

OREGON AGRICULTURAL COLLEGE

EXTENSION SERVICE

R. D. HETZEL,
Director.

Feeding Young Chickens

Prepared by

CLARA M. NIXON



[Printed 1914; Reprinted July, 1915]

The Bulletins of the Oregon Agricultural College are free to all residents of Oregon who request them.

OREGON AGRICULTURAL COLLEGE

W. J. Kerr, President.

EXTENSION SERVICE.

R. D. Hetzel, Director.

The Extension Service of the Oregon Agricultural College embraces all instructional work done by the College staff outside the institution. This includes institute, lecture, and fair work in all its varied phases; supervision of the county demonstration and farm work provided for by state legislation; correspondence courses; preparation of educative exhibits; publication of bulletins and distribution of news matter; cooperative work with granges, farmers' unions, schools, churches, commercial clubs, and other progressive organizations in the promotion of industrial and social enterprises. The Extension Service, in short, consists of carrying out to the people of Oregon practical and usable information on all subjects taught at the College.

Applications for assistance along any of the lines indicated, together with all particulars relating thereto, should be sent to the Director of Extension as far in advance as possible. It is the desire of the College to help all who apply, but its staff, facilities, and funds are limited; consequently, short-notice requests may not find the department in position to render the best service.

Particular attention is called to the fact that counties desiring to organize for agricultural field and demonstration work, under the provisions of Chapter 110, Laws of 1913, must make an initial appropriation in order to secure the State aid. Those interested in promoting this work should communicate with the Director of Extension, or the State Leader, at the Agricultural College, with reference to the best methods of procedure.

Department of Poultry Husbandry

James Dryden, Professor.

A. G. Lunn, Instructor.

C. S. Brewster, Foreman.

FEEDING YOUNG CHICKENS

The feeding of young chickens is an important factor in rearing, but good care and skillful feeding are wasted on sickly chicks. In order to have good chicks to feed, it is necessary, first, that they shall be hatched from eggs laid by vigorous hens kept under good conditions (R. 20, 21) (1); second, that the eggs shall have proper treatment during the period of incubation (R. 22). If the chicks are to remain in a healthy state, they must be brooded in the right manner (R. 22). Since these phases of poultry raising have been discussed in other numbers of this series, we shall proceed at once to the matter of feeding.

QUALITY OF CHICK FOOD

It is most essential that the food for young chickens should be fresh and wholesome, free from taint, mold, or mustiness.

Tainted Food. Meat food is the sort that is most commonly found in this condition. Tainted food is likely to cause death by poisoning. The chicks may die quite suddenly, or they may appear to have some mysterious disease. If any meat food has a spoiled odor, it should never be fed to chicks. A good way to test beef scrap is to hold a little in the closed hand till the scrap is warmed; the odor should be that of cooked meat, not that of fertilizer. Another way of testing is to pour boiling water over a little of the scrap; the odor will then be evident.

Musty Food. Corn meal and cracked corn may become heated and musty, especially in warm weather. This condition may be noticed by a slight stinging of the nostrils when smelling of the grain, or by a bitter taste of the food. Material of this sort is not fit for chicks. Commercial chick foods sometimes contain one or more sorts of foods which have become musty, thus rendering the entire mixture unfit for feeding.

Moldy Food. This is particularly to be avoided; it is likely to induce digestive troubles, and an entire flock may be lost from this cause alone. Further, the mold may cause a serious disease of another sort. We all know the smarting sensation in the nose when we open a box of moldy bread or a bag of moldy feed. This is caused by inhaling the mold spores which are carried about on the currents of air. Certain of the common molds will grow on the membrane of the chickens' lungs and air sacs, as well as on the grain or bread. If the spores are inhaled by the chicks, they may settle down on the membranes and grow into new mold plants, causing high mortality from the resulting disease—aspergillosis. (R. 1).

Composition of Food. The food for young chickens should be of

(1) See References at end of this bulletin.

such composition that the chicks may enjoy full crops without getting more nourishment than they can use (not too concentrated), but that they may obtain enough nourishment from the amount of food materials which can be contained in the alimentary tract without danger of digestive ailments (not too much fiber or other indigestible material.)

Ash. This is one of the great essentials, and none of the grain foods have enough of the material to supply the chicks. Beef scrap usually has a larger percentage of ash, but an experiment at the Rhode Island Station showed that a ration containing a good proportion of beef scrap was bettered by the addition of ash. Even foods which, by themselves, were not of great value to the chicks were made more useful by the addition of ash. In the same series of experiments, it was shown that bone meal or cracked bone is probably the best convenient material for supplying the extra ash needed. (R. 17, 25, 26).

Grit. Whether grit supplies any of the ash, or whether it is useful only as a grinding material, is an open question. At any rate, it seems to be necessary in chick feeding. Experiment demonstrated that oyster shells were less valuable for young chickens than sharp sand; the report of the experiment stated that the shells seemed to injure the digestive tract of the chicks. (R. 17). Good grit of chick size, or sharp sand, gives the best results.

Succulent Foods. Some sort of green food is necessary in poultry feeding, and especially for chicks. In a section where chick weed is abundant, this makes an excellent green food supply, particularly till the chicks are a few weeks old. Where kale grows all winter, this may be cut or shredded and given to the chicks. Lettuce is good, but is usually too expensive. Potatoes are not desirable if fed raw, but may be cooked and given with the moist mash. Sweet apples are very much liked, but very sour apples are not good for chickens. Mangel beets may be cut fine and mixed with the food; or they may be cut in halves and left for older chicks to peck at.

Where nothing else is to be had, clean, dry alfalfa or clover leaves (soaked) may be given, but this is not so good as fresh food. A good source of succulent food, and one which may be prepared at any season of the year, is sprouted oats. The grain should first be sprinkled with formalin in the proportion of one pint of formalin to thirty gallons of water. This is to prevent molding. The amount given is enough for thirty bushels of oats. The grain should be well mixed after sprinkling, covered with blankets or sacks, and allowed to remain for twelve hours. Then it may be dried and kept for sprouting. Trays about two inches deep, and well drained, are used for sprouting oats. They are filled with grain which has been soaked in warm water, and kept in a warm place, being sprinkled daily with warm water. If the temperature is right, the oats will grow to three inches in height in little over a week. (R. 12). The chicks will eat both top and root, and the grain

as well, as soon as they are able to swallow it. The tops should not get long, as they are too tough to be eaten by the young chickens. The old sprouts may be fed to the hens. Lawn clippings make good green food, and the tender leaves of vetch or clover are much relished. When available, a good grass run is best, though additional green food may often be given with advantage, especially while the chicks are young.

ANIMAL FOODS

If chicks are allowed to range with the hens, they find insects and worms, and do not so greatly need other animal foods. If, however, they are brooded artificially, or are not allowed to range, animal food must be provided. (R. 16, 24).

Skimmed milk is excellent, fed sweet or sour, (R. 4, 5, 13, 14), but it contains so large a proportion of water that the chicks do not get enough solid matter in the amount they can eat. Sour milk fed from the first meal, or a moderate amount of sour milk curd, appears to do no harm. If, however, older chicks which are not accustomed to the milk or the curd, are given all they will eat at first, they are likely to overeat, and may have looseness of the bowels.

If milk is not obtainable, **granulated milk or milk albumen** may be used, though it is not as well liked as the skimmed milk. All milk foods are deficient in ash, and bone meal should be given to supply this necessary deficiency. (R. 18, 26).

Cooked meat is often recommended, but is troublesome to prepare. If, however, bits of cooked meat from the kitchen are to be had, they may be profitably used. Chicks will eat all the 'waste pieces, if cooked very tender. This form of meat food has little ash. **Raw meat** finely chopped, or **fresh cut bone**, may be fed in small quantities and is especially valuable in keeping the chicks busy. Chickens will chase each other all about the place for a few scraps of meat, and are not so likely to begin toe-pecking or feather-pulling. This applies particularly to chicks in large flocks, and in confinement.

Where large numbers of chicks are reared, **beef scrap** is the best and most convenient form of commercial animal food. It usually contains quite a large proportion of bone, and supplies part of the needed ash. Experiments at the R. I. Station and at the Cornell Station obtained better results from the feeding of beef scrap, with bone meal, than from the use of other forms of animal food.

Blood meal is not very desirable for chicks, and **animal meal** is less valuable than beef scrap. (R. 26)

The tested out **infertile eggs** are commonly used for the youngest chicks. They are sometimes boiled hard and mixed with bread crumbs or rolled oats; and sometimes mixed raw with bran or bread crumbs. The shells are mixed with the food. In an experiment in which one flock of chicks was given eggs as meat food, and another flock had beef scrap to supply about the same amount of animal protein, the chicks having the beef scrap grew better than those having the eggs. (R. 13).

The **proportion** of animal food to be given, (R. 16, 25, 26), and the age at which it should be given, are subjects of much discussion. Some poultrymen give the chicks all the beef scrap they will eat from the first meal; others give no meat to chicks under four weeks old; still others give only a limited amount of meat food for the first two weeks. Hopper-fed beef scrap from the first meal appears to give no bad results, provided the scrap is good and the ration well balanced.

Chicks under four weeks old, which were fed a mash containing beef scrap, and beef scrap in a hopper, ate twelve to fourteen per cent of total food in beef scrap; from four to eight weeks, they ate from seven to eight per cent. Chicks which ate twenty-eight to thirty-five per cent of total food in beef scrap had high mortality from digestive troubles. Chicks which were given hopper-fed beef scrap from the first meal grew better than others having a similar ration, but only a limited amount of beef scrap. (R. 13).

GRAIN FOODS

A few grains seem to be essential, but a large variety of grains is not necessary in chick feeding.

Wheat is one of the best grain foods, and chicks do well if given wheat alone as a grain. It is usually cracked for the youngest chicks, though they will pick up small grains, like wheat screenings, after they are a few days old; especially if they are with the hen. Corn is another excellent food for chicks. A mixture of corn and wheat is good for chickens of all ages. **Millet** is not good, if fed in large proportion. The covering of the grains is very hard, and the seeds may collect in the digestive tract of the chicks, causing death. **Oats** are valuable food, but contain too large a proportion of husk for young chicks. **Hulled oats, steel cut oats, or oat groats** may be mixed with corn and wheat for the grain food. The hulled oats is the grain without the husk, and the others are the cut or broken hulled oats.

Commercial chick foods contain a larger variety of grains and often a lot of weed seeds. The latter are not particularly good food, and are expensive at the price paid. Many of the commercial grain mixtures contain a proportion of fine grit, which may be more cheaply purchased as grit than as chick food.

Cracked corn is usually one of the ingredients of commercial chick foods. Unless well cared for, this may become musty, rendering the entire mixture unfit to be fed. Home mixing makes it easier to avoid spoiled foods.

Commercial chick foods cost about \$2.50 a hundred weight, in quantity. Corn averages about \$1.50 a hundred pounds (1.6 bu.) and is seldom more than \$2.00 a hundred, even in smaller quantities. Wheat rarely costs over \$1.50 a 100 pounds. A mixture of equal parts wheat and corn would cost \$1.75 a hundred pounds. A mixture of three pounds wheat, two pounds corn, and one pound oat groats would cost \$1.91 a hundred weight. The former of these mixtures is 30 per cent cheaper than the commercial mixtures, and the

latter 23 per cent. The saving of one-fourth to one-third on the cost of food is quite an item, and will easily pay for the mixing.

Usually the cracked grains may be purchased at any of the larger mills; if, however, they are not available, the only thing to do is to use what is at hand, such as wheat screenings or small wheat, or else buy the prepared food. If the latter course is followed, the food should be carefully examined, by taste, sight, and odor, to make sure it is good.

METHODS OF FEEDING

Cracked and Ground Grain. Both ground grain and grain of large size seem necessary to the best growth of chicks. (R. 11, 13). The ground food is quickly digested, and furnishes the food elements without so great expense of energy in digestion. Cracked grain gives exercise and development to the digestive system, and remains longer in the crop. Chicks do not get so hungry in the night if their latest meal is of cracked grain. On the other hand, chicks fed only cracked grain grow less rapidly than others having ground food as well as cracked grain. (R. 11, 13, 14).

Dry or Moist Mash. Ground food moistened with milk gives more return in growth of chicks than the same amount fed dry. Chicks do well, however, on a ration of cracked wheat and dry mash, and the labor cost is less than for the moist mash. (R. 11, 13). This brings down the expense, if the chicks are reared in large numbers. Where chickens are raised by hens, moist mash is often preferred. Some poultrymen keep dry mash always before the chicks, however reared, and give one meal a day of moist mash. The chicks will usually eat more of the ground food if fed in this way, though the amount of moist mash should be limited. Chicks under one pound in weight are said to do better on moist mash, with grain, larger chickens growing better on dry mash. (R. 23).

Hand-feeding or Hopper-feeding. The hopper or some such device is practically a necessity in dry feeding. Hopper-feeding takes less time than hand-feeding, and many consider that chicks raised on cracked grain and hopper-fed dry mash make quite as good mature fowls as those reared by the hand-feeding system (moist mash). With hopper-feeding, it is possible to provide a constant supply of food which cannot be readily soiled by the chicks. For young chickens, hopper-feeding both grain and mash is not advisable. The chicks settle down by the grain hopper, and gorge themselves, taking too little exercise. This would probably be disastrous.

The safest method is to feed the dry mash (if used) in hoppers, hand-feeding the grain. Grit, charcaol, and fine cracked bone are hopper-fed; also beef scrap, if desired. Moist mash, if used, is necessarily hand-fed.

For growing stock on range, hopper-feeding works well. Labor is considerably reduced, and the birds grow finely.

Free Range or Confinement. As a rule, the more good range which can be given young chickens the better; though unlimited range

is not necessary until they are a few weeks old. If the yards are too small, the ground becomes filthy, and may communicate disease. In small yards, the chicks get too little exercise, with resulting lack of muscular development; and greater care in feeding is necessary.

For young broods, a sufficiently large range, and one which makes it possible to protect the chicks from accident and marauders, is best. Grass cut moderately short, where shelter from the hot sun is provided, is about the right condition. An orchard is a fine place for them, if they can be protected from hawks, crows, etc.

The older chicks may range in a sunflower patch, corn field, orchard, wood lot, or any convenient place where they can find insects and shelter. If allowed about the barn yard or pig sty, they are in danger of being trodden upon by the farm animals or eaten by the hogs.

MAINTENANCE RATION

A maintenance ration for chicks is one which will provide energy-forming material to sustain the body processes, and supply the elements needed in the repair of the organs and the growth and development of the body. Wheeler gives the following, which was calculated from actual food consumption of chicks:

Digestible Nutrients In Each 100 Lbs. Live Weight of Chicks (for 1 da.)

	To 2 Wks.	To 4 Wks.	To 6 Wks.
Dry Matter	10.1 lbs.	9.6 lbs.	8.6 lbs.
Ash	0.5	0.7	0.6
Protein	2.0	2.2	2.0
Carbohydrates	7.2	6.2	5.6
Fat	0.4	0.5	0.4

The amounts here given are the amounts digested, not total amounts eaten. (R. 3). The table shows that the chicks, though they need more nutriment for each chick as they grow older, do not require so much for each pound weight.

SEVERAL GOOD RATIONS

Oregon Experiment Station Ration

Starting Food	Grain Mixture	Mash Mixture
Bran mixed crumbly with	1 pint cracked wheat	3 lbs. wheat bran
raw egg; or bread squeezed dry out of milk.	1 pint cracked corn	1 lb. wheat middlings or shorts
		1 lb. corn
		Pinch of salt added when mixing

FIRST FEEDING TIME. 24 to 36 Hours.

First Week. Starting food twice a day; grain mixture three times a day on clean sand; after two or three days, grain in litter; clean water; grit, charcoal, cracked bone, in separate dishes; green food.

One to Three Weeks. One feed a day of moist mash, what they will clean up in an hour; grain mixture in litter two or three times a day; grit, charcoal, cracked bone, and beef scrap in hoppers; water, green food.

Three to Six Weeks. Morning feed of moist mash; two feeds of grain mixture; dry middlings in a hopper, if signs of diarrhoea appear;

hopper-fed beef scrap; water, grit, charcoal, cracked bone, always available; milk to drink; green food.

After Six Weeks, or On Range. Morning meal of moist mash; two feeds of grain mixture; milk (or beef scrap), charcoal, grit, bone, water. Oats may be added to the grain mixture, if desired; the proportion of wheat may be increased or decreased as it becomes lower or higher in price than corn.

Cornell Ration. (R. 13).

Starting Food	Grain Mixture	Mash Mixture
8 lbs. rolled oats	3 lbs. wheat	3 lbs. wheat bran
8 lbs. bread crumbs	2 lbs. corn	3 lbs. wheat middlings
2 lbs. sifted beef scrap	1 lb. hulled oats	3 lbs. corn meal
1 lb. bone meal	Fine cracked for the youngest chicks; whole wheat and hulled oats and larger cracked corn for older chicks; oats omitted for range chicks.	3 lbs. beef scrap
Moistened with skim-milk		1 lb. bone meal
		Fed dry from first meal;
		moist and dry after five days.

First Feeding Time. 36 to 48 hours.

First Five Days. Starting food five times a day, what they will eat in 15 minutes; grain mixture in tray of dry mash always available; fine grit, charcoal, bone, and green food scattered over other food; water.

After Five Days. Grain twice a day in litter; scanty feed of moist mash three times a day; as chicks grow older, two feeds of moist mash, then only one—at noon; water, grit, charcoal, cracked bone, always at hand, and hopper-fed beef scrap if desired; milk to drink. Chicks should be hungry once a day, preferably in the morning.

On Range. Grain, dry mash, beef scrap, grit, shell, bone, water, always at hand. One meal of moist mash if desired.

Maine Station Method. (R. 6).

Starting Food	Grain Mixture	Mash Mixture No. 1
4 lbs. wheat bran	15 lbs. cracked wheat	2 lbs. wheat bran
3½ lbs. corn meal	10 lbs. pinhead oatmeal	3 lbs. corn meal
2 lbs. screened beef scrap	15 lbs. fine cracked corn	1 lb. low grade flour
1 lb. alfalfa meal	3 lbs. fine cracked peas	1 lb. screened beef scrap
½ lb. linseed meal	2 lbs. broken rice	½ lb. linseed meal
	5 lbs. chick grit	Mash Mixture No. 2
	2 lbs. charcoal	1 lb. wheat bran
		2 lbs. corn meal
		1 lb. wheat middlings
		1 lb. beef scrap

First Feeding Time. 36 to 48 hours.

To Three Weeks. Two feeds of starting food, scalded and mixed with rolled oats, two parts of oats to six of mixture; two feeds of grain mixture in light litter; green food; fine grit, charcoal, cracked bone, and clean water always before the chicks.

Three to Six Weeks. Substitute mash mixture No. 1 (moist) for the starting food; otherwise as above.

On Range. (After six or eight weeks). Constant supply of wheat, cracked corn, beef scrap, cracked bone, oyster shell, and grit in separate troughs or hoppers; hopper-fed mash mixture No. 2; water.

Ontario Agricultural College Ration. (R. 19).

Starting Food	Grain Mixture	Mash Mixture
4 lbs. bread crumbs	30 lbs. cracked wheat	10 lbs. wheat bran
1 lb. hard-boiled egg	30 lbs. granulated oatmeal	10 lbs. shorts
Fed dry	30 lbs. fine cracked corn	10 lbs. corn meal
	10 lbs. small grit	3 lbs. animal meal

First Feeding Time. 24 to 48 hours.

First Two Days. Starting food, fed five times a day; lukewarm water to drink.

After Two Days. Three feeds of grain mixture, with one of bread and milk, and one of whole wheat; or with two feeds of moist mash; fresh boiled liver twice a week, if obtainable—in that case, animal meal omitted from the mash; for chicks on range with the hens, the grain mixture may be hopper-fed.

After Eight Weeks. Moist mash in the morning; grain noon and night. An increase in the proportion of animal food will hasten the development of the chicks.

If there is no green food within reach, it should be furnished to chicks of all ages.

Varying a Ration. Where chicks are reared in small numbers, as on a town or village lot, table scraps may be used to advantage with the other foods. They should always be fed fresh, however, as they may cause illness, if soured. A little cooked cereal left from breakfast may be mixed with bran to crumbly consistency, and will then make a good meal for the chicks. Bits of stale bread mixed with cooked potato, and moistened if too dry, will usually be eaten. Any extra milk is good to moisten the food, and a remnant of soup stock or meat gravy, if not too salty, answers the same purpose. Food salted as for the table will not harm chickens. Bits of waste meat, minced fine, will take the place of beef scrap, though bone meal or cracked bone should be supplied. All these things add variety to the ration and save on cost of food. Outer leaves of cabbage and lettuce, cut fine for the younger chicks, make good green food; in fact, chickens will eat much of the refuse of a garden, including the leaves of tender weeds.

For the farm flock, table scraps are useful, though they may not be available in sufficient quantity to form a large item in feeding as many chicks as are reared. Small wheat makes excellent grain food, and is often to be had on the farm. Farm-reared chicks usually have good range and plenty of insects, and skimmed milk will go far toward supplying the extra animal food needed. This is especially true, if fed in the form of sour milk curd or cottage cheese.

Training the Chicks. In natural rearing, the chicks at once recognize the call of the hen, and under her tuition, soon learn what to eat. The mother hen picks up bits of food and drops them down in front of the chicks, calling all the while as if telling them that this is good

to eat. Brooder chicks will come almost as quickly toward the sound of tapping, and will follow it from place to place. If the feeder, by this signal, calls the attention of the chicks to the food, picking up and dropping some particles as the hen does, most of the chicks soon learn to eat. If any seem awkward, they should be encouraged to eat forced from under the hover, care being taken that they go back again before they become chilled.

COST AND PROFIT OF CHICK REARING

The initial cost of chick raising is in (1) the cost of food, (2) cost of chicks, and (3) expense of labor in care and feeding; but the cost for each chick to any age is largely determined by the proportion of chicks reared. This is easily illustrated. If a flock of 100 chicks cost \$2.00 to a certain age, and all were reared, each chick would cost 2 cents, or \$2.00 for each 100 chicks. If 80 chicks remained, the cost for each chick would be 2½ cents, or \$2.50 for each 100 chicks reared. If only 25 were still alive, they would cost 8 cents each, or \$8.00 for each 100 chicks reared.

Another thing to be considered, when there is mortality in the flock, is how long the chicks, which finally die, have to be fed. If the weak chicks are removed before being placed in the brooder, there is no expense of food for them. If they are put in with the others, they may live two or three weeks and then die, consuming food which must be charged up to the account of the flock. This often amounts to considerable, with large numbers of chicks, and is an argument in favor of early and rigid culling.

Reports on the cost of food for chick rearing are as follows:

England, University College, Reading.

To 13 Weeks—

White Wyandottes	14.2 cents
Buff Orpingtons	13.5 cents
Faverolles	13.7 cents
Cross-breeds	12.3 cents (R. 2)

Maine, Agricultural College—Barred Plymouth Rocks—

To broiler size (about 2 lbs.)	16.5 cents
Pullet, to laying	48.0 cents

North Carolina, Experiment Station—Different breeds—

To 8 weeks	5.1 cents (R. 9)
------------------	------------------

New York (Geneva) Experiment Station—Different breeds—

To 10½ weeks	13.0 cents (R. 14)
--------------------	--------------------

New York (Cornell) Experiment Station—White Leghorns—

To 8 weeks	5.2 cents (R. 13)
------------------	-------------------

Ontario Agricultural College—Different breeds—

Four-pound cockerel, reared on range in a corn field (est.) ..	21.0 cents (R. 19)
--	--------------------

These estimates do not include the cost of labor or of hatching.

CLEANING AND DISINFECTING THE FEEDING UTENSILS

Cleanliness of surroundings is necessary to the best development of chicks, and cleanliness of food and water dishes is essential. Unless hopper-feeding is practiced, the chicks soil their food with the droppings, and the excrement is a common means of carrying disease. Simple washing of the dishes is not enough; they should be disinfected

in some way at least twice a week for young chicks. Boiling in water will cleanse them, or continued exposure to hot sunshine, after washing, will kill practically all disease germs. Washing the dishes in water, containing enough Permanganate of potash to color to quite red, will disinfect them, but the solution should be freshly prepared or else kept away from the light; if it turns brown, it is useless. A few drops of Creso-dip in a pail of water will do the work, but the dishes should be well aired after washing. The dishes in which the moist food is mixed should be as carefully cleaned as the others. The water dishes should be washed often enough to prevent their becoming slimy, and disinfected with the other dishes.

Whatever method of disinfection is employed, the work should be thoroughly and consistently done. The litter should never be allowed to become very dirty, and the food and water should be given in some way which will insure reasonable cleanliness.

Success in chick rearing demands good chicks, wholesome food of the right quality, fresh water, cleanliness, and good care.

REFERENCES

1. Canadian Poultry Review, Oct. 1909.
2. England, University College, "Growth of Chickens and Cost of Rearing."
3. The Feeding of Animals, Jordan (Chapter on Poultry Feeding, Wheeler).
4. Indiana (Purdue) Bul. No. 71.
5. Indiana (Purdue) Bul. No. 76.
6. Maine Agr. College, "Poultry Management at Maine Station."
7. Maine Agr. College Bul. No. 130.
8. Michigan Bul. No. 158.
9. North Carolina Bul. No. 152.
10. New York (Cornell) Bul. No. 25.
11. New York (Cornell) Bul. No. 282.
12. New York (Cornell) Bul. No. 284.
13. New York (Cornell) Bul. No. 327.
14. New York (Geneva) Bul. No. 39.
15. New York (Geneva) Bul. No. 126.
16. New York (Geneva) Bul. No. 171.
17. New York (Geneva) Bul. No. 242.
18. New York (Geneva) Bul. No. 271.
19. Ontario Agr. College, No. 189.
20. Oregon Agr. College, Extension ser. VII, No. 2.
21. Oregon Agr. College, Extension ser. VII, No. 3.
22. Oregon Agr. College, Extension ser. VII, No. 5.
23. Pennsylvania State College Bul. No. 107.
25. Rhode Island Bul. No. 126.
26. Rhode Island Bul. No. 145.
27. West Virginia Bul. No. 71.
24. Rhode Island Bul. No. 61.