# Economic Guides For Choosing Between Rations In Market Turkey Production

by

James S. Plaxico and George G. Judge
*Department of Agricultural Economics*

and

Rollin H. Thayer, George W. Newell
and Kenneth E. Dunkelgod
*Department of Poultry Husbandry*

OKLAHOMA A&M COLLEGE
DIVISION OF AGRICULTURE
SCIENCE SERVING AGRICULTURE
EXPERIMENT STATION

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## Objectives of This Study

The overall objective of this bulletin is to provide market turkey producers with technical and economic information necessary to select the most economic grain for the growing and finishing ration and to select the optimum marketing weight.

In developing this information the following objectives are delineated:

(1) To establish basic feed requirements and weight gain data, by sex, over the growing and finishing period on range, for a standard growing mash and alternative grains commonly used by market turkey producers in Oklahoma.

(2) To determine, on the basis of the derived input-output information, the optimum grain or combinations of grains under various price conditions.

(3) To transform the basic data in such a manner as to facilitate decisions relative to the choice of a ration and the time of marketing by turkey producers in Oklahoma.

### CONTENTS

## Summary and Conclusions

Two varieties of turkeys on range were fed a standard growing mash and five different grains. Weight and feed consumption information were secured at intervals. Thus, it was possible to estimate the relationship between weight gain and feed consumption by sex and ration for each week of the range growing period.

There was no significant difference in the weekly gain of the birds on the different rations, and the gain per week was constant over the range feeding period. However, there was a significant difference in feed consumption and gain between sexes. In addition, there was an important variation in the proportions of mash and grain consumed which was associated with the grain fed.

Based on the results of the feeding tests, two methods were used for selecting the most economical grains. These are budgets and general choice guides. Convenient budget forms are presented which will assist producers in selecting the most economic grain based on information from his own experience or from the experiment. The general choice guide is a table of values for alternative grains when milo is priced at various levels.

The experiment also provided the data basic to the development and presentation of information relating to the number of birds that must be weighed in order to estimate the average flock weight within prescribed accuracy limits. Also, "breakeven" prices (the price necessary to cover the feed cost involved in an additional feeding period) were computed.

For suggestions on how to use the results of such research in making practical choices of grains for turkey rations, see Okla. Agri. Exp. Sta. Bulletin No. B-476, "Choosing Turkey Rations: An Economic Guide."

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## The Problem Investigated

Feed is by far the largest single item of cost in producing market turkeys. Therefore, selection of the ration which is most efficient from the nutritional and economic standpoint is one of the more important management decisions facing the market turkey producer. Regardless of whether the producer buys grain or produces it on his own farm, it is important that he consider the alternative rations available and be aware of the economic consequences of selecting one grain over another. In some cases it may be more profitable for a farmer to produce one grain for market and buy another for his turkey enterprise.

The ration fed to market turkeys in Oklahoma during the growing and finishing period consists of a grower mash and a whole grain or a mixture of whole grains. The choice of the grain or grains to be used depends upon availability, cost, and relative nutritive value of the alternative grains. In Oklahoma, milos and kafirs have, in recent years, been in abundant supply and priced lower per pound than corn. Similarly, oats are often in abundant supply and priced low during the late summer and fall months.

In order to make an intelligent selection of the grain or combination of grains best suited for use in turkey rations in any given supply and price situation, a basis for a quick and accurate evaluation is needed. Both nutritive value and grain prices must be considered since the operator is interested in using the amounts and kinds of feeds which will result in maximum net returns.

In the study reported in this bulletin, economic guides were developed for use by turkey producers in selecting the grain or grain mixture which would bring the maximum net return under any given price situation. Required data on weight gain, mash consumption, grain consumption, and pounds of both mash and grain required per pound of gain for rations containing milo, corn, oats and combinations of these grains were obtained in a feeding test at the Oklahoma Agricultural Experiment Station. These production data were then used in making an economic analysis from which the economic guides were developed. In addition, the production data provided the basis for deriving a method for determining the necessary sample size to estimate the weight of a flock of turkeys. This information can then be used to select the optimum time at which the birds should be marketed.

## The Experimental Procedure

Broad Breasted Bronze and White Holland poults from the Oklahoma Agricultural Experiment Station breeder flocks were grown to eleven weeks of age under confinement conditions in brooder houses. They were fed the Oklahoma A. and M. College Turkey Starter Number 550 which is an all-mash turkey starter. Prior to being moved to the experimental ranges, the poults were sexed and each sex was divided at random into five lots with twenty Broad Breasted Bronze and twenty White Hollands in each lot. The following rations were fed from the eleventh through the thirty-second week of the growing period.

| Pen No. | Sex | Ration |
|---|---|---|
| 1 | Hens | Grower Mash + Whole Corn |
| 2 | " | Grower Mash + Whole Oats |
| 3 | " | Grower Mash + Whole Milo |
| 4 | " | Grower Mash + 80% Whole Corn and 20% Whole Oats |
| 5 | " | Grower Mash + 80% Whole Milo and 20% Whole Oats |
| 6 | Toms | Grower Mash + Whole Corn |
| 7 | " | Grower Mash + Whole Oats |
| 8 | " | Grower Mash + Whole Milo |
| 9 | " | Grower Mash + 80% Whole Corn and 20% Whole Oats |
| 10 | " | Grower Mash + 80% Whole Milo and 20% Whole Oats |

The grower mash fed was the Oklahoma A and M College Turkey Grower Mash Number 550. The formula for this mash is:

| Ingredients | Percent |
|---|---|
| Ground yellow corn | 50 |
| Pulverized oats | 3 |
| Alfalfa meal (17%) | 2.5 |
| Fish meal (60%) | 12.5 |
| Soybean oil meal (44%) | 15 |
| Meat and bone scrap (50%) | 10 |
| Dried whey | 2 |
| Dried butyl solubles | 2 |
| Calcium carbonate | 1 |
| Di-calcium phosphate (20% phosphorus) | 1 |
| Trace mineral mix | 0.05 |
| Salt | 0.5 |
| Vitamin concentrate | 0.5 |

The mash and whole grain were fed free choice.

The poults were individually weighed at four-week intervals during the first eight weeks of the test period and at weekly intervals thereafter. Feed consumption records were kept for each pen for the same time periods.

## Methods of Analysis

It was impossible to separate the hens from the toms with absolute accuracy when the birds were allocated to the various treatment pens at the beginning of the test. However, where an incorrect allocation occurred, the weight gain and feed requirement data have been adjusted to remove this possible source of error.

Also, a relatively large group of birds in one pen was killed by dogs. The data relating to this pen were adjusted to remove the amount of feed consumed by these birds prior to their destruction. Therefore, the data presented reflect the weight gain and feed requirements associated with the different rations fed, with other variables held constant.

There was a small element of random variation in the weight gain data by weeks. This variation appeared to be attributable to (1) temperature-weather variations, (2) differences in the weigh time for

the different periods, and (3) weighing error. Therefore, in most of the charts and tables presented, the data have been smoothed to remove this variation. The purpose of this smoothing was to derive net gains due to the ration, with other factors held constant or controlled.

The data relating to hens and toms are presented separately to show differences in feed intake and weight gain by sex. These data are important in determining the optimum marketing period since the females attained market finish in a shorter time than did the males. Average gains and feed intake for hens and toms are also presented because the sexes are ordinarily fed together and the producer in most cases wishes to select the ration which is optimum for the sexes combined.

The number of pens available was too small to allow feed intake estimates by varieties. However, the weight gain data did not differ significantly by varieties; therefore the data for the two varieties were combined.

## Results and Discussion

The rate at which feed can be converted into turkey meat is determined by many physical and biological factors. Type of feed, variety of turkeys, disease and parasite control and the many variations in management practices result in variation in feed inputs, which in turn influence growth and carcass development. In this study, interest is centered on types of rations and the corresponding turkey weight gains when other physical factors are held constant.

### WEIGHT GAINS BY SEX, WEEK AND RATION

The relationship between time and body weights for males and females, by rations, is shown in Figures 1 through 5 and Table 1 in the appendix. These data indicate that turkey meat output was a linear function of time over the growth range considered (that is, the gain per week was constant), and that the weight-time relationship for males and females differs significantly.

In order to compare and contrast the time-weight relationships for the five different rations, the average weights of the hens and toms were combined. The weight relationships for the various rations are shown in Figure 6. Little difference existed between the rations relative to weight at a given time. Only the milo-mash ration differed statistically from the other rations with regard to weight gain at the

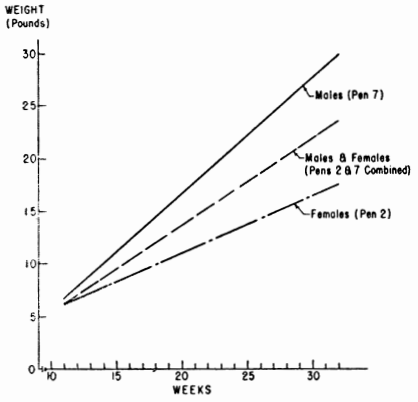


Fig. 1

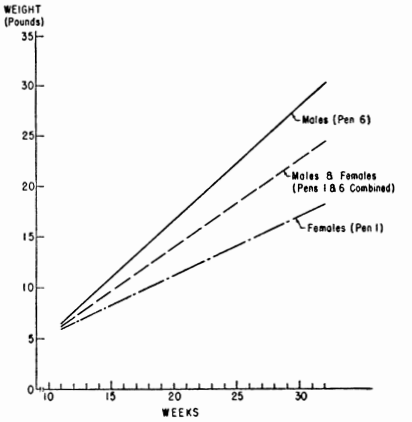


Fig. 2

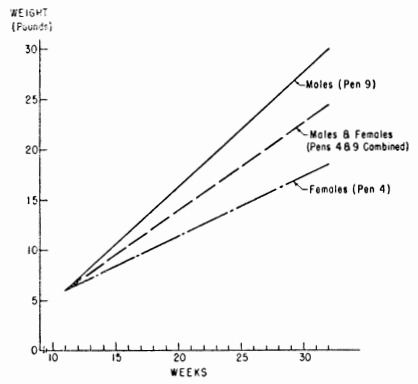


Fig. 3

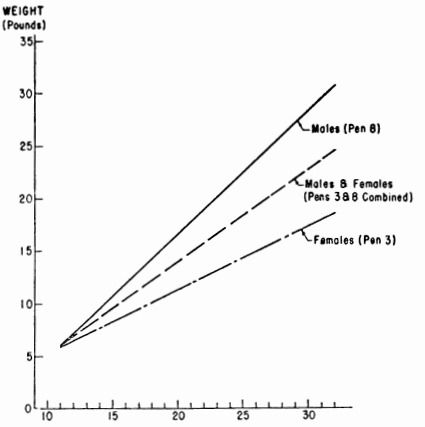


Fig. 4

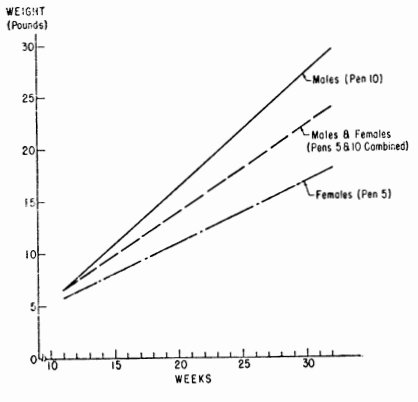


Fig. 5

Fig. 1—Average weekly body weights, by sex, of turkeys fed a grain supplement of corn.

Fig. 2—Average weekly body weight, by sex, of turkeys fed a grain supplement of oats.

Fig. 3—Average weekly body weights, by sex, of turkeys fed a grain supplement of milo.

Fig. 4—Average weekly body weights, by sex, of turkeys fed a grain supplement of corn.

Fig. 5—Average weekly body weights, by sex, of turkeys fed a grain supplement of milo and oats.

**TABLE I.—Weight Gain and Feed Requirements by Ration and Period.**

*Average of Hens and Toms, Oklahoma 1955*[1]

| Ration | Weight Gain | Feed Required for Period | | Feed Required per lb. Gain | |
|---|---|---|---|---|---|
| | | Mash | Grain | Mash | Grain |
| | | **13 to 17th Week** | | | |
| Corn | 4.3 | 13.25 | 3.0 | 3.08 | .697 |
| Oats | 4.1 | 12.3 | 3.75 | 2.96 | .900 |
| Milo | 4.5 | 11.3 | 3.0 | 2.67 | .650 |
| 80% Milo, 20% Oats | 4.3 | 12.4 | 2.75 | 2.88 | .639 |
| 80% Corn, 20% Oats | 4.25 | 12.35 | 3.0 | 2.94 | .714 |
| | | **18 to 22nd Week** | | | |
| Corn | 4.3 | 12.9 | 7.75 | 2.96 | 1.78 |
| Oats | 4.1 | 12.95 | 9.0 | 3.20 | 2.22 |
| Milo | 4.5 | 11.25 | 9.25 | 2.72 | 2.05 |
| 80% Corn, 20% Oats | 4.3 | 12.8 | 8.05 | 3.20 | 2.01 |
| 80% Milo, 20% Oats | 4.25 | 11.2 | 9.65 | 2.60 | 2.24 |
| | | **23 to 27th Week** | | | |
| Corn | 4.3 | 11.7 | 14.25 | 2.75 | 3.35 |
| Oats | 4.1 | 15.8 | 13.5 | 3.80 | 3.25 |
| Milo | 4.5 | 11.6 | 15.55 | 2.57 | 3.45 |
| 80% Corn, 20% Oats | 4.3 | 12.65 | 15.25 | 2.94 | 3.55 |
| 80% Milo, 20% Oats | 4.25 | 10.25 | 16.85 | 2.38 | 3.91 |
| | | **28 to 32nd Week** | | | |
| Corn | 4.3 | 11.9 | 18.55 | 2.73 | 4.26 |
| Oats | 4.1 | 18.3 | 16.75 | 4.46 | 4.08 |
| Milo | 4.5 | 11.25 | 21.05 | 2.5 | 4.67 |
| 80% Corn, 20% Oats | 4.3 | 13.2 | 19.2 | 3.03 | 4.41 |
| 80% Milo, 20% Oats | 4.25 | 9.75 | 22.1 | 2.32 | 5.26 |

[1] The data are adjusted for weekly variations in gains attributable to random factors such as weather and weigh time.

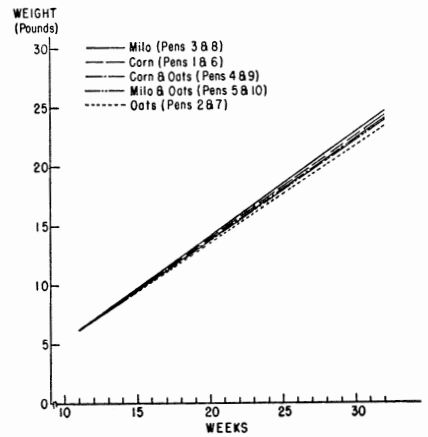


Fig. 6

**Fig. 6—Average weekly body weights of turkeys (males and females combined, by type of grain supplement.**

five percent probability level. Thus, for most practical purposes, the time-weight response relationship for the five rations can be considered to be essentially the same.

## FEED INPUTS BY SEX, WEEK AND RATION

The feed input data, as determined by this experiment, yield the time-feed input relationships for males and females which are shown in Figures 7 through 11. These data indicate that mash consumption is approximately a linear function of time. The mash-time relationship for males on corn (Figure 7) and the mash-time relationship for females on milo and oats (Figure 11) do deviate slightly from a linear function. However, even in these cases a straight line approximation describes the observations quite well. Although a linear approximation may be used for each ration, the rate of consumption of mash varies significantly between rations. For example, the males fed the ration containing whole oats consumed approximately 3.75 pounds of mash per bird per week (Figure 8). The males fed the ration containing a mixture of whole oats and milo consumed only 2.9 pounds of mash per bird per week (Figure 11).

The grain consumption per week increased as the age of the birds increased. Here again, grain consumption between males and females, and rate of grain consumption between rations, differed considerably. For example, in regard to grain consumption, males fed oats (Figure 8) required only fifty pounds of grain over the 21 week period while sixty-two pounds were consumed by males fed the ration containing a mixture of whole oats and milo (Figure 11).

The time-feed input relationships for the five different rations using combined male and female mash and grain consumption are compared in Figures 12 and 13.

## SELECTING THE MOST ECONOMICAL RATION

In choosing the most economical ration, it is necessary to consider (1) quantities of grain and mash that will be needed for the turkey to attain a given weight, and (2) the prices of the grain and mash. A summary of the data on weight gain; mash consumption; grain consumption; and mash and grain consumed per pound of gain as obtained in the feeding test is presented in Table 1. These

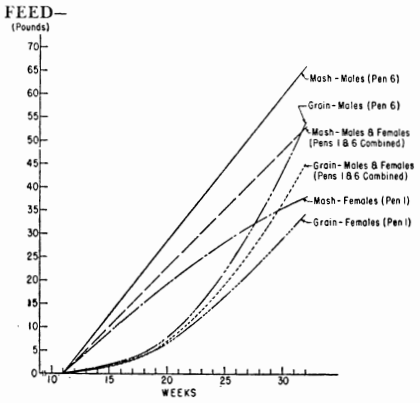


Fig. 7

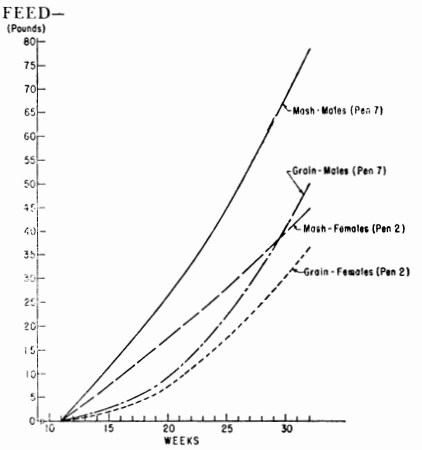


Fig. 8

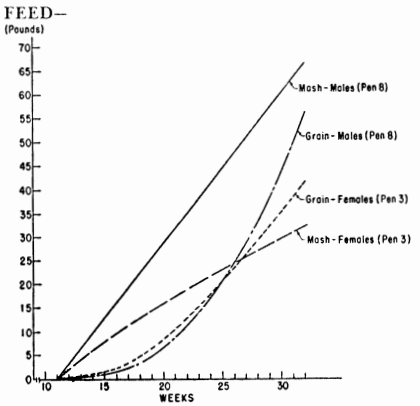


Fig. 9

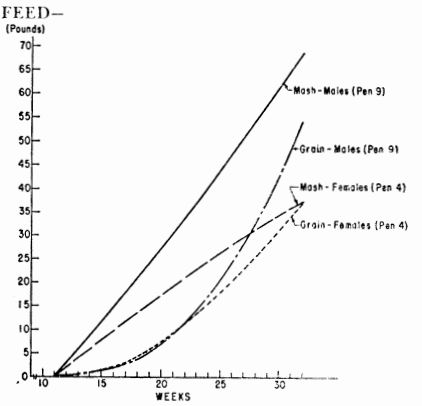


Fig. 10

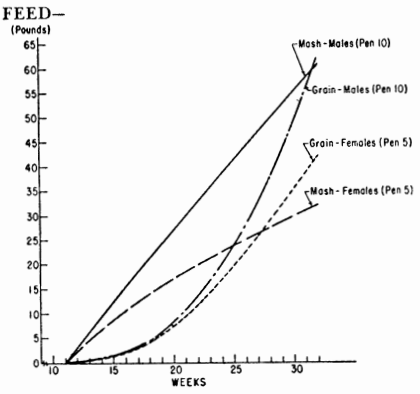


Fig. 11

Fig. 7—Accumulative adjusted average weekly mash and grain consumption, by sex, of turkeys fed a ration of grower mash and corn.

Fig. 8—Accumulative adjusted average weekly mash and grain consumption, by sex, of turkeys fed a ration of grower mash and oats.

Fig. 9—Accumulative adjusted average weekly mash and grain consumption, by sex, of turkeys fed a ration of grower mash and milo.

Fig. 10—Accumulative adjusted average weekly mash and grain consumption, by sex, of turkeys for a ration of grower mash, corn and oats.

Fig. 11—Accumulative adjusted average weekly mash and grain consumption, by sex, of turkeys fed a ration of grower mash, milo and oats.

data illustrate again that when the different grains are substituted one for the other, total mash requirements and requirements per pound of gain over time also change. For example, in the 13 through 17 week time period, when milo was replaced by oats, the birds ate more oats than milo (.90 lbs. compared to .65 lbs. per pound of gain) and consumed more mash (2.96 lbs. compared to 2.67 lbs. per pound of gain). Thus, in selecting the most profitable ration, both the price and quantity of mash and grain must be considered.

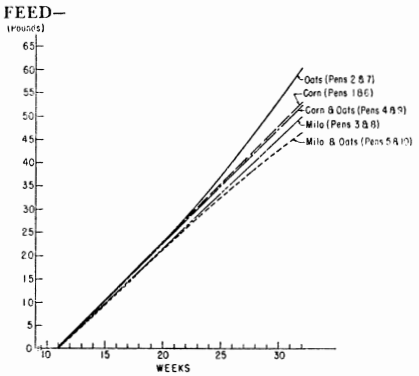


**Fig. 12—Accumulative adjusted average mash consumption by weeks of turkeys (males and females combined) by type of grain supplement.**

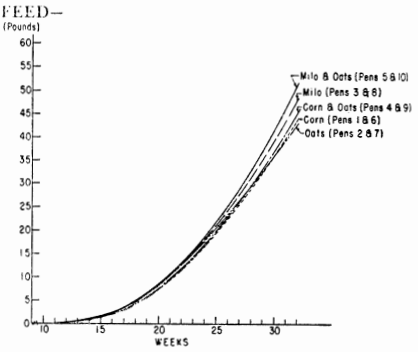


**Fig. 13—Accumulative adjusted average grain consumption by weeks of turkeys (males and females combined) by type of grain supplement.**

The data in Table 1 indicate that more feed is required per pound of gain during the later time periods, and that the ratio of grain to mash increases. This suggests that, depending upon the relative price of mash and grain, the optimum ration during the first period may not be optimum during later time periods.

Figure 6 suggests that there is no significant difference in the rate of gain between rations. This simplifies selection of the ration as the problem resolves itself into one of selecting the ration which minimizes either feed cost per pound of gain or feed cost over some chosen time period. However, the selection of a ration is an individual producer problem. What may be optimum for one producer in Oklahoma is not necessarily the best for others. This is the case because alternatives, in terms of availability and prices, vary among

producers due to (1) location, (2) amounts and price of farm produced grains available, and (3) prices of alternative grains not produced on the farm.

It is not always profitable to feed home-grown grain on the farm. The value of the home-grown grain in feeding (i.e., the weight gain resulting) and price relationship may be such that it would be more profitable to sell the grain on the market and buy another grain to feed. However, the cost of a home-grown grain for feeding is the market price available to the farmer at his farm, while the price of a purchased grain is the market price paid by the farmer plus any cost of delivery to the farm. Thus, the cost of transportation and margin may make a given grain cheaper to feed in a ration than any alternative purchased grain, although it may not be the "best buy" among purchased grains.

Given (1) the objective of the producer, (2) the problem of choosing between alternative rations, and (3) the basic feed input-weight gain data of Table 1, two methods of making a choice between rations may be utilized. These are:

(1) Individual budgets, and

(2) General choice guides developed from the experimental data. By using the budget method the producer may use either the gain and feed-input data of Table 1 or information more applicable to his individual situation. However, regardless of whether the budget or the choice guide method is used, prices reflecting the alternatives of the individual should be used. Both methods are described below.

### Budgeting to Select the Grain Ration

The relevant factors to consider are the price of mash, the price of the different grains, weight gains and feed requirements for the various rations. Budgets may be constructed as an aid in selecting the most profitable grain to feed by using the data in Appendices 1 and 2, or Table 1, or data from farm feeding records.

For example, assume that a producer has home-grown oats which he can sell for 70 cents per bushel (2.2 cents per pound), that he can buy milo for $1.90 per cwt. (1.9 cents per pound), and that mash costs $4.00 per cwt. (4.0 cents per pound). Considering the 23 through 27 week period on range and using the feed requirement data from Table 1, it is possible to estimate feed costs per pound of gain using the two rations. These computations are summarized in Table 2.

Carrying through the necessary computations at these prices, the resulting estimates of Table 2 indicate a higher cost using the oats ration (cost of 22.35 cents per pound of gain for oats as compared to 16.84 cents for milo). Thus, it would be more profitable to sell the oats and buy milo to feed turkeys if these are the only two alternatives available. However, the producer in question should also consider the alternative of mixing his home-grown oats with milo and/or corn, and similar budgets should be prepared. A sample blank budget form is shown in Table 3. This, or a similar form, may be used by producers to make such choices.

## A General Choice Guide

Using the feed consumption and weight gain data from the experiment, information has been developed which facilitates the choice of a grain to feed market turkeys over each of four time periods. Milo is generally available in most sections of Oklahoma. Thus, for the table of general choice guides, the value of other grains at selected milo-mash prices has been computed, i.e., what you could afford to pay for each of the grains to make it equal in feeding value to milo. These estimates are presented in Table 4.

**TABLE 2.—Budget to Decide Between Oats and Milo for a Market Turkey Ration 23-27 Week.**

| | Ration 1: Milo–Mash | | | Ration 2: Oats–Mash | | |
|---|---|---|---|---|---|---|
| Input | Lbs. required per lb. gain | Price Cents | Cost Cents | Lbs. required per lb. gain | Price Cents | Cost Cents |
| Grain | 3.45 | 1.9 | 6.56 | 3.25 | 2.2 | 7.15 |
| Mash | 2.57 | 4.0 | 10.28 | 3.80 | 4.0 | 15.20 |
| Total | XX | XX | 16.84 | XX | XX | 22.35 |

**TABLE 3.—Sample Budget to be Used as an Aid in Selecting the Optimum Ration for Market Turkeys.**

| | Ration: _____ | | | Ration: _____ | | |
|---|---|---|---|---|---|---|
| Input | Lbs. required per lb. gain | Price Cents | Cost Cents | Lbs. required per lb. gain | Price Cents | Cost Cents |
| Grain | --- | -- | ---- | --- | -- | ---- |
| Mash | --- | -- | ---- | --- | -- | ---- |
| Total | | | ---- | | | ---- |

**TABLE 4.—Replacement Value of Oats, Corn-Oats, and Milo-Oats Substituted for Milo in Feeding Market Turkeys for Given Milo and Mash Prices; by Growth Periods, Oklahoma 1955.**

| Price of Mash (Dollars) | Milo at 1.50 | Milo at 2.25 | Milo at 3.00 | Milo at 4.00 | Milo at 1.50 | Milo at 2.25 | Milo at 3.00 | Milo at 4.00 |
|---|---|---|---|---|---|---|---|---|
| | **13-17 Week** | | | | **18-22 Week** | | | |
| | | | | *Oats-Value/cwt.* | | | | |
| 3.00 | Nil. | .66 | 1.20 | 1.92 | .74 | 1.44 | 2.14 | 3.06 |
| 3.50 | Neg. | .50 | 1.04 | 1.77 | .64 | 1.33 | 2.03 | 2.95 |
| 4.00 | Neg. | .33 | .88 | 1.60 | .53 | 1.23 | 1.92 | 2.85 |
| 4.50 | Neg. | .18 | .72 | 1.44 | .42 | 1.12 | 1.81 | 2.74 |
| 5.50 | Neg. | Neg. | .40 | 1.12 | .20 | .90 | 1.59 | 2.52 |
| | | | | *Corn-Value/cwt.* | | | | |
| 3.00 | Neg. | .33 | 1.04 | 1.99 | 1.31 | 2.19 | 3.05 | 4.21 |
| 3.50 | Neg. | .04 | .75 | 1.70 | 1.24 | 2.11 | 2.98 | 4.13 |
| 4.00 | Neg. | Neg. | .45 | 1.39 | 1.17 | 2.04 | 2.91 | 4.07 |
| 4.50 | Neg. | Neg. | .16 | 1.10 | 1.11 | 1.98 | 2.84 | 4.00 |
| 5.50 | Neg. | Neg. | Neg. | .51 | .96 | 1.83 | 2.70 | 3.85 |
| | | | *80% Corn-20% Oats Value/cwt.* | | | | | |
| 3.00 | .53 | 1.30 | 2.06 | 3.08 | .82 | 1.59 | 2.36 | 3.38 |
| 3.50 | .38 | 1.14 | 1.91 | 2.92 | .70 | 1.47 | 2.24 | 3.26 |
| 4.00 | .20 | .97 | 1.73 | 2.75 | .58 | 1.35 | 2.12 | 3.14 |
| 4.50 | .05 | .81 | 1.58 | 2.59 | .46 | 1.23 | 2.00 | 3.02 |
| 5.50 | Neg. | .48 | 1.25 | 2.27 | .22 | 1.00 | 1.76 | 2.79 |
| | | | *80% Milo-20% Oats Value/cwt.* | | | | | |
| 3.00 | .23 | .92 | 1.61 | 2.52 | 1.54 | 2.23 | 2.92 | 3.84 |
| 3.50 | .04 | .73 | 1.42 | 2.34 | 1.57 | 2.26 | 2.95 | 3.87 |
| 4.00 | Neg. | .54 | 1.23 | 2.14 | 1.59 | 2.29 | 2.97 | 3.89 |
| 4.50 | Neg. | .35 | 1.04 | 1.96 | 1.62 | 2.31 | 3.00 | 3.92 |
| 5.50 | Neg. | Neg. | .66 | 1.58 | 1.67 | 2.37 | 3.05 | 3.97 |
| | **23-27 Week** | | | | **28-32 Week** | | | |
| | | | | *Oats-Value/cwt.* | | | | |
| 3.00 | .46 | 1.26 | 2.06 | 3.12 | .28 | 1.14 | 2.00 | 3.14 |
| 3.50 | .27 | 1.07 | 1.87 | 2.93 | .04 | .90 | 1.76 | 2.90 |
| 4.00 | .08 | .88 | 1.68 | 2.74 | Neg. | .66 | 1.52 | 2.66 |
| 4.50 | Neg. | .69 | 1.49 | 2.56 | Neg. | .42 | 1.28 | 2.42 |
| 5.50 | Neg. | .31 | 1.11 | 2.18 | Neg. | Neg. | .80 | 1.94 |
| | | | | *Corn-Value/cwt.* | | | | |
| 3.00 | 1.40 | 2.17 | 2.95 | 3.98 | 1.48 | 2.30 | 3.13 | 4.23 |
| 3.50 | 1.37 | 2.15 | 2.92 | 3.96 | 1.45 | 2.27 | 3.10 | 4.20 |
| 4.00 | 1.35 | 2.12 | 2.90 | 3.93 | 1.42 | 2.25 | 3.07 | 4.17 |
| 4.50 | 1.32 | 2.09 | 2.87 | 3.90 | 1.39 | 2.22 | 3.04 | 4.14 |
| 5.50 | 1.27 | 2.04 | 2.82 | 3.85 | 1.34 | 2.16 | 3.99 | 4.08 |
| | | | *80% Corn-20% Oats Value/cwt.* | | | | | |
| 3.00 | 1.16 | 1.89 | 2.62 | 3.59 | 1.23 | 2.03 | 2.82 | 3.88 |
| 3.50 | 1.11 | 1.84 | 2.57 | 3.54 | 1.17 | 1.97 | 2.76 | 3.83 |
| 4.00 | 1.06 | 1.79 | 2.52 | 3.49 | 1.11 | 1.91 | 2.70 | 3.76 |
| 4.50 | 1.00 | 1.74 | 2.47 | 3.44 | 1.05 | 1.85 | 2.64 | 3.70 |
| 5.50 | .90 | 1.63 | 2.37 | 3.34 | .93 | 1.73 | 2.52 | 3.59 |
| | | | *80% Milo-20% Oats Value/cwt.* | | | | | |
| 3.00 | 1.48 | 2.14 | 2.80 | 3.68 | 1.44 | 2.10 | 2.77 | 3.66 |
| 3.50 | 1.50 | 2.16 | 2.83 | 3.71 | 1.45 | 2.12 | 2.79 | 3.68 |
| 4.00 | 1.53 | 2.19 | 2.85 | 3.73 | 1.47 | 2.14 | 2.81 | 3.70 |
| 4.50 | 1.55 | 2.21 | 2.88 | 3.76 | 1.49 | 2.16 | 2.82 | 3.71 |
| 5.50 | 1.60 | 2.27 | 2.93 | 3.81 | 1.52 | 2.19 | 2.86 | 3.75 |

To use this table as an aid in selecting the most economical grain:

(1) Determine the price of milo and mash,

(2) For the growth period under consideration, read the value of oats, corn, corn and oats, and milo and oats from the table,

(3) Compare the feeding values of the different feeds to their market prices and select the one whose market value is lowest relative to its feeding value.

For example, assume that a producer can buy milo for $2.25 per cwt. and mash is priced at $4.00 per cwt. Then during the 13 through 17 week period, oats would be worth $0.33 per cwt., corn would have a negative value, the corn-oats mix would be worth $0.97 per cwt., and the milo-oats mix would be worth $0.54 per cwt. In similar fashion, during the 18 through 22 week period, with milo at $2.25 per cwt. and mash at $4.00 per cwt. oats, corn, corn-oats, and milo-oats are worth $1.23, $2.04, $1.35, and $2.29 per cwt., respectively, for feeding market turkeys.

If these alternative feeds are priced at the exact levels given in the table, costs would be identical regardless of the ration selected. If each of the four alternative grains is priced higher than the figure given in the table, then milo is the most economical ration. On the other hand, if one of the grains is priced lower than the figure taken from the table, this grain or grain mix would be a better buy than milo or any of the other grains considered. If two or more grains are priced lower than the value from the table, each is a better buy than milo and the most economical one is the one priced lowest relative to its feeding value taken from the table.

Therefore, to follow the guides presented in Table 2, the producer: (1) Determines the price to himself for milo and mash, (2) selects the milo-mash price from the table which most nearly approximates his own prices, (3) reads off the values of the alternative grain from the table for the period under consideration, and (4) selects the grain which minimizes cost. For example, in the problem budgeted for the 13 through 17 week period (milo $1.90 per cwt., oats $2.17 per cwt., and mash at $4.00 per cwt.), select the $2.25 per cwt. milo and the $4.00 mash price and read off a value of oats of $0.33 per cwt. or $0.10 per bushel. Thus, as we found earlier, it is more profitable under this set of circumstances to sell the oats and buy milo.

## Sampling Rates For Estimating Average Turkey Weights

There are times when the producer needs to estimate the average weight of his flock of birds so as to make decisions in his production program. This would be a simple process if he could look over his flock of turkeys and accurately estimate the average bird weight. However, visual inspection of turkeys is deceiving due to the variability of feathering and conformation of growing turkeys.

The question then arises as to how many birds should be weighed to estimate the average weight of a flock of birds within a given accuracy level. If information relating to the population distribution and variance (a measure of the dispersion of observations) is known, methods are available for obtaining a good estimate of the required sample size. Data from experiments, such as the one reported on pages 17 through 19 of this bulletin, provide good estimates of the magnitude of the population variance. However, the commercial turkey grower usually practices a culling program to eliminate "runts" and sick and/or injured birds, whereas this program is not followed in experiments. Therefore, the population distribution found under commercial conditions may result in the population variance being somewhat smaller than for experimental conditions. However, the discrepancy between the two sets of data is small and the experimental variance estimates provide information on sample sizes which are useful to the turkey producer.

To ascertain the necessary sample size, the estimated variances calculated from the experimental data, by weeks and by sex, are given for White Holland turkeys on a milo-mash ration in Table 5. These data indicate that the variability of weights increases as the birds become larger. In computing sample size, these single-valued estimates of the variability of bird weights are used as the best estimates of the true population value. On the basis of these estimated variances, the number of birds has been computed for one probability level with different allowable mean deviations (Table 6).

**TABLE 5.—Estimated Population Variances by Sex and Time Period, White Holland Turkeys on A Milo-Mash Ration.**

| | Estimated Variance | |
|---|---|---|
| Week | Females | Males |
| 16th | .18 | .63 |
| 21st | .47 | 1.56 |
| 26th | 1.03 | 4.29 |
| 31st | 1.69 | 4.43 |

The interpretation of Table 6 may be made clear by the following example. Suppose a producer has a flock of 1000 males 26 weeks old and wants to obtain an estimate of their average weight. He wants to know how many turkeys must be weighed to estimate the average weight (within one-half pound) with a 95 percent probable measure of confidence. Using the above information and reading from the table, the estimated size of sample required is found to be 64 birds. For any situation, given the age, sex and level of desired accuracy, the suggested number of birds to weigh can be read from Table 6. This method does not guarantee that the confidence interval will meet the designated requirements of length, since the estimates of variance before and after taking the sample may be poor. It does, however, give reasonable assurance that the interval will be close to the required length.

A basic assumption underlying sampling techniques is that of a random selection of the sample observations. Therefore, some basis for a random selection of the birds to be weighed is a necessary condition. The producer should therefore choose a basis for selecting the birds to weigh that will yield a sample of observations that will contain a minimum of bias.

**TABLE 6.—Estimated Number of Birds that Must be Weighed to Secure Various Degrees of Accuracy for Different Flock Sizes at the 95 percent Confidence Level.**

| | Required Accuracy Level (pounds) | Size of Flock | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 250 | 500 | 1,000 | 2,500 | 5,000 | 7,500 | 10,000 |
| **Female Birds** | | | | | | | | |
| 21st week | .25 | 27 | 28 | 29 | 30 | 30 | 30 | 30 |
| 26th week | .25 | 52 | 58 | 62 | 64 | 65 | 65 | 65 |
| | .50 | 15 | 16 | 16 | 16 | 16 | 16 | 16 |
| **Male Birds** | | | | | | | | |
| 21st week | .25 | 71 | 83 | 91 | 96 | 98 | 98 | 99 |
| | .50 | 23 | 24 | 24 | 25 | 25 | 25 | 25 |
| 26th week | .25 | 131 | 177 | 215 | 247 | 260 | 265 | 267 |
| | .50 | 54 | 60 | 64 | 67 | 68 | 68 | 68 |
| | .75 | 27 | 29 | 30 | 30 | 30 | 30 | 30 |
| | 1.00 | 16 | 17 | 17 | 17 | 17 | 17 | 17 |
| 30th week | .25 | 133 | 181 | 221 | 255 | 268 | 273 | 276 |
| | .50 | 55 | 62 | 66 | 69 | 70 | 70 | 70 |
| | .75 | 28 | 30 | 31 | 31 | 31 | 31 | 31 |
| | 1.00 | 17 | 17 | 17 | 18 | 18 | 18 | 18 |

## Time of Marketing

In general, hens attain market finish and may be marketed before toms are ready. However, there is some flexibility in the time for marketing both hens and toms. Thus, when a producer expects a change in market conditions, he may sell before his normal marketing time or hold the birds until past the normal period, depending on the nature of his price expectations.

Applying the data presented in Appendix Tables 1 and 2, or data from their own flocks, producers can determine the "break-even" price for turkeys after an additional feeding period. To make such estimates, it is necessary to know feed requirements and weight gains for the additional period and the present price of the turkeys. Table 7 is an illustration of the use of a convenient budget form for making such estimates. The "break-even" information under one set of conditions has been entered on this form.

To fill in the spaces in Table 7 certain data, which are facts known to the producer at the time the decision is to be made, were assumed. These assumptions were: (1) An offer of 30 cents per pound has been made for the turkey hens in the flock; (2) the birds are 24 weeks old; (3) the ration being fed is mash at $4.00 per cwt. with milo for grain at $3.00 per cwt.

**TABLE 7.—Budget Form for Estimating Time and Weight for Marketing Turkey Hens.**

| | |
|---|---|
| *(Value now per head)* | |
| Weight now 13.8 lbs. | |
| Price now 30¢ per lb. | |
| Value each now | $4.14 |
| *Added feed cost:* | |
| Lbs. of Mash 2.8 × .04 (Price) = .11 | |
| Lbs. of Grain 5.5 × .03 (Price) = .17 | |
| Total Estimated Additional Feed Cost | .28 |
| Value now plus additional feed cost | $4.42 |
| Weight after feeding period 15.0 lbs. | |
| Value after feeding period if 30 cent price is expected | 4.50 |
| "Break-even" Price 4.42 ÷ 15.0 = 29.5 Cents per pound | |
| Estimated return above feed cost | .08 cents |

By weighing an adequate number of birds, as discussed in the previous section, the producer finds that the hens average 13.8 pounds. At the market price of 30 cents per pound, each bird has a present value of $4.14. Feed consumption for the next two weeks will be 2.8 pounds of mash at a cost of 11 cents and 5.5 pounds of grain at a cost of 17 cents. Totaling then gives a value of $4.42 which must be received for the hen in two weeks in order to pay for the additional feed. However, during the ensuing two weeks, the hen would have gained 1.2 pounds so that she would then weigh 15 pounds. At the same 30 cents per pound the hen would bring $4.50 or an estimated return over feed cost of 8 cents. Further deduction will indicate that it would pay feed costs for the additional two week period if the price per pound did not drop below 29.5 cents. This could be called the "break-even" price. It should be noted that in almost all instances if the producer expects the price to remain constant or to increase it would be profitable to keep the birds two weeks longer where labor, equipment and other overhead costs are not considered. Table 8 shows the minimum price that can be received to "break even"; that is, to pay the additional feed cost for an additional feeding period.

Table 8 summarizes, in convenient form, "break-even" prices for certain assumed turkey, grain, and mash prices for an additional two-week feeding period for 24- through 26-week-old hens and for 27- through 29-week-old toms. To use the table, assume again that a producer has 24-week-old hens worth 30 cents per pound on a milo ration, and that milo costs $3.00 per cwt. and mash costs $4.00 per cwt. Then, by referring to the table, we find the "break-even" price to be 29.5 cents.

**TABLE 8.—"Break-Even price" for Additional 2 Weeks Feeding Period Using a Ration of Mash and Milo as Described and Assuming Input-Outputs to be the same as the Experimental Data.**

| Price of Turkeys now Per Lb. | Mash $3.50/cwt. Price of grain per cwt. Dollars | | | | Mash $4.00/cwt. Price of grain per cwt. Dollars | | | |
|---|---|---|---|---|---|---|---|---|
| | 1.50 | 2.25 | 3.00 | 4.00 | 1.50 | 2.25 | 3.00 | 4.00 |
| | | | | **24 week old Hens** | | | | |
| .25 | .242 | .245 | .248 | .251 | .243 | .246 | .248 | .252 |
| .30 | .288 | .291 | .294 | .297 | .289 | .292 | .295 | .298 |
| .35 | .334 | .337 | .340 | .343 | .335 | .338 | .340 | .344 |
| .40 | .380 | .383 | .386 | .389 | .381 | .384 | .386 | .390 |
| | | | | **26 week old Hens** | | | | |
| .25 | .243 | .246 | .248 | .252 | .244 | .246 | .249 | .253 |
| .30 | .289 | .292 | .295 | .298 | .290 | .293 | .296 | .299 |
| .35 | .335 | .338 | .341 | .345 | .336 | .339 | .342 | .346 |
| .40 | .382 | .385 | .387 | .391 | .383 | .385 | .388 | .392 |
| | | | | **27 week old Toms** | | | | |
| .25 | .242 | .245 | .248 | .252 | .243 | .246 | .249 | .253 |
| .30 | .288 | .291 | .293 | .297 | .289 | .292 | .295 | .299 |
| .35 | .334 | .336 | .339 | .343 | .335 | .338 | .340 | .344 |
| .40 | .379 | .382 | .385 | .389 | .380 | .383 | .386 | .390 |
| | | | | **29 week old Toms** | | | | |
| .25 | .243 | .246 | .249 | .253 | .244 | .247 | .250 | .254 |
| .30 | .289 | .292 | .295 | .299 | .290 | .293 | .296 | .300 |
| .35 | .335 | .338 | .341 | .345 | .336 | .339 | .342 | .346 |
| .40 | .381 | .384 | .387 | .391 | .382 | .385 | .388 | .392 |

Based on weight gain and feed requirement data from Appendix 1 and 2. No allowance has been made for costs other than feed involved in the extra feeding period.

**APPENDIX TABLE I.—Live Weights by Week and Sex, Market Turkeys Fed Growing Mash and Five Alternative Grains.**

| Weeks | Corn | | | Oats | | | Milo | | |
|---|---|---|---|---|---|---|---|---|---|
| | Females Pen 1 | Males Pen 6 | Avg. | Females Pen 2 | Males Pen 7 | Avg. | Females Pen 3 | Males Pen 8 | Avg. |
| 11 | 6.0 | 6.5 | 6.2 | 6.2 | 6.8 | 6.2 | 5.9 | 6.0 | 6.0 |
| 12 | 6.5 | 7.6 | 7.0 | 6.7 | 7.8 | 7.0 | 6.5 | 7.2 | 6.9 |
| 13 | 7.0 | 8.8 | 7.9 | 7.2 | 8.9 | 7.8 | 7.0 | 8.4 | 7.8 |
| 14 | 7.7 | 10.0 | 8.8 | 7.8 | 10.0 | 8.7 | 7.7 | 9.6 | 8.7 |
| 15 | 8.2 | 11.0 | 9.7 | 8.3 | 11.2 | 9.5 | 8.3 | 10.8 | 9.5 |
| 16 | 8.8 | 12.2 | 10.5 | 8.8 | 12.2 | 10.3 | 8.9 | 11.9 | 10.4 |
| 17 | 9.4 | 13.3 | 11.3 | 9.4 | 13.3 | 11.1 | 9.5 | 13.1 | 11.3 |
| 18 | 10.0 | 14.5 | 12.2 | 9.9 | 14.4 | 12.0 | 10.1 | 14.3 | 12.2 |
| 19 | 10.6 | 15.7 | 13.1 | 10.5 | 15.5 | 12.8 | 10.7 | 15.5 | 13.1 |
| 20 | 11.2 | 16.7 | 13.9 | 11.0 | 16.6 | 13.6 | 11.3 | 16.7 | 14.0 |
| 21 | 11.8 | 17.9 | 14.8 | 11.5 | 17.7 | 14.5 | 11.9 | 17.8 | 14.9 |
| 22 | 12.3 | 19.0 | 15.7 | 12.1 | 18.8 | 15.2 | 12.5 | 19.0 | 15.8 |
| 23 | 13.0 | 20.1 | 16.6 | 12.6 | 20.0 | 16.0 | 13.2 | 20.2 | 16.7 |
| 24 | 13.5 | 21.2 | 17.5 | 13.2 | 21.0 | 16.9 | 13.8 | 21.4 | 17.5 |
| 25 | 14.1 | 22.4 | 18.3 | 13.7 | 22.2 | 17.8 | 14.4 | 22.6 | 18.4 |
| 26 | 14.7 | 23.5 | 19.2 | 14.2 | 23.2 | 18.6 | 15.0 | 23.7 | 19.3 |
| 27 | 15.3 | 24.6 | 20.0 | 14.8 | 24.3 | 19.4 | 15.6 | 24.9 | 20.2 |
| 28 | 15.9 | 25.8 | 20.9 | 15.3 | 25.5 | 20.2 | 16.2 | 26.1 | 21.2 |
| 29 | 16.5 | 26.9 | 21.8 | 15.8 | 26.5 | 21.0 | 16.8 | 27.3 | 22.0 |
| 30 | 17.1 | 28.0 | 22.7 | 16.4 | 27.7 | 21.8 | 17.4 | 28.5 | 22.9 |
| 31 | 17.7 | 29.2 | 23.6 | 17.0 | 28.8 | 22.7 | 18.0 | 29.7 | 23.8 |
| 32 | 18.3 | 30.3 | 24.4 | 17.5 | 30.0 | 23.5 | 18.7 | 30.8 | 24.7 |

## APPENDIX TABLE I—continued

| Weeks | 80% Corn-20% Oats | | | 80% Milo-20% Oats | | |
|---|---|---|---|---|---|---|
| | Females Pen 4 | Males Pen 9 | Avg. | Females Pen 5 | Males Pen 10 | Avg. |
| 11 | 6.0 | 6.2 | 6.1 | 5.8 | 6.5 | 6.5 |
| 12 | 6.6 | 7.2 | 6.9 | 6.3 | 7.6 | 7.3 |
| 13 | 7.2 | 8.4 | 7.7 | 7.0 | 8.8 | 8.2 |
| 14 | 7.8 | 9.5 | 8.6 | 7.6 | 9.8 | 9.0 |
| 15 | 8.4 | 10.8 | 9.5 | 8.1 | 10.9 | 9.9 |
| 16 | 9.0 | 11.8 | 10.5 | 8.7 | 12.0 | 10.7 |
| 17 | 9.6 | 12.8 | 11.3 | 9.3 | 13.2 | 11.5 |
| 18 | 10.2 | 14.0 | 12.2 | 9.9 | 14.2 | 12.3 |
| 19 | 10.8 | 15.2 | 13.0 | 10.5 | 15.3 | 13.2 |
| 20 | 11.4 | 16.2 | 13.9 | 11.1 | 16.5 | 14.0 |
| 21 | 12.0 | 17.5 | 14.8 | 11.7 | 17.5 | 14.8 |
| 22 | 12.6 | 18.6 | 15.6 | 12.2 | 18.7 | 15.7 |
| 23 | 13.2 | 19.7 | 16.5 | 12.8 | 19.7 | 16.5 |
| 24 | 13.8 | 20.9 | 17.5 | 13.4 | 20.8 | 17.4 |
| 25 | 14.4 | 22.0 | 18.3 | 14.0 | 22.0 | 18.2 |
| 26 | 15.0 | 23.2 | 19.2 | 14.6 | 23.0 | 19.0 |
| 27 | 15.6 | 24.3 | 20.0 | 15.2 | 24.1 | 19.9 |
| 28 | 16.2 | 25.4 | 21.0 | 15.8 | 25.2 | 20.7 |
| 29 | 16.8 | 26.6 | 21.8 | 16.4 | 26.3 | 21.5 |
| 30 | 17.4 | 27.7 | 22.7 | 17.0 | 27.5 | 22.4 |
| 31 | 18.0 | 28.9 | 23.6 | 17.6 | 28.5 | 23.2 |
| 32 | 18.7 | 30.0 | 24.5 | 18.2 | 29.6 | 24.0 |

**APPENDIX TABLE II.—Smoothed Grain and Mash Requirements by Weeks and Sex, Market Turkeys Fed Growing Mash and Five Alternative Grains.**

| Weeks | Females | | Males | | Average | |
|---|---|---|---|---|---|---|
| | Mash | Grain | Mash | Grain | Mash | Grain |
| | | | **Corn** | | | |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 2.5 | 0 | 2.9 | .3 | 2.5 | 0 |
| 13 | 5.0 | .2 | 5.5 | .6 | 5.0 | .5 |
| 14 | 7.3 | .6 | 8.5 | 1.0 | 7.5 | 1.0 |
| 15 | 9.4 | 1.4 | 11.5 | 1.7 | 10.0 | 1.5 |
| 16 | 11.4 | 2.1 | 14.5 | 2.5 | 12.5 | 2.5 |
| 17 | 13.4 | 3.0 | 17.5 | 3.4 | 15.0 | 3.5 |
| 18 | 15.4 | 4.2 | 20.8 | 4.5 | 17.5 | 4.5 |
| 19 | 17.4 | 5.4 | 24.0 | 5.9 | 20.3 | 5.6 |
| 20 | 19.3 | 7.0 | 27.2 | 7.5 | 22.7 | 7.2 |
| 21 | 20.9 | 8.5 | 30.5 | 9.8 | 25.4 | 9.0 |
| 22 | 22.8 | 10.4 | 33.9 | 12.3 | 27.8 | 11.0 |
| 23 | 24.5 | 12.1 | 37.4 | 15.0 | 30.4 | 13.4 |
| 24 | 26.2 | 14.3 | 40.8 | 18.5 | 32.8 | 16.0 |
| 25 | 27.8 | 16.4 | 43.9 | 22.0 | 35.5 | 18.6 |
| 26 | 29.4 | 18.7 | 47.0 | 25.9 | 38.0 | 21.6 |
| 27 | 30.8 | 21.2 | 50.4 | 29.9 | 40.5 | 25.0 |
| 28 | 32.4 | 23.6 | 53.5 | 34.3 | 43.0 | 28.6 |
| 29 | 33.8 | 26.2 | 56.9 | 39.0 | 45.5 | 32.5 |
| 30 | 35.2 | 29.0 | 60.0 | 44.0 | 48.0 | 36.4 |
| 31 | 36.6 | 31.6 | 63.5 | 48.9 | 50.5 | 40.0 |
| 32 | 38.0 | 34.4 | 67.0 | 53.9 | 53.0 | 44.4 |
| | | | **Oats** | | | |
| 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 1.9 | 0 | 2.9 | 0 | 2.0 | 0 |
| 13 | 3.7 | .2 | 5.5 | .5 | 4.4 | .4 |
| 14 | 5.6 | .7 | 8.5 | 1.1 | 6.7 | .8 |
| 15 | 7.5 | 1.5 | 11.5 | 1.9 | 9.4 | 1.5 |
| 16 | 9.5 | 2.3 | 14.5 | 2.9 | 11.9 | 2.5 |
| 17 | 11.7 | 3.3 | 17.5 | 4.2 | 14.5 | 3.5 |
| 18 | 13.8 | 4.5 | 20.5 | 5.7 | 17.1 | 5.0 |
| 19 | 15.8 | 6.0 | 23.5 | 7.5 | 20.0 | 6.5 |
| 20 | 18.0 | 7.5 | 26.9 | 9.8 | 22.6 | 8.5 |
| 21 | 19.7 | 9.5 | 30.0 | 11.8 | 25.5 | 10.5 |
| 22 | 21.7 | 11.5 | 33.4 | 14.0 | 28.3 | 12.5 |
| 23 | 23.5 | 13.5 | 37.0 | 16.5 | 31.2 | 15.0 |
| 24 | 25.7 | 15.5 | 41.0 | 19.2 | 34.2 | 17.5 |
| 25 | 28.0 | 18.0 | 45.0 | 21.9 | 37.5 | 20.2 |
| 26 | 30.5 | 20.4 | 49.5 | 25.5 | 40.5 | 23.0 |
| 27 | 32.7 | 22.7 | 54.0 | 29.4 | 43.9 | 26.4 |
| 28 | 35.3 | 25.5 | 58.8 | 33.4 | 47.0 | 29.5 |
| 29 | 37.5 | 28.0 | 63.5 | 37.5 | 50.4 | 33.0 |
| 30 | 40.3 | 31.0 | 68.5 | 41.5 | 53.6 | 36.5 |
| 31 | 42.5 | 33.6 | 73.5 | 45.7 | 57.0 | 40.0 |
| 32 | 45.0 | 36.5 | 78.5 | 50.0 | 60.2 | 43.4 |

**APPENDIX TABLE II.—Continued.**

**Milo**

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 2.0 | 0 | 3.0 | 0 | 2.5 | 0 |
| 13 | 4.2 | 0 | 5.7 | 0 | 5.0 | 0 |
| 14 | 6.0 | .5 | 8.6 | .5 | 7.5 | .5 |
| 15 | 8.0 | 1.0 | 11.5 | 1.0 | 10.0 | 1.3 |
| 16 | 9.9 | 2.0 | 14.9 | 1.7 | 12.4 | 2.0 |
| 17 | 11.5 | 3.2 | 17.9 | 2.7 | 14.5 | 3.2 |
| 18 | 12.9 | 4.6 | 21.0 | 3.9 | 17.0 | 4.5 |
| 19 | 14.6 | 6.4 | 24.5 | 5.3 | 19.4 | 6.0 |
| 20 | 16.0 | 8.4 | 27.8 | 7.0 | 21.7 | 7.7 |
| 21 | 17.5 | 10.4 | 31.2 | 9.0 | 24.0 | 9.8 |
| 22 | 18.7 | 12.5 | 34.7 | 11.4 | 26.5 | 12.0 |
| 23 | 20.4 | 15.0 | 38.0 | 14.0 | 29.0 | 14.7 |
| 24 | 21.5 | 17.7 | 41.5 | 17.0 | 31.4 | 17.5 |
| 25 | 23.0 | 20.5 | 44.5 | 20.5 | 33.5 | 20.6 |
| 26 | 24.5 | 23.4 | 47.5 | 24.4 | 36.0 | 24.0 |
| 27 | 25.8 | 26.0 | 50.9 | 28.6 | 38.4 | 27.5 |
| 28 | 27.4 | 29.0 | 54.0 | 33.5 | 40.5 | 31.5 |
| 29 | 28.5 | 32.0 | 57.4 | 38.8 | 43.0 | 35.5 |
| 30 | 30.0 | 35.0 | 60.5 | 44.0 | 45.0 | 40.0 |
| 31 | 31.4 | 38.5 | 63.5 | 50.0 | 47.5 | 44.0 |
| 32 | 32.7 | 41.7 | 66.9 | 55.5 | 50.0 | 48.5 |

**80% Corn — 20% Oats**

| | | | | | | |
|---|---|---|---|---|---|---|
| 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 2.2 | 0 | 2.6 | 0 | 2.4 | 0 |
| 13 | 4.2 | .5 | 5.4 | .6 | 5.0 | .4 |
| 14 | 6.2 | .8 | 8.0 | 1.0 | 7.4 | .6 |
| 15 | 8.2 | 1.4 | 11.0 | 1.6 | 10.0 | 1.2 |
| 16 | 10.0 | 2.0 | 14.5 | 2.1 | 12.5 | 2.0 |
| 17 | 12.0 | 3.0 | 17.6 | 3.0 | 15.0 | 3.0 |
| 18 | 13.7 | 4.0 | 21.0 | 4.3 | 17.5 | 4.0 |
| 19 | 15.5 | 5.8 | 24.8 | 5.2 | 20.0 | 5.5 |
| 20 | 17.3 | 7.5 | 28.0 | 7.0 | 22.5 | 7.2 |
| 21 | 19.0 | 9.4 | 31.0 | 9.0 | 25.0 | 9.0 |
| 22 | 20.6 | 11.4 | 34.5 | 11.4 | 27.5 | 11.2 |
| 23 | 22.5 | 13.5 | 37.5 | 14.0 | 30.0 | 13.6 |
| 24 | 24.2 | 15.8 | 41.0 | 17.2 | 32.5 | 16.4 |
| 25 | 26.0 | 18.3 | 44.2 | 20.6 | 35.0 | 19.2 |
| 26 | 27.6 | 20.8 | 47.5 | 24.5 | 37.6 | 22.5 |
| 27 | 29.4 | 23.3 | 51.0 | 28.7 | 40.2 | 25.5 |
| 28 | 31.0 | 26.0 | 54.5 | 33.0 | 42.7 | 29.5 |
| 29 | 32.6 | 28.6 | 58.0 | 38.0 | 45.4 | 33.2 |
| 30 | 34.4 | 31.5 | 61.5 | 43.5 | 47.9 | 37.2 |
| 31 | 36.0 | 32.2 | 65.0 | 49.0 | 50.4 | 41.5 |
| 32 | 37.5 | 37.0 | 69.0 | 54.0 | 53.0 | 45.5 |

**APPENDIX TABLE II.—Continued.**

| | 80%Milo — 20% Oats | | | | | |
|---|---|---|---|---|---|---|
| 11 | 0 | 0 | 0 | 0 | 0 | 0 |
| 12 | 2.5 | 0 | 2.5 | 0 | 2.5 | 0 |
| 13 | 5.0 | .1 | 5.5 | .1 | 5.4 | 0 |
| 14 | 7.0 | .5 | 8.5 | .5 | 7.9 | .5 |
| 15 | 9.0 | 1.0 | 11.5 | 1.3 | 10.4 | 1.2 |
| 16 | 10.6 | 2.0 | 14.5 | 2.0 | 12.5 | 2.0 |
| 17 | 12.4 | 3.0 | 17.5 | 3.2 | 15.0 | 3.3 |
| 18 | 14.0 | 4.0 | 20.5 | 4.5 | 17.3 | 4.6 |
| 19 | 15.4 | 5.8 | 23.6 | 6.3 | 19.5 | 6.3 |
| 20 | 16.8 | 7.5 | 26.8 | 8.3 | 21.6 | 8.0 |
| 21 | 18.4 | 9.5 | 30.0 | 10.5 | 23.8 | 10.0 |
| 22 | 19.8 | 11.8 | 32.5 | 13.0 | 26.0 | 12.5 |
| 23 | 21.0 | 14.0 | 35.5 | 16.0 | 28.0 | 15.4 |
| 24 | 22.5 | 17.0 | 38.0 | 19.7 | 30.3 | 18.4 |
| 25 | 23.6 | 19.6 | 41.0 | 23.5 | 32.5 | 21.5 |
| 26 | 25.0 | 22.6 | 44.0 | 27.5 | 34.5 | 25.0 |
| 27 | 26.3 | 25.6 | 46.5 | 32.5 | 36.5 | 29.0 |
| 28 | 27.5 | 28.6 | 49.5 | 37.5 | 38.6 | 33.0 |
| 29 | 28.6 | 32.0 | 52.5 | 43.5 | 40.6 | 37.5 |
| 30 | 30.0 | 35.0 | 55.5 | 49.5 | 42.7 | 42.0 |
| 31 | 31.0 | 38.5 | 58.5 | 55.5 | 44.9 | 47.0 |
| 32 | 32.2 | 41.6 | 61.4 | 61.5 | 46.5 | 51.8 |

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