Restrictions

All controls of animal feeding-stuffs have now been revoked. Future supplies will depend upon the activities of private traders. No restriction has so far been placed upon their spending of any currency, including dollars, and if this continues there should be a greater supply than during the past few years. In addition the restriction upon the use of home-grown wheat has been withdrawn, and this should give poultry keepers access to supplies previously denied to them.

The Contribution of Grazing to the Nutrition of Farm Animals

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British farming is mainly devoted to livestock production, since 70–75% of the total value of all products sold off our farms is attributable to livestock, and nearly 50% to cattle and sheep. Approximately four-fifths of our total crop production, including grass, is used for animal feeding, supplemented by an annual importation of some 3–4 million tons of animal feeding-stuffs. Grass production is much the most extensive way of using agricultural land in the U.K. and of some 48 million acres, excluding 17 million acres of uncultivated rough grazings, three-fifths of the cultivated land is in grass.

Grass, therefore, is much the most important single crop in British farming and the main source of livestock food; in fact, it provides about twice the amount of nutrients obtained from all other sources combined. If annual food consumption of livestock is measured in terms of starch equivalent (S.E.), imports supply about 10% of the total, tillage crops and their by-products some 25%, and the balance, i.e. 65–70%, is supplied in grass. These proportions refer to food consumption by all livestock, including pigs and poultry which eat little grass, and therefore will not apply to the grass-eating animals. Between 80 and 90% of the total food intake of all cattle and sheep is obtained from grass but this proportion will vary considerably between the different types of grazing livestock. Obviously grass will be a relatively less important contributor to the diet of milk cows than with other cattle and sheep.

Conserved grass, hay, silage and dried grass, is used in the feeding of dairy cows to a much greater extent than in the feeding of other cattle and sheep and commonly provides about one-third of the winter food of the milk cow, or nearly one-fifth of her total annual consumption. Over the grazing season fresh grass supplies about three-quarters of the nutrient requirements of the cow. Over the year grass, in average practice, is the source of more than half the total food of cows.

The point is illustrated by the data from the Milk Marketing Board (1953) which indicate that about 55% of the energy nutrients eaten annually by cows are,

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on the average, derived from grass. The records from an analogous investigation, in which we are encouraging greater production and better utilization of grassland, shows that approximately 70% of the food requirements of milk cows, computed on the same basis, were obtained from grass in 1952 (Imperial Chemical Industries Ltd., unpublished data).

The total average annual production of grass in the U.K. (excluding rough grazing), calculated as S.E., is estimated at around 15 cwt./acre. This is really more an estimate of the utilized yield of grass than of the actual production available for use, since a good deal of the herbage grown is often wasted. The average of about 15 cwt. S.E./acre includes variations from as little as 6 cwt. up to 40 cwt. S.E./acre from grass on different farms and an even greater range in yields from different fields. Incidentally, in the investigation referred to earlier (Imperial Chemical Industries Ltd., unpublished data), the total average scale of utilized production from grass is approximately 1 ton S.E./acre annually, a figure slightly below the estimated national average for Holland. The main cause of this great range in grassland yield and the extent to which grass is commonly inefficiently utilized is its relative cost of production; the basic trouble is that grass, and notably when grazed, is extremely cheap in comparison with other foods. If its current general level of cost were doubled, grass would be exploited more efficiently and the average level of production substantially improved and it would still remain a relatively cheap food.

The economy of grass in livestock feeding is well illustrated in the comparisons, given in Table 1, between the relative importance and cost of foods from various sources (Milk Marketing Board, 1953).

Table 1. *Comparison of different foods for dairy cows in terms of percentage of total S.E. consumed and of percentage of total cost of food*

	Concentrates		Rough fodders		
	Purchased	Home-grown	Hay and silage	Other	Grazing
Percentage of annual consumption of S.E.	22	13	20	10	35
Percentage of total food cost	47	14	14	12	13

It will be noted that grazing was about five times cheaper than concentrates (and more than six times cheaper than purchased concentrates) and the costs of hay and silage were less than half that of concentrates and usually much less also than the cost of other fodders that were not by-products.

This particular example of relative food costs and the degree of reliance on grass in feeding dairy cows is quite typical of the findings in other analogous investigations which clearly establish that in common British practice grazing provides little more than a third of the average annual nutrients required by cows, although it does so for about one-eighth of the total food costs. On the other hand, purchased concentrates provide less than a quarter of the total nutrients at nearly half the total cost of feeding.

Why is this ? Is the reason that there is insufficient grass available on most milk-producing farms and it is either physically impossible or too costly to intensify current scales of grass production ? Or is it that grassland herbage, either grazed or conserved for winter feeding, is itself an unsuitable food for milk production and capable of sustaining only low levels of milk yields ?

In current common practice there is seldom such a shortage of grazing over most of the season as to make supplementary feeding necessary for the majority of cows, and in fact it is by no means rare, at least in some periods of the grazing season, to see herbage wasted on pastures. Moreover, by and large, there is no technical barrier to increasing the yield of grassland herbage on most farms very substantially, certainly by up to 50% above existing output. And this could usually be achieved with considerable economy in the current total cost of feeding. This contention is patently directly linked with the second of the possible limitations of the extent to which reliance can be placed on grass for milk production, i.e. its suitability only for low levels of yield. Clearly on this point our conclusions must be determined by actual experience under a wide variety of conditions, but theoretical speculation is also useful for indicating the scale of nutritive requirements that may be supplied in grass and the manner in which they are best provided from this source. Before turning to the latter aspect, Table 2 might be considered, which shows what has been achieved in practice on some fifty farms in 1952 where the deliberate aim is to use grass efficiently for milk production (Imperial Chemical Industries Ltd., unpublished data).

Table 2. *Contribution of grass to the feeding of milk cows on fifty farms endeavouring to use grass efficiently for milk production (Imperial Chemical Industries Ltd., unpublished data)*

	Concentrates		Rough fodder		Grazing	Total from grass
	Purchased	Home-grown	Roots, etc.	Hay and silage		
Percentage of total consumption of S.E.	13	10	9	27	41	68
Percentage of total food costs	29	14	8	25	24	49

Average annual milk yield per cow = 720 gal.

Average annual scale of grass utilization = 19–20 cwt. S.E./acre.

In considering the theoretical potentialities of grass for milk production primary significance attaches to requirements for energy (S.E.) and digestible protein (P.E.).

The S.E. and P.E. contents of grass at varying stages of growth, as indicated by crude-protein contents, are given in Table 3 together with the intake of these nutrients by cows grazing at two levels, 30 and 40 lb. dry matter daily. Table 3 also gives the numbers of gallons of milk that can be produced by the nutrients.

Table 3. *Level of potential milk production from grass according to nutritive value and daily consumption**

Composition of 100 lb. dry matter			Available nutrients in dry matter (lb.)				Gal. milk produced by nutrients after allowing for M†			
			30 lb. intake		40 lb. intake		30 lb. D.M. intake		40 lb. D.M. intake	
Crude protein (%)	S.E. (lb.)	P.E. (lb.)	S.E.	P.E.	S.E.	P.E.	S.E.	P.E.	S.E.	P.E.
12	56·0	7·5	16·8	2·25	22·4	3·0	3·5	2·9	5·8	4·4
14	57·5	9·0	17·2	2·70	23·0	3·6	3·7	3·8	6·0	5·6
16	59·0	11·0	17·7	3·30	23·6	4·4	3·9	5·0	6·2	7·2
18	60·5	12·5	18·1	3·75	24·2	5·0	4·0	5·9	6·5	8·4
20	61·5	14·0	18·4	4·20	24·6	5·6	4·2	6·8	6·6	9·6

* Allowance for milk production, 2·5 lb. S.E. + 0·5 lb. P.E. for each gal.

†M = Body maintenance and activity requirement, assumed as 8 lb. S.E. and 0·8 lb. P.E. daily.

The figures show that with poor quality low-protein grass, P.E. limits milk production, whereas with better grass, S.E. is the limiting nutrient. With an intake of 30 lb. dry matter daily, milk production varying from 2·9 to 4·2 gal., according to the quality of the grass, can be expected. Substantially higher yields, up to 6½ gal., result when the intake rises to 40 lb. dry matter daily.

Tangible evidence is afforded from the records of several hundreds of cows collected over the past 4 years that appropriately managed grass can normally meet the needs of cows giving up to 5–6 gal. daily—instances have been recorded of higher yields from grazing (Imperial Chemical Industries Ltd., unpublished data). These records refer only to animals that have maintained these yields for at least a month, and provided the management of grass (and animal) is right there is no evidence that the rate of decline of the lactation curve on good quality grazing is more rapid than normal.

Daily yields of 5 gal. and upwards from grazing alone are, however, rarely maintained throughout the season on any individual farm and, though readily obtainable in the spring months, are secured with increasing difficulty as summer advances into early autumn—although daily yields of 4 gal. on grass alone throughout September and into October have been recorded.

Analogous records of lactation yields show that with animals calving in early spring it is possible to obtain 600–700 gal. entirely from grazing and to feed 1000 gal. cows on grass alone. It is sometimes possible to lift these milk yields still higher by supplementary feeding to grazing cows, but this is generally unlikely where they are provided with good quality grass to satisfy appetite, except with those comparatively few cows inherently capable of abnormally high yields. As pointed out earlier, in ordinary practice grass provides little more than half the total feed requirements of milk cows, but individual farmers have obtained herd yields well above the national herd average when more than three-quarters of the milk—together with full maintenance—was provided from grass.

Compared with average practice this proportion may sound an excellent achievement, but taken for the herd over the year it means that grass is providing for little

more than maintenance and total average production of 1 gal. daily per cow. The National Milk Costs Investigation (Milk Marketing Board, 1953) shows that on the average almost $3\frac{1}{2}$ lb. of concentrates are fed for every gal. of milk produced throughout the year. Over the winter period the rate was $4\frac{1}{4}$ lb. for every gal. and 2 lb./gal. throughout summer. The national situation, therefore, is that all winter milk is produced on concentrates and in summer grazing provides for an average daily production of less than $1\frac{1}{2}$ gal. per cow.

All classes of grazing animal can be pastured more intensively than is the common practice in British farming. This implies growing more grass throughout the season over a longer season, and sustaining high nutritive quality of the herbage for animals with substantial requirements for production, i.e. milking cows and fattening stock. The technical methods of achieving these ends are now well tried, though it would be foolish to claim that no practical problems remain to be solved in producing and using the grass so as to satisfy optimum physiological needs of the animal and in integrating these factors in order to obtain greater output in the most profitable way. Greater progress has been made in postwar years in evolving the ways and means of exploiting more efficiently our greatest national farming asset; the more urgent remaining problem is to secure their incorporation in general farming practice.

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The Economical Rearing of Dairy Heifers

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The economical rearing of dairy heifers is more than a question of the amount of money spent on food, housing and labour to bring an animal to first calving. The value of a heifer at calving is probably about one-eighth only of the value of the milk she will produce during an average milking life, say of three and a half lactations, and although the cost of rearing is not an unimportant item in the economy of the farm it will always be a very variable one according to the price and kind of foodstuffs available at any given time. We know much about how to keep costs low without visibly affecting the health of the young stock, e.g. by the use of milk substitutes and cheap fodders. But if the environment, of which feeding is a part, during rearing should appreciably reduce the value of future milk production—irrespective of genetic capacity—it may be of the greatest importance in determining what is true economy in the feeding of dairy heifers.

Unfortunately there is little information on the effect of environment and especially feeding during the growth period on the production and health of dairy cows.