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6-1-1929

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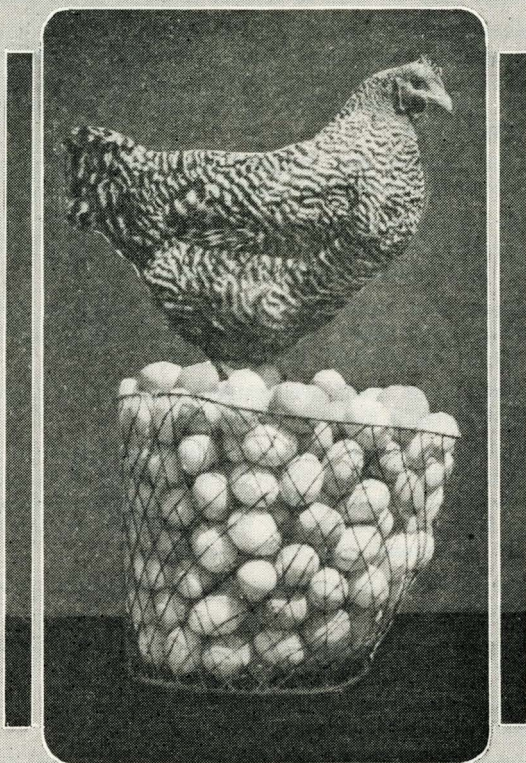
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Recommended Citation

Stevenson, G.L., "Results of Poultry Feeding Experiments" (1929). *Bulletins*. Paper 242.
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Results of Poultry Feeding Experiments



POULTRY DEPARTMENT
AGRICULTURAL EXPERIMENT STATION
SOUTH DAKOTA STATE COLLEGE OF
AGRICULTURE AND MECHANIC ARTS
BROOKINGS, S. D.

POULTRY FEEDING FACTS

For economical feeding results use a mash mixture along with scratch grains.

Most of the ingredients in a poultry ration may be produced on the farm and where many hens are kept it is profitable to grind and mix the feeds at home.

A good mash should contain some high protein feed and this may have to be purchased although alfalfa, soy beans and milk may be used to replace most of these concentrates.

Mash feeds are generally fed dry in self feeders open at all times. To induce the hens to consume more, warm wet mashes are often fed about the middle of the day. The greater the mash consumption, the greater is the possibility of egg production.

Farm grains are largely heat and energy producers. They furnish the fuel to operate the egg machine.

For variety's sake several grains should be included in the scratch mixture, but an excess of fiber grains like oats, barley, and emmer should be avoided.

About one half as much scratch feed is fed in the morning as at night. Deep clean litter encourages exercise and keeps the quarters more sanitary.

Fresh green feeds are desirable, but where these are not available alfalfa may be substituted.

Lack of mineral may be a limiting factor in egg production. Lime in some form is apparently essential for egg shell secretion, bone building and chemical balance in the body. Common sources of this material are oyster shell, ground limestone, and bone meal.

One per cent of common salt is generally added to the mash mixture.

Ordinary water washed gravel is very satisfactory for grit or grinding material.

Since the egg is nearly two-thirds water, it is advisable to provide a liberal supply at all times.

Vigorous healthy hens properly housed and fed are as sure a source of income as any enterprise on the farm.

RESULTS OF POULTRY FEEDING EXPERIMENTS

G. L. Stevenson

The object of the poultry breeder is to build up the productive ability of the hen but it is the task of the everyday poultryman to so manage his flock that this inherent capacity to produce may be utilized to the fullest extent. On the surface this seems like a simple matter but the problem of securing maximum egg production is a more complex one than merely bringing hens and certain feed combinations together. Several other important factors enter in but there is no doubt that feeding is one of greatest importance and rich in possibilities for improvement and progress.

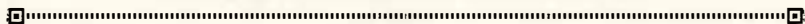
Many questions are as yet unanswered but the solution of the feeding problem seems nearer at hand than many others. The scientific knowledge along this line is fairly complete and is gradually taking on more and more of uniformity and standardization in substance and method. It is not so much a question now of digging up the facts in the case as it is of inducing the rank and file of poultry raisers to utilize more generally the information already at hand.

Balanced rations for the poultry flock are more the exception than the rule with farm flocks in South Dakota. Unbalanced, wasteful grain rations are still commonly used in attempting to make the hens lay and in growing chicks. This is probably due to inertia, to a lack of understanding of the advantages, to the idea that the proper feeding is too scientific and beyond their reach, or to the belief that the cost would be excessive and the thing not practical. There are many good commercial rations now being offered but farmers who have their own grain feeds hesitate to pay the rather extravagant prices asked for such products. As good or possibly better rations can be prepared at home for but little more than half the cost where home grown feeds are utilized. One of the purposes of this bulletin is to show the results of feeding unbalanced rations and to help the farm poultryman to formulate balanced rations using in so far as possible farm produced feeds.

Farm grains are largely energy material supplying fuel substances to run the animal mechanism. It requires concentrate feeds having higher protein content for growth and efficient egg production. Grain and animal by-products furnish desirable supplements for enriching the ration. To feed intelligently one should have a knowledge of the anatomy and functioning of the fowl's digestive system. Nature has not fitted it for handling coarse or heavy fiber feeds. Such feeds require more energy in the digestive process, and also tend to overload with indigestible material.

Fiber Grains For Hens

To demonstrate the limitations in feeding farm grains alone, tests were carried on for two years feeding hens fiber grains like oats, barley, buckwheat etc. This sort of feeding is actually practiced on some farms and considered satisfactory. The results of the experiment, however, indicate that hens do not thrive or produce satisfactorily on such rations. In the pen of hens fed this ration, egg production practically ceased dur-

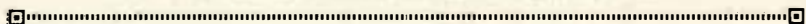


ing the fall and winter months and even in the spring, the normal laying season, the production was only about one-third of that in the pen on a standard, balanced ration. The laying period ran out in early summer and most of the birds went into a slow molt. The mortality ran somewhat higher in this lot due to liver and bowel disturbances, but was not as large as was expected. It has been found in work of several other stations that the crude fiber in the hens rations should not run much over five per cent, but oats and similar grains often exceed ten per cent.

During this same period another pen of thirty birds were fed a ration of corn, wheat, oats or barley. All conditions were as nearly alike as possible and run in competition with the check pen having a full balanced ration. These birds showed marked improvement over the pen fed fiber feeds and came through with lower mortality. There was a tendency for the hens to become heavy and fat and the laying period ended prematurely. The average production was less than 32 per cent as compared to an average of 24 per cent for the first pen. The check pen on balanced ration including scratch and mash feeds outclassed the others averaging nearly 45 per cent for the period. A considerable part of the production in the properly fed pen was done in the winter months when prices ranged higher and the feed cost was no greater than in the other pens, even with the higher priced mash. The feed cost per dozen eggs was much less. The pen with the laying mash consumed less scratch feed but produced more eggs. The hens used were American breeds in their second production year. These birds were culled as medium layers and divided up to make well balanced pens having approximately the same egg production average and breed representatives.

Table I.—Comparison of Fiber Grain Ration with Other Rations

	No. Birds	Ration	Daily Ration per Bird	Wt. at Start	Wt. at Close	Per cent Egg Production	Mortality No. Birds
Pen I	30	oats barley buckwheat emmer	4 ozs.	175 lbs.	182	24	9
Pen II	30	corn 2 pt. oats 1 barley 1 wheat 1	4 ozs.	173 lbs.	196	32	5
Pen III	30	corn 2 oats 1 barley 1 wheat 1 bran 1 middlings 1 gr. oats 1 gr. corn 1 tankage $\frac{3}{4}$ bone meal $\frac{1}{4}$	2 ozs. scratch 2 ozs. mash	169 lbs.	175	45	4



Alfalfa For Poultry

A well rounded ration usually means a combination of scratch grains for heat and energy and a mash mixture of grains and animal by-products for growth and production. A protein bearing feed of animal origin like milk, tankage, meat, meal, etc. is generally considered essential. Most farms are fairly well supplied with grains for scratch feeds but the mash ingredients in part at least have to be purchased and this seems to be one obstacle in the way of a more general use of home made laying mashes. Part of the investigational work at this station has been to discover and utilize, if possible, sources of protein feeds on the farm in place of the high priced commercial concentrates.

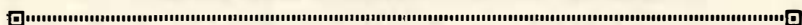
Alfalfa is one of our easily grown forage plants and is at the same time a most valuable source of protein, minerals and vitamins. It makes an excellent pasture for poultry and when cut early and properly cured and stored furnishes material for laying mashes and winter greens. If thoroughly dried and combined with a little shelled corn, it can be ground into satisfactory meal even with common mills. Home grinding often gives a better grade of meal than the commercial sort at a much lower price. The quality of the meal depends largely on the quality of the hay and the quantity of leaves included. The leaf meal runs lower in fiber and higher in protein and vitamins. The fiber content of the meal runs rather high so that one could feed to excess. In the feeding trials, good alfalfa meal replaced either bran or middlings in the laying mash and gave even better results in egg production. Green feed is highly desirable for poultry for the vitamin content and laxative effect, but on most farms there is no adequate supply through the winter months. Equipment or place for sprouting grains are not generally available. It has been found that alfalfa might be used to supply this deficiency. The hay may be fed directly in racks or as litter or the chaff may be soaked up with warm water and fed in wet mashes. Results in feeding cut green alfalfa in pens during the summer months were not very satisfactory as the waste was great and the hens did not seem to relish it especially if it was somewhat wilted. They seem to prefer to gather alfalfa fresh. The alfalfa chaff, if dry and free from molds, makes excellent litter for baby chicks in the brooder house. It furnishes a wholesome feed and stimulates their interest in scratching.

Soy Beans Good Substitute for High Priced Protein

Soy beans are another valuable crop readily grown in many parts of the state. They are rich in protein—37 per cent, and may be home ground and utilized to balance up the laying ration. In the experimental tests made, ground soy beans supplemented with bone meal gave almost as good results as tankage and meat scrap. The price paid for beans was much higher than they could be produced for on the farm. The feed cost per dozen eggs was the third lowest, being bettered only by milk and tankage.

High Protein Supplements

In the experiments with high protein supplements pens of hens were fed milk in the powder, semi-solid and liquid forms. These pens gave



considerably higher egg production than any others and though the rations were more expensive in general, the feed costs per dozen eggs were the lowest. Hens fed a 10 per cent tankage mash and given all the milk they wanted to drink produced as good and at a lower feed cost but they required more labor. It is always a problem to feed liquid milk and keep dishes and utensils clean and sanitary. To do so requires frequent washing and scalding. But in all rations for chicks, nothing seems to give as good results as milk, preferably in the form of fresh sour milk or buttermilk. Practically all stations recommend milk feeding for poultry where possible.

The pens in this experiment were made up of 30 second year S. C. White Leghorns of medium egg production. The basal ration shown in table II was used in all lots and balanced up with the various high protein feeds as listed.

The ration was balanced to give a nutritive ratio of one part of protein to 4.5 parts of carbohydrate equivalent with each of the protein concentrates. Feeds were figured at prices paid at the local market. The past year feeds averaged much higher in price. This gave a higher feed cost per dozen all through. The soy beans were seed stock which cost \$4.50 per hundred which would be a high price on the farm. To put the case for each in a concise form, the feed cost per dozen eggs was worked out, the total feed cost being divided by the number of dozen eggs produced by each pen.

Table II.—Comparison of High Protein Feeds for Poultry

Ration		Cost per dozen eggs	
		First Year	Second Year
Pen 1	Basal ration plus tankage	16.8c	21.9c
Pen 2	Basal ration plus meat scrap	20.5c	21.4c
Pen 3	Basal ration plus soy bean meal	20.0c	32.2c
Pen 4	Basal ration plus ground soy beans	18.1c	26.0c
Pen 5	Basal ration plus C. S. meal	21.0c	28.6c
Pen 6	Basal ration plus buttermilk powder	15.3c	23.0c
Pen 7	Basal ration plus tankage $\frac{1}{2}$ B. M. powder	16.6c	18.6c

NOTE—The following basal ration was used:

Mash:		Scratch:	
Bran	20	Corn	40
Middlings	20	Oats	20
Ground oats	20	Wheat	20
Corn meal	20	Barley	20
Bone meal	5		

The All-Mash Ration

In recent years there has been considerable agitation in favor of grinding all feed for poultry and feeding it in the form of mash. This is generally known as the all-mash ration. The argument for this method is that it is more sanitary, is more economical on labor and gets as good results. To test the practicability of the all-mash system, two pens of 50 birds each were fed the same ration, one as all-mash and the other

as mash and scratch. The scratch feed was fed morning and night in deep litter and the mash in self-feeders open at all times. The pens were continued for two laying years. Both pens consumed about the same amount of feed in the two year periods, the amount being slightly greater in the all-mash pen the first year and slightly greater for the mash and scratch pen the second year. The all-mash pen gained about .12 pounds per bird more the first year but both gained an average of two pounds per bird the second year. The egg production for the nine birds in the all-mash pen was 38 per cent the first year and 50 per cent the second year, compared to 44 per cent and 58 per cent for the scratch and mash pen. The extra labor cost in caring for the scratch and mash pen averaged about eight cents per bird but this was off-set by 6-8 per cent greater egg production. The mortality was 4 per cent for each pen. There is some advantage in the all-mash method in that it is more sanitary and saves labor but the production does not seem to run as high. In feeding scratch and mash, the attendant is more apt to observe results and keep better check on how the birds are coming along. In other words, there is a better follow-up of the feeding.

All-Mash Feeding of Chicks

The all-mash feeding of chicks, however, has proven very satisfactory for the first few weeks. It makes the feeding of chicks simpler, easier and more sanitary and does away with a lot of the guess work under the old system. This holds true for the most critical period—the first two or three weeks of the chick's life. Then they seem to develop a craving for scratch mixture like cracked corn and wheat to supplement the mash feed.

Minerals For Poultry

Experimental work with minerals indicated that hens will consume crushed limestone about as readily as oyster shell, about two pounds per year on the average. There is an abundant supply of high grade limestone in this state which would be suitable for poultry. Where hens were kept from any lime bearing feed, the egg shells were weakened, egg production slowed up and some hens lost control of their legs. The calcium in the lime substance is apparently the important factor. Elaborate mineral mixtures are not required. If hens are given plenty of oyster shell or limestone and salt, charcoal and raw bone meal in the mash, there is very little need of other mineral feeding. The tests indicated that there might be some slight need for sulphur and iron. This work is being continued to compare the feeding value of different sources of lime.

Vitamines In The Poultry Ration

Much attention is now being given to vitamins in the poultry ration. These mysterious substances are, for want of better names, labelled A, B, C, D, and E. If vitamin A is absent there is unsatisfactory growth and often an eye disease known as nutritional roup develops. The principal sources of this vitamin are leafy greens, yellow corn, egg yolk and cod liver oil. Vitamin B is so widely distributed in poultry feeds that there is usually an abundant supply present in any good ration. Vita-

mine C need not concern the poultry raiser as its absence shows no bad effects. Vitamine D is found in animal fats such as cod liver oil and egg yolk. Absence of this vitamine interferes with the utilization of the minerals in feeds and causes leg weakness in chicks. It also interferes with egg laying in the winter months when the hens are shut in. Cod liver oil one to two pints in one hundred pounds of mash, or exposure to direct sunlight, will counteract these conditions.

Glass substitutes let in some of the ultra violet rays of the sun, but most of them are not very durable and give away in a year or two. This station has tried feeding cod liver oil to chicks and breeding hens. Early chicks kept from direct sunshine showed no leg weakness when fed cod liver oil as above, but chicks exposed to direct sunshine showed up fully as well. The cod liver oil apparently is of great value to the early chick, but is not needed for chicks that have opportunity to run in sunshine. The cod liver oil apparently helps to give better fertility and hatchability to make hens consume as much mash as scratch feed in order to get the necessary protein supply for egg building. This means that one must limit the amount of scratch feed and encourage mash consumption by feeding a warm wet mash as well as the dry mash in the hoppers. Below are given some mash mixtures which have been tried and found satisfactory in the experiments.

Mixture 1.

Alfalfa Meal	10 pounds
Bran	10 pounds
Middlings	20 pounds
Yellow corn meal	20 pounds
Ground oats	20 pounds
Tankage	15 pounds
Bone Meal	5 pounds
Salt	1 pound

Mixture 2.

Alfalfa meal	20 pounds
Middlings	20 pounds
Yellow corn meal	20 pounds
Ground oats	20 pounds
Tankage	10 pounds
Milk powder	10 pounds
Bone meal	5 pounds
Salt	1 pound
$\frac{3}{4}$ gal. per 100 hens of fresh milk may be used in place of the milk powder.	

Mixture 3.—Standard Laying Mash

Bran	20 pounds
Middlings	20 pounds
Ground Oats	20 pounds
Corn meal	20 pounds
Tankage	15 pounds
Bone meal	5 pounds
Salt	1 pound

Mixture 4.

Alfalfa meal	10 pounds
Middlings	20 pounds
Yellow corn meal	20 pounds
Ground oats	20 pounds
Ground Soy Beans	30 pounds
Bone meal	5 pounds
Salt	1 pound

With any of these mashes, a scratch feed of yellow corn 40 pounds, oats 20 pounds, wheat 20 pounds, and barley or emmer 20 pounds makes a good balanced ration.

The all-mash ration recommended for chicks is as follows:

Yellow corn meal	80 pounds
Bran	20 pounds
Fine raw bone meal	5 pounds
Fine oyster shell	5 pounds
Salt	1 pound
All the sour skimmed milk or buttermilk they wish or 25 pounds milk powder plus 1 pound cod liver oil if the chicks can not get out into the direct sunshine.	