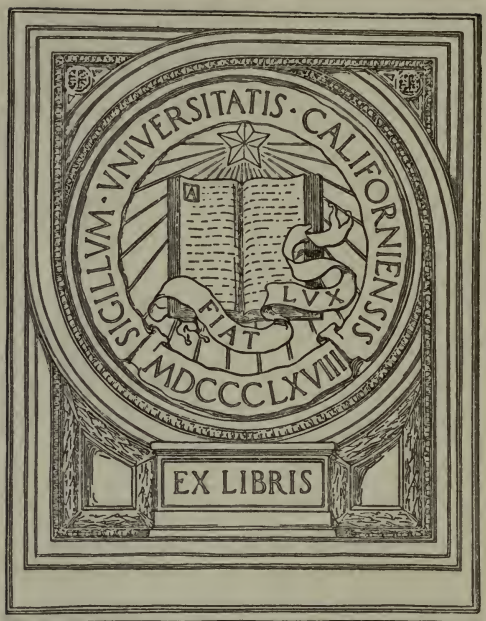
PROFITABLE STOCK RAISING

C. A. SHAMEL



F. V. Woll
1917

A NOTED PERCHERON STALLION

Profitable Stock Raising

A Careful Discussion

of the Problems Involved in the Development of Profitable Live Stock and the Maintenance of Soil Fertility

By

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Editor Orange Judd Farmer

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PREFACE

UPON improved live stock the prosperity of the American farmer depends. If he so desires, every American farmer can have profitable farm animals. To fully explain the general principles which enter into profitable live stock, this little book is written and given to the public. It points out the profitable types of farm animals, how to handle them so as to get the best returns, how to select breeding stock, how to feed and market all classes of farm animals. Technicalities have been carefully avoided so that anyone can, if he will, derive much benefit from studying its pages.

In the preparation of this book, I have been very ably assisted by Mr. Fred L. Petty, assistant editor of Orange Judd Farmer, to whom I hereby acknowledge my obligations.

CLARENCE A. SHAMEL.

Chicago, October, 1910.

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INTRODUCTION

No factor is of as great importance in American agriculture as the keeping of profitable live stock. By profitable live stock is meant stock that will pay for its keep and return a net profit. The value of profitable live stock is appreciated by a large number of people, but the bulk of the American farmers do not thoroughly understand why one animal is more profitable than another. It is manifestly bad policy to keep a dairy cow at a cost for feeding and maintenance of $60 a year when she returns only $40 or $50 in the form of butter and milk in addition to her calf. Dairy statisticians tell us that hundreds of thousands of dairy cows in the United States belong to that unprofitable type.

It is also perfectly apparent that a meat producing animal of any kind which does not mature rapidly, attain at least fair size in a short time, which does not utilize every bit of food eaten, and cannot be placed on the market at a good price, is also unprofitable. Live stock statisticians also tell us that there are many thousands of meat producing animals of this unprofitable type, particularly on the general farms in America.

Because of this lack of information, it is highly important that the general farmer, as well as the special stock farmer, should have these matters brought to his attention. For this reason this little book is written. It is impossible, in a work of this kind, to go into detail in any particular line. The thought throughout is to call attention, first, to the general principles involved in every branch of profitable live stock husbandry and to give

specific instances illustrating the problems discussed. It goes without saying that if the general principles are thoroughly understood, and if these general principles are illustrated even briefly, the progressive farmer will be able to work out his own salvation; consequently, while there are numberless books on different phases of live stock, there are none which fill the need which this book is intended to supply.

The exclusive grain growers of the Northwest are rapidly changing to diversified agriculture. In certain sections of South Dakota, for example, wheat and oats formerly occupied all the attention of the farmer. Yields greatly decreased until farming on a large scale became unprofitable except during the most favorable seasons. Diversification is rapidly taking place. Large numbers of farm animals are being kept. Corn is being grown, potatoes and even cabbage occupy a part of the land. In New England the worn-out farms are being made profitable by the keeping of dairy animals, of hogs and of poultry, by the growing of alfalfa, cowpeas, crimson clover and vetch, by the buying and feeding on the farms of some form of concentrated feeds like oil meal, cottonseed meal or refuse from the flour mills of the Northwest. It has been definitely proved that these older farms along the Atlantic coast can be profitably handled if live stock is kept, if leguminous plants are grown and if, third, but not least in importance, the soils are given thorough and intelligent treatment.

But it is not only South Dakota; it is not only New England; it is not only the older states along the Atlantic coast that must give this matter of profitable live stock careful attention. Illinois and Iowa, with their apparently inexhaustible soils,

are finding that with the increase in land values, it is impossible to pay even a reasonable interest on the investment unless, along with corn, hogs, cattle and sheep are raised; unless these black soils are frequently rested by the growing of some leguminous crops and by the feeding of these same crops to animals raised at home.

In profitable live stock production, of course, the first thing is the raising of sufficient feed. The next thing is the selection of animals in any department of animal industry whatever that will more than pay for their keep. If these two things are borne in mind; if particular attention is given to the treatment of soil to produce larger crops; if particular attention is given to getting rid of undesirable animals, no matter what the sacrifice may be; if particular attention is given to the selection of breeding stock of the chosen type, not only will the animals themselves become more profitable, but the fertility of the land will be built up rather than depleted. The producing capacity of every section of the United States will be increased by the keeping of profitable live stock.

So it comes about that this book is written to call attention to these important problems, and it is given to the public with the hope that it will be a factor in greater prosperity to the American farmer.

CHAPTER I

The Live Stock Field

Live stock is the most important factor in farm life. Without animals the fertility of the soil cannot be maintained. Without maintaining soil fertility profitable crop production is not possible. True, in a few thickly settled countries it is not possible to keep large numbers of farm animals, but where this condition exists, mineral plant food must be brought in from the outside. There is a limit to the supply of this mineral plant food, consequently the most satisfactory agriculture to work for must be that system which includes the best types of live stock.

Under present conditions in the United States the production of live stock is not keeping pace with the population. In spite of the fact that in the United States the total number of animals has increased during the past years, the fact remains that, measured by increasing population, we are in a diminished period of actual production. During the year 1909 there was much complaint among wage workers because of the high price of meats. Some of the resentment which was shown towards slaughterers and retailers had a good basis in fact, because both of these classes, particularly the latter, are absorbing a greater part of the value of the carcass than is warranted.

Making full allowance for this, the underlying reason for the increased cost of meat animals and also of work animals will be found to be the relative decrease in production. This reason is bound to

increase in magnitude as the years go by, because of the unwillingness or inability of the American farmers to increase their production of animals as rapidly as the population increases. This fact does not necessarily warrant any unusual alarm, because, as the situation demands it, a readjustment between supply and consumption will take place. Just as soon as it becomes apparent that more animals must be raised, farmers will be found who will increase their holdings of live stock. Conditions in the United States, however, do indicate that the producer of live stock is assured of higher values, which, of course, is gratifying to him. The consumer also must make up his mind to pay a higher price, whether he wants to or not. The trend of high prices, however, sympathetically shows the relation of supply to demand. When prices are high, it goes without saying that the supply is not keeping pace with demand.

The following table indicates the price at the beginning of 1910 for the different classes of animals produced in the United States, in comparison with the highest prices ever previously recorded:

Changes from High Point

	High point					
	Year	Price	1910	Change		Per ct.
Horses	1909	$91.02	$101.50	+	$10.48	11.5
Mules	1908	99.72	108.57	+	8.85	8.9
Milch cows	1909	32.00	35.25	+	3.25	10.1
Other cattle	1900	24.83	20.76	—	4.07	16.4
Hogs	1907	7.63	9.15	+	1.52	19.9
Sheep	1907	3.89	4.07	+	.18	4.6

The above table indicates that the prices of all classes of farm animals, with the exception of those listed under fat cattle, have increased, and of

course, is highly satisfactory, to the producer. This, however, does not tell the whole story. Such a comparison would not be complete without a corresponding showing of the variance of the present situation, as shown by the comparison of present prices with the lowest prices ever recorded at the bottom of periods of live stock or financial depression.

Indeed, such a showing probably best pictures the present highly satisfactory condition of the live stock industry. An examination of the table presented below will show that milch cows touched their lowest value in 1892, and since that time there has been an increase in the average price per head amounting to 64.7 per cent. In 1895 beef cattle touched their lowest point, since which time there has been an advance of 46.7 per cent.

Sheep touched the bottom in 1896 with the average value per head of $1.60, as compared with an average of $4.07 at present, while hogs reached their greatest depression in 1897, when they were worth $4.13 per head as against $9.15 at present. Horses and mules reached the bottom in 1897-98, since which time they have increased in value by 201 per cent in the case of horses and 173 per cent in the case of mules.

The accompanying statement shows the present value of the different classes of live stock, together with the lowest value ever previously recorded. It will be noted that with the exception of milch cows the increase from the bottom to the present range of values has taken place in practically one decade, and the increase in this decade is so great that it would seem almost incredible if it were not a matter of statistical record.

Changes from Low Point

	Low point				
	Year	Price	1910	Increase	Per ct.
Horses	1897	$33.65	$101.50	$67.85	201.6
Mules	1898	39.66	108.57	68.91	173.7
Milch cows	1892	21.40	35.24	13.84	64.7
Other cattle	1895	14.15	20.76	6.61	46.7
Hogs	1897	4.13	9.15	5.02	121.5
Sheep	1896	1.60	4.07	2.47	154.4

Details by States

In distribution of horses Illinois ranks first, closely followed by Iowa and Texas, with Kansas fourth, the last state having more than a million head. The average value per head of horses shows some peculiar conditions. New Jersey, as might naturally be expected, on account of its location between the great cities of the East, ranks first, with an average of $120. The state of Washington has a similar average, but Ohio stands first, with $118.15, in the states having large numbers of horses. In the case of mules Texas leads, with Missouri second. As in the case of horses, New Jersey leads in value per head.

The leading dairy states, as shown by the number of milch cows, are the New England states, New York and Pennsylvania in the East, Illinois, Wisconsin, Minnesota and Iowa in the West, with Texas having a large number because of the large total number of other forms of flesh food animals, such as cattle, in the state. The average price is highest in New Jersey, with $44, followed closely by Illinois, with $42, and Pennsylvania, $38. Arkansas, with $22.80, shows the lowest price.

In the case of cattle other than milch cows Texas leads, with $7,357,000, or nearly one-seventh of the total number in the country. Iowa comes second, with about half as many, followed by Kansas and

Nebraska. The highest average value is in Illinois, with $28.50.

The accompanying statement shows the total number and value of cows and other cattle by states:

Number and Value of Cattle by States January 1, 1910

[Last three figures, 000's, omitted.]

	Milch cows			Other cattle		
	No.	Per head	Value	No.	Per head	Value
N. E.....	1,049	$38.00	$39,862	664	$18.00	$11,952
N. Y.....	1,837	35.00	64,295	957	17.00	16,269
N. J.....	191	44.00	8,404	87	21.00	1,827
Pa.	1,163	38.00	44,194	946	19.00	17,974
Tex.	1,092	28.20	30,794	7,357	14.00	102,998
Ark.	349	22.80	7,957	645	11.20	7,224
Tenn.	382	30.00	11,460	658	15.90	10,462
W. Va....	220	33.50	7,370	539	21.00	11,319
Ky.	402	32.40	13,025	706	21.10	14,897
O.	949	39.20	37,201	1,115	25.00	27,875
Mich	840	39.90	33,516	979	21.00	20,559
Ind.	669	39.60	26,492	1,083	26.40	28,591
Ill.	1,287	42.00	54,054	2,058	28.50	58,653
Wis.	1,249	35.25	44,027	1,170	21.20	24,804
Minn.	1,065	34.35	36,583	1,200	20.10	24,120
Ia.	1,668	36.30	60,548	3,622	24.70	89,463
Mo.	878	34.10	29,940	2,165	23.80	51,527
Kan.	889	36.25	32,226	3,456	24.10	83,290
Neb.	780	35.10	27,375	3,063	22.80	69,836
N. D.....	248	37.60	9,325	732	24.70	18,080
S. D.....	632	33.80	21,362	1,433	24.00	34,392
Cal.	423	36.70	15,524	1,222	20.70	25,295
Ore.	182	42.10	7,662	739	22.10	16,332
Wash. ...	182	42.00	7,644	408	23.50	9,588
Okla.	229	33.25	7,614	1,300	20.00	26.000
Other	2,666	30.00	79,980	10,476	20.00	209,520
Total..	21,521	$35.24	$758,434	48,780	$20.76	$1,012,847

Something more than 60 per cent of the sheep of the country are in the Rocky Mountain states and on the Pacific coast. Ohio is the only mixed farming state making a large showing in numbers, followed by Michigan and New York in the order named. New York leads in average value per head again on account of its location and accessibility to market. Naturally, the heavy hog states are the states of the corn belt, Iowa leading, with 6,487,000,

followed by Illinois, with 3,646,000. Texas, on account of its large geographical area, stands third in number, and is rapidly increasing its importance as a hog state.

The following statement shows the number and value of sheep and hogs by states:

Number and Value of Sheep and Hogs by States January 1, 1910

[Last three figures, 000's, omitted.]

	Sheep			Hogs		
	No.	Per head	Value	No.	Per head	Value
N. E.....	644	$4.85	$3,123	309	$10.50	$3,245
N. Y.....	1,173	5.60	6,569	591	9.50	5,615
N. J.....	41	6.00	246	157	11.00	1,727
Pa.	1,086	5.50	5,973	934	9.00	8,406
Tex.	1,548	3.00	4,644	3,307	6.80	22,488
Ark.	278	2.75	764	1,074	5.25	5,639
Tenn.	337	4.00	1,348	1,249	8.00	9,992
W. Va....	693	5.00	3,465	338	7.20	2,434
Ky.	918	4.50	4,131	1,025	6.20	6,355
O.	3,148	4.80	15,110	2,036	9.50	19,342
Mich.	2,062	5.20	10,722	1,170	10.50	12,285
Ind.	1,093	5.05	5,520	2,515	9.55	24,018
Ill.	666	5.60	3,730	3,646	10.45	38,101
Wis.	944	4.70	4,437	1,555	10.75	16,716
Minn.	386	3.90	1,505	1,034	10.65	11,012
Ia.	628	5.60	3,517	6,487	12.00	77,844
Mo.	922	4.70	4,333	2,723	6.90	18,789
Kan.	238	4.60	1,095	2,240	9.50	21,280
Neb.	421	4.40	1,852	2,860	10.00	28,600
N. D.....	469	5.00	2,345	143	11.30	1,616
S. D.....	820	4.90	4,018	705	11.00	8,178
Cal.	2,289	3.70	8,469	424	8.40	3,562
Ore.	2,475	4.20	10,395	241	8.70	2,097
Wash. ...	744	4.25	3,162	132	9.00	1,188
Mont.	5,696	3.60	20,506	—	—	—
Wyo.	6,498	3.90	25,342	—	—	—
Col.	1,777	3.60	6,397	—	—	—
N. M.....	5,093	3.50	17,826	—	—	—
Utah	3,222	3.60	11,599	—	—	—
Nev.	1,658	3.35	5,554	—	—	—
Ida	4,087	3.70	15,122	—	—	—
Okla.	70	4.00	280	431	8.00	3,448
Other	2,602	3.75	9,758	7,640	7.50	57,300
Total..	54,726	$4.07	$222,857	44,966	$9.15	$411,277

The statement here printed shows the distribution of horses and mules by states:

Number and Value of Horses and Mules by States January 1, 1910

[Last three figures, 000's, omitted.]

	Horses			Mules		
	No.	Per head	Value	No.	Per head	Value
N. E....	433	$115.00	$49,795	1	$120.00	$ 120
N. Y....	700	114.00	79,800	4	130.00	520
N. J.....	103	120.00	12,360	6	135.00	810
Pa.	636	115.00	73,140	45	129.00	5,805
Tex.	1,351	77.00	104,027	656	101.00	66,256
Ark.	281	90.10	25,318	202	113.10	22,846
Tenn	338	104.30	35,253	280	116.00	32,480
W. Va...	193	98.00	18,914	11	120.00	1,320
Ky.	414	105.00	43,470	196	114.00	22,344
O.	970	118.15	114,606	15	117.00	1,755
Mich. ...	673	115.00	77,395	3	118.00	354
Ind.	803	110.00	88,330	83	116.05	9,632
Ill.	1,447	115.00	166,405	139	120.00	16,680
Wis.	656	114.00	74,784	5	115.00	575
Minn. ...	772	109.00	84 148	9	110.00	990
Ia.	1,395	114.00	159,030	59	127.00	7,493
Mo.	924	100.60	92,954	333	116.00	38,860
Kan.	1,066	103.00	109,798	140	123.20	17,248
Neb.	894	108.10	96,641	70	121.00	8,470
N. D....	595	102.00	66,640	7	122.00	854
S. D.....	561	110.00	61,710	8	120.00	960
Cal.	422	102.00	43,044	73	119.00	8,687
Ore.	289	108.00	31,212	7	115.00	805
Wash. ..	322	120.00	38,640	4	125.00	500
Okla. ...	443	88.75	39,316	184	115.40	21,234
Other ...	3,531	75.00	264,825	1,356	100.00	135,600
Total..	20,212	$101.50	$2,051,555	3,898	$108.57	$423,198

From the above it will be seen that the value of live stock in the United States at the beginning of 1910 was enormous. According to B. W. Snow, statistician for Orange Judd Company publications, the stock on American farms was worth on January 1, 1910, $4,880,068,000; the increase during the year 1909 amounted to the enormous sum of $560,190,000, or the largest annual increase ever recorded.

This upward movement of prices had been in progress for more than ten years, so that the importance, from a money standpoint alone, of the live stock industry, is apparent. The value of the different kind of farm animals and increase during the year 1909 is shown in the table below:

Total Value of Farm Animals

	1910	1909	Increase
Horses	$2,051,555,000	$1,816,074,000	$235,481,000
Mules	423,198,000	369,997,000	53,201,000
Milch cows	758,434,000	674,813,000	83,621,000
Other cattle	1,012,847,000	960,966,000	51,881,000
Hogs	411,177,000	310,806,000	100,371,000
Sheep	222,857,000	187,222,000	35,635,000
Total	4,880,068,000	$4,319,878,000	$560,190,000

Average Price Per Head

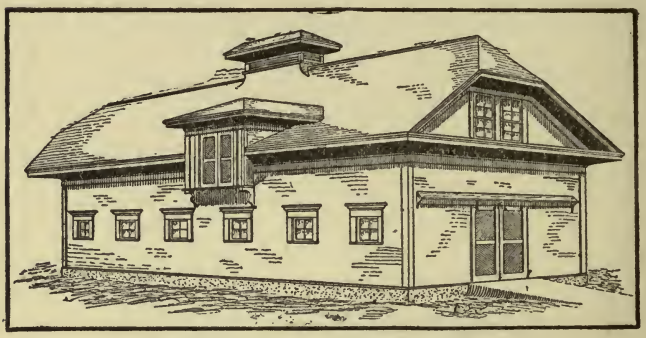
	1910	1909	Increase	Per ct.
Horses	$101.50	$91.02	$10.48	11.5
Mules	108.57	97.70	10.87	11.1
Milch cows	35.24	32.00	3.24	10.1
Other cattle	20.76	18.95	1.81	9.5
Hogs	9.15	6.22	2.93	47.1
Sheep	4.07	3.55	52	14.6

The problems connected with profitable live stock production are becoming more and more complex as the years go by. Prof Herbert W. Mumford, who has charge of the animal husbandry department at the university of Illinois, has probably made as careful a study of this proposition as any man in the country. He has not only visited the stock-growing regions in the United States, but made a thorough investigation of the conditions in the Argentine. He has attempted to get a broad view of the situation and has reached some interesting conclusions. He finds that in a country where agriculture is new, as in the United States, the problems were at first comparatively easy, but as time passed they became more complex and more difficult.

Until a permanent system of agriculture has been established, brief periods arise when grain farming becomes more profitable than live stock production, because temporarily the price of feeds used in the production of live stock becomes relatively higher than the price of animal products. These

high grain prices cause an extension of grain production, pastures are plowed up, farm animals are disposed of, and a very material reduction in the number of farm animals is the immediate result.

Further than this, the production of stock is, in a new country, associated with cheap land. As the land advances in value, it has been the common practice to reduce the number of farm animals, the



ELEVATION OF HORSE BARN

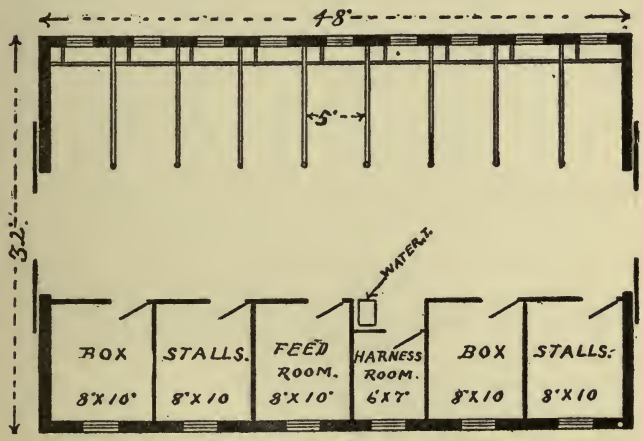
feeling being that cattle, sheep, hogs and horses cannot be profitably raised on high-price land.

Then an added factor is found by Professor Mumford to be having its influence. In some sections of the United States the tendency is toward tenant farming. The original landowners have accumulated enough money to retire and move to town. In securing tenants to replace these original holders there is great difficulty in getting hold of tenants who care to handle live stock. Some of them do not have experience, while others feel that as their stay is only temporary at best, it will not pay them to stock up with farm animals. The recent tendency, however, among farmers, to adopt per-

manent forms of agriculture and remain on their land will do much to counteract this difficulty.

WHY LIVE STOCK WILL PAY

There are many reasons why live stock will continue profitable. The multiplicity of kinds and methods of live stock production and the variation



GROUND PLAN OF HORSE BARN

in market value both of feeds used and animals involved, make it impossible to give a detailed statement of just how profitable this will be. Professor Mumford calls attention to a Missouri experiment where various forage and grain crops were consumed by hogs.

The hogs used in the investigation weighed at the beginning about 100 pounds each. The corn, where used as a supplement to forage crops, was charged against the hogs at 60 cents a bushel; the gains on hogs were credited at $6 per 100 pounds. Nothing was charged for labor and no credit given

for fertilizer. An acre of blue grass in the season of 1909, when pastured with hogs at the rate of 14 hogs per acre for a period of 140 days, was worth, after deducting the value of the corn used to supplement the pasture, $18.80. An acre of clover pastured by 12 hogs 90 days, under similar conditions yielded $37.59; rape, oats and clover in 1909, 10 hogs for 78 days, $22.02; cowpeas, 12 hogs for 32 days, $17.71; corn and cowpeas, 10 hogs for 32 days, $35.40. These figures speak for themselves.

While it is true that at different times and under unusual conditions, which have been unfavorable for live stock production, grain growing has seemed more profitable, this is not true at present, nor will it be permanently true until the various grain and forage crops fed to stock come into more general use in the human dietary. Some of the farm crops, such as the various hay crops and coarse grains, will never be very generally used for human food, consequently they must always be employed in the production of live stock. As long as these crops are grown in a country, farm animals must be raised.

If, according to popular belief, the increased population eventually forces live stock production out, Illinois lands may be used to produce crops suited to human food. Under conditions which will prevail for a great many decades, however, this is not likely to occur. Statistics do not prove that as population becomes more dense there is necessarily a decrease in live stock. On this point a lot of data collected by Professor Mumford is of particular interest. The following tables showing the number of the various kinds of live stock, per capita, for dates and countries indicated, are illuminating:

Live Stock Per Capita

GERMANY

	1810	1903
Horses	0.08	0.08
Cattle	0.25	0.36
Swine	0.15	0.39
Goats	0.04	0.06
Sheep	1.22	0.13

FRANCE

	1852	1908
Horses, mules and asses	0.10	0.09
Cows	0.16	0.19
Swine	0.14	0.18
Goats	0.03	0.03
Sheep	0.93	0.44

DENMARK

	1881	1903
Horses	0.17	0.19
Cattle	0.74	0.73
Swine	0.27	0.57
Sheep	0.78	0.35

HOLLAND

	1850	1897
Horses	0.08	0.06
Cattle	0.36	0.32
Swine	0.07	0.23
Sheep	0.25	0.18

ITALY

	1852	1890
Horses	0.03	0.07
Cattle	0.16	0.17
Swine	0.08	0.06
Goats	0.06	0.06
Sheep	0.29	0.23

The full significance of these statistics is not appreciated without the further statement that they represent numerical values only. There has been a very decided improvement in the quality of live stock in the various countries named. A small number of animals now with their increased efficiency equals a large number in former years. An increase in numbers as well as an increase in their efficiency is doubly significant. These statistics will also suggest along what lines changes have taken place in live stock production as population becomes more dense.

There is a sense in which it is true that the live stock per capita decreases. It is in the early history of a country when the population is small and extensive systems of live stock production largely constitute the agriculture of the country. In such instances population frequently increased more rapidly than live stock. When, however, the conditions demand the establishment of intensive forms of agriculture it appears, as in Germany, France, Denmark, Holland, Italy and the British Isles, that there is a tendency with but few exceptions, for live stock per capita to increase rather than decrease.

I think the above pretty clearly establishes the importance of live stock in farm life, and the average reader is probably convinced by this time that live stock should not be abandoned in the United States and that the thing to do is to so handle farm animals that the returns will be larger. This can be accomplished in a great many ways. In the first place, the animals should be so handled as to produce the largest amount of stable manure. This stable manure should be so taken care of as to give the largest possible increase in grain production on the farms where made. The use of the manure

spreader and the application of manure as soon as available will all tend toward greater fertility of farm lands and will result in larger net profit to the agricultural population. If, in connection with all these things, the need of more and better animals is fully realized, the future of the agriculture of America is assured. It does not pay to keep scrub animals. They eat just as much, and in some cases more, longer time is required for maturity and lower prices must be accepted. Consequently, why not get good breeding stock and reap the largest reward? The profitable live stock are animals that are well bred and well fed.

Some attention must also be given to keeping animals in a thrifty, growing condition, from the time they are born until disposed of. A little neglect at any period will result in a stunted condition which will require large amounts of feed and care to correct—in fact, negiect at any stage of the game can never be fully made up, no matter how much time and money is spent in trying to do it.

Bear in mind, therefore that the live stock field in the United States is comparatively unlimited, that there are fortunes in raising live stock in connection with general farming, for although the day of the big stock ranch is past, there is more money to be made and distributed among a larger number of farmers than ever before; that the number of first-class animals in the United States is not nearly as large as it should be; that for the coming century, at any rate, there is no probability of raising live stock at a loss, if properly handled, for in connection with the raising of live stock, feeds are consumed at home and permanent fertility of the land is maintained.

CHAPTER II

Principles of Permanent Agriculture

The first requisite for a system of permanent agriculture is some scientific and practical plan of soil management which will permit the removal of maximum yearly crops without permanently lowering the productive capacity of the land. This condition is one which has never been fully met in any except some isolated instances in the United States. In fact, it may be said that in only a few countries in the entire world has this balance between production and maintenance been so adjusted as to make possible a permanent agriculture. In some of the oldest countries of the world certain sections have been cultivated continuously since the most remote times and are still productive. This may be due to some special condition such as prevails in the Nile valley, whereby the spring floods bring down an annual fresh supply of rich soil, which is deposited upon the surface, or it may be due to the general practice of systems of agriculture which tend toward soil preservation. For the most part, however, the history of the oldest agricultural regions is one of ultimate famine and starvation, because production did not keep pace with the demand, and because soils were systematically robbed of their power to produce maximum yields. The conservation of all possible forms of fertility in the soil is found in the practice of Chinese farmers of today. Absolutely no scrap of vegetation or of any substance containing organic matter which can

be utilized in the fertilization of land is allowed to go to waste in this country, and yet there is scarcely a year when many deaths from starvation do not occur.

In the face of this lack of sufficient production even for maintaining life in the overcrowded population of the empire, there are stretches of hundreds of square miles of territory which all the evidence indicates were once inhabited and which now do not support any population, or at most only a few nomadic herdsmen. These lands have evidently been so depleted by unintelligent cropping at some remote period that their abandonment became necessary. Some method of restoring their lost productivity is today called "the problem of China," and has never yet been successfully worked out. The history of India reports a succession of famines in which millions of human beings have perished from starvation in a single year. Even at the present day there is never a year which does not witness thousands of deaths from starvation. The farmers of India live in the most pitiable condition of poverty which is known today. They have only enough to eat to maintain life at its lowest ebb in the most prosperous years, so that the least adverse crop condition brings about absolute starvation. On the one time rich cotton land of India, the production at present does not exceed 100 pounds per acre of cotton lint, while wheat and other agricultural products yield accordingly. Russia, in spite of its enormous extent of agricultural land and its normal surplus wheat production, has its years of famine as well, and these in times past have caused great suffering among the poor of that country.

SUCCESSFUL CONTINUOUS AGRICULTURE

Western Europe, as a whole, offers very good examples of continued high production upon lands that have been cultivated for more than a thousand years. The farmers of this region were compelled, generations ago, to face the question of soil maintenance, and they have gradually developed systems of agriculture which seem to be permanent and which, in general, are in accordance with well-known principles of agricultural science. The United States is the newest of the world's agricultural regions, yet it, too, has encountered the problems arising from depleted soils and the consequent lowering of crop production below the limits of profitable farming. Even in our new land, which was virgin soil when many of the still productive European fields had been tilled thousands of years, we have our large areas of abandoned land which was once highly productive, but which was managed in an unintelligent manner until the remaining fertility was no longer sufficient to produce crops which would pay for the cost of production. The old fields of the south were abandoned because they would no longer produce tobacco and cotton in sufficient quantities to pay the planter for his labor. New England and the north Atlantic states have thousands of farms which have been abandoned and which were deserted because of decreased production and because of the unlimited amount of rich lands in the West. In Maryland and Virginia today land can be purchased within 20 miles of the national capitol for from $1.50 to $15 per acre, which 100 years ago composed the rich tobacco plantations of this country, yet these farms were deserted, or practically so, because they could no

longer be made to pay dividends on a reasonable valuation.

SOIL MAINTENANCE AND MANAGEMENT

The questions pertaining to soil management and soil fertility are the most unsatisfactory to discuss of any phase of agricultural science. They offer the most complex problems and are influenced by the most widely varying factors of any phase of agriculture. These questions have occupied the attention of writers and scientists since the days of the Roman republic. The earliest agricultural investigators and writers gave especial attention to this phase of the science, and various infallible formulas have been promulgated to perpetuate maximum production. One of the oldest theories for the maintenance of maximum production is the doctrine of continuous culture advocated by Jethro Tull of England. By deep plowing and continuous intensive cultivation of the soil this gentleman was able to produce large crops, without rotation and without the addition of any outside material for a considerable number of years, upon the same plot of land, and he concluded from this, and widely published the conclusion, that "tillage is manure," and that thorough cultivation is all that is needed to produce maximum crops indefinitely.

The fact is as true today as it was then that tillage of this sort is an absolutely correct agricultural practice, but the idea that this alone suffices to maintain fertility was long ago abandoned. With the advance of science, it became possible to analyze the different soils and to determine accurately not only the different elements contained therein, but to compute exactly in what propor-

tions they occur. It also became possible to analyze the different plants and grains and to determine just what elements they contain and in just what proportions. It was then reasoned and widely announced that by analyzing any given soil, and comparing its contents with the amounts of these same elements removed by each crop, it could be determined exactly how many crops could be grown upon any piece of land without the addition of any kind of fertilizer. This theory was correct in part, for it can be accurately determined exactly how much nitrogen, phosphoric acid, potash and other constituents of plants are contained in any class of soil. The percentage of this plant food which is actually available for the use of plants and is in such mechanical and chemical condition as to be used by them, however, cannot be determined by the wisest chemist. The influence of various soil bacteria, some harmful and others beneficial, is knowledge which has been gained during the past decade, and it is probable that our knowledge of these factors is only rudimentary.

The rotation of crops has been widely taught as offering the solution of the problem of soil fertility. Intelligent crop rotations are the rule in the most progressive farming districts of the United States today, and much larger yields are always obtained than where a one-crop system is followed. Where a one-crop system is necessary, as has been the case in some exclusive grain-growing districts, the fallowing of the land every three or four years has been thought by many to be a means of restoring lost fertility, because the crops secured from these fallowed fields are always greater than those planted preceding fallowing. Under these conditions, fallowing is a good practice, and the rotation of crops

in the mixed-farming districts is absolutely essential to intelligent farm management. Yet none of these in itself restores anything to the soil from which vast quantities of material have been taken. The mere rotation of crops, because it tends to larger production, actually wears out the soil faster, the large crops thus grown taking away more of the available fertility than a small crop would do. Rotation in itself tends to exhaust the soil faster than would otherwise be done.

PRINCIPLES OF SOIL MAINTENANCE

There are certain principles and practices, however, which so far have stood the test of time and which are now believed to make possible a permanent agriculture, while at the same time producing constantly increasing crops annually, and by means of which the fertility of most land may not only be maintained, but constantly increased. The three elements which are most likely to become deficient in the soil and which are absolutely necessary to the growth of the plants are nitrogen, phosphoric acid and potash. Several other elements are used in the growth of the plant in small quantities, but they usually occur in sufficient amounts in all soils, with the exception of calcium, and this can be added in the form of land plaster or common lime. Most American soils contain sufficient potash to last for several hundred years, although occasionally there are circumstances which justify the addition of this element to the soil. Generally speaking, the fertility problem narrows itself down to the maintenance of the supply of nitrogen and phosphorus.

Humus is decayed organic matter, the function of which is partly chemical and partly mechanical,

This decay forms certain acids, and causes certain chemical reactions which serve to render available to the use of the plant roots, plant food already present. Its mechanical action, by adding bulk to the soil, keeps the fine soil particles from running together into a close compact mass when wet, provides air and water spaces, and enables the farmer to keep the soil in a condition of good tilth.

SYSTEMS OF SOIL MANAGEMENT

A system of soil management which seems to make for a permanent agriculture has been widely exploited in recent years by means of which grain farming alone can be continuously followed. This system demands the growth of leguminous crops and the plowing under of large quantities of leguminous vegetation in order to supply the nitrogen and the necessary humus, while the application of ground phosphate rock, steamed ground bone or phosphorus in some of its various available forms are depended upon to supply the phosphorous content. Lime can be added as needed to correct the acid condition of the soil and maximum crops of grain and hay can be produced apparently indefinitely. This plan has its adherents, and where it is clearly an advantage to pursue this type of farming the plan cannot be intelligently criticized. The other system of soil maintenance demands the keeping of live stock to the extent of the farm's capacity, the marketing, through the medium of fattened stock, of most of the grain and hay grown upon the land and the return to the soil of all the manure made by the live stock.

At all periods of agricultural history, no matter what new theories or fads have been advanced or

advised for maintaining soil fertility, there has been a definite and well-established connection between live stock and soil maintenance. Dr. E. H. Jenkins of the Connecticut experiment station, after having spent a lifetime in the investigation of soil problems and fertilizers, said that the only recommendation he could make, with confidence, was that barnyard manure is good to put upon land. While it is not to be argued that a permanent agriculture is not possible without live stock, it is true that much of the best agriculture of western Europe includes the keeping of a large number of animals, and it is equally true that some of the most poverty-stricken countries in the world, with the poorest types of agriculture, keep relatively few farm animals. Russia, with all her vast agricultural domain, has very few meat or milk-producing animals and her agriculture today does not include, to any particular extent, the application of manure to the land. All of her agricultural poverty cannot be attributed to this fact, for the plowing is poorly done with very crude implements, but her wheat yield of only 8½ bushels per acre can in a large part be attributed to this lack of live stock or of anything to take its place in maintaining fertility. Fallowing is practiced, but it alone has not been found sufficient. Although the agriculture of India includes the keeping of large numbers of animals, there is little or no relation between this live stock and the soil, for the reason that the people are driven in their poverty to using the dried manure of the animals for fuel, and, therefore, little or none of it is ever returned to the soil.

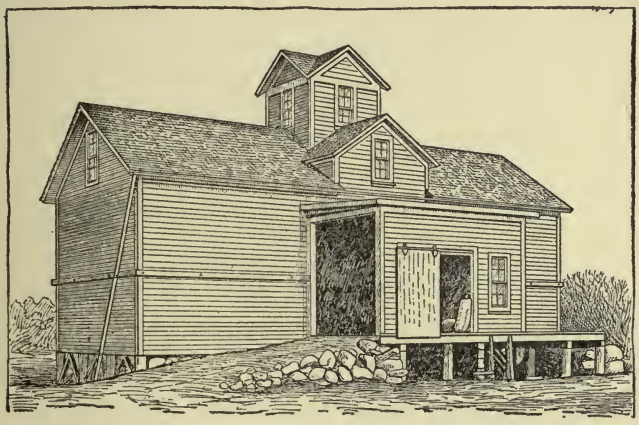
The abandoned lands of the United States all lie in regions where stock raising either never was a dominating feature or where the value of manure

was not recognized, and the stock industry was allowed to decline along with the crop production. Every instance of the building up of these worn-out soils has included either the keeping of increasing numbers of live stock and the growth of leguminous plants, or the heavy use of commercial fertilizers purchased at a relatively high rate in the market. The time has come when the American farmer must choose some definite system by which he can procure larger crops than he is doing at present and at the same time return to the soil plant food which will tend to continually increase the productive capacity of the soil, so that future generations will receive the land not in a depleted condition, but capable of producing more and more in order to keep pace with the growing demands of the nation for agricultural products.

LIVE STOCK SUPPLY

Under certain conditions, it may be true that a system of exclusive grain farming is necessary and is best suited to the surroundings, but on the large majority of the American farms today, there is a larger field for live stock and the type of farming which its keeping implies than there has been at any previous time in our history. There is a greater demand today for meat, for dairy products, for wool and for work animals than there ever was before. Population is increasing much more rapidly than our agricultural production, and farm products of all kinds will undoubtedly be in constantly stronger demand. The extremely high prices realized in recent years for all classes of meat-producing animals is caused by a marked shortage in the supply of these animals in the United States. The supply

of beef cattle has not increased since 1900, and at times has shown an absolute decline of at least 2,000,000 head over the number held in 1900. The same is true of sheep, while the supply of hogs has fluctuated from about the number held in 1900 to several millions less than that. All of this is in the face of a 20 per cent increase in the country's population and its consequent consuming capacity. The time was never more opportune for the extension of the live stock industry than at present, and the



A NORTHWESTERN FARM GRANARY

absolute necessity exists for an immediate tremendous increase of the number of farm animals in this country. This demand comes from the crying need of the soil for the manure produced from live stock farming on the one hand and from the insistent demands of the market for more and more animals on the other hand. It should not be argued that all farms should become exclusively producers of live stock, and it is worse than idle to suggest that

no grain should be marketed from American farms. The acreage devoted to the growing of grain for the market can never be less than it is at present, and must almost inevitably become greater because of the growing yearly demand for wheat, but keen discrimination should be used in choosing those locations which are best suited to grain production. Live stock farming should not be abandoned in favor of exclusive grain farming under conditions where it can be proved even equally as profitable. These differences in the types of farming must be worked out on each individual farm and not on an extensive scale for any given locality.

SINGLE SYSTEM BAD POLICY

No state can afford to rest her future upon any single system of farming. There are several types of live stock husbandry which are more profitable than grain farming, which make not only for a permanent agriculture, but for a higher type of country life and a more enduring civilization. There are several factors aside from the actual returns per acre in dollars and cents which should be considered in determining the relative merits of live stock and grain farming. It is reasonably certain that the best type of agriculture and the highest ideals of country life are not possible without the keeping of farm animals. The development of a more intelligent citizenship will rest very largely upon the possibility of high standards of living among country people. The strongest personal factor which has entered into the history of American agriculture has been the tendency of the ablest and most intelligent country boys to forsake the farm for city life and the professions at the earliest oppor-

tunity. This tendency is being overcome in a considerable measure at present, but its ultimate solution demands a type of agriculture which will require a high degree of intelligence and will necessitate the exercising of mental and executive ability equal to that demanded by the best professional work. American agriculture may well heed the example of English husbandry in this respect. British and American farming will always differ, in that in England farming is essentially an occupation of the aristocracy, while American agriculture depends for its development upon the small landowner. The feature which it is desirable for American agriculture to adopt from the English is the tendency of transmitting not only the land, but the farming practices and experiences of one generation to each succeeding generation, so that one definite system may be followed out in all its details through many generations in the same family. The development of some of the famous breeds and families of cattle has been brought about by this English custom of training the son to continue the father's work. Agriculture of this type has never been developed under any condition which does not include a large proportion of live stock husbandry. On the other hand, systems of exclusive grain farming have always tended toward a relatively low plane of country life, and in the last analysis, toward peasant farming.

CONSIDERATIONS OF FARM LABOR

The farm labor question is one of the most serious which now confronts the American farmer. One needs to look no further for evidence of this problem than the cry which goes up annually from

the great wheat section of the United States for thousands of harvest hands. This extra supply of help, which is needed for only a short period of the year, is not available in the grain regions, and must always be imported from far-away cities and communities having a surplus of labor. There is an annual exodus of tens of thousands of men from the centers of population into the grain sections at harvest time and back again upon the approach of cold weather, when the demand for their services suddenly ceases. This tends to create an itinerant class of farm laborers, and is undoubtedly a prolific source of the class of American society known as the hobo. Live stock farming, on the contrary, furnishes the opportunity for the continuous remunerative employment for large numbers of intelligent laborers throughout the entire year. It tends to equalize the labor supply in such a way that the farmer will usually have a sufficient number of men at his command during the extremely busy seasons of the year, because he has work enough to give employment during the slack season also. The keeping of live stock in connection with general farming thus make both for the welfare of the farmer and the laborer.

The establishment of particular systems of live stock farming which do not suit the times or conditions is not to be advocated. Some forms of stock production should be and undoubtedly will be abandoned. Others should be largely extended and developed. By the intelligent rotation of crops, in connection with live stock farming which returns to the soil the largest possible amount of fertility and organic material, the producing capacity of the American farm must be made to continually increase. These larger crops, in return,

will support greater numbers of live stock, and the process of building up the producing power of the land on the one hand and increasing the efficiency of farm animals by careful selection and breeding on the other, will tend toward a profitable and permanent live stock industry in America. It is probably true that occasionally plant food in some form will have to be purchased from the outside, because the fertility of the farm cannot be maintained simply by returning to the land the manure made by live stock fed upon crops grown upon the land. It is equally true, however, that most systems of live stock farming demand the purchase of vastly less plant food than is required by any system of grain farming. Raise good crops, but use them for making better stock. Then the transfer of plant food will be small and the profits from the farm be more satisfactory, more profitable, more uplifting, and the land will give out its fat with readiness and with unheard of liberality.

CHAPTER III

Agricultural Situation in the East

With the advent of the white man in America, farming was confined to the land along the Atlantic coast, from Florida to Maine, inclusive. The soil was fertile and responded readily to cultivation. There seemed to be little necessity for giving any particular attention to the maintenance of soil fertility. As soon as a field became nonproductive it was abandoned and new land further west was taken up. This continued as population increased. The younger generation crossed the Allegheny mountains and settled in the fertile Ohio valleys. The migration continued westward, until now almost all of the available lands in the United States are occupied. The bringing of new territory under cultivation maintained the general average production of the country, so that until recently it was difficult to realize that the older soils were decreasing very rapidly in fertility. In fact, today, if statistics alone are relied upon, it would be difficult to convince anyone that soils are wearing out. The taking up of new land, the improvement of seed and the fact that cultivation is more thoroughly understood, has resulted in larger yields per acre for all the leading crops than ever before noted in the history of the country. Of course, in the older settled sections of New England and all along the Atlantic coast, it is perfectly evident that the soil is not as productive as it was formerly, but taking the country as a whole, this depletion could not be proved.

It has become evident, however, that the farms of

New England, New York, New Jersey and the South are more or less unproductive. This, as stated before, has been brought about by a disregard of some of the primary principles of soil treatment. As the demand for land has become greater, attention is being given to the worn-out farms in the East, and it is gratifying to note that, intelligently handled, these farms are once more becoming very productive. The tide is being turned and many farmers are going East, buying abandoned farms and renovating them. That these soils under proper treatment can be made productive has been so fully demonstrated that there can be no argument on that point. In Maine, Massachusetts, Connecticut, New York and Pennsylvania there are today farms which are as productive as any on the face of the earth. Originally, they were no more fertile than thousands now considered unprofitable. The owners, however, have studied the problem thoroughly, have applied business methods, have used the latest discoveries of science and practice, have treated the soils so that they not only are in better tilth, but produce crops that are record breakers. It will be recalled that in 1908 a Connecticut farmer was awarded the champion prize for the largest yield of corn in the United States from an acre. The tobacco fields of Connecticut and Massachusetts are noted for their productivity. The potato fields of Maine have, for years, been a source of great profit. In Pennsylvania at least one grain farmer is producing annual yields ranging around 100 bushels per acre. The truck lands of New Jersey are very productive. Georgia has several exceedingly productive and profitable peach orchards. Thus it happens that many farmers are looking to the East for permanent homes.

The location of land adjacent to the Atlantic ocean is especially desirable because of the proximity to great market centers like New York, Boston, Philadelphia, Atlanta and Jacksonville.

SOIL MOISTURE MEASURES PRODUCTION

The productive capacity of the soil is measured largely by its water-holding capacity. True, every soil must contain a certain amount of plant food, but if it does not have the capacity to absorb and retain moisture so that this will be available during the period of plant development, it cannot be highly profitable. The treatment, therefore, of these abandoned soils should be such as to increase their water-holding capacity.

The quickest and best way to increase this water-holding capacity is to fill the land with humus. This is secured primarily in two ways. First, by growing leguminous crops, such as cowpeas, clovers, vetch, etc., and turning these under. If, allied with this growing of leguminous crops, live stock farming is practiced, it will not be many years before the Atlantic coast states will be infinitely more productive, from an agricultural standpoint, than at present. While it may not be entirely profitable to raise beef cattle, the locality is especially suited to dairying, to the raising of poultry, and to the raising of hogs in connection with dairying. The market for dairy products is almost unlimited and the prices are the best. The comparatively short distance from the producer to the consumer eliminates the matter of expensive freight and express rates. Consequently, it is a source of great encouragement to know that the so-called unproductive farms of the East may be

rendered very profitable by the raising of live stock and the growing of leguminous crops. These crops may either be turned under or may be fed to the farm stock. The latter procedure, of course, is the logical and common-sense one. The judicious application of a certain amount of commercial fertilizer will also assist.

The great importance of soil moisture can be no better illustrated than to remember that in order to produce a ton of dry hay on an acre of land it is necessary that the grass have approximately 500 tons of water. In order to supply this enormous quantity, the soil must not only be in condition to absorb and hold water well, but it must be porous enough to permit water to flow freely from one soil grain to another. The presence of large quantities of decaying organic matter, ordinarily termed humus, adds enormously to the water-holding capacity of the soil. One ton of humus will absorb two tons of water and give it up readily to growing crops. The shrinkage of the particles of decaying organic matter and the consequent loosening of soil grains keeps the soil open and porous.

Above and beyond all this, humus of good quality is exceedingly rich, both in nitrogen and in mineral plant food. The first step, therefore, to renovating worn-out soil is to give it an abundant supply of humus. Perhaps the best source of humus is stable manure, especially when animals are fed foods rich in nitrogen. Even poor barnyard manure has considerable value because of the humus it contains.

TILLAGE OF THE UTMOST IMPORTANCE

Careful tillage is another problem which must enter into the renovation of worn-out soil. In

many parts of the country the land is plowed only three or four inches deep. Below the plow the soil becomes sour, densely packed and unfit for plant roots. When such soils are plowed deeply and this sour subsoil is mixed with the upper portion, the first effect is to retard plant growth. This, however, must not be placed against deep plowing. A better method is to plow a little deeper each year until the land is annually stirred to a depth of eight or ten inches. This gives a deep layer well adapted to supporting plant life. When new land, that is, land which has been undisturbed for a number of years, is broken up it is always best to plow deep from the beginning. It is never wise to plow the same depth twice in succession. In general, fall plowing should be eight, nine or ten inches deep and spring plowing five to seven inches. Do not forget that there are special cases when this rule does not apply. Ground may be plowed shallower or even deeper to get best results. The object of plowing is to loosen the soil, get the air into it, turn under manure, etc. It is also the prime factor in the killing of weeds.

All soils except those quite sandy are injured if handled when wet. Nothing is more destructive or disastrous to a clay soil than treating it when it contains an excess of moisture. This must be looking after in all parts of the Eastern country where the subsoil is clay. Of course, some sections are sandy and this matter can be disregarded more or less. The best time to plow is when the land contains just enough moisture so that it will break up mellow. Of course, if continuous rains follow plowing little harm is done, but if wet land is turned up during a dry, sunny period the productive capacity will be greatly decreased.

After the plowing is thoroughly done the next important thing that the Eastern farmer must look out for, as noted before, is supplying the humus. Make all the stable manure you can, and to do this you must keep all the stock that you possibly can. Preserve your stable manure so it will be well rotted before it is applied. Do not let it stand out in the open where rains will leach out the soluble elements. An intelligent rotation of crops must be practiced even where manure is abundant and where leguminous crops are grown freely. If the land is seeded to timothy or clover and allowed to remain for two or three years, the upper layers will become well filled with plant roots so that when the sod is finally broken the soil will be in fine condition. If alfalfa is grown, and it can be in many parts of the Eastern section, nothing is better for renovating a soil. Its roots are long and penetrate to a great depth. It furnishes a forage that is a first-class dairy feed and also is excellent for raising hogs and feeding to poultry.

GREEN AND BARNYARD MANURES

The practice of plowing under green manures is not very general and probably never will be along the Atlantic coast, but it can be used to advantage in some cases. The chief objection, however, in this country is that the green crop when plowed under is apt to ferment and produce an acid in the soil. It is generally desirable to plow the green crop under and then seed the land to some winter crop. In New Jersey and Georgia crimson clover is used to good advantage. This particular clover stores up large amounts of nitrogen. It should be sown in July in the North and in September in the South.

Sometimes it fails, because the soil is not inoculated with the proper bacteria. Inoculated soil may be applied and this defect corrected. This crop also furnishes valuable winter pasturage for dairy cows and for hogs throughout the Southern territory. In Maryland, and in some other states, the practice of sowing crimson clover seed in corn just before the last plowing has given excellent results. In the spring the clover is plowed under and another crop of corn planted. Yields of corn have been increased from 35 to 50 bushels per acre in ten years by this practice. Vetches also do well, particularly in the South. Rye is a good crop to use in renovating soils, and it will grow on poor land, will make a good winter and spring pasture and can also be used as a soiling crop. It adds considerable humus to the soil, but does not, however, add nitrogen as do the legumes.

Possibly the best way to build up a worn-out soil where large quantities of barnyard manure are not available is to not only grow forage crops but buy grain to feed with them and return all the manure to the land. This, of course, cannot be done unless live stock farming is practiced. Dairying probably is the best system that can be practiced in the East. In this connection, of course, poultry and hogs can be raised with profit. Another form is to grow a succession of pasture crops for hogs. Keep the hogs on these pastures and feed them a light grain ration. Where corn can be grown, and it does grow well along the Atlantic coast if properly treated, plant enough for the pigs and for the dairy cattle. Sow either cowpeas, crimson clover or rye in the corn land each year. The two latter furnish winter pasture for pigs and result in increased yields from year to year. Sow oats in early spring,

follow with rye sown in August and follow this with sorghum the following spring. In September sow this sorghum field to rye again and the next spring sow either sorghum or cowpeas. A four-year rotation may be established by raising potatoes one year. If these crops are all utilized and if the hogs and cattle are fed a little grain in the meantime, this soil will improve. Of course, where the land is clay it must not be pastured when wet. This system of farming takes practically nothing from the land, but does add a great deal to it.

The Department of Agriculture, after carefully studying all phases of the soil fertility problem in the older section of the United States, concludes that the problem is not so much one of plant food as it is of soil treatment. Consequently, while it may be desirable to occasionally add plant food, the chief thought should be given to the supplying of the soil with humus and to so treating the land that it will be in the best possible mechanical condition. The department reaches the conclusion that the results of its investigation seem to indicate that the actual amount of water a soil can furnish the plant, irrespective of the percentage of water actually present in the soil, has a very important influence on yield. When the supply of water is inadequate to the need of the plant it is impossible for the nutritive solutions to be transferred to the roots. If water be not abundant, no matter how rich the soil may be in plant food, large yields cannot be secured.

Summing up the whole situation in New England and the Atlantic coast states, the success of agriculture in that region will be measured by the extent to which the raising of live stock is practiced, the attention given to the increasing of humus

in the soil and the care with which the soils are cultivated. There is no reason why the so-called abandoned or unproductive farms of New England and the old middle states may not eventually be made even more profitable than the farms in the great central West where the soil was originally much richer.

CHAPTER IV

Southern Agriculture Needs Farm Animals

THE ONE-CROP IDEA

For years the Southern farmer has realized that something is wrong with the agriculture of his section. The trouble began a good many years ago along the Atlantic seaboard when the soil which had been brought under cultivation by the early settlers of that region began to yield smaller returns of cotton and tobacco each year, until the crop harvested from the land would scarcely pay for the labor and expense necessary to produce the crop. Later, a similar discontent arose in the enormous southern empire which stretches away to the west, and extends practically to the Rio Grande river. In part of this region, the trouble came also from soil depletion, with its attendant necessity for abandoning the old fields and bringing new lands into cultivation; in other parts, it came from the inroads of crop pests, notably the boll weevil, in its destructive attack upon the cotton crop. Whatever was the specific agency which brought about unprofitable agricultural conditions, the trouble has always been traceable to the big underlying principle of southern agriculture, namely, the one-crop system. Ever since the days of the civil war, the South has staked its agricultural welfare upon a single-crop basis. In some sections this crop has been cotton, in others tobacco, and in still others rice or sugar cane, but the principle has been the same—that of expending

the entire energy in the production of one thing, and depending upon the open markets for the purchase of everything else.

This one-crop system was developed principally by the effects of the civil war and the stern necessity which the South faced in 1865 for establishing at once some form of industry which would afford living conditions to the thousands of people whose property had been devastated by the four years of warfare. Previous to that time, southern agriculture had been devoted in considerable measure to the production of various kinds of crops. In the early colonial days, land was about the cheapest imaginable commodity, while labor was the scarcest and most expensive. Crops grew with little or no trouble to the farmer on the rich virgin land, but the main question was how to get these crops cultivated and harvested. This imperative necessity for labor developed slavery in the South while withdrawing it from the North, and firmly fastened this institution upon the southern planters. The number of negroes increased very rapidly, much faster in proportion than the southern landowners, so that in the course of years the planters found themselves with a surplus of labor, more than they needed for the lands under cultivation. If their fields showed any signs of decreasing fertility, as many of them began to do at this time, the simplest and easiest remedy was to move on to new uncultivated lands, using slave labor in clearing away the timber and thus subduing rich new areas of fertile soil, and continuing the production of large crops. It was upon this kind of a basis that the settlement of Georgia, Mississippi, Arkansas, Louisiana and Texas was accomplished. The very nature of the times and conditions required that these

planters should produce nearly everything that they and their slaves required, because they were generally far removed from centers of population, railroads had not been built, and there was little or no opportunity for extensive importation of foodstuffs and feed for their live stock. Every well-managed plantation was a principality of its own where everything the inhabitants ate, drank or wore was produced. The slaves even made shoes and hats. If a planter desired to build a house, he manufactured his own brick, and the construction was done by his slaves, under his supervision.

The war put an end to this independent condition for all time and drove the southern farmers to a one-crop basis, at the same time developing a credit system which has effectually succeeded ever since in keeping the South upon this one-crop foundation. For 40 years the southern planter has purchased from the North and West nearly all his corn, which he could easily produce at one-quarter the cost. He has purchased all his flour at $6 per barrel which he could produce upon his own land for $2; all his meat at 10 cents a pound, which he could raise for 2 or 3 cents, and nearly all of the thousands of mules necessary to his operations have been brought from the North at $200 a head, when he could just as well have raised them for $75.

The one-crop idea has been responsible for all this purchase of the necessaries of life, while at the same time everything the southern farmers produced was shipped away in the form of tobacco, or cotton to the mills and factories of the North and of Europe. In all these 40 years the southern farmer, as a class, has annually shipped away thousands of tons of the raw material produced upon his land and has returned little or nothing

to the soil, except varying amounts of commercial fertilizer which in recent years he has been compelled to use in order to produce a crop. It is a mathematical certainty that continued subtraction from a definite amount will, in time, exhaust the original amount. This is the plan on which the southern farmer has worked. After all, or nearly all, of the virgin land had been brought under cultivation, he had only a stated amount of soil fertility. Every year for 40 years he has withdrawn from this stated amount all he was able to withdraw in the form of heavy crops, with the result that the original amount of fertility has been very materially decreased throughout the entire South, and, in thousands of instances, has been so nearly exhausted that farming is no longer profitable. There may have been here and there, in individual instances, notable exceptions to this statement, but broadly speaking of the South as a whole, this is an accurate statement of the situation up to within very recent years.

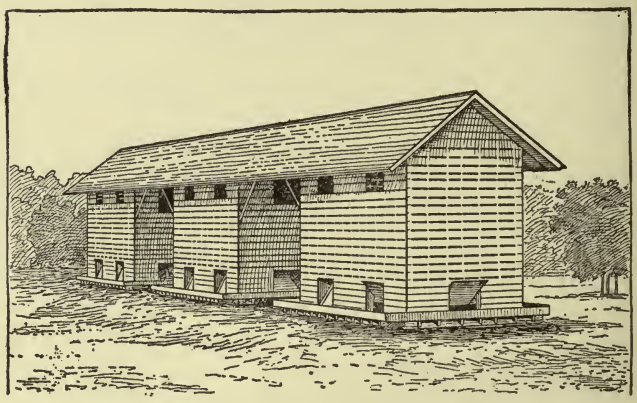
READJUSTMENT TAKING PLACE

A few years ago, however, signs of a readjustment of southern farm practice became evident in various sections. In some instances this was the result of the depleted soil which had been continuously farmed until the fertility it contained had become low and from which the humus had been long ago removed, so that the soil was lifeless and no longer responded in paying proportions to the use of commercial fertilizers. In the far Southwest and in the rich black lands of the Louisiana delta, where the original fertility of the soil had not yet been exhausted, this demand for the changed prac-

tice resulted from the inroads of the cotton boll-weevil, against which no method of combat was known, except by changing the crop. Whatever the cause, it has developed in the minds of the leaders in southern agriculture the idea that the basic trouble lies in the one-crop system and the realization that the remedy for the South's agricultural ills is the establishment of a diversified system of farming, which shall include the extensive growing of leguminous crops, the feeding of large numbers of farm animals, and the return to the soil of the plant food and humus this produces, for building up the soil to its original condition of productiveness.

A few years ago when the soil of a sloping field had been so robbed of its humus that the heavy rains began to wash enormous gullies through the hillsides and carry away into the streams all the top soil which the system of soil robbing had left, the remedy was to build terraces at intervals at right angles to the slope in order to arrest this removal of the soil by floods. The new Southern agriculture of today knows that the real remedy for this condition lies in planting that sloping field to clover or alfalfa or cowpeas or some other of the many rank growing forage crops which readily grow in such abundance throughout the whole South. The heavy vegetation thus produced effectually stops the action of flood waters. The busy soil microbes, working at the roots of the legumes, collect great stores of nitrogen from the air and add it to the soil's producing power, and when after a few years the farmer plows under this heavy growth, it adds great stores of humus, and marks a long step in bringing the field back to its original rich condition.

Meanwhile, he has pastured cattle, sheep or hogs throughout the year, winter as well as summer, upon his field, and has realized from them a greater profit than the field originally brought him when he applied commercial fertilizer and planted tobacco or cotton. The new South is realizing more and more the fact that it needs more good home-raised farm animals. Not only does it need greater num-



SELF-FEEDER FOR A MISSOURI FARM

bers, but it needs higher quality and increased efficiency in every class of domestic animals. The day has gone in the South as well as in other sections of the country when horses of no particular type or breeding are profitable to raise, when a steer which must be kept until it is four or five years old to be brought to marketable condition is a paying proposition, or when the razor-back type of hog can be profitably produced even in Southern canebrakes.

TOTAL PRODUCTION WILL INCREASE

In order to produce these diversified crops and to increase materially the number of farm animals raised, it should not be assumed that the output of cotton and tobacco need be decreased. On the other hand, it should constantly grow larger. The South can add enormously to its cotton crop without bringing into cultivation a single additional acre, and at the same time reduce the cost of production. It must do this by increasing the efficiency of each farm unit. The most accurate available figures appearing upon this subject are those furnished by the United States Department of Agriculture. These figures show that in 1900 Georgia, Mississippi and Iowa had approximately each the same number of farm families. The value of the farm products grown by these farm families in Georgia was $104,000,000, in Mississippi $102,000,000 and in Iowa $365,000,000. In other words, each farm family in Iowa produced nearly four times as much wealth as the family in Mississippi or Georgia. In producing these crops, Georgia spent $5,700,000 for commercial fertilizer, Mississippi spent $932,000, while Iowa spent but $337,190. In other words, while Iowa produced four times the farm wealth that Georgia produced, Georgia spent 60 times as much to raise each dollar's worth of produce as Iowa did. The significance of these figures is further illustrated when it is stated that, while Georgia owns but $33,000,000 worth of live stock, Iowa has $272,000,000 worth. These figures in themselves, without further comment, should serve to point to the Southern farmer the way out of his agricultural wilderness. In all the history of agriculture the connection between maximum crops and a high

degree of soil fertility, on the one hand, and the keeping of farm animals and the return to the soil of the manure produced by them, on the other, has always been apparent, and nowhere is it more forcibly illustrated than in an examination of agriculture in the South. The Iowa farmer returns to his soil the fertility produced by his live stock. The Southern farmer ships all this plant food away. That is the whole story.

In every section where it has become necessary, for any reason, to change the established system of agriculture, there have always been apologists for the old order of things, who have advanced local conditions as excuses for continuing the pernicious system of farm practice. The South has been unfortunately afflicted with its apologists of this nature. It has been argued that the South is not primarily adapted to live stock producing, that it hasn't the feeding nor the marketing facilities and that its climate is not suitable. All these excuses have in turn been proved fallacious. The most discouraging hindrance to southern cattle growing, until very recent years, has been the inroads which Texas fever has made on native southern cattle. This disease, however, is now thoroughly under control, and its absolute eradication is but a matter of a few years at the most. Any southern farmer can, with a minimum of expense and labor, rid his herd of Texas fever and keep it free indefinitely. This disease is no longer necessarily a hindrance to cattle growing. The entire South has a climate in which it is rarely necessary to protect cattle in winter. There is abundance of forage and plenty of water. The southern cattle grower has none of the severe drawbacks with which the northwestern ranchman has to contend.

The forage which grows wild, in the old field and waste lands of the South, and annually goes to waste there, would protect the cattle of the entire western ranges from winter starvation, which so frequently faces them now. For concentrated feeds and grain, the natural advantages of the South excel those of the best feeding districts in the northern Mississippi valley. The South, in spite of its record of only 14 to 16 bushels of corn per acre as an average, holds also the record for some of the highest acre yields ever produced in the world. The reason that the South buys corn from the North is not because of the inability of the southern soil and climate to produce this crop in tremendous quantities, but because of the absolute indifference and bad agricultural practice of the southern farmers.

SOUTHERN FEEDS AND FORAGES

There are millions of tons of cottonseed annually produced. Thirty years ago this by-product of cotton raising was considered a nuisance, and one of the problems of cotton gin owners was how to dispose of it. It was customary at that time to set fire to the large heaps which accumulated near the cotton gin and get rid of it in this manner. Finally someone began to use the half-decayed material from these cottonseed heaps for fertilizer, and found that it had considerable value for this purpose. Later it was found that the oil which could be extracted from cottonseed had many commercial uses, while the material left after pressing out the oil was eaten with great relish by live stock, and thus instead of being a waste product, cottonseed had come to have a definite recognized value as

a live stock food. It has steadily advanced in value from $3 to $5 a ton up through a steadily increasing scale until it has reached at times as high as $30 per ton. In 1909 the cottonseed crop of the South was valued at over $150,000,000. The oil meal cake made from cottonseed is one of the best meat and milk-producing feeds known. Yet most of this enormous amount is now shipped North or to Europe and fed there, its ultimate fertilizing value being lost to the southern fields and gained by the land upon which the feeding is done.

At the same time that thousands of tons of valuable forage are being allowed to waste, and that these millions of dollars worth of rich, concentrated feed are being shipped from the South, the packing houses at Kansas City, Chicago, Omaha and St. Louis are shipping into the South millions of pounds of dressed meats, which have, in large part, been finished upon southern-grown cottonseed meal.

What is true of the cattle situation, is equally true with regard to mules. For various reasons the mule is much in favor all over the South for a work animal, and for a great many years the South has been the principal market for the thousands of mules produced in the North and Northwest. In South Carolina alone it is estimated that at least 25,000 horses and mules must be added to the state's live stock supply annually in order to keep up the supply of work stock. At the present time, a very large per cent of these are produced outside of the state, and this condition prevails all over the South. Yet there is no section of the country more suited to the growing of good mules. There is scarcely a day in the year when a young mule will not run at large in the woods and waste lands of the South

and keep in good condition without receiving a single pound of feed other than he is able to gather for himself. This condition should be taken advantage of, and the millions of dollars now paid to northern farmers and stock raisers every year for animals with which to draw the plows in the southern fields, should be kept in the South where it belongs. Three million dollars a year for South Carolina alone represent the amount paid to northern farmers for work animals. The South should produce its own work animals, not only in order to keep these vast sums of money at home, but because they can produce animals which are suited by nature to southern conditions, while it takes from one to three years for northern-grown animals to become accustomed to the climate and to reach their greatest degree of efficiency. Another reason, and not the least of them, is that the estimated value of the manure produced annually by each horse or mule amounts to no less than $28, gauged by the market prices of commercial fertilizers. Southern soil needs this material.

The field for the growing of hogs in the South is unlimited. The old razor-back type which has been synonymous for southern live stock for generations, was developed from hogs which escaped from their owners and became half wild in the southern woods, subsisting upon nuts and other foods which they were able to find in the woods and swamps. They increased tremendously in number without any care or attention, and in the face of all the obstacles which they would be likely to encounter in wild life. The same conditions which permitted this class of animals to thrive so mightily are equally favorable for the breeding and growth of a type of hogs better suited to modern condi-

tions. Where corn and clover are available, there, generally speaking, hogs will thrive, and cheap gains will be procured. In most sections of the South, clover or some other leguminous forage can be used for hog pasture every day in the year. Corn can be produced at will, and the climate is especially favorable to the production of winter pigs, which have never been an unqualified success in the hog growing districts of the North.

The South is a wonderful land for legumes. There is scarcely a type of soil upon which some one or another of various rich leguminous crops will not thrive. In one section it may be red clover, in another alfalfa and in still another field peas or crimson clover or Japanese clover, or soy beans, but in nearly every instance some one or more of these can be made to produce abundant pasture throughout the year. The southern farmer should never lose sight of the wonderful soil-restoring properties of leguminous crops, while at the same time utilizing their growth in the feeding or pasturing of farm animals.

POSSIBILITIES OF SOUTHERN DAIRYING

Possibilities for dairying are almost without limit. Enough has been said already of the forage and feeds which can be produced in this section to indicate to the mind of any practical dairyman the wonderful possibilities of milk production under these conditions. This field has scarcely been touched. The creamery and butter production of the South is entirely inadequate to meet the demand. Less than one-twentieth of the amount used is produced in the South, although

the southern creameries produce a grade of butter that is equal to the best of northern and western product. It is estimated that at least 25,000,000 pounds of creamery butter are imported into the South annually from the northern and western states. The milk supply of most southern cities is inadequate to the demand. In many cities 10 cents a quart is the prevailing retail price of milk, and, in most instances, the product of a first-class, up-to-date, sanitary dairy would command much higher prices even than this. In some places, a shortage of fresh milk of any quality exists, so that large hotels are compelled to keep on hand a supply of condensed milk to be used in case of emergencies.

When we consider the effect that the up-to-date, advanced type of dairying has had upon the soils of northern communities where dairy farming has been practiced for a term of years, and when we consider also the tremendous field open in the South for this type of farming, the results to southern agriculture from the addition of several millions of dairy cows to its live stock supply can be readily imagined. Both the direct and indirect results from the development of an advanced type of dairying will make for the financial betterment of the farmers. The production of milk and butter for high-priced markets by the use of cheap feeds will bring immediate financial results to the farmer, while the indirect result from the application to the soil of the fertility produced by these millions of dairy cows will result in a permanent readjustment and the upbuilding of the soil's producing capacity. Still, many southern farmers have found dairying in that section unprofitable. The reason for this does not lie in the natural disadvantages of the region, but is rather because the farm-

ers themselves do not know how to make it profitable. In the 13 southern states the average cow, according to the census of 1900, produces annually only 3,036 pounds of milk. This will test on an average, 4⅘ per cent of butter fat, and will make, therefore, only about 170 pounds of butter. This low production and low degree of efficiency of the animals kept, is the greatest cause for small profits. The standard adopted for a good dairy cow requires that she shall produce at least 6,000 pounds of milk and 288 pounds of butter annually. The South not only needs more dairy cows, but it needs vastly better ones. In 1900 there were a few more than 4,000,000 dairy cows in the 13 southern states, producing 1,444,291,536 gallons of milk. These cows were in about the 3,000-pound class. If they had been of the standard adopted by dairymen for a good average dairy cow they would have produced 2,859,042,558. This would have represented an increased efficiency of 1,414,751,022 gallons of milk or 58,400,000 pounds of butter fat. This increase would have been worth something like $240,000,000. In other words, the South was feeding to her dairy cows an amount of feed which produced $240,000,000 less than its true feeding value indicated. The southern farmer has begun to see that it does not pay him to feed two or three cows in order to obtain the amount of milk which one cow should produce. He is beginning to see that it does not pay him to raise cattle which are worth $11 or $12 a head, when a good type of steer bred especially for the export beef trade sells in Virginia at from $60 to $80 a head. It takes as much feed and a lot more work and worry to produce the former type than the latter.

SIGNS OF THE TIMES

Certain districts in the South within the past five years have made enormous strides in ridding themselves of the one-crop idea. They no longer carry all their eggs in one basket. In some of the districts in Texas, which the boll-weevil devastated in 1903-4, they are now shipping carloads of cattle and hogs—this from a district where five years ago every pound of meat consumed locally was shipped in from northern packing centers. This same progress is true with regard to the raising of potatoes, onions and other food crops upon land formerly devoted exclusively to cotton growing. In one district the production of cotton dropped from 16,000 bales to 9,000. The farmers were driven to raising food crops and live stock, and within five years their output of these products had increased 500 per cent. At the same time they have been able to gradually increase their output of cotton, although farming a smaller area in cotton, so that by the time this tremendous output in foodstuffs was reached they were again producing from 15,000 to 18,000 bales of cotton.

These examples of a readjusted southern agriculture and the best teachings of the southern agricultural colleges, point out definitely and clearly the route for placing southern farming upon a permanent and suitable basis. Give the southern soil a chance to show what it can do in the way of growing heavy forage crops of legumes and what it can do in the way of producing more and better live stock. Give it a rest from its years of tobacco and cotton growing, and establish a definite rotation which will call for the growing of clovers, and for the addition of the fertility produced by the

animals. Feed those millions of tons of cottonseed meal in southern feed lots and return to the southern soil which produced it the millions of tons of soil fertility contained in it. Raise hogs, cattle, mules and sheep. They will represent so much clear profit. Return to the soil all the manure produced by these animals, and in addition occasionally plow under a good heavy growth of clover. Work into the soil all the organic matter which it can take care of. Southern soils must be built up and maintained. There is no new land to be opened when this wears out. Place soil maintenance upon a rational and scientific basis with a well-defined rotation of crops, with extensive live stock production as the balancing factor and connecting link between rotation and permanent fertility, and the South will present a condition of agricultural prosperity which has never been equaled by northern localities less favored by natural conditions.

CHAPTER V

Let the West Heed the Warning

The various examples of gradually decreasing yields in the southern states and along the Atlantic coast should be sufficient warning to the dwellers in the more fertile and newer regions of the West and Northwest. While it would be difficult to prove by statistics that the total yield of grains and other crops throughout the United States is less than formerly, this decrease is evident and easily proved in parts of New England, New York, New Jersey and the south Atlantic states, where the ground has been cultivated for several hundred years. In those localities there is not any question as to the result of continuous grain cropping and failure to keep large numbers of live stock. In fact, in many sections a considerable percentage of the farm land is unprofitable because of waning production. On the other hand, in these same old localities, frequently examples of maintained fertility and increased crop production demonstrate that by intelligent handling the productive capacity of almost any soil in the United States may continue for an indefinite period.

The most disastrous feature in these older sections, and which the West should heed, is the growing of grain crops continuously on the same land. It has been positively proved that decreased yields under those conditions must follow. In 1888, an experimental plot in Champaign county, Illinois, under the direction of the university of Illinois, was set aside for continuous corn grow-

ing. That year the plat yielded 54.3 bushels to the acre. The same plat in 1909 yielded 29.4 bushels per acre. This is one of the longest and most satisfactory experiments in the country with corn, and may be taken as an indication of the final result of cropping without rotation and live stock.

While the general farmer does not, of course, grow one grain continuously, he very frequently thinks that the rotation of corn with oats and wheat ought to bring him good results. Yields from that kind of a rotation, for a time at least, will be greater than from continuous growing of corn, or wheat or oats, but in time the land will become unprofitable. He soon learns that he must include in the rotation leguminous crops—the common clovers, alfalfa, beans, peas and vetches. If along with this he maintains enough live stock to consume the bulk of the grain and forage grown on his farm, he can continue to raise profitable crops almost indefinitely, provided he does not abuse his land by working it when too wet, or by allowing his farm animals on the fields when the ground is full of moisture.

A little figuring will demonstrate what the decrease in production really means to the United States in particular and to the world, as a whole. With the increase in population it will not be many years before famine conditions will exist in nearly every section. Of course, no one expects that farmers will be so unwise as to permit anything of this kind, but lack of intelligence and system in handling lands will ultimately result in just this thing. Statistics going as far back as records are available in the United States indicate that for the United States, as a whole, the yield of crops has increased in the aggregate per acre, rather than

decreased, as is commonly supposed. That this will continue is hardly to be expected. Up until within the last decade vast tracts of new lands have been opened each season and large yields from these have tended to maintain the general average. Further than that, the number of farm animals in the country have also shown an increase. It is a recognized fact that the increase in the productive capacity keeps pace with the increase in the number of farm animals kept.

Again, going back to figures, it has been shown that a 100-bushel crop of corn takes from the soil about 100 pounds of nitrogen, 17 pounds of phosphorus and 19 pounds of potassium in the grain, and about 48 pounds of nitrogen, six pounds of phosphorus and 52 pounds of potassium in the stalks. Now, if this grain and forage is all fed on the farm about three-fourths of the nitrogen and phosphorus and one-third of the potassium is left behind and is available for future crops, provided the manure is properly taken care of. If the manure is neglected one-half of the fertilizer constituents are frequently dissipated in three or four months.

FARM MANURE VERY VALUABLE

Now, to show how really valuable farm manure is it must be remembered that each ton of fresh manure contains about 10 pounds of nitrogen, 2 pounds of phosphorus and 8 pounds of potassium. As the nitrogen used in crop production can easily be collected from the air by growing leguminous crops, there is no reason why there should be any expense in supplying this element. One ton of clover hay contains about 40 pounds of nitrogen, 5 pounds

of phosphorus and 30 pounds of potassium. When grown on soil of average productiveness, the roots and stubble contain about as much nitrogen as the soil has furnished to the plants, so that that contained in the forage is the quantity added, provided it is fed on the farm.

The phosphorus and potassium actually used in crop production must be supplied by the purchase of commercial fertilizers in the form of bone meal, rock phosphate and the various potassium salts. The proposition to supply the necessary organic matter and keep the land in proper mechanical condition is not very difficult, because where live stock is kept there must be enough of this material for feeding the animals.

With these facts in mind it is self-evident that shipping away vast quantities of corn, oats and hay is exceedingly bad practice. It is bad practice from the standpoint of soil fertility, and it is bad practice to sell the raw material rather than work it into the finished product, for the manufacturer's profits are lost. It is bad practice to dispose of any raw material on the farm, if by utilizing it at home a higher grade of production can be secured and the cost of marketing thereby greatly reduced. Compare, for example, how much less expensive it is to market several carloads of cattle than to dispose of the corn and hay and other feeds required to feed them for market. A further illustration is seen in the dairy industry, where the milk is sold in bulk and shipped to distributing centers. Where this whole milk is sent to the creamery the skim milk is hauled back by the man who delivers the whole milk and the cost is practically nothing. The butter, which represents the finished product, is so small in bulk, compared to the milk, that the cost of marketing is

greatly lessened. It is the same all along the line. Market everything you can through your horses, your cattle, your hogs, or your sheep.

STOCK ON HIGH PRICE LAND

Accepting the above as good, sound business policy, the question naturally arises, can live stock be profitably raised on $200 an acre land? Prof. H. W. Mumford of the university of Illinois insists that it can. Some forms of live stock production should and will be abandoned. Scrubs must be disposed of. Plenty of feed must be used and the feed must be economically and judiciously handled. Contrary to the opinion that has been frequently expressed, Professor Mumford states that except in minor instances, it is not true that the older agricultural countries like Germany, France, Holland and Denmark, are abandoning live stock production because of increased population and increased price of land. Whether or not live stock may ultimately disappear from the farms of the United States is largely a matter of conjecture. This tendency is so remote that at present it need not be considered. It is the consumption of corn and other grains and hay by live stock that makes it possible for the man in the middle West to produce heavily and thus reach this present high valuation. With the elimination of live stock husbandry this large return would not be possible. It is estimated that 80 per cent of the corn produced in the United States is fed to live stock. This home consumption, therefore, is the chief reason for the high-price grain and consequent high price of land. Not every farmer will be able to make live stock on $200 an acre land pay, but, as a rule, the intelligent, skillful feeder can and

every farmer, even on this high-price land, will find it to his advantage to keep a limited number, at least, of all classes of animals adapted to farm conditions.

While it is true that profitable stock production up to date has been usually associated with the cheap lands and with free range in the West, it is also true that with the settlement of these areas the total number of animals in the United States is increasing and the benefit to the section as a whole is becoming greater and greater every year. Therefore, there is probably very little force in any argument against the general proposition that stock carefully selected, intelligently handled and economically fed is profitable on any land in the country.

The most difficult problem in profitable live stock husbandry on lands of the middle and western states, under present conditions, is that of cattle. Cattle require a large grazing area, and they must be at least two years old before they can profitably be disposed of. The best authorities say that even under these conditions there is no reason why, by selecting breeding stock with great care, by feeding economically and judiciously, cattle production is not profitable. With hogs and sheep, however, the problem is quite different. It is much easier to get a start with either hogs or sheep, they multiply more rapidly, can be kept on more restricted areas and do not consume nearly as large quantities of feed.

Taking sheep, there is little or no reason, present prices of wool and mutton considered, why every farm in the United States should not support a flock containing all the way from 25 to 60 head. It may surprise many to know that a flock of this

size on the average farm can be kept at very little expense. They will eat feed that other animals pass by, will destroy and keep down weeds, will clean up brush fields, will eat cheap roots and occupy very little stable room. They are not expensive animals to take care of, and the cost of maintenance for a year, if they are handled as indicated above, is so small that the greater part of the balance from sales of wool or mutton is net profit. By annually culling out the older and inferior animals a small flock of high quality can be maintained. They will bring a nice sum of money from the sale of wool alone. Every fall or winter a number of animals are available for fattening and sale as mutton. Sheep manure is exceedingly rich and being finely divided and widely distributed, is a valuable asset to the farmer who keeps a flock. Sheep husbandry for the West is, therefore, one of the means by which the waning fertility may be checked and conditions now existing in the older states prevented.

Much the same conditions surround the hog situation. Of course, hogs do not consume as much waste material as sheep. They must have considerable grain, particularly corn. But if properly handled, sows may be made to produce two litters of pigs every year, and at this rate it is easily possible to very rapidly increase the hog stock and still have available for sale every season a nice lot of fat hogs, which at prices that have prevailed during the past few years, are immensely profitable. Hogs can be partially fattened on clover pasture and on rape and on other crops which tend to increase the fertility of the soil and improve the mechanical condition. Hogs do not require a large amount of shelter, are easily handled, and during the past ten years have not been subject to nearly

so severe outbreaks of cholera and other swine diseases as a couple of decades ago.

That the supply of hogs is not keeping pace with the demand is proved by the wonderfully high prices paid for fat hogs during the winter of 1909-10, when hogs at the central markets sold for 10 to 11 cents on the hoof for weeks at a time. There is no reason why the industry should not be immensely profitable, even though the stock be raised on $200 an acre land and fed 60-cent corn.

The keeping of hogs and of sheep both tend to prevent waning fertility, because of the fact that they thrive and fatten on leguminous crops, particularly the common clovers, alfalfa, cowpeas, soy beans and in addition both are well fitted to consume root crops such as turnips. All these crops both add to the fertility of the soil and improve the mechanical condition, so that while the hogs and sheep are being fattened and fed, the productive capacity of the land is being increased.

As has been so frequently stated, one of the most expensive plant foods necessary to maintaining fertility is nitrogen. This can be secured by the growing of clover and leguminous crops and if large areas of these crops can be raised every year on every Illinois farm, and if these crops are consumed by some kind of live stock, the West will never be compelled to make good a lost fertility, as is being done in the East.

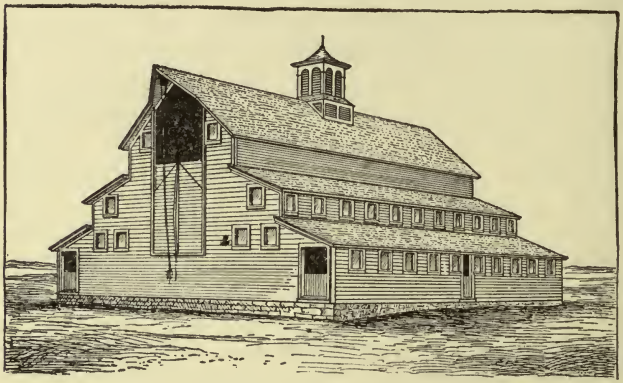
FEED ANIMALS LIBERALLY

The presence of large numbers of farm animals is not, however, the only item that is necessary to prevent waning fertility. These animals must be liberally fed and the feeds, if the whole proposition

is to be profitable, must be largely produced at home. Consequently, first see that you have plenty of live stock and then see that your land is in good condition and capable of producing large crops. After you have secured the crops see that the stock is given a liberal quantity and that this is fed judiciously, so that the largest amount of benefit is received. There is an old saying that the more manure produced on the farm the bigger the crops and that the bigger the crops the more live stock can be kept. This saying is just as true now as 200 years ago. Corn, alfalfa and common clover must be the tripod supporting western agriculture.

Since the matter of beef production is of such paramount importance, it goes without saying that on many farms in the middle West more feed will be demanded than can be supplied by the acreage under cultivation. Consequently, a careful consideration of buying feed for cattle is worthy of discussion. As a general proposition it is a pretty difficult problem for a cattleman to show a considerable profit where he must buy all his feed, including corn, or other concentrates and forage. The resident of the corn belt, therefore, is fortunate in that the bulk of the forage and the greater part of his grain feed can be purchased at home. The age and condition of the cattle used must, of course be considered. To fatten a two-year-old steer weighing 1,000 pounds will require about six months. During this time from 55 to 65 bushels of corn and one ton of hay will be used. It pays to supplement this carbonaceous feed with small quantities of oil meal or cottonseed meal. Then, if clover and alfalfa are available, conditions are quite satisfactory. If cattle are on grass during the time the grain is being fed, gains will be made

at a comparatively small cost. If the feeder knows about how much stuff his animals will consume during the feeding period he will be able to determine whether or not he can feed to advantage. So much depends upon local conditions that it is absolutely impossible in a work of this kind to give any absolute and specific advice. The cost of feed any one season, the price received for fat animals,



BEEF CATTLE BARN

the cost of hired help—all these things must be looked at in the light of local conditions.

The number of cattle to be kept on the individual farm is also a matter which the owner must decide for himself. It would probably be inadvisable, however, to feed less than a carload. He can handle these nicely on a small farm, and is in a position to secure numerous advantages in the way of reduction on freight, labor, purchased feeds, etc. Of course, if he can feed several carloads, he has still further advantages. Some animals do not fatten quite as quickly as others, so that those ready

first can be picked out and shipped and the others finished later. The successful feeding of cattle loses much of the labor to those who make a close study of the business, who take advantage of every favorable opportunity of carefully selecting and utilizing the various feeds available.

There are a number of things in feeding cattle which must be avoided. For example, one success in a neighborhood often results in disaster to those who have not had large experience. They figure that if one farmer can feed cattle successfully, there is no reason why another cannot, in spite of the fact that this other farmer has had no previous training and does not know how to make every item count. The only way to succeed is to start in a small way. Eventually you will become a skilled feeder and will know how to make a profit almost every year. In nearly every case cattle for feeding have to be purchased from outside. The profit in the proposition will depend very largely upon your skill in making a purchase. Not only should the animals be bought as cheaply as possible, but the great problem is to be a good enough judge of feeders to select steers of a quiet disposition, of typical beef conformation and animals that will put on fat rapidly, at the least possible cost. After this is done the matter of starting them on feed gradually and also being able to detect immediately any symptoms indicating sickness or failure to properly utilize all feed given, are of prime importance.

The general principles enumerated above in regard to cattle feeding apply also to feeding sheep and hogs and to a certain extent to the feeding of horses for market,

CHAPTER VI

Does Live Stock Pay?

All live stock is not profitable. It does not require careful observation and wide experience to demonstrate the truth of this statement. Hundreds of thousands of farm animals in the United States are kept at a loss. This is wholly unnecessary. If judgment is used in selecting breeding stock, if common sense is employed in handling and feeding it, there is no excuse for unprofitable animals anywhere. Occasionally an animal becomes unprofitable through sickness or age. Then the thing to do is to get rid of it without hesitancy. The great trouble to date has been, first, a lack of information as to just what a profitable animal is; second, a lack of inclination to dispose of unprofitable stock; third, neglect or ignorance in feeding and handling.

At this day and age of the world, there is absolutely no excuse for lack of information concerning farm live stock. There are enough successful and practical breeders in the country to prove what types are most profitable, so that anyone so disposed may easily find out what kind of a horse, or a cow, or a sheep, or a hog he must keep, if he desires to show a profit on the right side of the ledger. Never before have the agricultural colleges and experiment stations done so much along these lines. This information is available in bulletin and book form or can be obtained by visiting successful stock breeders, attending agricultural meetings, etc. To neglect this source of information is a decided weakness and should not be tolerated.

Lack of inclination to dispose of unprofitable stock is a more serious problem, for if farmers with the information at hand refuse to avail themselves of it, there is no means of compelling them to do it. The average of intelligence, however, is becoming higher and higher on the American farm, so that this problem will shortly solve itself. Further than this, it has been demonstrated so clearly that unprofitable animals are a serious detriment to American agriculture that no wide-awake farmer will tolerate them. Get rid of the unprofitable herd as soon as possible. Do not breed from such stock and unprofitable animals will soon disappear. Fatten the unprofitable cow, sheep or hog immediately and get it out of the way. An unprofitable dairy cow may have to be sold at a small figure, but the thing to do is to fatten her and send her to the slaughterhouse without delay.

Probably one of the greatest sources of loss by unprofitable live stock is keeping dairy cows that do not return enough in the way of production to pay for their keep. Before the advent of the Babcock test and the schemes for analyzing and valuing feeds, there might have been some excuse for not knowing just what the dairy cow was worth from year to year. With all these devices, however, it is now easily possible to determine just how much a cow eats during a given period, determine its cost, and then compare the cost of feed and handling with the return from the pail for a few weeks or a few months and you will know what the cow is worth to you for the year. Those that do not produce at least $10 to $15 above the cost of production should be disposed of immediately. No one should be satisfied with a herd that does not net him between $35 and $50 per head per year above

all expenses. Recent tests in various dairy sections of the United States have shown that in many cases four cows were not producing as much net profit as two should.

Dairy farming always will be the most profitable branch of American agriculture, as long as it is intelligently handled. A dairy farmer has a small manufacturing plant on his own place. There is the raw material in the way of feeds which enter into the finished product, such as milk or butter. The by-products are retained on the farm for feeding stock and enriching the soil. If cows of a high grade are kept, there is absolutely no question as to the final outcome, but the dairy cannot be profitably run unless all cows are paying their way from the start.

PROFITS ON HIGH PRICE LAND

The matter of profitable live stock is becoming of increasing importance with the advance of land values. When land was worth from $20 to $50 per acre, when corn could be had for 25 cents per bushel and oats at 20 cents, when grass could be had on the range or on land that was not costly, the proposition was not so serious. Of course, profits were correspondingly small, but the amount of capital invested was also small. With the passing of the years, however, all prices have advanced, so that today $200 an acre land in the corn belt is common. The dairyman must pay 50 to 60 cents per bushel for his corn and 30 to 40 cents and sometimes more for his oats. His grass is grown on land that in many cases is just as valuable as cultivated areas. Concentrated feed is also high, and so it comes about that the scrub must go. The

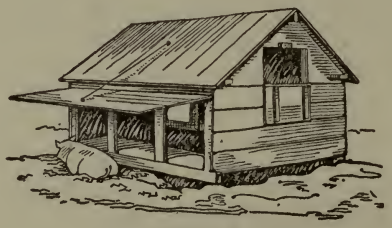
animal that will not mature quickly, will not breed well, will not produce large quantities of milk containing a high percentage of butterfat, is an unprofitable proposition. Scrub stock is unsatisfactory in more ways than one. Uniformity cannot be secured, early maturity is impossible, the maximum utilization of feed cannot be secured, so that the only possible way out of the difficulty is for the modern farmer to make up his mind to keep nothing but superior animals.

This is not as difficult a proposition as one would at first suppose. It is not beyond the means of any farmer to start and build up a profitable herd in any branch of live stock. Of course, I do not advise every man to spend a lot of money in starting a pure-bred herd, buying high price animals, but a profitable working herd may be built up without very much expense. Take, for example, dairy cows. If you already have a herd of 20 cows, test these carefully and retain only those that pay their board. Replace the ones disposed of by purchasing good, vigorous, thrifty, prolific cows of known value. Then buy a pure-bred bull of good individuality. When the calves come, retain only those which give promise of rapid growth and early maturity. When they come into milking, test them at once, and if they do not come up to the standard, throw them out. Decide on what breed you like and buy a bull of that breed. If you want to keep Jerseys get good Jersey cows, or at least a good grade, and keep a first-class Jersey bull. In four or five years you will have a herd of cows that cannot fail to return a profit.

With horses it is even easier. Buy up as many roomy, thrifty mares as you want. They need not be pure-bred animals, but see that each individual

is a good one. Then buy a stallion, or secure the use of one that is pure-bred, that comes from a line of ancestors noted for excellence. Dispose of the colts that are not satisfactory and in a few years you will have horses that will increase your bank account right along. The grade mares may gradually be replaced by pure breds, if you want a herd of this kind.

The sheep problem is still easier. There is no trouble at all in keeping up a lot of grade ewes that will breed you first-class lambs. Be sure that you have a pure-bred ram at the head and never vary



IOWA HOG HOUSE

from this. Dispose of the ewes as they get old, or as they become unprofitable from any other cause. Do not hesitate about this—fatten them and sell them. Keep only the best and in a little while you will have a working flock of sheep that is up to standard. With sheep you have not only mutton, but wool. Every farmer, or, at least, every farm, can profitably keep a small flock, to utilize waste feeds, keep down weeds and bring in money with a regularity that will be surprising.

The hog problem is also an easy one. If you like Berkshires, buy a couple of sows and a pure-bred boar, then use high-grade individual sows to make up the balance of your breeding herd. In a very

few years you will have pure Berkshires, which can be sold at a profit for breeding purposes, or turned over to the packer. It is just as easy to do the same thing with Poland Chinas, or Durocs, Chester Whites, or Mule Foot hogs, or any other of the standard breeds. Another thing, above all others, to be observed, is to get rid of unprofitable individuals and never, under any circumstances, use an inferior or grade sire. Always have a pure-bred male and see that he is a good one.

SELECTING BREEDING STOCK

The matter of intelligently selecting breeding stock calls for the nicest discrimination. While breeding animals must be pure bred, it does not always follow that a pedigreed animal is a desirable one. A lot of pedigreed scrubs have done untold damage to the breeding interests of this country. The individuality of the animal must be considered. If an animal has not proper conformation, if vigor and constitution are not present, if prepotency does not exist, there will be no satisfaction, to say nothing of profit.

The first thing to do in selecting a breeding animal is to consider blood lines very carefully. Find out what his ancestors have done, what their records are at shows and at the block. If you are breeding fast horses, look up the racing records of ancestors back as far as possible, at least eight to ten generations. If breeding beef cattle find out the show records of ancestors and how popular they have been with beef raisers. All these things must be given very careful consideration. If the pedigree is right and if the individual is right, and if the breed selected is your favorite,

the success of the enterprise depends, then, upon careful feeding and handling.

The greatest possible damage has resulted by an indiscriminate mixing of blood lines. It has been so fully demonstrated that a violent cross never can result satisfactorily that further discussion would seem unnecessary. Yet, even at this late date, it is not uncommon to see a cross between a Shorthorn and Holstein, between a Holstein and a Jersey —between Percherons and trotters. The resulting stock can never be satisfactory in the long run. The first cross may produce possibly a good animal, but subsequent crosses are sure to result in a lot of animals lacking in uniformity and in characteristics for which one or both lines have been noted. If you breed Shorthorns, stick to Shorthorns and the type which, to your mind, is most desirable. Do not cross Percherons with Clydesdales, for the colt will not make as satisfactory a horse as if animals of the same strain had been mated.

With hogs it is not so bad, if the first cross is to be sold to the butcher. A cross, for example, of a Berkshire and a Poland China often results in a market hog that can be raised with satisfaction and sold with profit. To maintain your herd, however, you must always have some pure-bred animals, as well as animals of some distinct standard breed. From these you can maintain your herd and replenish your breeding stock. If, after this has been done, you care to experiment with hogs intended for the block, possibly some good results may be secured. It is a pretty safe proposition, however, to stick to rigid lines and refrain from much crossing.

The only place where a pure-bred sire can be used without regard to the problems above enumer-

ated is when you are grading up your herd, or when you are breeding for a good working herd, without any regard to developing pure stock, or securing high prices for a pure-bred animal. If you have for instance, a lot of good individual cows of various breeds and crosses, the use of a pure-bred bull will give you meat animals that may be raised and disposed of at a profit. The same is true of sheep and hogs, that is, building up a working herd and not raising breeding stock. Too much emphasis cannot be placed upon this matter for as the years go by and as conditions change, it is more and more important to give careful thought to the matter of keeping your blood lines pure.

CHAPTER VII

Basis of Profitable Stock Breeding

The basis of all profitable live stock breeding should be good blood lines. By this is meant animals of quality, with ancestors with a record. It is not sufficient that an animal should simply have a pedigree. It must be a good individual and also have ancestors possessing like characteristics.

With this in mind, the next important step is discrimination in selection. The breeder must not be influenced by fancy, whim or what are considered strictly breed points. The fact that a man may much prefer a red Shorthorn will undoubtedly influence his selection of breeding stock, but it should not determine his choice of a moderately satisfactory animal of his favorite color, rather than a very high grade roan, for example. Of course, if the breeder is not in business from a purely money standpoint, he can afford to indulge in fancies, although the results will, in the end, not be so satisfactory as though he had adhered to recognized and established principles of breeding. If in connection with these principles of selection he feeds liberally and judiciously, provides shelter during the winter and shade during the summer, there is no reason why he should not have a profitable producing herd, which will increase in value from year to year.

The matter of selecting a breed is largely a matter of personal preference and environment. One

man may have a very marked preference for Shorthorns. This may be based on sentiment, or upon his belief that Shorthorns are the most profitable cattle. One may be attracted by the compact form and beautiful white markings of the Hereford. He may be convinced that Herefords are the best animals, but a choice between the Shorthorn and the Hereford quite often is determined by the belief that Herefords look better. Then, too, one feeder may prefer the Angus, partly because they are very compact animals, uniform in color, and, of course, they are high-grade beef producing animals. Then, too, the matter of environment must also be considered. Herefords have the reputation of being good rustlers, able to take care of themselves under rather adverse conditions. For this reason Hereford cattle have always been popular on the range, where occasionally feed may be short and weather conditions severe. Angus cattle are considered best adapted to the corn belt conditions, where rich pasture and plenty of grain are always available. Galloways ought to do well in rough, mountainous regions, because the breed originated in very rocky territory in Scotland.

Chester White hogs, for example, are not considered entirely satisfactory for southern latitudes, because it is claimed they show more of a tendency to sun scald than some of the dark breeds. Poland Chinas are exceedingly popular in the corn belt, because they do especially well on a ration consisting largely of corn. Yorkshires and Tamworths are considered desirable bacon hogs in Canada, because they thrive on field peas and oats, barley and other feeds which grow in abundance in that region.

Shire and Clydesdale horses are most popular in

Canada, because of the preponderance of English and Scotch. This is largely a sentimental reason. In the United States, where sentiment plays a smaller part, the Percheron is probably the most popular horse, because of his activity, his clean limbs and his value as a general purpose beast of burden.

Rambouillet and Merinos are popular on the western ranges because of their great rustling qualities and hardy constitution.

Consequently, because of the great variety of tastes and varying conditions of soil and climate, there will always be representatives of the leading breeds of live stock, widely distributed. It makes very little difference what breed is chosen, provided it is suited to the purpose for which it is purchased. There are excellent animals in all breeds, so that if one man prefers a Hereford, another a Shorthorn, and a third a Galloway, all of these breeders have a splendid chance to succeed, because they believe thoroughly in their favorite types and will build up a profitable herd.

SELECTING BREEDING ANIMALS

After the blood lines are determined upon, after the selection has been carefully made, after the breed has been decided upon, it must not be forgotten that, after all, the most important item is quality. Quality is a rather difficult term to describe, because it has a different meaning applied to different purposes. In general, it means a high grade animal, thrifty, compact and vigorous in every particular. Taking beef cattle, there are two divisions of quality. Generally speaking, quality means refinement of external conformation, as seen

in the head, form, bones, muscle and smoothness of outline. It is affected by nothing so much as by breeding. It is not often found in the plainer bred steer, but is generally characteristic of a well-bred animal. The possession of general quality is of the utmost importance in selecting feeders. It is difficult to explain; its determination comes largely by experience. It is for this reason that an old cattleman can often discover this form better than one who is thoroughly familiar with live stock, but has not had large experience in selecting the feeders.

The second quality is called handling quality. This indicates that the animal is a good feeder. This is determined by the feel of the skin. To be a good handler, the hair must be of medium fineness and the whole animal have the appearance of good breeding.

The farmer must be familiar with the leading characteristics of the different types. To illustrate this, a consideration of one type in each of the general classes of farm animals will be enumerated.

CONFORMATION AND CHARACTERISTICS

As the draft horse is probably the most profitable for the general farmer, a somewhat detailed enumeration of desirable characteristics will be given. The general formation of the draft horse includes a heavy frame, a compact and blocky body, a comparative shortness and strength of limb, all these being in proportion. The weight is a most important consideration in a draft horse. A draft animal in fair condition at maturity ought to weigh anywhere from 1,500 to 2,000 pounds. The height is not so material, provided the necessary weight is present. Quality and substance, as shown in hard

bone and joint, should be prominent. The hair should be fine and silky, the bones smooth, the joints neat and the lower limbs free from superfluous flesh. The action of the draft horse is particularly important in America. In the old country, where speed is not so important, the heavy and clumsy draft horse answers very well for hard work, but here even farmers desire action, and this is especially required by expressmen and others using large numbers of draft horses. Feet must be picked up with a snap and carried clear of the ground. High knee action is not essential, but a strong, steady movement of both knee and hock, without suddenness, is very important. The head should be lean, but not out of proportion to the body, having plenty of breadth between the eyes. The neck must be strong and muscular, with a slight arch. The shoulders should not be long and sloping as with light horses, but more upright, being well set in the back. The chest should be full and deep, indicating large capacity of the vital organs. The knee must be broad, the cannon bone round, with the tendons extending back to back, so that the attachment is deep and strong. The pastern, which is an important part of the leg, should be fairly long and perfectly smooth and free from extra flesh. The feet ought to be large, heavy, dense, preferably black in color and the frog large. The body should be short on top, long below, broad along the back, with ribs strongly attached.

The hock requires most careful study, for this joint is the seat of many troubles. As the horse stands in a natural position the hock should be straight and true, viewed from behind, showing no evidence of weakness. Where the hock holds a true position, the hind feet also stand true, neither

toeing in nor out. If a joint is too fleshy, puffiness is apt to occur, or a form of spavin is apt to exist.

Beef cattle, when of correct type, show a distinctly meat-producing formation. The animal is broad of back from shoulder points to hips, has a wide, deep body, short and somewhat thick neck, and rather a broad, thick, fleshy hindquarter. Viewed from one side the top and bottom lines of the body run nearly parallel, with the back quite level. Cattle of this type are commonly referred to as blocky, indicating compactness of form. The head must have a strong, broad muzzle, indicating superior grazing and feeding qualities. The nostrils should be broad, forehead broad and reasonably full, the horns refined, ears neat and attached to the head without coarseness.

The breast and chest are most important in beef animals. The breast should be carried well forward and be broad and full in the bosom. The chest, which lies between the shoulders and just back of them, should be full at the crops, showing much spring of ribs, and also well filled out in the front flanks. Too much depression behind the shoulders, or a narrow, contracted lower chest indicates lack of constitution. The front legs should have wide, muscular attachments. They should be short, coming straight down, viewed from the front or side. Closeness about the knees indicate a narrow chest. Fine bone and smooth joints are an evidence of superior quality.

The back of beef cattle carries an immense weight. It must, therefore, be strong. All the high price meats on the carcass are found on the back, so that it is important that the ribs be well arched, to carry as much of this high price product as possible. The hindquarters, viewed from behind, should be thick,

coming down perpendicularly on the outside, where the thighs naturally narrow.

Quality in a beef animal is shown by a fine bone; moderately fine hair; a mellow, moderately loose skin; medium size, well set ears, and horns of moderate size and fine texture. Coarse bone, rough joints, long legs, scraggy horns, indicate lack of quality. The skin is a most important indication of quality. Taken in the hands over the ribs it must seem mellow and pliable to the touch, being easily grasped and stretched. Thin skin is undesirable in a beef animal, while, on the other hand, a very thick skin is to be avoided.

The ability to put on flesh evenly is of great importance in the beef animal. The increase must be uniformly distributed all over the body. This can be determined by passing the palm of the hand along the back and shoulders or sides. It should find no evidence of irregular covering, with poor spots in one place and heavy fleshing in others.

DAIRY CHARACTERISTICS

Dairy cattle are entirely different from beef cattle. The body is not so thick, there is less strength of back, the thighs are narrow and the neck slender. The triple wedge form is associated with the dairy cow. Viewed from one side, she shows a less depth of body in front than behind. She gradually widens from the breast to a point of the hips and hindquarters. Looking down the back at the withers, the form widens out like a wedge toward the middle of the body. Many notable dairy cows possess this wedge form in a striking degree, but, of course, exceptions occasionally are made.

Fleshiness of the dairy cow is objectionable,

except possibly where the animals are young. The head of the dairy animal must be lean, with broad muzzle, short nose, large nostrils and dish face. The ears must be thin and pointed. The horns must be very fine, without any indication of coarseness. The neck is long and muscular, with the exception of bulls, in which it is strong and heavily muscled. Shoulders should incline at a good angle well into the back. The withers should be sharp and narrow.

The breast of dairy cattle does not show so great width as in the beef type and the same is true of the chest. The ribs must be well sprung, to provide large capacity for the consumption and utilization of feeds. Dairy cows with very short ribs are poor feeders and usually possess defective constitutions. The front legs should be straight.

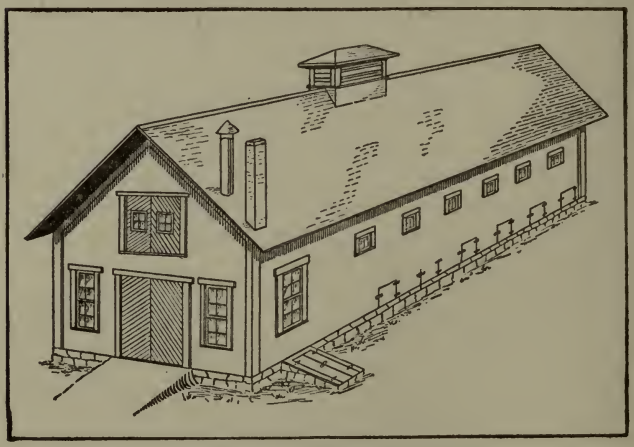
The back of the dairy cow usually shows some droop from shoulder to hip line. This, however, must not become excessive, as a strong, well-sustained back, with but little depression, is to be preferred to the sway back.

The udder of the dairy cow is a most important part, in that it indicates capacity of producing milk. The skin of the udder should be soft and the hair should be fine. Large cows should have larger udders than small cows, and the animal of from 900 to 1,000 pounds in weight should, at six years old, have an udder that will yield at least 40 pounds of milk a day. The milk veins which convey blood through the udder are usually regarded as indications of a cow's general capacity to produce milk. On good dairy cows the veins are very large, tortuous and prominent. The milk wells or openings admitting the milk veins into the under part of the belly should be large. Large milk wells and prom-

inent milk veins are a pretty safe guide as to the productive capacity of the dairy cow.

HOGS AND MUTTON SHEEP

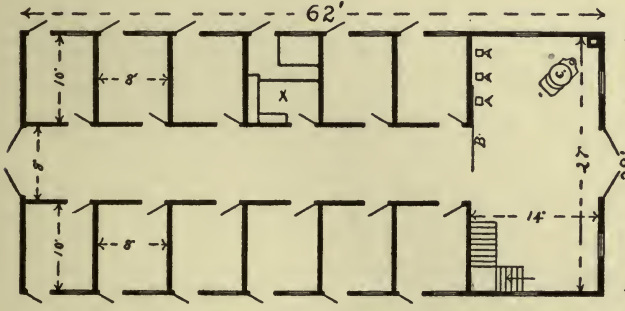
While it is very difficult to indicate the most striking features of sheep, in a general way the mutton type will be taken as an example. In general, the mutton conformation of the sheep has many of the features of the beef type in cattle. The body must be compact, the form blocky, the head and neck short, the back broad and level, hind-



ELEVATION OF HOG HOUSE

quarters full and heavy and body deep. With the mutton breeds the matter of flesh production is of first consideration, consequently the form that will produce the largest percentage of the most desirable cuts is the one to be aimed at. The shoulder is valuable for mutton and should be neatly placed

and not too prominent at the top. This entire part must be smoothly covered with flesh. The back and loins contain valuable cuts, so that the strength, width and thickness are essential at all times. The body, to have ample capacity, must, of course, have strongly arched and deep ribs. The thigh should be thick from behind and very full and low. The entire upper thigh should be heavily covered with flesh, as this is one of the most valuable mutton cuts. The chest, of course, is most important, as it contains the vital organs. It should have both thickness and depth. The withers must be wide and smoothly covered. As with the beef types of cattle, the flesh of the mutton type of sheep must



FLOOR PLAN OF HOG HOUSE.

be smooth and uniformly distributed, free from wads of fat or patchiness.

The wool of mutton sheep ranges in length from that of the Merino to ten or possibly more inches. The fleece does not cover the body as compactly as in the fine wool breeds. The fiber ranges from very fine to coarse. A bright fiber with a brilliant luster is very desirable. The entire body should be covered with fleece. The oil or yolk should be

of moderate abundance, thus keeping the wool in a healthy condition.

Probably no animal on the farm will make money more rapidly than the hog. Hogs are easily kept, large litters are produced that can be sent to market at nine months, thus enabling the farmer to turn his money quick. There are many varieties of hogs in the United States, but the most desirable type of any breed, as the animal is kept solely for pork, is the one that possesses compactness of form, breadth of back, large hams, strength of limb and a capacity to fatten rapidly and mature early. The American desires a type of hog that carries a large amount of fat. It represents the extreme type of meat production and, of course, is the most popular in the corn states. In other countries this type of hog is not looked upon with favor, as a bacon animal is preferred, but here bacon hogs are not very numerous and under the conditions existing in nearly every part of the country, even the bacon hogs begin to take on the fat-producing form after they have been bred for a number of years. It may be taken for granted, then, as a rule, that the hog popular in the corn belt is true to American type. In general, a profitable pork-producing hog should be compact and big of body, with a short, well-formed head, broad back, large, heavy hams, short legs, plenty of quality, as shown by an abundance of fine hair, strong bones and joints. In disposition the animal should be mild, so that he will fatten easily.

The size is largely determined by the demands of the market. At some markets hogs ranging from 220 to 230 pounds are most popular, while at others considerably heavier ones bring the best prices. It is pretty hard to breed for the ones

most in demand, because of the fluctuations in standards, consequently a moderate-sized animal that matures early will probably in the long run be the most profitable.

In hogs the head is an important indication of quality. It is short and broad. Excessive fat around the eyes is undesirable. The neck should not be long, but broad and strong. A wide breast and deep, capacious chest indicate constitution. The shoulder should fit smoothly to the body, showing no roughness or openness at the top. A smooth, broad, evenly fleshed shoulder is most desirable, from the market point of view. The back and loins are very important. The ribs must be well sprung and the loins broad and compact. The width of the back should be carried the entire length, from shoulder to hips. A drooping back indicates weakness. The ham is one of the highest priced parts of the hog, and must be fully developed. A high-class ham viewed from behind is thick at the edge and low at twist. From the side the relative length is long from hip joint to the lower corner of the ham.

The fleshing quality of the ham is most important. The flesh must be evenly distributed and the back and sides, shoulders, rump and hams must be uniformly covered with meat that feels mellow to the touch, yet firm. Smoothness of covering is very essential. Wrinkles are objectionable and indicate lack of quality in a hog.

The disposition of the hog should be quiet. The Poland China is a notable example of this phlegmatic character, and it is to this characteristic, to a large extent at any rate, that its great fattening ability is due. Active, restless hogs do not put on flesh.

Each particular type of farm animal has, of course, its distinctive characteristics, which cannot be presented in this connection. Enough has been said, however, to indicate what must be looked for in certain general types. If all these things are given consideration and carefully noted, live stock raising will be a success, provided the farmers see they are fed economically. There is a vast difference in individuals as to the utilization of feed. Some animals will eat sparingly and always be fat. Others will consume feed ravenously and will never fatten. When selecting breeding animals, as well as feeders, this property should be given careful attention, as it is most important, the profit end considered.

CHAPTER VIII

Principles of Breeding

The object of breeding is to increase the number of animals and to improve the herd. That is as far as the matter need go with the ordinary farmer. Of course, with the scientific breeder, the additional object of the origination of new varieties offers a fascinating field. For the general farmer, however, the two objects named should be the ones given the bulk of attention. Throughout the United States the improvement of the herd or flock is of the greatest possible importance. Very few farmers can afford to start with an entire outfit of pure-bred animals, both male and female. Wealthy people and those who plan to make the breeding of live stock their exclusive life work, probably can afford to do this, but for the ordinary stockman, for the general farmer, for the man who wants to keep farm animals to maintain the fertility of his land, the matter of starting with a pure-bred, high-grade individual sire and selecting good individual females from common stock, is the one that will, in the end, be the most profitable. Of course, the end is a purely commercial one, but the great majority of stockmen must consider the money side and largely disregard the sentimental features.

The above being true, grading—that is, the mating of a common or unimproved parent with a highly bred one—is the most satisfactory method. One pure-bred bull with a herd of 20 cows gives a crop of calves that are half bloods. In other words, this is a case where the bull is half the herd. If a pure-

bred cow is mated with a scrub bull, only one animal is a half breed. In the case noted, 20 of them are half blood. This shows the extreme necessity of having a pure-bred sire. By constantly using a pure-bred sire, it can be easily shown that the sixth generation contains 98.44 per cent of purity and only 1.56 per cent of unimproved blood. This sixth generation is practically pure-bred. The unimproved blood becomes insignificant and rapidly disappears. This is why, in the early days of a breed, the sixth or seventh generation is considered eligible to record. It must be remembered that if grades are used, absolutely no progress is made. For example, if half bloods are bred to half bloods, half bloods will be produced indefinitely. The progress in grading ceases as soon as the pure-bred sire is discontinued.

It is, therefore immensely important, in fact, almost a violation of one of the cardinal principles of live stock husbandry, to use anything but a pure-bred sire. Those not thoroughly informed are apt to be misled by the fact that occasionally a half blood sire is a splendid individual and to all outward appearances is superior to many pure-bred males. With the above in mind, however, it can be seen how exceedingly foolish it is to breed from anything but an animal of pure blood if improvement is expected and desired.

For practical purposes, many grades are just as satisfactory and as profitable as pure-bred animals. This is the cheering thought where herd improvement is desired by people of moderate means. Anyone visiting central live stock markets knows that the bulk of the offspring of fat stock is grades. Grades can be produced cheaply when fattened and disposed of at the slaughterhouses. The meat is,

however, practically as good and there is just as much of it as if the animals were pure bred. Consequently, to any but the man who is raising foundation stock and to the man who is a sentimentalist, the grade answers admirably, but do not use a grade sire.

CROSSING EXPLAINED

Crossing is the mating of two different, distinct races, breeds or varieties in hope of securing an animal that will be of high character. This form is adapted only to the production of new strains and should be handled with a great deal of care, and only by skillful breeders. Practically the only cross that can be employed on the general farm is that used in the production of the mule. The principles of mule raising are so thoroughly understood and so clearly set forth in another chapter of this book that no argument need be presented here in their favor. Outside of that, crossing is a pretty serious operation and is apt to result in disappointment. There is danger of reversion to the original type and the production of unprofitable animals to so great an extent that, with the single exception referred to, crossing may very wisely be avoided by any except those thoroughly informed. The mating of cattle, for example, of widely divergent type, such as the Shorthorn and the Jersey, is bad practice. You may get neither a good beef animal nor a good dairy animal. Size is lost and lack of uniformity is sure to result. In picking out feeders in any community, the man making the selection will carefully avoid any animal that shows signs of Jersey blood. Not that these crosses are not frequently fattened with profit, but the care and the risk is too great.

For the purpose of perpetuating certain desirable types of animals within a particular breed, line breeding is often practiced. By this is meant the restriction of selection and mating to the individuals of a single line of descent. Breed improvement, and sometimes herd improvement, makes it impossible to confine selection to the limits of the breed. However, those who practice line breeding are not so much concerned in the commercial side as in the establishment of a certain type. Line breeding excludes everything outside the approved type. It necessitates the mating of animals similar in character, purifies the pedigree and gives ancestors an opportunity to dominate the system, and while it is practiced by a number of breeders and some practical farmers in order to fix desirable characteristics, it is not the common practice and probably never will be among the general farmers and ordinary stockmen in the country. It has large advantages and should not be neglected. The chief danger in line breeding is that in the anxiety to perfect a pedigree and secure certain characteristics, breeding animals of inferior merit are often used. A line-bred animal is valuable or dangerous, exactly in proportion as the individual has been kept up to grade. No other system of breeding, however, has ever been of as great benefit to the live stock interests. The only thing to avoid is to be sure that all the animals used for breeding are animals of excellent individuality.

Another form of herd improvement not thoroughly understood and concerning which there has been much error is that of inbreeding. This means that animals closely related are mated. This form is used so that when an animal of superior excellence appears, his or her characteristics are pre-

CHAMPION JERSEY COW FROM COLORADO

A HIGH-CLASS ROAD MARE

served by breeding his descendants. It is possible by this method to secure the highest percentage of blood of an exceptional individual and to establish a strain that will perpetuate desirable characteristics. If persisted in, the outside blood disappears and the pedigree is rapidly enriched. Inbred animals are recognized as especially prepotent. The disadvantages of inbreeding are that if an animal possesses any undesirable characteristics, these characteristics, of course, are apt to be multiplied in the descendants, for good as well as bad features are transmitted. There have been numerous failures of inbreeding and these have probably overshadowed the advantages. A careful investigation shows that inbreeding is not necessarily harmful, if properly handled. If animals lacking in vigor and low in fertility are excluded, the best of results will ordinarily come from inbreeding. Some of the very best and most successful live-stock men in the United States have practiced inbreeding, and are able to show, at this time, herds and flocks in prize rings, successful at the heads of herds, and approaching, in every way, the breeder's ideal of profitable live stock. Vigor, of course, is the first proposition and fertility is a close second. If these two characteristics are looked out for, there will be very little danger in inbreeding. It is a rather risky proposition to recommend it indiscriminately to the general farmer, but the principles are perfectly plain, so that he can practice it with profit just as well as his more specialized brother.

IMPORTANCE OF PURE-BRED SIRE

With these general principles of breeding in mind, is it not perfectly plain that it will never do

to ignore the pure-bred sire? It will never do, under any circumstances, to use a sire that lacks pure blood because he is a splendid individual. It probably will be all right for the first generation if the animals are to be disposed of for meat, but even then it is a risky proposition. He will not produce as uniform stock as a pure-bred sire. The progeny will not fatten as readily, nor mature as uniformly, so that every farmer ought to make up his mind to use nothing but pure-bred sires, no matter what other advice may be given him or what his desires may be. In some instances, laws have been enacted against breeding anything but pure-bred stallions and forbidding the standing of a grade. Other states are rapidly taking up these laws, and it would be a splendid thing for the live stock interests if this law could apply also to cattle, sheep and hogs.

If it is admitted that the sire is half the herd, and the important part of the live stock industry, his care becomes a matter of great moment. Beginning with calfhood in cattle, he should be liberally, yet judiciously, fed. He should be so handled as to develop rapidly and completely. His vigor must always be taken into consideration. He must not be overfed, so that his vitality will be impaired in any way. He must not be kept too fat. He must not be fed exclusively on highly carbonaceous foods. He must not be confined; he must be given a liberal amount of exercise, but even here, moderation must rule. Of course, he will be started on mother's milk. This holds true in the cases of horses, cattle, sheep or hogs. If the supply is ample, no additional feed will be needed for some weeks, except that he should be permitted to run with the mother on pasture. He will soon learn to

nibble at the grass. A little later, he can be fed a small amount of crushed oats. He must also be taught, before cold weather arrives, to eat forage. Keep hay or fodder where he can get at it, and he will have acquired this without any teaching. It is presumed that on the ordinary farm the young stock come in the spring, so that his supply of feed during the summer will be the milk, the grass and the little grain that may be supplied. He will get plenty of exercise in the pasture, the only precaution necessary being that he be protected from flies during the hot, dry weather of August and early September. This is accomplished by providing a dark shed, to which the dam and the young animal may resort during the heat of the day. As fall approaches and cold weather begins to appear, some confinement will undoubtedly be necessary and the young animal will have to be weaned. Begin feeding gradually and insist on the future herd header running in the open as much as possible. Nothing is better than an open shed, adjacent to a pasture. Feed alfalfa hay and oats, to which a little corn may be added, providing this corn does not result in an abundance of fat. Keep him in a good, healthy growing condition without becoming overfat. Every day during the winter let the young animal run out, provided the weather is not stormy. He is a good deal better off in the open air, where he can get exercise, than confined in a stall. He must, however, always be provided with a warm stable during cold, wet, stormy or snowy weather. This is particularly important with sheep, but should not be neglected with cattle, horses or hogs. The second summer give him all the blue grass pasture he wants. Let him have a little clover; feed small amounts of oats all during the

season, so that he will continue to grow. If he can nibble at a manger full of tame hay—alfalfa or some of the clovers are best, but timothy will do no harm—he will grow more rapidly than if maintained on grass alone. Continue this treatment until he is ready to begin his services as a progenitor of high-grade animals. If he is a good individual, he will begin his work in the best possible condition and will give a good account of himself.

The care of the females is almost identical with that of the males. They must be liberally, yet judiciously, fed and sheltered. The feeds must be selected with an idea of building up frame, of developing muscle, of stimulating those qualities which are most desired—milk producing in the dairy animal, wool and mutton in the sheep, laying on of fat in the case of hogs, the production of a large percentage of well marbled beef in the heavy strains of cattle and the developing of stamina in the case of horses.

Note the difference between this treatment and that in animals intended for consumption. This applies to beef animals, hogs and the mutton breeds of sheep. These should be, of course, fed judiciously, but they should be pushed from the very start so as to hasten maturity, for it is the animal that goes to market quickest, other things being equal, that returns the largest profit. Note the popularity of baby beef and hothouse lambs and hogs that are sold at nine months. True, they must be fed so that large growth is possible, so that the greatest amount of gross weight may be secured at the end of any particular period, but after this is accomplished no consideration need be given to the descendants of these animals intended for the

block. The whole problem is simply to keep them in good healthy condition and to fatten them as rapidly as possible with the least expense. These animals, too, must be protected from unfavorable, disagreeable weather, must be given good, clean, wholesome feed, must be given a very limited amount of exercise and must be provided with pure water.

It goes without saying that blood cannot take the place of good feeding and good care. A pure-bred animal or herd will rapidly deteriorate and become an absolute expense, instead of a profit, if feeding and care is not present. The fact that most pure-bred animals are in better condition than those that are not royally bred is partly due to the fact that the breeder owning them has sufficient interest in his animals to give them better care than is accorded to the scrub animal. True, pure-bred animals of good individuality will do better under rough conditions and neglect than the animal whose ancestors have not been bred for a great many years for vigor and vitality, but no pure-bred herd can approach anything like a maximum of profit or of excellence if the feed is poor or if the shelter is not provided. Why was it necessary that the herd bulls on the range during the period of large ranches had to be so frequently replaced by animals from herds that were given liberal attention and good care? It was due to this very fact that it is impossible, on account of range conditions, to give the shelter and feed necessary to best developments. The pure-bred animal could not be seen at his best unless he was given this care on the ranch or brought from the older sections where abundance of feed and shelter were available.

To the average farmer who keeps stock, and every

farmer in the United States, must sooner or later keep farm animals, the breeding proposition is particularly fascinating and is interesting because of the fact that it results in a much larger profit. Don't think that you cannot handle pure-bred stock. They respond to good care better than scrubs. Don't think that you cannot get up your common herd or flock. You know what a good individual is if you have been brought up on a farm, and if you haven't, there are so many sources of information now that there is little excuse for ignorance. With this knowledge it is very easy to discard the unprofitable animals, to keep the best, to use a good individual, pure-bred sire and before many years you will have a herd of which you will be proud. You will have a herd in which your children will take a deep interest. You will have a herd that will increase your bank account from direct sales and also because of the part it plays in keeping up the fertility of the land devoted to cultivated crops.

CHAPTER IX

Feeds and Feeding

The problem of securing large and economical gains in the feeding of live stock is not entirely one of food supply, although this is the factor which can be most definitely controlled and upon which we have the most reliable information. The other factor is the individuality of the animals themselves. Two animals alike as to external appearance, of equal age and equal weight, when placed under exactly the same conditions and given exactly similar feed, will generally not make equal gains, because of the inherent ability of the one to utilize its feed to better advantage than the other. The general question of feeds, however, as to kind, amount and methods of feeding for securing any desired result with any one class of live stock, has received greater attention at the hands of investigators and experimenters than probably any other single phase of agricultural science.

PRINCIPLES OF FEEDING

We have a vast amount of reliable information bearing upon the composition of feeds under all conditions and the effect of these feeds used in varying proportions in securing a desired result in live stock feeding. It is not the purpose of this work to enter into extended discussion of all the problems pertaining to live stock feeding—to even touch upon each of the various phases of this subject would require a volume in itself. Much of

the really vital information bearing upon live stock feeding is of a highly technical nature, and it is not within the province of this volume to enter into a scientific or technical discussion of the facts. There are certain basic principles, however, underlying the science, which are essential to success, and which are observed by all experienced feeders. These principles are based upon the chemical composition of the animal body and upon the chemical composition of the forage and grain used to produce animal bodies. While there are many subdivisions of these materials, they may all be roughly divided into two general classes, which are known as nitrogenous and non-nitrogenous. The former composes, in a large degree, the muscular tissue of the body, while the latter class forms animal fat and serves to keep up the body heat. The forages and grains commonly used in animal feeding may also be divided roughly, according to chemical composition, into two similar groups, one of which contains a preponderance of the materials used in building up the muscular or nitrogenous parts of the animal body, and the other containing a large proportion of the chemical elements going to build up the non-nitrogenous portions of the body. The science of successful feeding consists of the blending of these two classes of feeds in such proportions that the best results will be secured in the animal growth. Protein is a term commonly applied to the muscle-building material in foods. The leguminous hays, such as clover, alfalfa and cowpeas, and such grains as oats, wheat and barley, are rich in this material. Carbohydrates is the term very commonly applied to the fat and heat-forming foods. Such forages as corn fodder, timothy and

other grasses, straw and sorghums, such grain as corn, and all substances containing starch and sugar in large proportions, belong in this class.

Generally speaking, the best results cannot be obtained from feeding exclusively rations which contain one of these important food elements to the practical exclusion of the other, for the needs of the animal body require that the two shall be blended in certain proportions in order that symmetrical development take place, and no part be developed at the expense of another. It should not be inferred that it is impossible to sustain life for considerable periods without the proper blending of all food elements. Life and a certain degree of growth have been maintained for long periods by the use of unlimited amounts of one kind of food. At the Illinois experiment station a June calf was maintained exclusively upon skim milk until the following January. At this time, however, it began to refuse its feed, became unable to hold up its head, and appeared to be about to die. Straw and hay were then offered it. It ate greedily and within a few hours had begun to improve, and from that time on made satisfactory gains upon mixed feed. Similar experiments were conducted, using skim milk and ground grain, and although enormous quantities of these feeds were consumed, they sufficed only to keep the animal alive and to give it a small amount of growth, while animals fed much smaller amounts of milk and grain in connection with a liberal ration of hay, made a more consistent growth and symmetrical development of all parts of the body, although using a smaller total quantity of feed. These and other similar experiments show that the quantity of feed consumed by an animal is not necessarily an indication of its economical

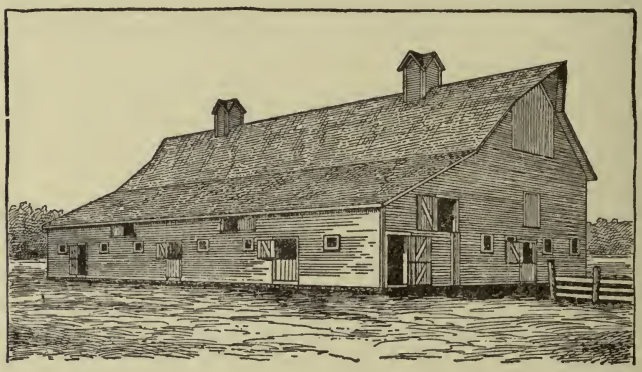
use, but rather that successful feeding depends upon the proper blending of different classes of feed.

In the investigation and discussion of feeding problems, the term "nutritive ratio" is one in very common use. By this term is meant the ratio which the total amount of digestible protein in a feeding ration bears to the total amount of digestible carbohydrates. The basis for computing such a ratio was found in the chemical analyses of the various feeds, which are now published in tabulated form in all books devoted exclusively to feeding problems. The nutritive ratio is said to be narrow or wide as it contains a relatively large or small proportion of protein. For instance, clover hay has a nutritive ratio of 1:5.2. This means that there is 5.2 times as much carbohydrates as protein in a given amount of clover hay. In skim milk the ratio is 1:1.63. This represents an extremely narrow nutritive ratio, while mangels, having a ratio of 1:9.2, represent an unusually wide nutritive ratio. A feeding standard is simply the somewhat arbitrary statement of the proportionate amounts of nitrogenous and non-nitrogenous foods required to effect a given purpose in feeding. Although feeding standards and nutritive ratios are published in all the works on feeding, they should not be regarded as an absolute and final guide in determining the formation of the best feeding ration for animals. There are such wide degrees of variation in the composition of feeds, and such great individual differences in the requirements of animals, that a ration which would be ideal under one condition, would not be well balanced under different circumstances. For instance, the composition of the corn plant varies at almost every stage of its growth, and varies upon

different soils, and in different climatic conditions at the same stage of growth. At different periods before maturity, the corn plant contains a very large per cent of water and a correspondingly small proportion of feeding value. As the time of maturity approaches, the water contained becomes less, the materials of definite feeding value are deposited both in the grain and in the leaves and stalk, and the feeding value consequently increases. Then, after harvest, the plant is likely to become less palatable, or is likely, through imperfect harvesting and storing conditions, to lose considerable amounts of its nutriment, and its degree of feeding value will vary considerably, depending upon the degree of perfection reached in harvesting and storing the crop.

This example may be taken as typical of the various kinds and classes of stock foods to indicate that no one chemical analysis can be rigidly applied in determining the value of feed. The same is true with regard to the individual animal's capacity to utilize feed to the best advantage. Digestion experiments, extending over many years' time, in different sections of the world, have shown that no two animals digest exactly the same amount of the feed given them, and consequently no two can be expected to make exactly the same relative gains, even though they be given the same amount of similar feeds. Every feeder of extended experience will recall individual animals which he has found it impossible to fatten. Every farmer has had experience with some ungainly, raw-boned horse, which will consume enormous quantities of feed and yet will always appear in poor condition of flesh. These instances illustrate the vast difference in the capacity of individual animals to

make good use of the feed given them. On account of these differences, both in the composition of feed and the utilizing capacity of animals, it is manifestly impossible to use arbitrary feeding standards as an absolute guide in composition of rations. They should be regarded as only approximately correct for average conditions, and fairly close computations, made with the idea of supplying a fairly well-balanced ration, will be found all



SOUTH DAKOTA STOCK BARN

that is necessary for a practical feeder under average conditions.

The amount and kind of feed to be given to farm animals and the character of the ration, whether it should be wide, medium or narrow, depends entirely upon the object sought by feeding. Young growing animals of any kind and animals intended for breeding will manifestly require a vastly different ration than those which are being fed for slaughter. Horses which are kept through the winter with but little work to perform, the object being simply to maintain them in a fair condition

of flesh, will require very different treatment than when performing hard labor. The ration suitable for dairy cows when being fed for high milk production would not be the most profitable feeding practice for animals being fattened for market.

OBJECT SOUGHT DETERMINES FEEDS

The first consideration in planning a system of feeding for any period should be the object for which the feeding is done. Another consideration is the class of feeds available in each individual instance. It is a comparatively easy matter to figure out a well-balanced ration if the feeder has at his command an unlimited variety of feeds. The average feeder is not situated under these conditions. The farmer of the midde West has corn, clover hay and corn stover, as well as blue grass and other pastures. Naturally, he wishes to use these home-grown grains and fodders to the best advantage, and to purchase from outside sources the minimum amount of feeding material. How best to combine these available feeds so as to produce the most economical results is the question of most moment to the average farmer and stockman.

For conditions in the corn belt, it is probable that clover or alfalfa hay and shelled corn constitute the basis for the most economical ration for fattening cattle, sheep or horses. At the Nebraska experiment station, four years of experiments demonstrated that prairie hay, when fed alone with corn to fatten cattle, produced small and unsatisfactory gains, and little or no profit, while alfalfa hay with corn alone produced large and profitable gains. The advantage of the latter ration lies in the fact that alfalfa hay contains a very large proportion of pro-

tein, while corn is very rich in carbohydrates. These two happen to be combined in such proportions as to form a nearly perfectly balanced ration. They furnish about an ideal proportion of the materials demanded by the digestive system of the cattle for building up fat and muscular tissue rapidly.

While alfalfa hay is beyond all question the best forage crop known, several other leguminous plants are classed as close seconds and can be substituted in this ration with excellent results. Where for any reason it is not possible or practical to grow alfalfa, then clover or cowpeas can be substituted. In the eastern part of the Mississippi valley region, clover will be found much more commonly than alfalfa. However, in the larger part of the clover-growing region of the United States and a very considerable part of the alfalfa-producing belt, corn is also a leading crop, and feeders naturally desire to utilize in some way, the tremendous tonnage of forage which is produced by the corn plant. Corn cut in good season and carefully shocked, furnishes tremendous amounts of excellent fodder and most farmers wish to utilize this in their feeding operations, both to avoid waste of good feed and in order to work up this material into fit condition to be returned as fertilizer to the soil. If, however, corn stover be depended upon entirely for forage, and corn for the grain portion of the ration, it will readily be seen that the feed will have too great a proportion of carbohydrates and not enough of protein. This will give a one-sided or unbalanced ration and the best gains will not be procured. What this ration obviously needs is the addition of some feed containing a large percentage of protein. If a feeder has some clover or alfalfa to mix with

the corn stover, it will serve to balance the ration. If not, this need may be supplied by bran, linseed meal or cottonseed meal. These feeds have a high protein content, and fed in relatively small amounts with the corn, will supply the elements in which the exclusive corn ration is deficient. This same general principle would hold equally true in fattening sheep or in feeding horses. It will hold equally true where timothy hay or sorghum be substituted for corn stover. On the other hand, in some of the western valleys alfalfa is raised in great abundance and all of the grains raised, such as barley and oats, also have a high protein content. This leaves the feeder of the mountain valleys with the problem of supplying carbohydrates to form a more perfectly balanced ration. He meets this by either shipping in corn from the eastern states, or by feeding sugar beets, which contain a high per cent of carbohydrates, or by utilizing waste molasses and other by-products of the sugar factory.

If a feeder of any experience nows the relative proportion of the elements contained in each class of feed, he will be able to form a satisfactory feeding ration by observing the effect which different combinations have upon the animals. The tendency with most feeders is to give too little protein. They should not hesitate to purchase considerable amounts of concentrated protein feeds, such as oil meal, in cases where their home-grown crops do not furnish this element. These feeds may cost a little more per pound, but they will often be cheaper in the ultimate result than those capable of producing fat alone. It seems to matter little whether the protein is derived from the grain or the roughage. Corn fed with a leguminous hay seems

to give fully as good results as corn and oil meal or cottonseed meal fed with timothy hay or corn stover. The animal that has enough protein in its food and is young enough to make a good growth, will finish better, and will not become "patchy" when fattened, like one that is fed on a less nitrogenous ration.

FEEDING INFLUENCED BY AGE

The age at which animals are fed strongly influences their powers of assimilation. The younger the animal, in general, the less the cost of gains. Prof. H. R. Smith says that in six different trials when accurate records were kept of gains and cost of food, it was found that during the first 12 months each 100 pounds increase in live weight cost $3.45; during the second 12 months, $11.50. At the Illinois experiment station at the beginning of an experiment, calves averaged 384 pounds, yearlings 784 pounds and two-year-olds 1,032 pounds. The net cost of 100 pounds of gain was $4.10 on calves, $5.60 on yearlings and $6.60 on two-year-olds. The profit in beef production, however, consists not alone in the increased weight of the animal, but also in the enhanced value of the original carcass. Thus, if an 800-pound animal costs 4 cents a pound and after being fattened sells for 5 cents a pound, there is a profit of $8 on the original carcass. Where meat animals are grown for market, the greatest profit will nearly always be found in fattening as young as possible. If western animals are to be fed, however, it will often be found more profitable to feed the larger ones as long yearlings and two-year-olds, on account of the greater margin afforded by the heavier original weight.

EFFECTS OF ONE-SIDED RATION

In hog feeding these principles hold equally true as in the handling of cattle, sheep and horses. The pernicious effects of the exclusive feeding of highly carbonaceous feeds is nowhere more apparent than in the case of hogs which have been kept for several generations on a single corn diet. Years ago the custom was much more prevalent than at present, of attempting to keep hogs in small pens during their entire period of existence and feeding them little or nothing but grain, and this usually meant corn. Immense amounts of corn were required in fattening animals, but in those days it was worth only a few cents a bushel and so there was little object in saving it. The effect of this kind of feeding is most noticeable upon the breeding stock, especially where it is continued for several generations. Farmers who pursued this plan of hog raising found that the second or third generation was seriously deficient as to type, constitution and vigor, and that they were no longer prolific. Several of the most valuable families or strains of hogs have been actually bred out of existence by this type of mismanagement.

Contrary to this experience, those breeders who have sown clover or alfalfa for permanent hog pasture, and have used rape, rye or the various other quick-growing crops in order to keep green feed available for their hogs in connection with the grain during the greater part of the year, have always obtained cheap and rapid growth, have maintained their stock in a high state of health and vigor, and have made their business permanently successful. The secret is that the clover, or other pasture, furnished protein to balance up the carbohydrate con-

tent of the corn, thus enabling the animal to make its growth and perform its bodily functions without so overburdening the digestive system as to impair health and vitality.

MAINTENANCE RATIONS

By a maintenance ration is meant a ration of such quantity and composition as to simply maintain an animal in fair condition of flesh and to furnish enough nutrition to keep up body heat and vitality without decreasing or increasing the weight. It is often desirable to carry breeding animals through the winter on this basis, or to carry cattle which it is desired to fatten upon next season's grass through the winter without using a lot of expensive grain feed. A ration with this object in view will be narrower than that required for fattening animals, and will not usually require such judicious selection. An abundance of alfalfa or clover hay alone will serve very well for such purposes as these, because they contain a sufficient amount of fat-forming materials to keep up body heat and a large proportion of muscle-forming material to maintain the body weight.

At the Missouri experiment station, timothy hay of average quality was found to be nutritious enough to maintain the weight of yearling steers throughout the winter. To do this required a little more than one and one-half tons to winter each steer weighing 750 pounds from November 1st to April 1st. Upon this basis, the steers not only maintained their weight, but gained about 50 pounds during the winter. At the same station it was found that cured corn stover handled in the ordinary farm practice would not quite maintain yearling steers. Each animal showed a loss of 33 pounds

on the six months' feeding, even after consuming three tons of corn stover. A very little clover or alfalfa mixed with this corn stover would add enough to its feeding value to make it a good maintenance feed. All the rough feeds such as kafir corn, sorghum, millet and straw may be profitably utilized in wintering stock in this manner, providing a small amount of grain is available to assist in completing the ration.

CONCENTRATES

All of the grains and such feeds as bran, oil meal, cottonseed meal, dried blood and other packing house by-products, brewers' grains, in fact all feeds having small bulk and high feeding value, are termed concentrates. It is frequently possible by the purchase of relatively small amounts of some one or another of these feeds to so complete the ration as to get high returns out of the rough forage of the farm, which alone would not serve even as a good maintenance ration. Farmers are usually loath to purchase these products on account of their seeming high price per pound, but when the relatively high feeding value is considered in comparison with that of some of the home-grown products, it will be seen that good value is received, in spite of the high initial cost. Especially in maintaining young animals where the greatest and most vigorous growth is desired, it will never pay to feed an inferior ration, when a purchase of small amounts of concentrated protein will so greatly improve the ration. Growth which is lost at this time in the life of young animals can never be regained no matter how well cared for they are later. The stunted animal never acquires the quality which it would have had, had its growth been continuous.

SUCCULENT FEEDS

The one factor in the feeding of animals which is most likely to be overlooked or ignored by the American farmer is that of some kind of a succulent or juicy feed to be used in connection with the dry hay and grain. English and Scotch farmers, who produce the finest specimens of sheep and cattle known in the world today, have for generations emphasized the need of feeds of this character and have constantly used root crops and juicy feeds of various kinds in feeding their animals at all times of the year when green grass is not available. Good green grass in itself is practically a balanced ration, and ordinarily needs nothing additional, unless the stock is being fed for slaughter. In addition to the actual food constituents contained in grass, it has also a large per cent of juice or water, and the function of succulent feeds for winter is to supply this condition as nearly as possible in dry feeds used in the winter time. This can be supplied in some form under almost all American farm conditions, but it is safe to say that upon 90 per cent of the farms where live stock is kept in America, no special provision is made for feeds of this character. This class of feed may consist of root crops, such as beets, mangels or turnips; it may consist of silage or wet brewers' grains or pulp from the sugar beet factories. The only places where it is extensively used are in dairies of the East and middle West where the silo is now considered almost indispensable, and in the immediate vicinity of beet sugar factories where the pulp is easily available. The value of succulent feed is hard to determine, and it is hard to point out just from whence this value comes. For instance,

a chemical analysis of beet pulp shows a very small per cent of digestible material of any sort in it, the solid portion consisting principally of wood fiber or cellulose. There is a trifling amount of sugar and a small per cent of digestible protein, yet cattle and sheep fed upon corn, alfalfa and beet pulp will make immensely better gains than when fed upon corn and alfalfa, even though in greater amounts. The value is probably in its beneficial effect upon the digestive system of the animal, which enables it to make better use of the corn and hay consumed and to transform a larger percentage of it into fat and muscle.

Of course silage, especially corn silage, has a definite feeding value aside from its succulent characteristics, and is used not only in maintaining but in fattening cattle, to excellent advantage. The number of feeders at the present time who provide silage for their fattening stock is very small, but its use seems to be increasing. Where it is available there is no better feed in winter for fattening cattle. They may be given from 10 to 12 pounds daily per head. Experiments at Purdue university proved that corn silage was very satisfactory in fattening steers where a nitrogenous concentrate such as cottonseed meal was used with it. Silage-fed steers fed better, made more rapid and cheaper gains, acquired a higher finish and returned a greater profit than similar cattle fed under identical conditions without silage. The best financial results obtained at Purdue have been from cattle fed on shelled corn, cottonseed meal and corn silage. These cattle, after paying for all the other feed, returned 96.7 cents per bushel for all the corn consumed.

Too much feed is wasted on the average

American farm. The amount of first-class fodder which goes to waste every year in the corn fields of the Mississippi valley, if preserved either as forage or silage, would support many thousands of additional meat animals, which are now so sorely needed in the markets of the country. Much material that is now little valued really has definite feeding value, and ought to be utilized as such. There are annually many thousands of bushels of soft corn produced on account of unfavorable weather conditions, early frosts and other causes. There is a common idea that soft corn, and likewise light oats are very poor feed. The amounts fed of either should be measured by weight, not by bulk, and with soft corn the basis of computation should be its dry matter. It seems to be a general principle that different grades and qualities of corn and of oats, really have practically the same feeding value for each pound of dry matter, provided the grain has not been injured by mold or decay. The Iowa experiment station discovered in feeding corn of the 1902 crop to cattle, that a pound of dry matter in soft corn was practically equal to a pound of dry matter in sound corn for feeding to fattening steers. The New Hampshire experiment station has recently discovered that pound for pound, light oats are only a possible shade inferior to heavy oats for horse feeding. The real feeding value of grain of this character is greater than farmers generally suppose.

Many American farmers are raising grain with the fixed intention of hauling it to the elevator for sale. Every crop removed thus from the farm detracts just that much from the available fertility of the soil, because that much material is gone and can never be regained except by direct purchase.

The average farmer has too little appreciation of the value of the grain and forage he produces for live stock feeding purposes. He is too willing to abandon live stock production and feeding as unprofitable, because, for the moment, grain growing seems more attractive. He needs a keener appreciation of the feeding value of the different crops possible for him to grow, of the profits which careful breeding and intelligent feeding of farm animals will bring him, and of the cumulative effect produced upon his soil by a continued application to it of the manure produced by this live stock in consuming the corn stover, straw, hay and grain which he can grow. The live stock breeder should inform himself of the principles which underly this science, and should develop an accurate appreciation of the values of different kinds of feed. He should be able to know when the products grown upon his farm are insufficient for the needs of the growing animal, and what he should produce to supply this deficiency. He should be able to judge when it will be profitable for him to purchase high-priced concentrates, and just what the character of these concentrates should be. It pays for nearly every farm to produce a sufficient variety of feeding material to furnish a well balanced ration. This is especially true in all regions where it is possible to raise corn, because here also in nearly every instance it is possible to raise clover and alfalfa. Close attention to the needs of animals under different conditions and full information as to the kinds of forage and grain which will most fully and most economically supply these needs is the basic information without which successful feeding on an intelligent basis will be found impossible.

CHAPTER X

Profit from the Dairy

MAGNITUDE OF DAIRY INDUSTRY

The dairy industry in the United States is of much greater magnitude than is apparent to the average observer. The most reliable figures available in 1910 place the total number of dairy cows in the United States at 21,801,000, having a total farm value of more than $780,000,000. The dairy products have an annual value closely approximating $800,000,000. This is greater than the value of any farm crop, except corn. When the dairy output is combined with the valuation of dairy stock it represents a total of more than $1,500,000,000. This represents more investment than all the meat cattle of the land, together with the hogs and sheep. It is an industry that tends to intensify farming methods. Where people are obliged to live on small farms and closely together, it is found necessary, in order to keep up the required land fertility and utilize in the most economical way the farm forage products. It is one of the factors which enters most strongly into the great question of conserving soil fertility. Where butter is made and sold from the farm practically no soil fertility leaves, but on the contrary, the farm is made richer.

It requires a frugal, industrious people for this work, as it means steady employment and careful, painstaking methods. Where grain is raised exclusively, the labor is confined to a few months in each year, but in the dairy business employment is

constant. It advances the value of land, and being economical in its nature can be carried on where land values are so high that most of the common farm practices must be abandoned. For example, in Denmark where the people live closely together on small farms, the dairy business is found most fully developed. From this little country every year is sold over $40,000,000 worth of butter, and the government considers it so important that not less than 16 dairy schools are maintained in this small area. It is one of the best means of condensing our farm crops and raw material into a product which is worth more per pound than any other sold from the farm. For example, butter produced in the central part of America can be marketed in any part of the world. The rough fodders and grasses of our farms can be concentrated into a condensed form which will require a very light tax to market in distant lands. It is an industry that thrives where knowledge and science are applied. No industry, perhaps, requires this more than the dairy business. It is an industry of the people. It is not one that is hampered by trust or consolidation, but is enjoyed by every farmer of the land who wishes to engage in the enterprise. May it always be so preserved!

FIELDS FOR IMPROVEMENT

There are two great fields for improvement, namely, to raise the annual production of our cows and to improve the quality of the products. In these two fields, perhaps, the most important is the first, and could the annual product of the American cow be advanced a few pounds of butter per year, it would bring a vast fortune to our producers. This improvement is going on rapidly, and prom-

ises to accomplish much during the next few years. For example, the Nebraska experiment station has a cow which has produced 17,000 pounds of milk and 650 pounds of butter. The average cow produces about 3,000 pounds of milk and 100 pounds of butter. It will be seen that this good cow is equal to six average animals in production. Now, it is possible to develop such animals. A daughter of this cow, which is called Katy Gerben, has equaled her mother in the milk and butter record, and here promises a family which can produce such records. Better care of the stock we now have would, without doubt, increase the annual production 30 per cent; this, with wise selection of the young animals, would, in a short time, double the output with the same number of cows.

The quality of the product is of vast importance, and could we produce such butter as the Danes are making, we would be able to obtain possession of the English market, which would bring to our nation forty or fifty million dollars per year. If we could improve the quality of our cheese it would save a vast amount of money and give us a foreign market for our surplus make. During the past decade great improvements have been made in the methods of assembling and manufacturing the products. The centrifugal separator brought a revolution to the dairy world, and made possible the creaming of milk in an economical manner and in a short space of time.

The milking machine is now deemed a success, and all it requires is a little time to place it in general use. There are at the present time over 1,000 milking machines in operation in this country, and from reports by the users there is good evidence that they are giving satisfaction. With this ma-

chine the labor problem, which is one of the vexing features of dairying, will be greatly simplified.

The butter accumulator is now also receiving much attention. This machine takes the fresh milk and turns it into butter, skim milk and buttermilk in a few minutes. The Babcock test made a revolution and brought untold good to the dairy world. It has made possible the finding in a few minutes of the value of the dairy products, and is the means of obtaining the value of milk and cream as sold to the general market.

With all that has been accomplished and the bright future so full of encouragement with good things to come, still there is a vast field for improvement. Through the broad land the rank and file of cow keepers are failing in what we term successful dairying. This failure is due to the few undone little things about the dairy. It is those most talked of and written about, but still foreign to the masses, who, at least, do not carry them out in practice. Sharp competition may in time bring about an improvement, through sheer necessity for more profit.

TYPES OF DAIRYING

The dairy industry of the United States may be divided roughly into two general types, one of which has for its object the furnishing of fresh milk for domestic use to people living in towns and cities. The other type is concerned in the production of milk to be used in the manufacture of butter and cheese either on a small scale upon the farm or on a larger scale by centralized creameries. Which one of these types it is most practical to follow depends almost entirely upon the geographical location. It can readily be seen that farms

remotely removed from cities or farms not readily accessible to quick transportation facilities, could not produce milk for city markets. The milk used for domestic purposes in such large consuming centers as Chicago, for instance, is all produced within an approximate radius of 100 miles from the city, and except under unusually favorable transportation conditions, it will not be profitable to ship milk much further than this.

The other type of dairying, on the contrary, can be conducted upon any farm which is producing the necessary feed for carrying on dairy operations. Nearly every farm in the middle West and Northwest conducts a dairy of some sort or other. Since the introduction into nearly every farm home of the hand separator, the production of cream for sale to large butter-making concerns has materially increased. By the use of these machines it is possible for the farmer to secure the available butter fat from the fresh milk within a very few minutes after milking, and use the sweet, warm skim milk for feeding calves or pigs. The cream is then sold either to the local creamery or to representatives of some of the large buttermaking concerns, and a definite, monthly income is thus assured. Fresh, wholesome skim milk secured by this process can be so judiciously fed as to develop calves equally as good as though they had been allowed to follow their dams. This fact has been taken advantage of in recent years by thousands of farmers who originally kept cattle only for the increase. Under this system, by milking the cows and raising the calves to be finished later for beef, they are able to have two sources of revenue, while the old system gave them only one.

The production of milk for the city market

usually demands cows of a pronounced dairy type. Such breeds as the Jerseys, Guernseys and Holsteins, which have been bred for hundreds of years exclusively for dairy purposes, are unquestionably the most profitable animals to keep for this purpose. A great many farmers say that for any type of dairying the dairy breeds are the only profitable type of cows to keep. On the other hand, in the middle western country, there are thousands of farmers whose circumstances demand that the finishing of live stock shall constitute the leading feature of their farm practice. They have a good deal of pasture, and their farms produce enormous amounts of forage and grain. These they do not wish to sell in the market because of considerations relating to soil fertility. For various reasons, chief among them the increasingly perplexing proposition of farm labor, they are unable or unwilling to change their type of farming to exclusive dairying. Yet, upon their high-priced land, they do not think that they are justified in keeping large numbers of breeding cattle merely for the production of calves.

These conditions place them under the necessity of keeping a type of animals from which reasonable returns can be realized in dairy operations, and which will also produce a type of offspring well suited to being fattened for beef. These conditions have given rise to a strong demand on the part of many American farmers, for a dual purpose type of cattle. The so-called dual purpose breeds are Red Polls, the milking Shorthorn, the Brown Swiss and the Devon. Of these, the milking Shorthorn and Red Poll are most common upon American farms, and it is probable that the milking strains of Shorthorns are by far the most popular. These cattle produce calves of very good beef type,

and at the same time are heavy milkers. Rose, a Shorthorn cow owned by N. G. Simpson of New Hampshire, has a record of 11,000 pounds of milk produced in one year. Another has a record of 9,550 pounds of milk, from which were made 448 pounds of butter. Still another produced 60 pounds of milk, making 2 pounds 12½ ounces of butter, in 24 hours. While these records are by no means equal to the production of famous cows of the dairy breeds, still they show that profitable dairying is possible with the best type of dual purpose stock under conditions which seem suited to this type of dairying.

The farmer should use his best judgment in determining whether his surroundings justify an exclusive dairy industry, or whether his conditions will demand a more mixed type of farming, and then direct his entire energy toward securing and breeding the very best animals of the particular type upon which he decides. If he is just starting in the business, he had better begin with a few good cows and gradually work up until the carrying capacity of his farm is reached, rather than start too heavily and later have to decrease his numbers on account of having too little feed. The crying need of dairying inAmerica today is not for more dairy cows but for better ones. The feed which it requires to support our 21,000,000 dairy cows ought to produce at least twice the amount of dairy products that it does. There is a smaller degree of efficiency in cows used in milk production in the United States than in any other class of live stock.

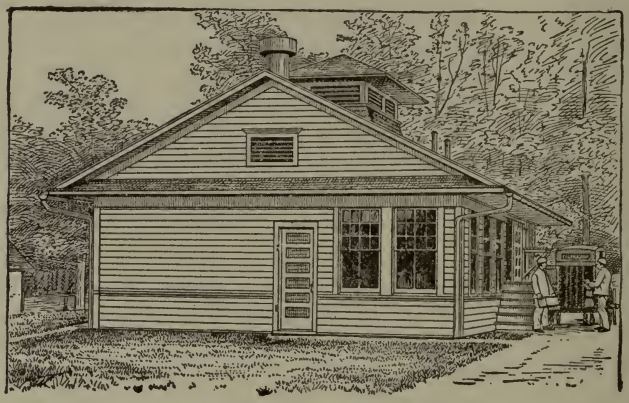
CONSIDERATIONS OF EFFICIENCY

What are some of the means by which the producing capacity of the dairy herds can be increased?

Intelligent selection, breeding and keeping accurate records of each cow's production, use of the Babcock tester in determining the amount of butter fat contained in each cow's milk and the prompt elimination from the herd of all cows not producing milk in paying quantities, will go a long way toward this end. A careful and systematic testing for disease, so that no animals will be kept which are not in perfect physical condition, will stop a great deal more waste. A keen appreciation of the principles of feeding and the use in the dairy of feeds and feeding methods calculated to stimulate milk production to its highest point, will be found not the least important detail to be considered.

The farmer, first of all, must have a definite idea of what constitutes dairy type in cows, and then select such breeding stock as most nearly conform to this ideal. It is folly to maintain for exclusive dairy purposes a cow of marked beef type. There is as much difference between the dairy type and the beef type as there is between a draft horse and a racer. The farmer should familiarize himself with these points of difference and make use of them in choosing his foundation stock. In his breeding operations he should constantly select as the animals which he intends to keep not only the best appearing individuals in his herd, but those which are the offspring of cows having satisfactory dairy records. These cows he will know because of the tests he has made to determine their milk and butter production. By selecting foundation stock in this way and by rearing the best offspring, a paying herd, producing high-grade milk may be built up in a comparatively short time.

Never before has the importance of cutting out and disposing of the unprofitable cows from the herd been more prominent than at the present time. It is not a difficult matter to determine whether a herd is profitable or not or whether any individual in the herd is profitable. It can be readily seen that if a man has three cows which produce enough milk to pay a liberal margin of profit over the



MODERN DAIRY HOUSE

amount of feed they receive, and three others, which give an equal amount less than the value of their feed, the deficiency of the latter three simply balances the good qualities of the former three, and eliminates any possible profit from the whole herd. The three poor producers not only do not pay for their own board, but are dependent upon the good qualities of the profitable three in order to make the books balance. In order to determine which individuals are boarders and which are dividend payers, it is only necessary to weigh each day the milk of each cow, and to occasionally test for butter

fat samples of each cow's milk. There are numerous handy devices for weighing milk and keeping a record for each cow which can be secured at trifling cost from any dealer in dairy supplies, while the use of the Babcock tester is so simple and so well known that it needs no comment. By using these devices and keeping a fairly accurate record of the feed consumed, one can readily determine which cow should be culled out from the herd. Not only will this elimination of profitless stock prove a direct benefit in the saving of feed and labor, but the herd will be greatly improved, and the offspring from the selected cows, if sired by a male of known breeding quality, will be worth several hundred per cent more than those from an untested herd.

CO-OPERATIVE IMPROVEMENT

In some of the most progressive dairy sections of the United States, recent years have developed so keen a realization of the necessity for intelligent breeding and for careful testing that co-operative breeding associations and cow-testing associations have been formed. These have almost invariably proved successful and have been the means of tremendously increasing the efficiency of the dairy stock in every section where they have been given careful trials. The general plan of a co-operative breeding association requires that a number of farmers living reasonably near together, purchase pure-bred bulls with which to head their herds. Sometimes several farmers may combine in getting the same animal if their circumstances and location seem to justify this. A farmer or group of farmers somewhere in the neighborhood may purchase another pure-bred bull. By combining their resources

in this manner they are able to spend more money and secure a better individual than they would otherwise have done. At the end of two years at most, it is always customary for a breeder to get rid of his herd bull and purchase one of different family in order to avoid inbreeding, or a too close relationship between these families. The members of the co-operative breeding association always arrange to make their original purchases from different strains of stock, so that when the necessity for this change arises, they simply trade bulls. This plan serves to keep in the one community valuable animals which under the old plan would probably have been shipped to distant points. It prevents needless expenditure and duplication of animals and has proved very satisfactory in its effect of constantly upbuilding a class of stock not only for individuals but for entire communities.

Co-operative testing associations usually consist of about 26 members each. They pay a stated sum per month, depending upon the number of cows each has, the money going to pay the salary of a man whose business it is to test each herd once a month. This is planned on the basis of one herd for each working day, but in case the members live so closely together that it would be possible to test two herds or more a day, the number of members can be increased, and the cost per member decreased accordingly. Each member keeps for himself the weight of milk per cow for each day, but turns the card over to the representative of the association upon his arrival. This representative is equipped with a Babcock tester and the necessary chemicals for making a test, and is furnished with samples of the milk of each cow. This does away with the trouble and work incidental to taking care of the

records and provides a reliable guide for the farmer in determining which of his cows should be eliminated from the herd.

Careful selection, intelligent breeding and continual discrimination in culling out unprofitable individuals are essential to the most satisfactory type of dairying, but these in themselves, no matter how faithfully followed, will not bring results to the farmer. The dairy cow is a highly developed machine for transforming grain and forage into milk and dairy products. It will be necessary to furnish her with all the feed she can consume, and it will be further necessary that this feed should be so selected and furnished in such proportions as to enable her to produce the greatest possible amount of milk and the greatest possible amount of butter fat. An engine cannot be expected to develop its full amount of power unless plenty of fuel is furnished, and it is no more reasonable to expect a cow to accomplish her greatest production unless she is heavily and intelligently fed.

SILOS AND SILAGE

In these days, when one hears the word dairy, he thinks of a silo. Under the present conditions, when land in the dairy districts is extremely high in price, and when all the feeds used in dairying are in strong market demand and correspondingly valuable, it is scarcely possible to realize the maximum profits from the dairy without using a silo in which to store a cheap supply of efficient feed. The corn crop furnishes by all odds the best feed for use in a silo. The heavy tonnage makes it possible to raise enough corn to fill a large silo upon a comparatively small area of land, while the large amount of nourishing grain contained in this crop

at the time it is cut for silage adds materially to its feeding value. There is no question that corn silage and alfalfa hay, fed together, form the most ideal combination known for dairy feeding. Where alfalfa is not produced, bright well-cured clover or cowpeas will do nearly as well. Alfalfa will, to a great extent, take the place of bran in a ration on account of its high protein content. Careful, conservative dairymen who have kept accurate account of the results obtained from different feeds, state that rather than be without alfalfa hay in winter they would pay $20 a ton for it. The cheapest combination ever used by the Nebraska experiment station in producing milk and butter consisted of 100 tons of alfalfa hay fed in connection with 125 tons of corn silage. This was fed during the winter to 40 cows, which averaged over 400 pounds of butter each.

It will scarcely pay a man to engage in any form of agriculture without fairly satisfactory equipment with which to perform his work. This is especially true of dairying. After reasonably good stock has been secured, undoubtedly the most valuable and nearly indispensable article of dairy equipment is the silo. The cost is so trifling when compared with the advantages to be derived as to be a matter of little or no consideration. It may be said to be indispensable to the most profitable dairy practice under all conditions except in sections of the south where green feed is available at all periods of the year.

Just what feeds the dairyman shall use, depends very largely, of course, upon the local conditions under which he works. Many men who are engaged in producing milk for city markets have only a small piece of land and are not able to raise large

amounts of forage of such bulky nature as clover or alfalfa hay. Under these conditions, their best plan is probably to raise all the corn they can for silage and then purchase in the markets their protein feed. The silage will furnish succulence and bulk to the ration, and will supply all, or nearly all, of the carbohydrates needed, but milk production requires especially large quantities of protein. This can be supplied in the form of bran, linseed meal, cottonseed meal, brewers' grain and various manufactured feeds which are sold under a guarantee as to their protein contents.

In recent years the alfalfa-growing districts in the far West have built up a considerable industry in grinding alfalfa hay into the form of meal, which is shipped in sacks and can be used the same as bran as concentrated protein. Where the very best quality of this is obtainable, its feeding value as a concentrate is nearly, or quite, equal to that of bran. In many of the semi-arid districts of the far West dairying is depended upon in considerable degree for the family income. In many of these regions they do not raise much alfalfa or other leguminous hay. Their forages consist of millet, sorghum and corn fodder. Few, if any, have as yet even thought of building silos, yet it is possible for them to feed a fairly satisfactory dairy ration by mixing with their carbonaceous forages liberal proportions of oats, barley or other nitrogenous grains. The great fault with a dairy ration of this character is that it lacks succulence, and this quality in the feed is one of the prime requisites in the most successful type of dairying. Silage furnishes succulence along with its other desirable qualities. Root crops also serve this purpose very well, but should be finely chopped or sliced when fed to

cows, in order to avoid the danger of choking.

Pasture grass, either the blue grass of the East and South or the nutritious wild grasses found in the West, form an almost ideal all-around feed for the dairy. There are, however, only two or three months of the year when these grasses are at their best, and supplementary feeding is required for the largest results during the greater portion of the year. Another disadvantage of pasturing, especially upon high-priced land, is its wastefulness. The necessity for the economical utilization of all the feed raised on a farm under intensive conditions has led to the system of feeding known as soiling. This plan requires keeping the cows in a barn, or in relatively small lots, at all times, and cutting green growing crops such as rye, rape, clover or other suitable plants each day and feeding in just such quantities as are required. This does away with wastefulness of pasturing and enables the keeping of a larger number of animals than could otherwise be done. The silo can be used in connection with soiling, to very good advantage, or it can be used in connection with pasturing by providing a supply of the summer silage to use when the grass gets short and dry during the latter part of the summer. One of the most successful dairymen in Illinois cuts from five to seven acres of rye and clover in June and chops it finely in his silage cutter, packs it in the silo for summer use, and finishes feeding it out only just before the corn silage is available in the fall. He states that he finds this the most profitable crop of his entire farm.

NEEDS OF MILK PRODUCTION

Whatever feeds are given and whatever is the feeding practice, it should always be borne in mind

that milk production requires lots of protein, and that maximum milk production requires a succulent feed. The greatest profits from dairying are not possible without the strictest attention to the needs of the cow in planning her ration.

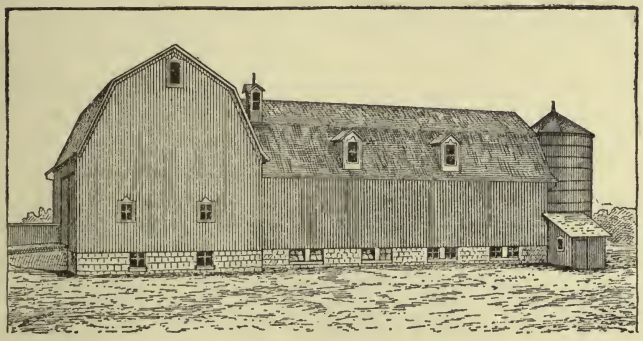
The dairy industry, so far as it relates to the production of milk, is rapidly undergoing a revolution. The changes demanded by the boards of health must necessarily increase the cost of production somewhat, although not to the extent of making dairying unprofitable, under conditions of reasonable farm efficiency. Many of the careless methods which have been sanctioned in the past must go. What is required from the present day standpoint? In few words, the demand is for clean, healthy cows, well-lighted, well-ventilated clean and airy stables, tight, sound floors, clean, healthy attendants, clean utensils, prompt removal and cooling of the milk in a proper room used exclusively for the purpose, and storage at a temperature below 60 degrees. The use of the small top milk pail cannot be too strongly recommended in eliminating dirt and bacteria. In one instance, where a study was made of this point, it was found that where the ordinary open pail was used, the bacterial count was 3,439,000 per cubic centimeter, as compared with 6,600 with the small top pail. The use of the damp cloth in wiping the udders and flanks of the cows before milking is very important in reducing the bacterial count. It was found that where this was practiced in one instance, the number of bacteria in the milk was 716 per cubic centimeter, as compared with 7,058 per cubic centimeter where the moist cloth was not used.

Public opinion is yearly becoming more insistent in its demands for elimination of infectious diseases

from herds furnishing milk for public use. This refers especially to tuberculosis. It is unfortunately a fact that many thousands of cows which now furnish milk to the cities are in various stages of this disease. There is no longer any doubt that it is possible for this scourge to be communicated to human beings through the medium of milk. The time is near at hand when those dairymen who do not voluntarily clean up their herds by means of the tuberculin test, will be compelled to do so by force of public opinion expressed through ordinances and state laws. This elimination of tubercular cows will not prove the hardship that it seems. It is inconceivable that a cow suffering from this disease in any advanced form, can possibly be a paying proposition to the dairyman. The disease will have so impaired her efficiency as a milk producer that, in a great majority of cases, she will not be paying for the feed she consumes. A careful test of dairy cows suffering from this disease would undoubtedly demonstrate this fact.

Good dairy barns are one of the requirements for profits in this business. These barns are as necessary to protect the cows from heat and flies in summer as from cold and exposure in winter. Just what the type of barn shall be depends upon the taste of the farmer, and upon the money he wishes to invest in the building. This much should be common to all barns : that perfect ventilation should be provided in some manner so that the stock need not be exposed to the direct action of cold winds in winter. It is not desirable to have the barn uncomfortably warm in cold weather, but rather to have a reasonable temperature and fresh, pure air at all times of the day and night. The problem of keeping a dairy barn clean and free from

dust and obnoxious odors which are readily absorbed by milk is one of the difficult phases of this business. The problem of affording sufficient protection, and at the same time giving cows enough exercise and enough pure air to keep them in healthful condition, is a grave one. The closely built, tightly closed dairy barns of the East and middle West have undoubtedly been responsible for the development and spread of tuberculosis in a large



A MICHIGAN DAIRY BARN AND SILO

number of valuable herds in that region. Ventilation is a phase which has always received too little attention at the hands of the farmer.

A type of barn or shelter for dairy stock which seems very satisfactory, not only in protecting the animals and maintaining their health, but also in reducing materially the amount of labor required in caring for them, is found in a sort of covered barnyard. This consists of a covered yard or room where the cows are allowed to run loose in winter and has only a few stalls in which the cows are fastened while being milked. This suffices equally as well where milking machines are used as where

hand milking is done. The relative cheapness of a structure of this sort makes it possible to give each animal a large amount of room and a large amount of air space. Movable racks are placed at convenient intervals for containing the feed for the cows, and they are allowed to help themselves, except to the concentrated feeds, which are given during milking time. By this method most of the manure is deposited near the feed racks and is so thoroughly tramped and mixed with straw or other litter furnished for bedding as to practically exclude air. Little or no heating takes place, and there is no loss of fertility through leaching or any of the processes which take place when the manure is piled in heaps in the open air.

The problem of keeping the cows clean is a simple one and consists in supplying plenty of bedding. Straw is usually very cheap and can be had in unlimited amounts under most conditions. Shredded corn fodder also makes an excellent bedding for cows, and is used with great success by some dairymen for this purpose. After the cows have eaten all of the fodder they will, there will be considerable quantities left which are not edible, but which will make very good bedding. It has great absorbent properties and is especially desirable on this account. Cows managed in a yard of this kind will undoubtedly have better health, because they are free to move about, receive more air and have access to water as they desire instead of stated intervals. Air, sunlight and cleanliness are essential in every dairy barn of whatever type.

ILLINOIS DAIRY EXPERIENCE

The question of the returns from market dairying, or the making of milk for the city markets, is

one which has attracted much interest and discussion within recent years in all the large dairy sections of the country. This is especially true in the dairy districts which furnish the milk supply of Chicago. Farmers, on one hand, claim that the high cost of feed and labor has made the production of milk at present prices unprofitable, or at best given only a narrow margin of profit. The distributors say that the increased cost of handling the milk, due to more stringent sanitary regulations, as well as to the general increase in labor and other expense items, has made it imperative that they receive more money.

This contention between the producer and the distributor has resulted in the formation of associations among the farmers calculated to insist upon higher wholesale prices. Whether or not any appreciable gain will come to the farmer through agitation, it is certain that somebody was getting 1 cent per quart more for milk in 1910 than in 1909, because the consumer had to pay 8 cents then, instead of the 7 cents formerly demanded.

There is no question that the expense of producing milk has risen very materially and much out of proportion to any trifling increase farmers may have received for their product. However this may be, there are dairymen who have made profits even under the most unfavorable conditions of production, cost and the markets. The average dairyman has likely just about been holding his own, while there is a considerable class of farmers of indifferent methods, whose dairy operations are returning them a net loss. The dairymen who have put the maximum amount of intelligence and business management into the conduct of their business are not seriously complaining about low markets

nor decreased gains. By attention to details and by the utilization of the most approved methods of dairy and farm management, they have been able to offset the increased cost of production by a corresponding increase in efficiency of their milk-producing machinery. They have increased the producing capacity of their cows by selection and intelligent feeding, and have kept down operating expenses by the installment of labor-saving machinery.

For instance, one cow will produce 6,000 pounds of milk per year, with practically the same feed consumption as another cow which produces only 4,000 pounds per year. This difference in production represents the difference in efficiency of the two animals. The wise dairyman who has discarded the 4,000-pound kind of cows and given his feed to the 6,000-pound sort is the man who is not seriously complaining about the milk market.

Granting that market conditions, the cost of production and the increased expense of feed and labor have worked a hardship upon the average dairyman, the experience and methods of such farmers as have been able to overcome these unfavorable conditions should be of especial interest and value. Definite facts and figures are hard to obtain. Comparatively few farmers, even after all that has been said as to keeping farm accounts, have any actual figures upon which to base definite estimates. The experience, therefore, of a man who can show exactly to the cent the results of his year's dairying operations is of great interest. The figures furnished by F. B. Pratt of Du Page county, Ill., covering his dairy operations of 1909, have created a great deal of comment in the local and agricultural press and are well worthy of consideration.

It should be said in advance that Mr. Pratt is

the manager of a large stock farm, which demands all his own time, and conducts his dairy as a side issue, depending entirely upon hired labor, under his more or less personal supervision.

His farm consists of 131½ acres, in addition to which he handles 80 acres of rented land. In 1909 his crops consisted of 60 acres of corn, 30 of which were placed in the silo and 30 husked from the shock, 20 acres of alsike clover, 20 acres of red clover and timothy and four acres of rye. He had some 15 acres of oats and the balance of the land is in pasture. Farm equipment includes two silos, an 18-horse power gasoline engine for running the silage cutter, feed grinders and pump, and such machinery as would ordinarily be used in conducting a farm of this size.

His milking herd consisted of 59 head of Holsteins, five of which were pure bred, and the balance were high grade. The milk from this herd was sold to the condenseries at current market price, absolutely no advantage in price being received for the excellent sanitary conditions under which it was produced. Contrary to the average dairy, the greatest output from this farm was in the winter months, although the amount sold remained fairly equal throughout the year, varying from 32,000 to 42,000 pounds monthly. The total amount sold to the condensery amounted to 426,150 pounds. Adding to this 18,360 pounds fed calves and 3,876 sold locally, the total production of this herd was 448,396 pounds, or 7,600 pounds of milk for each cow. The average price paid was $1.40 per hundred, making the gross production per cow $106.40.

FIGURES ARE CONCLUSIVE

A very complete book account was kept by Mr. Pratt, including absolutely all expense items, including also depreciation in value for such cows as had passed the age of greatest value, also deterioration of machinery, taxes and insurance, and allowing 5 per cent interest upon an investment of $20,000. Every item which could reasonably be charged against the gross operation of the farm was added to the expense account, and even then the net profit amounted to $1,977.40. This record is so remarkable as to have occasioned doubts of its accuracy among some well-informed dairymen, but Mr. Pratt has the figures, the bills for cash expended and the statements of the condensery as to amount of milk received, and the figures are absolutely conclusive.

After ascertaining the fact that the record was actually made under genuine farm conditions, by a dairy operated for profit and not for pastime, I was especially interested in learning from Mr. Pratt the methods of feeding and management which contributed to this result. The distribution of his crop has already been described. Very little dependence was placed upon pasture, its principal use being to give the animals exercise in the fresh air daily. All feeding was done, summer and winter, in the barn. Stated amounts were not given each animal, but the amount fed was gauged rather by the consuming and producing capacity of the animal. The previous year's supply of corn silage lasted until June, and at this time four acres of rye and three of alsike clover were cut and placed in the silo for summer feeding. This was run through the silage cutter and very finely chopped, carefully

packed and remained in excellent condition until entirely consumed. This seven acres of rye and clover Mr. Pratt considers the most profitable crop he raised. It lasted from the middle of June until September, when the new corn silage was ready to use. He fed the cows all they would eat of it, and assured me that the results from its use were of greatest benefit in maintaining the flow of milk during the period of the summer when the dairymen depending upon pasture always figure on a heavy decrease in production.

SILOS FURNISH MOST FEED

His two silos are filled with finely-chopped corn silage in September, and this feed supply will easily last until the coming June, when some of the summer silage will be ready for use. The grain ration consists of equal parts of finely ground corn and cob meal, dried brewers' grains, bran and wheat middlings. The silage and grain are fed night and morning and clover hay at noon.

There is nothing in the management of this farm that cannot be duplicated upon any farm in Illinois. The two factors of its success are: First, using cows of high-producing capacity. Second, utilizing by means of the silo the best dairy feed, and the absolute elimination of waste by feeding in the barn throughout the year. Such feeds as brewers' grain and shorts, which are purchased on the market, Mr. Pratt buys early in the season in carload lots, instead of paying the advanced prices demanded later in the year. Results upon similar farms in the same county, figuring absolutely the same items of expense and receipts, figuring the same interest upon land valuation and the same cost

for labor, show an absolute net loss of $4 to $5 per day. The difference between the approximate $2,000 loss and $2,000 profit represents the difference in the standards of efficiency and management of the two farms.

PAYS TO RAISE CALVES

How to profitably raise calves for use in building up the standard of dairy herds has always been a puzzling question to the farmers producing milk for city markets, where there is no skim milk or by-products of any kind to feed young animals. As we noted before, Mr. Pratt fed more than 18,000 pounds of this expensive milk to fifteen head of calves. "Isn't this a rather expensive method of producing stock," I inquired of Mr. Pratt. "Well, I fed this 18,000 pounds of milk, which was worth $235 upon the market, to fifteen head of Holstein calves. I sold three or four of these the other day for $50 per head. These were not pure breds, but simply well-graded calves. I can secure this average for the whole bunch. In other words, I will sell for $750 animals that were produced with $235 worth of milk.

"At the present values of good dairy stock it pays to feed this expensive market milk to the calves. I feed them until they are three months old, gradually introducing crushed oats and other easily assimilated feeds until the complete change is made from milk to dry feed, without any serious detriment to the growth of the young animal. Under present conditions I do not think the making of milk for market, profitable as it has proved for me, represents the greatest or most profitable type of dairy farming. I intend to install very shortly a

complete apparatus for churning and handling butter upon my farm. Some of the best butter-makers are now obtaining 5 pounds of butter for each hundred pounds of milk. Even if I can only secure 4½ pounds per hundred pounds of milk, I figure that I can secure as great cash returns as though the milk were sold upon the market, and have left as clear gain the skim milk, which I shall utilize in feeding calves and pigs.

"Four and one-half pounds of butter, which ought to bring 30 cents per pound, amounts to $1.35, or within 5 cents per hundred pounds of my last year's average for market milk. The by-product in the form of skim milk retained upon the farm and fed to young stock ought to increase the profits by one-half. In addition to this we will be spared the labor and expense of making daily deliveries of the large bulk of the milk output.

"I think it is probably true that the distributor exacts too great a profit, yet I am sure that the ultimate success of the dairy industry does not depend so much upon boosting the price as it does upon the development of more intelligent methods of dairying. The percentage of profit or loss from dairying operations in this county is pretty accurately measured by the degree of skill and special management which the individual dairyman devotes to his business."

INDIRECT RESULTS OF DAIRYING

The economical handling of manure produced by dairy animals for the enrichment of the soil is by no means the least important consideration in determining the merits of the industry. The soil of exclusive dairy sections is usually very rich after

a few years of dairying, because not only is all the grain and forage produced upon this land returned to it in the form of manure, but large quantities of concentrated feeds are purchased from outside sources and fertility is also gained by the dairy farm.

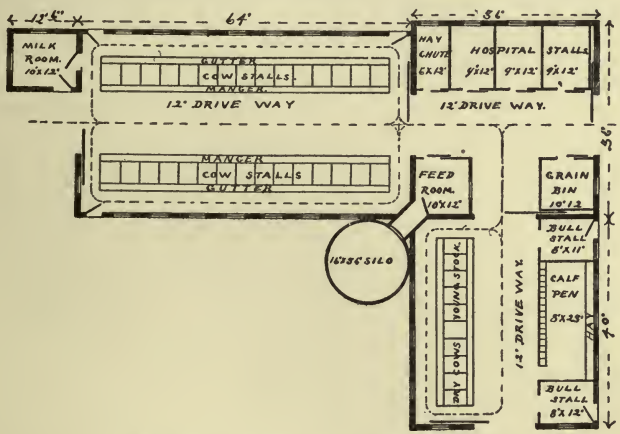
The indirect returns from dairying are deserving of fully as much consideration as the immediate financial results. The most highly developed type of dairying in regions of heavy forage and grain production can, by using the silo for preserving winter feed and by feeding soiling crops in summer, maintain one cow per acre of land. Very few

ELEVATION OF DAIRY BARN

are doing this, it is true, but it can be done, and is being done in some notable instances. The American dairyman should get rid of a few of his cows and double the producing capacity of those he keeps. This improvement in quality is the most imperative need of the industry at this time. Coupled with this must be heavy, intelligent feeding. Return to the soil of the dairy

farm the tremendous amounts of valuable fertility produced by the stock in order to raise still larger crops the following year. The effect will be cumulative.

Greater fertility will produce heavier crops. This, in turn, will maintain more live stock and the process will be repeated in some degree each succeeding year until the maximum producing capacity of the land is reached. There is scarcely



GROUND PLAN OF DAIRY BARN

a farm in the country today which has ever been made to produce its maximum amount. The time is rapidly approaching when the insistent demands of an unsupplied market will drive the American farmer and dairyman to more intensive methods and will compel a largely increased return from each acre of land now cultivated. The field for intelligence and special management is no greater in any line of business than is found in the dairy industry today. There is no

field which promises greater returns for the money and skill expended, yet there is no industry which, on an average, under present conditions, pays a smaller percentage. The instances are many where large profits are made both in direct returns and in the upbuilding of the soil, but the average remains discouragingly low. It is high time for the American farmer to awaken to his opportunities in this field, and to get out of this important industry the wealth that lies hidden in it.

CHAPTER XI

Sheep Under Farm Conditions

The sheep is known to have been under domestication longer than any other animal. Whether it was originally one of the species of wild sheep still found in uninhabited places, or whether it is a descendant of one of the wild species now extinct is an undecided question. It has been under the control of man for so many generations that it has lost all of the original wild animal characteristics, and is the most helpless and incapable of self-preservation of any of the domestic animals. Certain it is that long before the most remote legendary and Biblical times, the sheep was thoroughly domesticated, and was one of the most important animals. In the western movement of settlement across Europe and later across the Atlantic, this animal has always been in the advance guard of civilization. It was brought to America by Columbus and subsequent Spanish explorers, and rapidly obtained a foothold in the West Indies, Central and South America and Florida. Later, the early English and Dutch settlers in New England and New York brought numbers of sheep with them, with the expectation of developing sheep growing in their new colonies. Naturally, the Spanish importations consisted of the fine wooled Merinos which, at that time, made Spain famous as the world's leader in the production of fine wool and fabrics; while the sheep imported to the North were of the large, coarse-wooled varieties from England and the north of Europe.

Sheep, in the northern part of America, did not thrive and increase very rapidly until late in the colonial period, principally on account of the depredations of wild animals, and because of oppressive trade regulations imposed by the mother country. In striking contrast was the development of the sheep-growing industry in all of the Spanish-American colonies. The original stock introduced into the West Indies and Yucatan was carefully preserved, and under the intelligent and fostering care of the Spanish government, the number of sheep rapidly increased. They spread over the country with the same rapidity as the early Spanish settlers, soon obtaining a foothold in Mexico and spreading from there northward into Texas, New Mexico and California. As early as 1560, it was written by a Spanish historian that "much woolen cloth was made this year in New Spain." By 1750, sheep were very abundant in the Spanish province which is now New Mexico, and in 1773 they had spread into southern California. From 1775 to 1850 was the period of greatest Spanish activity in California, when many missions were established, and the first beginnings of permanent settlement were made. Every Spanish mission owned and fostered its large flocks of sheep, and by 1825 the 17 missions between San Diego and San Francisco owned more than 1,000,000 sheep. In addition to this, the early ranchers of that period owned, perhaps, as many more. All of these southwestern sheep were of the Merino type, being relatively heavy wool producers and very light meat producers.

At a period early in the nineteenth century the present territory of New Mexico supported probably a greater number of sheep than it does

now. When the rush to the gold fields in California began in 1849, creating suddenly an abnormal demand for food products of all kinds, many of the early Spanish sheepmen of this territory trailed enormous flocks from the ranges of New Mexico across the mountains, down the Gila and Salt rivers to the Colorado, crossing at a point near the present site of Yuma, then across the Mojave desert of California, across the Sierras and up the coast to San Francisco, where they were disposed of to the miners, during the first few years, at extremely high prices, and brought heavy profits to their owners, in spite of the 1,000-mile overland march to market. The foundation stock of the entire western range, which now supports approximately 70 per cent of the sheep of the United States, came from these old Spanish Merino herds.

In the eastern part of the United States the sheep industry has varied greatly at different periods. At times the craze for fine-wooled sheep has taken possession of the entire sheep-growing sections, and fancy Merinos have sold at most exorbitant figures. At other times, the popular fancy has tended to the coarse-wooled mutton breeds, and the importations from English sources have been correspondingly heavy. The East reached its highest point in sheep production in the decade following the civil war, when the territory east of the Mississippi supported a little more than 24,000,000 head, against 11,000,000 owned west of the Mississippi. From this time on the ratio has steadily changed, the East gradually losing interest in the industry on account of the competition of the free western ranges, because of the greater profits to be had from grain farming, and from other forms of live stock, because of cheap wool

and a small market demand for mutton, until at present the territory east of the Mississippi has but 17,675,000 head, while the western farms and ranges carry 38,328,000 head.

THE DUAL-PURPOSE TYPE

The changing conditions of the past 20 years, which have caused the constant decrease in beef production as compared with the population in the United States, has led to a constantly increasing market demand for mutton. Several of our great cities today demand more than a million head of sheep yearly to supply their local meat trade, while a few years ago only a negligible quantity of mutton was required. The land upon which sheep are grown has constantly increased in value. Even upon the free land of the western ranges, maintenance expenses have very materially increased, so that it has become no longer profitable to raise sheep for the wool alone, as was commonly done in the earlier history of the country. These changing conditions have led to a demand for a dual-purpose type of sheep which will produce a reasonable fleece, and still be of sufficient weight and mutton quality that it will dress out a fair percentage of meat when placed upon the market. There are probably no conditions in the United States today which will justify the raising, on a commercial basis, of sheep either for wool or for mutton alone. This type of breeding is left entirely to the breeders of registered animals, and is not practiced by the breeders of ordinary market sheep. Farm conditions demand a type of sheep which will shear at least nine or ten pounds of wool and which will produce a lamb which may be mar-

keted under a year old at a weight of 85 to 90 pounds. This type has been developed by a blending of the extreme wool-producing tendencies of the Merino, and other fine wool breeds, with the blocky mutton form of the English mutton breeds. Probably the most common course in developing this type has been the use of Shropshire rams upon the common Merino foundation stock. This is especially true in the western range country. When lambs sell, as they have in recent years, as high as 5½ cents per pound on the open range, and, when fattened, for as high as 10 cents per pound on the Chicago market, it can readily be seen that we are far removed from the day when sheep could be grown for wool alone.

BREEDING FOR WOOL AND MUTTON

This demand for a combined wool and mutton type has shown its result in marked change in the characteristics of the foundation stock of the country, both in the large flocks of the West and under farm conditions in the East. While the Merino characteristics are still easily discernible, the continued intelligent selection of the dual-purpose type, and the long-continued use of rams from the Shropshire and other mutton breeds, have produced breeding stock which, to a large degree, represents the dual-purpose ideal toward which progressive breeders have been striving for the past 20 years. The wool-producing characteristics have been preserved by the occasional use of Rambouillet or Merino rams when it was seen that the type was inclining too much to mutton form or when the weight of the fleeces began to decrease.

In recent years the fattening of lambs for market

has become an industry of large proportions, and the feeders from eastern farms and from the western mountain valleys have searched for lambs of the most desirable feeding type. This has led to the practice on the part of some sheep breeders of using rams of the extremely heavy mutton type, such as Lincoln or Hampshires, upon the common grade ewe, with the result that an unusually large, heavy mutton form lamb was produced to be placed in the feed lot at five months old. This has given the feeders a lamb of large frame and great feed-consuming capacity and a resulting heavier-dressed carcass has appeared in the markets. This practice has been very successful in cases where all the lambs were intended for sale. The cross, however, is so violent that the product has not been satisfactory when part of the lambs are kept for future breeding. Generally, whether under farm or range conditions, a desirable dual-purpose type of sheep may be maintained by intelligent selection of breeding ewes, and the alternation as needed of the type of ram, using the mutton breeds when the stock begins to incline too much to fineness of wool, and using Rambouillet or Merino rams when the coarse-wooled mutton type begins to predominate too largely.

MANAGEMENT OF BREEDING SHEEP

The feeding and management of breeding animals of any class differs very materially from that of animals intended for the block. This is especially true of sheep. The ewe lambs which are intended for future breeding should be selected as early as possible, preferably just after weaning, choosing only those which conform most nearly to

the desired type. At this time it is impossible to determine just what animals are best, because of their immature development, but the poor ones can easily be eliminated later on as age and development demonstrate their unfitness. These selected lambs should be kept constantly growing, since any setback in their development will never be entirely overcome by any subsequent care that may be given. Good, fresh pasture is the prime requisite for the most satisfactory growth of lambs. Provision should be made for supplementary grazing for late summer and early fall, when the ordinary clover and blue grass pastures are likely to become dry and poor. The stubble may be utilized to good advantage at this time, or a number of autumn grazing crops such as rye or rape, sown in the growing corn, may be used.

DESIRABLE FEEDS

The method of feeding depends very much upon local conditions. The feeds given will depend largely upon the character of the crops produced upon the farm. Under ranch conditions, the range is depended upon, to a large extent, for winter sustenance as well as for summer, and alfalfa or timothy hay will be practically the only feed available. This is usually used only in times of severe storms. The best eastern farmers who keep sheep depend largely upon clover hay and roots for the feed for their breeding sheep in winter. It will usually pay to feed a small grain ration even though the animals are already in good condition. Just what this grain ration will be will depend considerably upon the kind and condition of the rough feed. If clover or alfalfa hay is being used quite

liberally, a small ration of cracked corn and, perhaps, a little oil meal occasionally, will serve to balance up the ration very evenly. In case mixed hay and grasses or oat straw is being used, the ration should include some grain rich in protein. Bran or oats mixed with the corn will serve to supply this need. The oil meal should always be fed in the lump form to sheep, as they seem to relish it more. It is best fed mixed with bran or cracked grain.

Succulent feed of some sort is essential to the best development of sheep under farm conditions. This need may be met in a number of ways. Various root crops may be grown which are easily stored throughout the winter, and which furnish a very satisfactory addition to the ration. Sugar beets are probably the best crop which can be grown for this purpose. The English and Scotch shepherds are very partial to turnips for their sheep feed, and these may be grown almost any place in this country in liberal quantities. Rutabagas, mangel-wurzels and other roots form very satisfactory succulent feeds. The roots should be fed finely chopped or sliced, so that there will be no danger of choking. Where roots are not available, silage is an excellent winter feed, furnishing not only succulence, but having a high degree of nutriment. Sheep will learn to eat it very readily, and relish it. There is frequently danger in feeding it in a frozen condition, and this should be guarded against, as best results will not be possible from its use for any kind of animals while in this condition. Frequently, it is desirable to scatter the grain upon the silage, so that the entire ration will be consumed together. Mr. Richard Gibson of Ontario, after 50 years of experience in sheep breed-

ing and management, and after having won more prizes for fine sheep than all the other breeders of the United States and Canada combined, says: "I attribute my success as an exhibitor to the frequent feeding of a great variety of green feeds or forage plants. I find that cabbage and kale are extremely valuable green feeds. Turnips, when fully ripe, are also fine." It will usually be best to cut down somewhat the amount of succulent feed given for a few days preceding lambing time, and then increase it gradually to its maximum after the lambs are born.

EXERCISE IN WINTER ESSENTIAL

The ewes, during the winter, should be handled carefully to prevent possible injury. Care should always be taken that they are not rushed through narrow doors, nor frightened by dogs, nor by strangers going through the yards. It is also important that they have plenty of exercise. It is usually possible to give them access to large yards or to some open field where they may browse about a straw stack, or in the standing corn stalks, on such winter days as the weather permits. In case of long-continued, heavy snows, when this sort of exercise is not possible, a passageway should be made through the snow from one barn to another, or from the barn to the feeding racks removed to some distance, so that the ewes will be obliged to take exercise enough to keep them in vigorous condition. Animals which have been kept closely stabled during the winter have frequently borne lambs which were so weak and delicate that very few of them survived. This was due entirely to the lack of exercise on the part of the mother. It is preferable that the sheep should spend as much

of their time as possible in the open, and under ordinary conditions it is not necessary to house them in tightly closed barns if a comfortable shed opening into a roomy barnyard be provided, especially if the barnyard be well bedded or provided with a good-sized straw stack. The animals will spend most of their time, even in the coldest winter weather, out of doors, seeking the shelter of the shed only during snowstorms or wet weather. Their heavy winter coat protects them from the air, and the thick bed of straw will prevent any ill effects from the cold ground. Under these conditions, the sheep will be healthier and more vigorous, and will come through the winter in better condition than if they are constantly kept in a warm, closed barn. The water supply, it is needless to say, should be ample at all times, but extremely cold water is not the best, especially for pregnant ewes. Water fresh from the well or cistern, or from which the chill has been removed by means of a tank heater, is much to be preferred to ice cold water.

The winter feeding and managing of rams does not differ very materially from the keeping of breeding ewes, except that it is not advisable to feed a heavy ration of succulent feed. A small amount of this can be given with good results, but it is better to feed a larger proportion of dry feed. Plenty of exercise is essential in order to keep the animals in robust physical condition, and this detail should not be overlooked.

LAMBING A CRITICAL TIME

Lambing time is the most critical and important period in the life of the flock. At this time, unfavorable conditions or a little neglect on the part

of the farmer may result in the loss of large numbers of lambs, and the normal increase of the herd wiped out. The breeding period should be so timed that all the lambs will be born within the shortest possible space of time, and in this manner constant attention can be given during a lambing period. Early lambs are usually more profitable under farm conditions, because they can be matured

AN IDAHO LAMBING SHED

and marketed before the heavy shipments of range lambs begin. Under range conditions, it is not usually possible to have the lambing period until the weather has become quite warm, as few of the large breeders are equipped with lambing sheds or other shelter. Good warm quarters for the protection of the flock during lambing time are essential to the successful production of early lambs. It is important that the young lamb should not suffer from cold or become chilled during its early life, when the vitality is naturally low. Heavy losses will surely occur if the young lambs are exposed to cold wind or to the rains of early spring. It will be necessary to give a lot of attention to the flock

during this period to make sure that each ewe recognizes her own lamb and takes care of it. It will always pay to have a number of small pens in the lambing shed into which the ewes with their newly born lambs may be placed for a few hours or days until the lamb has gained a little strength and until the mother has become accustomed to her offspring.

The owner should be careful to notice whether the lamb sucks during the first few hours of its life. Occasionally the ewe will not permit this, and in some cases it will be necessary to hold the ewe and teach the young lamb to suck by giving it a little milk with a spoon to begin with. Sometimes when a ewe has twins, she will pay attention to only one of them, perhaps the larger and stronger one. Such a contingency as this must be guarded against. Frequently, it is possible to separate the twins, giving one of them to some ewe whose lamb has died. Since ewes recognize their lambs by means of the sense of smell, this trick of transferring lambs to a foster mother is usually accomplished by tying the skin of the dead lamb on the live one, leaving it for several days until the ewe has become used to the adopted lamb. As soon as weather conditions permit, the ewes with their young lambs should be turned out in open lots or pasture during the warm part of the day, but should be sheltered at night until the lambs have become strong and have a protecting coat of wool, because the chilly spring nights are apt to be injurious to them if unsheltered.

FEEDING EWES AND LAMBS

The feeding of ewes after lambing does not differ radically from the methods already outlined. The

object of feeding at this period should be not only to maintain them in as good condition of flesh as possible, but to produce at the same time a heavy flow of milk. Naturally, the ration should include as large a proportion as is thought advisable of succulent feed, and such forage and grain as will furnish a large proportion of protein. If only a limited amount of alfalfa or clover hay be available, it is advisable to feed corn fodder earlier in the season, and keep this hay until after lambing, as it will, at this time, serve for best results. Timothy hay and prairie hay are probably the poorest forage feeds which can be given at this time, and their use should be supplemented by liberal amounts of bran and oats. A satisfactory ration for ewes with lambs by their sides will be about 4 pounds of corn silage, 1 pound of mangels or other roots, and about 1½ pounds of mixed grains, for each 100 pounds of live weight. This mixed grain should consist of 100 pounds of wheat bran, 25 pounds of oats, 25 pounds of cracked oil cake, and a little corn. In addition to this they should have all the clover hay they will eat, and if they have access to bright, clean straw, so much the better.

SUMMER PASTURE AND MANAGEMENT

As early as possible in the spring the sheep should be placed upon pasture. It is essentially a grazing animal, and the best and cheapest gains are made from pasture. The change from the dry feed of winter to the soft, green feed of early spring should be made somewhat gradually, especially if the supply of succulent feed has been low. Frequently, a few hours in the middle of the day is all

that it is advisable to pasture the animals, feeding them their regular ration in the morning and evening. After the first few days, when the grass becomes stronger and contains more nutriment, the animals may be left continuously upon pasture without serious detriment. Ordinarily, no feed is given while pasture is good, although this is frequently profitable when some special object is sought, such as the fitting of sheep for fairs or rapid growth of the lambs is desired for an especially early market. Grass, water and shade are essential for the best growth in summer. Close account should be kept of the animals, especially in late summer, when the grass is likely to become poor and dry, and extra feed should be given upon any indication of retarded growth.

When the spring lambs are intended to be fattened for market the following fall, it is especially important that they be kept growing and thriving from the very day of birth. This continuous growth has been well begun when the management of the ewes has provided for a liberal flow of milk for the young lambs during their early life. This gives them a good thrifty start, and encourages a rapid, strong development, so that at a very early age they will begin to eat a little of the feed or pasture which supports their mothers. This amount of solid food taken will rapidly increase as the animals are placed upon tender pasture, and at an early age the lamb will be drawing its sustenance from the two sources. The lambs will learn to eat a little crushed grain or bran before they are very old, and if this be kept before them they will consume increasing amounts of it during the summer, with marked effect upon their growth and condition.

If it is impossible to change the sheep from one pasture to another as the grass becomes poor, then the feed supply may be increased with some of the first cutting of clover or alfalfa, and later in the summer the green corn may be cut and fed in the open pasture with good results. It is easy to provide plenty of good green feed for autumn by sowing quick-growing crops in the stubble field, or in the growing corn, and pasturing this in September and October. By this means the lamb will receive no setback in its growth from the time of its birth to its arrival in the fattening pen. This change from pasture conditions to the feed lot is a critical period, and should be made gradually. The lamb should be weaned some time previous to its removal from the pasture to the feed lot, so that its milk ration and the green feed of the pasture shall not be taken away at the same time. If good, green grazing has been provided for the period just following weaning there need be no bad effects noticeable when this change is made.

DOCKING

Docking young lambs is an almost universal custom. The only section of the country where this is not commonly practiced is the territory of New Mexico, where the wether lambs are often left undocked. A flock of long-tailed sheep in the stock yards is put down at once as New Mexico stock, so prevalent is the docking custom in all other sections of the country. The tail is a useless appendage, hard to shear and of more nuisance than benefit to the animal, and this is the reason for docking. The lambs are usually docked at from ten days to three weeks old, because at that age the

wounds will heal quickly and little pain or discomfort is experienced. Some growers use a sharp knife, cutting off the tail at a single blow, while others prefer to use a chisel. When the chisel is used, the lamb is drawn against a block, and the tail severed by a single blow, leaving a stub about 2 inches in length. Under farm conditions, branding or ear marking is usually unnecessary, while under range conditions it is absolutely essential. If the ears are to be marked, this may well be done at the same time that the lambs are docked.

SHEARING

Shearing should be done as early in the season as weather conditions will permit. The old custom of waiting until June or even midsummer before removing the wool was an unbusinesslike one, reducing the amount and value of the wool received by the owner and undoubtedly causing great discomfort to the animal which had to wear this heavy coat during the extremely warm weather. The old custom of washing the sheep before shearing has also passed away, and is probably no longer practiced anywhere in the United States. Shearing is done either by hand or by means of machinery. It is very doubtful if shearing machines are profitable under farm conditions where the flocks handled are comparatively small. It requires two men to operate a small hand-driven machine, and it is doubtful if results justify the double expenditure of labor thus necessitated as compared with hand shearing, while the installation of a power plant calls for a number of machines, which would not be justified by the small number of sheep handled. It is unquestionably true that a small additional

amount of wool can be obtained by the use of shearing machines, since they clip much closer to the skin than it is possible to do by hand. This is not a distinct advantage, however, under all circumstances, since sheep which have been thus closely shorn, if exposed continuously to the sun and wind immediately afterward are likely to suffer from a blistered skin.

MACHINE SHEARING

Machine shearing is practiced quite extensively in the range country, where the large number of animals justify the outlay necessary for a large plant. It is customary to install the plant at some convenient point on the railroad where the sheep owners may drive their flocks for shearing, and thus save the expense of hauling the wool a long distance by wagon. These plants are operated by steam or gasoline engines, and may have from ten to 30 machines in operation. They are placed where the number of sheep handled may amount to several hundred thousand in the course of a year. Even in the range country, opinion is considerably divided as to the relative merits of hand or machine shearing. An objection frequently given by western sheep men is that the vibration of the machines in shearing pregnant ewes has frequently resulted in abortion and other severe injuries, which have offset any possible gain from the use of the machines. The experience of others does not seem to bear this out. The probabilities are that the injuries come fully as much from rough handling on the part of the machine operators as from the motion of the machine itself.

CARE OF WOOL

The handling and packing of the wool is a matter of considerable importance. Eastern wool growers who have to handle comparatively few sheep take great pains in folding and tying each fleece. and in the packing of the wool, with the result that their product commands a higher price than the average western wool. The fleece is spread upon the floor, the edge turned in and the entire fleece folded into a neat compact bundle. Often a folding box is used to compress the wool and make each fleece into a bundle of the same size and general outline. It is then carefully tied with wool twine and packed into a regular wool sack. Where the fleece is of an unusually fine quality, free from dirt and bits of brush, as is usually the case under farm conditions, this extra care in handling and packing the wool will pay good profits for the time and labor expended.

TREATMENT FOR PARASITES

Hundreds of years of domestication have made sheep in some respects a delicate animal, and singularly susceptible to disease and to the attacks of parasites, both internal and external, when conditions are at all favorable to the development of either. The heavy coat of wool also furnishes favorable environment for the protection and growth of insect parasites. For this reason, the methods of combating these enemies of the sheep are of great importance to the grower. Of all the external parasites, scabies has probably caused the most serious damage to the sheep industry, with ticks a close second. Until comparatively recent

years, scabies was considered an eruption upon the skin from some unknown affection of the blood, and there was little or nothing to be done in the way of combating it. Modern investigation and the microscope, however, revealed the multitudes of mites working upon the surface of the skin, and when the true cause was known it was only a question of time and experimentation when definite remedies were produced. At present, this disease has largely disappeared from the range, due to persistent dipping and disinfecting, and there is absolutely no excuse for its continuation under farm conditions. A few dollars invested in a dipping plant and a few hours' work once or twice a year will serve to keep the sheep free from not only this disease, but from ticks, lice and other parasitic pests which may infest the herd. The type of dipping plant desirable will depend entirely upon the number of sheep to be handled. If several hundred head are supported upon the farm, it will pay to install a plank or cement-lined vat. This should be made about 5 feet deep, 30 inches wide at the top and tapering to about 8 inches wide at the bottom. It may vary from 28 to 30 feet in length, if only a few hundred are handled, to 100 feet long, as is the case when several thousand are to be handled. When only a small number of animals are kept, a galvanized iron dipping tank may be purchased at small cost, which will serve very well. There are many different dipping preparations upon the market which are guaranteed to destroy any of the ordinary parasites. Any of these preparations bearing the indorsement of the federal bureau of animal industry may be considered reliable, and should be used at exactly the strength indicated by the directions.

Internal parasites, such as stomach worms, may be easily controlled. There are a number of medicated stock powders which can be fed to the sheep, and which will destroy these parasites, but probably the most common and effectual remedy is the feeding of ordinary tobacco stems. Powdered tobacco may be mixed with grain or bran, and fed to the sheep if desired, but the refuse stems should be placed in the feeding stalls where the sheep have easy access to them. They will usually soon learn to nibble at them, and eat small portions, which will be sufficient to keep them free from the ordinary internal parasites.

FEEDING LAMBS FOR MARKET

There is no branch of animal husbandry which has attracted more attention, in recent years, nor from which greater profits have been realized than from the fattening of lambs for market upon the farms of the middle and far West. There have been some years when heavy losses have been incurred, due to extravagant prices exacted by the sheep raisers, by the high price for feed, or low condition of the market at a time when it was necessary to sell these lambs. But taking any considerable term of years together, lamb fattening has proved a profitable industry in every community where it has been undertaken within the past 20 years, and it is becoming increasingly so at present because of the continuously increasing demand for mutton in the face of a practically stationary supply. If large profits have been realized by feeders who have paid from 3 to 5½ cents per pound for the original stock, and paid high prices for all the feed consumed by it, it can be readily seen that the farmer who has

MUTTON WETHERS OF APPROVED TYPE

HIGH-CLASS POLAND CHINA HOGS

kept a few score or a few hundred sheep upon his pasture and waste land, and has received, as practically clear profit, the market returns from all the lambs he raised, has a source of revenue from his small flock of sheep which is equaled from no live stock investment which it is possible for him to make.

For most markets, the feeding process is begun late in October or in November. In addition to late fall pasture, such as rye or rape, the lamb will have been eating a good deal of straw, corn fodder and other dry forage, so that by the time he is actually confined in close feeding pens and placed upon a fattening ration, his digestive system has become accustomed to the dry feed, and he will be in condition to handle in an economical manner large amounts of forage and grain, and should gain almost from the first day. Roots and succulent feeds are not essential in successful lamb feeding. Exhaustive experiments conducted at the Iowa station indicate that, under some conditions, these feeds may be detrimental to the most economical gains. A well-balanced ration of hay and grain, plenty of water, a favorable climate and regular feeding are the factors which produce nearly all of the fat lambs which are marketed in the great packing centers of this country. Alfalfa is beyond question the best forage for fattening lambs. Clover, cowpeas or some other leguminous forage crop is almost indispensable. Where it is impossible to secure forage of this character, sugar cane, kafir corn or millet which have been cut at the proper period and carefully cured, will produce good gains when used in connection with a liberal grain ration. Nearly all of the hundreds of thousands of lambs fattened in the far West receive only al-

falfa or cowpeas, with a small ration of corn, throughout the feeding period. In the middle states, clover usually takes the place of alfalfa, and a little more liberal corn ration is probably the rule.

The grain ration will usually consist of corn, and it is generally conceded that better results are obtained from cracked corn than by feeding it whole. The amount given will be very small to begin with, and will be gradually increased throughout the feeding period. The best practice, especially where large numbers of lambs are handled, is to have one pen containing troughs for the grain apart from the pens in which the roughage is fed. The grain is placed in these troughs, the gate opened, and the sheep from one pen allowed to enter and eat their grain. While they are doing this, the hay or forage is placed in the racks and when the grain is consumed these lambs are driven back into their pen and another lot given grain. Small amounts of oil meal or crushed oats, or both, may be introduced into the ration with good effect, but these are not usually essential, and some of the most economical gains which have been produced have resulted from cracked corn as the sole grain ration. Lambs should average, perhaps, 60 pounds when they are placed in the feed lot, and after a feeding period of from 60 to 90 days, should weigh from 90 to 95 pounds. Frequently, heavier weights than this are obtained, but when a lamb weighs more than 100 pounds, he is likely to be discriminated against by the buyers, and may possibly have to be sold for a sheep instead of a lamb, with the resulting lower price.

Whether or not to clip before shipping, depends entirely upon local conditions. In the far West lambs which have been brought from the range in

December are frequently fed until April, then shorn before shipping. There is no definite rule by which it can be determined whether this early spring shearing pays or not, since ordinarily the approximate value of the wool will be deducted from the market price of the shorn lamb. There is always to be considered the possibility of a sudden change in the weather, which may result in severe loss in case the shearing is done in extreme early spring.

FATTENING GROWN SHEEP

The feeding of wethers or grown ewes for market is not greatly different from the method outlined in fattening lambs. Where pasture is plentiful, lambs intended for market may be profitably kept until they are yearlings or older in order to secure one or two wool clips, as well as the increased weight at marketing time. However, it should be remembered that the market price per pound of matured sheep is always less than that of fat lambs. This class of sheep, kept upon good pasture throughout the summer and placed in the feed lot in the autumn, will usually make excellent use of grain and hay given, and may be marketed during the winter. The only type of sheep which requires special feeding is the old "broken mouthed" ewe. When ewes become old, especially range ewes, which have often been obliged to subsist on hard, dry feed, such as sage brush, their teeth break, and they become unable to consume dry forage or hard grain in any considerable quantities. It is frequently profitable to purchase these animals from the ranges where they can usually be secured very cheaply, and fatten them for market, in case a farmer is so situated as to have available soft feeds

which they can make use of freely. They are purchased in the spring or early summer and shipped to the farms while the grass in the pastures is plentiful and tender, and then later in the summer special pasture crops, principally rape, are made use of. By keeping them constantly on soft succulent food of this character, it is often possible to market them direct from pasture in the fall, and in excellent condition for slaughter. Feeders living in the immediate vicinity of sugar factories frequently make use of the wet beet pulp, which can be secured cheaply and in large quantities for feeding animals of this class. Various concentrated feeds, such as cracked or ground grain, alfalfa meal or molasses from the factories, can be mixed with it and a well-balanced ration secured, all from feeds in a condition to be used by these animals to good advantage. If they are fed throughout the winter in this way, a heavy wool clip may be secured the following spring before the animals are marketed, and in this way very satisfactory profits are secured.

ECONOMIC UTILITY OF SHEEP

Not the least marked of the valuable qualities of sheep under farm conditions is their capacity for utilizing materials which would otherwise be wasted. As removers of weeds in the fields and meadows sheep have no equal, with the possible exception of goats. They will graze in out-of-the-way places along the roadside and along the fences where large quantities of vegetation grow, but which it is impossible to utilize in any other way. Stubble fields always contain a lot of secondary growth of grain and weeds, as well as large amounts

of headed grain which fell down or lodged before harvest and was not gathered by the reaper. All of this the sheep will pick up and transform into mutton and wool, and several weeks' good feed which would otherwise be lost may be obtained every year from the cut-over grain fields. Frequently the corn fields can be pastured in the early autumn, and enormous quantities of the lower leaves will be eaten by the sheep without any injury to the ears of the corn. Not only will large quantities of other waste feed be utilized in this manner, but a constant improvement of the land will result. The old saying that "the sheep has a golden hoof" is well borne out by the experience of men who keep large numbers of sheep, in the constant building up of the fertility of their soils.

SHEEP ON VALUABLE LAND

While it is true that sheep are well adapted to grazing on semi-arid land and to utilizing waste feed and the vegetation on land which cannot be profitably managed in any other way, it should not be inferred that they have no place on the rich, high-priced farming land. An erroneous idea has often prevailed that sheep are profitable only on inferior land which is suited to nothing else. This could hardly be farther from the truth. The rich agricultural lands of England sustain an average of 680 sheep to every 1,000 acres, while some of the best land in Scotland has supported at times as high as 1,380 sheep per 1,000 acres. The best agricultural states of America do not support an average of more than 25 sheep to every 1,000 acres. Careful breeding and intelligent management of sheep will return greater profits to the owner of

the valuable land of the middle states than he can realize from any other live stock source, with the possible exception of hogs.

FUTURE OF THE INDUSTRY

It is from the farm districts that any marked future increase in the total number of sheep in the United States will probably come. The past 40 years have witnessed enormous decreases in the number of sheep owned in this section, and the phenomenal increase in the great flocks held upon the western ranges. While this industry in the West has probably not reached its greatest point of development, we can hardly expect such continued increase in the future in this section as there has been in the past. Yet there is an imperative demand for more sheep and for more wool in this country. During the year 1909, in spite of an extremely high tariff on wool, we imported not less than $40,000,000 worth of raw wool from foreign countries, while lambs selling for 10 cents per pound upon the Chicago market demonstrated an undeniable shortage in the supply of mutton animals for the block. Meat production of all kinds in the United States is decreasing at an alarming rate, and this decrease is rendered more significant when the rapid increase in population and meat-consuming capacity of the country is considered. It has been pretty thoroughly demonstrated that beef cattle cannot be profitably raised on land which commands a market price of $200 to $250 per acre, as is the case in many sections of the middle West, yet live stock of some sort must be produced in order to consume the surplus of grain and hay and in order to maintain a con-

necting link between soil fertility and crop production. Hogs have always been largely depended upon by the farmers of this region, and will continue to be, but it seems clear that there is room for many millions of sheep at present on these high-priced farms. The maintenance of sheep on the farm is a profitable business, and the man who likes this particular line of stock raising and is willing to give close study to details of management will be able to realize larger profits from this source than from probably any other one branch of agricultural activity. A start in the business does not require a very large outlay of capital, and the industry is comparatively easy to enter. The most prudent and advisable way to start in the sheep business is to purchase a few good ewes of approved type, and then expand as the knowledge of the business grows and as circumstances seem to justify. By this means, the farm will not be overstocked by placing upon it more than it will support, and the number can be gradually increased up to the total carrying capacity of the land.

ROOM FOR EXPANSION

There are thousands of farms throughout New England and the eastern and southern states, as well as the middle and northwestern states, which have considerable areas of land absolutely unfit for anything but pasture. Much of this is overgrown with brush and weeds unfit for cattle pasture, and giving absolutely no return upon its value. Such land as this is ideal for sheep raising, except such of it as is extremely low and wet, and may be made to produce large quantities of wool and mutton and pay handsome divi-

dends to the owner by a system of intelligent sheep husbandry. Large areas of land which are susceptible to cultivation in all parts of the country are kept in pasture of a more or less permanent nature. There is no more profitable method of utilizing this grass than by raising sheep upon it. Even where it is kept primarily for the use of milch cows a considerable number of sheep can be pastured without any apparent decrease in the carrying capacity of the pasture. Any sort of grass which is suitable for permanent pastures will be consumed readily by sheep. Clover, blue grass, vetches, brome grass pastures or any of the various legumes planted primarily for soil renovation make sheep pasture of the very highest quality. It has been frequently questioned whether it is ever safe to pasture sheep upon alfalfa. Severe losses have occurred in many instances through its use, but it is now well established that alfalfa may be safely pastured if care is taken to gradually accustom the sheep to its use. They should never be turned into an alfalfa field hungry, and it is usually better to wait until the dew is off in the morning during the first week or two of grazing. Cowpeas, rape or rye sown in corn stalks furnish immense amounts of excellent pasture for sheep in late summer and in autumn. For pasture in the very late fall and very early spring, rye probably has no equal, although its value for this purpose has frequently been much underestimated.

CHAPTER XII

The Swine Industry

The factors leading to success in swine husbandry include good animals, good feed and good care. If we fail to provide any one of these, no matter in what perfect form the others may appear, a full measure of success is impossible. In meat animals conformation, constitution and type are the essentials and are found in most perfect form in pure-bred or high-grade animals. Such have the power to convert a larger part of the feed consumed into carcass than the scrub, which allows much of the feed consumed to pass out of the system as waste matter. As to breeds, all have their strong and weak points. A better feeding animal is frequently secured by cross-breeding. This is understood to mean the progeny of pure-bred parent stock. The character of the progeny of pure-bred parents can be foretold with a marked degree of certainty, but of cross-bred parents not at all. The black breeds usually give the highest grade meats with the least offal, but many of them have been bred for heavy points and consequently have lost fecundity. Relief in this line may be obtained by using Chester White, Duroc Jersey or Large Yorkshire sows which are prolific breeders and excellent mothers. These are bred to a pure-bred Poland China boar. A Poland China boar and Yorkshire sow bring a very superior feeder.

BREEDS AND TYPES

The question of what breed of hogs is best for a farmer to raise is one upon which little definite

information can be given. Conditions are often equally as favorable for success with two or more breeds of hogs, and the breed chosen will depend entirely upon the personal tastes and fancies of the farmer. While one man's fancy may lead him to adopt the Poland China as his favorite breed, his neighbor just across the road, situated under similar conditions, may choose the Berkshire or Duroc Jersey, and the success of the two may be equal. The question of type, however, is one which is vitally influenced by local conditions, and particularly by the classes of feed which are best suited to the locality. Hogs are divided into two general classes or types, which are designated the lard type and the bacon type. The lard type includes the Poland China and similar breeds, which are characterized by heavy weight and excessive production of fat. The bacon type includes the Tamworth, Yorkshire and similar breeds, which are characterized by the production of a large proportion of lean meat, and are of wide, deep conformation suited to the production of bacon. The lard type is primarily adapted to the conditions of the corn belt, where the principal grain produced is of a highly carbonaceous nature, and, therefore, peculiarly suited to the excessive fat formation characteristic in this type of hogs. The bacon type is more especially adapted to regions where such grains as barley and field peas are grown in profusion and where corn is not the leading cereal crop. The highest-priced bacon produced in the world is grown by the Danish and Irish farmers, with the Canadian export bacon in close competition. The hogs producing this bacon receive no corn, but are fed upon grains and grasses in which protein is the predominant element. Very excellent bacon is also

now being produced in the high valleys of the Rocky Mountain states where alfalfa pasture, western grown barley, peas and sugar beets constitute the ration.

In choosing the type of hogs to be bred, the farmer should pay particular attention to the natural conditions under which he is working, and should breed the type of hogs that thrive best upon the grains and forages his farm will produce. The selection of the foundation stock for a herd of hogs is of the utmost importance. Poorly chosen individuals of indifferent breeding will tend to transmit their undesirable characteristics to their offspring, with the result that the quality of the entire herd is likely to be low. Learn to appreciate the strong points in whatever particular breed is chosen, and then select those individuals for breeding which most nearly conform to the ideal type. In selecting breeding hogs, either male or female, the following points should receive consideration: Form, size for age, quality and feet and legs. To thoroughly inspect a hog it is necessary to view it from the sides, front and rear, both standing and in motion. From the side, the hog should show a rather short head, full jowl and neck, a strong, rather arched back without any depression back of the shoulders or at the loin, a deep body of good length, and a deep, well-rounded ham. From front and rear the side lines of the body should be straight and parallel, and this will be true if the development of shoulder, spring of rib and ham are uniform. Good quality is indicated by fine hair, medium bone and absence of wrinkles and general coarseness. Hogs coarse in type mature slowly and fatten indifferently. Those possessing harsh hair and skin and showing wrinkles will produce

inferior pork. Breeding hogs should have short, strong legs and strong, upright pasterns. Lack of sufficient bone as shown by weak, broken-down pasterns, is a common defect noticeable in brood sows, especially those that have been fed largely on corn. In fact, feed has much to do with development and strength of bone. A low, weak back indicates weakness, and no young sow showing such a defect should be kept for breeding These two defects, weak pasterns and backs, may be readily noticed when the pig is moved and often when standing. Other common faults are coarse shoulders open on top, poorly sprung short ribs and narrow loin.

SELECTION FOR BREEDING

The fecundity of sows always appeals to hog-raisers. The size of litters varies with breeds to some extent, but still more with individuals. Statistics compiled by the Indiana experiment station show that the average size of several hundred of Poland China, Berkshire and Chester White litters were: Poland China 6.5 pigs to the litter, Berkshire 7 pigs to the litter, and Chester White 7.5 pigs to the litter. However, litters of these breeds will vary from three or four to ten or more pigs to the litter. Confinement and overfattening tend to reduce fecundity. Again, sows that are sluggish or over-refined in type are usually indifferent breeders. So far as known, the sow controls the size of litters, and since fecundity is largely a family or individual characteristic, it is good policy to select brood sows only from litters of which at least seven pigs have been successfully raised. Select for a sire a pure-bred animal, using as much care and

thought as the successful horseman uses in selecting his breeding stock. Use one that is recorded in the herd books of the breed you select. This registration is a guarantee of his purity and insures a uniform conformity to the litters. This is an item of value when they are ready for market, and of satisfaction to their owner all through the growth. He should be kept in good, vigorous, thrifty condition, not fat, with plenty of exercise. For summer, give him a pasture run or feed green food in a large yard. In winter, part of his feed can be roots. It is better if his quarters are away from the other hogs. Handle him kindly, but with an understanding that he must obey, and he will be quiet and kind.

In the care of sows during pregnancy, remember that the sow has two duties to perform, namely, keeping up the functions of her own body and supplying the unborn litter with the elements necessary for its development. In order to properly perform these duties, the sow's feed must be rich in protein. The ration should never be allowed to become excessive in carbohydrates. One of the greatest dangers to avoid is constipation. Although feeding at this time will not need to be so heavy as after the pigs are farrowed, it should be liberal Aim to keep sows in good condition, neither too fat nor too lean. The error of allowing the sow to become fat would perhaps be least productive of serious consequences. The mistake in feeding breeding animals is most frequently that of keeping such stock in a thin, half-starved condition under the idea that the reproductive organs are peculiarly liable to become transformed into masses of fat. It should be borne in mind that the main demands upon the sow are those for the build-

ing of new tissue; hence, the kind of feed is important. The nitrogenous or protein-bearing feeds are needed at this time. These are oil meal, bran, beans, peas, oats and barley, and to a moderate extent wheat. The forage plants that are especially suitable for pregnant brood sows are the clovers and their relatives, alfalfa, peas and beans. The ordinary pasture grasses are also of much value. In feeding sows, always give the ration in such form that the system of the sow will be at its best. Never feed corn in large amounts to breeding stock. It is too heating, and contains too much of the fat-forming elements. During the winter season, the hog's system not only craves green feed, but bulk is demanded. This is especially needed when considerable confinement is necessary. To offset the lack of green feed, there is nothing that surpasses roots. These may be sliced or pulped and mixed with the grain, or may be given whole, as a noon feed. Some care must be exercised in feeding roots, as they are laxative in effect, and if fed in excessive amounts may bring about profuse action of the bowels. Keep charcoal, ashes and chalk in reach of the sows at all times. These act as a vermifuge and preventive of disease and meet the hog's craving for mineral matter. The constant use of such a preparation with a varied ration will, in a large measure, prevent sows from eating their pigs at farrowing time.

HOW MANY LITTERS?

One of the mooted questions of hog raising is whether it is profitable to try to raise more than one litter per year from the same breeding stock. This problem is one which must be decided by each

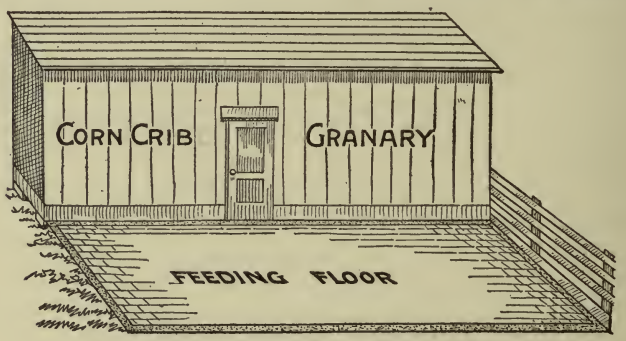
farmer for himself and it depends entirely upon the conditions under which he is working and the equipment he has for caring for hogs. Pigs born in the fall are never profitable unless the farmer is prepared to take the very best care of them during the winter. If he has warm shelter for them and has an abundance of milk or ground feed and roots with which to keep them growing, and has equipment for heating or cooking this feed during the cold months, fall pigs may be made to pay fair profits. Unless they can be very carefully taken care of, they will not thrive during the cold weather, will become stunted, and it will be impossible to get the growth out of them that is necessary for profitable stock production. To successfully raise two litters per year from one sow, it will be necessary to plan for the arrival of a spring litter early in March. This frequently will be found a disadvantage because the weather at this time is usually cold and stormy and not conducive to thrifty growth during the first month of the pig's life, which is a vital period. By planning the arrival of the spring litter at this time, the fall litter should be farrowed by the middle of August or early September, so as to have the fall pigs well started on their growth before the cold weather arrives.

An important detail in the management of growing pigs, especially fall pigs, is to see that they get plenty of exercise. The spring pigs will usually take plenty of exercise of their own accord, especially when raised on pasture, but in winter, when they are likely to receive a large concentrated grain ration in the barn, there is danger that they will become sluggish and not move about enough. Pigs which are heavily fed, and take insufficient exercise, will very probably develop the disease

known as thumps, for which there is no remedy, and which almost invariably ends fatally. Furthermore, in the lack of exercise, the pig will not develop bone and constitution, and will tend toward the small blocky type of little constitution and inferior breeding qualities.

FEEDS FOR GROWING PIGS

There is no feed more adapted to the needs of growing pigs than skim milk. This makes hog raising a valuable adjunct to the dairy industry.



A BRICK FEEDING FLOOR

As the pig grows older, it can be fed increasing amounts of grain with this milk by mixing the two into slop. Bran, shorts and other mill feeds, or ground oats and barley, with a little cornmeal, make excellent grains for use in connection with skim milk.

It has long been known that plenty of pasture during as much of the year as is possible is absolutely essential to the most economical hog growing. Conditions during recent years have served to emphasize this need. The prevailing high prices of grain have had a tendency to induce hog

raisers and breeders to rely on pasture for feed much more than was formerly customary. All pasture grasses are not of equal value. The poorest kinds are much better than none, but the benefit received from any depends largely upon the management of both hogs and pasture. Alfalfa stands at the head of the list, clover a close second, with white clover, June grass and timothy in the order named.

It is a mistake to compel the hogs to depend entirely upon the grass, even though the prices of grain and mill feeds are high. The stomach of the pig is not like that of the sheep and cow, and cannot be used as a repository for a large amount of coarse feed at one time. It has been found by experience and experiment that hogs fed a half ration of cornmeal while running to clover will make as rapid gains as they will if confined and fed a whole ration, and that, too, of a better quality of meat than that made wholly from corn. The grass gives bulk to the mass in the stomach, enabling the gastric juice to circulate more freely through it, and digestion is more completely accomplished than if grain constitutes the entire ration. And, further, the clover contains the elements that promote the growth of bone and muscle which helps to make up a pretty well-balanced ration.

PASTURE AND FORAGE

For late fall and winter pasture, rape and rye are two of the most valuable crops which the farmer in the corn belt can raise. Where he has an abundance of alfalfa or clover so that it will not be pastured too closely during the summer, this can be used during the greater part of the winter. It will remain in a partially green condition and will be eaten

with relish by hogs all winter except when the ground is covered with snow. But, frequently, there is no winter supply of this pasture. In this case rape should be planted in the corn field at the time of the last cultivation, and by the time the corn has been gathered from the field there will be a fine heavy growth of green, juicy, nutritious feed which will be pastured by hogs and sheep until well into December. In some other field rye should be sown late in August or early in September. This will grow up sufficiently to cover the ground before cold weather stops its growth, and it will remain green and in good condition for pasturing all winter, so that when the rape is used up or destroyed by frost, the rye can be used until green feed makes its appearance next spring.

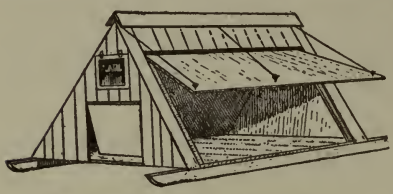
In the absence of conditions which favor winter grazing, many farmers are using finely chopped alfalfa or clover hay with excellent results. Alfalfa meal, which can be purchased at almost any feed store now, is particularly adapted to winter feeding of hogs and it can be readily mixed with chopped grain, or other feed. It furnishes a ration of high protein content, and serves to add bulk to the feed. This last is of greater importance than many farmers have thought in adding to the health and thrift of their hogs. An excessive concentrated grain ration has been found less efficient than a smaller quantity of grain fed in connection with some bulkier feed, such as chopped hay or roots.

On farms where the amount of land which can be devoted to hog pasture is not large, greater efficiency of the pasture can be secured by using the lot system of grazing. This consists simply in having the grazing land divided into two or more portions, so that one may be grazed while

the pasture in the other is growing up, and they are used alternately. If the pasture be of a permanent nature, such as clover or alfalfa, it will generally pay to go over each lot with the mowing machine immediately after the hogs are placed on the other lot. This cuts down the old dry stalks that have been left and stimulates a new rapid growth of young, tender shoots. There will be less tendency to waste feed by this method than where a large number of hogs are kept continuously in one pasture, and it is also undoubtedly true that a larger number of animals can be maintained on a given area of land.

In some corn-growing districts, and more especially in some of the pea-growing regions of the mountain valleys, the custom of "hogging off" a crop has become quite common. This consists simply of turning animals into a corn field or pea field and allowing them to harvest the crop, consuming all they desire of the grain and keeping them in the field until it is all cleaned up. Some hold the idea that hogging off a crop is a shiftless way of farming. This is based neither on facts nor good judgment, according to the statement made in a bulletin on this subject, issued by the Minnesota experiment station. As a method of economical feeding, the practice of hogging off corn has been growing in favor during the past few years and seems to be a practical and economical way of feeding hogs for several weeks during the fall. A two-years' investigation into this subject was made at the Minnesota station. Comparisons were made with other methods of feeding corn and letters of inquiry were sent to many farmers who had experimented with this plan. As a result, the station is strong in its recommendation of this plan, viewed

from an economical standpoint brought about by the reduced bill for labor. Pork was produced with less grain by hogging corn than by feeding ear or snapped corn in yards. Hogs fed in fields gained nearly one-third more rapidly than those fed in yards. The cost of fencing the corn field may be from $1 to $2.50 less per acre than the cost of husking corn. It requires no more labor to prepare for subsequent crops fields that have been hogged off than those that have been treated by the ordinary methods of harvesting. Hogs waste no more corn in the field than when fed in a yard. They pick the corn as clean as most men do in husking. Labor in caring for hogs is not increased by hogging off corn, but may be decreased if systematic methods are employed.



MOVABLE HOG SHELTER

FATTENING RATIONS

It is coming to be generally recognized that so far as health, thrift and rapidity of gains are concerned, corn alone, at least in dry-lot feeding, does not give as satisfactory results, especially for growing pigs, as a combination of corn and some feed adding protein to the ration. Wheat shorts is very commonly considered the best feed to use with corn for young pigs, but other feeds are on the market which contain still larger quantities of protein, and their merits for pig feeding deserve investigation. With this object in view, the Iowa experiment station conducted a series of experiments

in swine feeding. In using meat meal and tankage as supplemental feeds the following conclusions were reached: that meat meal and tankage of similar chemical composition are almost equal, pound for pound, as a supplement to a corn ration for growing pigs and fattening hogs. That growing pigs fed meat meal and tankage to the extent of 16⅔ per cent of their ration, and older hogs having these feeds to the extent of 10 per cent of their ration with corn, ate more feed and made more rapid gains than those fed on any other combination, such as shorts, barley and corn, or shorts and corn tested in these experiments. In dry lot feeding, a ration composed of corn with either meat meal or tankage, produced from 25 to 40 per cent faster gains on quite mature hogs and from 50 to 60 per cent faster gains on younger hogs than a ration of corn alone. In every instance, the number of pounds of feed required per hundred pounds gain was decidedly less with the mixed ration.

Under certain special conditions it is possible to raise and fatten hogs without the use of grain. Farmers situated in immediate proximity to creameries having large quantities of skim milk and buttermilk which can be purchased cheaply, and farmers living near cities where the refuse from hotel kitchens can be obtained, have frequently secured large profits from hogs raised and fattened on these materials. It is also possible to maintain breeding animals in a medium state of thrift on pasture without the use of any grain, but this is never an advisable practice where even a small grain ration can possibly be supplied. Experiments have shown conclusively that hogs on even the best pasture grow faster and make vastly more economical gains if a ration of grain be furnished.

The phenomenal rise in land values in recent years has resulted in a depreciation of interest in live stock production throughout the entire country. This is applied with less force, perhaps, to the hog industry than to cattle and sheep growing, but its effect has been very noticeable even in this. In addition, a short period of extremely low prices was experienced as a direct result of the financial flurry of 1907, when the hogs which had been raised and finished on high-priced grain were marketed at so low a price as not to pay for the grain they had consumed. These two factors resulted in the marketing of hundreds of thousands of breeding hogs in all parts of the country. The direct result of this move was in turn seen two years later when the markets of the country offered the highest prices paid for fat hogs since the civil war, and were even then unable to secure a supply adequate for the needs of the packers. The rapidity with which the hog supply of the country may be diminished or increased is one of the remarkable features of the industry, and one reason why it is impossible to forecast for any considerable length of time just what the market supply or demand will be. The supply will probably continue to fluctuate in the future as it has in the past in sympathy with agricultural conditions. This much, however, is certain: that hogs managed and fed in the most economical manner, with a liberal use of pasture and forage, and the feeding of minimum amounts of high-priced grain, will pay higher interest on the high-priced lands of the Mississippi valley than will any other single class of live stock. Their value as improvers of the soil should not be overlooked. Although it is considerably less than that of cattle and sheep, still they have a high value for

this purpose, probably much greater than has usually been accorded them.

MARKET DEMANDS

The type of hog most favored in the markets is very different from that demanded 20, 30 or 40 years ago. Then the large hog, with the broad, fat back and sides, was the type demanded. The taste of consumers has greatly changed since then. The popular demand at the present time is for early maturing hogs weighing from 200 to 300 pounds each. These hogs furnish a smaller amount of lard and a relatively greater percentage of ham and bacon. The public demand at this time favors light, lean hams and thin, rather lean bacon, and this is produced only by the light, trim-built type of hog. The farmer who would get the largest per cent of profit must know the demands of the market, must cater to that demand and produce what the buyers want. This type of hogs should be brought to maturity and marketed at from eight to ten months old, certainly not more than ten months.

The unusually high prices realized for fat hogs in the winter of 1909-10 will undoubtedly not be maintained indefinitely. They were induced in a very large degree by the definite shortage of hogs throughout the country. This shortage will be supplied within a year or two, and it is only reasonable to suppose that lower prices will prevail. However, it is extremely unlikely that the prices for fat hogs will ever again drop to the low level which they have at times in the past, except in the case of some unforeseen financial emergency, such as occurred in 1907. The demand for meat products is continually increasing in the

United States. The supply of mutton is practically stationary, the supply of beef is decreasing, and already the United States has practically given up its former vast export meat trade because there is absolutely not enough meat produced in the United States to much more than supply the local demand. The quickest increase can be brought about by the hog breeder because of the large per cent of increase in this class of animals. On account of the decreasing beef supply and the continually increasing population, it seems reasonable to suppose that the consumption of pork in this country will constantly increase, and, therefore, furnish a continuously expanding market for all the pork products we are able to grow through a considerable term of years. The fact to be emphasized, however, is that careless and wasteful methods in raising and fattening hogs must go. There is no longer any place in American agriculture for the type of farmer who is not willing to mix with his farming operations the maximum amount of brains and intelligence. He can no longer depend upon feeding corn to his hogs in small pens throughout the whole year as he did years ago, and expect to make a dollar of profit. Under present conditions, an ample supply of pasturage is the first requisite for success in raising hogs. A certain amount of grain will be necessary to profitable production. A willingness and ability on the part of the farmer himself to select and breed in the most intelligent manner, to feed economically and efficiently, to know the markets and to be able to take advantage of the conditions offered by the market, will go a long way toward insuring permanent success.

CHAPTER XIII

The American Horse Market

The total value of horses in the United States at present is stupendous. According to carefully compiled statistics, under date of January 1, 1910, the value of horses in the United States amounts to the magnificent figure of $2,051,555,000. At that time there were 20,212,000 horses in the United States, giving an average value of $101.50 per head. Of course, this is considerably higher than for a number of years, because of the fact that values have advanced rather than decreased. The demand for horses is on the up grade and very strong, in spite of the widespread introduction of automobiles and other motor-driven machines. The supply will not very easily overtake the demand. In fact, if the past two decades are any indication, the demand will increase faster than the supply. The population of the United States is becoming greater and greater every year, more land is being worked and the use of horses is naturally becoming wider and wider. It takes a long time to augment the horse stock of any country, particularly where a lot of work is done in the field. Such a large proportion of mares are unproductive every season that the increase is naturally slow. On an average, probably not more than 1,500,000 colts are raised every year. When it is remembered that a lot of horses go out of commission every season because of age and disability, the reason for this slow increase is readily apparent.

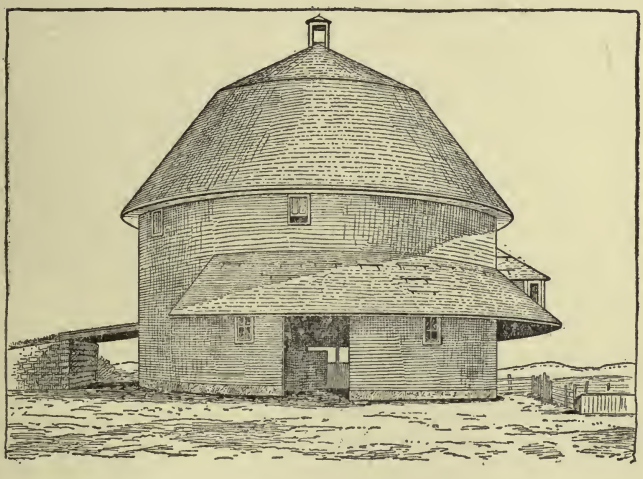
The future of the horse in America is assured. When the bicycle became popular it was confidently

predicted that the horse industry was ruined. For a time, indeed, it did look as if the business was seriously impaired, but the bicycle had its day and horsemen continued to prosper. With the advent of the automobile in large numbers, the same prediction was made, although in a half-hearted way, for the bicycle era was still in mind. Although automobiles have been sold in large numbers during the last two years, it has not affected the price of horses in the least. In fact, the advance in horse values has been greater during that time than during any previous period for a great many seasons, so that the ordinary farmer, the stock raiser, the breeder of pure-bred animals apparently has nothing to fear. This is undoubtedly the opinion of importers, for 1909 saw an unusually large number of horses brought over from the old country. This record of 1909 was exceeded by the importations of the following year. This shows that breeders as well as importers and farmers have implicit faith in the future of the horse industry. There is money, and lots of it, to be made in horses properly handled and the reward to the general farmer who keeps all the way from three or four to 15 and 20 mares is positively assured. He can raise his colts at very small cost, because his mares can be used for farm work most of the time, and his feed, of course, is cheap.

DRAFTERS ADAPTED TO FARMERS

The breeds and types of horses to be raised on the American farm will be determined largely by the monetary consideration involved. Not many horsemen are raising animals from a purely sentimental standpoint. A few wealthy breeders are

undoubtedly handling horse stock simply for the pleasure they get out of it, or with some scientific problem in view, but the great bulk of the horse raisers in America are raising colts for profit. This being true, the breed which will bring in the most money, which is the most hardy and prolific, which can be handled with the minimum expense and the smallest percentage of loss, which will mature moderately early and go on the market in prime condition, is the one to choose. With many farmers it



AN ILLINOIS ROUND BARN

is the Percheron, for undoubtedly the raising of draft horses is better suited to the farmer of America than the more specialized work of raising saddlers, trotting horses, roadsters or even coach horses. It requires less skill to produce a draft animal than the more delicate type suited to light harness or saddle conditions. Of course, any horse

must be given good care and attention, but the heavy breeds are more rugged and able to withstand unfavorable conditions better than the lighter type. As a rule, therefore, the draft breed is the one for the average farmer to choose. If he delights in a horse of good action, of clean limbs, of good size, of uniformly good disposition, he chooses the Percheron. In some localities, particularly those where foreigners predominate, the breed chosen is apt to be colored by what was raised by these same people in the old country. For example, Scotchmen raise Clydesdales, Englishmen delight in Shires. Belgians, of course, are exceeding popular, being heavier than Percherons. These are admirable animals and are being raised largely in many parts of the United States. In the black soil regions of the United States where mud is very abundant at certain times of the year, horses with legs free from hair seem to be more popular than Shires or Clydesdales. It is, however, largely a matter of preference and individual taste.

After the breed is decided upon, plan to stick to one line and not to constantly change. It will pay in the long run, in every respect. Then the choice of breeding stock comes in and this is the paramount issue. No matter what reputation a breed may have, no matter how long and satisfactory the pedigrees are, profitable horse breeding on the average American farm will be impossible if, in selecting stallions and mares, particular attention is not given to individuality. If the particular animals you choose are not high class, are not prepotent, are not prolific, you cannot hope to make any money. The first thing to do is to get rid of your scrub mares. It doesn't pay to propagate inferiority in horses. It is a more serious problem than with

most other forms of live stock. An undesirable steer or hog or sheep can be killed for meat and something gotten out of it, but a scrub colt is a source of loss and annoyance; consequently, get rid of your poor mares; or, at any rate, do not breed them. Pick out good individuals which have proved good breeders or give indications of being successful mothers. See that they have good bone, are full of life and also see that they are well fed and cared for.

In selecting a brood mare, length of loin and a wide and deep rib must be given the highest consideration. Select those showing feminine character rather than masculine. The mare's jaw should be lighter than that of a stallion. The neck should also show refinement. If mares are to be bought, two rules are a pretty safe guide. One is to buy the mare with a foal at foot. This gives the purchaser an opportunity to see what kind of colts the mare brings. The other is to buy young fillies of the man who bred them. This gives an opportunity to see both sire and dam. In purchasing pure-bred stock, of course, the pedigree or certificate must be right. See that the animal has good ancestors. In conformation, the draft mare should have the sloping pastern and shoulder, good feet, excellent hocks, compact bone, and must have a good disposition.

After the mares have been chosen, the selection of a stallion requires the highest skill and the best experience. He should be a horse of good size if a drafter. He must be well balanced, strong and virile in every particular. He must have a massive jaw, a clear, bright eye, good width between the eyes, indicating intelligence; he must have sound feet; his bones must be clean and compact; all his

joints must be neat and free from defects; he must be a powerfully built animal, capable of transmitting all his good qualities to his progeny.

After you have decided what kind of a stallion you want, probably no place is as satisfactory for purchasing as the home of some reputable breeder, where not only the sire, but the dam and frequently the second and third dams, can be seen. If his ancestors are of the right type you may be pretty certain that his colts will be satisfactory. Decide fully what you want before leaving home, and do not allow a seller to change your opinion. See first if his age, color and marking correspond with his certificate. Be very careful to examine his eyes, for defective vision is transmitted with great certainty. A good draft stallion should have a heavy jaw and a clean, neat throat. His ears should stand erect; his crest should be well developed with a neck of fairly good length. Few draft horses have ever had too long a neck. This neck should be set upon nicely sloping shoulders. Viewed from in front, he should be wide, carrying his width all the way back. He should be well muscled upon shoulder, arm and forearm. His legs should be set well under him and only medium in length. The knee should be wide, carrying its width well down. He should measure not less than 10 inches below the knee, nor less than 12 below the hock. Viewed from the side, all his legs should stand perpendicular to the body. The pastern should stand at an angle of 45 degrees.

The length of the back, from shoulder blade to point of hip, should never exceed the length of that part of the quarter measured from the point of hip to point of buttock. If depth of shoulder and length of quarter each exceed the length of

back, we have a near approach to the principle of the arch, the strongest self-supporting figure known to mechanics. A long back is a defect in draft horses. The body should be round, with ribs well sprung and extending well downward. This gives good lung capacity and indicates that the stallion is a good feeder. A horse cut up in the flank is a poor feeder, and cannot stand any extra exertion.

A draft horse should be heavily muscled throughout the hindquarters, for the hindquarters furnish most of the power in drawing heavy loads. The hock should be given more attention than any other part of the horse, for draft horses go wrong because of defective hocks more than from all other defects combined. No hocks can be too good or too strong. Viewed from both in front and at the side, the hocks should appear broad, yet clean cut and free from fullness. In front of the hock and slightly to the inside, look closely for a spavin. Never buy a stallion with a spavin, even though you pay a small sum for him. The tendency for the development of spavins is likely to be transmitted. Quality in the horse is indicated by fine, short hair associated with a soft skin, strong, solid tendons and bone that is compact.

After all these things have been looked after, put the stallion to the test of walking. This is the only gait to which the draft horse should be subjected. Give strict attention to every movement. The feet should be lifted clear of the ground, placed down evenly and in line. From behind the legs should be kept well under him, the flexion of the hock even and in line, the bottom of the feet showing at every step. From the side, his stride should appear balanced, quick and elastic. His every movement

should indicate strength and show that nerves, muscles and tendons are made of the very best material. The tendency among stallion salesmen is to show the animals at a trot. The trot is of little value to a draft horse and should be disregarded.

Do not buy a stallion excessively fat, for this extra flesh covers a multitude of defects. One in fair condition will be most satisfactory.

Be sure and test the stallion's wind. Without good lungs he is of no value. This is seldom done, but it should be done in every case. Horsemen generally recognize that defect in wind is transmissible to colts, so that it is of the very highest importance. The present-day stallion of any of the above draft breeds should weigh from 1,800 to 2,000 pounds when in moderate flesh. Two or three hundred pounds can easily be added by a little feeding if this is ever found desirable.

Another thing of utmost importance is to avoid buying a stallion with a bad disposition. They are not only difficult and dangerous to handle, but disposition is transmitted, producing colts that are bad actors and resulting in loss in more ways than one. Grade stallions should always be avoided. Occasionally a grade stallion has every appearance of being as good as a pure bred, but his colts will not be as uniform, and a number of states are now prohibiting the standing of grade stallions.

HANDLING STALLIONS

Upon the handling of a stallion will depend his usefulness in a community. This refers to exercise, shelter and feed. Corn is a very poor feed for a stallion. Grass and alfalfa is undoubtedly the best. Oats and bran rank second, while oats

alone probably rank third. On western farms stallions are kept on grass and alfalfa without any grain at any season of the year. These stallions are the best colt getters in the world. They run in pastures about four months of the year, then are taken up and fed alfalfa the remainder of the time. In the corn states, where this coarse grain forms a considerable portion of the ration, the percentage of mares in foal is smaller than in any other locality. For example, in Colorado and Idaho the percentage of mares in foal is highest, while in Indiana, Illinois, Iowa and Kansas the percentage is smallest. In the light of these facts, the nearer we can get to a grass ration the larger will be the number of colts produced. The nearer we can get to a strictly corn ration, the smaller will be the number of colts. Ordinarily, stallions are fed too much rather than too little. The feed for a stallion should be of the very best quality. Badly cured or musty hay should always be avoided. Clover and alfalfa, if properly cured, have no equal. Clover and timothy, mixed, is the next best hay. Good hay is everything in feeding a stallion. No one grain should ever be fed alone. If this must be done, oats certainly is the best grain feed. The next best is barley, but it should always be crushed. A little bran in addition to the grain feed will help.

Stallions should have plenty of exercise. They must not be overworked, but if all stallions were required to work a little every day in the year, the results would be much more satisfactory. The fact of the matter is few of them are ever required to work at all. This is not only bad from the breeding point of view, but it is the source of much trouble from sore legs. If the animal cannot be

worked he should, at any rate, be given considerable exercise in the way of walking. He should have at least a walk of three to five miles every day and more if desirable. To describe a work rule is, of course, no easy matter. Stallions are different in temperament. Some require a good deal of exercise, while others require little. The exercise should be sufficient to expand the lungs, quicken the circulation, strengthen the nervous system and harden the muscles. Real draft work in harness is the very best exercise for a draft stallion. Drawing the plow, harrow, disk, mower or binder will not only furnish exercise for a draft stallion, but will result in foals of the highest quality, possessing a vitality that cannot be produced by a stallion which does not work. Nor should stallions stop work during the breeding season. A draft stallion may work several hours every day during the summer; and if not abused, the harder the work the better will be his foal.

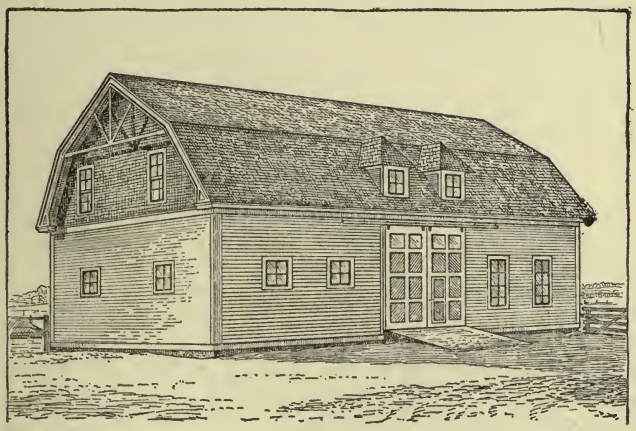
CARE OF THE COLT

The care of the colt from the beginning is an important proposition. It goes without saying that every colt must be properly fed from the start. Begin by feeding the mares liberally so that the milk supply will be abundant. Well-cured clover, hay and oats is the best combination for this purpose that can ever be secured. Of course, for the first ten days the mare must be fed sparingly. The digestive organs of the colt are delicate at first. After this, however, increase the feed of the mare until she is getting all she will eat.

Should the mare have no milk, feed cow's milk. Cow's milk should, however, be prepared with great

care. Into a pint fruit jar, previously sterilized, pour seven parts of water and one part of new milk. To this add one teaspoonful of granulated sugar. Feed warm. The pint will be sufficient for one feed, but the colt should be fed every two hours. It is a lot of work to raise a colt in this way, but it can be done all right. A nipple over the spout of a teapot is the best thing to use for feeding a hand-raised colt.

At weaning time simply let the colt suck less frequently. The mare will gradually dry up. After



GENERAL FARM BARN

the weaning, colts should never want for pure water or wholesome food. Give an abundance of oats, timothy or prairie hay, add a little bran to the grain and feed occasionally. If alfalfa and clover hay is used, bran will be unnecessary, although it makes a fine addition to the colt's ration.

If a self-feeder can be used so that the colt can eat whenever it wants to, the results will be better.

It is impossible to raise heavy horses without their getting plenty of feed during their growing period.

Colts should have plenty of exercise. This develops their muscle and bone, and vital organs. Give them plenty of room to run and play. Of course, during summer colts should be at pasture all the time. During winter they must be well sheltered, but must also have an open lot in which to run when the weather is not too severe. A woods pasture is ideal for winter.

Another thing that should be given careful attention is the colt's feet. For the first year or two the hoofs may require trimming. Some are inclined to turn over on the side. This can easily be corrected by carefully trimming. If neglected, a valuable animal may be ruined.

FEEDING HORSES

In feeding horses in general the stuff raised on the farm must necessarily be used, with the possible exception that additional concentrates are occasionally purchased. This being true, it is highly desirable that feeds best suited to horses be produced. Nobody disputes the feed value of oats for horses. Prof. W. A. Henry states that horses nurtured on oats show mettle which cannot be reached by the use of any other feeding stuff. Then, too, there is no grain so safe for horse feeding, the animal rarely being seriously injured if by accident or otherwise the groom deals out an oversupply. This safety is due in no small measure to the presence of the oat hull, which causes a given weight of grain to possess considerable volume, because of which there is less liability of mistake in measuring out the ration; further, the digestive

tract cannot hold a quantity of oat grains sufficient to produce serious disorders. Unless the horse is hard pressed for time or has poor teeth oats should be fed in the whole condition. Musty oats should be avoided. Horsemen generally agree that new oats should not be used, though Boussingault, conducting extensive experiments with army horses, arrived at the conclusion that new oats do not possess the injurious qualities attributed to them.

The grain most commonly substituted for oats is corn. While corn is not an ideal horse feed, it must necessarily make up a part of the ration in the United States. If used in moderation, in connection with oats, shorts or middlings, the outcome will be quite satisfactory.

The best forage, undoubtedly, is alfalfa or ordinary clover hay. If alfalfa is used the supply of nitrogen in the food is increased; consequently, it is not so necessary to buy concentrates like bran, shorts or middlings. It goes well with corn, which is a highly carbonaceous feed.

Timothy hay, while considered by most people an ideal horse feed, has its drawbacks. Good timothy hay, however, is first class, and horses do well on it. Well-cured prairie hay, cut at the right time, is usually free from dust and is very popular as a horse feed.

During the fall and winter, nothing is better for young colts and all kinds of horse stock than bright, well-cured corn stover. This can be scattered out in the open pasture and horses pick at it during the day. In this way a lot of valuable feed can be utilized. Bright corn stover is readily eaten by horses.

In the Northwest where corn is not largely grown, barley is often fed to horses with good results. It,

of course, must be used in connection with oats and should always be ground. In this country, however, barley is not widely fed and may never become exceedingly popular.

The feeding of small quantities of oil cake has an excellent effect on the digestive system of the horse, but this must be fed carefully. Start with a small handful a day and increase this gradually. Oil meal results in a very glossy coat, and ought to form a part of the ration, especially where horses are being fattened for market.

This chapter would be incomplete if horse growers were not urged to supply their animals with an abundance of the best water obtainable. The animal's body is made up largely by water, and if it is not supplied regularly and when needed, growth will not be rapid and the animal cannot be kept in a thrifty condition. Water is especially important when bulky, dry feeds form the principal part of the ration. Where succulent substances are used. like soiling crops, silage or the like, these feeds supply a large amount of moisture. In America the watering of horses before feeding seems best. Some prefer watering after feeding, but it will be a pretty safe conclusion on the part of the ordinary farmer to water his horses before he gives them feed. If heated when in from work, great care must be used to prevent the drinking of too much water at once. Common sense will indicate how to handle this proposition.

CHAPTER XIV

Mules Are Profitable

The production of mules in the United States has shown a steady increase for a number of years, but the demand is still much in excess of the supply. Prices are the highest on record. In spite of the high prices offered at all the leading markets, and in spite of the increase in the number of animals owned in the country, the market offerings grow smaller yearly instead of increasing. Notwithstanding that there are more horses and mules in the United States today than at any previous period in our history, a very marked scarcity prevails in all the leading markets. This unique condition is caused primarily by the marked prosperity of the agricultural sections. The South is the greatest mule-buying section of the country, and on account of the extremely high prices the southern farmers have received for cotton in recent years, there is more money in that section to be used for agricultural development than ever before. A good deal of this ready capital is being used in the better equipment of southern farms with work stock, which consists almost entirely of mules. Also, recent years have witnessed a phenomenal expansion in the farming and mining industries of the West and Northwest, which has called for enormous numbers of work animals for use in farming operations, in building irrigation ditches and railroads, and for use in the mines. This western demand has served, not only to decrease the exportation of range horses and mules, but has drawn, to

a great extent, upon the markets of Kansas City, and other western points. In spite of the wonderful development of motor-driven vehicles in the cities, good horses and mules for street use have never been so scarce, and have never commanded such prices. It is difficult to imagine how, for many years to come, this country can possibly produce good mules enough to oversupply the market. The opportunities for assured profits in this industry were never so great, and the outlook was never so good as at present.

RANGE OF VALUES

If the statistics of the comparative average values of horses and mules for any period of years since the civil war be examined, it will be found that the average price for mules has always been $5 to $15 per head greater than that of horses. In spite of the great advance in the values of both classes of animals during more recent years, the difference has gradually increased, and the average value of the mule has constantly become greater.

TYPES AND BREEDS

The beginning of mule breeding in the United States dates back to an early period in the history of the country, when Spanish jacks were sent by certain European rulers as presents to George Washington. They were used by him on his farm at Mt. Vernon. Later, Henry Clay imported several of the best jacks from southern Europe into Kentucky, and thus laid the foundation for the development of mule breeding in this country, and also for the development of an American type of jack. There are several types or breeds of jacks known in

Europe, chief among which are the Catalonian, Maltese, Andalusian, Majorca, Italian and Poitou. The Andalusian comes from Spain, and was first introduced into this country as a gift from the King of Spain to George Washington, and also later was imported into Kentucky. In color, it ranges from gray to white with an occasional blue one. It stands from 14 to 15 hands high, is comparatively heavy boned, and shows very good conformation in regard to the head and ears. It is not popular on account of its color. The Maltese is a small animal coming from the island of Malta. Its color is black or brown. It has a well-formed head, but is light boned and for this reason it is not popular, except for breeding light mules for use in mines or under similar conditions.

The Catalonian is another Spanish breed, and was the first introduced into America by Henry Clay. These jacks are of a good black color with white points, and possess excellent style and action. They are also heavy boned, and stand from 14½ to 15 hands high. On account of their desirable color and excellent quality, they are very popular. Most of the best characteristics which have been bred into the native American jack have come from the Catalonian cross. The Majorca jack comes from the Island of Majorca. This is the largest of all the imported jacks, often standing 16 hands high, and possesses the greatest weight and heaviest bone of all the jack breeds. The Italian jack has been imported into this country in considerable numbers. It is the smallest of all the breeds, and correspondingly lower in price. Although it is a somewhat blocky and heavy-boned animal, it is too small for use in producing the type of mules which the American market demands.

The Poitou is a French breed and has been greatly improved in that country by intelligent selection and breeding. Importations into America have been relatively small on account of the large demand for them in France and Spain. It is the highest priced of all the European breeds, individuals often selling in France for $3,000.

MAMMOTH JACKS

Notwithstanding the excellent qualities of many of the imported breeds of jacks, it is the opinion of most American breeders that better mules will result from the use of the best type of the American-bred jack with a properly blended imported ancestry. The best strains of American-bred jacks trace their ancestry to Mammoth, a jack early imported into Kentucky and generally conceded to be the best individual ever brought to America. The judicious blending of this blood with imported animals of other breeds and careful selection through a good many generations have served to fix type and color quite definitely, and has developed the breed known as the Mammoth jack. It is purely an American breed, from individuals of which most American mules are now produced.

The hinny is the product of crossing the stallion with the jennet. It resembles the mule in most respects except that it is usually smaller, and has no particular utility which is not possessed in an equal degree by the mule. It is quite common in the West, and is used in mines and for similar purposes. Extravagant claims have been made at times concerning the strength and endurance of these animals, but these qualities are probably no more pronounced than in the mule.

BREEDING TYPE OF MARE

The mule is an unnatural animal, being a hybrid, and the product of crossing the jack with the mare. It is incapable of producing young, and for this reason it is impossible to improve the animal through the ordinary means of selection by which other types of animals are improved. It has been possible, as explained before, to improve and develop the jack by selection and intelligent crossing. The method by which the production of good mules is made possible is by the mating of the best type of jack with an approved type of mare. In order to select this stock intelligently, the breeder must have a knowledge, first, of what the market recognizes as the most approved type of mule, and, second, just what characteristics the mule is likely to inherit from his sire and what characteristics from his dam. Formerly, the requirements of the South, which was the principal mule market, were for rather small animals of a good deal of quality and life, and the lightness of bone and smallness of hoof belonging to this type of mule was not considered a handicap. Breeders used small or medium-sized mares, often with a large proportion of coaching or standard blood, possessing plenty of life and spirit. The mules resulting from crosses of this kind are tough, wiry, capable of great endurance and altogether a very serviceable type of animal. The market requirements of the present day demand a quite different type of animal, although in the cotton fields of the South there is still a large demand for animals of the type just described. These are known in the markets as cotton mules. The draft mule, which now commands the highest price of any type, must be heavier, larger and

bulkier throughout. He must stand 16 hands high, weigh from 1,200 pounds up, the heavier the better, and must be heavy boned in proportion to the increased weight. To produce a mule of this type, heavy draft mares must be used. The danger of making a cross of this kind is of sacrificing quality and conformation to mere size; and the production of one of these heavy mules so as to insure considerable quality and heavy enough bone to make an ideal animal requires very careful judgment in the selection of the mare. It is easy to select a mare which has a blocky build, large feet and heavy, strong legs, but this type of mare is very likely to lack quality and life. Where it is impossible to choose the ideal mare for this purpose a lot of attention should be given to the quality. Above all she should be of an ambitious disposition and have good life and good action. Generally speaking, the mule inherits from its sire the characteristics of the neck and head and in a marked degree its legs and feet, while its body conforms quite strongly to that of its dam. It can readily be seen that breeding a mare of markedly light bone and small feet to a jack simply tends to intensify in the mule the light bone and small footed characteristics of the jack. It used to be said that the size of a mule's foot was a matter of little importance, that his hoof was naturally small and compact and his legs light and slender. But when a 1,200 to 1,400-pound body is bred upon feet and legs intended to support only 900 or 1,000 pounds, the tendency toward strains and permanent impairment is introduced and intensified from the very beginning, while if the mare has heavy, strong legs and large, firm feet, the mule will have some chance of inheriting in part these desirable characteristics.

CARE AND MANAGEMENT

The old idea that any sort of an ill-conditioned misfit of a mare belonging in no particular market class, and having nothing to commend her as a breeding animal, should be bred to a jack with the expectation of producing a good mule, has been entirely discredited by the practice of modern breeders. It is to this erroneous idea of the nature of the animal that the mule owes all of his reputation for an evil disposition. As a matter of fact, mules which have reasonably good breeding back of them, and which have been managed in an intelligent manner in being broken to work, are gentler and easier to handle and are more trustworthy than the average horse. Nearly every case of trickiness or viciousness on the part of a mule can be traced either to a similar tendency on the part of its dam, or to abuse and mismanagement while breaking the animal to work. The attitude of careless or ignorant people toward the mule in assuming that he is naturally a vicious animal, and one to be subdued by abuse has been responsible for more permanently ruined animals than any other one cause. The mule, more than any other animal, requires kind and intelligent treatment, and will respond to this, while any abuse during its training period will probably always show its effect upon the disposition of the animal.

Where mules are raised under farm conditions, it is usually possible to handle the young colts almost from the time of their birth, and it is wise to do this and accustom them to being handled as early as possible. It will frequently be necessary to tie the young colts up when their mothers are to be worked, and they can easily be accustomed to the use of the halter while very young, so that later

the task of breaking them to lead will be insignificant. The general care of the mule colt does not differ materially from that of raising horse colts. Generally, it is less liable to the diseases which ordinarily affect horse colts, is less liable to injury from accident because it will usually be found amply able to take care of itself, and shows a greater intelligence in extricating itself from dangerous situations than the ordinary horse colt. Where barbed wire pastures are used, it is very seldom that a young mule is injured in the wire, while it may be put down as almost an impossibility to raise five or six horse colts under these conditions without one or more of them being permanently injured by the wire.

LIBERAL FEEDING A NECESSITY

It is frequently stated that mules grow and develop and perform their labor on less feed than is necessary for horses. The truth of this idea is to be seriously doubted. It is very unlikely that the average mule will perform a given amount of work on less feed than the average horse of the same weight would consume in performing the same work. However this may be, it is certain that the best development of the growing animal calls for liberal feeding. Under farm conditions, it is almost always necessary to work the dam during a considerable part of the summer, and unusually good care and feeding should be given her in order to provide for a liberal flow of milk. The colt will learn to eat a little bran when it is only a few weeks old, and a feed box should be provided and some crushed or ground grain, preferably oats, should be kept where the young animals can eat a

few mouthfuls whenever they will. In cases where the dam is found to be not a good brood mare and having an insufficient milk supply, it is a comparatively easy task to teach the colt to drink milk. A pint of cow's milk night and morning will materially aid in preventing retarded growth.

Five months is usually considered the proper age for weaning, and the colt at this time should be accustomed to eating considerable hay and grain, and should receive quite a variety in order that the withdrawal of the milk ration will not tend toward stunted growth. If some fresh, green pasture is available at the weaning period, it will be found useful in keeping the colts in good condition. This period, however, is usually in the fall, and unless special provision has been made to have some good fall pasture the young animal will probably have to depend upon the ordinary barnyard feeding. Alfalfa or clover are excellent feeds for this period, and, in fact, during the first winter. The grain ration should consist of oats and cracked corn, if the forage is of a leguminous character, such as alfalfa, or of oats and bran if no leguminous hays are used. Liberal feeding, good shelter and plenty of exercise during the first winter and plenty of good pasture during the following summer will keep the young colt growing, and bring out the maximum development.

BREAKING THE MULE TO WORK

The best time to break colts to harness is a matter of some dispute among breeders. If the breeder is disposed to place the young animals at hard work as soon as they are trained to the harness, then he had better wait until they are four

years old. They may very well be broken to harness at the age of two, but at this time they are too young to be placed at steady hard work. A little light driving or an occasional half day's light work in the field will be of benefit to them, but overwork at this time will result in stunted growth. At three years old they are shedding their teeth, and on this account are peculiarly unfitted for any severe work. If they have been broken to harness as two-year-olds, the light work and driving may be kept up while they are three-year-olds, but under no circumstances should they be placed at hard work this year. Special attention should be given to their feeding at this time, because frequently while they are losing their teeth their mouths will become so sore as to make it impossible for them to chew dry, hard grain. If circumstances are such that the animals will be put to work as soon as they are broken to harness, by all means wait until they are four years old. They will be able to do a lot of work this year, and when they are five years old will be ready for complete service of all kinds.

The mule's ears are much more sensitive than those of the horse, and it is very easy during the training period to develop permanently a bad habit on the part of the animal by careless or rough handling of its head. A careless blow with a whip or with the hand across the mule's ears may instill into his mind a fear that years will not overcome. Some people have made the practice of seizing an unruly mule by the ears to hold him, thus taking advantage of this sensitiveness, but this is never a safe practice, as the disposition of the animal may be permanently ruined by such treatment.

By the careful selection of breeding mares and by intelligent care and feeding of the growing animals, a finished product is developed at four or five years old, which will command, on an average, higher prices upon the market than a horse colt raised under similar conditions. The risk is considerably less, and the expense no greater, while the demand for this type of animals is continuously increasing, and will undoubtedly do so for years to come. It will pay enterprising farmers to thoroughly investigate the possibilities of mule raising with a view to engaging in it for the production of market types of animals.

CHAPTER XV

Baby Beef

WHAT IT IS

The production of the type of meat animals known as baby beef is a development of comparatively recent years, and has been brought about by the more intensive conditions of modern American agriculture. In the old days of cheap land and free grass, the idea was to raise cattle until they reached the age of four or five years before marketing. Modern conditions require that the animal intended for slaughter shall receive the maximum amount of growth and be ready for the block as young as possible and with the minimum of expense for labor and feed in the process of its development. It requires much more feed and much more time and keeps the money locked up for a longer period to maintain beef cattle until they are three or four years old before marketing them than if they are given a forced rapid growth and marketed younger, and the returns must be correspondingly large in order to pay a profit and interest on the initial investment for the longer period. Market conditions in recent years are such that the younger animals command the higher price, and so when the difference in the amount of feed and labor is considered, the balance under farm conditions is likely to be in favor of the shorter feeding period. Under conditions where cattle could subsist upon the free grass of the open range for an indefinite period, it mattered little to the

owner whether they were sold at three or at five years of age, but under farm conditions the relative length of the maintenance period often means the difference between a net profit and net loss. If the animals can be brought to nearly the same weight at the age of from 15 to 24 months, all of the feed for maintenance is saved, but half the amount of labor is expended and the money represented in the investment is used for but half the period. These are important considerations in growing live stock of any kind.

This necessity for marketing finished beef animals at the earliest possible date has given rise to a distinct market class which is known as baby beef. Generally speaking, a calf marketed any time after the veal age and under the age of 24 months in a well-fattened and highly finished condition is classified as baby beef.

FASTER GAINS POSSIBLE

The feeding of the best type of baby beef requires a high degree of skill on the part of the feeder. One of the greatest economies in feeding baby beef lies in the fact that young animals will make gains upon a relatively smaller ration than can be done by older animals. Records show that each succeeding year up to the age of five requires nearly 50 per cent more feed for the same amount of gain than was used the preceding year. Tests made at the Illinois experiment station show that the cost of producing gains on yearlings was 37 per cent greater than on calves, and 18 per cent more on two-year-olds than on yearlings. In these days of high-priced feed, this rapid gain which can be produced

by early feeding is a very strong argument in favor of fitting beef animals for the block before they are two-year-olds. This ability of young animals to make greater use of their feed lies in the fact that nearly half of the feed consumed is used in maintaining weight already gained. The larger and heavier the animal the more energy, and consequently the more feed is required to keep up the body heat, build up broken-down tissues, keep the blood in circulation and perform the bodily functions incidental to maintenance.

TYPES AND KINDS

In the production of early baby beef, calves which have run with their dams during the first five or six months furnish the best foundation for high-class feeders. Such calves are usually in better flesh at weaning time and make more thrifty and vigorous growth during their early life and have developed better feeding capacities than calves which have been hand-fed the greater part of this period. Where the calves are raised primarily to be fed for baby beef and it is desired to market them at the earliest possible age, feeding should begin as soon as the young calf can be induced to eat, since the successful finishing of baby beef is essentially a forcing process. It is important that the maximum amount of growth and weight should be secured in the shortest possible time regardless of considerations of the after effect, which would be imperative if the animal were kept for breeding purposes. The sole object of feeding and managing should be to mature a calf as young as possible and with a high degree of quality and finish. The best baby beef type is the low-down

blocky, compact form which is typical only of the beef breeds, or typical in a marked degree only in animals having a large preponderance of clearly defined beef type. The Aberdeen-Angus is unquestionably the one breed best suited to the production of baby beef animals. In conformation and type, this breed corresponds most nearly to the ideal, and its early maturing characteristics make it especially desirable for the feeding and finishing of young animals. Calves showing a large percentage of Hereford or Shorthorn blood also make excellent feeders. Frequently the dual-purpose type will finish very smoothly, while the dairy breeds have the least adaptation to this use, although large numbers of them are annually finished for the baby beef market.

SOURCES OF STOCK

The closing out of many of the large cattle ranches of the West in recent years has thrown upon the markets large numbers of high-grade range cows with calves following them. This stock is usually marketed in late summer after having had the benefit of the best summer grass available upon the range, and are usually in excellent condition. The calves will be found thrifty and of large frame and good feeding capacity and average, perhaps, 400 pounds in weight. This class of cattle is placed upon the market when the calves are at the proper age for weaning, and many thousands of them have been purchased by the middle western farmers to be finished for baby beef. The cumulative effect of 30 years or more of pure-bred sires upon the western ranges shows itself in the high-class cross-bred Herefords and Shorthorns which are now yearly offered in the markets of Chicago, Kansas City and

Omaha. This excellent beef type is especially noticeable in the calves marketed and shows to its best advantage in the finishing of calves for baby beef. Their active life upon the open range, usually with an abundance of feed, has given them a good frame and has developed a large feeding capacity, and these characteristics are made use of when the calf is put in the feed lot in the fall.

Another source from which large numbers of calves are drawn for early feeding are the dairy farms which are so situated as not to be able to raise the calves to maturity. These farms are found especially in dairy districts contiguous to large cities which furnish a market for all the milk produced at such prices that it is often thought unprofitable to use the milk for feeding calves. A good many of the calves from these dairies are sold as veal, but large numbers are also fed on milk for a short time, until they are able to eat grain and other concentrated feeds. They may be purchased at very reasonable prices as soon as they are old enough to eat grain and are taken to farms in the grain-growing districts. It is often possible for the farmer who is favorably situated for feeding to buy one or more carloads of calves each year in his own immediate neighborhood by picking up a few in each place. The high price of land and the growing scarcity of grazing land makes it imperative that stock of this kind shall be finished and marketed immediately, and so the greater number of these animals purchased at random throughout the country are fattened and marketed under two years old.

As has already been explained, the very best class of baby beef is produced from calves of the most pronounced beef type. It does not necessarily fol-

low, however, that only one extreme type will return a profit from the feed yard. Calves from dual purpose breeds, such as milking Shorthorns or Red Polled, frequently finish very smoothly and make good use of their feed. The purely dairy breeds can usually, with careful feeding and good care, be fattened at good profit. Holstein calves are especially adaptable to this purpose when they are handled from the time of birth with the idea of marketing them for beef. The heavy grain feeding forces a rapid growth and a corresponding production of fat, so that the pronounced dairy type does not predominate until 15 or 16 months old, and by this time they should be ready for market.

HOW TO FEED

It is unquestionably true that the most rapid growth and the best development of the beef type can be produced by beginning comparatively heavy grain feeding while the calves are still with their dams. This grain feeding should be begun as soon as the calves will eat, when they may be given a little bran and crushed oats. They will learn to eat shelled corn at an early age, and this should be gradually introduced, after which the grain ration should be about one-half shelled corn, one-fourth oats and one-fourth bran. There is no single grain calculated to form a more satisfactory supplement to the milk diet than oats, and if one grain only is available it should be this one. Its high protein content in connection with the well-balanced ration furnished by milk serves to build a good frame and tends toward muscular development. Shelled corn is a fattening feed, and when used in connection with the oats and milk completes a ration which includes the maximum amount of muscle and fat

formation which is so desirable in this kind of feeding. This grain feeding may be begun when the calf is about two months old and gradually increased until as much is given as the animal will consume. The calf should be weaned when it is five or six months old. The weaning time will generally be in late summer or early autumn. At this time, the feed should be varied so that it will include oil meal or cottonseed meal. The percentage of shelled corn may be increased at this time also. A satisfactory grain mixture consists of 80 per cent shelled corn, 10 per cent oats and 10 per cent linseed oil meal. Calves at this age will consume from 17 to 20 pounds of grain per 1,000 pounds of live weight. As the milk ration is withdrawn, it will be well to take particular pains to provide green feed. There will usually be clover or some other freshly mown hay available for feed at the weaning period in case pasture is short. Green sweet corn or ordinary field corn may be cut and fed with advantage at this time, gradually leading up to dry, shocked corn which it may be desirable to feed later in the winter. It is best to keep the calves on green pasture as late in the fall as it is possible while at the same time keeping them well supplied with all the grain that they will eat. As the pasture is used up, it would be replaced with increasing amounts of roughage, and the change from pasture conditions to the dry feed lot will thus be made without any setback to growth and without any serious derangement of the animals' digestive systems.

FORAGE AND SUCCULENCE

Alfalfa, clover or cowpeas form most satisfactory forage for winter feeding. Corn fodder is in com-

mon use in many sections of the middle West and is greatly relished by the calves. It has been the experience of certain Indiana farmers who make a practice of feeding clover hay and corn fodder that the calves will consume bright, well-cured clean fodder in preference to clover and make excellent gains upon it. The experience of feeders who have practiced shredding corn fodder and storing it in large stacks for winter feeding also bears out this statement. Shredded fodder in large stacks is likely to heat a little and undergo a mild fermentation, and it is the opinion of some feeders that this adds both to palatability and digestibility. While it is true that the larger percentage of calves finished for baby beef do not receive any succulent feed during the winter, it is equally true that feeds of this character introduced into the ration return large profits upon its cost. The value of succulent feed is not so much in its intrinsic fattening properties as in its tendency to regulate the digestive system of the animal in such a way that a larger percentage of the grain and hay is transformed into fat and muscle. In other words, it enables the animal to make better use of the concentrated feeds and forage given. The liberal use of succulent feeds tends to produce the juiciness of meat and the high finish of the animal which is so characteristic of first-class baby beef. Corn silage is one of the most satisfactory feeds of this character, and one of the most easily available throughout the corn belt. Root crops of all kinds, such as sugar beets and mangel-wurzels are also valuable, and in sugar-growing districts beet pulp from the factories makes a very excellent succulent ration. Calves which have been raised by their dams, and have been fed in the manner just described should be

ready for market at the age of from 11 to 12 months, and should weigh at this time anywhere from 800 to 1,000 pounds.

MANAGEMENT OF HAND-RAISED CALVES

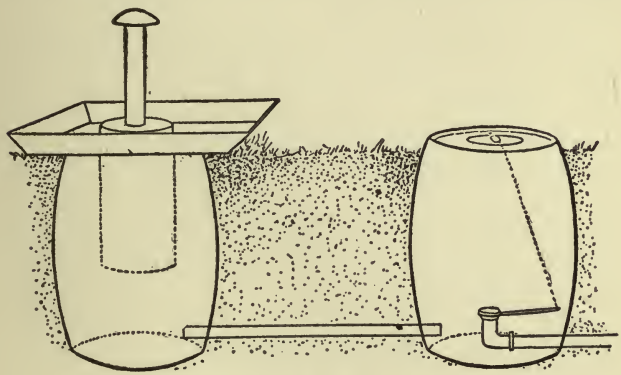
Calves which have been raised on skimmed milk will usually be slower in maturing and will not ordinarily be marketed under 15 to 18 months old. The method of handling hand-raised calves is essentially the same as when they have followed their dams. The hand-raised calf at the weaning age will usually have a larger frame and carry less flesh than the calf which has had its natural ration of whole milk. The natural tendency of the calf at this age is to develop frame and muscle, and to offset this tendency a heavy percentage of fat-forming feed should be given.

HEIFERS FINISH WELL

Heifer calves have a particular adaptation for feeding for baby beef. When fed for this purpose they take on flesh very rapidly and acquire as good a finish than steers; in some cases better. There is no discrimination against them when offered for sale in the markets, and their meat is equal to that of the best steers. The large numbers of western cattle offered for sale every fall has always thrown numbers of heifers on the market, and sometimes causes serious depreciation in the price of this class of animals. The increased feeding of baby beef in all sections of the corn belt offers a very satisfactory outlet for this class of stock, and indicates the most satisfactory and profitable method for marketing it.

FINISH AND QUALITY

The object to be most emphasized at all times in feeding baby beef is the securing of quality and finish in connection with rapid and economical gains. The value of a high finish is apparent by the way in which it influences values. Suppose a steer is marketed at the age of 18 months and at the weight of 1,200 pounds. Every fourth of a cent



HEATING WATER SUPPLY

difference in price per pound makes a difference of $3 in the value of the steer. A difference of one cent per pound makes a difference of $12 in the selling price. If this same steer, because of low finish, sells at 4 cents per pound while another of high finish sells for 5½ cents per pound, the difference in price between the two steers will amount to $18. This upon a carload of 20 would amount to $360, and might mean the difference between net profit and net loss on the feeding operations.

MARKETING

The time for marketing baby beef is in the summer or late spring at a period when packers do not desire the heavy carcasses of older animals coming from a long feeding period in the feed lots. It is not always possible to market the baby beef at this time, because, like all other types of fat animals, they cannot be profitably held for any great length of time after they are finished. For this reason, it is necessary to market in early spring calves which were born early the previous spring, and which have been forced constantly throughout the year. The hand-raised calves purchased from the dairy districts lend themselves very well to marketing when market demands are favorable for this type of beef. These calves are fed heavily during the winter, and are turned upon pasture as early in the spring as is practicable, the heavy grain feeding being continued. They will make rapid gains and acquire excellent finish and quality during this forcing period of their second summer, after the winter feeding with its long-continued use of dry forage. The change is a very wholesome one, however, and extremely cheap gains may be expected from this last period of the feeding season. They should be finished by July or August, being from 17 to 18 months old at this time, and may be thus marketed at the season when the packers demand light carcasses. Beef of this character is in great demand in the summer, and prices are most likely to be high at this time.

The feeding of baby beef may be found profitable under conditions where it is not possible to maintain steers until they have reached the age to be fed for heavy beef. Its greatest utility is found upon

farms having a limited amount of pasturage, but where it is not possible to keep breeding animals in sufficient numbers to raise heavy steers for market trade. The ease and relative cheapness with which gains are secured upon young animals and the relative high prices which the market has offered in recent years gives this type of feeding under present farm conditions a decided advantage over the old plan of fattening steers.

INDIANA EXPERIENCE

During recent seasons a considerable number of western calves were finished for baby beef in central Indiana. Among the more successful feeders is Ed Flannigan of Franklin county. In 1908 Mr. Flannigan purchased 30 head of high-grade Hereford calves in Kansas City, shipped them to his Indiana farm, and fed them out for baby beef. The results were so satisfactory that the following fall he purchased 60 head at the same market for himself, and something like 600 head for neighboring farmers in Franklin county. The 60 head which Mr. Flannigan retained for his own feeding were unusually high-grade Herefords. They were unbranded, which showed that they probably came from Kansas or Oklahoma stock farms. When seen in March, in the feeding pens, they were in most excellent condition, and their quality showed to the very best advantage. It would have taken an expert to distinguish them from pure-bred Herefords. As to the details of handling these cattle from the time they were taken from their mothers, and the feeds and feeding methods used, Mr. Flannigan stated that the calves averaged 400 pounds when purchased in Kansas City, and that they cost him $4.75 per 100 pounds.

This original cost, however, was increased to approximately $5 per 100 pounds by the time the expense of shipping from Kansas City to Franklin, Ind., was added. They were about four or five months old when they arrived upon Mr. Flannigan's farm late in October. In order to make the change from milk to dry feed less abrupt, he placed them upon blue grass pasture for a short period, gradually introducing clean, new clover hay where they could get it, and learn to eat it. Upon this hay, after a short time, he sprinkled small quantities of cracked corn, so that the calves would eat some of it with the hay, and thus gradually acquire a taste for corn. Later, he fed them small amounts of corn in the shock, so that they learned to eat fodder. By the time the calves were placed in the dry lot, some time in November, they had learned to eat all kinds of roughage as well as corn.

Practically all the feed they received was produced on the farm, the only feed purchased being some amounts of cottonseed meal. Corn fodder and clover hay formed the roughage ration, and cracked corn, with occasionally a little cottonseed meal, was the grain ration. The calves made continued, steady gains from the very day they arrived upon the farm. The fodder given them had been cut and placed in large shocks in the very best of condition, and came out all through the winter bright, green and free from dust. It was greatly relished by the stock. Although good, clean clover hay was available for the calves every day, they invariably ate their corn fodder first, apparently relishing it more than the hay.

The amount of corn was gradually increased until the calves were given all the grain that they would clean up every day. At the period when they were

eating most, the 60 head received about seven bushels per day of shelled and cracked corn, or about 6½ pounds per head. They were given all the roughage they would consume, and no especial record was kept of the amount consumed at different parts of the feeding period. Basing an estimate of the total amount to be consumed from November to May, inclusively, upon the amounts which he had already fed up to the middle of March, Mr. Flannigan stated that about 21 loads of clover hay, and all the fodder from 30 acres of unusually heavy corn would be consumed by the 60 head of calves. Fresh water was available to the animals at all times, both day and night. A tank heater was used in winter to keep the temperature up.

The calves spent the winter for the most part in the open air. There was a large, straw-covered shed, at one side of the corral, and the stock were free to enter this shed at any time. They seemed, however, to prefer the outside, even in the very coldest nights of winter, except on two or three occasions when a wet, heavy snow was falling. The hogs following the cattle had shelled corn and hominy grits where they could have access to them in a pen apart from the cattle. Very rapid gains were obtained from the hog feeding part of the proposition. Approximately, two pounds per head per day represents the gain of the cattle throughout the feeding period. Mr. Flannigan sold these cattle in May, and the average weight at this time was about 750 pounds per head. In addition to the cash returns, which gave a very high rate of gain, both for the corn and forage consumed, a large amount of valuable manure was available for use upon the land. After the close of the feeding period

last year, Mr. Flannigan applied a heavy coating of manure to 70 acres of corn land, and top-dressed 30 acres of wheat. This year there was sufficient manure to cover about 100 acres of land with a rich top-dressing. This cumulative effect of continuous feeding, whereby the accretions of one year's feeding serves to materially increase the yield of next year's crop is by no means the least important feature to be considered in computing the total results of a year's operations.

PRIZE-WINNING HEREFORDS

A HERD OF CHAMPION SHORTHORNS

CHAPTER XVI

Hothouse Lambs

The production of hothouse lambs on farms within reasonable proximity to large cities has become one of the important specialized forms of animal husbandry within recent years. By hothouse lambs, which are also called milk lambs or winter lambs, is meant lambs which are born in late autumn or early winter, and so managed that a rapid forced growth is secured and the animals marketed while they are still being suckled by their dams. The meat of such lambs is juicy, tender and of a delicate flavor and commands relatively high prices in certain city markets. The principal consumers of this product are the large hotels, fashionable clubs and wealthy families of large cities.

EQUIPMENT AND MANAGEMENT

Success in this industry, perhaps more than in any other branch of stock raising, requires the proper equipment for handling the stock and protecting it in winter. It also requires skill and judgment in breeding and feeding in a very marked degree. The ewes must be bred so that the lambs will arrive at the desired time, which is seldom later than the first week in December and may be any time in November. The ewes should have a marked tendency toward being heavy milkers, so that the young lambs will grow rapidly and become fat at the proper time for marketing. Good shelter

must be provided to prevent severe losses of the lambs at the time of birth and to insure against shrinkage on account of cold weather during growing time.

BREEDING

The Dorset sheep, or cross-bred Dorset Merino, are the most suitable of the best-known American sheep for breeding for winter lambs, because they will breed at any season of the year, and the arrival of the lambs can be timed to suit the desires of the owner. Professor Shaw, at the Minnesota experiment station, crossed ordinary range ewes with Dorset rams, and then selected from this offspring the ewe lambs which showed markedly the early breeding tendencies of the Dorset for the second cross, and at the end of three generations had established a very successful type of sheep for the production of winter lambs. In addition to the hardy qualities of the common western sheep, this stock showed the early breeding tendencies and quick-maturing qualities of the Dorset. This breeding procedure may be safely recommended to any farmer who desires to develop the best type of breeding ewes for raising hothouse lambs. An excellent breeding practice is the crossing of ewes of the type just described with Hampshire or Cleveland rams. This will tend to produce unusually large lambs, and while the cross would be unfavorable if the lambs were to be kept to maturity, it will tend toward the production of lambs of a marketable weight in a shorter period of time than by any other method. The more common practice is the crossing of this type of ewes with Shropshire rams.

FEEDING AND CARE

The management of ewes previous to lambing requires no special methods not ordinarily used in the general care of breeding ewes. Throughout the autumn they should be allowed the range of the farm, grazing wherever feed is to be found. In case the pasturage is insufficient to keep the ewes in the very best of condition, a liberal quantity of clover hay or sheaf oats, or some other feed having a high protein content, should be given. It is not essential to have the ewes extremely fat at this time, but they should be kept in a strong, vigorous condition, without which it will be impossible for them to produce thrifty, quick-growing lambs. If they are given the freedom of the farm, they will obtain for themselves the exercise so essential. If, however, for any reason, it is necessary to keep the ewes in a small inclosure, some provision should be made for plenty of exercise. As lambing time approaches the ration given should include more and more of feeds calculated to produce a heavy flow of milk. It will be necessary to have the milk production of the ewes at the maximum from the time the lambs are born. This change from ordinary feeding to feeding for a heavy milk flow cannot be made suddenly, so preparation for it should begin several weeks before the actual time of lambing. In probably no other line of stock feeding, with the possible exception of the production of market milk, is the value of succulent feed so apparent as in the raising of hothouse lambs. The silo is a valuable, although not indispensable adjunct to this industry. Succulence may consist either of corn silage or of any of the common root crops which are in use for stock feeding. A liberal supply of leguminous hay

will be found almost indispensable in feeding for this heavy milk production. If it is impossible to supply this feed, by all means see that the ration contains a very high protein content. This can be furnished by oats, bran and similar feeds. The ration for ewes at this time will not differ materially from the feeds given in a dairy for forcing high milk production.

SHELTER

Good, warm shelter is essential, and ample provision should be made for keeping all the animals under shelter during most of the growing period of the lambs. One man can usually handle from 125 to 175 head of ewes very easily if stabling facilities are properly arranged. Not only must the quarters be warm, but they must be dry and well ventilated. It is impossible for lambs or any other young animals to make their best growth in damp, dark, ill-ventilated barns or basements such as are sometimes used for this purpose. The basement of the barn may, however, be arranged so as to form almost ideal quarters for the lambs if it has a south exposure so that the winter sunlight may be used to the best advantage. Ample bedding of clean, dry straw should be provided, and the ventilation should embrace some system which, while admitting plenty of fresh air, does not permit cold winter winds to enter at any time. Young lambs are singularly susceptible to the influence of temperature and may easily be fatally chilled. The details of feeding and managing of the ewes and lambs can be easily worked out if the ultimate object be kept in view. This object is to secure a forced growth of the young lambs from the moment of birth. Upon

farms where a surplus of cow's milk is available, it will frequently pay to feed a liberal ration of this to the young lambs to supplement the milk ration furnished by the ewes. It is no great task to teach the young animals to drink, and this extra milk ration will have a marked effect in fitting the lambs for the market. At the earliest possible moment a grain ration should be added. If the lambs be given individual attention they may be taught to eat sifted oatmeal or ground barley and a little oil cake while very young. This is best fed by fixing a creep for the lambs so that they can have access to a trough containing some of this mixed grain without being disturbed.

A difficulty which is likely to be met when the sheep are kept closely confined under shelter, as is necessary for the growing of winter lambs, is that the older and stronger lambs are likely to rob the younger ones of their feed. This point should be watched and met by the prompt separation of the smaller and weaker lambs in pens by themselves. It will also require constant close attention to keep the young lambs free from stomach worms and other parasitic disorders. The ordinary well-known means of combating these pests will suffice equally well for young lambs of this character. The most effectual treatment for stomach worms and intestinal parasites of all kinds is the administering of a small quantity of gasoline to each lamb suspected of infestation. The growing lambs will soon learn to nibble at fine, well-cured alfalfa or clover hay, and will consume considerable quantities of it if it is kept constantly available to them. These nibbling propensities may be taken advantage of in keeping the animals healthy by placing a small quantity of tobacco stems in one end of their man-

gers so that they will occasionally eat a little of the weed, which tends to prevent parasitic troubles.

MARKETING

Profit from winter lambs is not entirely a question of breeding the sheep, of handling or managing, or feeding or sheltering or protecting them in winter. Attention to all these factors would fail to produce a profit unless there is a reasonable proximity of market. It is obviously impossible to ship lambs which have not yet learned to subsist without their mother's milk to any great distance with the expectation of selling them for slaughter upon their arrival. The suffering of the animals under these conditions would be extreme, and the shrinkage would be so great as to wipe out any possible profits. A few years ago a Colorado sheep man shipped some ten-week-old lambs direct from the range to Kansas City with the expectation of selling them as milk lambs. After separating them from their dams, they were loaded into a car and forwarded as rapidly as possible, but the shrinkage was great and the lambs arrived in such poor condition as to be almost unsalable. The experiment was a total failure. The most successful producers of hothouse lambs are found under farm conditions where from 50 to 200 ewes can be handled. By continued selection of breeding stock a large percentage of ewes can be secured which will bear twin lambs, and in this way the increase may be as high as 150 per cent. It is customary to slaughter these lambs upon the farm a few at a time and ship the dressed carcasses by express to city markets, the sales having been made previous to slaughtering the animals. In this way shrinkage is avoided.

Quality and high finish are essential to the securing of high prices for this product, and this method of marketing them avoids the loss of quality which is sure to follow the marketing of milk-fed animals on the hoof.

WEIGHT FOR MARKET

Winter lamb production is not a difficult proposition, although the farmer must be prepared to take the best of care of his sheep, and must be willing to spend considerable extra effort upon details. Lambs properly managed and well nourished should gain one pound per day from the day of birth until marketed. Just what weight is best for marketing is a matter of some uncertainty, ranging from 45 to 60 pounds.

PROFITS

Since not infrequently as much as 25 cents per pound dressed weight is realized for them it can be seen that the profits are quite large. Each lamb may net from $8 to $12. These prices can be secured only by having the lambs ready for market at the time when the greatest demand exists. If they are finished too early and sold during the holiday season they come in competition with the immense quantities of poultry annually fattened for the Christmas market. On the other hand, if they are offered for sale too late in the season, they will have to compete with feed-lot lambs and thus the high prices will not be realized. This period between the holidays and the first appearance of corn-fed lambs, including January and most of February, is the time when farmers should plan to market

their hothouse lambs. In spite of the high percentage of profit frequently made, this business has never yet been overdone, and there is a very considerable field for the industry upon farms within reasonable distances of the larger cities of this country.

CHAPTER XVII

Pastures for Grazing Farm Animals

About one-third of the improved land in the United States is used for pasturage purposes. In other words, about 300,000,000 acres are devoted to the growing of grasses in the cultivated area. This does not take into account the millions of acres on the range. It is a pretty safe conclusion that very little of this land is yielding what it really ought to. Pasture improvement has been neglected. The selection of grass seeds has never been given very much attention. This comes about largely from the fact that the real value of the pasture is not recognized by very many people. Grass furnishes the cheapest and best feed for developing young animals, and it is most satisfactory for maintaining breeding stock. It is an exceedingly valuable adjunct during the fattening period. It costs nothing to raise grasses when pasture is once started. The crop requires no particular attention, so that it is surprising that this problem has never been more thoroughly studied.

In England the value of good pasture is recognized. An English farmer being asked how to secure a good turf, said: "Oh, that is easy. Prepare your ground well, be careful in selecting your seed mixture and then roll each spring for 300 years and you will get a good turf." Some of the best pastures in England are hundreds and hundreds of years old.

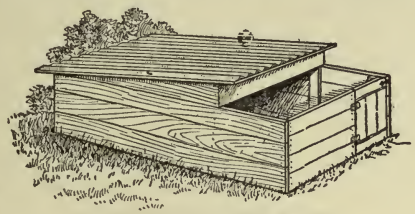
The idea of permanent pasture is growing in this country. A quarter of a century ago very few

Americans would even consider a permanent pasture. They figured that land seeded to grass crops for two or three years should be plowed up and planted to corn. They thought that blue grass turf, or, in fact, turf of any of our grass crops, after the third or fourth year became sodbound, as they called it; that it must be torn up and plowed up. As a consequence the very few pieces of permanent pasture in existence were rather unsatisfactory, because of the fact that they were so new. Of late years, however, permanent pastures are being established on all the big farms in the country, and they are exceedingly satisfactory. Blue grass pastures 25 years old on a central Illinois farm will return more per acre than in any other crop. Almost any farmer can devote 15 to 20 acres to a permanent blue grass pasture. It should be near the house and barn and it should be used almost exclusively for a night pasture for horses during the working season, a pasture for milch cows and probably a few sheep. Twenty acres will take care of all the work and milk animals on a 160-acre farm and leave sufficient growth in the autumn to provide winter grazing during the mild days. This pasture will start ten days to two weeks earlier in the spring than the ordinary pasture, so that the grazing period is very greatly extended, the supply of nutritious forage very large and the profit from permanent pasture great, to say nothing of the satisfaction of having a splendid piece of turf adjacent to the farm buildings.

MANURING PASTURES

Permanent pastures on the rich soils of the United States will not require much additional manuring. The droppings from the animals pas-

tured will add to the fertility, but it will do no harm to spread stable manure frequently over spots that do not appear to be doing well. This spreading can be done during the period of the year when crops occupy the rest of the farm and it is desirable to have a place to spread the fresh manure. A little attention here and additional attention to



RUN FOR SMALL PIGS

prevent the growth of weeds in a permanent pasture will soon result in a solid mat of blue grass that will grow better and better with each succeeding year.

Of course, all sections of the United States cannot grow blue grass. The semi-arid regions of the Northwest will have to depend upon brome grass and alfalfa and a few other forage plants for their pasture. Brome grass is proving a splendid pasture grass, even in the humid areas. It forms a compact sod, supplies a large amount of forage and will thrive under what are ordinarily considered adverse conditions. This grass should not be neglected in the regions above mentioned.

In order to start a permanent pasture, the first thing to do is to clean up the ground designed for this purpose. If it is an old pasture, pretty thoroughly manure the land by top dressing and apply the seeding of blue grass, or any other mixture that is desired. On uplands or dry hillsides, a mix-

ture of seed consisting of timothy 4 pounds, orchard grass 3 pounds, meadow fescue 4 pounds, hard fescue 3 pounds, Kentucky blue grass 4 pounds, white clover 4 pounds, red clover 4 pounds, has been used with satisfaction in the eastern part of the United States. On moist soils 4 pounds of red top may take the place of the hard fescue. In the middle West and the far West these mixtures are not as popular. More dependence is put on clovers, alfalfa, timothy and brome grass. In the East also it is customary to apply some commercial fertilizers, from 200 to 400 pounds of a mixture composed of 50 pounds of nitrate of soda, 150 pounds of tankage, 700 pounds of acid phosphate and 100 pounds of muriate of potash being quite satisfactory.

During the first season the land should not be pastured. The following spring, after the grass has started nicely, additional commercial fertilizers may be applied, or spots that do not appear perfectly thrifty may be treated with a light top dressing of stable manure. Grass will soon take possession of the ground, and will be ready for stock.

It must be remembered that it never pays to overstock any pasture, particularly one that is just getting started. Let the animals run on it occasionally, but do not let them graze too closely.

It must also be remembered that in the South Bermuda grass is especially adapted to conditions existing there. This takes the place of blue grass of the middle states and brome grass of the Northwest.

STARTING NEW PASTURES

Where pastures are to be started on cultivated lands, several years are required to secure one that

is satisfactory. Grass seed is usually applied to the ground in the fall, with wheat, or, if clover is to be added, the timothy, red top, etc., is seeded in the fall and clover applied in the spring. The first year nothing is obtained from the field except a crop of wheat. In the fall the land has to be mowed, to keep down the weeds. If the stand is good, the new pasture may be grazed very lightly the first fall, but stock should be kept off during the winter. The next season the grass ought to be fairly well established and capable of supporting a pretty fair number of farm animals. During this second season care must be taken to take off the stock at the first appearance of overpasturing. Then, too, if weeds of any kind appear, they must be mowed and disposed of before the seed appears. By the end of the third or fourth year a start toward a permanent pasture is well under way.

Another practice is to sow the grass seed alone without a nurse crop. The crop of fall grain is practically last, but, in many cases, particularly where there is apt to be a shortage of moisture, it is better to seed alone. The same precautions noted concerning weeds and overpasturing must be observed in this case. If the ground to be devoted to pasture has a very compact and stubborn subsoil, it ought to be subsoil plowed before it is seeded to grass. The cost of this extra labor will be more than made up by the increased thrift of the pasture crop.

Prof. W. J. Spillman states that there are three great pasture grasses in the United States—brome grass for the Northwest, blue grass for all the central area and Bermuda grass for the South. To this must, of course, be added alfalfa, which, although

primarily a forage plant, will, after being well established, furnish excellent pasturage, if treated right. Professor Spillman also believes that while the seeding of mixtures such as are used in the old country have not been very popular in the United States, the practice ought not to be abandoned until a thorough tryout is given. Possibly some successful mixture will be found. If it is, it will mean a whole lot to the live stock industry of the country.

The seeding of timothy and clover together seems to be one of the popular forms of starting a pasture in this country, to which other grasses ought to be added, particularly blue grass. In seeding grasses it must be remembered that, other things being equal, rich land requires more seed than poor land and wet land more than dry. A well-prepared seedbed requires less seed than one poorly prepared. A single pound of timothy seed to the acre, if every seed produced a thrifty plant, would produce 27 pounds on every square foot.

Mrs. Meredith, on her Indiana farm, devoted to the raising of pure-bred Shorthorns, is a very firm believer in a permanent pasture. She contends that it not only enables her to keep more live stock but it gives her a larger proportion of feed than most people think can be secured from pasture land. Further than this, the fact that farm animals become accustomed to grazing in certain fields and get used to a permanent pasture must be given consideration.

While permanent pastures are highly desirable, temporary pastures often are a great help. These may be made in the North in summer by sowing winter cereals in the spring. A true winter cereal, if seeded in the spring, will not head out that year,

but will produce a vast growth of leaves, which stock eat with a relish. These temporary pastures may also be grazed the following winter and sometimes they produce a crop the next spring. The difficulty unsurmounted in this temporary pasture proposition is that there is frequently a temptation to keep the stock on when the ground is too wet, thus seriously injuring the mechanical condition of the soil.

CHAPTER XVIII

Finishing Stock for Market

As has already been stated, the feeding of live stock is a difficult and complex art on account of the great number of influencing factors. These factors do not all pertain to the composition and combination of feeds which will produce the greatest absolute results in whatever line of feeding is pursued, but they relate in still greater measure to the relative profits to be secured from different feeding practices. A feeding ration which is well adapted to the needs of certain conditions, is not necessarily the best under all conditions. Because a certain system of feeding will produce given known results with a certain class of stock is not in itself evidence that the most profitable returns will be secured from it. The value of feed and the market price of finished live stock enter into the question and form intricate problems which require for their solution the best judgment that education and experience can furnish. What will prove profitable feeding practice for one season, with a stated value for feeds and a corresponding price for feeding animals, will not necessarily prove profitable the next season when both the raw material and the finished product may have far different relative values. Wide experience and an intelligent interest in market conditions and in crop production will go a long way toward promoting the formation of an intelligent opinion on questions of values. Yet instances are numerous in the experience of almost every feeder when

the opinion of those best informed upon feed and live stock values has proved faulty by the time the stock was fitted for market.

The finishing of live stock on a basis profitable to the feeder is an industry that is carried on under continually changing conditions, and requires a keenness and alertness on the part of those who engage in it fully as great as that required in any business or profession. A mistake in judgment when purchasing steers for fattening, for instance, may result in a loss on the year's operations large enough to wipe out the profits of one or more preceding years. Calculations based upon the hypothesis that corn will be worth 30 cents per bushel are entirely upset should market conditions force the price to 50 cents. It is a question of grave moment whether to market half-finished cattle when the price is high, or whether to continue feeding them on expensive feeds until finished and take a chance of finding a lower market. These, and numberless other considerations, enter so largely into the question of expediency in live stock feeding that the making of definite, set rules for the guidance of the farmer is an utter impossibility. The numberless details of market conditions and demands, of feed values and live stock values, of the thousands of little things that enter into the most successful type of feeding, can be gained only by experience and by a large degree of intelligence and observation on the part of the feeder. While each may be a small thing in itself, taken collectively they frequently denote the difference between success and failure in the feeding operations of the farm for any term of years. There is scarcely a feeder of extended experience anywhere in the country who has not, in some particular season, lost money

on his operations, but there are thousands who have procured good profits if the operations for any definite term of years be considered.

FEEDING PERIODS

Fattening stock for the market frequently demands different practice for different portions of the feeding period. Feeding management which will give the best results at the beginning of a fattening period will seldom or never be the best during the finishing period. Cattle which are placed in a feed lot in a thin condition of flesh on account of insufficient feeding cannot be handled in the same manner as thrifty, well-conditioned stock. Such animals as these can be fed during the first few weeks upon nourishing and strength-giving feeds, largely of a protein nature, which will build up the general physical condition of the animal, enrich the blood, and induce a thrifty, growing condition. Then gradually change the feed to one of a more carbonaceous nature, so that fat will be formed and weight gained while still maintaining the strong muscular frame produced by the previous feeding. The management of growing animals is, as a rule, much better understood by farmers than are the best methods of fattening, and this refers especially to the finishing period of the fattening process.

The vital question for successful marketing is, when is the proper time or the proper stage of development to market an animal to the greatest advantage? The answer is, of course, the time when it will make the most profit. This, as has already been pointed out, is a very difficult matter to decide. A visit to the live stock markets any day in the year will reveal large numbers of animals

offered for sale in a partly finished condition. This can have but one meaning, namely, that feeders of experience find that under some conditions it is more profitable to market stock at this stage than to continue feeding for 30 or 60 days longer in order to secure a high finish. It is always true that well-finished animals sell for higher prices than those not well finished. It is not necessarily always true that the highly finished class returns the greatest profit to the man who fed it on account of the difference in the cost of production. A lot of expensive feed is given to put a high finish on the high-priced animals, and it might easily be true that the cost of this feed more than offsets the difference in price. However, it is always desirable to feed cattle or any other class of meat-producing animals until they have a high finish, or "bloom," under all conditions where it can be done at a profit. These conditions are usually found when there is a reasonable margin between the value of feed and the market value of the finished animal.

In competitions involving the relative merits of fat animals, very frequently the deciding factor will be that one animal or one lot has a higher finish than its nearest competitor. This finish of fattened animals may be likened to quality in breeding animals. It is something that is hard to define, being of a variable nature. Its consideration includes not only the absolute amount of flesh the animal carries, but the manner of its distribution upon the carcass, the quality and the consistency of the meat and the external appearance of the animal. The securing of exactly the right degree of finish, of being able to distinguish the exact stage when the animals are ripe for market and of

offering them for sale without any deterioration from this condition, is one of the fine points of successful feeding and requires the widest experience and keenest discrimination. There are a large number of animals, particularly cattle, which it is simply a physical impossibility to feed to a finished condition. Such animals as old cows and types of the rough, poorly graded stock of no particular breeding, will never acquire a high finish no matter how long or how carefully fed. It is manifestly the course of wisdom to dispose of such animals as these as soon as they are in condition to be marketable.

INFLUENCE OF AGE

Generally speaking, it is much easier to feed young animals until they are finished than is the case with older stock. Cattle under two years of age which show a fair degree of beef type can usually be finished in excellent form, and this is one of the characteristics which give to baby beef its peculiar value. The same is true of sheep and hogs. Lambs fattened and marketed under a year old can be finished in almost perfect form, and hogs placed upon the market after careful feeding and management at the age of from nine to ten months, will invariably command a much higher price per pound than older animals of greater weight. Difference in value comes through difference in quality.

In considering the cattle feeding practice for the different parts of the feeding period, we may state that during the first several weeks the ration should be largely nitrogenous in its composition. This tends to develop the frame and feeding capacity of the animal in considerable degree. It gets the digestive and assimilative system into a condition

favorable to the economical use of fat-forming feeds later on. This does not mean that an exclusively protein ration should be given, but simply that the ration used at this time may be narrower than that given later. The second period will demand feeds of a more carbonaceous nature. A liberal proportion of corn may be given, and molasses or other sugar-bearing food may be added if such rations as this are available. This is the period of gross fat production. Not only should fat be deposited in the regular fat cells of the animal's system, but also between the muscular fibers and upon the surface of the muscular frame. The ration at this time will be quite wide, although it must still contain a liberal amount of protein.

The market requirements for meat of the best quality demand that the muscular tissue shall be well marbled; that is, a layer of fat will alternate with a layer of lean meat. Feeding animals to produce meat of this character requires scientific feeding, and is an art in itself, which is done at its best by only a few feeders. An animal which may appear fat and smooth to the eye will not necessarily be fattened in this manner. Nearly every cattle man has seen steers which have presented an excellent general appearance, yet the slaughter tests showed fat to be deposited in thick layers as a covering to the muscular tissue, with the result that the meat was of a very inferior quality and disappointing to the purchaser. Animals of this character can be distinguished only by experienced buyers of the stockyards. A carload of steers, showing external fat of this kind, or which have been fed until the fat is deposited in such a way as to become "patchy," will always be discriminated against in price.

The finishing period in a feed lot should include special attention to the needs of each individual animal. By this time the individual differences in feeding capacity will have manifested themselves, so that it may pay to divide a lot into two or more pens and feed each lot according to the apparent needs. A farmer fattening two or more carloads of cattle may by this means be able to dispose of one lot several weeks in advance of the second. During the finishing period a little more protein may be added to the ration than during the middle part of the feeding season. It will generally pay to add linseed meal to the feed at this time in rather liberal proportions. The beneficial effects of this feed will be seen in several ways. One effect is that, being a feed extremely rich in protein, it will tend to counteract the tendency of corn to produce excessive fat in patches. It will tend toward the formation of some muscular tissue along with the fat formation, and thus add quality to the meat. Its effect upon the digestion is also a desirable feature. In the advanced stages of feeding, the difficulty is to maintain suitable gains in profitable proportions to the amount of feed used. By the use of oil cake at this time, the animal's digestion is kept in better condition, and gains are made for a longer period than would otherwise be possible.

In feeding cattle, from two to three pounds of linseed meal a day can be given at this time, providing the animals are gradually accustomed to its use. It would, of course, be disastrous to introduce this amount of oil meal into the ration suddenly if they had previously been receiving none. Another effect of feeds of this character which will be quite noticeable is its effect upon the external appearance

of the animal. Oil meal tends to add quality. The animal looks smoother, its coat becomes fine and glossy and the hair contains much oil. Such points as these tell favorably when the stockyards are reached and when the animals are subjected to the inspection of a critical buyer. In hog feeding, tankage or other packing house by-products may be substituted for oil meal if it is so desired, and the results will be practically the same, and equally favorable. Hogs respond well to a rich, concentrated feed of this kind, in the last few weeks of their fattening period, and the general tone and thrifty condition which they develop will easily pay the cost of the feed. Sheep may be fed oil meal the same as cattle and in proportionate amounts.

PREPARING FOR SHIPMENT

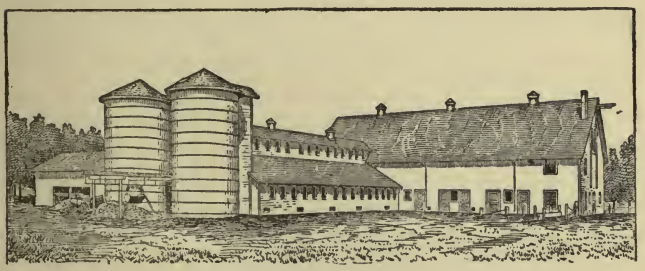
The last few days of the feeding season should be devoted to preparing the animals for shipment. A large proportion of the meat-producing animals which are sold in the packing centers are shipped considerable distances, varying from 100 to several hundred miles. The effect of this long journey is invariably a shrinkage in weight. How to reduce this shrinkage to a minimum is a problem which continues to engross the attention of feeders and shippers. In general, during the last few days in the feed yard, the stock should be given drier feed, if possible, than that to which they have been accustomed. If silage or roots are being fed, this succulent ration should be cut off gradually during the last ten days, and none should be given for three or four days preceding shipment. Oil meal should be used very sparingly during the last 24 or 36 hours and in its place a little more dry corn

or barley should be substituted. If alfalfa or clover is being fed, the supply should be decreased and more timothy or corn fodder given. This treatment will tend somewhat to harden the flesh, and heavy shrinkage will be less likely to occur.

The preparing of animals for market should include not only developing their final condition to its highest points, but keen discrimination in grading the stock. Uniformity in car lots has fully as much to do with the price received as the actual condition of the animals. Every farmer knows that if he takes to market a lot of cattle of mixed color and of varying sizes he will be discriminated against on this account. A lot of pure black cattle, or a car lot in which every individual shows the white face of the Hereford breed, or the pure red or roan color of the Shorthorn, will invariably command a better price, each separated by itself, than if the three cars were mingled together in one pen and offered for sale. By far the greatest number of championships for carload lots of fat cattle at the international stock show at Chicago has been won by black Angus cattle. It is finish and uniformity which has brought this result in nearly every instance. These cattle finish remarkably well, better than the average of other breeds, and they are bred so true to type that, with good judgment in making the original selection, a carload can be gotten together in which each individual is almost exactly like every other one. This quality of uniformity is one which should receive more attention than is ordinarily given it. A farmer who fattens more than one car of cattle, sheep or hogs can afford to spend a lot of time in selecting and separating his stock at shipping time so that each lot will show a

high degree of uniformity as to size, color and general condition. A car of hogs in which the individuals vary in weight but little will always receive favorable attention, and a lot of lambs which are well finished, and almost all alike, will command the attention of buyers when a poorly selected lot will be unsalable.

It should not be expected, no matter how much care or how much skill be devoted to the selection and management of fattening stock, that the deficiencies due to early management can be overcome.



REAR VIEW OF DAIRY BARN

The cattle, sheep or hogs which top the market are in every case animals which have received good care and have made continuous thrifty growth from the moment of birth. A calf which is stunted in its growth during the first year, loses quality. This quality can never be regained even under the most careful and judicious feeding. The animal may become thrifty, he may grow fat and make good gains upon the feed given, but he will never have the quality that a similar animal kept growing from birth will show. On this account it is not always possible for even the most successful feeders to attain the highly finished condition in stock which has been

purchased by them for the feeding lot, but which was not under their control previous to that time.

Prof. Thomas Shaw, known all over the world as an authority on live stock and feeding, writes as follows in *Orange Judd Farmer* concerning finishing cattle for market:

"The method of fattening cattle with swine following, is well nigh universal in the corn belt, where fattening is still conducted. Where only timothy hay or corn fodder is fed along with the grain, and the grain almost or entirely corn, there will be waste of the food, and such waste cannot possibly be avoided. The ration thus fed is ill-balanced. Experience has shown that with such food a good finish can be made, but it is made at quite a sacrifice of food. The food is too rich in carbohydrates to balance the protein content, hence a certain proportion of it will be consumed for which there is no return. This, when food was very cheap, as was the case years ago, was not of much moment, but now since corn has trebled in value it is of much moment.

"It is of so much moment that it should lead farmers so to farm that the fodder fed will, in the true sense, be the complement of the grain fed through bringing it into balance. Happy are the farmer feeders who have clover or alfalfa hay, or even mixed hay, of which a part is clover, to feed along with the corn. When such hay can be fed, it would seem safe to say that from 25 to 33 per cent less feed would answer the purpose. This would mean a very substantial saving in these days of dear grain. The feeders are also fortunate who can feed the corn in the form of silage. This insures a larger consumption of cheap fodder than would otherwise be consumed. If clover or mixed

hay could be fed with good silage, it would seem safe to say that from March 1 to June 1 not more than 12 pounds of grain per day would be called for by the steer weighing 1,200 to 1,400 pounds. If, however, the steer can only have corn and corn stalks, or timothy hay, the same animal would need not less than 18 to 20 pounds of grain, which is very expensive feeding, even when swine follow. The fattening of cattle without swine following is likely to grow in favor, and for the reason, chiefly, that it can be done with a smaller amount of dear grain. It may call for some more labor. The grain must needs be ground. When it is ground, it will be mixed with cut fodder or silage, or at least it ought to be so mixed. The food will then be thoroughly digested. Because it is, a minimum amount of meal is called for. The saving thus effected in the meal should more than offset the cost of grinding. By no other method of feeding can grain be fed so economically.

"When the animals are being fed on grains other than corn, the grain must of necessity be ground. Barley, rye, oats and peas, also speltz, must be ground to give the best results. This means that swine could not follow, as they would get little or nothing that would benefit them in the droppings. Oats are too dear relatively for such feeding. At present prices no grain is cheaper than corn, hence, unless the farmer has enough of home-grown grains it may pay him to feed corn freely. Where he does, two-thirds of the grain or meal may be corn. The other third may consist of bran and oilcake. If, however, he has rye, barley or speltz, or two or all of these, they may be made to take the place of corn. They should, of course, be mixed with some cut feed, and for such a use nothing is better than

silage, nor is any kind of roughage so cheap. From 20 to 40 pounds may be fed to each animal daily, dependent upon the other feed, and the feeder is fortunate who can feed clover or alfalfa with the above.

WHEN CROWDING WITH FEED

"The three months now being considered are the three finishing months of feeding the animals that are to be disposed of June 1. Such animals should not be finished on grass. It would be difficult to maintain the gains on grass at so early a period. Up to March 1 the feeding would be, in a sense, preliminary to the final finishing. The heaviest feeding of grain, therefore, would take place during these three months. During these months of crowding it is necessary to feed at least a limited amount of some food that will tend to keep the digestion in tone. When the digestion gets out of tone, the fact is usually disclosed by the condition of the droppings. The odor from them is offensive in proportion as the digestion is overtaxed. To prevent this, oilcake or wheat bran should be used. Oilcake is dear, but one or two pounds a day per animal will probably more than pay. During these finishing months, the animals cannot be watched too closely lest they get off feed. The aim should be to crowd them along, but not to overcrowd. It is the steady and continuous gains that should be sought, rather than rapid gains followed by slowing-up periods. As the weather gets warm in May, much watchfulness is necessary lest the animals shall lose appetite, and, in consequence, cease to gain. If they are to be kept longer than June 1 they should be finished on grass, accompanied by a limited amount of grain."

FATTENING HORSES

What has been said with regard to meat-producing animals applies with equal force to horses being prepared for market. The purchase of horses in poor or medium condition of flesh, and feeding them so that they may be placed upon the city market in good condition, is an industry of considerable proportions in various sections of the West. The same principles that apply to the feeding and finishing of meat animals can be safely applied to horses. While the object for horse feeding is not simply for increasing the weight and fat, yet it is true that a horse offered upon the market while not in a very fair condition of flesh will not command the price that the fat horses would. The utility of the horse lies solely in his ability to expend muscular energy, and horse feeding must necessarily take this into consideration. The ration should be one which will develop muscular energy, but it should contain enough of the carbohydrate contents to cover the horse's ribs well with a smooth layer of fat, and make him appear in a healthy, thrifty condition. The addition of oil meal or similar concentrates to the ration will be more noticeable in its effects upon the external appearance of the horses than in feeding cattle. Nowhere does a shiny, silky coat count to better advantage than in selling horses. The horses with smooth, shiny, oily hair, which has been well groomed and cared for, will invariably outsell the rough-coated animal, although he be in himself a less valuable individual.

CHAPTER XIX

Outlook for Live Stock

Stock production for profit in the United States is an industry which is yearly requiring an increasing amount of skill and general intelligence. How to maintain breeding animals on high-priced land, how to rear and develop the young stock in such a manner as to get the greatest possible growth in the least time and with the smallest expenditure of feed, how to fatten and finish these animals for market, and how to market them in the most advantageous manner, are questions which require for their solution ability and intelligence of no mean order. Each phase of the industry would require a volume in itself for adequate discussion. Upon some of these subjects a tremendous amount of accurate and valuable information is available. Other phases so change from year to year and from month to month that little can be said at one time which could be applied to conditions a year later. These points must be threshed out through the experience and keen judgment of the farmer and feeder himself.

THE BEEF SITUATION

The question of the future beef supply of the country is one of the most interesting as well as the most important questions in the entire field of agricultural economics. For more than 50 years the number of cattle per capita in the United States has been decreasing, although the absolute num-

ber of cattle in the country has more than doubled. The pork and mutton supply of the country is more susceptible than the beef supply to the factors influencing the market, due to the relatively short time required in increasing very largely the total number of either swine or sheep. A serious shortage in the total number of cattle in the country, however, is a matter which cannot be made up in a few months, but takes years to replace. The price of corn is so inseparably involved with the production of meat that it may be considered the greatest factor influencing both supplies and prices of live stock. The present high prices of all the meat-producing animals are due in a large degree to two influences: First, the high price of corn, and, second, the shortage in breeding stock, especially cattle and hogs, throughout the entire country.

It is the supply of cattle, however which presents the most interesting phase of the question of future meat supply. While all of the corn-growing states of the middle West are large producers and finishers of cattle, the relatively cheap production of the western ranges has always been a rather uncertain element in influencing the market conditions and supplies of cattle.

In the entire trans-Missouri country the cattle industry in every section was a forerunner of civilization. As this advanced westward in the northern part of the United States, the pioneer cattleman looked to the Texas ranges for the supply of breeding stock. In this way the historic old overland cattle trail from Texas to Dakota was started. Along this trail for a number of years great herds of Texas cattle were moved to the northern ranges, and distributed throughout Nebraska, Dakota,

Wyoming and Montana. Heavy, pure-bred Shorthorn and Hereford bulls were imported from the East and from Europe in large numbers, and used in grading up these herds, using the Texas stock as the original foundation. There was gradually evolved a very fair type of beef animals upon the western and northwestern ranges.

The days of the great Texas cattle trail were soon ended. This was due to the influx of farmers who worked their way across the West in Nebraska and Kansas, but it served its purpose, and established the great herds of the western cattle barons, whose halcyon days were in the late '70's and up to about 1890.

HOW CATTLE WERE SHIPPED

The building of the western railroads furnished means for shipping the stock East, and stimulated, to a great extent, the population of all the range by cattlemen. Cattle raising on the magnificent scale where one company or outfit owned anything up to half a million head of cattle, continued until late in the '80's and early '90's, when the gradual western advance of the farmers, with its consequent fencing of the country, caused a breaking up of the old bonanza cattle outfits. This movement reached western Nebraska in about 1889, and three years following saw the same inroads being made in the great herds of the mountain states. In those sections which did not attract the farmers, the small cattleman began to obtain a foothold, and to operate with relatively smaller holdings within the formerly acknowledged range of the cattle kings.

The range sheep industry became prominent about this time also, and its encroachment upon

the cattle territory has extended to this day. The settlement of the region of the great plains by farmers, removed, at the time of settlement, practically all of the cattle in the country. The homesteader found it necessary to devote his efforts, for the first few years, to the production of strictly cash crops, and had neither time nor resources for raising cattle, even on a small scale. The big cattleman found it necessary to round up and ship out of the country his entire holdings, so that for the time being cattle in the newly settled regions were very scarce. Later, this condition was changed, so that today these farming sections probably produce a larger number of cattle than were ever held there under range conditions.

In the extreme western states, the decade from 1880 to 1890 is shown by the census reports to have witnessed an enormous increase in the holdings of cattle. The next step in range development, after the advent of the farmer and small rancher in certain sections, was the leasing and acquiring title in various ways, to such grazing land as was possible and especially to water, upon which successful grazing depended. With a legal foothold of this kind, rich cattle companies then proceeded to fence, not only their own leases and filings, but hundreds of square miles of the public domain. Here, for a time, cattle raising on a comparatively large scale flourished.

ADVENT OF THE HOMESTEADER

The homesteader was still a source of a good deal of trouble to these large cattle owners, because of his persistence in filing on claims included in these pastures. The big cattleman has always opposed these settlements and kept them

back as long as it was possible. The era of big pastures on public land came to an end a number of years ago, through government intervention. The immediate result of this was the throwing upon the market enormous numbers of range cattle. It is, no doubt, due to this fact more than to any other that the exportation of cattle became so heavy in the years between 1902 and 1906. Besides all the cattle of these big companies which were fit for slaughter being placed upon the market, the pastures and feed yard of the Mississippi valley states were filled with western cattle to be finished for market in the corn-growing states. Still there were large areas of land which were controlled by cattle raisers, and which continue, even up to the present, to support great numbers of range cattle. The holdings of individual ranchmen were very largely reduced, and a greater number of small cattle growers took charge of the industry.

Irrigation along the valleys has, meanwhile, been developing, so that great amounts of winter feed are grown and the more progressive of these ranchmen have begun feeding in the winter, thus reducing their loss and placing the business upon a more stable basis. Title to range land has been acquired by them in most cases. State and school lands have been leased, while the open government land has been used as summer range upon the rule of "First come first served."

TEXAS A GREAT CATTLE STATE

Texas has continued to be the greatest cattle-producing state. The holdings there have ranged from 7,000,000 to 10,000,000 for a great many years. These cattle have been kept principally in pastures for a long time. This is made possible by the fact

that the state and individuals own all the land. Conditions of range and climate in the Northwest have served to develop a system of shipping southern cattle in the spring to the northern ranges for summer pasture. From the plains they are shipped, in autumn, grass-fattened, to the markets.

The last five years have witnessed the inauguration of a far-reaching change in the economic conditions of both the far West and the southwestern cattle country. From 1900 up to 1910, there has been no perceptible change in the visible cattle supply. This, it should be remembered, is in the face of a 20 per cent increase in population. Not only did the supply remain stationary for eight years, but within the year 1909, according to government figures, the total beef cattle supply decreased by more than 2,000,000 head. Exportations of packing-house products and live cattle have fallen off in the last four years nearly 50 per cent. These figures, together with the transitional and indefinite state of the cattle business in the West, have caused widespread interest in the cattle situation and its future prospects. This shortage of 2,000,000 head would be hard to replace, even if there remained any section in which the cattle-growing industry were capable of immediate expansion. The change in western range conditions has removed any prospect of an immediate future development in that section. The middle states are raising more cattle than ever before, but we can look to no sudden increase here. Further than this, never in the history of the government reports have so many calves been slaughtered as is being done at present. Not only are we decreasing our supply of grown cattle, but we are drawing to a dangerous extent upon our future supply by this slaughter of calves.

RUSHING CATTLE TO MARKET

Recently the great receiving markets of Chicago, Kansas City and Omaha have been overcrowded with cattle offered for slaughter in an immature and unfinished condition. A consideration of the immediate reasons for these conditions is of particular interest. The large number of western cattle offered marks the final closing out of nearly every big outfit in the Northwest. The smaller ranchers, who have made establishments along creeks and rivers, where they are able to irrigate and raise winter feed, are keeping their stock, and will do so indefinitely. But the cattle growers whose holdings range from 2,000 head up have been shipping out the remains of their herds.

Just the influences which have caused the large rancher to close out his holdings have been roughly outlined already. Two additional factors for curtailing the extent of cattle ranges have entered during the last five years. One of these is the immense profits which have been realized from sheep in the West. The steady increase in the number of range flocks has prevailed for the last 15 years, in spite of the most strenuous efforts of the cattlemen to keep them out of cattle-grazing territory. These two classes of animals are not good neighbors on the range, since the sheep are able to crop the grass much more closely than cattle. This makes it impossible for cattle to live on range on which sheep have been pastured. Hundreds of cattle growers, some who were in the business on a small scale, and some of the large ones, have accepted the inevitable, closed out their cattle holdings, and bought sheep instead.

For 30 years and more, both cattlemen, sheep-

men and old settlers, in general, have declared that the great stretches of plains which constitute the eastern half of the great state of Montana, that part of the Dakotas west of the Missouri river and the rolling prairies of eastern Wyoming and Colorado were unfit for anything but stock growing, and could never be used for any other purpose. The last five years have witnessed here one of the most remarkable changes in the history of western development. Upon the plains of the semi-arid belt, the dry farmer with his half section of homestead has invaded this territory in every state from the panhandle of western Texas to northern Montana, and throughout hundreds of square miles has literally crowded both cattle and sheep out of the country.

Colorado stockmen have recognized the changed conditions, and have shown a disposition to adjust themselves accordingly by the admission to the cattle and horse growers' association of the cattle and horse growers of the small ranches, men whose stock is kept under practically farm conditions. Hitherto, this class has not been admitted to membership in the association. Fred Johnson of Colorado secretary of the Colorado association, states that "practically the last of the big outfits have gone from the ranges of the centennial state." He adds, however, "that there were some large steer outfits left far back from the railroad in the northwestern part of that state, but that the steers which hitherto have been readily purchased in the Southwest are becoming scarce as the proverbial hens' teeth." The same is true of the great ranges of western Texas. This land has been found too valuable to remain longer in the raw condition, and supports only the live stock which can be grazed

there, and millions of acres have been sold to settlers and devoted to crop production.

These are the influences which have so seriously reduced the cattle supply, and which will undoubtedly further reduce it rather than bring about any immediate increase. Eventually, the dry-farming regions will raise more cattle than were ever produced under the old range conditions, but this will not be in the immediate future. It is entirely likely that several years hence the total number of cattle in the country will be greater than at any previous period. By this time, however, the population of the country and the corresponding demand for beef will have increased to such an extent that the beef production per capita will never be able to catch up.

CHEAP BEEF FOREVER GONE

In view of these conditions, it is hard to conceive just how or why we should ever have cheap beef again. The number of animals kept on the middle West farms is continuing to increase, but this increase is gradual, and by no means equal to the rate of increase in population. Cattle growing, even on high-priced land, will probably continue to be exceedingly profitable. The ranchmen who have been able to stay in the business in the West will also realize good profits from their stock.

It is likely that the thousands of range cattle which will always be produced in certain parts of the range country, will, in time, be fed and fitted for the market in the western states, instead of being sent to the feed yards of the middle West. The growing of barley, field peas, alfalfa and similar crops, both upon irrigated and dry farms, is leading cattlemen to realize what the possibilities

are for finishing stock. A considerable number of them are already starting in the business, and a better class of cattle are being raised every year. This is due to the introduction of pure blood continually, and due also to the increased number of ranchmen who feed their cattle, especially their yearling calves, during the winter months, instead of compelling them to rustle or starve, as in the old range days.

If a shortage of cattle were the only deficiency the United States is facing, we might hope for a heavy increase in beef production within the next few years, but the situation in regard to wheat is equally acute. An increased area must be devoted to wheat growing if we are still to produce the bread supply for ourselves and the increase in population. We now raise about one-sixth of all the cattle in the world, our strongest competitors being Canada and Argentina. Even now certain far-seeing American packers are causing investigations to be conducted in South America concerning the feasibility of importing chilled beef from the Argentine.

It is extremely likely that the relatively near future will witness importations of beef into this country from South America. Meanwhile, the cost of home-grown beef will increase until it approximates the value of the imported article. According to the Secretary of Agriculture, the farmer has not been getting his due share of the high prices for finished cattle. The price paid by the packer to the grower, in other words, is not as much as it should be when the high price of corn and the high retail price of beef are considered. This does not apply with equal force to the man who is fortunate enough to own, or control, cheap grass land. His

beef will cost him little, if any, more than it did 25 years ago, while the high price of cattle will give him a high net return. The present is the time to stay in the cattle business, if it is possible to do so, and not the time to quit, even to enter the profitable sheep business.

Live stock production, especially that relating to meat animals, is now at a transitional stage in the United States. Old conditions are rapidly passing away. Cheap land and cheap feed we have no longer, and never will have again. The hundreds of thousands of square miles which only a few years ago constituted the free range and the free grass of the West have been reduced to the vanishing point, and their ultimate disappearance is only a question of time. The days of cheap live stock production by indifferent methods have gone. The days of very large American export trade in meat have gone also. The domestic consumption so nearly approximates the home production as to leave only relatively trifling amounts of live stock and live stock products for export. With this condition has come a continually increasing population, which will tend to constantly increase the meat-producing capacity of the United States. If we are to continue as a nation producing its own foodstuffs, it will be necessary to have vast increases in our meat production in the relatively near future. Public ranges can no longer be looked to to supply this increase. It must come from the high-priced farms of the Mississippi valley, from the old settled portions of New England, and from the great undeveloped agricultural empire of the South. In time, the far West may be expected to produce more stock than it does now, but little of this supply can ever again be

diverted to the eastern centers of population on account of the greater demand for meat products on the part of the West itself. This is illustrated forcibly by conditions which exist at this writing. Only a few years ago many thousands of hay-fed cattle from the ranches of Montana were annually marketed in Chicago and other eastern markets. At present, although there is little, if any, reduction in the number of these animals fed in Montana, the East gets very few of them. Nearly all are shipped across the mountains to supply the meat demands of the Pacific Northwest and Alaska. This present and prospective demand for animals and animal products merits the attention of every American farmer. He should carefully weigh the considerations both for and against live stock farming before he definitely determines to abandon it in favor of grain production. He should become very keenly alive to the advantages of stock farming and to the returns which it is possible for him to secure from it. As an average, he has never made the most of his opportunities in this line, but conditions are now such as to merit greater attention to details of breeding and management and the securing of correspondingly greater returns for his labor and investment. To the individual farmer the methods of profitable live stock production are of vital importance, since upon their solution depends his own ability to remain in the live stock business. To the American farmer, as a class, the live stock problem has even greater significance, because upon its intelligent solution rests, in a large degree, the future agricultural prosperity of the country, and the hope of ultimately placing the agriculture of this country on a permanent and stable basis.

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