ROTHAMSTED RESEARCH

The Growth of Cheaper Winter Food for Livestock

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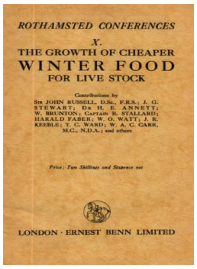

The Growth of Crops for Dairy Cattle

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taking care of when grown, and should not be left at risk of frost doing damage unnecessarily.

Swedes we cut and drop on the ground when required for immediate use for the cattle, but slung into heaps and soiled-up if intended for sheep food or later seasonal use for the cattle. We aim at having all root-crops secure from weather risks not later than the end of November or the first week in December.

As indicated previously, our normal rotation is a six-year course —two root-crops and one of clover alternated with three straw crops. The price of home-grown grain being what it is, and to enable us to grow the acreage of beet we desire, we started two years ago to follow our potato crop with beet instead of spring corn. This now throws us with about half our arable acreage under roots of one kind or another, entailing a very heavy labour bill, but at the present level of prices I propose keeping my acreage under grain within the narrowest possible limits.

Growing cattle foods, vegetables or beet *may* pay some years; producing grain under present conditions cannot.

THE GROWTH OF CROPS FOR DAIRY CATTLE

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Crops for Dairy Cows

About two-thirds of the cost of keeping a dairy cow arises from feeding, and on the majority of farms this portion is divided almost equally between home-grown and purchased foods. In theory concentrated foods are needed chiefly for cows giving 3 to 6 gallons. These do not, as a rule, make up a big proportion of our herds at any time. Most farmers have perforce to content themselves with sales equivalent to an *average* daily output of under 2 gallons. If one wishes to visualize a dairy herd, therefore, as an economic unit, it is a picture of a number of animals giving rather under 2 gallons apiece, and needing somewhere about 11 or 12 lb. starch equivalent per head per day, that one must call up.

It is possible to make up from home-grown foods alone a ration closely approaching this standard. One of the main points in herd management is, therefore, can rations so constituted be grown more cheaply than their equivalent could be bought?

The whole question of costs on a dairy farm is surrounded by difficulties. To instance but two, crops are grown by labour

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employed primarily for another purpose—in a sense surplus labour; it is charged for at full rates, though not skilful in arable work.

With our small arable acreage depreciation on implements reaches a staggering figure per acre, and the standard of fertility on the land is determined in great measure by the dung, which a paternal government requires one to remove from the precincts of the cowhouse—again a surplus product.

For reasons such as these, costs per acre, if calculated in the normal manner, are apt to prove very high—though it must be admitted that one of these items ought to be cancelled out by correspondingly high yields. There is, however, no escape from costing methods if one wishes to evaluate crops grown.

Our arable land in South Cheshire is generally worked on a four-course rotation, with oats replacing the barley of the original Norfolk rotation.

The root-crop is a convenient starting-point in the shift, as this gets the farmyard manure. Valued by the modified Hall & Voelcker method, which we adopt, the cost of muck at Reaseheath runs from 9s. 6d. to 11s. per ton; so that, as 14 to 16 tons per acre is applied for roots, we start with an initial charge of £7 or £8 for dung and about £2 for carting and spreading—roughly £10 in all, which has got to be spread over the rotation somehow. We charge half—*i.e.* roughly £5—to the roots and the remainder equally between the next two crops.

Mangolds

In common with our neighbours, we invariably plough in during winter, after autumn cultivation, if the land is at all weedy. We find it difficult in the spring to conserve surface moisture and at the same time to keep down annual weeds, which are a sore trouble:

"We sow with all the art we know, but 'fore a plant appears,
A single seed from any weed a thousand children rears."

So serious is this trouble with a "slow starter" like mangolds that we are doubtful of the wisdom of growing in narrow drills, though we can generally grow much heavier crops. Successional sowings in patches of about an acre, at intervals of about a week, are highly desirable, and early singling essential. Despite the ravages of mangold-fly—an increasingly serious pest—it is a safe crop. We have never seen a real failure, and have frequently grown over 40 tons.

At Reaseheath our average costs (excluding managerial charges) during the past three years have been £35, 10s. We put the average crop at 35 tons, which, at our costs, is equal to £1 per ton, or 16s. 8d. per cwt. S.E.

Swedes are so variable, owing to "misses" in germination, mildew and *phoma*, that it is difficult to state an average. In good years 30 tons

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per acre is easily grown, so we doubt if the average can be less than 22 tons; and as costs are fairly constant at about £24 per acre this gives a cost of 22s. per ton, or 13s. 9d. per cwt. S.E.

Marrow-stem kale is easy to grow, cheap and safe. Our average cost is £30 per acre and the crop 25 tons—that is, £1, 4s. per ton, or 13s. 4d. per cwt. S.E.

Corn Crops

In judging the economics of corn crops in this area it is necessary to bear two facts in mind—the one, harvest difficulties, the other, the value of the straw for litter. It takes half-a-ton of straw per cow to litter a herd. The clean-milk movement has increased the demand greatly. Few farms grow enough. Of late years it has rarely been worth less than £3 on the farm. This year wheat straw is worth £4 and oat £5. A corn crop is therefore worth £4 to £6 per acre for straw alone. Spring oats constitute the standard corn crop of the area. We have known but one failure—due to frit-fly—in ten years, though we have both seen and experienced heavy losses due to lodging and other troubles associated with wet harvest weather. Taken after roots, the crop costs at Reaseheath, approximately, £13 per acre, or if £4 be deducted for straw, £9 per acre: yields vary greatly, 30 cwt. per acre is often grown, and sometimes harvested. We are confident the average for the area is at least 20 cwt. This corresponds to 15s. per cwt. S.E.

Taken as the fourth crop in the rotation it escapes any charge for farmyard manure, and the cost is reduced to about £10 per acre, or £6 if straw is deducted. We have, unfortunately, little direct evidence from our own farm, but the average crop harvested is not less than after roots. This makes the cost about 10s. per cwt. S.E.

Hay

Rye-grass is invariably mixed with clover for one-year leys, and grows so fast in the early summer that large crops of grassy hay result. It is rare to lose a crop through bad harvest weather, though we have once had this experience.

The second crop contains much more clover, and is generally harvested successfully in September's waning sunshine.

The two cuts may conveniently be taken together in arriving at costs. Average-yield costs of growing amount to £7 per acre, and the double crop 42 cwt. per acre out of stack.

If allowance is made for loss of one crop in ten years this amounts to an average per ton out of stack of 38 cwt. Judging by a few analyses Featherstone has done for us, S.E. is not more than 35, with dig. protein probably 4·5 per cent. This gives a cost of 10s. 7d. per cwt. S.E.

The costs for second-year seeds hay, when grown, depend

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mainly on whether a dressing of farmyard manure or of artificials is given. In the latter event a very cheap crop is produced, in the former the cost approaches that of meadow hay.

By way of comparison one may refer to meadow hay. Owing to the universal custom of putting on about 12 tons of dung at least once in two years, this is a very expensive crop to grow, and if the crop is cut reasonably early the yield is small compared with seeds hay. We do not usually get more than 20 to 22 cwt. per acre out of the stack. With an average cost of £6 per acre this is equivalent to £5, 14s. per ton, or (again utilizing our own analyses) of 14s. 3d. per cwt. S.E. The S.E. is, probably, at least 40. Again, however, costs are greatly reduced on meadows which will carry a respectable crop for several years without dung.

In dealing with hay crops we would draw attention to the misleading habit experimentalists have of stating yields in terms of tonnage carted. This is 30 per cent. above the weight of usable hay obtained from the stack.

In order to judge the cheapness, or otherwise, of home-grown fodders one cannot take any crop singly. A fairer picture is obtained if one takes a hypothetical area and calculates costs over a rotation thus:

	Yield (tons)	*Starch Equivalent (cwt.)*	*Cost*
Roots (3 acres)—1 acre mangolds	35	42	£35 10 0
1 ,, swedes .	22	35·2	24 0 0
1 ,, kale .	25	45	30 0 0
Oats 3 acres . .	3	36	27 0 0
Seeds 3 ,, . .	5·7	39·9	21 0 0
Oats 3 ,, . .	3	36	18 0 0
		234·1	£155 10 0

Average cost per unit of starch equivalent—13s. 3d.

The average cost per unit of starch equivalent in purchased foods is 14s. to 15s. Thus, despite high costs and the conservative estimates of yields we have taken, home-grown fodders appear to work out cheaper than purchased. In any event, they are the only means open to us of cashing the costly dung and surplus labour.

We can, and do generally, feed a ration of home-grown foodstuffs capable of supplying maintenance and the first gallon of milk; on

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occasion we have successfully fed on home-grown foods up to 2 gallons, by using large quantities of hay or of kale.

With cows above 3 gallons, however, difficulties of bulk come in if more than the first gallon is made up of bulky foods; indeed we think that it is generally advisable to restrict such foods to maintenance quantities with cows over 3 gallons.

Although a good case can be made out for home-grown fodders on the score of cheapness, two factors militate with us against full utilization of our own findings—viz.

(1) The limited quantities which the higher-yielding cows can economically deal with—especially hay aud roots;

(2) The limited quantities per cow available, owing to the heavy stock we carry. This is by far the greater difficulty.

The current view of concentrates as production foods, though useful, obscures the fact that they have also a maintenance value —that is to say, when used they reduce the consumption of home-grown fodders. Modern dairying has reached such a pitch of intensity that we could not keep our cows alive at all on the resources of our own farms. Many a Cheshire farmer uses concentrates in the first place as a means of keeping more cows on his holding. Unconsciously we all adopt this practice to some extent. As to whether this practice is wise or not, that is beyond the scope of this paper to discuss. Obviously it is a question depending on that other portion of the costs which is made up of depreciation, overhead charges and so forth.

Feeding Cattle

To turn to farms in N.E. Scotland, the position here is very different. They are distinctly dual-purpose farms. The lay-out is designed for ease of working under the plough; but feeding is carried out as part and parcel of the profit-making, not as a means of making dung, wherewith to grow saleable crops.

Successful feeding demands a supply of cheap food, and the rotation is planned to this end. Being in touch with the methods adopted on certain farms in Kincardineshire, where cattle are successfully fed almost entirely on home-grown food, some account of the system may be of interest.

The soil on the farms is not naturally rich, but owing to the use of wild white clover in the temporary leys big crops are grown. If this land is worked under a four-course rotation, and is ploughed up after one year's ley, crops tend to be poor, so a six-course rotation is followed, the leys remaining down for three years. A heavy crop of clover hay may be cut the first year, but there is now a tendency to graze feeding cattle on part of the first year's seeds. The demand for hay is not so good as formerly, and it is not required to a large extent for feeding purposes—good oat straw giving almost as good

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results when fed with roots. The cost of growing hay is probably less than in Cheshire, but even so £5 per ton is not considered an attractive price.

Feeding cattle graze the whole of the second- and third-year leys, and the herbage is such that they fatten without corn or cake. On occasion a few potatoes and locust beans are fed in order to finish cattle early in the grazing season.

Oats normally follow the leys in the rotation, though potatoes are grown on part of the area—the most fertile part. Oats are the favourite cereal, as the crop can be depended on to yield, without manure, 22 to 30 cwt. of good grain, which may be sold or utilized for feeding; moreover the straw, when cut "sharp" and well harvested, provides excellent fodder at a low cost. According to Collins, oat straw grown after a good turf has a higher feeding value than straw grown on land containing little organic matter.

By using tractors and modern machinery the cost of growing oats is reduced to a minimum.

Oats are followed by turnips, swedes and potatoes—turnips for use in early autumn and swedes to provide a daily ration of about 70 lb. per head of cattle during winter. Like other crops in the rotation, roots derive much benefit from the residue of the ley.

Large-scale methods again reduce the cost of root-growing, and crops of 25 to 30 tons per acre can be relied on. Attempts have been made to substitute silage or hay for roots, but a moderate ration of swedes is regarded almost as essential to successful feeding.

Barley and oats are grown after roots and form the nurse crops for the seeds. Barley is grown for sale to distillers, but a good deal can be fed to cattle, and the straw comes in useful for bedding.

Home-grown oats, barley, oat straw and swedes are therefore available at a low cost for winter feeding, and practice proves that purchased foods are almost unnecessary.

Cattle of about 10 cwt. receive and eat 12 to 14 lb. of good straw and 70 lb. swedes or thereby. On this ration there is no tendency for animals to scour. Straw is not fed *ad lib.*, as is often recommended, and this is considered a point of importance. No animal receives more straw than it will clean up within an hour or so after feeding, and the butt-ends are eaten as well as the finer parts.

Oats and barley have meantime a very low selling value, current quotations at Aberdeen being 6s. and 8s. 6d. per cwt. respectively for high-quality grain. At these prices farmers should feed corn in preference to cake.

Considerable care is necessary in feeding grain to cattle in fat condition. At one time digestive troubles invariably followed attempts to substitute for the greater portion of the cake, normally fed, corn, especially barley. It may be that this result was to some extent due to the custom of drying in a kiln all grain sent to the

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mill for grinding. It was, however, discovered that if a little crushed linseed was added to a cereal mixture there was no trouble with cattle going off their feed, and this has led to a considerable economy in feeding. At the present time the ration in use is as follows: 6 parts oats; 1½ parts barley; ¼ to ⅓ part crushed linseed.

The ration has S.E. of 62, and costs about £7 per ton, whereas cakes with a S.E. of 70 to 73 cost from £12 to £14 per ton. Only first-class dry grain is used, and it is considered that it must not be kiln-dried. It is found that 4 to 5 lb. of this corn mixture, together with roots and straw, make an efficient fattening ration.

Rough tests on the farms tend to show that cattle can be finished rather earlier with a liberal use of cakes, but the type of ration mentioned has been used for at least three winters, and the results have been highly satisfactory.

On occasion a little linseed cake is added, and if cattle are on a heavy feed it has been found advisable to increase the quantity of linseed. The cattle purchased for feeding are not by any means outstanding, but the finished animals kill well, and hold a high reputation at Aberdeen auction, where the standard of fat cattle is high.

Now it is notoriously difficult to apply the findings obtained from consideration of farming methods of one area to another area. But there are certain general features which apply in both the areas under consideration. It is in the first place clear that there are limits to the dissection of farming costs and processes. The value of a crop can be judged only in the light of its position in the farming system as a whole. And secondly, cheap fodder, though doubtless less efficient than concentrated foods, is justified, or indeed necessitated, when the end-product commands a low price in the country's markets, or in other words—but we will refrain from quoting in this place the famous dictum of your illustrious founder.

THE DISCUSSION

Mr Harold Drewitt, Colworth, Chichester, said: Nearly all the speakers have dealt with the provision of winter food for live stock from the intensive-production point of view, but it must not be forgotten that there is another aspect of the question as regards milk production—viz. the cheaper production of milk without so much regard being paid to the quantity produced. This system simplifies and cheapens milk production in several ways. No elaborate buildings are wanted to house the cows in, as they lie out day and night whatever the weather, and are only brought into a temporary yard with a movable milking-shed at milking time; no

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