the corresponding model size when 100 percent of capacity was utilized.

[e]Toms were marketed at 24 weeks and averaged 26.2 pounds.

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AN ECONOMIC ANALYSIS OF PRODUCING MARKET TURKEYS IN KANSAS USING SEMICONFINEMENT REARING

by

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Producing market turkeys under semiconfinement is of fairly recent origin in Kansas. The major purpose of this study is to provide the turkey industry with information regarding the economics of producing market turkeys by this method.

Objectives were: (1) to estimate the total capital investment in land, buildings, machinery, and equipment to produce market turkeys in relation to size of operation; (2) to estimate per unit costs of producing market turkeys in relation to scale, flock sex, and degree of utilization of production facilities; (3) to analyze variable and fixed cost components of producing market turkeys; (4) to identify and determine the relative importance of factors contributing to economies of scale; and (5) to analyze the influence of feed prices and flock mortality upon production costs.

Five model sizes--20,000, 35,000, 70,000, and 105,000 birds, with size based on annual brooding capacity, were synthesized using recommended budget standards obtained from field survey data, research publications, extension personnel, and industry trade journals.

Input prices from local businesses, government sources, and equipment manufacturers were used to compute capital investment as well as fixed and variable costs for the five models based on the 1968-69 price level.

Fixed and variable costs were summed and divided by the pounds of turkey sold for each model to obtain the cost per pound of production.

Capital investment ranged from $62,135 for 20,000 birds ($3.11 per poult) to $240,324 for 105,000 birds ($2.29 per poult).

Short-run average cost curves were approximated by computing the cost of production for 25, 50, 75, and 100 per cent of model capacity. From these an economies of scale curve was derived.

Average total costs of producing tom turkeys ranged from 20.31 cents per pound for 20,000 birds to 19.53 cents for 105,000 birds. For hen turkeys, costs ranged from 23.87 cents per pound to 22.59 cents for corresponding sizes. Production costs for toms were approximately 3.5 to 3.0 cents per pound lower than for hens, reflecting greater market weights of turkey sold and despite higher flock mortality (12 per cent for toms and 5 per cent for hens).

Economies by increasing scale from 20,000 to 105,000 birds amounted to 0.78 cent per pound for toms and 1.28 cents per pound for hens. Approximately 50 per cent of the economies of scale occurred between 20,000 and 35,000 size models. Four cost items, in order of importance (depreciation, poults, interest on fixed investment and repairs and maintenance) accounted for approximately 87 per cent of the economies.

Feed was the largest cost item and accounted for 61.25 per cent and 53.88 per cent of total costs for toms and hens, respectively. Poults ranked second as a production expense item.

Feed conversion and the cost of producing toms were related to mortality. As total flock mortality increased from eight to 14 per cent average total costs increased 0.66 cent per pound for the 20,000 bird model. Feed required per pound of gain increased 0.04 pound, or 0.95 pound per turkey sold.

Costs of production were related to different feed prices in producing toms. Prices were allowed to vary 10 per cent above and below a computed "base" feed price for each protein level. As a result, average total costs varied directly 1.29 cents per pound or 33.8 cents per tom turkey sold for all models.