

would cut but a poor figure if the cleaning and manuring for the swedes and mangels were omitted. Lastly, the chemists have succeeded in bewildering many half-educated men by the analyses of roots they have published. That "90 % of water" startles many a good honest fellow, who has been accustomed to see his sheep and cattle thrive delightfully, under the old-fashioned regimen of cake and roots, and he begins to think it can hardly be economical to cart from field to farm-yard such a lot of water. But there is no getting over the facts that hundreds of thousands of cattle of all kinds have been sent to market *ripe-fat*, after having been fed entirely on swedes and straw, and that the great ram-breeders of the South of England, the Webbs, the Rigdens, the Goringes, &c., when their farms, in June, are covered with trifolium, red clover, tares, and all sorts of green food, will give any price for mangels for their exhibition sheep. And if the percentage of water in roots growing in the field seems to be large, we must not forget that day after day, when stored in the barn-cellar or in the root-house, they are losing water rapidly. Besides, what amount of water does the chemist find in the much vaunted beet pulp from the sugar-factories? According to Mr. Petermann, the well known chief of the Gembloux (Belgium) agricultural station, the following are the average constituents of best pulp after the diffusion process :

Water.....	90.00
Albuminoids	0.93
Fat.....	0.07
Carbohydrates	6.27
Inorganic matter.	0.75
Fibre	1.98
	100.00

Compare this with Wolff's analysis of swedes :

Water.....	87.00
Albuminoids	1.30
Fat.....	0.1
Carbohydrates	9.50
Inorganic matter (ash).....	1.00
Fibre	1.10
	100.00

You see at a glance that the swede is far more valuable than the pulp, for it contains 3 per cent. less water, 37 % more albuminoids, .03 % more fat, 3.23 % more carbohydrates—sugar, starch, &c.—.25 % more ash—including phosphates for bone building—and .35 % less indigestible matter—fibre. So, you see that, even theoretically, the root-crop is not so despicable a thing as it is too often esteemed to be in this country.

But about this water-in-the-swede-question. Is it so bad a thing after all? People who harp so on the matter seem to overlook the fact that this admirable commingling of the water with the cellular matter of the swede assists in producing a natural food suitable to the digestive system of animals. I do not believe that any man of science would differ from me when I state that in a well grown swede there cannot be found, barring perhaps an infinitesimal part of the fibre, any indigestible matter at all. The whole is available for nutrition. If the water contained in the root were only of the value of water from the spring, or from the well, as some want us to believe, then we might conclude that dried turnips, moistened with water, would produce the same results as swedes from the root-house! Similarly, it might be held that dried beef and water are as nutritious as fresh beef! Or, that hay and water are as good as grass! Or, that dry bread and water are equal to fresh bread! No one can main-

tain such a view; and the assertion that the water contained in a swede is of no more value than water from the pump, is therefore open to grave doubt. The effect on the palate, on the flow of saliva, on the animal when eating, must be allowed considerable weight.

Lawes, in his experiments on cattle-feeding at Rothamsted, showed that a ton of roots would produce 14 lbs. of beef or mutton. But this result was arrived at by deducting the actual cost of the hay, cake, and meal, fed with the roots, and assigning to the roots the balance in cash left after the sale of the animals. Thus if a lot of beasts leaves \$300, and has consumed \$200 worth of other foods, the \$100 left would be credited to the roots, and if fifty tons of roots had been eaten, they would be set down as worth \$2.00 a ton. To my mind, this mode of computing the value of a ton of roots does not touch the question: how far does the presence of the roots affects the feeding value—i. e. the assimilation—of the cake, hay, and meal?

Mr. Wrightson, the Principal of the Agricultural College at Downton, England, but in spite of his occupying that invidious position, a thoroughly practical farmer, esteems the value of root-crops very highly, particularly when they are consumed by sheep. He puts the average value of a ton of swedes at 10s. 4d. sterling = \$2.50. In the case of lambs of the improved Hampshire breed, which at eight months old have been sold for from 60s to 80s a head—\$12 to \$16—he seems to feel sure that the value of roots consumed to account for the yield of mutton cannot have been less than from \$4 to \$4.50 a ton!

My own impression is that swedes are worth to the farmer in this country, \$2.50 a ton. And now let us see, fairly, what they cost to grow.

First, what is the cost to the farmer of ploughing an acre of land? The wages of a man may be averaged at \$1 a day; a horse will consume, say, 10 lbs. of oats and 25 lbs. of hay and straw *per diem* which, at present rates, not counting the straw, are worth, *on the farm*, 17½ cents (1); therefore a man and his team cost the farmer \$1.35 a day. (2) They will plough, on an average, an acre and a quarter a day, at least; so, we get, as the cost of ploughing an acre: \$1.08 :

2 ploughings.....	\$2.16
4 harrowings	0.40
2 grubblings	0.40
Drilling and splitting drills.....	1.20
Loading, carting and spreading 12 tons of dung.....	3.00
3 lbs. seed and sowing.....	1.00
Horse-hoeing 3 times.....	0.75
—Singling—4 women, one day.....	2.40
2nd hoeing.....	1.00
Topping, tailing, carting, &c	7 00
Rent—i. e. interest on capital.....	4.00

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Now, supposing the rotation of crops on an average farm in this district to be a seven-course one, I do not think it would be fair to charge the whole of the cost of cleaning and manuring to the root-crop; I think two-thirds would be about right; for in a seven-year rotation you would have your farm divided as follows :

(1) A small charge might be made for wear and tear of horses, harness, implements, &c Mr Barnard thinks a allowance should also be made for the time the horses stand idle. A. R. J. F.

(2) No profit can be fairly charged on food given, *on the farm*, to the stock of the farm, as all expenses of marketing, &c., are saved.