To the Advisory Committee of the Illinois Live Stock Breeders' Association and to all interested in the profitable production of animal products of better quality:

Believing that the plan, progress and results of the work undertaken and outlined under Section I of House Bill No. 315 is of general interest the following report has been prepared.

According to the conditions of said bill the work undertaken under the Live Stock Section has been carried forward as agreed upon by the Dean of the College of Agriculture and a committee of five appointed by the Illinois Live Stock Breeders' Association. This Committee has held three meetings for the purpose of advising with reference to lines of work to be taken up and methods of procedure.

The bill referred to specifically states that these investigations shall consist of a study of conditions and methods of meat production at home and abroad and "to determine the most successful combinations of stock foods, particularly of Illinois grains and forage crops, and to discover the most economical and successful methods of maintaining animals and fitting them for the markets."

Since the amount appropriated was considerably less than the amount asked for it was agreed that owing to the extent and importance of the beef producing interests of Illinois the investigations should be confined largely to that subject. As the amount of land
Figure 1. University of Illinois Experimental Feed Lots.
available for pasturage was small, in fact too small to accommodate even specimen animals, summer feeding experiments, or fattening cattle on grass could not be considered. No feed lots or sheds for winter feeding of beef cattle were on the Experiment Station farm. This made it necessary to construct sheds and feed lots for the accommodation of experimental and specimen beef cattle as well as storage for grain and roughage.

The accompanying cut, Figure 1, shows a view of one of the sheds with accompanying feed lots and corn crib constructed for conducting winter cattle feeding experiments. The corn crib is one hundred forty-four feet in length with a capacity of over five thousand bushels. Each of the seven feed lots shown is thirty-six feet wide by forty-eight feet long opening into sheds twelve by thirty-six feet. These sheds are open to the south. All lots are provided with watering tanks which are supplied from the University water system. These lots and accompanying sheds are intended for conducting feeding experiments when it is desirable to have each lot accommodate a car-load of feeding cattle. The results of many cattle feeding experiments hitherto conducted in this country are not reliable on account of the small number of cattle involved. Where only a few animals constitute each lot, the possibility has been great that the individuality of the animal has been a more important factor than the rations fed.

The people of the state of Illinois have shown good judgment and economy by making it possible to have experimental cattle fed in car-load lots. They have shown economy because the results from such feeding experiments are exceedingly valuable since the factor of individuality of the animals used is reduced to the minimum.

In addition to the sheds and feed lots shown, another shed was built parallel to and about fifty feet north. This second shed is twenty-four feet wide by forty-eight feet long and has been used almost exclusively for housing specimen stock used in giving instruction in judging live stock and for storing grain and roughage for their maintenance. This shed is by no means suitable for sheltering valuable animals accustomed to good keep; it has been used only temporarily for the purpose named, the plan being that it shall ultimately be used to increase the equipment for handling a larger number of feeding cattle experimentally.

For storing grain and roughage for experimental cattle a storage barn forty-four by seventy-two feet with eighteen-foot posts and hip-roof has been built within twenty-five feet of the east end of the shed shown in the cut. Several sets of scales for weighing feed and cattle
have been provided. The nature of the soil is such that where the feed lots are located it was necessary to pave with brick a large part of the area devoted to winter cattle feeding experiments. The building of seven large and four small lots with small hog cots for each within the past eighteen months has still further added to the expense of the equipment. It will be seen that extensive improvements have been made. These and other improvements have cost the Station $4,698.11.

At the first meeting of the Live Stock Advisory Board after the live stock investigations were placed in the hands of the present Head of the Animal Husbandry Department, a large number of important experiments were suggested. It was evident that only a small proportion of them could be undertaken during the life of Bill 315. It was further observed that all experiments suggested could be classified under certain definite headings which would stand for distinct lines of live stock investigation. Accordingly, an outline submitted to the Board by the Director of the Experiment Station and the Head of the Animal Husbandry Department was agreed upon as a guide for future work. The outline adopted follows:

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LIVE STOCK INVESTIGATIONS.

Live stock investigations and experiments should as far as possible be undertaken from the viewpoint of the consumer of meat. Believing that the fundamental proposition is,—are we producing a maximum of what the people want at a minimum cost with residues disposed of to the best advantage?

Besides conducting experiments calculated to establish certain facts, we should also institute investigations to ascertain the present state of knowledge and belief which represents the accumulated experience of generations of stockmen, regarding the points in question.

I. Feeding Experiments and Investigations.

1. Converting the corn crop into meat.
   (a) Preparation of corn.
   (b) Supplementary feeds.
   (c) Treatment of animals as meat producers.
   (d) Is the treatment of animals as meat producers incompatible with the treatment of the animal whose function it is to breed meat producers?
II. Meat on Hook and Hoof.
An exhaustive study of meat because such study is indispensable for the purpose of establishing standards of judging animals on the hoof.

III. Dissemination.
1. Bulletins.
2. Circulars.
3. Class Room.

It is believed that by closely adhering to this outline there will be unity and consistency throughout the work and no pertinent questions relating to the industry will long be neglected.

To canvass the broad field of live stock practice and experimentation seemed a logical method of procedure in order to form a more intelligent idea of the unsettled and disputed problems in Animal Husbandry, and to arrange such facts in bulletin form as appear settled by long experience, thus giving each cattle breeder and feeder the benefit of the experience of a large number engaged in similar work. As it was decided to throw the principal effort into beef production during the years 1901 and 1902 the following investigation of present methods of beef production was begun. One hundred questions were prepared for mailing to a large number of successful cattle raisers and feeders which were intended to bring out the present practice concerning:

(a) The preparation of the corn crop for fattening steers.
(b) The use of supplementary feeds to corn, both in the form of concentrates and roughage.
(c) The treatment of animals as meat producers, or, in other words, the care and management of steers and heifers which ultimately find their way to the open market.

The following letter accompanied questions in each instance:

ANIMAL HUSBANDRY DEPARTMENT. Form No. 5.

DEAR SIR:—The Animal Husbandry Department of the University of Illinois is collecting information upon the methods of beef production. It is doing this with a view of determining: first, all the methods in use; second, which are most profitable; third, which produce the highest classes of beef; and, fourth, which result in products able to compete most successfully with those produced by the same or different methods in other states or countries; finally to answer the question, "How can beef production be rendered more profitable?"

The success of this investigation depends upon the willingness of the people actually engaged in the business to give the facts. I know this
means some trouble, but each will learn something, and the beef producing interests will certainly be benefited.

I have, therefore, taken the liberty of addressing the questions on the accompanying blank to you with the request that you give them careful consideration. We know you are a busy man, but at the same time we feel assured that you are deeply interested in this question and I am sure will cooperate with us.

We hope to publish a bulletin containing the results of these investigations, and will take pleasure in forwarding a copy to you as soon as issued.

Very truly yours,

(Signed) HERBERT W. MUMFORD.

ANIMAL HUSBANDRY DEPARTMENT. Form No. 6.

PRESENT METHODS OF BEEF PRODUCTION.

(A blank space is left after each question for answer; if you need more space kindly answer questions on the back of this sheet, being careful to accompany answer with the corresponding number of the question).

1. Do you buy your feeders or breed them?
2. If you breed them, what class of cows do you keep; i. e., are they largely of beef blood and if so of what breed?
3. Is the bull pure bred? If so, of what breed?
4. Do you ever practice inbreeding?
5. At what age do you breed the heifers to produce market stock?
6. At what season is the principal crop of calves dropped?
7. Do you intend to make baby beef of them?
8. If so, how long do they suckle their dams?
9. Do they get grain while suckling their dams? If so, what kind and how much?
10. At what age do you castrate calves?
11. Do you keep the heifers until they have reached maturity?
12. At what age do you finally sell the cows; at what season, and in what condition?
13. How do you manage the calves intended for baby beef from weaning time until marketed?
14. How long do you permit calves to suckle dams when not intended for baby beef?
15. Do you feed any grain to such calves when suckling their dams?
16. In buying stockers or feeders, what age, weight, breed and condition of flesh have given you the best returns? (a) age, (b) weight, (c) breed, (d) condition of flesh.
17. What margin over cost price do you consider necessary in order to make your feeding operations come out even, on a basis of 35c corn and $8.00 hay, under average conditions of buying and selling your cattle; that is, that you shall neither gain nor lose by the enterprise?
18. What margin over cost price will give you a satisfactory profit?
19. What breed has given you the most general satisfaction and why?
20. What season have you found best for buying stockers?
21. What do they cost per pound delivered at your farm?
22. Where do you secure your stockers as a rule and why?
23. Do you ever feed spayed or open heifers?
24. Have you been able to realize as much profit from feeding them as steers?
25. How long do you plan to feed?
26. Have you found winter feeding profitable? If not, why not?
27. What season of the year can you fatten cattle to the best advantage and with the most profit?
28. As a result of your experience, what do you consider the best length for the feeding period? (This refers to the number of days on full feed).
29. At about what age and weight do you aim to market your cattle, assuming, of course, that you market them when they will give you the greatest net profit? (a) age, (b) weight.
30. Have you found it profitable to produce 1,500 to 1,600 pound steers; if so, under what conditions?
31. At approximately what date do you turn your cattle to grass?
32. Do you run the cattle on pasture in July and August?
33. If so, do you feed them any other green feed?
34. How many months do you pasture your cattle intended for market?
35. What kind of pasture do you provide for your cattle?
36. How many acres of pasture named above, in an average season, are sufficient to carry: (a) 20 two-year-old steers? (b) 20 yearling steers? (c) 20 cows or heifers with calves at foot?
37. When do you aim to get the cattle on full feed?
38. When are they taken off the pasture?
39. When do you aim to have them finished?
40. Where and how do you sell your cattle?
41. What particular care, if any, do you take before shipping cattle to market in order to have them reach the market with light shrink and in the best possible condition? (a) In summer from grass; (b) in winter from feed lot.
42. Will your local butcher handle some of your best cattle, or does he handle a cheaper grade?
43. Does he handle your culls and old stock, or do you ship them?
44. What class of beef do you attempt to produce?
45. What prices have you received when sold at home?
   Date...........1898, Price...........; Date...........1899, Price...........
   Date...........1900, Price...........; Date...........1901, Price...........
   Date...........1902, Price...........
46. If you have shipped, what prices at the market?
   Date...........1898, Price...........; Date...........1899, Price...........
   Date...........1900, Price...........; Date...........1901, Price...........
   Date...........1902, Price...........
47. What season have you found best for marketing your fat cattle?
48. Do you use the self feeder?
49. If so, what are its advantages?
50. What are its disadvantages?
51. Do you feed in sheds or in the stall; in pens, or open field?
52. Would you, under any circumstances, advise feeding cattle in the open lot without shelter of any kind?
53. Do you believe any better results could be secured if steers had access to a closed shed or warm barn?
54. How many steers do you run in a feed lot together?
55. In fattening cattle in winter do you think it advisable to give access to good blue grass pasture during open weather or confine them to the feed lot?
56. Do you use rock (jump) or barrel salt? Why?
57. Do you keep salt before your cattle at all times or salt them at regular intervals?
58. What provision, if any, do you make to keep feed lots from getting muddy during broken weather?
59. What average daily gain do you secure? (a) In summer on full feed and grass; (b) in winter on full feed.
60. (a) Taking the whole of the grazing season through, what average daily gain do you secure with yearlings on grass alone? (b) Two-year-olds on grass alone?
61. At what age do you find it pays to put steers on full grain feed?
62. What is the best method for wintering steer calves, i.e., from weaning time to grass in spring?
63. What is the best method you have found for wintering yearlings?
64. How many days do you take to get steers unaccustomed to grain, on full feed?
65. State briefly your method of feeding steers during their fattening period including feeds used and the number of feedings per day.
66. What disposition do you make of the corn stalks or stover?
67. Of the feeds used, what do you aim to produce?
68. What feeds, if any, do you buy?
69. State your experience in feeding cotton seed meal as to amount fed to each steer and results.
70. Have you found it undesirable to run hogs after cattle receiving cotton seed meal?
71. In your experience have you found it profitable to feed any bran or linseed meal with corn? If so, which one, and in what quantities?
72. Have you used other grains with corn, such as gluten meal, flaxseed meal, germ meal, malt sprouts or brewer’s grains? If so, in what quantities, and with what results?
73. When steers are on full feed, what roughage do you prefer, and why?
74. Do you allow the steers all the roughage they will eat during the fattening period?
75. If not, why not and what kind and how much roughage do you feed?
76. Do you vary roughage in an attempt to make steers eat more of it?
77. If you have had any experience in feeding silage to fattening steers, kindly state briefly the results which followed such feeding.
78. How do you feed your corn; that is, in shock, snapped, in the ear, husked, broken, or shelled; do you crush, crack, grind, or soak your corn? (a) Winter feeding; (b) summer feeding.
79. Why do you prefer the method of feeding corn you practice?
80. Do you make a practice of feeding grain to cattle on grass? If so, during what months? Months...... Kinds...... Amount.

81. What amount and kind of grain do you ordinarily feed per day, per head when on full feed? (a) Yearlings in winter; yearlings in summer on grass; (b) two-year-olds in winter; two-year-olds in summer on grass.

82. Do you run hogs behind your cattle?

83. If so, how many 150-pound shoats do you consider will thrive well per steer on what they can secure from the droppings of the steer and without additional corn being given them?

84. What average daily gain do you secure on pigs with this method of feeding?

85. What shelter do the pigs have?

86. What age, breed, and weight of hogs do you prefer for following steers in the feed lot? (a) Age; (b) breed; (c) weight.

87. Do you aim to keep just enough pigs following steers to consume droppings, or do you plan to feed pigs something besides what they get from the droppings?

88. When a thousand bushels of ear corn are fed to cattle in the ordinary way, what proportion of it would you consider fair to be charged up to the hog that follows the steer?

89. Have you found that the feeding of oil meal to the steers has been a decided advantage to the pigs following the steers?

90. Have you fed any other supplementary feed to the steers that has had an equally good effect upon the pigs?

91. Do you consider it advisable to warm water for cattle during the winter months any more than to keep tanks from freezing when exposed?

92. As the result of your experience, what method or combination of methods of preparing the corn crop has returned the greatest profit, everything considered, and why?

93. How much grain and how much hay do you estimate it takes on the average to produce 100 pounds of gain on? (a) Calves; in winter .... bu. corn; ...... lbs hay. Calves; in summer on grass.... bu. corn; ...... lbs. hay. (b) Yearlings; in winter .... bu. corn; ...... lbs. hay. Yearlings; in summer on grass .... bu. corn; ......lbs. hay. (c) Two-year-olds; in winter .... bu. corn; ...... lbs. hay. Two-year-olds, in summer on grass ....; bu. corn; ...... lbs. hay.

94. How many years' experience in feeding steers have you had?

95. During this time, how many cattle, approximately, have you fattened and marketed?

96. Can you produce beef at a profit at present prices of feed and fat cattle? If so, how would you manage it?

97. What is the average price of land upon which you grow and fatten cattle?

98. Is land increasing or decreasing in value in your section?

99. Is cattle breeding and feeding increasing or decreasing in your section, and why?

100. In your judgment what changes of conditions are most necessary in order to render beef production more profitable?
Note.—We do not expect, except in rare instances, that any one feeder will be able to answer every one of the above questions. Inability to answer all should not deter any one from answering such questions as his experience makes possible. It is the feeder’s experience, his successes first and his failures last that we want most.

H. W. M.

This investigation began March, 1902. Nearly six thousand letters enclosing the above one hundred questions were sent out to as many prominent cattle men most of whom reside in Illinois; however, it was not thought advisable to confine this investigation to Illinois beef producers, but rather to extend the inquiry to beef producers in other and especially in adjoining states whose cattle come in direct competition with those marketed from Illinois farms. Answers are still coming in, but the work of tabulating and arranging replies will begin at an early date. Enough answers have been received to make the investigation cover 14,073 years of practical experience during which the feeding of a total of 1,313,106 cattle has been involved. This is by far the most thorough and extensive investigation of present methods of beef production ever undertaken by any experiment station of any state in the Union. It is thought that a bulletin detailing the results of this investigation will be ready for distribution about June 1, 1903.

AN INVESTIGATION OF MARKET CONDITIONS.

Those most familiar with the cattle trade agree that wide differences often exist between the actual selling price of cattle in the market and the previous estimate by the feeders sending them forward as to the prices they should bring. This discrepancy is generally due not to a spasmodic variation in the market, nor to an attempt by somebody controlling the market to take advantage of the feeder or shipper, but to a lack of knowledge of market conditions by feeders and shippers. The latter depend upon the live stock and agricultural press for their information along these lines. Unfortunately no two live stock or agricultural journals report the live stock markets under uniform systems; hence, the tendency is to confuse rather than inform the reader. The buyers and salesmen at the leading live stock markets have no difficulty in assigning values to the various grades of cattle reaching those markets. In other words, these grades have
always existed in the leading markets and those best acquainted with market conditions have been able to assign values to such grades. It still remained for some one to determine what these various grades are and by definition and illustration convey to the cattle raisers of this country a correct idea of existing market conditions and especially of the importance of the factors of quality and condition as affecting market values. This work the Illinois Experiment Station undertook to do under the provisions of Bill 315. The result of this investigation appeared as Bulletin No. 78 entitled Market Classes and Grades of Cattle with Suggestions for Interpreting Market Quotations.

This bulletin was the result of a thorough investigation of market conditions at the Chicago Union Stock Yards. It was found necessary to spend several weeks at this market in order to make the work an authority on the subject. Neither the importance of such a work nor the difficulties in executing it were fully realized until the work was fairly begun. Some of the difficulties experienced were: First, the somewhat variable nature of the different classes and grades; that is, they vary with the quality, condition and visible supply of cattle, and the activity in the dressed beef trade; second, the difficulty of accurately describing animals typical of the various grades; third, the difficulty of securing photographs of average types representing the market grades; and fourth, a lack of uniformity in the classification of the various market grades of cattle and in the use of terms by those instructed with selling, buying and reporting the cattle market. The importance of the work has been emphasized by the following facts: Close observation has revealed the fact that the small feeder who seldom follows his cattle to market has a poor chance to learn market conditions and requirements, but the regular shipper has an excellent opportunity to do so. The small feeder must rely largely upon the market reports for his knowledge of the condition of the cattle trade. Market reports will always be more intelligent to readers who are thoroughly familiar with stockyards vernacular. Inability on the part of the feeder to correctly interpret market quotations places him at the mercy of the shipper.

It is evident that the value of a thorough knowledge of the various market grades of cattle is not fully appreciated by a majority of the feeders and breeders of beef cattle.

Without a thorough understanding of market and feed lot requirements the feeder is groping in the dark. If he secures a profit it is more the result of an accident than of a definitely determined
and intelligently executed plan. Such guesswork is more often followed by loss than by profit. It might appear on first thought that a knowledge of market requirements and the conditions that govern them would be of little interest and of still less importance to the breeder of pedigreed beef cattle. Unless the breeder of registered beef cattle is fortified with such information, however, he is too apt to breed without attaching sufficient importance to the fact that the only reason for the existence of the improved breeds of beef cattle is that they facilitate the economical production of beef of high quality. The first lesson for the breeder of registered beef cattle should be to thoroughly familiarize himself with the demands of the fat cattle market. It is needless to say that very many breeders have almost entirely overlooked this fundamental consideration. They are breeding Shorthorns, or Aberdeen Angus, Galloways or Herefords because they are Shorthorns, Aberdeen Angus, Galloways or Herefords and not because they see in these cattle especial fitness for the economical production of beef of high quality. In other words, many lose sight of market requirements.

The breeder of registered beef cattle who long overlooks the ability of his stock to produce animals that will meet the requirements of the open market will find his trade gradually, but surely slipping away, for the successful breeder of the future will be obliged to meet the demands of a more intelligent public. Beef producers in general wanting registered bulls of some one of the breeds of beef cattle are rapidly acquiring a more critical knowledge of their business, and they keenly appreciate a thoroughly good animal, while the inferior animal, pure bred though he may be, no longer receives serious consideration. Never before in the history of improved breeds of beef cattle have so many breeders turned their attention to a study of market and feed lot requirements as a basis for their breeding operations.

It is hoped that Bulletin No. 78 will demonstrate the importance of this subject in a way that will influence many to make a careful study of market conditions and to lead all to look upon a study of the market as of great importance in the production of meats generally, for what is true of the beef cattle market is also true to a large extent of the sheep and hog markets. Already its influence has been felt in giving to all interested in the cattle trade terms which may be used freely with the feeling that they are understood. It has demonstrated the folly and absolute incorrectness of attempting to use any other basis for classification in beef cattle than that of quality and condition.
Figure 2. One of the 48 plates used to illustrate Bulletin No. 78. The car load of cattle shown is Lot 3 of experiment reported in Bulletin No. 83.
Further, that it is misleading to use the terms export, and shipping steers in quoting the market and that a very large proportion of our best beef cattle, prime steers, is slaughtered and consumed in this country.

To the end that this work may be made more valuable to the live stock producing interests of this country we suggest a greater uniformity in reporting the live stock markets by live stock and agricultural journals and by commission firms; also the general adoption of the nomenclature used in Bulletin No. 78 of the Illinois Experiment Station, which is not an arbitrary or unmeaning nomenclature, but a correct statement of existing market conditions.

FEEDING EXPERIMENTS.

Four feeding experiments have been conducted or are in progress involving in all two hundred and thirty cattle. Two of these experiments have been inquiries into methods of utilizing the corn crop, the one in the form of silage, the other by the use or exclusion of nitrogenous supplementary feeds with corn. One of the above, namely, the silage experiment is still in progress as are the other two of the four. These latter consist of an experiment to determine the grade of feeders it pays best to feed and the other an experiment, the object of which is to throw some light on the economy of paving feed lots.

AN EXPERIMENT TO DETERMINE THE BEST METHOD OF PRESERVING AND FEEDING THE CORN CROP.

The initial study of this question was started as a co-operative experiment on the farm of Mr. E. D. Funk, an extensive cattle feeder of Bloomington, Illinois, upon whose farm this experiment was conducted and to whom the Experiment Station is indebted for his active interest and cooperation.

OBJECT.

The object of this experiment is to determine the relative merits of silage and shock corn as factors in beef production. The comparison is made both by weight of feeds and area used in their production. Everything considered it seemed best to begin with eight-months-old calves; to feed them liberally through the winter months without attempting to fatten them or to secure the greatest possible gains, to turn them to grass with or without grain according to the season, and the abundance and kind of pasturage available; and, finally, to finish them during the second fall and winter on rations
similar to those used in wintering them as calves. The calves were purchased in Kansas during the early fall of 1901.

**PLAN OF EXPERIMENT—ANIMALS USED.**

Fifty eight-months-old grade Hereford and grade Shorthorn calves were selected for this experiment. Upon their arrival at Mr. Funk’s farm the calves were given the run of blue grass pasture and stalk fields until within a few weeks of the date of beginning the experiment when they all received shock corn and mixed hay. The calves as they arrived from Kansas were quite thin, showing the effect of short pastures; but by the time they were put in the experiment, February 5, 1902, they were in good thrifty condition and of about 500 pounds average weight. It was a decided advantage to be able to get calves that were so nearly uniform and that had been similarly treated. They were divided into two lots of twenty-five each, care being taken to make the lots equal as to age, thrift and quality.

Ten shotts averaging 65 pounds each were placed with each lot of calves, the object being to reduce the waste of shock corn feeding to the minimum by converting the corn in the droppings into pork and to determine what benefit, if any, pigs would get in following silage-fed steers.

The feeding extended over a period of 88 days. Equal areas of the same kind of corn were harvested as silage and shock corn for use in this experiment, a careful record being kept of the cost of harvesting and feeding each. After the termination of the winter feeding the calves were turned to grass May 17, 1902. Their gains will be noted at frequent intervals during the grazing season. Next fall and winter they will again be placed in the feed lot where they will receive rations similar to those of the first winter for a time sufficient to finish them for the market. The experiment will be terminated by a slaughter test.

**SHELTER FOR CALVES AND PIGS.**

The calves and pigs were given the run of feed lots in which they had access to the shelter of a large shed adjoining the barn in which were the mixed hay and the stave silo containing the silage used in this experiment. The shelter provided for these calves was warmer and more protected than the average feed lot shed, owing to its location and to the fact that it was not all open on one side. The calves and pigs gained access to it by large doorways opening to the south. The kind of shelter afforded is specified because it is generally believed, and rightly so, that cattle fed largely on silage or other succulent food should have warmer quarters than those fed on a dry
ration. Then, again, it should be remembered that the animals used in this experiment were calves which we were not attempting to fatten, but simply to keep growing nicely. It is economy to give such calves reasonably warm winter quarters even in localities where there might be a question as to the economy of furnishing to fleshy cattle on full feed anything more than shelter from wet storms and cold driving winds.

Every effort was made to surround both the silage and the shock corn lots with conditions equally favorable for securing the best results from each feed.

Up to the present time this experiment indicates that there are at least nine advantages of a system of silage feeding over that of shock corn in the wintering of calves intended for beef production.

First, the corn can be hauled from the field and stored in the silo at a time when little damage is done to the soil by getting on the land when it is too wet.

Second, the manure and litter incident to the feeding of steers where silage is used, are in much more convenient form to handle, and probably more readily available as plant food than where shock corn is fed.

Third, the quality of silage and the cost and convenience of feeding is but little, if any, affected by bad weather which in Illinois so frequently makes it next to impossible to feed shock corn to advantage.

Fourth, the calves in the spring are in better thrift and flesh.

Fifth, more rapid gains can be secured.

Sixth, in case of an epidemic of cholera or other contagious swine disorder, the pigs as a factor in economical production of beef may be eliminated without any considerable loss, which would be impossible in case of steers feeding on shock or whole corn.

Seventh, more pounds of meat can be produced per acre where silage is fed to steers than where shock corn is used; even though the greater amount of pork produced in case of a system of shock corn feeding is taken into account.

Eighth, a much larger proportion of the meat produced is beef.

Ninth, the corn may be harvested earlier in the season, generally before danger of frosts, and at a season, in Illinois at least, when other farm work is not pressing. In speaking of the advantages of the silo it should not be overlooked that silage may be stored for late summer feeding when pastures are often short and the new corn crop is too immature to feed to good advantage.
The disadvantages appear to be:

First, that in feeding equal acreages of corn as silage and as shock corn a greater acreage of crops other than corn is required to supplement silage than shock corn. This is an item which cannot consistently be overlooked, as economical beef production in the corn belt involves the utilization of as large a proportionate amount of corn as possible; nevertheless, when we consider the ultimate effect upon the fertility of the soil, the clover acreage, at least, may be very profitably increased.

Second, it is believed that warmer quarters must be provided for silage fed steers than for those receiving shock corn.

Third, a system of feeding steers on silage involves more capital and labor.

Before attempting to draw final conclusions from the results of this experiment as to the value of silage in beef production the reader should bear in mind that wintering calves is but one factor in beef production and that this experiment will not be complete until we have an opportunity to study the subsequent development of these two lots and the quality of the finished product. Conclusions are withheld, therefore, until the experiment is completed.

This experiment is but one of a series in which it is the purpose to investigate thoroughly this subject of silage as a factor in beef production.

AN EXPERIMENT TO DETERMINE THE ADVISABILITY OF USING SUPPLEMENTARY FEEDS WITH CORN.

This experiment involved an investigation of methods of feeding and marketing. Corn may be supplemented in feeding steers by the use of roughage or concentrates. Investigators have given much attention to the subject of supplementing various concentrated food-stuffs; while relatively few have considered the possibility of supplementing corn with roughage in such a way as to secure the same or similar advantageous results, as when corn is supplemented with a concentrate such as oil meal.

The Experiment Station of the University of Illinois is making a thorough study of this question. The results of this experiment reported in Bulletin No. 83 will tend to emphasize the importance of this subject. We proceed on the principle that the farm on which the cattle are fed should produce as far as possible the food-stuffs required; hence, these investigations will consider the results to be secured from the feeding of such varieties of hay and other roughage as can be grown in the corn belt, to determine what available
roughage or combination will best supplement corn and require the least cash outlay for concentrates.

Whatever may be the prevailing opinion among cattle feeders as to the value of corn and clover hay as an ideal ration for fattening steers, the most progressive breeders and those who send the best finished cattle to the market agree that the highest finish in a given time can not be secured by adhering strictly to this ration throughout the feeding period. They believe that the effectiveness of such a ration, so far as producing a quick and complete finish is concerned is materially enhanced by the addition of some highly nitrogenous concentrate either throughout or toward the end of the feeding period. One of the objects of this experiment was to secure additional data on this important subject.

That the question of the economy of securing a quick and perfect finish should not be overlooked, the corn and clover hay ration was compared with the ration calculated to produce a quicker finish or at any rate, a ration that would give to the steer on foot the appearance of being better finished. The ration selected for this comparison was corn, gluten meal, timothy hay and corn stover. This ration was chosen because gluten meal is a corn product, and it is obvious that every pound of corn products that can be economically used in the feed lot has a tendency to make a better market for the corn produced on Illinois farms. Other things being equal, where the feeding of a nitrogenous concentrate is practical it is good practice for the Illinois feeder to supplement corn with a nitrogenous concentrate the use of which has a tendency to enhance the value of products grown in Illinois soil. Such concentrates are to be found among corn products and the by-products of packing houses.

Timothy hay was used as part of the roughage in order to demonstrate that where clover hay or some other nitrogenous roughage is not available for feeding a nitrogenous concentrate may be so used to supplement corn that the results obtained from the standpoint of the producer will be satisfactory.

That an instructive object lesson might be furnished to show the wastefulness of attempting to fatten cattle on corn without supplementing it with a nitrogenous food-stuff either in the form of a concentrate or of roughage, a ration of corn and timothy hay was fed in comparison with the others mentioned. Since one lot was fed on corn and clover hay the feeding of the corn and timothy hay ration made it possible to determine how much more valuable clover hay is than timothy where fed with corn as the grain part of the ration.
That it might be determined whether or not the advantages of certain rations used in this experiment were real or apparent the cattle were sold on the Chicago market and the experiment terminated with a slaughter test.

Since the pork produced under ordinary feeding conditions is an all important factor the effect of the various rations fed to the steers upon the pigs following was carefully noted.

The individuality of the steers comprising the various lots received some study.

**PLAN OF EXPERIMENT.**

**Animals used.** The steers used in this experiment were purchased at the Union Stock Yards, Chicago, January 13, 1902. The order for these steers had been in the hands of Clay, Robinson & Co. for some time, but owing to the nature of the order, the season, and the supply of feeders reaching the market, it could not be promptly filled.

While it was thought advisable to secure fleshy feeders of good quality it was soon found impossible to do so, at any rate, on a basis that would leave a probable chance for profit in feeding.

Such steers as were available in the Chicago market at the time were purchased for use in this experiment. The steers selected were natives and all from the same lot so that it was known that the steers up to the beginning of the experiment had been similarly treated, an important factor in live stock experimentation readily recognized. They were of uniformly good colors, dehorned, thin in flesh, and common in quality. As indicated while their colors were not objectionable, being largely reds, suggesting the presence of Shorthorn parentage, the form and general type of the steers was such as to indicate that they possessed only a small portion of beef blood. If they contained a high percentage of Shorthorn blood it must have been of the very plainest and most objectionable kind. The most conspicuous faults of these steers as ideal feeders were their long legs, narrow, somewhat peaked backs and rumps, their coarse, rough bones, and flat ribs. Many also lacked length and depth of quarter and were deficient at the flanks. Such objectionable characteristics in feeding cattle usually suggest to the experienced feeder the unprofitableness of carrying them to a point where they would be prime in condition. The very fact that they were common in quality as feeders is sufficient evidence that, no matter how long they were fed, they would never possess prime quality.

Steers of good quality showing only a moderate amount of flesh were at this time selling for dressed beef at from $5.50 to $6.00 per
hundred weight, a figure that seemed at the time almost prohibitive in considering them for feed lot purposes.

The steers used in this experiment averaged 917 pounds each and cost $4.60 per hundred weight, Chicago weights. The condition and quality of these steers was such that it rendered the consideration of a short feeding period impracticable. While the steers were common in quality, and as feeders go, common in condition, they were a very uniform lot, rendering it a comparatively easy matter to separate them into three groups which were uniform and comparable as to age, thrift, condition, quality and weight.

A few days after the steers reached the University farm, and after adding another steer of similar weight and quality purchased from W. C. Dallenbach of Champaign, they were divided into three lots of thirteen each, January 18th. In this division every effort was made to make the lots entirely comparable; in other words, so to divide the steers that had they been fed precisely the same and sold on the same market they would have brought the same price per hundred weight; they would have made equally great and equally economical gains, and finally they would have been equally profitable from the butcher's standpoint.

Since the steers were a uniform lot, this did not appear to be a difficult task and the division as made seemed to leave little doubt in the mind of the author but that the three lots entered the feeding test with equal opportunities. Whatever differences appear, therefore, during and at the end of the feeding period may be justly referred to the various rations fed.

To make it possible to determine the gains made by each steer during the feeding period and for convenience in recording data concerning the type and behavior of the steers from time to time an ear label bearing a number was inserted in the left ear of each steer. The steers in lot 1 were given numbers from 1 to 13 inclusive; in lot 2 from 14 to 26 inclusive; and in lot 3, from 27 to 39 inclusive. No. 15 in lot 2 proved absolutely worthless as a feeder and was accordingly sold to the butcher, April 5th. As it was desirable to have each lot contain the same number of steers it was thought advisable to remove one steer from each of the other lots which would be as nearly comparable with No. 15 in lot 2 as possible. No. 8 was taken from lot 1, and No. 27 from lot 3. These steers were also sold to the butcher, hence, the experiment was continued with twelve steers in each lot, Nos. 8, 15 and 27 not appearing in the notes on individual steers.
Three lots of pigs were provided to follow the steers to utilize whatever undigested food-stuffs passed through the steers. The first lot of pigs followed the cattle during the time they received shelled corn, the second lot from the time the feeding of the shelled corn was discontinued and the corn and cob meal feeding began until the end of the experiment.

When the plan of the experiment was outlined it was believed best to put enough pigs behind steers to consume such part of the droppings as would be found available for pork production and limit the number so that food-stuffs other than that contained in the droppings of the steers would be unnecessary in order to secure satisfactory gains on the pigs. It is obvious, therefore, that to get the greatest benefit from the droppings and still determine the relative amounts of pork that the undigested food in the droppings of each lot of steers would make, the number of pigs should be kept as small as possible, as under this system a minimum amount of food found in the droppings is used for the mere maintenance of the animal.

The feed racks were so constructed and the feeding done in such a manner that no grain was available for hog food that had not first passed through the steers. Results of former feeding experiments made it possible to determine approximately the percentage of corn fed to the steers that would eventually be available in the droppings for hog food. Careful computations convinced us that seven pigs for each lot of steers was the number best calculated to serve all desired ends. As the experiment progressed the satisfactory gains of the pigs indicated that the number decided upon was approximately correct.

The first lot of pigs were sired by a Duroc-Jersey boar, their dams being Poland Chinas and Chester Whites. The second lot were decidedly mixed in breeding, but the Duroc-Jersey blood predominated, although some of the pigs showed evidences of Yorkshire, Chester White and Poland China blood. The first lot were purchased at $5.75 per hundred weight, February 1, 1902. The first lot were 130-pound thrifty shoats of good quality, but rather more fleshy than is thought ideal for such uses. The second lot were in good thrift. They were bought off the pasture weighing an average of 136 pounds. A part of the pigs comprising the second lot cost $6.50 per hundred weight, and the remainder $6.00 per hundred weight. Both lots were sold to T. J. Colvin, of Urbana, Illinois, the former lot at $6.50 and the latter at $7.00 per hundred weight.
SHELTER, FEED LOTS, AND WATER SUPPLY.

Beginning with the purchase of the steers in the Chicago Union Stock Yards and ending with their final disposition there, the conditions surrounding the steers and pigs used in this experiment, are made comparable in every particular with average feed lot conditions in Illinois. Whether such conditions are as advantageous as might be is not a subject for discussion in this Bulletin No. 83. Suffice it to say, that it is the opinion of the author that were the average feed lot conditions brought up to the standard of the best practice of our most successful and progressive feeders, it would not be in good taste for any man to criticise such conditions without being sure of his ground and even then such criticisms would be valueless unless the critic had something better to suggest.

The feed lots prepared for this experiment were laid out on an old, well established blue grass sod, the whole sloping slightly to the south. The soil was of the deep, black, prairie loam order so characteristic of Central Illinois. Each lot was 36x60 feet, being longest north and south, with a twelve-foot open shed running along the north side. The feed lot to the extreme west was further protected by a five-foot tight board fence and a single row of trees which served as a wind break. The lots and more especially the part immediately under the shed were frequently bedded, an effort being made to make it possible for the steers to have access to a dry clean place to lie down even when the lots were otherwise very muddy. Other than the floor of the lots they could not be criticised from the standpoint of furnishing comfort to the steers. Deep, black, prairie soil is not, however, suitable for small feed lots. It is the opinion of the author that where such soil only is available for feed lots it will be economy to make some provision for keeping the cattle out of the deep mud during bad weather. This subject is receiving attention at the Illinois Experiment Station.

Water was furnished the steers from the University plant and was stored in galvanized steel tanks so that the steers had access to fresh, pure water at all times except when it was withheld, as was the rule just before each weighing. The tanks were banked to prevent as far as possible severe freezing, but no attempt was made to keep the water warm.

METHOD OF FEEDING STEERS.

The experiment proper began February 8th and from this date throughout the experiment the steers were fed grain and roughage twice daily, grain being fed before the roughage. During the winter
months they received their grain at 7 a.m. and at 4 p.m., the rough-
age being fed as soon as the grain ration was consumed. As the sea-
son advanced the morning ration was fed earlier in the day. About
the first of April it seemed advisable either to grind or to soak the
corn fed to the steers; and, as ear corn was available and the grinding
of the grain, cob and all, promised to add value to the experiment by
making it possible to secure data on the subject of the influence of
meal feeding to steers upon the pigs following, the latter course was
decided upon. During the first two weeks of April, therefore, the
three lots of steers were accustomed to receiving their grain as meal
rather than as whole grain by a gradual substitution of corn and cob
meal for a part of the whole corn fed. From April 13th until May
31st the various lots received their corn in the form of corn and cob
meal. During the last two weeks of the experimental period or be-
tween May 31st and June 14th some corn meal was substituted for a
part of the corn and cob meal.

As has been stated elsewhere each steer in the different lots was
getting an average daily grain ration of ten pounds at the beginning
of the experiment proper, February 8th. This was gradually and some-
what rapidly increased during the next few weeks and more slowly
toward the end until at the termination of the experiment each steer
in lot 1 was getting a daily grain ration of 25.4 pounds; each steer in
lot 2, 22.6 pounds, and each steer in lot 3, 21.7 pounds.

Concerning the roughage part of the ration it may be stated that
lot 1 received clover hay as the only roughage; however, timothy hay
was fed to this lot for two days before shipping them to market, as
it is believed that cattle so fed will shrink less, and are less liable to
bloat in transit. This use of timothy hay is not material since it did
not take place until after the final weights of the experiment were
secured. The appetites of the steers furnished the basis for deter-
mining the amount of clover hay fed from day to day, the steers being
given all they would consume without material waste during the
greater part of the feeding period; however, as the steers showed a
tendency to be paunchy it was thought advisable to restrict the
amount of hay fed during the latter part of the experiment.

The quality of the clover hay was much better during the latter
than the earlier part of the experiment. In general, it may be stated
that the quality of the clover hay was good. Lots 2 and 3 received
their roughage in the form of timothy hay and corn stover. The
corn stover was shredded during the early part of the experiment and
cut during the latter part. In this experiment it could not be said
that the one method of preparing the stover was to be preferred to
the other; the steers did not consume any considerable amount of the coarser portions of the stalk in either case. The feeding of corn stover being discontinued on April 23d, lots 2 and 3 received from that date timothy hay as their only roughage.

Both the steers and pigs were weighed every two weeks. The initial weights were secured by taking the average of the weights on February 6th, 7th and 8th. In securing the weights at the beginning of the experiment and all subsequent weights, the steers were weighed immediately after they had consumed their morning feed of grain, and before roughage was given them, water having been withheld the night before.

**SPRAYING FOR LICE.**

Soon after the steers arrived at the University Farm it became evident that they were badly infested with lice. For some time unusually cold weather rendered it impracticable to treat the steers. The weather moderated sufficiently so that on March 11th, lot 1, on March 14th, lot 2, and on March 19th, lot 3 were treated with a ten per cent. solution of kerosene emulsion. A chute was constructed into which a single steer could be driven and closely confined until thoroughly sprayed with this emulsion. The time required to thus treat each steer varied from five to ten minutes. It required about six quarts of the emulsion to thoroughly spray a steer. The cost of materials amounted to about one cent per steer. This is an effective remedy for lice where it can be conveniently applied.

As the steers were weighed every two weeks and careful weighings made of each feed the steers received, data are at hand with which to construct tables showing the relative amount of food consumed, together with the actual gains in live weight by periods throughout the experiment. It is believed that an enumeration of such points as are important will better serve the object than a reproduction of these complicated tables.

Following the common practice of feeders the maximum amount of roughage and the minimum amount of grain was fed to the steers during the first few weeks. During the progress of the experiment this relation between the amount of roughage and grain fed was reversed so that at the end of the experiment the steers were getting their maximum grain ration and their minimum roughage ration. In order to emphasize how complete this change was it may be stated that during the first two weeks of the experiment each steer in lot 1 received a daily ration of 12.47 pounds grain and 18.39 pounds roughage, the proportion of grain to roughage being as 1:1.47. At
the end of the experiment each steer in lot 1 received an average daily ration of 25.4 pounds grain and 8 pounds roughage, the proportion being as 1 : .312. In connection with the feeding practice noted above, lot 1 was not materially different from lots 2 and 3.

Within any given lot of steers the extent of the gains made and the relative economy of such gains were more dependent upon the condition of the feed lots and general atmospheric conditions than upon the amount or nature of the food-stuffs fed or upon the generally recognized important factor of whether the gains made are during the early or latter part of the fattening period. To illustrate, it may be stated that whenever the feed lots were dry and the variations in the weather but slight and those gradual, there was but very little difference either in the extent of the gains made or the economy of such gains from period to period; on the other hand whenever the lots were extremely muddy and the variations in temperature and humidity great and sudden the gains of the steers were not only much smaller, but were decidedly more expensive. This suggests that possibly we have not attached enough importance to providing fattening steers with comfortable feed lots. Since the condition of the lots in this instance was beyond our control, any deductions that might be made from data in hand relative to the expense of gains during the early and the latter part of the feeding period would be valueless.

After all has been said the reader should not conclude that the conditions surrounding the steers in this experiment were unlike the average feed lot conditions in Illinois, and while the total gains were not as large as are sometimes reported they are still creditable, and when the cost of such gains are considered much above results usually obtained. The results are valuable as showing what feeders may reasonably expect from feeding the products of Illinois land to feeding cattle of the common and medium grades under average corn belt conditions.

In Bulletin No. 83 now in the hands of the printer will be found a full discussion of the interesting features of this experiment. Attention is here called to a few of the conclusions arrived at as a result of this experiment.

CONCLUSIONS.

1. This experiment indicates that corn may be supplemented with clover hay, a nitrogenous roughage, in such a way that its influence will be practically as beneficial as the supplementing of corn with a nitrogenous concentrate such as gluten meal.
2. That where clover hay or some other nitrogenous roughage is not available for supplementing the corn crop for fattening steers, a nitrogenous concentrate like gluten meal is highly advantageous.

3. That neither the corn ration supplemented by the use of a nitrogenous roughage on the one hand, nor of a nitrogenous concentrate on the other proved to be an ideal ration; it is believed that some judicious combination of the two, yet to be determined, will be found more satisfactory and profitable than either.

4. A ration of corn, timothy hay and corn stover has little to recommend it for beef production. It is not favorable for the production of large, rapid or economical gains, nor is the beef produced by the use of such a ration desirable. It required 1.5 pounds more grain and .7 pounds more roughage to produce each pound of gain where timothy hay supplemented corn than where clover hay was used.

5. The corn and clover hay ration possessed the following advantages: (a) Available on Illinois farms; (b) Produced large gains; (c) Considered either from the standpoint of total beef produced or the cost of such beef it was a large and economical producer; (d) The beneficial effects of the clover hay in the ration of lot 1 appeared to extend to the pigs as not only were greater gains in live weight of pigs made in lot 1 than in the other lots, but also more economical gains.

6. This experiment emphasizes the importance of the roughage part of the ration for fattening steers.

7. The slaughter test of this experiment showed that the corn and timothy hay ration had a tendency to produce a high percentage of internal fat without securing a relatively high percentage of dressed beef, thickness of flesh or covering of surface fat, all of which are very important from the standpoint of a profitable animal for the butcher, and hence its value on the market.

8. It is impossible to determine whether the corn and clover hay ration or the corn, gluten meal, timothy hay and corn stover ration had the greater tendency to produce lean beef, or flesh as the greater gain of the steers fed corn and clover hay would naturally be followed by thicker flesh, provided their lean beef making tendencies were the same. It is evident, however, that both the corn and clover hay ration and the corn, gluten meal, timothy hay and corn stover ration had an advantage over the corn, timothy hay and corn stover ration in this respect.

9. It appears that the ration, where gluten meal is the conspicuous nitrogenous factor, has the ability to produce the finish demanded by the market with the least expenditure of both quantity and cost of
food-stuffs of any ration used in this experiment. The fact that there was more profit to the producer in the use of the ration containing gluten meal, notwithstanding the somewhat expensive nitrogenous concentrate used is due to the combined facts of its being an equally effective ration as corn and clover hay, to the securing of better finish without the necessity of putting on the maximum amount of unprofitable gains in live weight, and to the current prices of corn, gluten meal and clover hay.

10. The value of the manure made by the steers fed on corn and clover hay would be much more valuable per ton than that made by either of the other lots.

11. The condition of the feed lots is an important factor both in the extent and economy of gains.

12. In practice the feeder must determine for himself the best ration for fattening steers by knowing the effectiveness of various rations, their availability, and cost.

**Feeding Cattle of the Various Grades.**

The object of this experiment now in progress is to secure accurate data on the feeding qualities of the various grades of feeding cattle as to extent, rapidity, nature and cost of gains. Whether or not feeding cattle of the common and inferior grades will make as great, as rapid, and as economical gains as feeding cattle of the better grades, and how the beef produced by these commoner grades differs from that produced by high grade feeding cattle of the improved beef breeds.

To throw some light on these intricate and exceedingly important questions, a car-load of each of the various grades of two-year-old feeding cattle have been placed in feed lots and are being fed under uniform conditions. This experiment involves the feeding of six carloads of cattle. The fancy selected, the choice, the good, the medium, the common, and the inferior grades as described in Bulletin No. 78 of this Station are each represented. Every load is fed in paved lots of equal size, provided with the same kind and amount of shelter, and the same exposure. The rations fed to each are of the same kind and of approximately the same amount to a thousand pounds live weight of cattle.

At the beginning of the experiment the cattle were examined by a committee of experts from the Chicago Union Stock Yards whose judgment was asked with reference to the grading and the market value of each grade. The same committee visits the Station at intervals of one month when the improvement in value per hundred pounds of each grade is fixed. The market at the beginning of the experi-
ment will be the basis for all values assigned to the cattle that there may be no variations in the values for which market fluctuations are wholly responsible. This committee will continue their work up to and including the time of marketing. As the cattle are weighed every two weeks and a careful record kept of the rations fed it will be possible at the end of the experiment to determine at what time it would pay the feeder best to have disposed of the various loads. The experiment will be terminated with a slaughter test, that the grades of beef produced by the various grades of feeding cattle may be determined.

AN EXPERIMENT TO DETERMINE THE ADVISABILITY OF PAVING FEEDLOTS.

Cattle feeders of the Central West are beginning to make inquiry into the advisability of paving feed lots for spring, autumn and winter feeding. An experiment is now in progress involving two car-loads of steers. One car-load is being fed in a lot that has been paved with brick. Another is being fed in an adjoining lot of the same size and provided with the same shelter where all conditions are the same except that the latter lot is not paved, but has been left to represent the ordinary feed lot where natural drainage is depended upon to keep the lot presentable. The results of this experiment will appear in bulletin form soon after the completion of the experiment next June.

MEAT INVESTIGATIONS.

This investigation ought among other things to furnish information on the following points:

1. The class or grade of meats demanded by the various classes of consumers of meat.

2. Why more meat is not used for food, to the end that suggested methods for the utilization of cheaper cuts for the poorer classes may be put in their hands, and that meat of better quality,—meat more healthful and more appetizing may be supplied in larger quantities to meet the ever increasing demand of the wealthier classes.

Such information widely disseminated will tend to increase the per capita consumption and stimulate the trade in meats; all of which necessarily means better prices to the producer, and followed by the advance in the price of farming and grazing lands.

To determine these questions a large number of animals must be slaughtered, the history both as to the breeding and methods of feeding of which is fully known. Twenty-two steers have already been slaughtered under the direction of the Animal Husbandry Depart-
ment and much valuable information secured which will form the basis of future meat investigations.

An attempt has been made to use judiciously the money appropriated for live stock investigations in a study of the four most vital problems that present themselves to the cattle raisers of this country to-day, namely:

First, the beef producing capacity of the various grades of feeding cattle, looking toward the solution of the question—What grade of feeding cattle does it pay best to feed, and how may the feeding of the various grades be made profitable?

Second, how best to utilize the corn crop; the advisability of the use of supplementary feeds both roughage and concentrates, and silage as a factor in beef production.

Third, the stage or degree of fatness for marketing cattle in order to secure greatest profits.

Fourth, methods of breeding and feeding as affecting quality in beef.

Important as is the work accomplished and also that in hand, it can only be said that a mere beginning has been made along the lines indicated. From necessity a vast number of problems slightly less important have not been investigated; chief among which is, “How may the entire process of beef making be made profitable on the high priced lands of Illinois?”

The bulletins and circul ars already published available for distribution as a result of the money appropriated by the last General Assembly for Live Stock Investigations are as follows:

Bulletin No. 73 Comparison of Silage and Shock Corn for Wintering Calves Intended for Beef Production.

Bulletin No. 78 Market Classes and Grades of Cattle with Suggestions for Interpreting Market Quotations.

Bulletin No. 83 Feeds Supplementary to Corn for Fattening Steers.

Circular No. 38 Characteristics of the Prime Steer.

Circular No. 48 Characteristics of Stockers and Feeders.

Circular No. 61 Supplement to Bulletin No. 73.

Circular No. 65 Live Stock Investigations.