

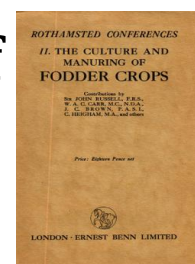
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The Culture and Manuring of Fodder Crops

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Forage Crop Mixtures

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artificial— $1\frac{1}{2}$ cwt. sulphate of ammonia, 3 super and $1\frac{1}{2}$ muriate of potash :

	<i>Tons per acre</i>
Basal manure but no nitrate	16.0
„ „ and 1 cwt. nitrate of soda	19.4
„ „ and 2 „ „ „ „	22.8

The crop being of a leafy nature responds to nitrogen, and it is possible we could have profitably increased the dressing.

Kale is now finding a place on many farms in England, and farmers seem satisfied with the crop. There is, however, a danger of over-production. The produce of 1 acre of marrow-stem kale will, I think, provide sufficient green stuff for fourteen or fifteen cows up to Christmas, after which I prefer swedes or mangolds.

FORAGE CROP MIXTURES

By J. C. BROWN, P.A.S.I.

FORAGE crops attracted considerable attention in this country during the eighteenth century when the ancient system of agriculture was breaking up and the system now practised was taking definite form; but the economic forces of the late eighteenth and early nineteenth centuries favoured corn production, and in consequence these crops almost disappeared from British agriculture. But it is of interest to recall that in several Continental countries—notably in districts in Germany—a forage-cropping agriculture continued steadily to develop during the last century, and has at the present time reached an advanced stage of progress. In recent years in the United States of America a very considerable live-stock industry has sprung up which rests almost entirely on arable forage crops. The crops and methods employed in these countries are not well suited to English conditions, but a considerable range of forage crops exists which can be grown successfully in this country, while others need but slight improvement to render them of great value. Examples of the latter are the flat pea (*Lathyrus sylvestris*) and Bokhara clover (*Melilotus alba et off.*); both these crops give very high yields of nutritious fodder, are easily cultivated, and are almost independent of soil conditions, but the rapidity with which the stems of the plants become woody in character and unpalatable to stock renders them practically useless in their present form. Similarly, maize and lucerne, which are so largely employed in the United States, are not adapted to general cultivation, at the present time, in this

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country. We have, however, a number of well-trying crops, which, while not so productive as some of those previously mentioned, are well suited to our soil and climatic conditions, and which make excellent fodder for farm live stock. Mixtures of rye and vetches, rye and beans, rye and peas, oats and vetches, peas and oats, peas and wheat, chicory and alsike, wheat and vetches, beans, peas and wheat, beans, peas, barley and oats, and mixtures of carrots and parsnips, can be effectively employed in the feeding of live stock. The best-known of the above mixtures is of course the mixture of rye and vetches, which, on many farms, is grown for early spring fodder. In spite of its widespread use, however, it is not entirely satisfactory, because the vetches mature much more slowly than the rye, very little of the vetches being seen at the time when the rye is ready to cut, and for this reason, except when the crop is required for feeding to sheep, a mixture of rye and beans is to be preferred. Sheep are not fond of the bean plant, and eat it much less readily than vetches. Rye has also the great drawback, like Bokhara clover, that it is only palatable in the earlier stages of growth.

On light soils a mixture of peas and rye, sown early in January, will be ready for use as soon as the autumn-sown crop of rye and vetches, and is considerably less inclined to become woody. The common practice is to take a crop of turnips or cabbage after an early crop of rye used for green fodder, but if the land is clean, and early autumn fodder is needed, a mixture of St John's Day rye, or of buckwheat and peas, may be grown instead—in favourable seasons these crops may yield very heavily. On the lighter soils a very good plan is to sow rye in wide drills in September and drill peas between the rows in January, when the two crops will mature about the same time. If this mixture is cut before the flowering of the rye it is highly nutritious. A mixture of April bearded wheat and peas sown at any time during January or February is a useful mixture crop for harvesting as a grain crop; it makes very rapid growth and is well suited to the weaker soils. If desired it may be used as a hay crop. When cut for hay the mixture should not be allowed to pass the flowering stage. The most suitable mixture for making into hay is one of oats and peas. Any variety of oat or field pea may be employed, but to obtain the best results the variety of oat known as Duns should be grown, because of its hardy nature and the very large quantity of leaf and stem which it produces. This mixture should be sown in January or February, at the rate of $2\frac{1}{2}$ bushels of oats and 1 bushel of peas per acre: later sowings will give good results, but the heaviest yields are obtained from early sowings. Very heavy yields of hay, even on inferior soils, can be obtained from this mixture.

To obtain the maximum weight from the crop it is necessary

to delay cutting until the first pods on the peas are beginning to form; but if hay of high quality is preferred to quantity, the crop should be cut when the oats are flowering. When cut thus early the crop will, in favourable seasons, make a second growth as heavy as the first, which is particularly useful on the dairy farm for autumn green fodder. When the crop has reached full growth it is not more difficult to make than any other hay, but when cut before this stage is reached it is rather difficult to turn unless the weather be good—artificial drying would be distinctly useful in this case. If well harvested this early cut hay is little short of concentrated food in value. This mixture is one of the most useful to the stock owner, owing to the heavy yields of high quality fodder which can be obtained by its use. The mixture can be used as a seed crop by sowing the Marvellous oat in place of the Duns for early sowing and any good grain oat for later sowing; success, however, depends largely on early sowing, as an attack of frit-fly on the later-sown crop may seriously reduce its yield.

Valuable as the arable hay crops are, the experience of recent years leads to the conclusion that the best results are obtained from growing the mixture crops as grain crops and feeding them in conjunction with succulent fodder. Recent experiments tend to show that a given weight of green fodder has a greater value in the form of ensilage than of hay, but the extra cost of the ensilage is a drawback to its use. A cheaper food of equal value can be produced by combining a forage mixture harvested as grain and a succulent fodder crop. The most successful of all the mixtures available for this purpose is one composed of beans, peas, barley and oats, varied according to the nature of the soil and district. It can be grown on practically all soils, and is especially suited to the weaker wheat soils and the heavy soils which need frequent bare fallowing: good crops can also be obtained on the lighter soils by suitable manuring and cultivation. The crop gives such heavy yields that it is necessary to take precautions against lodging by including a sufficiently high proportion of beans: the ideal mixture for the growing crop is half pulse and half cereal. A seed mixture made up of beans, 2 bushels; field peas, $1\frac{1}{2}$ bushel; oats, 1 bushel; barley, $1\frac{1}{2}$ bushel, sown at the rate of 4 bushels per acre, on average land, will give this result. On some soils this seeding would be too heavy; on high-lying lands an increased seeding might give improved returns. If the crop is sown before mid-November 1 bushel of vetches should be substituted for the peas.

The behaviour of the various species is very different in the mixture to the pure crop, and there is no doubt that each crop could be very much improved for this particular purpose. An interesting fact in this connection is the much more luxuriant growth of the cereals when mixed with pulse as compared with the pure

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crops. The taller the beans the better they are suited to the mixture, while a rapid-growing, widely branching pea, the straw of which does not ripen, is best suited for the purpose. A wide-spreading, vigorous root system in both species is also important. The crop should form a close covering over the ground at an early stage of its growth, in order that it may check the growth of weeds; once the ground is covered it is practically impossible for anything but the strongest kinds of weeds to survive, owing to the dense close growth of the crop. If sown in the autumn, or early spring, it is rarely seriously damaged by drought or excessive wet during the following summer, if the land on which it is grown is well drained. The seed may be either drilled or sown broadcast. If sown broadcast the different species should be mixed together, sown on the raw furrows, and harrowed in by giving two strokes with the spring-tined harrow. When the seed is drilled, the mixture may be sown in the usual way or the pulse may be sown separately in one direction and the cereals at right angles to it. When this method is adopted it is a good plan to sow the pulse in wider drills than the cereals, taking out each alternate coulter for the purpose. On the lighter soils it is advisable to sow deeply. No spring cultivation is required for the autumn-sown crop. The crop may be sown at any time from September until the end of March for seed and for green fodder; in some districts it may be sown as late as June. No universal rule can be laid down as to the best time to sow, as this varies with the district; but the autumn-sown crop is nearly always more resistant to adverse weather conditions. On light soils the crop is greatly benefited, in the first year, by a generous dressing of farmyard manure, otherwise the beans may not pod well. On the heavier soils, unless the land be in very poor condition, a dressing of from 5 cwt. to 8 cwt. of basic slag is sufficient to give a full yield. Top-dressing with quick-acting, nitrogenous manures is sometimes effective, but more often they do not give any return. If used at all they should be applied early.

The ordinary binder takes up the crop quite satisfactorily, and the large rough sheaves thus formed stand well in the stook and are resistant to bad weather. The crop may be cut with the ordinary grass-mower and cured in much the same way as hay. In the majority of districts the beans ripen less rapidly than the other constituents of the crop, which should therefore be cut when the cereals are ready—the beans, if not quite ripe, will ripen out satisfactorily in the stook. Early cutting greatly enhances the value of the straw for feeding purposes. The crop is thrashed with the ordinary thrashing box and any good farm grinding mill will reduce the grain to meal. One of the advantages of the crop is that it can be grown year after year on the same land with improving yield.

Its effect on the soil is quite different from that of a pure cereal. The cereal crop, owing to its open character, allows the land to become weedy and its root system destroys the soil textures. Long ago Tull showed that cereals can be grown continuously on the same land without any falling off in yield, providing sufficient mechanical cultivation is given. The mixed crop automatically pulverises the soil by the action of the roots of the plants: the difference in the soil condition after a forage crop is obvious to the eye and touch. The smother-effect of the mixed crop is so complete that, if the land be clean when the cropping is commenced, no weeds can establish themselves beneath it; and when conditions favour the crop, really weedy land can be cleaned through the smother-effect of the crop.

The yield of the crop when grown continuously on the same land is considerably better on the average than that of the pure cereal grown in the rotation. The grain of the mixed crop is well suited to the feeding of all kinds of farm stock, and if succulent fodder is available, the straw, if well harvested, is useful fodder. The grain is a concentrate which can be easily adjusted for any particular use. The cost of growing varies from £6 to £9 per acre according to the character of the land, and on an average the yield of grain is about 25 cwt. per acre and 35 cwt. of straw. The cost per lb. of starch equivalent produced is about .8d. Even without putting any value on the straw the grain is a cheap concentrated food. The crop is best used with marrow-stem kale as a succulent fodder: 100 lb. of kale, 4 lb. of the grain of the mixture and 4 lb. of the straw give a composition which closely approximates that of the best pasture grass. As kale can be produced at a cost of 6d. per cwt., this mixture is a very cheap food, well suited to cattle of all kinds; I have fed as much as 125 lb. per head per day to dairy cows with good results. If a more usual method of feeding is preferred, a suitable maintenance ration is 5 lb. of marrow-stem kale, 12 lb. of the straw of the mixture and $2\frac{1}{2}$ lb. of the grain. The extent to which in the States the practice of feeding off standing maize and peas is carried on suggests the possibility of developing a parallel practice in this country, using in place of maize a mixed grain crop.

The mixed crops can be taken after a cereal crop in the ordinary rotation, but the most effective method of growing them is to recast the scheme of cropping on a plan which reduces the area under pure cereals but which increases their yield per acre, eliminates the greater part of the unprofitable root crop, and provides an increased and more regular supply of food for live stock from the arable land.

The following rotations, based on a large number of experiments, secures the above aims:—

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Suggested Rotations

- | | | |
|---------------------------------------|---|--------------------------|
| (1) Beans, peas, barley, oats mixture | } | for grain |
| (2) " " " | | |
| (3) " " " | | |
| (4) " " " | | |
| (5) Wheat | | green fodder or ensilage |
| (6) Kale | | |
| (7) Kale and mangolds | | |
| (8) Oats | | |
| (9) Seeds | } | for grazing |
| (10) " " | | |
| (11) " " | | |
| (12) Wheat | | |

Scheme of Feeding Stock from Arable Land

- | | | |
|-----------|-------------------------------------|----------------------------------------|
| May | } | Temporary pasture |
| June | | Permanent grass |
| July | | Grain of mixture crop |
| August | } | Grass supplemented with— |
| September | | (a) Aftermath of peas and oat hay crop |
| October | | (b) Maize |
| | | (c) Buckwheat and peas |
| | | (d) Autumn-sown marrow-stem kale |
| | (e) Grain and straw of mixture crop | |
| November | } | Straw and grain of mixture crop |
| December | | |
| January | | |
| February | | |
| March | } | Mangolds |
| April | | Grain of mixture crop |
| | | Arable hay mixture |

The common system of management of live stock in this country does not secure the full output of which the animals are naturally capable, because of the falling off in nutritive value of the grass during the late summer and early autumn months. By supplementing grass pasture with forage crops produced on arable land the rate of progress of the best summer period can be maintained and the carrying capacity of pastures considerably increased. The summer feeding of ensilage is a common practice in the United States: in this country a combination of mixed corn, arable hay and kale can be produced at a lower cost, and is possibly better suited to the purpose.