

England are well suited to the growth of the root is clearly set at rest, not only by the analytical tests made by Professor Voelcker upon roots grown in England, in Belgium, and in France, but by practical results obtained by Mr. Duncan at the sugar factory in Suffolk. The percentage of sugar in beet is, upon an average, estimated on the Continent at about 10 or 11 per cent, whilst the roots analyzed by Professor Voelcker, grown at Barking with London sewage only as a manure, contained 13 per cent, equal to the very best Silesian. That the sugar-beet requires for its perfection a better climate than ours, will, I believe, be proved by further experience to be a fallacy. The temperature of the north of France and Germany is far more suitable to its growth than that of the southern parts of those countries. What I learned to be of most importance is, that the months of August, September, and the early part of October, should be warm and sunny; for it is in the latter stages that the sugar is formed. To ensure the best results, great care is necessary with the manuring and proper tillage of the soil, the choice of seed, the subsequent cultivation, and the harvesting. At Cologne, I visited a large concern belonging to the Rhenish Beetroot Sugar Company, a firm composed of three partners. In addition to the roots grown on their own extensive farm of 7200 imperial acres which I shall notice presently, large quantities are bought of the surrounding farmers, at 20s. per ton, the pulp being given back free. The firm has issued printed instructions for the guidance of the farmers in the neighbourhood.

"1. In order to grow good sugar-beet it is necessary that the land intended for the roots should be ploughed at least 10 inches deep before the winter; as the frosts render the soil as fine as ashes, it enables the farmer to work the land readily in spring, and the rapid growth of the plant is greatly facilitated. 2. From experience it is proved that roots planted in ground freshly manured, either with farm-yard dung or compost, suffer from *unequal growth and various kinds of insects*. The quality also, in most cases, is inferior. It is better, therefore, to highly manure the previous crops and avoid the direct application of manure to the beet-field. 3. As soon in the month of April as the land has become sufficiently warm (say 45 to 50 deg. Fahrenheit) the sowing of the seed should commence, for according to all experience, the earliest planted beet are always the best. Drilling in all cases is to be preferred to sowing by hand. The cultivator should always bear in mind that the soil should be as fine as meal, yet not too loose, so that the seed is not deposited too deep. 4. If sown by hand, the roots should be

in 14 inch squares, within the radius of the Cologne fortification, a rich district; the rows should be 12 inches wide, and the roots 8 inches apart, so that they do not become too big. If drilled with a machine, the distance should not exceed 15 inches, and thinned out at 10 inches. 5. As soon as the plants are visible, hoeing between the rows should commence. The growth of the weeds is thereby checked, and also, the ever-forming crust which shuts out the air, is broken, and insects and vermin are destroyed. When the plants have six leaves, the thinning or singling out should be begun. Frequent hoeing subsequently is also necessary to keep the land from becoming bound. When, in the month of July, the heads of the roots show above ground, which heads are totally useless for the sugar manufacture, their development must be checked by moulding-up, which operation also facilitates the getting up of the roots when ripe. 6. Leaves are to a plant what lungs are to an animal; therefore, nothing damages the beetroot more than taking off the leaves before harvest. Such a senseless course reduces the value of the crop one-half. 7. Roots, which are to be kept for several weeks, perhaps months, before being taken to the factory, should be quite ripe when gathered, should not have been exposed to frost, and should have been harvested in a fresh or moist condition. The roots are seldom ripe before the middle of October, yet frequent frosts occur at the beginning of November; the beetroot cultivator must, therefore, make haste to harvest his crop before the frost commences, and postpone all other work until the crop is secured. If a long drought has occurred, the growers should wait until a good rain has fallen, for roots which are harvested in dry weather, and after a long drought, will not keep. 8. The raising of the roots is best performed by means of spades or shovels; forks are not suitable for this operation, for, from experiment, too many roots get pricked, and pricks are a certain cause of decay, whereas a smooth cut with a shovel is not so injurious. In any case, however, wounding of the roots must be most carefully guarded against. 9. The leaves of the gathered roots should be cut off with a sharp knife close to the crown, also the under leaves, which in most cases are decayed, must be removed by the hand or the knife, because they induce rotteness, and if left on are troublesome during the washing process. 10. Roots which are to be conveyed to the factory within three or four days of gathering should be plentifully covered with leaves, because the sun's rays beget decay of the roots, and rotten roots produce dark-coloured juices which are valueless. If the roots have to be taken to the factory later, they must be thoroughly well covered with

earth, either in pits or heaps, so as to protect them as well from the heat of the sun as from the frost, and thus prevent their losing quality or quantity. The beetroot cultivator should remember the well-known proverb, 'Out of the earth, into the earth,' i. e., the earth not only produces but preserves. 11. The pits or heaps should be 3 feet wide, and one spit deep, and of any convenient length. The roots should be laid with the heads outwards. The work of covering up as well as the removal to the factory should be carefully performed, so as to avoid the bruising or wounding of the roots, as their *soundness is of the utmost consequence*. Heaps which are three feet wide should not be more than three feet high, so as to keep the roots cool and prevent their sprouting. The roots should be covered up *immediately*, with at least 2 feet of earth, in order to avoid thoroughly the admission of air, for every change of temperature is injurious to the roots. Ventilation by straw chimneys or other methods must be most strictly avoided. If the heaps cannot be completed before night, a thick layer of leaves should be used as a temporary covering to prevent damage by night frosts. 12. In carting the roots to the factory, great care must be taken against bruising or breaking off the tap-root (the tap-root is the richest in sugar), for roots handled roughly soon show black spots and quickly rot. 13. That the foregoing rules are attended to properly, the inspector appointed by the sugar factory will satisfy himself from time to time by actual observation."

If I do not mistake, these rules contain matter for reflection, and may suggest to the thoughtful English farmer some useful lessons in the cultivating and harvesting in the ordinary mangold crop. The processes pursued in the sugar factories of the Continent are very simple. The roots, being first washed in a machine, are dried and pulped, the juice pressed out by hydraulic machines, followed by the usual refining process. At the great manufactory I have referred to at Cologne, at which 150 tons of beetroot are converted into sugar daily, the process of extracting *the sugar is unique, and far more perfect* than any other factory I had the opportunity of inspecting. Indeed, the whole arrangements are most complete. Every department was thrown open to me, and every process explained, without the least reserve. When the inspection of the factory was finished, a carriage and pair, belonging to one of the partners, was politely placed at my disposal for a drive round their extensive farm. To return, however, to the sugar-making: Instead of extracting the juice from the pulp by pressure, as is the general practice, the pulp is put into a kind of collander, placed inside of a cylindrical vessel; when filled, the collanders are put in action by