Livestock production represents a major portion of Kentucky's total agricultural economy. In most of our livestock enterprises, over half of the total cost of production is associated with the cost of feed. In many instances feed may even account for as much as seventy or eighty percent of the total production expense. Therefore, any significant reduction in the cost of obtaining feed also represents a significant reduction in the total cost of production and an increased profit margin for the farmer.

In recent years, many livestock producers have turned to on-farm feed processing systems as a means of reducing the expense associated with obtaining feed. Naturally, the move to an on-farm system requires some expenditure of capital and some decisions in regard to the type of equipment to be used. Many options are available and, in some cases, the economics of such a venture can indeed be questionable. The producer will need to evaluate his individual production system very carefully in order to determine if it will be profitable to purchase his own feed processing equipment. Factors to be taken into consideration include the following:

1) quality and quantity of feed required,
2) cost and advantages of commercial services,
3) availability of ration ingredients,
4) availability of labor,
5) hauling expenses,
6) equipment costs,
7) net return on investment, and
8) overall convenience.

PRODUCTION SYSTEMS

There is a wide variety of situations from which a farmer may begin his consideration of on-farm feed processing. Let us now look at three general types of production systems which describe most of our livestock enterprises and see what factors will affect the economic evaluation of a feed processing system for each case.

The first system is that of a grain farmer who already has a livestock enterprise or is considering the addition of such an enterprise. Basically, he wants to market part or all of his grain through his livestock. He grows his own grain, has grain storage, drying and handling facilities; and has previously been getting his feed processed at a local mill or by a custom operator. The return to on-farm feed processing is the difference between the fixed and operating cost of his own processing unit and the cost of commercial processing. However, he also has storage to consider. To evaluate his return to storage, this producer must consider the difference in price between the average value of grain purchased off the farm and the average value of grain in his own storage.

A second system is one in which livestock is the only farm enterprise. There is neither grain production nor grain storage on the farm, and there are no plans to change that situation. At the present time, feed ingredients are purchased from a neighbor and/or feed store as needed, and the feed is processed commercially. Or, more typically, the producer may be buying a complete ground, mixed, and delivered ration from a single source. For this system, the economic evaluation would be a comparison between the cost of having a ration prepared commercially and the cost of owning and operating the on-farm system. In both cases, ingredients would be purchased off the farm as required.

The third production system is one in which the farmer produces none of his own grain and has no storage or feed processing equipment for his livestock enterprise but is willing to consider the addition of these facilities. Presently he is purchasing a commercially prepared ration for his livestock, but he will consider storage as part of his feed processing system, feeling that he can obtain his lowest ration cost by purchasing his grain during harvest time and processing it on his own farm. This farmer is concerned with the difference between the price of a commercially prepared ration and a farm-prepared ration, with his storage considered as a part of the feed processing expense.

All of these producers are basically concerned with the difference between on-farm costs and commercial costs. However, these costs will not be the same for each case. To determine the net return for each of the above situations, we must first determine the farm and commercial expenses for processing feed.
FARM FEED PROCESSING AND EQUIPMENT EXPENSES

The equipment used for farm feed processing usually consists of a portable or stationary mill of either the roller or hammer type. The mill may be powered by either an electric motor or a tractor. The stationary electric grinder-mixer ranges from 2 to 10 horsepower at a cost of $2000 to $4500. Various accessories can be obtained for an added cost. A breakdown of typical electric mill ownership and operating costs is given in Table 1 and graphically displayed in Figure 1.

![Figure 1: Annual cost per ton for two types of processing mills.](image)

**TABLE 1. FEED PROCESSING COSTS: ELECTRIC BLENDER-GRINDER, HAMMER TYPES** *(McFate, 1973 with modifications)*

<table>
<thead>
<tr>
<th>Tons Processed Per Year</th>
<th>50</th>
<th>100</th>
<th>200</th>
<th>400</th>
<th>800</th>
<th>1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Depreciation, Mill &amp; Accessories</td>
<td>$250.00</td>
<td>$250.00</td>
<td>$250.00</td>
<td>$250.00</td>
<td>$250.00</td>
<td>$250.00</td>
</tr>
<tr>
<td>(2) Interest, Mill and Accessories</td>
<td>150.00</td>
<td>150.00</td>
<td>150.00</td>
<td>150.00</td>
<td>150.00</td>
<td>150.00</td>
</tr>
<tr>
<td>(3) Insurances, Taxes &amp; Mill Housing</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
<td>60.00</td>
</tr>
</tbody>
</table>

**OPERATING COST ($/Ton)**

<table>
<thead>
<tr>
<th>Item</th>
<th>5.00</th>
<th>10.00</th>
<th>20.00</th>
<th>40.00</th>
<th>80.00</th>
<th>120.00</th>
</tr>
</thead>
<tbody>
<tr>
<td>(4) Repairs and Replacements</td>
<td>$5.00</td>
<td>$10.00</td>
<td>$20.00</td>
<td>$40.00</td>
<td>$80.00</td>
<td>$120.00</td>
</tr>
<tr>
<td>(5) Maintenance Time Cost</td>
<td>5.37</td>
<td>10.73</td>
<td>21.46</td>
<td>42.92</td>
<td>85.84</td>
<td>128.76</td>
</tr>
<tr>
<td>(6) Supervisory Time Cost</td>
<td>18.00</td>
<td>36.00</td>
<td>72.00</td>
<td>144.00</td>
<td>288.00</td>
<td>432.00</td>
</tr>
<tr>
<td>(7) Electricity, $0.00875/Ton</td>
<td>4.38</td>
<td>8.75</td>
<td>17.50</td>
<td>35.00</td>
<td>70.00</td>
<td>105.00</td>
</tr>
</tbody>
</table>

**TOTAL COST****

<table>
<thead>
<tr>
<th>Item</th>
<th>9.86</th>
<th>5.25</th>
<th>2.95</th>
<th>1.80</th>
<th>1.23</th>
<th>1.04</th>
</tr>
</thead>
<tbody>
<tr>
<td>(8) Total Cost, $</td>
<td>$492.75</td>
<td>$525.48</td>
<td>$590.96</td>
<td>$721.92</td>
<td>$983.84</td>
<td>$1245.76</td>
</tr>
<tr>
<td>(9) Total Cost, $/Ton</td>
<td>9.86</td>
<td>5.25</td>
<td>2.95</td>
<td>1.80</td>
<td>1.23</td>
<td>1.04</td>
</tr>
</tbody>
</table>

*Includes base mill and accessories for $3000. No grain storage costs included.

**Fixed cost calculations:**
(1) Estimated average mill life, 12 years or 8.25%/year.
(2) Interest at 10%/year on average investment, or 5% of initial cost.
(3) Insurance, taxes, and mill housing estimated to be 2%/year of the purchase price.

***Operating cost calculations:**
(4) Repairs and replacements = 0.10/ton, based on Missouri user experience.
(5) Maintenance time cost = $0.1075/ton based on 13.7 min./wk. and avg. 332 ton/yr with labor at $3.00/hr.
(6) Supervisory time cost = $0.35/ton based on 46.3 min./wk. and avg. of 332 ton/yr, with labor at $3.00/hr.
(7) Electricity cost = $0.00875/ton based on 3.5 kwh/ton at 2.56/kwh. Supply and discharge augers included.

****Total cost calculations:**
(8) Total cost, $ = the sum of the cost for items 1-7.
(9) Total cost, $/ton = the total cost divided by the tons processed per year.
Portable mills are usually powered by the tractor PTO. Initial investment in a portable grinder-mixer ranges from $2500 to $5000, again depending upon size and accessories. More labor and energy inputs will be required when a portable mill is used. The annual costs for depreciation, interest, repairs, taxes, insurance, etc. can be determined in much the same manner as for electric mills and are presented in Table 2, with the graphical display in Figure 1. Although the higher labor and energy inputs are a disadvantage, this type of mill is portable and very appropriate for many feeding operations, especially those which utilize roughages such as hay or corn cobs.

Other items may also be required in addition to the portable or stationary processing mill. These include regular storage bins, hopper bottom bins, augers, electric motors, wiring and controls. The cost of these items may be approximated from Table 3 and their annual cost can be estimated from Table 4. Labor and energy costs must be added to the annual fixed costs to obtain the total annual cost.

**TABLE 2. FEED PROCESSING COSTS-PORTABLE GRINDER-MIXER HAMMER-TYPE***

<table>
<thead>
<tr>
<th>Tons Processed Per Year</th>
<th>50</th>
<th>100</th>
<th>200</th>
<th>400</th>
<th>800</th>
<th>1200</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) Depreciation, Mill &amp; Accessories</td>
<td>$500.00</td>
<td>$500.00</td>
<td>$500.00</td>
<td>$500.00</td>
<td>$500.00</td>
<td>$500.00</td>
</tr>
<tr>
<td>(2) Interest, Mill and Accessories</td>
<td>200.00</td>
<td>200.00</td>
<td>200.00</td>
<td>200.00</td>
<td>200.00</td>
<td>200.00</td>
</tr>
<tr>
<td>(3) Insurances, Taxes and Mill Housing</td>
<td>80.00</td>
<td>80.00</td>
<td>80.00</td>
<td>80.00</td>
<td>80.00</td>
<td>80.00</td>
</tr>
<tr>
<td>(4) Repairs and Replacements</td>
<td>$5.00</td>
<td>$10.00</td>
<td>$20.00</td>
<td>$40.00</td>
<td>$80.00</td>
<td>$120.00</td>
</tr>
<tr>
<td>(5) Maintenance Time Cost</td>
<td>5.37</td>
<td>10.73</td>
<td>21.46</td>
<td>42.92</td>
<td>85.84</td>
<td>128.76</td>
</tr>
<tr>
<td>(6) Supervisory Time Cost</td>
<td>25.00</td>
<td>50.00</td>
<td>100.00</td>
<td>200.00</td>
<td>400.00</td>
<td>600.00</td>
</tr>
<tr>
<td>(7) Fuel Cost</td>
<td>18.50</td>
<td>37.00</td>
<td>74.00</td>
<td>148.00</td>
<td>296.00</td>
<td>444.00</td>
</tr>
<tr>
<td><strong>TOTAL COST</strong></td>
<td><strong>$833.87</strong></td>
<td><strong>$887.73</strong></td>
<td><strong>$995.46</strong></td>
<td><strong>$1210.92</strong></td>
<td><strong>$1641.84</strong></td>
<td><strong>$2072.76</strong></td>
</tr>
</tbody>
</table>

*Includes 3 ton capacity base mill and accessories. No grain storage costs included.

**Fixed cost calculations:
(1) Estimated average mill life, 8 years or 12.5%/year.
(2) Interest at 10%/year on average investment, or 5% of initial cost.
(3) Insurance, taxes, and mill housing estimated to be 2%/year of the purchase price.

***Variable cost calculations:
(4) Repairs and replacements - estimated to be $0.10/ton.
(5) Maintenance time cost = $0.1073/ton, estimated to be the same as in Table 1.
(6) Supervisory time = $0.50/ton based on 30 min. to grind 3 tons with labor at $3.00/hour.
(7) Fuel cost = $0.37/ton based on 80 hp tractor using 5.52 gal. of diesel at $0.40/gal. for 30 min. to prepare 3 tons.

**Total cost calculations:
(8) Total cost, $ = sum of items 1-7.
(9) Total cost, $/Ton - the total cost divided by the ton processed per year.
### TABLE 3. APPROXIMATE COST AND LIFE OF FEED PROCESSING RELATED EQUIPMENT

<table>
<thead>
<tr>
<th>ITEM</th>
<th>COST ESTIMATE/UNIT</th>
<th>ESTIMATED LIFE, YEARS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flat Bottom Bin, Structure Only</td>
<td>$0.40—$0.60/bu</td>
<td>20</td>
</tr>
<tr>
<td>Hopper Bottom Bins (under 500 bu)</td>
<td>$1.00—$1.50/bu</td>
<td>15</td>
</tr>
<tr>
<td>Automatic Electric Mill</td>
<td>$2000 and up</td>
<td>12</td>
</tr>
<tr>
<td>Auger - 4-in. Tube</td>
<td>$5.00—$7.00/ft</td>
<td>7</td>
</tr>
<tr>
<td>Electric Motors under 1 hp</td>
<td>$120.00—$150.00/hp</td>
<td>10</td>
</tr>
<tr>
<td>1-5 hp</td>
<td>$70.00—100.00/hp</td>
<td>20</td>
</tr>
<tr>
<td>Wiring and Controls</td>
<td>$500.00 and up</td>
<td></td>
</tr>
</tbody>
</table>

### TABLE 4. ITEMS TO BE CONSIDERED WHEN DETERMINING FIXED COST

- **DEPRECIATION** = Total Value ÷ Years of Life
- **INTEREST** = (Purchase Price ÷ 2) x Rate of Interest
- **TAXES** = (Purchase Price ÷ 2) x Rate of Tax
- **INSURANCE** = (Purchase Price ÷ 2) x Insurance Rate
- **REPAIRS AND MAINTENANCE** = (Purchase Price) x (% total repairs will be of purchase price) ÷ (Years to be used)

*Assuming straight line depreciation with no salvage value.

### TABLE 5. TYPICAL CUSTOM RATES FOR THE SOUTHEASTERN AND SOUTHWESTERN UNITED STATES (Progressive Farmer, October, 1974)

<table>
<thead>
<tr>
<th>JOB</th>
<th>SOUTHEAST</th>
<th>SOUTHWEST</th>
</tr>
</thead>
<tbody>
<tr>
<td>Harvesting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Corn picking-2-row</td>
<td>$9.60/acre</td>
<td>$5.30/acre</td>
</tr>
<tr>
<td>Corn combining</td>
<td>12.00/acre</td>
<td>8.10/acre</td>
</tr>
<tr>
<td>Combining</td>
<td></td>
<td></td>
</tr>
<tr>
<td>soybeans</td>
<td>10.00/acre</td>
<td>6.30/acre</td>
</tr>
<tr>
<td>grain sorghum</td>
<td>9.40/acre</td>
<td>5.20/acre</td>
</tr>
<tr>
<td>wheat, oats, barley</td>
<td>9.20/acre</td>
<td>5.00/acre</td>
</tr>
<tr>
<td>Crop</td>
<td></td>
<td></td>
</tr>
<tr>
<td>dry corn</td>
<td>0.09/bu.</td>
<td>.09/bu.</td>
</tr>
<tr>
<td>dry sorghum</td>
<td>0.11/cwt.</td>
<td>.12/cwt.</td>
</tr>
<tr>
<td>shelling corn</td>
<td>0.10/bu.</td>
<td>.05/bu.</td>
</tr>
<tr>
<td>Miscellaneous</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Grinding Feed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>corn</td>
<td>0.27/cwt.</td>
<td>.18/cwt.</td>
</tr>
<tr>
<td>corn and cobs</td>
<td>0.27/cwt.</td>
<td>.21/cwt.</td>
</tr>
<tr>
<td>oats</td>
<td>0.27/cwt.</td>
<td>.18/cwt.</td>
</tr>
<tr>
<td>sorghum</td>
<td>0.28/cwt.</td>
<td>.19/cwt.</td>
</tr>
<tr>
<td>barley</td>
<td>0.27/cwt.</td>
<td>.18/cwt.</td>
</tr>
<tr>
<td>Mixing feed</td>
<td>0.17/cwt.</td>
<td>.16/cwt.</td>
</tr>
</tbody>
</table>
hauling associated with delivery to and from the commercial facility.

**BREAK EVEN POINT DETERMINATION**

Once the expenses associated with both farm processing and commercial processing have been established, it will be possible to calculate the annual feed tonnage required to make on-farm feed processing profitable. This is called the break-even-point and can be calculated using the following formula:

\[
\text{Break-even-point} = \frac{(\text{Total annual fixed cost for farm processing})}{(\text{Commercial processing cost/ton} - \text{Farm operating cost/ton})}
\]

Certainly the break-even-point will not be the same for all producers and it will vary with each individual farming operation. To illustrate this point, three example calculations will be made to represent each of the three previously described production systems.

**Example 1:** The first system was that of a producer who grows his own grain, has his own grain storage facility, and wants to determine his break-even-point for installing farm feed processing utilizing a stationary electric mill. He estimates that an additional 200 bu. of supplement and ration storage and 150 feet of 4-in. auger (with a 2 hp. electric motor) will be required to utilize this system compared to commercial processing. Referring to Tables 1, 2, and 3, he calculates his cost to be the following:

**Example 1: Stationary Mill System**

**I. Electric Mill: Purchase Price = $5000**

A. Fixed Cost per year:
   (1) Depreciation = $250.00
   (2) Interest = 150.00
   (3) Insurance, taxes, housing = 50.00

B. Operating Cost/ton:
   (1) Repairs and Replacements = $0.10
   (2) Maintenance Time Cost = 0.11
   (3) Supervisory Time Cost = 0.36
   (4) Electricity = 0.0875

**II. Extra Bulk Storage: Purchase price = $300 (200 bu. @ $1.50/bu.)**

A. Fixed cost per year:
   (1) Depreciation = $300/15 yr = $20.00
   (2) Interest = $300 x 5% = 15.00
   (3) Insurance, Taxes = $300 x 2% = 6.00

B. Operating Cost/ton = $0.00

**III. Transport Auger Purchase Price = $1050 (150 ft. @ $7/ft.)**

A. Fixed cost per year:
   (1) Depreciation = $1050/7 yr = $150.00
   (2) Interest = $1050 x 5% = 52.50
   (3) Insurance, Taxes = $1050 x 2% = 21.00

B. Operating cost per ton:
   (1) Repairs, Misc., Estimated = $0.10

**IV. Electric Motor: Purchase price = $200 (2 hp. @ $100/hp)**

A. Fixed Cost per year:
   (1) Depreciation = $200/10 yr = $20.00
   (2) Interest = $200 x 5% = 10.00
   (3) Insurance, Taxes = $200 x 2% = 4.00

B. Operating cost per ton:
   (1) Repairs - estimated = $0.01
   (2) Electricity-based on 2.54l/kw hour at 140 bu/hr. = $0.01

**V. Totals**

A. Fixed Cost per year: $758.50
B. Operating cost per ton: $0.7775

*Refer to Table 1*

If he has his feed processed commercially at the local feed mill, he estimates that it will cost him $8.80/ton (0.44 cwt, Table 5) for grinding and mixing and $0.60/ton for hauling and labor for a total cost of $9.40/ton. The break-even-point can now be calculated using our formula as follows:

\[
\text{Break-even-point} = \frac{($758.50)}{(9.40/ton - $0.7775/ton)} = 88 \text{ tons/year}
\]

**Example 2:** In our second system, the farmer produces no grain. He has no grain storage and doesn’t intend to purchase any. All of his grain is purchased from his neighbors. Unlike the first producer, he wishes to use a portable grinder-mixer. He estimates that it will require 30 min. to deliver 3 tons of the processed feed after it has been prepared. Also, to support his electric mill, he plans to purchase 500 bushels of hopper-bottom storage for supplement ration and ingredients. Using Tables 2-4, his cost calculations are as follows:

**Example 2: Portable Grinder-Mixer System, 3 ton capacity**

**I. Portable Grinder-Mixer: Purchase price = $4000**

A. Fixed Cost per year:
   (1) Depreciation = $4000/15 yr = $266.67
   (2) Interest = 200.00
   (3) Insurance, Taxes, housing = 80.00

B. Operating cost per ton:
   (1) Repairs and Replacements = $0.10
   (2) Maintenance Cost = 0.11
   (3) Supervisory Time Cost = 0.50
   (4) Fuel Cost = 0.37

**II. Extra Bulk Storage: Purchase price = $750 (500 bu. @ $1.50/bu.)**

A. Fixed cost per year:
   (1) Depreciation = $750/15 yr = $50.00
   (2) Interest = 37.50
   (3) Insurance, Taxes = $750 x 2% = 15.00

B. Operating Cost per ton = 0.00

**III. Delivery Expense**

A. Fixed cost per year: Assuming tractor cost is assigned to other farm operations = 0.00

B. Operating Cost per ton:
   (1) Fuel: 5.52 gal/hr @ 404/gal for 30 min = $0.57
   (2) Labor = 30 min. @ $3/hr = 0.50
IV. Totals
A. Fixed cost per year $882.50
B. Operating Cost per ton $1.95

*Refer to Table 2.

He presently has his grain both ground and mixed at a cost of $10.80/ton. Because he has to haul his grain regardless of whether he uses commercial or farming processing, his hauling expense would be the same in both cases and so he does not include this cost in his calculations. For this example, then,

\[
\text{Break-even-point} = \frac{882.50}{10.80/\text{ton} - 1.95/\text{ton}} = 100 \text{ tons/year}
\]

Example 3: In this system the producer wishes to purchase dry grain during harvest and store and process it on his own farm. He will consider storage as part of his feed processing operation. As with the first example, he estimates his total stationary mill fixed cost to be $758.50 per year plus an operating cost of $0.7775/ton. Using Tables 3-4 and AEN-35 as a guide, he determines his annual storage cost to be about $1500. Based on his local conditions, he estimates that it will cost him an additional $16.07/ton ($0.45/bu) to buy a commercially prepared ration instead of purchasing his grain during harvest and storing it on his farm. In this case, commercial processing cost includes the increased cost of commercially stored ingredients. Therefore, for his situation,

\[
\text{Break-even point} = \frac{(758.50 + 1500)}{(16.07/\text{ton} - 0.7775/\text{ton})} = 148 \text{ tons/year}
\]

If the additional cost of the commercially prepared ration had been $25/ton, his break-even-point would have been 93 tons. For this producer, the grain storage return is assumed to be part of the feed processing return.

If this producer decided to use a portable grinder-mixer like the one selected in Example 2, his fixed cost per year would be $882.50 while his operating cost would be $1.95 per ton. Adding the $1500 per year cost for storage, the break-even-point is:

\[
\text{Break-even point} = \frac{882.50 + 1500.00}{16.07 - 1.95} = 169 \text{ ton/year}
\]

Again, if the difference had been $25/ton, the break-even-point would have been 103 tons per year.

There are several points illustrated by these examples. They are:

1. Feed processing costs involve more than just the price of the stationary or portable mill.
2. Factors such as delivery time and distance may dictate which type of mill is most economical.
3. The break-even-point is greatly influenced by local economic conditions relating to the cost of grain and processing.
4. Each farm situation is fairly unique relative to cost. Therefore, each farmer should make his own calculations before deciding on farm processing. Of course, other factors such as discounts on bulk purchases of supplements, feed quality, availability, and labor may dictate this decision.

OTHER DRYING AND STORAGE CONSIDERATIONS

How does drying fit into the farm processing scheme? As with the commercial elevator or feed processor, grain must be preserved by some method if it is to be stored for a substantial period of time. Drying, acid treatment, and high moisture corn storage are all proven methods of storing corn. Of these, only drying allows the corn to be sold through normal marketing channels, thereby giving the farmer the option of either selling or feeding.

One of the biggest concerns of a cash grain farmer who stores his grain is the loss of weight due to drying below the base moisture content. However, the producer who dries and feeds his own grain need not be as concerned about this point. Certainly more fuel is required to dry corn to the level required for long term storage, but if the corn is to be fed to animals, there is little economic loss. Remember, nutritional value is primarily dependent upon dry matter. The weight loss of corn when dried below 15.5% moisture content is mostly water and therefore represents little loss of nutritional value. This is not to say that high-moisture corn does not have feeding advantages, but rather, that there is little difference between feeding 15.5% moisture content corn and 13% moisture content corn.

SUMMARY

The economic return to feed processing is dependent on the particular producer and his local market and processing situation (Table 6). Feed processing systems interact with storage and drying systems such that the total enterprise must be evaluated to insure that there is no duplication of return or expense.

**TABLE 6. SIZE OF HERD OR FLOCK REQUIRED TO CONSUME VARIOUS TONNAGES OF FEED ANNUALLY**

<table>
<thead>
<tr>
<th>Class of Livestock</th>
<th>Level of Production</th>
<th>Annual Tons of Feed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>50</td>
<td>100</td>
</tr>
<tr>
<td>Dairy cows</td>
<td>15,000 lbs. of milk</td>
<td>17</td>
</tr>
<tr>
<td>Steers</td>
<td>250 lbs. of grain</td>
<td>140</td>
</tr>
<tr>
<td>Hogs</td>
<td>160 lbs. of grain</td>
<td>184</td>
</tr>
<tr>
<td>Layers</td>
<td>240 eggs</td>
<td>1,250</td>
</tr>
</tbody>
</table>

REFERENCES CITED


