

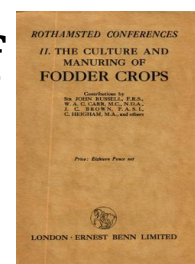
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# The Culture and Manuring of Fodder Crops

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## Mangolds and Sugar-beet

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## MANGOLDS AND SUGAR-BEET

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In grouping together mangolds and sugar-beet in a single short paper there is some danger that the great distinction between them may be lost to view and that their many similarities alone will be recognised. It is well therefore to state by way of preamble that whereas mangolds are for the most part produced as a winter food for stock on the farm and as a land-cleaning agent in the rotation, sugar-beet are intended primarily for human food and for direct sale, and that this consideration alone is enough to keep the agricultural treatment of the two crops on different lines. The facts that beet can be used very successfully as a fallow crop and that their by-products make excellent feed for many classes of stock add greatly to their value to the farmer who grows them, but it is the cash return which they bring which is the real cause for the recent multiplication of acres under the crop.

In 1923 the area under sugar-beet in this country was only 16,920 acres, most of which was found in one district in East Anglia. Last season the area cropped was over 58,000 acres spread over a much larger district, and the current estimates show that as much as 128,000 acres are to carry the crop in the present season (Table I., p. 32).

Factories for the extraction of sugar from the beets are appearing in all parts of the country, and, for the moment at any rate, there seems to be some hope that both grower and manufacturer may derive a fair profit from the crop which will help to discount losses in other branches of the industry. Naturally enough the rapid development of this crop has been made at the expense of other crops, and of these the mangold has been the one which was most often replaced. The general similarity of habit of the two roots has led in many cases to the easy replacement of the one by the other and to the substitution of a cash profit for what has often been regarded as an inevitable and perennial loss. This has been done with but small disturbance to the normal rotation of the farms and, in cases where beet tops and extracted pulp have been used to full advantage, without reduction to the head of stock supported on the land.

For something like one hundred and forty years the mangold has maintained a high reputation as a food for stock and as a fallow crop, and through all the agricultural vicissitudes of that period it has kept its place as a crop of first-class importance.

It is typically a south land crop and has never had any vogue in

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Scotland, and the areas under it from 1910 to 1924 have been as follows:—

Year	Acres under Mangold
1910 . . . . .	442,779
1915 . . . . .	413,710
1920 . . . . .	395,680
1924 . . . . .	388,184

The decrease may become greater in the next year or two, because not only is the sugar-beet area extending, but it appears that the use of ensilage and kale is increasing. Quite recently the value of mangolds and other roots as a food for some classes of stock has been seriously challenged, and it has been shown that in certain situations it is possible to manage dairy herds very successfully without recourse to a ration of roots.

This revelation is as yet too new to allow any reliable estimate to be formed as to the extent of its application, but it is reasonable to expect it to reduce the area under mangolds in places where the crop has no important secondary function as a cleaning agent.

*The Critical Stage in the Growing of Mangolds*

The characteristics of the mangold as a cropping plant are well marked. It is deep rooted and capable when once established of drawing its water supply from deep down in the soil, and it is a gross feeder which answers very well to generous treatment.

Springing as it does from a very small seed, it is delicate in its early life and is not capable at that stage of competing unassisted with strong and quick-growing weed species. The most critical period of its growth commences immediately after germination, while the first roots have still to make their way down to an adequate water supply, and it leads a more or less precarious existence till the immediate after-effects of the process of singling have passed away.

It is the grower's business to suit his operations to the characteristics of his crop, and bearing this in mind it would appear that there is an excellent case for deep ploughing or subsoiling in preparation for the crop. Unfortunately these operations are expensive, and most mangold growers are not in a position to spend an extra thirty shillings per acre on their crop without some very definite prospect of an adequate return.

There is very little experimental evidence in support of subsoiling as a general practice, and, save in cases where a definite pan is found which hinders the free drainage of the top soil, it may be difficult to justify the extra expense involved by the operation.

The delicacy of the plant in its earliest and most critical period of growth suggests at once that it should be sown not too deeply on a fine and firm seed bed which is moist. This requirement is

simple enough in itself, but it is often very difficult to obtain the conditions outlined and at the same time to take advantage of the season of spring cleaning before the crop is sown.

When the root shift comes round to any field most farmers find that they have weeds to kill on it, and even when an early harvest and a dry autumn allows this work to be commenced in good time much remains to be done in the spring. It happens only too often that a thorough spring cleaning leads to a dried-out seed bed and a partial failure of mangold plant. Where farmyard manure is applied in a dry spring, either on the flat or under the ridge, this risk is enhanced. No doubt the ideal to be aimed at in preparing for mangolds, in the drier parts of the country, is to have all the deep and heavy work and the organic manuring completed by mid-February, and to confine operations after that date to mere stirrings and rollings of the surface to obtain an adequate surface tilth for the seed. It is unfortunate that the vagaries of season and the accumulation of weeds of various kinds sometimes make it difficult to keep at all close to this plan of action in those districts where it would be most effective.

The incapacity of the young mangolds to deal faithfully with vigorous competitors for light and moisture is the next characteristic which the farmer must consider. He must be prepared to bring assistance to his crop at the earliest possible moment, and for this reason alone there is much to be said for the practice of growing the crop on ridges. It is possible to get the hoes to work in a ridged crop as soon as need be without fear of destroying rows of mangolds; while on the flat, even when the cereals are sown with the roots as indicators, an appreciable time must elapse before the rows are strong enough to serve as guides to the horse-hoers.

The mangold plants require a great deal of light, space and moisture for their free development, and it is only in the very earliest stages that they can live crowded together in the rows without damage to their ultimate prospects. Early singling or at least early bunching is an operation of great importance, and delay in this operation probably shares, with faulty and deep sowing, the blame for most of the failures of the crop.

It is nearly always difficult to keep the work of hand-hoeing up to date, and it is curious that more use has not been made of the various types of horse-drawn gapping and bunching machines which are on the market. In the spring of 1923 a strike of agricultural labourers occurred in Norfolk and lasted about six weeks. One of the effects of it was to disturb the working time-tables of most farms, and a number of people found themselves faced with the prospect of being unable to get their root crops hoed and singled before they were spoiled. Under these circumstances such horse-drawn bunching machines as could be obtained locally were put

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into use and several of them did excellent work. An observation taken at the time showed that with a crop of mangolds on light land, sown in flat rows 24 in. apart, the speed of working was 4.53 acres per day. The work was regular in depth and the subsequent singling out of the bunches was rendered very easy.

Once the stage of singling has been passed and the young plants are growing on freely under improved conditions the really critical stage of the crop is passed. Regular hoeings are generally considered to be beneficial as long as the horses and implements can pass through the rows without damaging the plants.

Nitrogenous top-dressings may do much to help on the plants or to develop a quick growth of leaf in the face of such attacking pests as the mangold fly or the leaf-miner grub, but these things, though they may affect the yield materially, do not generally affect the actual existence of the plants as do the earlier operations already mentioned.

### *Some Points in the Culture of Sugar-Beet*

Many of the points stressed in the growing of mangolds are of at least equal importance with sugar-beet, but it is to be remembered that as the use and the price per ton of the two crops vary very widely, so must the grower's regard for the points at issue be modified.

With mangolds the chief consideration is the weight of roots per acre which can be produced for the feeding of his own or someone else's stock. With sugar-beet the critical figure is found in the amount of sugar per acre which can be grown and sent to the factory.

The quality factor in the crop assumes an added importance, as it comes to have a direct cash value, and the grower is brought to consider his operations from a different point of view.

In the first place the question of subsoiling as a preparation for the crop assumes a new aspect and the arguments in favour of it become more cogent. As the return to be expected is greater so the outlay that can be afforded may be increased, and the thirty shillings per acre which seemed prohibitive with the low-priced crop appears more reasonable with the sugar-beet. Further, the nature of the sugar-beet itself lends force to the arguments in favour of it on all but the deepest and loosest soils.

The root which it is desired to grow is long and tapering and almost entirely subterranean. It is free of branches or "fangs" which, when trimmed off in the field or at the factory, lead to a loss both of weight and of sugar content. It seems certain that the free and quick growth of the deep-rooting system of a plant which requires a great deal of moisture for transpiration during its life must be encouraged by the thorough breaking of the subsoil by mechanical means.

This supposition finds ample support in the practice of most of the more advanced sugar-growing countries, and subsoiling or deep ploughing, 12 to 13 in., has become, in many cases, a matter of routine in preparation for the crop.

The question of the time of application of the farmyard manure and its nature also has some bearing upon this point of form and quality in the root, for it has been found that late applications of dung, or the use of it in a long or ill-rotted state, may lead to that forking and branching which it is desired to avoid. For this reason, as well as in order to avoid the danger of drying out the seed bed, winter applications of dung, 12 to 13 tons per acre, are generally recommended.

#### *Seeding*

The sugar-beet seed is almost exactly like that of the mangold, and equal care in the preparation of a bed for it is required. Under ordinary conditions the ultimate yield of sugar per acre will depend more upon the number of roots grown than upon either the size of individual roots or the percentage of sugar in them. It is therefore particularly important to obtain a close and even plant over the whole area under the crop. In order to do this it has become the practice in some Continental countries to place the rows very close together and to use a very large seeding. Rows 14 in. apart and seedings up to 25 and 30 lb. per acre are found in Holland and parts of Germany. In the matter of the heavy seeding it is often argued that if 7 or 8 lb. of mangold seed per acre will give a thick plant which requires drastic singling, a great part of the 15 to 20 lb. recommended for sugar-beet must be wasted. It is certainly true that the 7 to 8 lb. seeding can, under good conditions, produce enough plants per acre for a good sugar-beet crop, but the conditions are so often not good and the importance of securing a "tight plant" is so great that the extra seed may be regarded as a measure of precaution which costs the grower some 7d. or 8d. per lb.

The use of very narrow rows is a matter which demands separate consideration, for a great deal of the subsequent cost and management of the crop must depend on the decision. The recommendation to use them comes from countries where the problem of securing good manual labour on the land is not the same as in this country. Where hand labour is plentiful and cheap it is probable that the benefit to be derived from growing the roots as close together as possible may outweigh the additional expenses of seeding, hoeing and harvesting. In England agricultural labour is neither plentiful nor cheap, and it is often practically impossible to obtain and house extra hands in rural districts.

Perhaps at some future time, when the sugar-growing industry

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is more firmly established, it will be possible to erect standing camps and barracks for the imported hoeing and harvest hands, as is done for hop and fruit gatherers in some districts, but at present there is no more than a bare indication of this development.

Under the existing conditions it seems that we cannot afford to replace horses with men, and if the narrow rows involve this change then we have very good reason for not using them. In many districts farmers are growing sugar-beet with the same operations and at the same distances as they have grown other roots for years past. This enables them to produce a new crop without extra implements and with the assurance that the men will be able to handle the operations easily. There can be no reasonable doubt but that the crop requires closer spacing than our other root crops, and a measure of this can be obtained without sacrifice of time and labour-saving machinery.

Rows 18 to 20 in. apart, with the roots 10 in. apart in the row, allow the ordinary operations of horse-hoeing to be carried through cleanly and punctually, and at the same time permit of a root population of about 34,600 per acre, which under good conditions is equivalent to a crop for sale of 12 to 13 tons per acre.

It is possible that with the very high price of beet obtained during the past year or two, and which will be continued for this year, the strict economies of cultivation may lose some of their point, but it is to be remembered that this high price is due in part to a temporary subsidy paid by the Government to the factories. In a definite time this subsidy will shrink and disappear, leaving the industry to fight its own battles in the world markets.

The present period is necessarily one in which the position and technique of both the growers and the factories must be built up and strengthened, and it is important that only those methods which are recognised as being the most efficient and most economical shall survive to the era of open competition.

Sugar-beet are generally grown on the flat, but quite a number of new growers in this country who have been used to growing other roots on the ridge, and who appreciate the advantage in cleaning which this method gives them, are inclined to challenge the established practice. There does not seem to be any very reliable experimental evidence to support either method as against the other, though it is said that to carry the maximum content of sugar the root should be as much underground as possible. If this is true, it would appear that the advantage must lie with the practice of sowing on the flat.

The actual process of drilling is a critical one, as it is very important that the seed bed should be fine and that the seed should

not be buried too deeply. The seed rates already mentioned, 15 to 30 lb., are below those found in many Continental districts, but even so there may be some considerable difficulty in getting on the required amount of seed per acre with the drills commonly found in this country.

There are various special drills coming on to the market now that the crop is becoming an important one, but with a little modification of the size of its cups and some alteration of gearing an ordinary "flat-work" turnip drill can generally be made to do the work. A common type of sugar-beet drill used in Germany is nearly 14 ft. long, and will cover eight or nine rows at a time. Behind each seed-spout of this machine follows an iron presser-wheel which serves to push the seed down  $\frac{1}{2}$  to  $\frac{3}{4}$  in. on to a firm bed. Great importance is attached to this firm planting, and thorough rolling of the rows immediately after sowing is generally to be recommended. The practice of sowing a little barley with the beet seed in order to get early definition of the rows is common in Germany and works well in England.

#### *Hoeing, Rolling, Bunching and Singling*

The exact sequence of operations must depend upon the soil and the season, and it may be necessary to frame the programme either to conserve moisture in the soil or to draw it up to the seeds at the surface.

In some places—for example, Silesia—great value is placed upon very early hoeing, and where there is a delay in the appearance of the beet "blind hoeing" is practised.

Whatever the wisdom of this may be, it is certain that all the best growers use their hoeing implements freely whenever opportunity offers, and continue the work until quite late in the growth of the crop.

There are various kinds of special horse-hoes for sugar-beet now coming on to the market, but good and close work can be done with the existing tools if they are fitted with suitable hoe-blades and are carefully set. The Danish type of horse-hoe, which has a disc to run beside and protect the young plants, is very well suited to the early work with sugar-beet.

Bunching, which is accomplished with a heavy hand-hoe 8 to 10 in. wide, should take place as soon as the young plants form definite and continuous rows. Care must be taken that the hoe stroke is deep enough to destroy the unwanted plants and generally it should not be less than  $1\frac{1}{2}$  in. The work requires care and close supervision, especially in districts where the men have not had much experience of root hoeing.

Singling, which follows the bunching, should begin as soon as the



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young plants have four leaves (Table II., p. 33). It is a very critical operation both in point of time and in the care which is required in it. The young plants in the bunches tend to twine together, and the longer they are left the more difficult becomes the task of disentangling them. Singling cannot be done really well with the hoe alone, it requires the fingers and meticulous care. The best plant of each bunch should be selected and held down firmly in the ground with one hand while the remaining plants are removed with the other.

When singling has been really well done the plants should be left evenly spaced in the rows (8 to 10 in. apart) and so well planted that the shock of the drastic operation through which they have passed is reduced to a minimum.

Singling may be followed immediately by rolling to restore the firmness of the top soil round the plants, and the hoes should be busy again without unnecessary delay. Hoeing, both with drawn hoes and with hand tools, is continued until the leaves of the crop form complete land cover, and some damage to the crop is sometimes excused on the ground that the benefits arising from the hoeing will more than make up for it.

### *Manuring of Sugar-Beet*

Although a great deal of research work has been done on the Continent in ascertaining the manurial requirements of the sugar-beet, there is practically no experimental evidence which has a direct bearing in this country. There is work in hand at the present time at Woburn which is designed to tell us something of the action of nitrogen and potash upon yield and sugar content. Somewhat similar work has been carried out by the Norfolk Agricultural Station in the past two years, and there is a scheme in being for a co-ordination of plans of experiment in several counties.

The results so far obtained require confirmation before they can be considered as being really reliable, but in the main they agree with the recommendations made to growers in Germany.

Further investigation is required into the relative values of farm-yard and green manure for sugar-beet, and there is much to be done in following up the action of potash in the plant and its influence upon the gross yield and the sugar percentage. From the work already done it appears that sulphate of ammonia and nitrate of soda in quantities above 3 cwt. per acre may cause a small reduction in the percentage of sugar in the individual roots, but this tends to be outweighed by the increase in yield of roots and in the sugar per acre.

A great many English growers give their sugar-beet the same dressings as their mangolds or potatoes, and successful crops have

been produced in this way. Both mangolds and potatoes are potash-loving plants and answer well to large doses of the various potash salts, but it is by no means certain that the sugar-beet is equally responsive to heavy potash dressings.

*Sugar-Beet as a Forage Crop* (Table III)

The forage value of sugar-beet is found in the by-products. These are the tops, the extracted pulp and the beet molasses.

The tops consist not only of the leaves but also of the upper part of the root down to the lowest leaf bud. They weigh from 5 to 10 tons per acre and form a very valuable feeding stuff available for nearly all classes of stock. They are sometimes fed fresh in the field but are more often made into silage in large pits.

The pulp straight from the factory is a valuable cattle food, and is used extensively all over Europe for both fattening and milking stock. Unfortunately it is heavy and bulky to handle, and is not easily conveyed from the factory to the more distant farms. In this country all the factories have drying plants, and the pulp is dried out before it is sold back to the growers or is put on the general market.

Under many contracts the grower has the option on a weight of dried pulp equal to 5 per cent. of his root deliveries. The price to growers at the present time is about £5 per ton.

A comparison between the ordinary root crops—swedes and mangolds—and “dried sugar-beet slices” was made at the Norfolk Agricultural Station in the years 1909 and 1910. Two yards of fattening bullocks were fed on identical rations with the exception that one lot received the ordinary ration of roots and the other a calculated quantity of dried slices which had been soaked in water the night before. The results obtained were remarkably consistent and showed that for the purpose in question 14 lb. of dried pulp were equal to 1 cwt. of mangolds.

TABLE I

SUGAR-BEET AREAS IN ENGLAND

Year	Acres
1920	3,017
1921	8,333
1922	8,400
1923	16,920
1924	22,440
1925	58,700
1926	128,000 (estimate)

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TABLE II  
A GERMAN EXPERIMENT

<i>Time of Singling</i>	<i>Yield in Tons</i>
At the proper time . . . . .	15.0
One week later . . . . .	13.5
Two weeks later . . . . .	10.0
Three weeks later . . . . .	7.0

TABLE III  
SUGAR-BEET BY-PRODUCTS

	<i>Sugar-Beet Tops</i>	<i>Sugar-Beet Pulp</i>	<i>Mangolds</i>	<i>Swedes</i>
Crude protein . . . . .	17.41	10.43	8.35	10.01
Oil . . . . .	2.32	0.70	0.85	1.54
Fibre . . . . .	8.27	20.01	5.84	9.24
Carbohydrate . . . . .	51.37	64.86	79.12	73.82
Ash . . . . .	18.03	4.00	5.84	5.39
Earth . . . . .	2.10	...	...	...
Moisture . . . . .	83.9	84.8	89.3	88.5

## THE DISCUSSION

LORD BLEDISLOE, Chairman of the Conference, speaking in discussion, said that with reference to the matter of the early sowing of swedes mentioned by Mr Carr, his own recent experience showed that swedes sown very early in Gloucestershire suffered badly from mildew.

In the matter of varieties he was interested to observe that the Danish swede, Bangholm, had done so well both in total yield and in yield of dry matter in the trials at Aberdeen, Edinburgh and Glasgow.

Concerning marrow-stem kale he had found that it is an excellent food for pigs, and he considered that for this class of stock it is second only to lucerne. His own kale crop had stood the severe frosts of last winter without damage.

Mr CRAWFORD was anxious to know how the dressings of artificials which had been put forward compared with dung when measured