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THE SOYBEAN CROP FOR FATTENING  
WESTERN LAMBS

By W. G. KAMMLADE AND A. K. MACKEY



URBANA, ILLINOIS, MARCH, 1925

IN MANY SECTIONS of the country shelled corn and alfalfa hay have come to be considered a standard ration for fattening western lambs. A number of experiments have shown clover hay to be practically equal to alfalfa hay of the same quality for this purpose. These simple home-grown rations are seldom excelled unless it be thru the use of corn silage and a protein concentrate in addition.

Legumes such as alfalfa and clover, however, require non-acid soils, and many farms are therefore not suited to their production. Because soybeans will grow on soils deficient in lime they have been recommended as a satisfactory source of protein, in place of alfalfa or clover, as a part of the ration for fattening lambs.

These experiments show that soybean hay, altho not fully equal to alfalfa hay, may be used in place of alfalfa in the rations of fattening lambs. No consideration has been given, however, to the question of relative yields per acre of the two crops, soil requirements, or labor requirements; so far as these matters are concerned, the individual farmer who is fattening lambs will have to be his own judge as to the desirability of substituting soybeans for alfalfa.

A brief summary of the results obtained in this experiment will be found on pages 206 and 207.



# THE SOYBEAN CROP FOR FATTENING WESTERN LAMBS

By W. G. KAMMLADE, Assistant Chief in Sheep Husbandry, and  
A. K. MACKEY, First Assistant in Animal Husbandry

The marked increase in the production of soybeans in Illinois in the last few years has brought up sharply the question of the place and value of this crop in the rations of farm animals. From the standpoint of good farming practice, the way in which a legume crop is used may be quite as important as its production. The value of clover and alfalfa for sheep and lamb feeding is already established, but there has been little study of the value of soybeans for this purpose.

The two experiments reported in this bulletin were undertaken to determine the usefulness of soybean hay, soybean straw, whole soybeans, ground soybeans, and soybean oil meal when fed with shelled corn, for fattening western lambs.

Six lots of 25 lambs each were used in each of the two experiments, 300 animals in all. They were selected on the Chicago market from shipments of Idaho lambs and were graded as choice feeders. In general, they were representative of lambs produced by mutton type rams crossed on ewes of fine wool blood.

The first test extended from October 25, 1922, to January 29, 1923; the second from October 29, 1923, to January 21, 1924; the time during which many lambs of this character are fattened for market.

## SOYBEANS FED IN FIVE DIFFERENT COMBINATIONS

In the first experiment, soybeans in five different combinations were fed to five different lots of sheep. Another lot was fed alfalfa hay and shelled corn by way of supplying a standard basis for comparison. All grains, roughages, and refused feeds were weighed separately for each lot.

### RATIONS FED

<i>Lot 1</i>	<i>Lot 2</i>	<i>Lot 3</i>
Shelled corn Alfalfa hay	Shelled corn Soybean hay	Shelled corn, 4 parts <sup>1</sup> Whole soybeans, 1 part Soybean straw
<i>Lot 4</i>	<i>Lot 5</i>	<i>Lot 6</i>
Shelled corn, 4 parts *Ground soybeans, 1 part *Soybean straw	Shelled corn, 4 parts Soybean oil meal, 1 part Soybean straw	Shelled corn, 4 parts Linseed oil meal, 1 part Soybean straw

(\* Changed in second experiment, see text.)

<sup>1</sup>In all lots, the proportions are by weight.

In the second experiment, the rations were the same except that in Lot 4 ground soybeans and soybean straw were replaced with soybean

oil meal one part and oat straw, in order to afford direct comparison with Lot 5 as to the relative values of oat and soybean straws.

The corn used was No. 2 yellow. The alfalfa hay was grown on the University farm and was of choice quality.

The soybeans, soybean hay, and soybean straw were of the Mid-west variety. The soybeans were cut for hay when the beans were well formed, that is, about two-thirds or three-fourths developed. The hay was leafy and of good quality, and was the best obtainable in this locality. The soybean straw and oat straw were also of good quality. The soybean oil meal (the residue or meal remaining after a large percentage of the oil has been removed) was obtained from a factory using a pressure process of oil extraction. The only other feed used was old process linseed oil meal.

Both grain and roughage were fed twice a day and were divided equally for the two feedings. Grain was fed first, and as soon as it was eaten roughage was placed in the racks. The appetites of the lambs were carefully watched and just enough roughage fed so that all but the very coarse stems were eaten. Water and salt were available at all times.

In each experiment the lambs were at the farm a few days before the experiment began, and during this time were fed alfalfa hay only, each lamb receiving about 1.25 pounds daily.

All lots were bedded with straw during the first three weeks of the first experiment. After that time, the lots fed soybean hay, soybean straw, and oat straw were bedded with the refuse. Lot 1 was bedded with straw thruout the experiment. For some time it was thought advisable to sprinkle over the straw a small amount of dip, but this was discontinued because the lambs showed no inclination to eat the straw or the refuse used as bedding. In the second experiment, the lambs were bedded with refuse thruout the experiment except in Lot 1, where oat straw was used.

Individual weights of all lambs were taken on three consecutive days at the beginning of the experiments and at the close. The averages of these weights for each animal were taken as the initial and the final weights, respectively. Individual weights were also taken at the end of each 28-day period.

## RESULTS OF FIRST EXPERIMENT: 96 DAYS

The lambs of all six lots at the beginning of the experiment were very uniform as regards both initial weight and condition. As shown in Table 1, the lightest lot averaged only .9 of a pound less than the heaviest; moreover the weights of the individual lambs in the various lots corresponded closely.

## SOYBEAN HAY AS A SUBSTITUTE FOR ALFALFA

At the end of the 96-day feeding period, Lot 1, fed shelled corn and alfalfa hay, averaged 90.8 pounds. This was more than any of the other lots, altho Lot 2, fed shelled corn and soybean hay, was practically the same, those lambs averaging 90.4 pounds. In other words, the corn-and-alfalfa-fed lambs made an average gain of .34 pound daily, or a total gain during the period of 32.4 pounds to a lamb; while the lambs fed corn and soybean hay made .33 pound daily, or a total gain of 31.9 pounds.

The lambs in the soybean lot received .03 pound more of shelled corn per head daily than those in the alfalfa lot. They also received more hay, the lambs in the alfalfa lot using 1.45 pounds of hay per head daily and in the soybean lot, 1.74 pounds. The soybean lot refused approximately 25 percent of the hay; hence it was necessary to feed considerably more hay to this lot than to the alfalfa lot.

A further comparison of these lots shows that to produce 100 pounds of gain the lambs fed soybean hay were fed 13.9 pounds more corn and 93.1 pounds more hay than those fed alfalfa; the alfalfa lot using 323.4 pounds of shelled corn and 431.4 pounds of hay and the soybean lot, 337.3 pounds of shelled corn and 524.5 pounds of hay. It is interesting to note, however, that the amounts of alfalfa hay and soybean hay *actually consumed* per 100 pounds of gain were exactly the same, the much greater amount of refuse from the soybean hay being chiefly responsible for so large a difference between the two hays.

## NO ADVANTAGE IN GRINDING BEANS

The only difference between the rations of Lots 3 and 4, it will be noted, was the form in which the soybeans were fed; to Lot 3 they were fed whole, to Lot 4 ground. Since the lambs gained less in Lot 4 than in Lot 3, and more corn, soybeans, and soybean straw were required to produce 100 pounds of gain, there would seem to be no advantage in grinding soybeans for fattening lambs. Moreover, the whole beans seemed to be relished more than the ground beans, altho the animals in both lots tended to go "off feed" during periods of warm weather. There was no scouring in either lot at these times, but the lambs did not have good appetites. The differences, however, between the lots in feed requirements and gains were not large enough to seem significant.

## SOYBEAN MEAL MORE PALATABLE THAN WHOLE OR GROUND BEANS

Lot 5 received soybean oil meal as a supplement. A somewhat greater gain per head was made by this lot than by Lots 3 and 4, to which whole soybeans and ground soybeans were fed. The amount of concentrates required to produce 100 pounds gain was less than with Lot 4, where ground soybeans were fed, and more than with Lot 3,

TABLE 1.—SUMMARY OF FIRST LAMB-FEEDING EXPERIMENT  
October 25, 1922, to January 29, 1923: 96 days

Lot No.	1		2		3		4		5		6	
	Shelled corn Alfalfa hay	25	Shelled corn Soybean hay	25	Shelled corn Whole soybeans Soybean straw	25	Shelled corn Ground soybeans Soybean straw	25	Shelled corn Soybean oil meal Soybean straw	24 <sup>1</sup>	Shelled corn Linseed oil meal Soybean straw	25
<i>Weights</i>												
Aver. initial weight per lamb.....	lbs. 58.5		lbs. 58.5		lbs. 58.7		lbs. 58.9		lbs. 58.0		lbs. 58.2	
Aver. final weight per lamb.....	90.8		90.4		83.7		83.1		83.7		83.6	
<i>Gains</i>												
Aver. gain per lamb.....	32.4		31.9		25.1		24.2		25.7		25.4	
Aver. daily gain per lamb.....	.34		.33		.26		.25		.27		.27	
<i>Aver. daily feed per lamb</i>												
Corn.....	1.09		1.12		.88		.87		.90		.90	
Supplement.....	.....		.....		.22		.22		.23		.23	
Roughage.....	1.45		1.74		2.16		2.16		2.16		2.16	
<i>Total feed per lamb for 96 days</i>												
Corn.....	104.7		107.5		83.8		83.5		86.2		86.2	
Supplement.....	.....		.....		21.0		20.9		21.6		21.6	
Roughage.....	139.7		167.2		207.5		207.3		207.5		207.5	
Roughage refused.....	8.1%		24.2%		44.2%		44.8%		45.1%		42.6%	
<i>Feed per 100 pounds gain</i>												
Corn.....	323.4		337.3		334.6		344.4		336.1		339.2	
Supplement.....	.....		.....		83.9		86.1		84.1		84.8	
Total concentrates.....	323.4		337.3		418.5		430.5		420.2		424.0	
Roughage fed.....	431.4		524.5		828.4		855.2		808.7		816.5	
Roughage consumed.....	396.0		396.1		462.3		472.1		444.1		468.5	

<sup>1</sup>A lamb died in Lot 5 twenty-four days after the beginning of the experiment. Post-mortem examination showed that death apparently resulted from impaction. A correction in the data was made by subtracting the initial weight of the lamb and assuming that it had eaten one twenty-fifth of the feed given to the lambs in this lot during the time it was in the lot.

where whole soybeans were used. The soybean straw required in making 100 pounds of gain was 808.7 pounds in Lot 5, 828.4 pounds in Lot 3, and 855.2 pounds in Lot 4.

The lambs getting soybean oil meal had good appetites at all times and were never "off feed." Soybeans in this form seemed much more palatable than either the whole or the ground soybeans. Altho no marked superiority was shown by soybean oil meal as compared with whole or ground soybeans, still because of its greater palatability and the slightly faster gains which it produced, it should be given a little better rating as a supplement than the whole or ground beans. The lambs fed soybean oil meal were more desirably finished than those fed the whole or ground beans.

#### LITTLE CHOICE BETWEEN SOYBEAN AND LINSEED OIL MEAL

Lots 5 and 6 give a direct comparison between soybean oil meal and linseed oil meal as supplements. Any significant difference between these supplements would be expected to show when they were used with a roughage such as soybean straw, but the results with them were almost identical. No difference in the palatability of soybean oil meal and linseed oil meal was apparent. Neither was there any important difference in the rate of gain. The lambs fed linseed oil meal required 3.1 pounds more corn, .7 pound more meal, and 7.8 pounds more soybean straw than the lambs fed soybean meal, to produce 100 pounds gain, but these differences are so small as to be of little importance. Judging from this part of the experiment, one would select either soybean oil meal or linseed oil meal according to price. Market men considered Lot 5 a little more desirably finished than Lot 6, but the difference was not great enough to make any difference in the selling price.

#### SOYBEAN CROP BEST FED AS HAY

The differences between the lots receiving shelled corn and soybean straw supplemented with either soybeans, soybean oil meal, or linseed oil meal have been noted. A comparison of any or all of these lots with either Lot 1, fed shelled corn and alfalfa hay, or Lot 2, fed shelled corn and soybean hay, shows the hay rations much superior in rate of gain and in feed required to produce the gain. When soybean straw replaced either alfalfa or soybean hay, the gains were slower, and there was a much larger consumption of concentrates to a pound of gain.

#### RESULTS OF SECOND EXPERIMENT: 84 DAYS

There are two important differences between the first and second experiments. In the first experiment Lot 4 received shelled corn, ground soybeans, and soybean straw; in the second, shelled corn, soybean oil



TABLE 2.—SUMMARY OF SECOND LAMB-FEEDING EXPERIMENT  
October 29, 1923, to January 21, 1924; 84 days

Lot No.	1	2	3	4	5	6
Ration.	Shelled corn Alfalfa hay	Shelled corn Soybean hay	Shelled corn Whole soybeans Soybean straw	Shelled corn Soybean oil meal Oat straw	Shelled corn Soybean oil meal Soybean straw	Shelled corn Linseed oil meal Soybean straw
No. of lambs per lot	23 <sup>1</sup>	24 <sup>1</sup>	25	25	23 <sup>1</sup>	25
<i>Weights</i>						
Aver. initial weight per lamb.	62.2	61.6	62.0	61.7	61.3	61.6
Aver. final weight per lamb.	89.0	87.3	82.5	81.8	83.4	83.0
<i>Gains</i>						
Aver. gain per lamb.	26.8	25.7	20.5	20.1	22.1	21.4
Aver. daily gain per lamb.	.32	.31	.24	.24	.26	.25
<i>Average daily feed per lamb</i>						
Corn.	1.16	1.10	.87	.91	.92	.91
Supplement.	.....	.....	.22	.23	.23	.23
Roughage.	1.34	1.51	2.03	1.41	2.04	2.03
<i>Total feed per lamb for 84 days</i>						
Corn.	97.8	92.7	73.2	76.7	77.4	76.7
Supplement.	.....	.....	18.5	19.2	19.3	19.2
Roughage.	112.2	127.2	170.8	118.8	171.8	170.8
Roughage refused.	8.8%	20.7%	42.7%	34.4%	41.1%	40.5%
<i>Feed per 100 pounds gain</i>						
Corn.	364.8	361.2	357.1	381.7	350.1	359.0
Supplement.	.....	.....	90.2	95.4	87.4	89.9
Total concentrates.	364.8	361.2	447.3	477.1	437.5	448.9
Roughage fed.	418.4	495.5	833.5	591.0	777.3	799.3
Roughage consumed.	381.5	392.8	477.4	387.7	457.9	475.8

<sup>1</sup>All lots contained 25 lambs at the start of the experiment. These numbers are for the close of the experiment. Corrections in the data were made by subtracting the initial weight of each lamb that died and assuming that it had eaten one twenty-fifth of the feed given to the lambs of that lot during the time it was in the lot. One lamb of Lot 1 died from an injury received on October 29. Another lamb in this lot died November 26 from digestive disturbances. One lamb of Lot 2 died from an unknown cause, November 4. Two lambs of Lot 5 died December 26 and 28; symptoms were those of poisoning, perhaps due to some mold in the feed.

meal, and oat straw. This change was made because in the first experiment no advantage was shown in grinding the soybeans.

The other difference is in the length of the feeding period. The first experiment covered 96 days; the second only 84 days because the lambs in this experiment started a little heavier, their initial weight averaging about 62 pounds as compared with 58.5 pounds for the lambs in the first experiment.

In Table 2 is given a summary of the data for the 1923-24 experiment. By means of this table comparisons similar to those already noted in discussing the 1922-23 experiment may be made.

#### ALFALFA HAY PRODUCED BETTER FINISH

The lambs fed shelled corn and alfalfa hay gained a little more rapidly than those fed shelled corn and soybean hay. The alfalfa lot required 364.8 pounds of shelled corn and 418.4 pounds of hay to produce 100 pounds of gain; the soybean lot required 361.2 pounds of corn and 495.5 pounds of hay. This means an advantage of 3.6 pounds of corn and a disadvantage of 77.1 pounds of hay for the soybean-hay lot compared with the alfalfa-hay lot. Market men considered the alfalfa lot a little more desirable in finish than the soybean lot.

#### SOYBEAN MEAL SUPERIOR TO WHOLE BEANS

Lots 3, 5, and 6 show essentially the same results as in the first experiment. Whole soybeans, the supplement used for Lot 3, were not so palatable as soybean oil meal used for Lot 5. The rate of gain was less with the whole soybeans than with the soybean oil meal, .24 pound a head daily with the whole beans as compared with .26 pound with the soybean oil meal. To produce 100 pounds of gain the lambs receiving whole soybeans were fed 7 pounds more corn, 2.8 pounds more supplement, and 56.2 pounds more soybean straw than was fed to the lambs receiving soybean oil meal, and they were not so well finished at the close of the experiment.

Altho the difference is not great, soybean oil meal in this experiment, as in the first experiment, fed with shelled corn and soybean straw, excelled whole soybeans as a supplement, both in palatability and in gains produced.

#### ESSENTIALLY THE SAME RESULTS WITH LINSEED AND SOYBEAN OIL MEAL

Soybean oil meal proved to be a little more efficient than linseed oil meal in the production of gains and in the amount of corn, supplement, and soybean straw required for 100 pounds of gain. Eight and nine-tenths pounds less of corn, 2.5 pounds less of supplement, and 22 pounds less of roughage was used by the lambs fed soybean oil meal

(Lot 5) than by those fed linseed oil meal (Lot 6), to make 100 pounds of gain.

The finish on Lot 5 was somewhat more desirable than that on Lot 6. However, the differences between the two rations were not great enough to warrant saying definitely that soybean oil meal is superior to linseed oil meal. Judging from this experiment, as from the first experiment, one would expect essentially the same result from either ration and would purchase the supplement that was the cheaper.

#### SOYBEAN STRAW COMPARED WITH OAT STRAW

Lots 4 and 5 were fed the same grain rations: namely, shelled corn and soybean oil meal, with oat straw as the roughage for Lot 4 and soybean straw for Lot 5. The gains in the lot fed soybean straw were greater than those in the lot fed oat straw. Market men considered the oat-straw lot the poorest finished of the six lots in the experiment. The lambs were not well fleshed; eight of the twenty-five had to be sold as "culls" because they were not satisfactorily fattened.

It will be noted also from Table 2 that there was a considerable difference in the amount of feed required to produce 100 pounds of gain in these lots. The oat-straw lot required 381.7 pounds of shelled corn and 95.4 pounds of soybean oil meal; the soybean-straw lot, 350.1 pounds of shelled corn and 87.4 pounds of soybean oil meal. This was a difference of 31.6 pounds of corn and 8 pounds of soybean oil meal, or a total of 39.6 pounds of concentrates in favor of Lot 5. The roughage fed in the production of 100 pounds of gain was 591 pounds of oat straw in Lot 4 and 777.3 pounds of soybean straw in Lot 5, or 186.3 pounds more soybean straw than oat straw. Lot 5, however, actually *consumed* only 70.2 pounds more of soybean straw than Lot 4 did of oat straw for each 100 pounds of gain, a large amount of the soybean straw being refused because of its coarseness. The soybean straw seemed to be more palatable than the oat straw. Oat straw was not a satisfactory roughage, even tho a nitrogenous supplement was fed.

#### SUMMARY AND CONCLUSIONS

In these experiments shelled corn and alfalfa hay proved somewhat superior to shelled corn and soybean hay for fattening western lambs, the former ration resulting in slightly greater total gains and in lower feed consumption for 100 pounds of gain. In both rations the amounts of corn required for 100 pounds of gain were practically equal, but the hay required was about 20 percent greater with soybean hay than with alfalfa hay.

The edible portion of the soybean hay was apparently as palatable as alfalfa hay and as efficient in producing gains, but there was a much larger amount of refuse from the soybean hay.



As between hay and threshed straw, the soybean plant is best fed to fattening lambs in the form of hay, even tho the beans or other supplement is used with the straw. Either shelled corn and alfalfa hay or shelled corn and soybean hay were distinctly superior to any of the rations in which soybean straw was used, as judged by rate of gain and by the amounts of concentrates and roughage required for 100 pounds of gain.

There was no advantage whatever in grinding the soybeans.

Soybeans, whole or ground, were not so palatable as soybean oil meal or linseed oil meal, and gains were somewhat slower when they were used as a supplement than when soybean oil meal or linseed oil meal was used.

Soybean oil meal used as a supplement to shelled corn and soybean straw resulted in somewhat more rapid gains and in the use of slightly less feed for 100 pounds of gain, than did linseed oil meal.

Oat straw fed as a roughage with shelled corn and soybean oil meal produced less gain than soybean straw fed with the same concentrates.

In these experiments with western lambs, with corn at 65c a bushel and alfalfa at \$20 a ton soybean hay had a value of approximately \$17 a ton for fattening lambs. With the same prices for corn and alfalfa hay and \$50 a ton for the nitrogenous supplements, soybean straw for fattening lambs was worth about \$5 a ton.

Altho, as stated previously, these experiments show that soybean hay, while not fully equal to alfalfa hay, may be used in place of alfalfa hay in the rations of fattening lambs, no consideration has been given to the questions of relative yields per acre of the two crops, soil require-

TABLE 3.—PERCENTAGE COMPOSITION OF FEEDS USED IN EXPERIMENTS  
(Analyses made by Division of Animal Nutrition)

	Dry matter	N-free extract	Crude protein	Ether extract	Crude ash	Crude fiber	Gross energy sm. cal.-gm
FIRST EXPERIMENT							
Corn.....	89.63	71.44	10.14	4.03	1.47	2.55	.....
Linseed oil meal.....	92.87	35.28	38.82	5.49	4.99	8.29	.....
Soybean oil meal.....	90.61	27.85	45.68	6.90	4.66	5.52	.....
Ground soybeans.....	89.74	25.39	38.87	15.66	4.54	5.28	.....
Whole soybeans.....	89.83	22.40	39.56	17.38	4.57	5.92	.....
Alfalfa hay.....	93.57	43.23	13.14	1.64	5.85	29.71	.....
Soybean hay.....	94.56	36.61	15.55	3.76	7.76	30.88	.....
Soybean straw.....	94.20	36.31	3.75	1.29	3.93	48.92	.....
SECOND EXPERIMENT							
Shelled corn.....	86.94	72.18	8.81	2.34	1.23	2.38	3825
Linseed oil meal.....	89.17	36.32	34.81	4.44	6.13	7.47	4163
Soybean oil meal.....	90.18	27.93	45.63	7.34	4.73	4.55	4447
Whole soybeans.....	86.29	22.35	28.95	18.86	5.26	10.87	4690
Alfalfa hay.....	84.09	33.70	12.91	1.65	5.85	29.98	3703
Soybean hay.....	83.66	31.81	9.89	4.35	6.24	31.37	3614
Soybean straw.....	78.96	28.95	3.07	0.68	3.33	42.93	3392
Oat straw.....	86.20	38.83	5.82	2.23	8.27	31.05	3564
Percentage Composition of Refuse from Second Experiment							
Alfalfa hay orts.....	81.73	27.29	6.86	0.82	4.26	42.50	3517
Soybean hay orts.....	82.39	28.07	2.85	0.80	4.02	46.65	3504
Soybean straw orts.....	80.58	26.11	2.77	0.76	2.67	48.27	3530
Oat straw orts.....	86.73	36.65	3.81	1.35	6.15	38.77	3675

ments, or labor requirements. So far as these matters are concerned, because of the great diversity of conditions, the individual farmer who is fattening lambs will have to be his own judge as to the desirability of substituting soybeans for alfalfa.

### FINANCIAL CONSIDERATIONS

The phase of feeding experiments which is of the most interest to feeders is *the cost of feed required to make 100 pounds of gain*.

Calculations involving feed costs, however, become quickly out of date with fluctuating prices, and much of the value and effectiveness of the experiments is lost.

It is possible by presenting properly constructed charts instead of the usual financial tables, to give to the operator an easy way of applying to the results of a feeding experiment any reasonable combination of feed prices, so that he may fit the project into his own peculiar and changing conditions and have a good basis for deciding when and whether the procedure would be worth his following. Such charts have been constructed for the experiments reported herein, and are shown as Figs. 1 and 2. By carefully following the directions given below, it is believed that no difficulty will be experienced in their use, but, on the contrary, their advantage will be recognized.

#### HOW TO USE THE CHARTS FOR LOTS 1 AND 2

The rations for Lots 1 and 2 for both years contained only two feeds, and, therefore, the calculation of feed costs is very simple.

For the purpose of illustration, let us assume that Lot 1 was fed the first year on alfalfa hay costing \$25 a ton and corn costing 60 cents a bushel. To read the chart place a string or straight edge across its face, so that the straight edge will connect points on the two outside scales representing the assumed prices of alfalfa hay and of corn (see line "A" of Fig. 1). The straight edge intersects the perpendicular labelled "Cost of Gain, Lot 1" at the point which reads \$8.86. This then is what it cost to put 100 pounds of gain on the lambs in this lot, with feed at the prices assumed above.

For Lot 2 of the first year, the cost of 100 pounds of gain would be indicated by the point at which the straight edge intersects the upright scale representing that lot. For Lots 1 and 2 of the second year, the chart shown as Fig 2 would be used in the same way that Fig. 1 is used for the first year.

#### HOW TO USE THE CHARTS FOR LOTS 3, 4, 5, AND 6

Where three feeds are used, one additional step is necessary.

Let us assume that Lot 3 was fed the first year upon soybean straw at \$5 a ton, soybeans at \$50 a ton, and shelled corn at 65 cents a bushel.

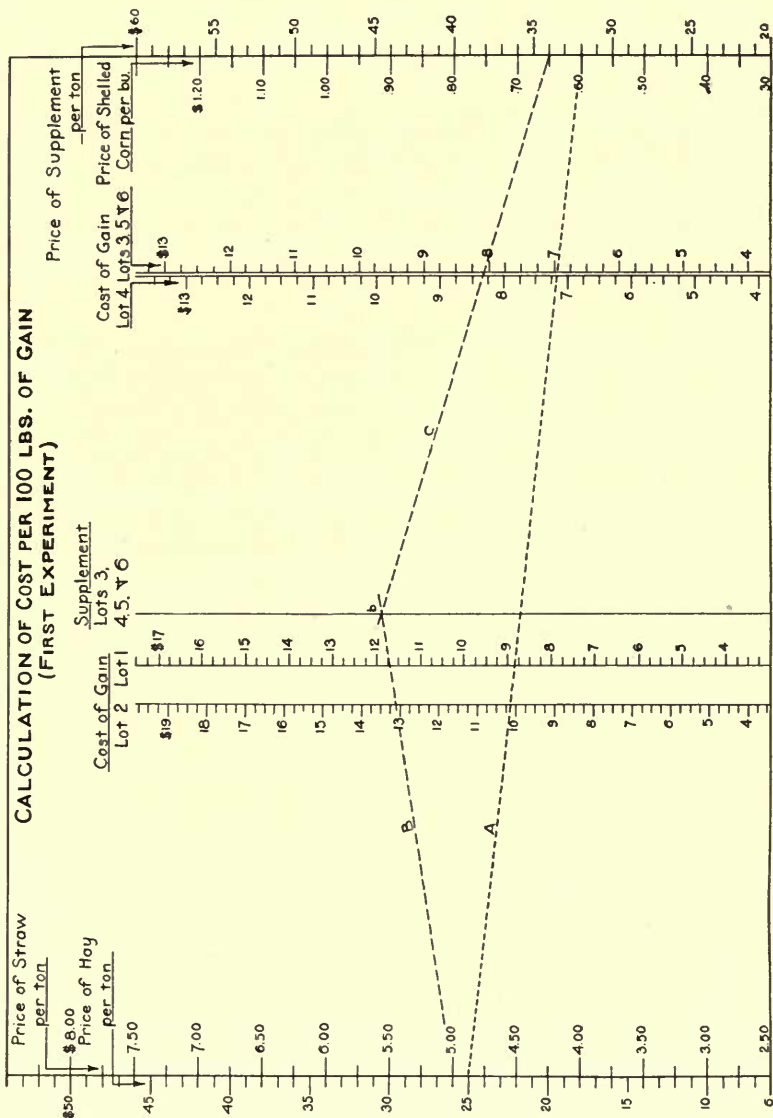


FIG. 1.—CHART FOR CALCULATING COST OF 100 POUNDS OF GAIN IN THE FIRST EXPERIMENT  
See accompanying text for directions for using both this chart and the one shown as Fig. 2.

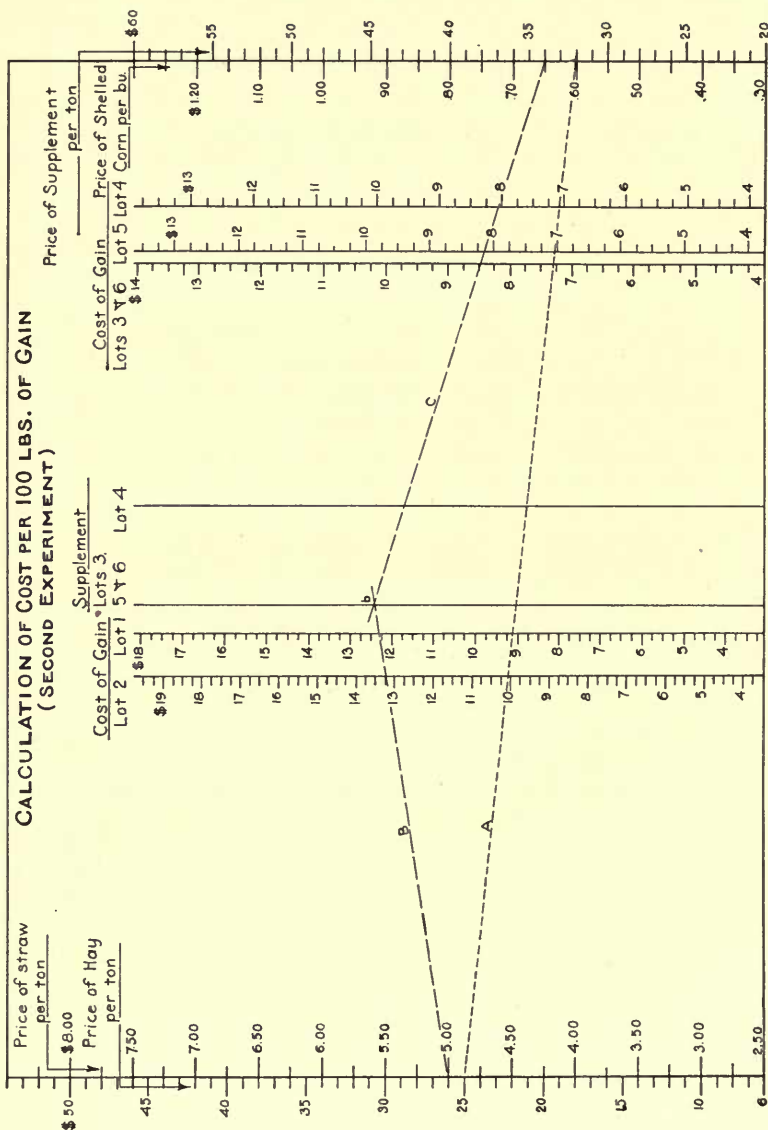


FIG. 2.—CHART FOR CALCULATING COST OF 100 POUNDS OF GAIN IN THE SECOND EXPERIMENT

With a straight edge, connect the point on the left scale which represents \$5 a ton for soybean straw, with that on the right scale indicating \$50 a ton for the supplement (see line "B" Fig. 1). Check the point where the straight edge cuts the plain perpendicular line labelled "Supplement Lots 3, 4, 5, and 6" (see point b, Fig. 1). Now shift the straight edge so as to connect point "b" with the point on the inside of the right-hand scale indicating the price for corn as 65 cents a bushel (see line "C," Fig. 1). Now read the point where the straight edge cuts the perpendicular scale used to represent the cost of gain for Lot 3. In this case the point of intersection is at \$8.08, which then is the cost of the feed used to put 100 pounds of gain on these lambs, with the feeds at the prices assumed. In the same way the cost of gain may be quickly calculated for the other lots.

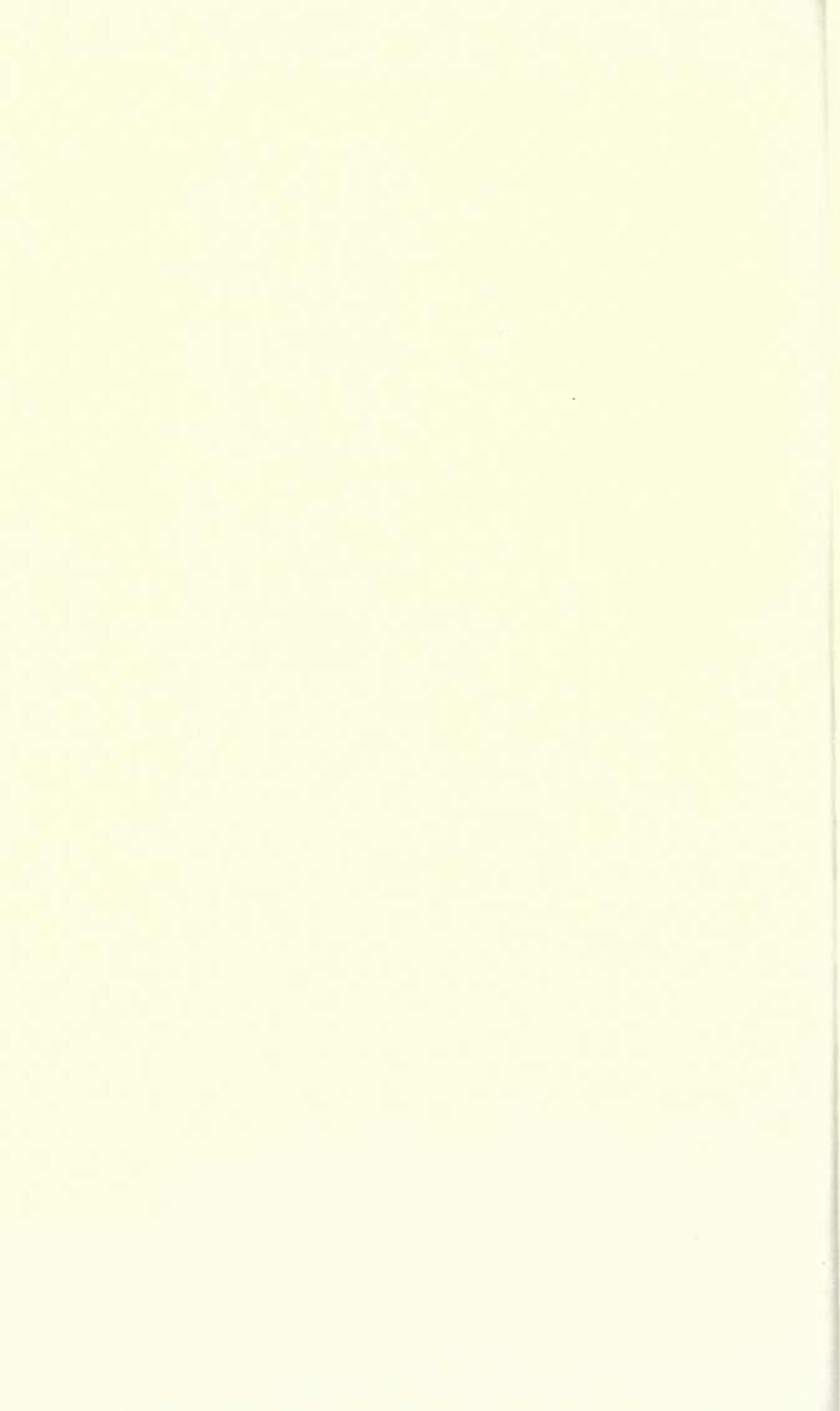
It is important to remember that this order of locating points on the chart *must always be followed when three feeds are used*, since the construction of the chart is based upon it. The prices for roughage and supplement must first be connected, and the point checked where the straight edge intersects the plain perpendicular representing the lot under study. This point is then connected by a straight edge with the corn price, which is the last item to be considered.

Because of the limitations of space these charts cannot be made large enough to show to the accuracy of a cent, what the cost was of putting 100 pounds of gain on these lambs, assuming certain prices for feeds used. However, since no two feeding trials, tho conducted under as nearly identical conditions as possible, would produce exactly the same results, any calculations made from these particular experiments would apply only approximately to any other feeding venture. The figures resulting from the use of these charts will be as true an index of what an operator may expect under his own conditions as would more exact figures, and may be relied upon as a useful guide.

Directions for growing soybeans in Illinois, together with recommendations as to varieties, will be found in Circular 255 of this Station. This circular will be sent upon request; address Illinois Agricultural Experiment Station, Urbana.















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