

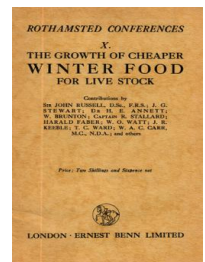
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The Growth of Cheaper Winter Food for Livestock

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H. Faber (1931) *Growing of Fodder Roots in Denmark* ; The Growth Of Cheaper Winter Food For Livestock, pp 29 - 33 - DOI: <https://doi.org/10.23637/ERADOC-1-203>

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The wheat not required for poultry can usually be exchanged for bran, to advantage, with the local miller, and if I could dispose of the oats profitably to the local hunt I should not hesitate to do so, buying maize germ meal or dried grains with the money.

GROWING OF FODDER ROOTS IN DENMARK

BY HARALD FABER

Agricultural Commissioner to the Danish Government

DANISH farmers were late in learning to grow roots. They saw root-growing in England and Scotland, where several progressive Danish farmers in the sixties and seventies of last century went to study practical agriculture. The growing of sugar-beets was introduced into Denmark from Germany in the late seventies. By the year 1881, roots for feeding occupied only 45,000 acres, being two-thirds of 1 per cent. of the arable land, while Great Britain devoted 13 per cent. of her arable land to all root-crops. Danish farmers at that time had no faith in the feeding value of roots, such as mangolds and turnips, as they considered them worth little more than water. A series of very practical feeding experiments by the late N. J. Fjord, carried out on large farms in various parts of the country, showed that 1 lb. of dry matter in roots has the same feeding value as 1 lb. of corn when fed to pigs or to cows in milk. With the usual yields of roots and barley this meant that on 1 acre of land you can produce two and a half times as much foodstuffs by growing swedes or mangels as by growing barley. That opened the eyes of the farmers to the value of roots, and before the War the acreage of roots for feeding had increased to 630,000 acres. In thirty years the acreage had been multiplied by 14.

The roots were grown from seeds sold by merchants under a variety of names, either imported or grown in Denmark, and with little or no guarantee as to yield or purity, until a society was formed for improving cultivated plants. This society aimed at growing roots from selected stock seed, and tried to do away with the many trade names for really identical kinds of roots, thereby helping farmers in their selection when buying seed. At the same time, the analysis of seed for purity and germination at the (at first private) seed-testing station, which was opened in 1871, was becoming more general.

From about 1890 a most important series of field trials was begun for the purpose of improving the growing of roots so as to obtain the largest possible yield of foodstuffs per acre. The different kinds

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of roots have different contents of dry matter—roughly 12 per cent. in mangolds and swedes and 9 per cent. in turnips. The feeding experiments had shown that 1 lb. of dry matter in roots has the same feeding value as 1 lb. of corn. But it was soon found that within each kind of root there are many different strains with distinct characters, such as contents of dry matter, tendency to run to seed, and so on. And it was found that these characters are hereditary. The object of the trials was therefore *to find such strains as gave the greatest yield of foodstuff per acre*. Some strains would give a large yield of roots per acre, but if the roots contained a low percentage of dry matter, and consequently a large percentage of water, the total amount of foodstuff per acre might be low, which means that there would be cartloads of water to be carried from the fields, which water could be had just as well and cheaper from the well on the farm. As the roots are grown to feed cattle it is evidently to the advantage of the farmer to grow such strains as yield the greatest amount of foodstuff per acre. It was, therefore, the aim of the field trials to find such strains, and this work is being carried on to the present day.

At the same time it is important, by better cultivation, more manure, and so on, to increase the yield of roots, always provided that the yield of foodstuffs is increased in at least the same proportion. It can be proved from agricultural statistics that Denmark was considerably behind England and Scotland forty years ago with regard to the yield of roots, but that now she is a good deal ahead.

Taking all kinds of roots together, including potatoes, we find the following yields:

TABLE I
YIELDS PER ACRE OF ROOTS IN (METRIC)¹ TONS AND OF
DRY MATTER IN CWT.

	Roots in (Metric) Tons per Acre			Dry Matter in Cwt. per Acre		
	England and Wales	Scotland	Denmark	England and Wales	Scotland	Denmark
1889-1893 . .	12.9	13.4	10.1	30.4	32.5	27.3
1899-1903 . .	12.5	12.9	12.6	29.7	30.5	32.9
1909-1913 . .	13.4	14.7	15.9	32.2	35.4	41.3
1923-1927 . .	12.2	14.1	17.4	31.9	34.7	40.0

¹ A metric ton is $1\frac{1}{2}$ per cent. smaller than an English ton.

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A detailed description of the trials carried out at the Government Experimental Stations would take too much time here. It will be enough to mention that growers of seed were invited to submit samples of their stock, to be grown for some years in succession in competition. The final report would show which strains had yielded the greatest amount of foodstuff per acre, and the growers of such strains were rewarded for their efforts in improving them by the higher prices they would obtain for their seed.

The first series of trials aimed at comparing samples of trade seed. From these trials it resulted that a few good strains of each kind of root held the field and all others were neglected. That has the great advantage that the efforts to improve the strains are thereby concentrated on these few strains. Of mangolds some strains are descended from a sort which was introduced by the firm of Vilmorin, Andrieux & Co., Paris, in 1853, and brought to Denmark a few years later. It was known as Yellow Egg-shaped des Barres, and was extensively grown in Denmark under the name of Barres. In 1880 samples of Oval-shaped Yellow or Yellow Intermediate were bought from the firm of Peter Lawson & Son, Edinburgh. It is very similar to the Barres of Vilmorin. Strains of these two kinds, both known in Denmark as Barres, have competed severely for years, but lately the strains of Barres descended from the samples from Peter Lawson are ousting all other kinds of mangolds from the Danish fields. In 1884, 21 per cent. of all mangolds grown were of these two kinds; by the year 1915 over 88 per cent. of all mangolds grown in Denmark were of various strains of Barres, and now the preponderance of Barres is probably still greater. Many of these strains have been developed by selection from roots grown by the leading seed merchants on their own fields.

From 1920 a new series (the sixth) began, for the purpose of serving more particularly the interests of seed merchants by comparing samples of stock seed, in order to show seed merchants where they can buy the best stock seed for cultivation through their seed-growers or on their own farms. This series was carried out by cultivations for four years. Twenty strains of Barres and twenty strains of swedes were compared. Each competing owner of stock seed must have a stock of at least 110 lb. of a Barres strain or 65 lb. of a strain of swedes. A sample of 33 lb. of Barres seed or 12 lb. of swedes seed had to be given free to be tested. While all the mangels were of Barres strains, six of the best strains of swedes were of Bangholm strains. The Bangholm strains are descended from seed which in the seventies was bought under that name from the firm of Peter Lawson & Son, Edinburgh. During the first two years all forty samples were grown on five experimental stations. At the end of the second year a report was drawn up classifying the samples according to yield of foodstuff per acre. Those samples

which came in the lower half were then discarded. For each sample in the upper half—that is, nine samples of Barres and ten samples of swedes—two new samples were called for from the owners of the strains—viz. one sample of trade seed cultivated from the stock seed already examined, and one sample of the new generation of stock seed—and these samples were then grown for two more years and classified. In this way it was possible to point out the best stock seed of the latest generation—that is, of those samples which came in Class I.—and trade seed from former generations of the same strains were considered superannuated and no longer reliable.

It is, of course, a necessary condition for this work that the Government Committee which carries out the trials is able to control the trade in seed, and that each generation of stock seed and the trade seed grown therefrom are described in a way to give buyers a guarantee that they get what they want. For that purpose the generations of seed of Class I. are distinguished by a Roman figure. Stock seed of Class I. from the trial begun in 1920 was available in 1924, while trade seed of Class I. grown from that stock seed was available in 1926. Both are distinguished by the Roman figure VI., indicating that they have been found of Class I. in the sixth series of field trials.

The control so far as concerned stock seed was carried out in the following way in the previous (the fifth) series, when stock seed was examined for the first time. The samples of stock seed to be grown in the trial were drawn during the winter by the leader of the trials from the whole stock on hand, and then all the bags containing the whole stock were sealed with the seal of the committee. When the report was published showing which samples came in Class I. there was a rush from seed merchants to buy. The leader of the trials then opened the sealed bags of stock seed, saw the parcels to be sold packed in bags, and sealed these, so that the buyers received their purchases under official seal and thereby had a guarantee that they got what they wanted. For stock seed sold under this arrangement as much as £2 and £3 was paid per lb. of seed for respectively mangels and swedes.

But the chief control, both of stock seed and trade seed, has been gradually developed by co-operation between wholesale seed merchants, Farmers' Co-operative Seed Supply, and the Government Root Seed Commissioner. It began by the Commissioner growing samples of seed which were sold as of a special strain, in order to see if the resulting roots corresponded to roots grown from seed known to be of that strain. To invoice seed under the name of a special strain if it is not of that strain is an offence under the Law on Trade Description. As a result of this control several irregularities were discovered. One merchant had, for instance, to pay a compensation of £350 for having sent out inferior seed of turnips.

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In most countries seed merchants print on their invoice that: "We give no warranty as to description, quality or productiveness of any seed we send out, and we will not be in any way responsible for the crop." Differently in Denmark, where the Society of Danish Seed Merchants in 1912 adopted the "Guarantee of Genuineness" in the trade in root seed, guaranteeing that it was of the strain indicated and offering full compensation to the buyer for smaller yield resulting if it should be found that seed of another and inferior strain had been sold. This applies to mangolds, swedes, turnips and carrots. Samples of consignments sold were sown in control fields by the Commissioner, so that he in the autumn could decide whether the seed was what it professed to be, while a comparison was also possible with crops grown by other buyers (farmers) from the same stock seed. Inferiority in a crop due to faulty cultivation or to disease could thereby be proved, and no compensation would be due in such cases, but if seed of an inferior strain had been sold full compensation was paid to the farmer. In 1913 the Commissioner Helweg could write: "We have come to this state, that no seed merchant dares sell bad root seed in Denmark." This guarantee has also been extended to seed sold for export to other countries.

With such a development of the growing of roots it is evident that farmers profit by having a full guarantee of the quality of the seed they sow and by reaping the greatest possible yield of foodstuff per acre. The result thereof has been a rapidly increasing acreage of roots and yields of roots. The yield in metric tons per acre in Denmark was:

TABLE II

	<i>Mangolds</i>	<i>Turnips</i>	<i>Swedes</i>
1889-1893	1,003,266	901,032	169,074
1899-1903	2,092,360	2,038,410	1,271,490
1909-1913	4,414,600	2,738,500	4,554,600
1923-1927	5,698,658	2,467,357	10,425,874

It will be noticed that turnips have been grown lately to a somewhat smaller extent, because of the lower yield of foodstuff, and that the higher yielding swedes are grown to such an extent that the total crops of swedes in little Denmark in 1923-1927 was heavier than the total crop of turnips and swedes together in England and Wales. The total area devoted to fodder roots in Denmark is now about 900,000 acres, or $13\frac{1}{2}$ per cent. of the arable land.