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PASTURES FOR GROWING PULLETS

By

Jesse E. Parker and B. J. McSpadden



Barred Rock pullets on lespedeza pasture.

KNOXVILLE

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PASTURES FOR GROWING PULLETS

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INTRODUCTION

Succulent green feed provides all of the vitamins required by growing pullets, with the possible exception of vitamin D, which chickens get from sunlight when on range. In addition to vitamins, green feed supplies proteins, minerals, and carbohydrates.

While some poultrymen believe that pasture is of no great importance as a supplement to the so-called complete rations, many chick growers and poultry specialists claim decided benefits from it. Estimates of feed saved vary from almost none to as high as 25 percent. Reliable data are rare, however, and assertions relative to the importance of green feed often appear to be based on conjecture rather than on results from controlled experiments.

At the present time there are shortages of certain feedstuffs that have come to be recognized as highly nutritious for poultry. This is true in particular of the protein and vitamin supplements. Obviously, many of the wartime poultry rations are deficient in certain essential nutrients. In view of this fact, emphasis recently has been placed upon the possibilities in poultry pastures.

OBJECTS OF THE EXPERIMENT

The climate of Tennessee favors the production of many pasture crops. In the spring of 1940, the Agricultural Experiment Station began a study of the value of certain of these crops for growing pullets. The principal objects of these investigations were:

1. To observe several commonly grown pasture plants, individually and in mixtures, with reference to their suitability for supplying green feed throughout the normal chick-growing season.
2. To study the biological effects of green feed on chicks that are being fed a good chick ration.
3. To determine the economy of providing growing chicks with pasture, as measured by feed consumption and efficiency of feed utilization.

PLAN OF THE EXPERIMENT

The experiment was conducted on four adjacent ranges, the dimensions of each being approximately 50 x 140 feet. A 10 x 12-foot colony brooder house was placed on each range. Prior to the 1940 seedlings, stable manure, limestone, and a phosphate fertilizer were applied at about the same rates to each of the four areas. These treatments were not repeated

in 1941 and 1942. On March 18, 1940, three of the ranges were seeded broadcast, following the preparation of a seedbed, one range being left unseeded:

Lot 1—Bare range—no pasture crop—used for control group (fig. 1.).

Lot 2—Spring oats, 2 bushels per acre.

Lot 3—A mixture of ryegrass, 15 pounds per acre; Korean lespedeza, 10 pounds; and Kobe lespedeza, 10 pounds.

Lot 4—Alfalfa, 25 pounds of inoculated seed per acre.

In the spring of 1941, and again in the spring of 1942, lot 2 was seeded to oats as in 1940. In 1941 only a part of lot 3, around the brooder house and comprising about one-sixth of the total area, was reseeded with the ryegrass-lespedeza mixture. This range was believed to be sufficiently self-seeded by the 1940 crops to insure a stand for the 1941 season. There was relatively little growth of the lespedeza in 1941, however, because of a severe drouth in May.¹ The lot therefore was seeded in 1942 as in 1940. Lot 4, with the exception of about one-fourth of the area, near the brooder house, was not reseeded to alfalfa in 1941, as there was a good stand remaining from the 1940 planting. It was plowed to control weeds, and again seeded to alfalfa in 1942.

An attempt was made to keep lots 3 and 4 free from weeds; but after midsummer a few weeds were observed in these ranges, the principal one being crabgrass.

Each year 125 unsexed Barred Rock chicks were placed in each lot. In 1940 they were started on March 13; in 1941 and 1942, on March 21. All cockerel chicks were removed from the experiments at 8 weeks of age. As the chicks were not turned out of the houses until they were 4 weeks of age, the mortality rate was measured for the period from 4 to 28 weeks. Up to 4 weeks the mortality rate in all groups was low. The total number of 4-week-old pullets involved in these studies was 740.

All groups of chicks were fed, ad libitum, a growing mash of the following composition:

	Percent
Ground yellow corn.....	45.0
Ground wheat	20.0
Ground oats	10.0
Alfalfa leaf meal	5.0
Meat meal	13.0
Dried skimmilk	6.0
Salt mixture ²	0.8
Cod-liver oil (fortified) ³	0.2
	100.0

In 1942, dried skimmilk was unobtainable, and an equal weight of dried whey was substituted. The meat meal used during the first two

¹This was the driest May since the establishment of the Weather Bureau Office at Knoxville in 1871. Rainfall was 0.71 inch, as compared with a normal of 3.75 inches.

²Common salt, 98 parts; and manganous sulfate, 2 parts.

³Contained approximately 400 A.O.A.C. chick units per gram of vitamin D and 3000 International units of vitamin A.

years was the product of a large packing concern, and had a guaranteed minimum protein content of 55 percent. In 1942 the meat meal was purchased from a local packer, and had a guaranteed minimum of 50 percent protein.

Whole yellow corn was hopper-fed as a grain feed, in addition to the mash, from the time the chicks were 8 weeks of age. All feed hoppers were placed in the brooder houses. No special effort was made to induce the chicks to remain outside.



Fig. 1—Bare range.

This condition is not conducive to efficient pullet production.

Body weights and feed consumption were recorded at 4-week intervals. All chicks were weighed in the morning before they had access to feed.

OBSERVATIONS AND RESULTS

PASTURE CROPS

Oats produce excellent pasture, but do not furnish tender green feed over a very long period (fig. 2). By the latter part of May and the first of June the plants head out and the leaves become tough and unpalatable. Recent results reported by Smith and Robb⁴ indicate that the protein and carotene content of growing oat plants decreases materially after the plants reach a height of 15 inches. In this lot there was considerable volunteer growth of lespedeza and some crabgrass, which provided considerable

⁴Smith, A. M., and Robb, W. The Carotene and protein in oats and barley at different stages of growth. Jour. Agr. Sci. 33:119-121. 1943.



Fig. 2—Oats pasture. Top to bottom—May 3, June 4, September 16, 1940. Oats remain succulent for a relatively short period. Sow with lespedeza or some other crop to provide green feed during late summer and fall.

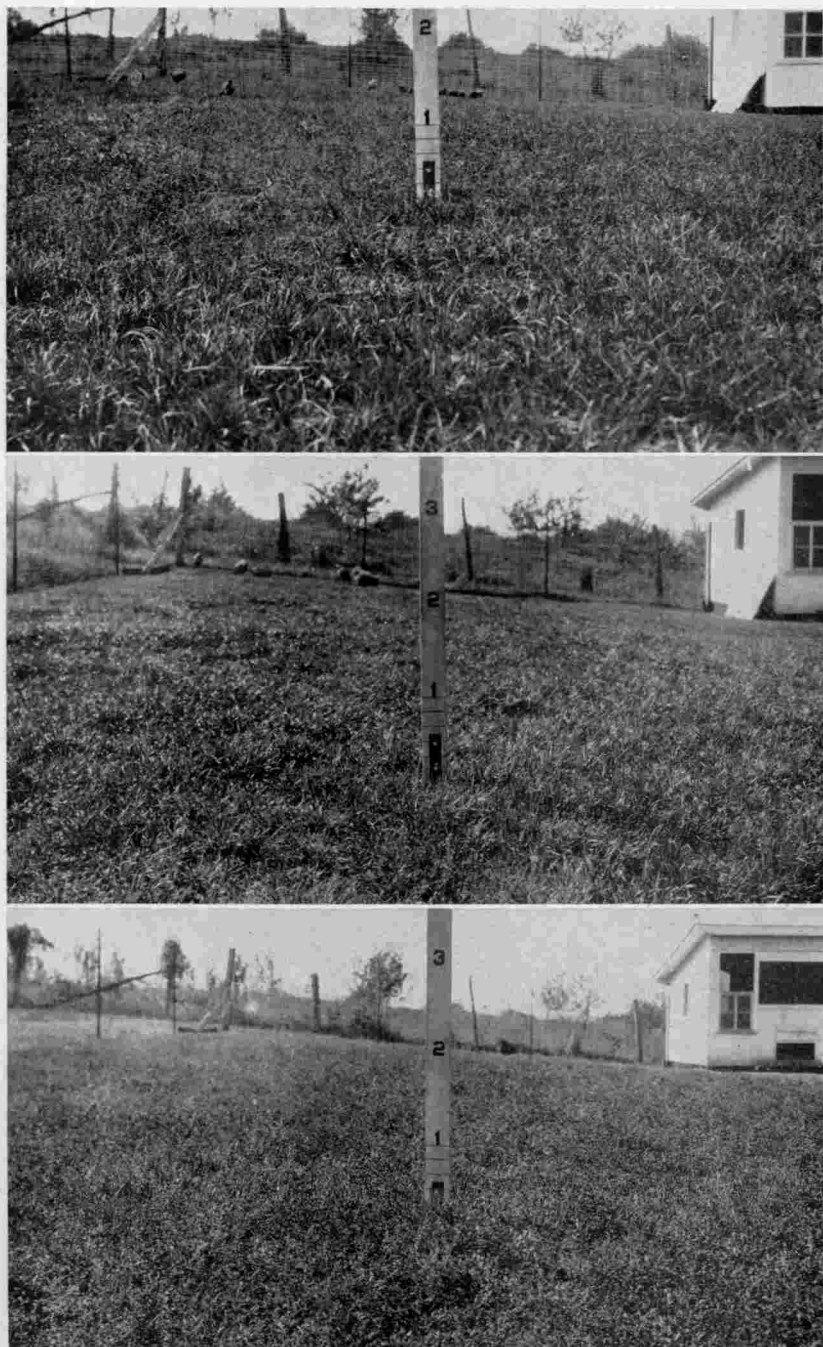


Fig. 3—Ryegrass-lespedeza pasture. Top to bottom—May 3, June 4, September 16, 1940. Ryegrass provides excellent spring and early-summer grazing and lespedeza makes fine late-summer and fall pasture.

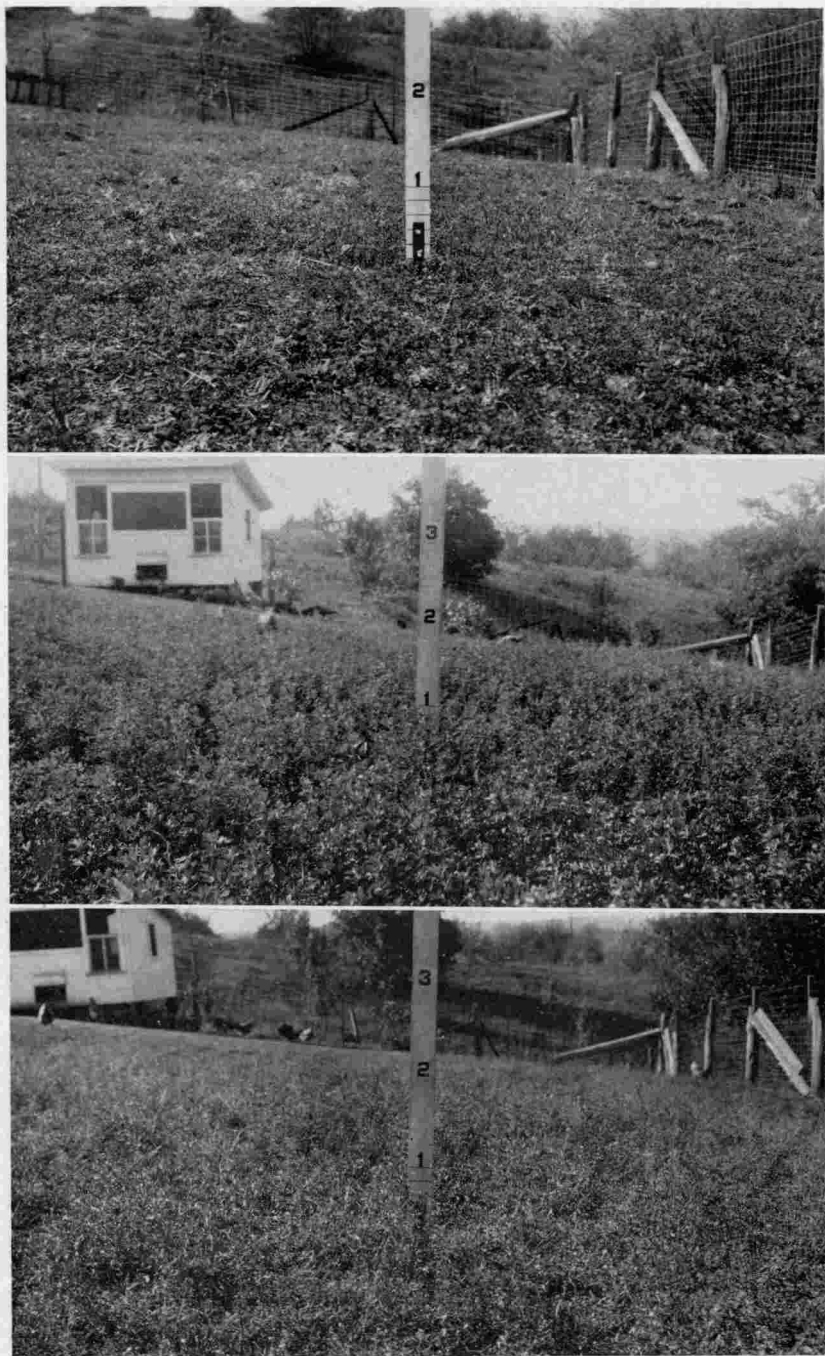


Fig. 4—Alfalfa pasture. Top to bottom—May 3, June 4, September 16, 1940. Alfalfa provides high-quality pasture through the normal chick-growing season.

grazing after the oats ceased to afford green feed. Through the spring and summer months, green feeds cannot be supplied by oats alone.

Ryegrass and lespedeza proved to be an excellent combination for continuous grazing; the ryegrass furnished an abundance of palatable early green feed, and the lespedeza lasted until fall (fig. 3). By the time the ryegrass matured and was unpalatable the lespedeza had made sufficient growth to stand considerable grazing. During the 1940 and 1942 seasons this range afforded ample green feed until late September, but in 1941 the lespedeza suffered from the severe drouth and the pasture appeared to be of rather poor quality after the first of June. Under favorable climatic and grazing conditions this mixture may be expected to reseed itself. Since ryegrass is a prolific producer of seeds, there is possible danger of its over-seeding unless some of the crop is cut before the seeds mature. Lespedeza seeds are palatable to chickens, and for that reason if it is desired that the crop reseed itself the range should not be pastured heavily in the late season after the seeds mature. In general practice the pullets would be moved off the range into the laying house before that time.

Alfalfa supplied palatable green feed through the growing period each year (fig. 4), with the exception of about 20 days during the extreme drouth of 1941. It provided succulent green feed during the late summer and fall—a period when many pasture plants are unpalatable and of low nutritive value. The crop makes the best grazing when it is cut several times. Chickens relish the tender leaves. When once established, alfalfa will tolerate considerable grazing unless the weather is unseasonably dry. Although it does not make abundant growth in the early spring, it will produce enough green feed for the young chicks if they are not hatched extremely early in the season.

Some writers have discredited alfalfa as a poultry-pasture crop, on the ground that since the plants are tall they are difficult to graze and shade the soil. In our experiments these conditions did not appear to be serious drawbacks. While some soils in Tennessee may be poorly adapted to alfalfa, experience throughout the State is demonstrating continually that crops can be produced on much land previously considered unsuitable.

GROWTH OF PULLETS

The 3-year-average body weights for Barred Rock pullets on the four types of range, by 4-week periods to 28 weeks, are shown in table 1. To 12 weeks of age there was little difference in the four groups, but from 12 to 28 weeks the pasture-raised pullets, with the exception of those on oats for the 16- and 20-week weighings, were consistently heavier than the check group, raised on bare range. At 28 weeks the pullets on the alfalfa range averaged 0.3 pound heavier than those on the bare range; the pullets on oats pasture averaged 0.15 pound heavier, and those on ryegrass and lespedeza 0.16 pound heavier. These differences, though small, cannot be ignored. Actually the pasture-raised pullets showed greater superiority over the bare-range pullets than the differences in body weights indicate. They were more uniform in size, in pigmentation, and in condition of feathers.

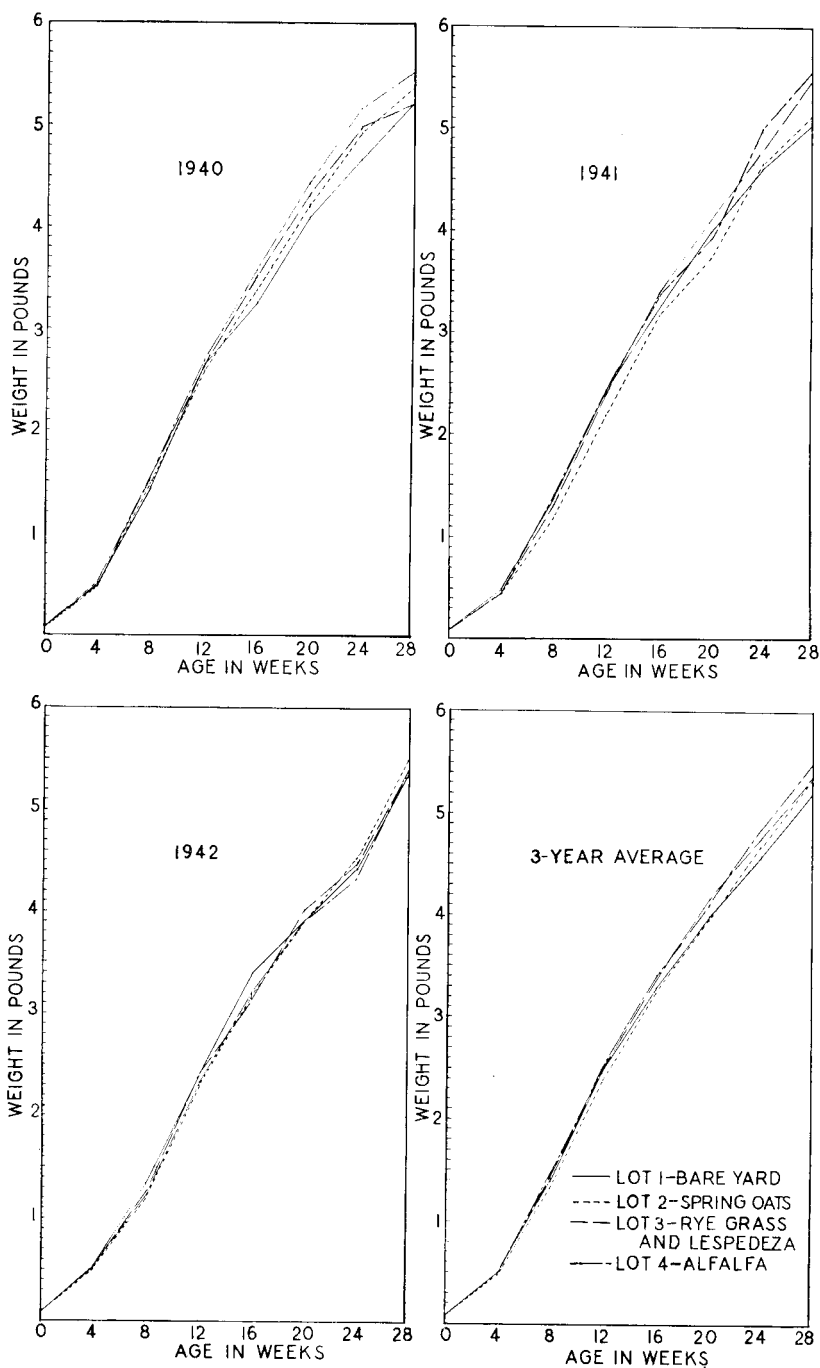


Fig. 5—Average body weights of Barred Rock pullets raised on several types of range.

TABLE 1.—Average body weights of Barred Rock pullets grown on different types of range.

Data are 3-year averages.

Age	Lot number and kind of range			
	1	2	3	4
	Bare yard	Spring oats	Ryegrass and lespedeza	Alfalfa
Weeks (1 day)	Pounds	Pounds	Pounds	Pounds
	0.085	0.086	0.085	0.085
4	0.50	0.49	0.49	0.50
8	1.38	1.35	1.40	1.47
12	2.49	2.39	2.49	2.49
16	3.30	3.26	3.37	3.40
20	4.00	3.96	4.17	4.12
24	4.58	4.68	4.76	4.86
28	5.20	5.35	5.36	5.50

Average body weights of the pullets for each of the three years are shown graphically in figure 5. The pullets on the alfalfa range were 0.32 pound heavier than the check group in 1940, and 0.53 pound heavier in 1941, while in 1942 there was practically no difference between the two groups. In fact, during the last year all groups grew at about the same rate. The relatively good growth made by the no-pasture group during 1942 may have been influenced by changes in the growing mash that year—meat meal was obtained from a local packer, and dried whey was substituted for dried skim milk. These changes probably affected the nutritive value of the feed, in particular by increasing the content of vitamins of the B complex.

During 1940 and 1941 the pullets were kept on the range until they were 32 weeks of age. The average 2-year body weights at 32 weeks were 5.46, 5.65, 5.74, and 5.96 pounds, respectively, for lots 1, 2, 3, and 4.

MORTALITY

The mortality percentages of pullets grown on the several types of pasture are shown in table 2. The 3-year-average mortality of all pullets on pasture was 9.5 percent, as compared with 13.0 percent for those on the bare range. The mortality rate for pullets raised on the alfalfa range was

TABLE 2.—Mortality of Barred Rock pullets grown on different types of range.

Lot	Type of range	Mortality from 4 to 28 weeks of age			
		1940	1941	1942	3-year average
		Percent	Percent	Percent	Percent
1	Bare.....	14.9	15.7	7.3	13.0
2	Spring oats.....	5.4	23.0	7.1	12.1
3	Ryegrass and lespedeza.....	10.3	10.8	9.1	10.1
4	Alfalfa.....	4.3	11.3	3.6	6.4

half that of pullets raised on the bare range. In 1940 and 1942 the mortality rates of pullets on the oats pasture were relatively low, but the heavy loss in this group in 1941—for which no explanation is available—caused the 3-year-average to approximate that of the no-pasture group. The data

indicate that it is possible to reduce the mortality in growing pullets by providing a good pasture crop on the range.

FEED CONSUMPTION

Contrary to common belief, the total amount of feed required to bring a pullet to 28 weeks of age was about the same for all groups (table 3). It is noted, however, that the birds in lot 1, without pasture, consumed a larger proportion of mash. Since mash is more expensive than grain (corn in this instance) the feed cost of producing a pullet was higher for the bare-range group.

TABLE 3—*Feed consumption of Barred Rock pullets grown on different types of range.*
Data are 3-year averages.

Lot	Type of range	Feed consumption per pullet to 28 weeks			Proportion of mash to total feed
		Mash	Grain	Total	
		Pounds	Pounds	Pounds	Percent
1	Bare.....	22.6	8.4	31.0	72.9
2	Spring oats.....	20.2	10.6	30.8	65.6
3	Ryegrass and lespedeza	20.6	10.5	31.1	66.2
4	Alfalfa.....	20.3	10.3	30.6	66.3

EFFICIENCY OF FEED UTILIZATION

Although the pullets on pasture consumed as much feed as those on bare range, the amount of feed required to produce a pound of gain to 28 weeks was less for the pasture-raised pullets (table 4). This was to be

TABLE 4—*Efficiency of feed utilization of Barred Rock pullets grown on different types of range.*

Lot	Type of range	Amount of feed required to produce 1 pound of gain			
		1940	1941	1942	3-year average
		Pounds	Pounds	Pounds	Pounds
1	Bare.....	6.36	6.26	5.57	6.08
2	Spring oats.....	5.84	6.43	5.43	5.87
3	Ryegrass and lespedeza.	6.35	5.83	5.46	5.91
4	Alfalfa.....	5.81	5.79	5.31	5.66

expected, since they were heavier (table 1 and fig. 5) and had a lower mortality rate (table 2). Pullets on the bare range required 7.4 percent more feed per pound of gain than pullets on alfalfa pasture, 3.6 percent more than those on oats, and 2.9 percent more than those on ryegrass and lespedeza.

PERCENTAGE OF PULLETS PLACED IN LAYING HOUSES

During the first year of the experiment, pullets from the several ranges were culled before being placed in the laying houses. Culling was done on the basis of apparent vigor, all undersized and unthrifty-appearing

pullets being discarded. Table 5 shows the percentage of pullets culled at 32 weeks of age and of those living at 4 weeks that were retained for the laying flock. While the data are for one year only, they indicate that a larger percentage of desirable pullets may be obtained if young chickens are raised on a range sown to a good pasture crop.

TABLE 5—*Mortality, pullets culled, and pullets housed, 1940.*

Lot	Type of range	Pullets at 4 weeks of age	Mortality 4 to 32 weeks	Pullets culled at 32 weeks	Pullets put in the laying house at 32 weeks	
		Number	Percent	Percent	Number	Percent ¹
1	Bare.....	67	19.4	13.0	47	70.1
2	Spring oats.....	56	5.4	5.9	50	89.3
3	Ryegrass and lespedeza.....	68	10.3	5.0	58	85.3
4	Alfalfa.....	69	4.3	1.6	65	94.2

¹Percent of those alive at 4 weeks.

DISCUSSION

Although an attempt was made to feed the chicks a well-balanced ration at the outset of these experiments, the data in general show that green feed on range in the form of pasture crops was a profitable addition to the mash-and-grain diet. The results of the 1942 trials, however, indicate that it may be possible to provide a mash-and-grain combination that is a "complete" ration. It is conceivable that there are mixed feeds containing all of the nutrients required for optimum growth, but at the present time, owing to shortages of many feedstuffs used in the formulating of poultry rations, it may be difficult to provide a complete ration without green feed.

When green feed will improve a ration that contains relatively large amounts of meat meal, dried skim milk, alfalfa leaf meal, and cod-liver oil, as was the case in these experiments, its addition to the average farm ration would be expected to produce even greater beneficial results. Supplying the growing flock with succulent green pasture is a reliable and economical means of incorporating certain valuable nutrients in the diet.

Of the three pasture crops studied, alfalfa proved to be of greatest value in furnishing continuous green feed and in producing superior pullets. On soils not suited to alfalfa, a mixture of ryegrass and lespedeza could be used. Spring oats, since they produce succulent green feed for only a short time, are not satisfactory unless they are sown with some crop that will provide late-summer and fall grazing. Lespedeza is suitable for this purpose.

No doubt there are many other pasture crops and crop mixtures that would be as desirable as some of those used in these trials for supplying green feed for growing chicks. Recent observations at the Station poultry plant indicate that browntop millet (*Panicum fasciculatum*) is well suited for summer grazing if it is cut occasionally to keep it from seeding. Permanent pastures containing mixtures of grasses and clovers make good ranges.

SUMMARY

Studies covering a 3-year period with 740 Barred Rock pullets raised on a bare range and ranges seeded to spring oats, a ryegrass-lespedeza mixture, and alfalfa gave the following results:

1. Pullets grown on ranges sown to pasture crops were heavier at 28 and 32 weeks of age than pullets grown on bare range. Pullets with access to alfalfa were heaviest of the four groups.
2. Reduced mortality was noted in pullets raised on pasture. The 3-year-average mortality rate of alfalfa-ranged pullets was only half that of pullets on bare range.
3. Approximately 31 pounds of feed was eaten by each pullet to 28 weeks of age, regardless of pasture.
4. Pullets on bare range consumed a larger proportion of mash than pullets on pastures.
5. The amount of feed required to produce a pound of gain was greatest for pullets raised on the bare yard. Pullets on alfalfa range utilized their feed more efficiently than any of the other groups.
6. From both pasture and pullet-production standpoints, alfalfa made the most desirable range. A mixture of ryegrass and lespedeza also was satisfactory. Spring oats, because they remain in a succulent stage for only a short period, are not recommended to be sown alone; they require lespedeza or some other crop to provide late-summer and fall grazing.

NOTE—For information on culture of pasture crops, see Tenn. Agr. Exp. Sta. Bulletin 165, on "Clovers and Grasses for Hay and Pasture," by C. A. Mooers, which can be obtained upon request.