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MANAGEMENT

A HANDBOOK
FOR FARM TOPICS

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FARM MANAGEMENT

A HANDBOOK
FOR FARM PUPILS

BY

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PREFACE

THE object of this book is to give farm pupils, farmers' sons, and all who are commencing the study of agriculture, a clear conception of the manner in which a farm is organised and managed. There is much valuable literature describing in detail the different breeds of stock, the varieties of farm crops, and the numerous operations connected with each, but, to the beginner, such books are apt to be confusing, as he is at a loss to understand properly how one thing fits in with another, how the stock kept influences the crops grown, and how the various matters concerned have to be controlled in order to make farming a remunerative pursuit.

This work is also intended as a guide to the

beginner in determining the manner in which he shall acquire a sound knowledge of agriculture, and in deciding on the particular system of farming to follow.

A. E. BRUCE FIELDING.

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FARM MANAGEMENT

CHAPTER I

THE STUDY OF FARMING

FARMING demands a wide knowledge of many things before success can be achieved, and he who has elected to get his living out of the land can advance his fortunes to no small degree by arranging his training from the outset on judicious lines. So many take up the study of agriculture with but a vague idea of the particular kind of farming they will ultimately adopt that, when they come to farm themselves, they find that much they have learnt is useless, and that there is a great deal they require to know but have not learnt, as every farm is necessarily intended for some particular kind of farming, and must be managed accordingly to be profitable.

The student must realise at the commencement of his training, that farming is a broad

word which covers a large variety of agricultural systems. These systems may be divided into Mixed Farming, Stock Farming, Arable Farming and Dairy Farming, but each of these includes a number of fundamentally different systems. For example, the sheep farming of the Northern hills differs substantially from the sheep farming of the Southern Downs, and the pupil who hopes eventually to become a flockmaster in the Cheviots would be ill-advised to secure his experience on the Downs. Therefore, the first point the student must definitely decide is the particular kind of farming he will take up, and a few months occupied in enquiring into the different systems and firmly deciding this point will be well spent. Of course this will be unnecessary if he has a predilection for some particular kind of farming, or is the son of a farmer and intends following in his father's footsteps. In any case, the kind of farming decided on from the first should be the dominating factor in arranging one's agricultural education; it will avoid the waste of time in acquiring experience one may never need, and failing to learn many things that may be required. There is far too

much to learn to allow of either of these contingencies being realised.

Having decided on the exact kind of farming it is intended to pursue, the locality one will settle in will be more or less fixed. The next point is to arrange to be taken on a farm of the kind one ultimately hopes to take oneself, and it is a point of some importance to ascertain that the farmer, who is to be one's future mentor, is making his farm pay as a tenant-farmer, and is not merely using the farm as an adjunct to some other business out of which his real income is derived, or is "farming pupils"; because, if the farm be producing a proper income, it may fairly be assumed that sound, practical and remunerative methods of farming are to be learnt there. It is not to be inferred from the above remarks that the student is advised to spend all his pupilage on one farm—on the contrary, it is well to see the working of more than one farm; but what he should do is to gain all his experience on farms in the same locality and devoted to the same class of farming, as by so doing, he not only learns the kind of farming he is going in for, but acquires considerable knowledge as to

local conditions of soil, weather, markets, methods of cultivation, etc., which materially affect farming. Again, by remaining in one neighbourhood the student is enabled to become known to and, if he merits it, respected by, local landowners and their agents, with the result that when he comes to take a farm himself, he stands a good chance of being accepted as a tenant of a good holding. The importance of this point is seldom realised by the average pupil, as good farms are by no means to be had for the asking, but are keenly competed for when to let, and naturally the best man is given the tenancy, providing he has the necessary capital. Many pupils, who spend a few years on two or three different farms in various parts of the country, find the greatest difficulty in ultimately securing a farm for themselves, and often have to take one of indifferent quality, which is both expensive and difficult to work.

The pupil, having decided on the farm he will go to for his training, must have a clear understanding from the farmer as to what he is to do, and not be left to wander about looking on or be given any odd job that turns up. He

should be regularly employed in work of increasing responsibility as his knowledge extends. Further, he should make a point of studying the management and organisation of the farm, and not, as is so often done, spend all his time in merely acquiring proficiency in such operations as ploughing, driving a mowing machine, etc., however fascinating they may be. For after all, while it is desirable to be familiar with them, they are the province of the farm labourer, whereas the would-be farmer's particular province is management, organisation, the capacity to judge stock and crops, and a detailed knowledge of the £ s. d. of everything that is done. The best way to perfect oneself in this latter very important item is to write up a diary each evening of the day's doings on the farm, particularly details as to time taken over any operation, labour involved, and notes of expenditure and receipts that occur. In this way much valuable information and statistics can be accumulated, from which one will be able to estimate the cost of different matters, such as the growth of a crop, or the fattening of stock, and determine where economy could be effected. Stock markets should, of course, be regularly

attended. A good weekly agricultural journal should be taken in and, in winter evenings, the student should set himself a course of reading, as there are plenty of good text-books on agriculture now available.

There is a good living to be made out of farming, as in any other business, by those possessed of sound intelligence, industrious habits, and who secure their training in a proper manner. Agriculture is not the moribund business many would have us believe, and the student need not attach much weight to the purveyors of gloomy prognostications as to his future prospects.

CHAPTER II

FARM CROPS

A LARGE variety of crops are grown on a farm, but they can all be grouped into three divisions for practical purposes, namely, corn, root and forage crops. Crops are divided thus because the main object in growing them is to provide food for the stock, and the food of all animals is generally made up of members of each group.

The corn, cereal, or white straw crops comprise wheat, barley and oats, and they are grown, unlike any other crops, for two reasons, their grain and their straw. The bulk of the grain is sold off the farm, but certain quantities, particularly of oats, are retained for feeding to the stock ; grain being a particularly rich form of food for stock is necessary to supplement the less rich but more bulky food-stuffs, namely, hay and roots. The straw is partly used as a food-

stuff for stock and also as litter or bedding for them, when it becomes mixed with their dung and urine, forming farmyard manure, which is returned to the land to enrich it sufficiently to grow good crops next year.

Peas and beans, although not called corn crops, may nevertheless be included in this division, as their grain is a rich food-stuff and their straw or "haulm" serves the same purpose as corn straw, though much inferior to it.

The forage crops comprise all those giving bulky nutritious herbage, such as meadow grass, rye, lucerne, sainfoin, vetches, clover, maize, timothy, etc. These crops may be cut and made into hay for future use or may be consumed in the green state.

Root crops comprise turnips, swedes, mangels, rape, kohlrabi, potatoes, cabbages, etc., and they provide the succulent cooling food that is required by animals in connection with grain and hay; moreover, they form the bulk of the animals' food in winter, when their chief summer food, grass, has ceased to yield a sufficiency.

The above are the crops grown on the arable or cultivated part of the farm. The grass

portion of the farm is divided into meadows and pastures. Meadows really belong to the division of forage crops, as they produce hay for future use. They differ however from the forage crops grown on the arable land in that they are permanent, that is to say, they produce hay year after year, whereas forage crops are usually ploughed up after a year, in some cases after two or three years, and in the case of lucerne or sainfoin, longer. Meadows differ again from ordinary forage crops in that they act as pastures at certain times of the year, usually after hay-making, when they are grazed for a short time. The pastures on a farm are used solely for grazing stock, and form the bulk of the food for animals during summer.

It will thus be seen that on the average mixed farm the stock are during summer fed chiefly on grass, supplemented, however, with some hay and corn and perhaps green forage crops if the pastures fail through drought. During this time the arable land and meadows are growing supplies of roots, corn and hay to provide food for the stock in winter, when the pastures are not yielding.

It will now be evident that the greater

the proportion of grass the farm consists of the less will be the area of corn sold off, so that the farm will be more a stock farm, producing just enough corn and roots for use in winter.

Rotations.—It is an established principle that the same crop must not be grown successively on the same land. It is not an absolute principle, as there are instances of corn being grown continuously on the same land year after year, but to do so requires special knowledge and skill.

There are a variety of reasons why crops should be alternated, the chief being that, if a crop be grown year after year on the same soil, the soil becomes denuded of the plant-food for that crop, and so inferior crops result. Again, the insects and plant diseases that favour that particular crop would become especially strong if the crop were grown annually. Further, some crops give a much better yield if certain other crops have been grown before them. For these and other reasons it is necessary to arrange the corn, root and forage crops in a certain annual order or rotation.

Nearly every district has a rotation of its

own which experience has shown to answer best, but there is one named the Norfolk or four-course rotation, of which all others may be said to be variations. This rotation is as follows :—First year—an autumn-sown corn crop ; second year—a root crop ; third year—a spring-sown corn crop ; fourth year—a forage crop ; the rotation is of course repeated in this order every four years.

Next as to the reasons which have fixed this rotation in the order it is. The wheat is grown after the clover because it is a crop that flourishes best when it has a plentiful supply of a certain kind of plant-food, termed nitrates. Now, the forage crop that usually precedes wheat is clover, and clover belongs to an order of plants botanists term the *leguminosæ*—they are plants which produce pods, and include clover, lucerne, sainfoin, peas, beans, etc. These crops have a characteristic possessed by no other plants, it is the power to extract nitrogen from the air and convert it to nitrates, and after the crop has left the land their roots leave the soil enriched with these nitrates ; consequently, as wheat requires these nitrates so much, it naturally follows clover. Roots are

sown after the corn, because no crop takes so much plant-food out of the soil as does corn, and therefore to restore the fertility of the soil, roots are grown, because, as they are not sown till later than other crops, they allow plenty of time for the land to be thoroughly well-cultivated and manured, and as the root crop takes but little from the soil, the land is left in excellent condition for growing a corn crop. The land being now restored to good condition, a corn crop is sown next, but, as roots are generally eaten off the land by sheep during the winter, an autumn corn crop cannot be grown, and so a spring corn crop is sown instead, that is, oats or barley instead of wheat. Next year the land is occupied by a forage crop, usually clover or clover and grasses *e.g.*, rye; this crop restores to the land a great deal of plant-food, in the form of nitrates, that the corn has taken, and so prepares it to receive an autumn-sown corn crop, namely wheat. Clover follows corn for the further reason that it requires two years' growth, so that by sowing it in among the spring corn it can grow with it, and will not occupy the land alone until after the corn has been harvested; in this way a year is saved.

The clover could not be sown with roots in this way, and so it must necessarily follow a corn crop.

The Norfolk rotation is not suited to every district, and many variations of it exist. Further, in many cases a strict rotation is not always followed, as it may be altered from time to time as conditions necessitate ; also the rotation on one part of a farm may be different than on the rest, owing to the nature of the soil or situation. In no case, however, should the rotation be altered so as to violate the principles laid down above. There are only two ways in which a rotation may be altered, one is to grow the same kind of crop two years running, possibly three in some cases, and the other is to multiply the number of crops grown—in other words, say the root land need not all be under turnips, but part may be under mangels, part under potatoes, part under cabbages, and so forth. To return to the first method of altering the Norfolk rotation. A five or six years' rotation may be made by allowing the forage crop to remain down for two or three years, mowing it the first year and grazing and mowing it the second and third years. The

advantage of this is to lessen the labour bill, as no cultivation of the land under the forage crop is required; furthermore, in the second and third years more stock can be kept where this is done. A five years' rotation could also be made by growing roots two years running and, if the forage crop remained down two or three years also, a seven or eight years' rotation results. This duplicating of the roots is most beneficial on light, chalky soils, as the double manuring the soil would thus get improves the texture and gives body to such poor soils. Two corn crops may also be grown in succession if the land be rich enough; in fact it is often necessary to grow a corn crop between a root crop and barley, because, if the roots have been well-manured and also fed off on the land by sheep, getting concentrated food as well, the soil will be left so rich by the manure and the droppings of the sheep that it would cause the barley which follows to be of very coarse quality, whereas it is essential that barley be of fine quality for malting purposes. To prevent this coarseness in the barley, wheat is grown first, as it can stand a rich soil without harm, and will remove the excessive

fertility of the soil and leave it in the required condition for barley.

As regards the second method of altering a rotation, we have seen that a large number of crops come under the headings corn, root and forage crops, and the crops to be selected for each year of the rotation will vary according to the climate and soil. For example, mangels and wheat are at their best in the warm south, but in the cool north oats and turnips are more prominent. On reclaimed peat, potatoes, oats, rye and cabbages should be grown. For heavy and clayey soils, wheat, beans, mangels and cabbages are best suited. For light loams, barley, potatoes and turnips should be grown. Chalky soils like leguminous crops, such as peas, lucerne, clover and vetches. Market prices, of course, greatly influence the crop to be grown, *e.g.*, if wheat is selling well one would naturally put as much as possible of the corn land under wheat; again, if mutton is fetching good prices it would be advisable to keep as many sheep as possible, and one's rotation would have to be modified accordingly, on the lines to be indicated later.

There are a number of advantages to be

gained by growing as many different crops as possible ; the labour bill is lessened, as the sowing and harvesting of each crop varies somewhat, thereby providing regular employment for the farm staff without having to engage an extra number at any one time ; a serious loss from insects or plant diseases attacking any particular crop is avoided ; a better balance is kept in the food stores of the soil, as different crops take different amounts of the various food ingredients ; and, what is equally important, their roots feed at different depths in the soil, and so do not exhaust any particular layer. If the season be bad for one crop it may be good for others. Finally, food is provided for the stock at all periods of the year.

On light thin soils, such as the Downs, this diversity of crops is a prominent feature in the husbandry, the system here being to keep the land continually cropped with quick-growing crops following one another closely, chiefly forage crops, and feeding them off on the land by sheep. The advantages of this system of farming for such soils are, that by keeping the land continually under crops there is little risk

of plant food being lost in the water, which drains so easily from these soils. Again, these crops give a regular supply of bulky green fodder, on which sheep can be remuneratively kept all through the summer, as such soils cannot grow pastures good enough to provide sufficient sheep food in the hot months ; finally, by cropping the arable land in this way, and continually feeding off with sheep, the soil is cheaply manured by the droppings of the animals, and consolidated by their treading, the result being that the land is got into good condition to grow a remunerative crop of corn next year, which it could not otherwise grow at anything like the cost. By modifications of this same system sheep are maintained on arable farms all over the country, but where the land is heavy, sheep are not suitable, and bullocks are kept instead, being fattened indoors in winter and their dung used to manure the arable land.

Catch Cropping.—We have now considered the systems on which crops are grown, but there is one practice that remains to be referred to, namely, that known as catch cropping. This is the growth of a quick-

growing forage crop, such as trifolium, between two main crops of a rotation, say between roots and spring corn. It is chiefly of advantage on light land that is apt to have a lot of plant food washed out of it if left bare through the winter, and the catch crop grown provides useful sheep food early in the year. It must be got off early, however, or it will interfere with the cultivation of the spring corn, and, in any case, the crop following a catch crop is usually somewhat inferior than it would otherwise be. Catch crops are to be regarded as occasional crops, and should not be allowed to interfere with main crops. Their greatest utility is after a hot, dry summer, when the yields of hay, straw and roots for winter food have been small, consequently a catch crop giving sheep food early in the new year will be a useful supplement to the rapidly diminishing stores of winter food.

CHAPTER III

FARM CROPS

(Continued)

HAVING considered the systems and principles concerned with the growth of crops we come to a closer study of the crops themselves.

Corn Crops.—Each of the corn crops can be sown in either autumn or spring, but the purpose for which they are grown varies with the time they are sown. Wheat sown in autumn is sown to produce grain and straw next summer, but the varieties of oats and barley, termed winter oats and barley, that may be sown in autumn, are only sown as catch crops. Oats and barley when grown for their grain are sown in early spring; wheat may also be sown in early spring, that is, the variety known as spring wheat, but it is very necessary to make sure that genuine spring wheat is used. If the autumn-sown wheat is doing badly it may be ploughed up and spring wheat put in its place.

Wheat then being ordinarily sown in autumn, we will glance at its cultivation. The clover lea is ploughed up and the land worked down to a good tilth, which must be firm; if the soil be heavy it should not be worked too deeply before seeding, and then it can be rolled afterwards to consolidate it. The seed is drilled, but if the land be too sticky it should be broadcasted, to avoid the weight of the drill going over the land. About 3 bushels per acre are sown, and about 4 quarters grain and thirty hundredweight of straw is an average crop. In spring, weeds should be kept down by horse and hand hoeing, rolling and harrowing are also advantageous; if the crop be too luxuriant at this time, as it may be after a mild winter, it should be lightly eaten down by sheep. As wheat follows crops that leave the land rich, but little manuring is necessary; $1\frac{1}{2}$ cwt. of super, or slag if the land be poor in lime, may be applied with the seed, and in spring 1 cwt. per acre of nitrate of soda is advisable after a hard winter, and in any case with spring wheat. The stronger soils and warm climates give the best wheats.

Oats and barley are sown about March, in

fact as soon as a good seed-bed can be prepared, which will be dependent on the weather, as more harm than good can be done by cultivating land that is too wet. For barley a good seed-bed is more essential than for either of the other crops, as barley, being required for malting purposes, the production of a perfectly uniform crop of good quality grain is necessary. If the land cannot be got into good enough condition to ensure this it would be better to substitute oats or spring wheat, rather than produce a crop of barley worth only a low price. On light, calcareous, or sandy loams there is less difficulty in getting a good seed-bed than on the heavier soils, where skilful management is required to get the requisite tilth. The remarks in the last chapter respecting the richness of the soil must also be borne in mind. For barley a shallow, finely-reduced seed-bed must be produced, to attain which it is as well to have ploughed only 4 inches deep ; 2-3 bushels of seed are sown and covered with light harrows, followed by a light rolling.

For oats 5-6 bushels is the usual quantity to sow, and 2 cwt. super, 2 cwt. kainit, $\frac{1}{2}$ cwt. nitrate of soda and $\frac{1}{2}$ cwt. sulphate of ammonia

is a good manurial dressing. For barley 1 cwt. sulphate of ammonia, 2 cwt. super and 1 cwt. kainit produces good results. About 33 bushels per acre is the average yield of barley and about 42 bushels for oats. Oats prefer the cooler and moister climates and so are seen at their best in the north; lack of moisture is more detrimental to oats than either of the other cereals. Barley prefers light, sandy or calcareous soils and warm climates.

As a forage crop usually has to follow spring-sown corn the seeds are sown in amongst it, as already stated, but care must be taken that they are not sown too early or they may smother the corn. There is the further disadvantage that when the corn is harvested there is too big a bulk of green stuff in the butts of the sheaves, which necessitates the crop being left in the field a longer time to dry this green stuff than is good for the corn.

Harvesting.—Wheat should not be allowed to get fully ripe before cutting, but should be severed when the straw immediately below the ear begins to assume a yellow tinge. Barley, on the other hand, requires to be

thoroughly ripe before cutting, the ears hanging down and the straw white. Oats, again, must not get fully ripe or much grain will be shed in carting ; they should be cut when there is a light yellow shade noticeable throughout the field, and when the grains from the greenest ears can be separated from the chaff by rubbing in the hand.

Corn is usually cut with the string-binder, which cuts and ties the corn into sheaves in one operation ; if, however, much of the corn be laid, the string-binder will be impracticable and the reaper will have to be used and the sheaves tied by hand ; in some cases the scythe will have to be used also where the corn is very badly laid. The sheaves are set in stooks after cutting, each stook consisting of about twelve sheaves, six a-side, and the stooks so placed that they get an equal amount of sun on each side, or the ripening will be uneven. Barley is sometimes allowed to lie loose instead of tying in sheaves, and is then fit to cart sooner. As soon as the sheaves are dry they are carted to the stack, which may be built in the open or under a Dutch barn, and in either case it is essential that the stack should stand

on a dry bottom, and preferably a raised one, to keep away vermin,

Extra labour has to be employed at harvest time, as the work is too heavy to be dealt with by the ordinary staff. Such extra assistance may be paid by the day or by piece-work.

Roots.—The preparation of the land for roots is much more elaborate than for any other crop, as not only is it necessary for the crop itself, but also for the crops that follow, which would otherwise require a more extensive cultivation than they usually get, and this it would not be convenient to give them owing to the short time available before seeding. Heavy manuring and extensive cultivation for a root crop is shown by experience to be the most economical method of preparation for this and the following crops. The cultivation of the land begins in autumn, after the corn has all left, the land being broken up and dunged, and is then left in a roughly ploughed state till spring. It is during this period that the land may be occupied by a catch crop, if it be a light, quick-draining soil, or if sheep feed be needed in spring. In the spring a good

seed-bed is prepared with the aid of the plough, harrow and roller.

Mangels.—The time of sowing of a root crop depends on the crop ; for mangels the last week in April is about the best time, drilling 8 lbs. per acre in rows 2 feet apart. The seedlings are subsequently thinned out to suitable distances apart. Horse and hand hoeing must subsequently be done to keep down weeds, and this, of course, applies to all root crops. Mangels are not suitable for feeding direct to stock, but are kept in clamps, that is, in heaps covered with straw and earth, to ripen. They are essentially a cattle food, but may be given to ewes and lambs. The yield is about 20 tons per acre. They are the most nutritious roots we have, and resist drought better than any others. They like warm climates and fairly heavy soils. As regards manure, mangels may get 12–15 tons per acre of dung supplemented with 5 cwt. super, 3 cwt. kainit, and 2 cwt. nitrate of soda ; salt is also beneficial.

Turnips.—There are three varieties of turnips, namely, the white turnip, the yellow turnip and the swede. The white is the least

nutritious and the poorest keeper, the swede is the most nutritious and the best keeper, the yellow being intermediate in both respects. The white grows quickest, the yellow next, and the swede last, so that if some of each variety be sown a supply is ensured through the winter, as yellows are ready for folding after the whites are done, and after the yellows the swedes are ready. Turnips prefer lighter soils than mangels, the whites flourishing on poorer soils than will carry either yellows or swedes, the swedes requiring better soils than either of the others. Turnips are suitable for all stock, but notably for sheep and cattle. They are not sown till the end of May or beginning of June, and so there is ample time to get the land in first-rate condition. About 3-4 lbs. per acre are sown, and the usual thinning and hoeing follows. The average yield is about 20 tons per acre. The manuring should consist of about 10 tons per acre of farmyard manure with some 5 cwt. of super, or partly basic slag.

Potatoes are divided into three main groups, namely early varieties, main-crop varieties and late varieties. Deep loams are necessary to a good crop, and the land must

be well-tilled. Planting is done from February to May, the "sets," that is, small tubers or larger ones cut into two or three pieces each, being usually planted about a foot apart on the dung in the rows; the rows are then split back, and must be earthed up from time to time or they lose their shape. About 16 cwt. per acre of sets is sown, and the average yield is about 8 tons per acre, but it is a very speculative crop to grow. A suitable manuring would be 10 tons of dung, 5 cwt. of super, 1 cwt. of sulphate of ammonia, and $1\frac{1}{2}$ cwt. of sulphate of potash.

It is now getting a common practice, particularly with early varieties, to "box" the tubers to be used for seed. The tubers are placed in shallow boxes or trays, and kept in well-lit sheds through the winter, with the result that thick, strong stems develop, and these tubers, when planted, grow quicker and are ready for lifting much sooner than others.

Kohl Rabi and kale are two crops grown to some extent in the southern counties to provide sheep feed in autumn and early winter, for which they are very useful. Kohl rabi does not give such a good bulk as turnips

or mangels, but is a better yielder in a dry summer. The cultivation is similar to turnips.

Rape is a crop often grown for sheep food. It is similar to the turnip as regards cultivation, but is more usually grown as a catch crop, particularly on the Downs.

Cabbages.—Field cabbages are a useful crop for folding sheep on, and for cutting and giving green to cows and bullocks as a supplement to other food. They can be folded a second and sometimes a third time. Ram breeders particularly favour cabbages. They have a nutritive value about equal to yellow turnips. Cabbages are usually sown in autumn on well-cultivated land, and are ready for use in spring and summer. They require a heavy dunging, and super and kainit in addition. They may also be sown in spring to supply food from September to Christmas. The seed may be drilled direct, or plants may be raised from seed in a specially prepared seed-bed and transplanted; this is more frequently adopted with spring-sown cabbages. Half an acre of seed-bed will give enough plants for 10 acres. The smaller varieties are planted 2 feet apart in the rows and the larger varieties 3 feet.

Weeds must be kept down by horse and hand hoeing between the rows, and any plants pulled up must be replaced from the seed-bed; those pulled up should not be put back again, as they have probably been vitally hurt.

Forage Crops.—Less cultivation is required for these than for either corn or root crops. In fact, when sown amongst corn, as is most frequently the case, especially with clover and grass seeds, no cultivation at all is involved. Lucerne and sainfoin are two forage crops grown extensively in the south on chalky soils to provide food for sheep, and the crop usually remains down for five to seven years. Their manurial requirements are phosphatic and potassic, and of course lime must be present. When sowing lucerne about 20 lbs. per acre is sown, and the annual yield is about 20 tons of green fodder or 5 tons of hay. Sainfoin is sown at the rate of 56 lbs. of milled seed or 4 bushels of unmilled seed (seed in the husks), and yields $1\frac{1}{2}$ to 2 tons of hay per annum. Vetches are a crop usually sown in small areas in winter or spring to provide green forage for all kinds of stock in spring and autumn respectively, and are a very useful crop to have on a farm.

3½ bushels per acre are sown and about 15 tons is the yield.

Haymaking.—All the forage crops may be made into hay, but the great bulk of the hay made on the farm is from the permanent meadows, which are cut in June as a rule, and later in the summer a second cutting, called the aftermath, may be taken. The hay is cut, the swathes turned and tedded to let the sun dry them on both sides, then raked into windrows, and finally into cocks. As soon as dry, the hay is carted and stacked. If stacked at all damp it will heat, and may take fire, in which case a slice should be cut out of the centre to admit air. Cutting out a slice in this way, and so dividing the stack into two, is more effective than merely cutting a hole from the centre downwards, which is the common practice.

Silage.—When wet weather makes it impossible to cart any forage crop, then it may be stacked in the wet state to form silage; heavy weights must be placed on top of the stack to prevent air from gaining admission to the mass and causing it to rot. The silage may be cut and fed to the stock during the winter, but

should not be given to cows just before milking, or its strong odour will taint the milk.

Peas and Beans.—Peas are a very erratic crop as regards yield, and require light loams with plenty of lime in them. Both peas and beans are usually grown instead of clover in the rotation, as they are leguminous crops. About 3 bushels per acre are drilled at the end of February and about 34 bushels is an average yield. Beans require heavy soils and, like peas, are very uncertain in their yield. They are sown in February, but there is a winter variety that may be sown in October; 4 bushels is the usual quantity to sow, and the yield may be about 4 quarters. Both peas and beans are excellent cleaning crops, as they smother out weeds. Farmyard manure should not be applied to either crop, but peas should get 4 cwt. of super and beans 6 cwt., and both may get, say, 2 cwt. of a potassic manure.

In deciding on the crops to be grown on each particular field the future requirements of the stock must be kept well in mind. It is advisable to calculate roughly beforehand what amount of food will be required during each

month of the year, and to arrange to have the same available, as any deficiency means buying in food, which, as a rule, is ruinously expensive, or being forced to sell off some of the stock at times unfavourable to selling.

Drought.—Calculating supplies beforehand can, of course, only be done approximately, as the weather, plant diseases and insects are always liable to upset one's estimates. The weather, in particular, when it takes the form of a summer drought, may have a serious effect on the supplies of food for the subsequent winter, and coping with such a contingency merits consideration here.

Lack of water adversely effects swedes and turnips very quickly, but not mangels, which are splendid drought-resisters. To maintain the supply of moisture for the roots, the land must be kept well-hoed, not merely for the purpose of keeping down weeds, but in order to keep the surface soil in a fine, crumbly state, as this condition encourages the rise of water from the subsoil to the upper layers, and so gives the roots the moisture so indispensable to them. This renders them more or less independent of the lack of rain that drought

causes. Next, as regards the forage crops. Droughty conditions in the early part of the year mean a light hay crop, though of somewhat greater nutritive value than it would otherwise be. When this occurs one has to consider how the ricks may be supplemented, as the winter feeding of the stock till next year relies largely on having sufficient hay, and it is impossible to cause the hay to give a satisfactory yield, as can be done with the roots, by means of hoeing. To supplement the meadow hay it would be necessary to make into hay any lucerne or sainfoin one may have growing. It should be cut just before flowering, or it gives a woody hay, and requires very careful handling in making as the leaves quickly wither and drop off. It gives a valuable and highly nutritious hay, best adapted for horses, and the aftermath can be grazed with sheep or cattle. If, by making these crops into hay, it entails a deficiency in forage when the pastures fail in late summer (which these crops were intended to supplement), then the best remedy is to have some land under maize, which revels in a hot summer and can be cut for green fodder from September till the frost sets in. Another

method is to buy some cabbage seedlings and plant them out as soon as possible on well-manured land; they soon cover the ground, and are capital for all stock, serving as a stand-by when both root and forage crops fail.

When the supply of hay is not plentiful then more straw than usual will have to be used during winter in the animals' rations, and consequently, less straw will have to be used as litter, and such substitutes as peat-moss, bracken, etc., introduced instead.

Practically nothing can be done to combat the effects of drought in the case of corn crops, which under such conditions give low yields.

Permanent Pastures.—As the farming of this country is tending more and more to the keeping of stock rather than to grain-growing, the area of land put under grass increases every year, but this putting of land down to grass requires to be done with care and knowledge, or but poor pastures result.

All kinds of soils are put under permanent grass, but pastures do best on the heavier rather than the lighter soils, and as these are the most expensive to cultivate and the latest in giving a crop, they are best suited to being converted

into pasture. The land must be well drained first, as it does not do to form a pasture on land that is likely to have stagnant water; even mossy and rushy lands may be converted to sound pasture if well drained. The next proceeding after draining, if it has been necessary, is to lime the land, applying from three tons on the lighter soils to eight on the heavier or more peaty soils; this is very necessary, as on some soils the finer grasses will not flourish if the land has not been limed.

After draining and liming the land, one must set about getting it into clean condition and good heart. The best method of doing this is to grow a good clean crop of swedes and feed them off with sheep, getting cake in addition; two such crops may be taken if the land be in very poor condition. A fine seed-bed has now to be prepared, as grass roots are very delicate, and some go so short a distance in search of food that their feeding-ground must be in a very fine state. After the sheep have left the ground it is ploughed twice, and then left till spring, when a fine and firm seed-bed is produced with harrows and rollers. The seeds are sown on a still day in April, and

preferably not in dry weather. At the same time a very light seeding of oats may be sown to afford shelter to the young plants ; this may be cut early as forage, and will partly pay the expense of laying down the pasture. The distribution of the seeds will be more uniform if the grass seeds be sown in one direction and the clover seeds sown separately across them. Chain harrows follow and cover the seed about a quarter of an inch deep ; the land is finally rolled twice to get a firm seed-bed.

Now as to the after-management of the pasture. The first year a crop of hay is taken for preference, and then any vacant patches carefully raked over and re-seeded, or the land may be lightly stocked with young cattle, but not before the flowering stems appear. Vacant spots would then be re-seeded in the spring ; this re-seeding is also necessary to avoid moss growing, which must always be kept out of pastures. On no account should lambs be put on new pasture instead of cattle, as they injure and pull up a lot of plants, particularly the young, tender seedlings. Early in the first winter and, again, in the following spring, the pasture should be rolled and, in the second

year, grazed with young cattle and 8 to 12 tons of well-made compost may be applied. In the third year, grazing with young cattle in spring is advisable, and in autumn, sheep may be admitted. In the fourth year the pasture may be regarded as established, and either sheep or cattle put on, but if the former, let the grass have a good start in spring.

In future the pasture must be kept well grazed, any rough grass left after summer should be eaten off by bullocks. If there be an excess of grass, as in a wet summer, the stock ought to be removed for a few days and the grass mown, then the pasture can be left unoccupied for a few weeks and a good aftermath will result.

In composing the mixture of grasses and clovers that are to be sown for a permanent pasture, it is well to ascertain what grows best in the neighbourhood, and give them a prominent place in the mixture. But seeds that only grow well on much better soil than that to be laid down should not be included to any extent, as they will not flourish. Any of the first-class seed firms will supply a mixture suitable to the particular soil concerned.

There has been a great change in recent years in the manuring of grass land ; lime and well-rotted dung were universally used, but now basic slag is superseding them, and with excellent results. Slag not only supplies phosphates and lime to a soil, but by its notable encouragement of the leguminous plants, namely the clovers, it increases the supply of nitrogen to the soil. The amounts of slag applied vary according to the nature of the grass, but 7 cwt. per acre applied, say, every seven years, has excellent effects, and some 5 cwt. of kainit may also be added, particularly on the lighter soils.

The pasture will, of course, receive considerable manuring from the stock grazed on it, and this manure requires to be spread from time to time by light harrows. Pastures also require to be rolled regularly.

For meadows the following is a very effective annual dressing :—12 tons per acre of dung every third year and, in intervening years, apply $1\frac{1}{2}$ cwt. each of nitrate of soda, basic slag and superphosphate. If no dung be available, then apply an extra hundredweight of both super and kainit, and an extra $\frac{1}{2}$ cwt. of

nitrate of soda. These manures are not to be applied at the same time ; the slag, which is to be preferred to the super on the sourer and more clayey soils, should be applied in January, the kainit in autumn, the super in early spring, and the nitrate of soda not till growth commences.

CHAPTER IV

MANURES

THE prime object of manuring is to supply to the soil something it lacks, to enable it to produce crops of the quantity and quality desired. Obviously then, we must know what it is the soil lacks. Now the plant feeds on certain chemical substances it gets from the soil and the air. It has been ascertained, by research, that there are only four of these substances of which the soil is likely to be depleted by the continued growth of crops ; consequently, to the farmer, the whole subject of manuring resolves itself into maintaining the supply of these particular four substances in the soil. The other substances need not concern him, as the supply of them is always sufficient.

The four substances we have to consider may be termed nitrates, phosphates, potash and lime, and the growth of any crop is largely dependent on an adequate supply of these in

an "available" form, that is to say, available to the plant, which they can only be if they are soluble in water or in the acid sap which plant roots exude, as plants can only absorb fluids and not solids. For example, it is possible for a soil to be rich in potash and yet require applications of a manure supplying potash ; this is because the potash in the soil is in an "unavailable" state, that is to say, it exists in the form of a chemical compound which will not dissolve, and so is useless to the plant.

Nitrates require additional notice as, owing to their being readily soluble, they are easily lost in the drainage waters leaving land if it is not under a crop. Further, under certain conditions they are converted to the gas ammonia, and this passes away into the air and so is lost.

It is not intended here to give details of the different manures available, as there is already ample literature to be had concerning them, but a classification of them is necessary.

All manures fall into one or other of the following classes :—

(1) Nitrogenous manures, which supply nitrates only, are nitrate of soda and sulphate

of ammonia. The former acts very quickly, being readily soluble in water, and so this manure is only applied to crops as a top dressing when they are coming up, and its effects are quickly seen in increased herbage. Sulphate of ammonia acts more slowly, and is sown with the seed ; it is preferable to nitrate of soda on wet land or for use in wet weather.

(2) Phosphatic manures, supplying phosphates only, are superphosphate, basic slag, and bones. Superphosphate is the most quickly available, and so suited where prompt results are required. Slag is more slowly available, and most of the bone manures take some time to become available.

(3) Potash manures, which supply potash only, are kainit, sulphate of potash and muriate of potash.

(4) Manures supplying lime only are limestone, chalk, ground lime, quicklime and slaked lime.

(5) General manures, which supply all the necessary compounds, are farmyard manure, guano (this contains principally phosphates, with small amounts of the other ingredients), fish manure, soot, dried blood, etc.

(6) Partially general manures are nitrate of lime and nitrolim, both of which supply both nitrates and lime. Basic slag, though usually regarded as a phosphatic manure, really belongs to this class, as it contains lime. Bones also contain small quantities of the other substances.

Some of the manures perform other duties as well as those indicated above. For example, the soda of nitrate of soda helps, by chemical reaction, to bring into use unavailable potash. Lime is the best check for insect attacks and plant diseases we have, also for sweetening sour land, for breaking down clays, and for converting nitrogenous vegetable and animal matter in the soil to available nitrates. Farm-yard manure, if applied when fresh to heavy soils, opens them up by admitting air, and if applied when well rotted to light, sandy soils it gives them "body," and a greater capacity to hold water and therefore plant-food.

The basis of all manuring is farmyard manure, and all other manures are to be regarded purely as supplements to it. Farm-yard manure is produced on every farm, and as it cannot be allowed to accumulate it must be

put on the land as a manure, and is really the returning to the land much of what the crops have taken from it. All, however, that has been taken from the land cannot be returned to it, as a great deal leaves the farm in the form of flesh and crops, and it is the object of artificial manures to make up this deficiency.

All the crops grown on the farm may receive a dressing of dung, but the bulk of the dung available is usually applied to the root crop, partly because it does not take much from the soil, and partly because the plant-food contained in dung is not quickly available, so that a great deal of it is left in the ground for the benefit of the corn crop that follows and also for future crops. As, however, there is not enough dung produced on a farm to supply all the wants of the crops, the question arises as to how the artificials are to be used as supplements, and this is answered by the fact that each kind of crop requires more of one food constituent than of the others. The corn crops require nitrates in particular; the root and forage crops, phosphates; and potatoes, potash. Knowing what each crop requires most, the artificials are applied accordingly; but each

crop will also require a smaller quantity of each of the other ingredients, or the balance of plant food in the soil will be upset. For example, if corn receives a good dressing of nitrates in the form of nitrate of soda, it will take from the soil a corresponding amount of phosphates and potash to meet its increased growth, and to allow for this one must supply phosphates and potash along with the nitrate of soda or the soil will become unduly depleted of them. Or the soil may not have enough to meet the demand, and so the nitrate of soda is wasted, as it can produce no extra growth if enough of the other constituents are not available to help it.

The actual quantities of manures to be applied to different crops will vary with the nature of the soil, and will have to be regulated accordingly. The quantities mentioned in the last chapter are typical examples for securing full crops on average soils. Manurial experiments and chemical analysis of the soil furnish the most reliable information as to what manuring is required for the different crops.

We have seen that dung is the mainstay of the fertility of the soil, therefore it is necessary to make the most of it, and thereby

lessen the artificial manure bill as much as possible. To get the most out of it, it must be well-preserved till required, as much of the plant-food contained in dung, particularly the nitrates, may be lost in the liquid draining from the dung-heap and by volatilisation. Nitrates being the most expensive of the plant-foods to be replaced by artificials, their preservation is very necessary.

The ideal way to preserve dung is under a covered yard having no drainage from it. Into such a yard, or yards, all the manure from the adjacent stables, cow-sheds, loose boxes, etc., may be thrown each day ; further, stock may in winter be fattened in this yard, and their treading will make a compact mass of the dung. Such a yard should have a cement bottom sloping to a centre, and a light roof of creosoted narrow planks set about half an inch apart. Underground drainage from such a yard is quite unnecessary, as all the liquid will be required to keep the manure moist ; it is only in the case of uncovered yards that drainage is justified, owing to the additional liquid, in the form of rain, which the manure receives.

If a closed-in yard be not available then the

dung must be piled in a heap in a convenient place, starting with a layer of straw, and keeping the sides of the heap upright, and covered with a layer of earth to prevent nitrates volatilising away as ammonia. By forming a heap in this way there will be less loss of liquid, and what does drain away may be caught in a shallow trench surrounding the heap, with pits at intervals, from which the liquid may be thrown back on to the heap from time to time.

Mixing.—In the application of artificial manures care must be taken not to mix certain manures together, *e.g.*, lime or slag (which contains lime) must not be mixed with, or sown immediately after, dung, or volatilisation of ammonia takes place. For the same reason sulphate of ammonia must not be mixed with slag, although it may safely be mixed with super or bones. Nitrate of soda may be mixed with slag, but not with acid manures such as super. The phosphatic and potassic manures can be mixed together without injury. Super and slag are often mixed together, as both are then more convenient to sow than by themselves. In any case, as mixtures of manures are liable to become lumpy on standing, it is

always best to postpone mixing them till just before they are to be sown.

Buying Manures.—When buying artificial manures the buyer is legally entitled to receive a guarantee from the seller that the manure contains a certain percentage of whatever ingredient the manure is bought for. Neither this nor the price per ton, however, decides which is the cheaper of two manures of the same kind. To determine this divide the price per ton in each case by the percentage of, say, nitrogen the manure is said to contain, and the result is the price of one per cent. of nitrogen in the manure, or the "unit value," as it is termed. Knowing, then, the unit value of nitrogen in each of the manures, you know which is the cheaper of the two.

This valuation by unit values is of particular use in determining the value of special compound manures that manufacturers often sell. Such a manure will be guaranteed to contain certain percentages of nitrogen, phosphates and potash, and if these percentages are multiplied by their unit values, as sold in ordinary artificial manures, and 7*s.* 6*d.* per ton added for mixing, you know what the special manure is really worth.

Further, in valuing manures it is only the "available" percentage guaranteed in the analysis that should be taken into account. This particularly applies to phosphatic manures, where the analysis is made to look of greater value than it really is by the inclusion of the insoluble phosphates. In the case of slag the available phosphates are described as "citric-soluble" and in the case of superphosphate as "water-soluble." It is in buying compound manures that the greatest risk is run of buying unavailable plant-food, as the makers of these manures not uncommonly employ substances that have good percentages of, say, nitrogen but in a very unavailable form.

Liming requires separate notice, as it is usually done apart from the general scheme of manuring. Lime is not applied to soils merely as a manure, but also to help to render other plant-foods more available, to remove sourness and thereby sweeten the soil, to render clay land more amenable to cultivation, to kill insects and to check fungoid diseases of plants. The commonest forms in which lime is now applied to land is as ground lime (usually ground quicklime), slaked lime (quicklime acted on by water),

or compost (earth mixed with quicklime which becomes slaked).

Much less liming is now done than hitherto owing to the popularity of basic slag, which contains considerable lime and also supplies phosphates; on rough moorland pastures its action has been very marked, and on grass land generally it is largely superseding lime.

Broadly speaking, lime should be applied on arable land to the root crop, and at the rate of about 10 cwt. per acre, applied in autumn and ploughed in with the stubble. On sour or peaty soils, or those affected by finger-and-toe disease, much larger dressings are necessary.

CHAPTER V

HORSES

THE number of horses kept on a holding for farm work is largely determined by the amount of arable land there is, as it is the working of this for which horse labour is primarily required. Roughly speaking, one team of horses is required for every 50–60 acres of arable. A team consists of two, three or four horses according to the nature of the soil, as the heavier the soil the more horses will be required per team.

Cart-horse breeding cannot very well be gone in for on arable farms, and is best confined to farms having a fair proportion of ordinary grass land, not rich, fattening grass, but bone-and-muscle-forming pasture. Breeding heavy cart horses undoubtedly pays best ; they should be sound, big and well-proportioned horses, and are at their best at five to six years old. If horse-breeding is to be gone in for on a mixed

farm, then the bulk of the horses kept to do the work should be breeding mares. They should be put to the stallion at such time as will cause them to give birth to their foals when the greater part of the spring work of ploughing, sowing, etc., is over, and so no inconvenience will be caused by their being laid up at that time ; further, there is plenty of young sweet grass available for the mare, which is productive of a copious milk-supply.

Where horses are to be bred from, size in the brood mare is as important as size in the sire, as then good-sized offspring are more likely to result, such being more valuable and fetch better prices. Mares with roomy bodies, broad hips and free from any internal defects are best for breeding from ; fat mares are not desirable. Mares are first put to the stallion when fully developed, that is, at three to four years old. Many however are covered at two years old, and such are often sure breeders, but it is apt to retard their growth ; though this may be guarded against by giving them a thoroughly liberal and nutritious diet, so that the mare may support her foal without interfering with her own growth. Breeding from old

mares is not to be recommended, as their offspring are usually small and enfeebled. .

Mares in foal should be kept at moderate work till within a few weeks of foaling, but no hard work should be performed, such as backing, which strains the abdomen too much. Too severe exertion, or bad food, may cause a mare to abort. A little linseed or Barbadoes aloes before foaling keeps the mare's bowels open, and bran mashes bring up the milk if she is likely to be a poor milker. Foaling should take place in a clean, disinfected loose box; someone should be in constant attendance, as any difficulty in giving birth may be serious for both mother and foal if no help be available.

For five to six weeks after foaling the mare and her foal should run loose on short, sweet grass. After this the mare must resume her work, the foal being put in a loose box, and the mare allowed to see it every two hours, so that the foal can get its mother's milk frequently; long waits being productive of scour in the youngster. The foal will now soon learn to eat if some finely-broken linseed cake be left in its box. When about four months old the foal is gradually weaned, and is then put in a straw-

yard or loose box for a few days with two or three others for preference, as they flourish better in company; they are fed on cut grass with a little bran and oats. Next the youngsters are turned out to grass, but it must not be rich grass or they will gorge themselves. The foal being now deprived of its mother's milk, will require something in addition to the grass, or it may become lean and pot-bellied. At the same time anything that will fatten the animal must be avoided, as it is flesh and bone that is wanted at this stage, and for this purpose ground oats are best, and should be given sparingly at first.

During their first winter foals are best running loose, with a shed to retire to, and the grass can be supplemented with a mixture of cut hay, bran and bruised oats, the whole moistened with treacle and given in three meals a day, long hay for the nights should also be provided; further, a hot mash on cold evenings will be very beneficial. When about a year old the colts must be gelded.

The foal spends the summer following at grass, but getting a meal morning and evening in spring till the grass is well up. In the

autumn the foal is broken in and put to light work, preferably yoked with a steady old horse. Next summer he again spends at grass, and in the autumn should be put to regular work and kept at it.

Now as regards the feeding and management of working horses. Horses are brought indoors as soon as the pastures fail, that is, about the end of September, and put on a winter ration of oats and hay chiefly, but many other things are also used as a substitute for these, such as maize, beans and straw, also roots are good for them. A typical ration would be :—12 lbs. of hay, 5 lbs. of oat straw, 6 lbs. of oats, 5 lbs. of maize and 2 lbs. of beans. About the beginning of May the horses are turned to grass, and two or three days beforehand their corn ration should be reduced and cut grass and hay added. If turned out hungry to succulent grass a bad attack of colic may supervene. Some crushed oats and chaff should be given them during seeding and root preparation, when the work they are called upon to perform is more strenuous than usual.

Horses should always be watered before, and not after, feeding, as in the latter case the

water washes the food out of the stomach before it is properly digested.

There are but three breeds of cart horses kept in this country, namely, the Clydesdale in the North, the more massive Shire in the South, and the sturdy little Suffolk Punch in the Eastern counties.

CHAPTER VI

CATTLE

THERE are several systems in vogue concerning the management of cattle. First there is the system of buying cows just before or after calving, and feeding them to produce as much milk as possible, and at the same time to get them fat for the butcher in about twelve months. No breeding is done, and the cows often cost three or four pounds more when bought than when sold. This method is pursued on farms near large cities having little or no arable land. The ground is often poor but highly rented, owing to its natural advantages for milk-selling.

On cheese farms a breeding herd of cows is kept ; all calves are sold at a week old, except the best heifer calves, which are kept for future use in the herd. The cows are spring calvers.

On farms having a lot of grass and a fair

amount of arable, stores are bought about one and a half years old in autumn, and cheaply and fairly well kept during the winter and then fattened on grass in summer, with or without cake.

On arable farms cattle are bought at a somewhat older age than above, in autumn, and fattened during the winter in yards. In this system the cattle consume about half the roots grown on the farm and the sheep eat the other half.

On rich grazing lands, fetching, say, 50s. per acre, stores may be bought in spring and fattened off on the grass, getting cake in addition according to the quality of the grass. The store carcase usually costs more per hundredweight than it sells for, but the system pays owing to the large increase in weight.

On remote farms, having half pasture and half arable, a breeding herd is kept and butter-making practised. The steer calves are sold at a year old and the heifer calves are kept and mated at about eighteen months old. After calving, the best heifers are used to replace the drafted cows in the herd, and the rest are sold with their calves at their sides.

On farms similar to the above, but possessing a fair amount of land good enough for grazing, the same system is followed, but all the calves are reared, the steers fattened off at two to two and a half years old on pasture, and also the heifers not required for breeding purposes.

On high-lying, wet grass farms, such as Irish and Scottish stores come from, the whole object is to rear stores and sell them to farmers who fatten them. All calves are of course reared, the steers being sold as stores at about two years old; a large number of the heifers are mated, and the calves run with their dams. The cattle are kept out of doors during winter and supplied with hay. Sometimes calves are also bought in to be reared.

There are a number of breeds of cattle, but, with possibly the only exception of the Short-horn, each breed is adapted for either milk or beef production, and not equally for both. The Channel Island breeds, the Kerries, the Devon breeds, the Ayrshires and Holsteins are the great milk-producing breeds. The three first mentioned are noted for giving a rich milk, specially good for butter-making, whilst the Ayrshires are the great cheese-making breed,

and the Holsteins are remarkable for the quantity of milk they yield. The Herefords, Aberdeen - Angus, Galloway and Highland breeds are the great beef-producers, the former being specially adapted for fattening on rich pastures. The Red Polls and Welsh cattle are good beefers and fair milkers.

The Shorthorn is by far the most extensively kept breed, and has as great a reputation as any for both beef and milk. There are strains particularly good for milk and others for beef, whilst still others are known as dual-purpose animals, that is, they are first-rate milkers and yet fatten well for the butcher when dry, which is a characteristic lacking in the Channel Island breeds.

The Kerries, Ayrshires, Galloways and Highlanders are the breeds most suitable for rough, exposed farms, as they are extremely hardy and will flourish on rations that would be far too scanty for the other breeds.

Calf-Rearing.—The first weeks of a calf's life are the most critical. It is much better to feed the calf on whole milk during the first month, as any temporary gain got from substitutes will be paid for later on. Assuming it

is winter, the calf should be removed from the cow in the course of a week and put in a warm, airy calf pen, well-drained and well-littered ; if a wooden grating be put on the floor it will ensure dry lying for the calf. The calves may be put together in lots, and should be fed three times a day with milk from their mothers' udders for choice and given at the new milk temperature. The quantity should be five quarts a day, increasing to six by the end of the month, and the milk given to the calves direct from the cow without allowing it to stand.

Economy necessitates a change during the second month. The new milk is gradually replaced by separated milk, and the quantity given gradually increased by, say, a couple of quarts daily. The youngster will now begin to eat a little solid food, even when three weeks old hay may be put within its reach. Sweet unchopped hay is best as the first solid food for the calf, and presently a little chaff with just a little of the best linseed cake crumbled in it.

By the third month the animal's appetite will be assuming big dimensions ; five quarts of separated milk are taken in the morning, and

as much in the evening with great relish. Still more solid food will be taken; linseed cake, crushed oats, barley, maize and pea meals are all beneficial to a degree, although good unchopped hay given *ad lib.* is probably the best. A few carrots or swedes may be given pulped with the chaff.

In the fourth and fifth months there is little change to make in the meals, only that more must be gradually supplied and more fresh air given. The milk is gradually withdrawn and stopped at five months old, and the food increased thereafter to make up for it; also water must be supplied.

It is, of course, only where butter is made that the separated milk referred to will be available. On farms where the milk is sold off whole no separated milk is available as a rule, and in such cases the calves may be reared on milk substitutes, the whole milk being stopped after the first fortnight. Numerous substitutes for milk have been recommended, and a good one is three pounds per day of the following:—two parts linseed cake, one part crushed linseed, and two parts oatmeal, the whole mixed with five quarts of boiling water

overnight and boiled for a short time next morning, and salt and sugar added.

All calves are turned to grass about May, and get a pound or two of linseed cake each per day. Calves born after August are not turned to grass till next year, and generally do well, as they have a start over spring calves. Calves should be brought into yards in October or November from the pastures. The winter the calves are then entering on is a critical time ; they should be divided into two lots, one comprising the older and bigger calves and the other the younger calves only about six months old. Put the older ones in a strawyard, but give the younger ones better shelter and feeding at the homestead ; 13 lbs. of roots, $2\frac{1}{2}$ lbs. of linseed cake, and hay *ad lib.* will be a good diet for them, with plenty of water. Early in May they should be put on rough pasture till December. In the second winter straw, roots, and about 4 lbs. of cotton cake should be given in two meals a day. The third summer resembles the preceding. The cattle are now two, to two and a half years old, and may be steers ready for fattening or in-calvers.

Fattening.—We next come to the fattening

of cattle for the butcher. Fattening in yards is chiefly confined to arable farms, and is done as much for the purpose of manufacturing manure as for making a profit out of the animals themselves; in fact, it is often found that the manure is the only profit attaching to the proceeding. By fattening stock in this way the roots are consumed which it is necessary to grow in order to prepare the land for corn, so that it is really to the corn crop one must look for the actual profit attaching to the growth of roots and the fattening of bullocks on them.

This fattening in stalls or yards is carried out in winter, the store cattle being bought in at about 8 cwt. each and fattened for a period of some three months, and then sold weighing about 13 cwt. each. The food consists mainly of roots, oat straw and hay, supplemented with grain and cake; a typical daily ration would be as follows:—1 cwt. swedes, 2 lbs. decorticated cotton cake, 2 lbs. linseed cake, and 14 lbs. oat straw. The rations, however, vary a good deal according to the weight of green food available and the market prices of the purchased food-stuffs, as, of course, the cheapest should be

bought providing the quality is right. The method of compounding these rations will be considered later.

The secret of success in bullock-fattening is to produce the roots and straw as economically as possible, as they form the bulk of the animal's food. If it be found that bullock-fattening is costing too much it is well to seek for the cause in the methods of growing the roots and corn, and not to assume the fault lies only with the food rations or the prices paid and received for the stock. To put it briefly, the cheaper roots and corn can be fed to the bullocks the greater the prospect of profit on their fattening.

The fattening of bullocks on grass is a system to which a more certain profit attaches. Bullocks used for this purpose are generally fattened off at a much younger age than in the preceding case. They are usually winter-born calves, well-fed from birth. They are bought in the early summer for fattening on grass supplemented with 2 to 3 lbs. of cotton cake and crushed grain, or they may receive no cake, and consequently are only half fat by the autumn, when they are brought inside as the weather gets colder, and stall-fattened for the

Christmas markets. In the latter case the cattle will run a risk of losing condition if not given a little cake and corn during the last weeks at grass, as the pastures will be getting thin.

To make grass-fattening as profitable as possible, plenty of attention must be given to the improvement of the pastures, and all one's attention not solely devoted to selecting the best stock and the best food mixtures. Grass land is, as a rule, always capable of improvement, and it is neither an expensive nor difficult proceeding, consisting of judicious applications of artificial manures, notably basic slag, rolling and chain harrowing at the right times, and keeping coarse grass eaten down. Improving the pasture will not, however, appreciably reduce the cake and corn bill, as these foods are necessary to balance the grass consumed, but what it will do is to enable more bullocks to be kept on the same land. Improving pastures has the further advantage of being permanent, and so the benefit is reaped year after year.

“Baby” Beef.—There is a considerable and increasing demand for small joints of beef

by dwellers in towns, and it is a demand worth catering for. To do so one must aim at rearing what may be termed "baby" beef, in other words, the cattle must be got ready for the butcher at from one to one and a half years old, instead of from two to three years old. The economy of this is evident when one realises that it results in the saving of one to two years' keep, a very important item. This young beef, however, is scarcely equal in quality to older meat, it is fatter and less tasty; but as these small joints find a ready sale to the butcher, and are cheaply produced, they are well worth going in for.

To produce this young beef sound, well-bred stock, of a strain that can be relied on as good doers, are necessary. Any good beef-producing breed will do, but the best are a cross between the Shorthorn and the Galloway or Aberdeen-Angus, the progeny being termed Blue-greys. The calves must be fed extra well from birth, and no milk substitutes should be used in their younger days; they should be given whole milk till weaning and a little meal in addition. Their subsequent diet of roots, hay and straw should be supplemented with good linseed cake.

Cross-Breeding for Beef.—The study of the characteristics of the various breeds provides knowledge that can be put to good account in catering for the beef market. No one breed possesses all the characteristics of an ideal beefeer; some excel in quality, others in size, others in early maturity, etc., therefore, to get as near the ideal as possible the qualities of different breeds must be combined by crossing one with another.

We have already referred to the Blue-grey, which is probably one of the most noted crosses for fattening purposes. The cross is most popular on the Borders, where the Shorthorn bull is used on Galloway heifers, as Galloway heifers are cheaper to keep than Shorthorns. Further north the Aberdeen-Angus are the heifers used. Blue-greys are splendid fatteners under rough conditions, and combine the quality of the Galloway beef with the quick-maturing and fattening properties of the Shorthorn. It should be noted, however, that breeding Blue-greys with each other results in inferior progeny; in fact, it may be taken as a general principle, that it is never advisable to mate any cross-bred stock.

Amongst dairy herds of Ayrshires, both Shorthorn and Aberdeen-Angus bulls are liked, as the progeny is bigger than the Ayrshire and fattens better for both beef and veal. The Red Poll bull and Shorthorn is a reliable cross. Bulls of the Hereford breed have such great prepotent powers that they always stamp any inferior breed with their splendid fattening qualities. The Devon and Aberdeen-Angus cross is also good, and for small cross-breds the Dexter and Aberdeen-Angus gives very satisfactory results.

Herds belonging to no particular breed can be "graded" into practically pure stock by the regular use of pedigree bulls of the breed whose qualities are most desired, and using only the best heifers for breeding from.

In selecting a bull for beef-production, the great qualities it should be able to impart to its offspring are early maturity, hardy constitution, high quality meat, and the capacity to produce the maximum of flesh with the minimum of food, as it is this latter point which determines the profit of fattening.

Cows.—First as to calving cows. In-calf cows, in winter, should be turned out each day

for a drink and some exercise, as it is bad for both cow and calf to keep the cow confined indoors all day. The food at this time should be chiefly hay, straw and turnips, but if roots and hay are not plentiful, give 2 to 3 lbs. of linseed cake per day. The average cow will consume about 9 lbs. of hay and about 25 lbs. of roots per day. It is one of the axioms of farming that animals with young should not be fed richly before calving; in the case of cows it is apt to result in milk fever. As cows near their time, and when the weather will be improving, it is as well to turn them on to rather bare pasture. A week before calving, however, bring them inside and feed chiefly on hay, supplemented with a little bran and treacle. A month or two before calving, the cows become dry; should they not do so, however, as happens not infrequently, then they should be dried off by milking less and less each day.

The method of letting a cow calve in a loose box, rather than tied up in a stall, is to be preferred, as then the calf is attended to naturally. The cow should be put in the box two or three days before she is due to calve, and the

calf and cow should be left together for three days in the box.

The summer management of cows next demands attention. They are turned to grass towards the end of April or early in June, according to the district. This transition from indoor rations to pastures is not, however, without its dangers. First there is the tendency to scour, and secondly, though the milk yield increases in quantity, it does not improve in quality ; in fact, the proportion of fat in the milk may possibly fall below the legal limit of 3 per cent., as the nutritive qualities of grass in April are comparatively low. Obviously then the grass must be supplemented with something else, and undecorticated cotton cake is the best addition that can be made ; its binding nature counteracts the laxative tendency of the grass and prevents scour. The cows must, of course, come inside at night, and not be left out permanently till they have become accustomed to the grass and the weather is warmer. As soon as the grass has attained its full feeding value the question of concentrates will have to be reconsidered, and the quantity will depend entirely on the quality of the grass. Either of

the cotton cakes would do, the undecorticated being best for washy pastures. Crushed oats and hay are also good, oats, in particular, being excellent for butter-making cows, as no food produces such well-flavoured butter as oats. The cows must, of course, have sufficient water.

When the pastures fail, that is, about the end of September, the cows are brought indoors and put on winter rations, whose composition will depend on the food-stuffs available. The following is an example of such a ration:—20 lbs. mangels, 30 lbs. hay and $2\frac{1}{2}$ lbs. decorticated cotton cake.

Improving Cows.—Considerable improvement is often possible in many dairy herds, because although an average yield of 600 gallons per annum is regarded as satisfactory, yet it is by no means uncommon for individual cows to yield 1000 gallons and upwards. Evidently then there is scope for improvement.

The first step to take in improving a herd is to institute milk records, if they are not already in vogue. Records of every cow's daily yield should be kept on every dairy farm, as they enable the farmer to select with exactness the

heifer calves from his deepest milkers for subsequent retention in the herd. Though it is not definitely certain, there is, nevertheless, every probability that the progeny of a deep-milking cow will also develop deep-milking qualities. It is, however, equally necessary that the maternal ancestors of the bull used in the herd should have been noted deep-milkers. The bull's mother, and father's mother in particular, should be known to have been heavy milkers. Shorthorn bulls are the most widely used amongst dairy herds, and in the majority of cases cannot be improved upon, as a Shorthorn bull from a good milking strain not only begets good milkers, but also cows that fatten off well after their milking days are over.

Concluding Remarks.—Cows require careful management or the effect will soon be seen in a diminished milk yield. Their milk-producing organs should be well-developed by careful and thorough milking of the young cow, every drop of milk being stripped from her at each milking-time.

In the feeding of dairy cows each individual animal should be studied, and rations given her which will keep her milk yield up to its highest

pitch. The milk records will show the effects of different rations, and the cows' highest limit of quantity and quality can soon be determined, beyond which any extra food is superfluous, and every cow has her limit in this respect. It is poor policy to adopt a fixed ration for all cows, big and little, as it will result in some cows never getting enough and others more than they need.

The usual age for putting cows to the bull is two years old, though it may be as low as fifteen months, but heifers must be strong and well-grown to be mated so early, as it is liable to retard their growth. Many heifers are mated at eighteen months old, and it is a further incentive to aim at improvement in the herd when it is possible to produce well-grown heifers of sound constitution which will stand this early mating, and thereby earn their living earlier.

CHAPTER VII

SHEEP

THERE are three systems of sheep-farming, namely, keeping a permanent flock, keeping a temporary flock, and buying sheep to fatten.

A permanent flock is kept on a regular sheep farm, which is usually of light land, the useless ewes in the flock being replaced each year by others bred on the same farm. The annual produce from the flock may be either sold as early fat lamb, or summer-fattened on rape, or fattened on turnips and sold in the following spring, or sold as summer-fat in their second summer.

Temporary flocks are kept on farms that are not really adapted to sheep-farming, the land being usually too heavy to carry sheep profitably all the year round. The ewes are bought in summer and put to the ram according to the time lambs are wanted, the ewes being finally

sold fat the following summer after shearing. The produce may be sold as early fat lamb, or summer-fat lamb, or if there be sufficient roots, they may be held over till the following spring and sold after clipping.

The buying of sheep to fatten is gone in for on arable farms where there is not sufficient pasture to keep sheep long, and where the seeds are put down for one year and sold off as hay. The sheep are bought in the autumn and fattened on turnips during the winter. On heavy clay soils the winter folding of sheep does more harm than good, tending, as it does, to the further consolidation of soil that is already too heavy, hence such farms are not adapted to sheep.

Sheep-farming has many advantages. In the first place the keeping of sheep reduces the labour bill to a minimum, as sheep largely consume their food where it is grown and also deposit their manure on the land direct. Sheep are also excellent distributors of manure, and are much better in this respect than cattle, who drop their manure in large lumps. Further, the food fed to sheep has a higher manurial value than it would have if fed to any other stock.

On light arable farms sheep are absolutely necessary, as their constant manuring of these poor soils is the only means by which corn crops can be profitably grown on them. Further advantages are that mutton usually sells for more than beef, and moreover, sheep give wool.

Flock Management.—In describing the system of management of sheep, we will assume a permanent flock in early July. In addition to the flock of ewes, at this period there will be the lambs born this year, and also some shearlings from last year's crop of lambs. The first thing to be done is the drafting of the ewe flock, that is to say, the removal from the flock of all ewes that, for one reason or another, such as age, disease, etc., are not suitable to remain. These drafted ewes are sent to the market and sold, and their places taken by the best shearling ewes available. If there are not enough good shearlings to make up the number of the flock, then a bunch should be bought in, at a depenshing sale if possible, rather than use indifferent shearlings, as poor quality in a ewe is passed on from generation to generation, and it costs as much to keep poor stock as good, yet the

prices realised for them are by no means the same.

Shortly after drafting, and about five weeks after shearing, when the wool will be about half an inch long, the sheep are dipped to destroy parasites, such as lice, maggots, etc. This dipping is compulsory by law, and returns must be made to the authorities. Dipping is best done in a narrow swim-bath, and care must be taken that the sheep swallow none of the dip, as most of the sheep dips sold are highly poisonous. Each sheep is kept in the bath for about a minute; it should be cool and rested before dipping and left quiet for a little time after. After dipping, the sheep are turned on old pasture, or "seeds" that have not yet carried sheep.

The next important item is the mating of the sheep. The ewes are put to the ram between August and October, according to the district and as to when the lambs are required. About a month before mating the ewes are turned on to aftermath, rape or kale to "flush" them, which causes them to take the ram better.

The pregnant ewes, if on an arable farm,

will now have to go on turnips and will get a little sweet hay and linseed cake in addition. If rough grass be available it is best to turn them on to it, and they may get turnips and cake, but no hay. It is very advisable to keep ewes comparatively poor till lambing time, as if brought into anything like high condition too many deaths will result amongst the lambs. Too much hay is liable to get ewes into too good condition, and when this seems to be resulting straw should be given instead. Ewes with lamb must, of course, be treated gently and not be excited by over-driving, etc.

Ewes are lambled in the open in the south, if dropped after March; if before, they are lambled in small pastures, with sheds divided into pens by hurdles filled with straw. In the north the ewes are brought into the stackyard and lambled.

For about three days after lambing the ewes and their lambs should be in coops, and given roots, hay, and a little linseed cake. The next three days should be spent in a strawyard, and then turn them on to meadow grass and "seeds," failing which, roots or rape, if the lambing takes place before March.

As far as possible the ewes with twins should be put on the better pasture, otherwise they should get cake in addition to the grass. If the fields are not sufficiently sheltered for the lambs, then thatched hurdles or boxes, with their backs to the wind, should be provided to give shelter. At three weeks old the male lambs are castrated and their tails docked.

About June, when the lambs will be fourteen weeks old, they are weaned. After weaning put the ewes on the poorer pastures to dry up their udders. The lambs are dipped and put on sweet herbage that has not carried sheep for some time. A little later they may go on to rape or kale and get dry food as well. The wether and ewe lambs should be separated as winter approaches. The wethers may be fattened in winter and sold fat in March after clipping. Sheep as a rule should be washed before being shorn, in order to clean the wool, the washing being done in a pond, stream or tank, each sheep being thrown into the water and kept there for about a minute.

Early Lamb.—The earlier lambs can be put on the market, the more profitable they are. In the production of early lamb four principles

must be adhered to. First and foremost the flock must possess the inherent quality of early maturity ; secondly, the rams used must come from a breed noted for maturing quickly ; thirdly, mating at as young an age as is safe must be adopted ; and finally, that great essential to all successful breeding must be attended to, namely, the food. This, in brief, is the science of early maturity.

The characteristic of coming to maturity early is natural to all the Down breeds, to many well-known crosses, and also to some of the more northern breeds, such as the Shropshires. Any flock can, however, be caused to give quicker maturing lambs by working on the following lines. Use rams of a breed known to be early maturers and use them at as young an age as possible, keep the flock of ewes a young one by drafting out ewes on the score of age earlier than usual. Intensive feeding should be adopted by giving plenty of rich and easily digested food from birth, but taking care that the animals' health is not affected, as is liable to occur with injudicious forcing. This intensive feeding must be adopted gradually, going in for it more strongly each year

according as the in-bred capacity for early maturity increases in the flock.

The actual feeding varies in the north and south. In the former the whole flock goes on to swedes and young grass as soon as available, but in the south swedes are the diet, and subsequently the flock is folded on a variety of winter-grown forage crops, often moving from one crop to another two or three times a day. In either case concentrates are added, and it is more conducive to quick fattening to give a mixture of a number of food-stuffs, such as decorticated cotton cake, linseed cake, maize, peas, locust beans, crushed oats and malt combs.

By the above method lambs can be marketed at anything from three to twelve months old, and at the youngest age mentioned it is quite possible for them to weigh five stones each, or three stones dead weight.

Cross-Breeding.—There are some twenty breeds of sheep in this country, each breed being particularly adapted to its own locality. It is always risky to introduce a flock belonging to a breed from another district; in fact, when taking over a farm it is not only

advisable to keep the breed of sheep indigent to the neighbourhood but, if possible, the flock already on the farm should be purchased, as sheep do better on their own land than elsewhere. In Scotland this latter fact is very much appreciated, and substantial value attached to it by insisting on an "acclimatization value" being paid for a flock taken over by a new tenant, this being additional to the price of the flock.

Whilst, however, it does not do to introduce ewes of a breed foreign to the locality there are, nevertheless, great possibilities in crossing breeds of sheep, owing to the large number of breeds there are. For securing stock of good fattening capacity crossing is far more widely practised amongst sheep than amongst cattle and pigs.

In the north there are two breeds which are very prominent for crossing purposes amongst mountain flocks, they are the Border Leicester and Wensleydale breeds. The mountain breeds, the Blackfaces and Cheviots, give too small a carcase to be readily profitable, but the mutton is of high quality; by using rams of the two breeds mentioned, however, size and quick fattening are combined with the quality of

the mountain breeds. The Border Leicester and Cheviot cross is larger than the Border Leicester and Blackface cross, but the quality of the mutton is said to be not quite as high. Wensleydales are used on Blackfaces, in preference to Border Leicesters, where the Blackfaces are bigger and leaner. What are known as Mashams are the produce of the Wensleydale and Blackface cross, and are extensively kept for fattening.

These crosses can also be advantageously carried a step further, by mating the half-bred ewe with the Border Leicester ram, the result being lambs noted for the fat lamb market. Wensleydales on Mashams give a high quality of lean mutton.

Oxford Down rams are sometimes used on the half-breds mentioned above to avoid the fattiness in the meat that is liable to result when Border Leicesters are used.

Down breeds are such splendid early maturers that they are largely used amongst Border Leicester, Clun Forest and Welsh sheep, especially Suffolk Down and Shropshire rams. Shropshire rams on Dorset Horns give very early-maturing lambs, in fact, for fat lamb

the Shropshire cross is one of the best. Southdowns are much used in Kent and Suffolk for producing mutton of high quality in the local flocks; on almost all breeds Southdowns give excellent results. Hampshire Down ram lambs are splendid for crossing with other breeds to get prime mutton. Cotswold rams are excellent for crossing with sheep on poor soils in order to secure size, fleshiness, hardiness, early maturity and better wool.

Wool is a secondary consideration with the British flock-master, to whom meat is the prime object in keeping sheep, and consequently he does not specially breed and rear sheep for their wool, particularly as the competition is so keen, notably from Australia.

Our different breeds vary a great deal in the quality and quantity of wool they yield. The largest yielders of wool are the Leicester, Lincoln, Wensleydale and Cotswold breeds; much coarser wool is given by the mountain breeds, but in this respect they are much improved when crossed with Border Leicesters or Wensleydales. The best quality of wool, but the shortest in the staple, is given by the Down breeds.

CHAPTER VIII

PIGS

PIGS are to be regarded as more of a side line on a farm than as part of the regular system. They are such an up-and-down trade that it only pays to keep them where there are waste products they can consume, which could not be put to use in any other way. Whey and separated milk are the chief waste products used for feeding pigs, consequently pigs are kept most extensively on farms where butter or cheese is made.

There are some half-dozen breeds of pigs, some, like the Middle White, being noted for their pork, and others, like the Tamworth, for their bacon.

The pigs of a district are often closely related owing to using the same boar, it is therefore advisable from time to time to use a boar from another district ; of course this will not apply so

much where a number of pigs are kept and a boar solely for them. The boar used should have the qualities of early maturity, quick growth, docility of temper, and should be of the form desired in the offspring. A good boar is really more essential than a good sow, as the male has greater powers of transmitting his qualities than the female. A docile disposition in the boar is very necessary, as bad temper is easily transmitted to the offspring, which adversely affects their fattening. Both boars and sows are used for breeding when eight months old.

The brood sow should be good-tempered, with exceptionally wide hips and long back ; she should have twelve teats, all likely to give milk in due course.

Sows are generally mated in April and October, and during gestation should not be pampered but allowed to rough it, particularly keep them from animal food (especially after-births), as they acquire a taste for eating their pigs that way. A week before farrowing she should get sloppy food, which will bring her milk up, keep her bowels in order and her blood cool. After farrowing the sow is fed on

ground oats, bran and sharps, scalded into a porridge and mixed with separated milk if possible. Every day after farrowing the sow should be made to come out for some exercise, otherwise her bowels will get constipated. Ten days after birth the young pigs should be allowed a run out too. The sow gets three or four meals a day of sharps and separated milk at this period. The pigs should be kept warm and dry in the piggeries with plenty of litter.

The young pigs are weaned at eight weeks old, and afterwards get four meals a day of sharps, skim milk and a quarter of an ounce of cod-liver oil. When three to four months old add a grain or pea meal also. In spring and summer green food should be given in addition.

The sow is put to the boar again a few days after her offspring have been weaned.

Both the male and female pigs, not required for breeding, should be operated on when six weeks old to remove the breeding organs, otherwise they will prove very unprofitable fatteners.

The practice of running pigs as stores and then fattening them is losing favour, as it is found to be far more profitable to fatten them

as they grow, a fact which is being more freely recognised with all kinds of stock.

We now have to consider the feeding of pigs for bacon and pork respectively, and they are usually put up for this special fattening at about five months old.

Bacon.—Bacon pigs sell best at not more than about 210 lbs. live weight. A good bacon pig should have plenty of “middle,” with fine skin and hair and light quarters.

A good ration for fattening pigs for bacon would be 6 lbs. of boiled potatoes mixed with 6 lbs. of equal parts of bran, pea meal and ground oats.

Pork.—Pigs for pork are killed at about 100 lbs. live weight, though it varies considerably in different districts. A more compact and more-quickly growing animal than that liked for bacon pigs is preferred for porkers.

A suitable ration for fattening a porker would be $\frac{3}{4}$ gall. of whey, 4 lbs. of ground oats, and 1 lb. of pea meal.

CHAPTER IX

FEEDING

THIS book would be incomplete without reference to the principles that underlie the composing of rations for stock, which is such an important item in farm economy.

We have seen that the bulk of an animal's food consists of root and forage crops, but for the economical fattening of stock, grain and purchased food-stuffs have to be added, and the question one has continually to answer is what kind of food-stuff and how much must be added to the root and forage crops. This question is largely decided on the chemical analysis of the food-stuff which must, by law, be supplied by the seller. The constituents of the food-stuff named in the analysis may be divided into those containing nitrogen and those which do not, and it is the ratio these two bear to each other which has to be considered in making up rations.

The constituents containing nitrogen are named the albuminoids, and those which do not consist of the carbo-hydrates (starch, sugar, cellulose, etc.), the fats and oils and the ash. The chief vocation of the albuminoids is the maintenance of lean flesh or muscle in the body, and it is only from them it can be formed. The carbo-hydrates and fats and oils supply energy by their combustion, and also are stored up as fat. There is, however, just this difference between the carbo-hydrates and the fats and oils; fats and oils are in a sense concentrated carbo-hydrates, because weight for weight they are nearly two and a half times more valuable than carbo-hydrates. The ash, or mineral matter, is concerned chiefly in the formation of bone, and as practically all food-stuffs contain a sufficiency of it, it does not require further attention here.

Now for each kind of farm animal there is a more or less fixed proportion the albuminoids must bear to the other constituents, and this proportion is termed the "albuminoid ratio." The albuminoid ratio is the proportion the albuminoids bear to the total of the carbo-hydrates and the fats and oils, the latter being

multiplied by two and a half before adding to the carbo-hydrates.

The albuminoid ratios for the different classes of stock have been determined by scientists to be about 1 : 3·5 for very young animals, 1 : 4·5 for animals fattening as they grow, 1 : 6 for cows, cattle and horses, 1 : 8 for growing sheep fifteen to twenty months old. Milk is the natural food which meets the albuminoid ratio requirements of young animals most closely, and grass or hay comes nearest to meeting the albuminoid ratio requirements of older stock.

If the food given to the animals contains more albuminoids or carbo-hydrates than the ratio requires, then the surplus will be wasted and voided in the manure. Obviously then it is bad economy to give to stock rations which contain an excess of albuminoids over the carbo-hydrates or an excess of carbo-hydrates over the albuminoids, as regulated by the albuminoid ratio.

The question, therefore, the farmer has to decide, with the use of the albuminoid ratio, is how much purchased food, and of what kind, must he buy to add to his roots and forage

crops to make the albuminoid ratio right. Roots by themselves have an albuminoid ratio of about 1 : 10, oat straw about 1 : 40, it is thus evident that something must be added to these two food-stuffs that is rich in albuminoids, such as cotton or linseed cakes, till the albuminoid ratio is right; *e.g.*, if the stock were intended to receive a daily ration of 20 lbs. of oat straw and 70 lbs. of swedes, then, if it be calculated out, it will be found that, say, 8 lbs. of cotton cake would make the albuminoid ratio of the ration right. Market rates will largely determine what particular food-stuff should be bought to supplement the roots and straw, or a mixture of several may prove cheaper, in fact, recent experiments have shown that it is nearly always advisable to use a mixture of concentrates rather than only one.

Now we have seen that where the bulk of the home-grown food-stuffs are roots and straw, as would be the case on farms largely arable, then nitrogenous food-stuffs, such as cakes, have to be bought in. On stock farms, however, such as a dairy farm, where hay forms the bulk of the home-grown food-stuffs, the question is different.

Hay, and particularly clover hay, has an albuminoid ratio that is nearly right, so that highly nitrogenous foods are not necessary. Hay is slightly below the standard, and so the compound cakes, or mixtures of them with oats, bran, etc., or cotton cake mixed with maize and barley, are best. If straw or roots are added to the hay, then more nitrogenous purchased foods will have to be added to balance the excess of carbo-hydrates. Clover hay, having a higher albuminoid ratio than meadow hay, requires less nitrogenous food added to it, and so roots, maize, barley, sharps and bran are used.

Of course, in calculating out rations on the above lines, it must not be thought that a fine degree of accuracy is necessary, as if the albuminoid ratio of the rations proposed is approximately right it will suffice. Furthermore, the question of digestibility arises. A food may be rich in the required constituents but, at the same time, be not very digestible, and this lessens its value considerably. The carbo-hydrates of roots are very easily digested, but straw and hay not quite so well, and therefore are not as well suited to young stock, for

whom the food given must all be highly digestible. Again, the oil of rice and maize has a much lower feeding value than has that of linseed. Consequently, in purchasing food-stuffs, this point of digestibility must not be ignored, or the foods bought may prove dear, despite their good analysis. Information as to the digestibility of any food-stuff that may seem cheap may generally be had from the nearest agricultural college, and also analyses of the farm crops that are not purchased.

CHAPTER X

SYSTEMS OF FARMING

THE word farming covers a wide variety of different agricultural systems, and as it is very necessary, as stated in Chapter I, that anyone entering on farming should decide at the outset what type of farming he will go in for, we will consider the different methods of farming there are.

Farming may be divided into the following divisions :—Arable Farming, Stock Farming, Dairy Farming and Mixed Farming. Arable farming may have wheat or potatoes as its main object ; stock farming may be devoted to cattle, sheep or horses ; dairy farming is really stock farming, where the production of milk instead of meat is the prime factor ; mixed farming explains itself. A consideration of each in further detail now demands attention.

The bulk of arable farming has the growth of corn, usually wheat, as its prime object,

roots and forage crops are grown in due rotation, chiefly for the purpose of preparing the land for the wheat and to produce manure for the same object by feeding these crops to stock bought in to fatten. The profit attaching to this kind of farming is slender, because of the keen competition by other countries and our colonies in the growing of cheap wheat and of a quality which is better than our climate allows to be produced. Furthermore, the fattening of cattle in yards is productive of very little profit, apart from the manure so got; the fattening of sheep is, however, more remunerative, as they eat their food where it is grown and drop their manure where it is wanted, and mutton fetches better prices than beef. But as typical wheat land is rather heavy soil, much folding of sheep is impracticable, because their treading would further consolidate soil that is already too compact.

On some arable farms barley is the chief product, and this is more profitable; but barley-growing can only be successfully followed on soil and in a climate suited to the crop; moreover, considerable skill and judgment is required in growing a good malting sample of barley.

In other districts, where the soil is suitable, such as the Lothians, the growth of potatoes is the staple object of the arable farmer, and appears to pay well, but it is difficult to secure the tenancy of a good potato-growing farm.

Generally speaking, the farm pupil, if he has not been brought up on a farm, should not take to arable farming, for several reasons. A great deal more has to be learnt within the time available for study than would be the case on a stock-farm, as he has to become a judge not only of stock, but also of crops, soils, tillages, the weather, etc. He has all the risks of loss of stock from disease, and added to this the risks of poor crops due to plant diseases, insects, bad weather, etc.

In addition to arable farming proper, there is what might be described as stock-farming on light arable farms. This consists of the keeping of sheep on light, hilly, or chalk down land, which usually has a fair proportion of rough grazing attached. The plough-land is kept continually cropped with roots and a wide variety of forage crops ; on these a large head of sheep is folded, and their constant treading and manuring gives these otherwise unfertile

soils the necessary condition to grow remunerative crops of oats and barley.

One of the various kinds of stock-farming has many advantages to commend itself as compared with arable farming. There is not such a vast amount of knowledge to acquire before starting for oneself, and the profits are less uncertain. The outlay of capital is confined chiefly to the purchase of stock, and the heavy initial expenses an arable farmer has to meet for tenant-right, implements, seeds, fertilisers, etc., are avoided. The bulk of stock-farming is concerned with the rearing of stock as opposed to fattening. In the case of sheep a regular breeding flock is kept, and the lambs reared to be sold as stores for fattening on arable farms, or they may be kept and fattened if there are roots, or enough good pasture. The rearing of cattle is not quite on the same lines, as if a breeding herd be kept the milk has to be disposed of, and so the system becomes dairy-farming just as much as stock-farming. On dairy-farms having sufficient rough grazing the calves are reared and sold as stores, but on most dairy-farms, particularly where the milk is sold whole, the calves are usually sold at once

to go to Welsh, Irish and Scottish rough grazing farms, where they are reared till one and a half to two and a half years old, when they are sold as stores for fattening.

On some farms cattle and sheep-rearing are combined, a regular breeding flock of sheep being kept and a small herd of breeding cows, whose produce is supplemented by purchased calves.

The grazing or fattening of purchased stock on grass is a remunerative proceeding on rich pastures, but farms of this kind are hard to come by and command high rents. There is, however, a good deal of scope on an ordinary farm by so improving the pasture that it will half-fatten or wholly fatten stock, instead of selling them as stores. Careful stocking, rolling and harrowing, and the judicious application of fertilisers, will considerably improve very ordinary pasture.

Horse-breeding is another system of stock-farming that needs mention. Light horse-breeding can only be practised successfully where the farmer possesses considerable experience, capital and natural powers of selection, and has a farm peculiarly adapted to

horse-breeding, otherwise it is a very precarious calling to follow. The breeding of cart horses is safer, but it is better treated as a side line to one's ordinary farming, by the average man, than as a system in itself.

Dairy-farming is doubtless the best system for the man of limited means, as it is a ready money business as compared with others, and so extra capital to carry on till receipts are coming in is not so necessary. As regards the three kinds of dairy-farming, namely, selling the milk whole, butter-making and cheese-making, the first involves less labour and no heavy outlay in dairy plant, and generally speaking is somewhat more profitable. A dairy farm consists largely of grass, half of which is used for summer grazing and the other half for growing hay for the cows' winter food, which is further supplemented by roots and oats grown on a small portion of arable, which also provides forage for "soiling" the cows in late summer when the pastures fail.

A milk-selling farm of, say, 200 acres, would carry a breeding herd of about fifty cows, and ten heifer calves would be set aside each year to replace old ones in the herd. Pigs on

such a farm are rather out of place, as there is no whey or separated milk for them. On milk-selling farms, close to big towns, that are highly rented accordingly, a regular breeding herd is not kept, but the system pursued is one of buying in cows freshly calved and feeding them well to give the maximum of milk, and also to get them fat when they run dry, and they are then sold to the butcher. The advantage of this is that full milkers can always be kept, and so a big output of milk is available, and the supply can be kept regular all the year round. The disadvantages are that one is always having to buy in new cows, however bad the market may be, to keep up the yield of milk, and they have to be sold again when ready even if prices are down; further, there is the great risk of introducing disease in the herd.

Butter and cheese are made on more remote dairy farms. Cheese is only made during the summer and the milk sold in winter; the land must be good cheese-making land to be successful. Pigs are kept largely on cheese and butter farms, and also calves not required for the herd are more freely reared.

Mixed farming is the last system to be

considered. This class of farming almost invariably leans more particularly to one or other of the systems already dealt with, and may be regarded accordingly. The more stock or dairying prevails, the more likely it is to pay, and of course mixed farming always has the advantage that if one thing fails others will not.

Stocking of Farms.—The usual dates for entering on a farm are Ladyday and Michaelmas. Less working capital is required on the former date, as receipts from harvest, etc., will be coming in within six months, and a heavy winter ration bill will not be in front of one, but the advantage of a Michaelmas entry is that one can arrange the cropping, etc. beforehand. The amount of the ingoing in either case will be larger according to the amount of arable.

As to the implements and stock required for the farm, a beginner will be able to estimate this from what the previous tenant had, but it does not do to follow his system of farming, unless one can be sure he made it pay. A beginner is advised to understock and never by any chance overstock his land, or he will be

sorely bitten if a bad season causes a shortage of food and necessitates stock being sold off at unfavourable times, whereas, if understocked, one can always buy in stores to eat off any surplus there may be, or the surplus can be sold.

It is a grave mistake to keep the wrong kind of stock ; the practice of the neighbourhood should be followed, and if the herds or flocks kept in the district are breeding stock, then it would be bad policy to go in for fattening instead, as the land would not be suitable in all probability.

When buying in breeding stock, draft animals that have been discarded should be avoided. Taking over the stock already on the farm, or buying in at a dispenishing sale, is best, as the quality of breeding stock is reflected down the generations, and it costs as much to keep poor stock as good, yet the former fetch far less. Stock from poorer land is always to be preferred.

It is far better to farm a small area with ample capital than a larger area with only just enough, as then there is no margin against bad times.

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Roughly speaking, about £10 per acre capital is required, but this varies considerably; about one-tenth of the capital is spent in implements, and broadly speaking, the farmer's income is about equal to his rent.

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