

RAW MATERIALS FOR IRISH ANIMAL HUSBANDRY.

By PROFESSOR JOHNSTON, S.F.T.C.D.

(Read before the Society, December 8th, 1950.)

There are three possible objectives for agricultural production. One may produce cash crops for direct human consumption. This, of course, involves tillage. One may produce animal products also for human consumption. In those few countries in which grass will grow readily this in some form—as grass, as hay or as silage—is the cheapest of all raw materials for animal product production. But tillage is also necessary in order to supplement the deficiencies of grass—fresh or preserved—as winter feed for cattle, and also in order to provide food for those animals, e.g. pigs, which can only make use of grass to a limited extent. The tillage need not necessarily take place on a farm which specialises in animal products, but the products of tillage must be available from some source, native or external, if such a farm is to specialise in animal product production. The third possible objective of agricultural activity is the production of raw materials for industry. The growing of cotton, jute, or flax are typical examples of the third objective. Agriculture in Eire is only concerned to a limited extent with this form of production but in Northern Ireland the growing of flax is quite important. There are a few areas in Eire also in which flax is grown.

The primary object of the first two forms of agriculture is the production of human food. But bye-products or joint products, which become raw materials for industry, are incidentally produced, for example, hides and wool. The converse also takes place. Cotton seed oil is an important bye-product of cotton growing. It is also possible to grow flax for the production of linseed as well as fibre.

Irish agriculture is concerned mainly with the first two forms and, traditionally, more disposed to produce animal products than cash crops for direct human consumption. Nature has clothed the Emerald Isle in a garment of grass and there are only a few areas in which it is *essential* to till the soil regularly in order to keep that garment fresh and green. According to modern scientific opinion there are only a few areas in which it would not be *desirable* to “take the plough round the farm,” and assist nature by treating grass as a crop well worthy of cultivation.

In regions where grass of some sort will persist from year to year it is possible to have a cattle or sheep economy with little or no cultivation of the soil apart from hay making. But if the cattle are to be adequately fed in the winter time, and other more intensive forms of animal husbandry practised, e.g. pig or poultry production, it is not possible to proceed without using the products of tillage husbandry conducted somewhere or other.

Broadly speaking the production of cash crops, e.g. wheat, is an important feature of overseas agriculture, while animal husbandry tends to become the main agricultural activity of Western European countries.

If the object of agriculture *was* merely to provide a maximum of subsistence with a minimum of labour there would, in the world as a whole, be less animal husbandry, and in fact less cultivation of the soil than there normally is. For much of the cultivation that takes place in time of peace (if such a time can be called normal) is with a view to providing food for animals in some country or other.

The pig is the most economical transformer of cereal raw materials into high class human food, but even the pig requires about 4 lbs. of a balanced cereal ration to produce 1 lb. of pig (live weight). Millions of human beings have in recent years learnt to subsist on the cereal products which in happier times were fed to hens and pigs, and there are hundreds of millions of Asiatics and others who have never known any higher level of subsistence. From the purely biological standpoint much of the animal husbandry that normally takes place is wasteful. Unfortunately in time of war, and post war (or inter war) emergency, the biological point of view must predominate. For many years after 1939 the specialised production of poultry and pig products was, in all European countries, either economically impossible or politically unjustifiable. Such animal husbandry as managed to survive was incidental to other farming operations, and the birds and animals concerned have been in the main scavengers of what would otherwise have been waste products. The one exception to this generalisation is milk production. Even in war time this particular form of animal husbandry must be maintained, for child life depends on it; even for adults it is an economic source of protein in the ration. Hence milch cows get the highest priority in the allotment of limited cereal supplies for animal feeding.

In time of peace there is a secular tendency for the general standard of living to rise. This is reflected in a relative increase in the consumption of animal products, and a stationary or declining trend in the consumption per head of wheat, potatoes, and other cheap sources of energy. In the course of the last century the relative cheapness of cereal products imported from overseas, and the rising standard of living in the industrialised countries of Western Europe have influenced the character of the agricultural activity that tends to prevail in their own countries. This trend may be illustrated from both British and Irish statistics.

In 1908 livestock and livestock products were 67 per cent. of British agricultural output. In 1925 they were 71 per cent. In the case of the twenty-six county area in Ireland the percentage rose from 86 in 1926-27 to 89 in 1929-30.

The tendency to specialise more and more on livestock and livestock products is, for all European countries where soil and climate are suitable and market outlets available, a normal and healthy peace time development. In the circumstances of the free economies characteristic of the nineteenth century the ultimate explanation may be sought in the changes of relative prices which made it more profitable to expand agricultural production in one direction rather than another.

The late Thomas Barrington read a paper entitled "A Review of Irish Agricultural Prices" to the Statistical and Social Inquiry Society of Ireland on 6th May, 1926. Some of the data contained in that paper illustrate a secular trend of relative prices which is significant for Western European as well as Irish agriculture. Between 1873 and 1896 general prices fell from an index of 100 to an index of 55. Wheat fell to nearly the same extent—to an index of 57. Butter prices fell only to an index of 65, pork to an index of 68, store cattle 1-2 years to 91, and 2-3 years to 92, whereas egg prices actually rose to an index of 120.

Comparing 1896 with 1913 general prices rose from an index of 100 to an index of 139. Butter prices rose relatively less—to an index of 115. Store cattle 2-3 years rose only to 133, but pork prices rose to an index of 178, and store cattle 1-2 years to an index of 147. Eggs at 147 exceeded the general index also.

When the prices of 1913 are compared with those of 1925 it becomes obvious that the permanent secular trend had not fully asserted itself after the dislocations of the First World War. The general price index was 160 in 1925 (1913=100), but wheat was still abnormally dear (179). Soon, like humpty dumpty, it was destined to receive a great fall. The pork index was below the general index (152). So too were store cattle 1-2 years at 152. Butter at 173 was above the general index. So, too, were eggs at 176. It is a thousand pities that Mr. Barrington did not live to continue these calculations into the 1930's. If that were done it would indicate a reassertion of the secular trend. The general principle may be stated as follows. In times of general economic expansion and rising general prices, the prices of animal products rise relatively more than the prices of cereal products. In times of general economic depression and falling general prices the prices of animal products fall relatively less than the prices of cereal products.

As we shall see Irish agriculture did react in an intelligible manner to the change in relative prices. The reaction was unnecessarily painful because of the thoroughly unjust land system that prevailed almost up to the end of the nineteenth century. But even if the land system had been an ideal one the final result, in terms of the relative emphasis on various agricultural objectives, would not have been essentially different.

In 1873, the twenty-six county area had 2,479,193 acres under corn, root and green crops, flax and fruit. In 1913 that acreage was only 1,697,706. There was a corresponding increase in "other land" which includes "grazed and barren mountain, turf bog, marsh, water, roads, etc." The area under pasture and hay remained much the same.

There is a widespread belief that more tillage even if it means less pasture, is synonymous with more agricultural production. This is not necessarily the case. A change from a tillage to a pastoral economy may cause some diminution of total agricultural employment, but it does not necessarily diminish the aggregate of employment and production in the nation as a whole, and may even contribute to its increase. In our special circumstances the change to an intensive grass farming economy and the further development of intensive animal husbandry (as soon as world circumstances will make it possible), might well increase the volume of production and employment in the nation's agriculture. An increase in total agri-

cultural output, associated with an increase in output per head of agricultural producers would provide the economic foundation for an increase in commerce between country and town, and therefore in the standard of living of both urban and agricultural producers.

If a farm is highly specialised for e.g. milk production or poultry product production it might well provide work for from six to eight persons per 100 acres of crops and pasture. It will make little difference to total agricultural employment, and perhaps none at all to the employment actually given on such a farm, whether the farmer concerned cultivates portion of his land to ordinary arable crops or whether he cultivates only a high quality of grass and buys the tillage crops he needs for his cattle and poultry rations.

A hen will consume nearly a hundred-weight of cereal products in the year and half of that will consist mainly of oats. Thus 100 hens would consume 50 cwts. of oats in a year, the produce of two and a half acres of land. From the national point of view it makes no difference, so long as a man is profitably feeding a large flock of hens, whether he grows the oats for them himself or whether he buys the produce of his neighbour's tillage. Normally small farmers *must* specialise in animal husbandry if they want to make any sort of tolerable living. And they *must* buy the bulk of the rations which they feed to their pigs and poultry. Hence their special dependence on imported feeding stuffs, but an important proportion of their requirements in this respect is normally obtainable from other Irish farms if not from their own.

Output per acre is said to be higher on small farms than on large. In fact the smaller the farm the higher, as a general rule, is output per acre. But the smaller the farm the greater is the relative importance of "farmyard products," e.g., pigs and poultry, as distinct from "farm products", e.g., wheat and potatoes. As we have seen the small farm which specialises in farmyard products must have access to raw materials from sources other than the farm itself. Total output per acre includes the output of farmyard as well as farm products. Since the former bulk so largely in the economy of the small farm its output per acre appears to be very high. It is necessary to bear this fact in mind in interpreting the relevant agricultural statistics.

More tillage can sometimes mean less production. Something of the kind seems to have happened in our agricultural experience in the years following the outbreak of the "Economic War" in 1932. The policy of the new Government was to "speed the plough" and promote the maximum degree of agricultural self-sufficiency. Prior to that date the natural tendency to specialise in animal husbandry had led to the production of important export surpluses of cattle, dairy products, eggs, poultry and pig products. Hardly any wheat was produced at home, and we imported also considerable quantities of maize and other feeding stuffs. We also imported significant amounts of relatively low quality foreign bacon to take the place of some of the high quality native product which we preferred to sell in export markets. The new agricultural policy took the form of a guaranteed price for wheat, much higher than the world price, and also aimed at producing most of the 100,000 tons of sugar we normally consumed. The effect on our export capacity was injurious, but in any case our exports were tending to dwindle in consequence of the penal duties confronting them in the British

market. In the course of a very few years the pattern of our agricultural output was drastically changed. The total tillage was increased. In 1931 we had 1,426,090 acres of corn, root and green crops, as compared with 1,698,000 acres in 1913. In 1938 the acreage had increased to 1,567,000 from the level to which it had fallen in 1931. But the emphasis was no longer on animal husbandry as it had been in 1913 and 1931. In 1929 only one-tenth of our agricultural output took the form of cash crops. In 1938 this proportion had increased to one-sixth. More tillage, however, did not mean a greater volume of physical production. Here is an index of the physical volume of agricultural production, calculated by Professor Duncan, F.T.C.D., and published in a paper read to the Statistical and Social Inquiry Society of Ireland on 26th October, 1939.

TABLE I

Physical Volume of Agricultural Production (Index 1929=100)

	1926	1929	1931	1933	1936	1937	1938
Crops	104	100	91	103	130	124	120
Livestock and Livestock Products	92	100	103	93	98	90	93
Total	94	100	101	95	103	95	98
Prices	101	100	81	62	72	78	82

The increase in crop production reached a maximum in 1936, but in view of the relatively greater weight that was still attached to our (declining) animal husbandry it only carried the index of *total* agricultural production (physical volume) to a level 3 per cent. in excess of the standard year. In the following two years crop production declined from this maximum. The general effect of the whole policy was that, while the pattern of our agricultural effort was changed, the physical volume of production *as a whole* fluctuated closely round about the level of the standard year and displayed a considerable degree of inelasticity. In fact if we may regard the increase from 94 in 1926 to 101 in 1931 as a normal trend the subsequent years were years of arrested progress with a long term tendency to decline.

One aspect of the change was a decline in the proportion of the oat crop fed to live stock. In 1926-27 this was officially recorded as 68.75 per cent. In 1929-30 it was 73.2 per cent.—a healthy and normal trend. In 1934-35, it was only 61.6 per cent. The total acreage under oats declined as the area under wheat increased. In 1931 we had 623,000 acres of oats, in 1938 only 570,000 acres. Oats is pre-eminently a forage crop closely related to the processes of animal husbandry. The decline in its production, and in the proportion of the crop used for animal feeding, was symptomatic of the decline in animal husbandry that was the converse of the new emphasis on cash crop production.

The acreage under wheat increased from 21,000 in 1931 to a maximum of 255 000 during the Economic War. Even that high level

has had to be more than doubled during the Second World War, and yet we had to rely on external sources for a considerable proportion of our wheat supplies in those tragic years. Agricultural self-sufficiency has continued to elude us with regard to this crop, and is now no longer sought.

We were more successful with sugar beet. We had 5,000 acres of this in 1931. During the Economic War it was raised to 62,000. In 1943, an acreage of 83,000 was enough to provide us with a nearly normal ration of sugar.

Our policy in the 1930's with regard to both wheat and sugar has been defended on the ground that it enabled us to come through the Second World War with a greater degree of comfort than would otherwise have been possible. Both may be regarded as measures of national insurance, and both were certainly expensive at the time, in terms of higher cost of living and indirect cost to the exchequer.

Actually, the growing of wheat before 1939 as a cash crop, divorced from a profitable live stock economy, was destructive of the fertility of our soil, and probably impaired our capacity to provide ourselves with an adequate supply of native wheat during the actual war years. The sugar beet policy practised is more defensible in the light of after events, but a policy of large scale storage of cheap imported sugar with a smaller acreage under beet at home might have been equally effective and certainly much cheaper.

Our agriculture is mainly an affair of animal product production. Even in the midst of the Economic War in 1935-36 when gross output amounted only to £42,553,000 live stock and live-stock products accounted for £30,934,000 of this total. In 1942-43 in the middle of the Second World War when crop production had reached its maximum expansion, live stock and live-stock products contributed £57,584,000 to a total gross output of £86,203,000.

The principal raw material of animal husbandry in our case is, always has been, and always will be grass—in one or other of its forms, fresh or preserved. We have normally about 8,000,000 acres under pasture and 2,000,000 under hay in a total area of crops and pasture of about 11,500,000 acres. Even in 1851 when the area of ploughed land was at its maximum, 3,509,000 acres, more than two-thirds of our total agricultural area was nevertheless, in grass. Grass is therefore by all odds our most important crop, and the principal raw material of our animal husbandry.

Lately agricultural scientists have attempted to estimate the "total digestible nutrients" derived by animals from grass, and express the result in terms of a common unit which will facilitate comparison with the food units derived from ordinary tillage crops. The terms "starch equivalent," "protein equivalent" and "cereal equivalent" are commonly used in this connection. The present writer does not pretend to any expert scientific knowledge in these matters but he has derived much information from farmers who take an intelligent interest in their job. On an average Irish pasture a two year old bullock ought to put up half a hundred weight a month during the six months that the average pasture maintains its feeding value. That amounts to three hundred weight derived from grass alone. At the usual ratio of 4 lbs. cereal equivalent to 1 lb. live weight of beef it would take 1,344 lbs. of a cereal ration to give the same result. Incidentally it would *not* give the same

result for the lack of succulence in the cereal ration would have to be supplemented in some way.

About half the "input" of food is required as a maintenance ration. In an open winter an average pasture will provide a maintenance ration even in the six winter months. Only when the ground is covered with frost and snow is it usual to supply hay to our out-wintered dry cattle. If then an average pasture will provide a maintenance ration for twelve months and a growth ration of three hundred weight live weight in six of those months it follows that the total cereal equivalent yielded is three times 1,344 lbs., or 4,032 lbs.

Allowing two statute acres of average pasture to each large bovine animal it looks as if the food units derived from grass are of the order of one ton per acre.

Dr. Henry Kennedy, who is an enthusiast as well as a scientific authority on these matters, estimates the average output as "somewhat under 1,000 lbs. starch equivalent per acre." He adds that Stapledon and Davies in their book on "Ley Farming," have given grounds for believing that a young ley pasture, if properly utilised, will produce 4,032 lbs. of starch equivalent and 7.2 cwt. of protein equivalent per acre per year.

Anyhow there is no doubt that even if our large area of pasture produces only half a ton per acre per annum of starch equivalent it is by far the principal contributor of raw material to our animal husbandry as a whole. There is equally no doubt that by the application of scientific methods of intensive grass cultivation this output could be doubled and possibly even trebled or quadrupled in the course of a very few years. This is not only the opinion of academic scientists but of practical farmers who have proved it in their own experience and profited by the result.

Even our tillage operations are normally aimed at producing food for animals rather than cash crops for direct human consumption. Grass is of fundamental importance, but its feeding value falls off in the winter months, and pigs and poultry require a more concentrated ration than grass affords. It is not generally realised that even pigs and poultry can derive an important proportion of their ration, perhaps a fifth or so, direct from grass.

Normally about 70 per cent. of our oat crop and 40 per cent. of our barley crop are fed to live stock. Normally the whole of our root crop and over 70 per cent. of our potato crop are similarly used. Beet pulp has also been available for this purpose to an increasing extent. The total of these, expressed in terms of cereal equivalent, represents the contribution of our own agriculture, apart from grass, to the supply of raw materials for animal husbandry.

Among imported raw materials maize is of chief importance. Since 1932 the import of maize meal has practically ceased. The grain has been imported and ground into meal over here. A certain amount of wheaten bye-products have also been regularly imported.

There is also an item referred to in the table below as "Home Processed Wheaten Bye-products." This doubtless includes some bye-products of home-grown wheat, but also no doubt some imported materials. As it was impossible to say in what proportion they were home-grown or imported, they are placed in a separate column. The data contained in the table below are adapted from p. 97 of the Majority Report on Agricultural Policy, issued by the Committee of Inquiry on Post-Emergency Agricultural Policy.

TABLE II.

Raw materials for animal husbandry (in thousands of cereal tons).

Products of	1926	1932	1936	1939	1940	1943	1947	1948	1949
<i>Domestic tillage</i>									
Oats (1) ...	443	435	358	374	502	552	542	657	464
Barley (2) ...	72	53	61	37	69	94	43	50	78
Potatoes (3) ...	308	579	430	575	605	599	475	644	498
Turnips (4) ...	374	338	266	258	244	226	237	246	199
Mangles (5) ...	168	164	160	169	170	142	125	138	144
Beet Pulp (6) ...	6	11	46	30	48	53	35	45	47
Total (1) to (6)	1,371	1,580	1,321	1,443	1,638	1,666	1,457	1,780	1,430
<i>Imports</i>									
Maize (7) ...	323	561	217	408	289	Nil	76	225	290
Maize meal (8)	43	24	Nil	2	2	Nil	2	2	4
Wheaten by-products (9)	22	40	1	31	15	Nil	3	5	Nil
Total (7) to (9)	388	625	218	441	306	Nil	81	232	294
Home processed Wheaten by-products (10)	86	89	152	164	146	11	57	61	93
Total available supplies ...	1,845	2,294	1,691	2,047	2,090	1,677	1,595	2,076	1,817

In arriving at units of cereal equivalent it was assumed that the food value of oats, barley and maize were much the same, weight for weight. In the case of turnips and mangels the gross weight of the annual crop was divided by ten in order to arrive at the cereal equivalent. In the case of potatoes the gross weight of the crop available for animal feed was divided by four.

In interpreting this table it must be constantly kept in mind that it refers only to a fraction of our grand total of raw materials for animal product production. It does not include the food units supplied by 8,000,000 acres of pasture and 2,000,000 acres of hay and silage. In 1913 we had just over 2,000,000 acres under hay. The yield was just over 4,500,000 tons. This has been officially calculated as equivalent to just over 1,000,000 starch tons in food value (*Agricultural Statistics, 1847-1926, p.11*). Apparently, it takes about four tons of hay to yield one ton of what is called for short S.E. In 1913 we had a yield of 850,000 tons of wheat, oats, barley and rye, and the S.E. equivalent of this total is given as 531,000. Very roughly we may assume that eight units of cereal equivalent contain five units of S.E. In terms of cereal equivalent, then, 1,000,000 tons of S.E. derived from hay (in 1913) may be shown as 1,600,000 tons.

We have already seen that Dr. Kennedy estimates the average output of our 8,000,000 acres of good, bad and indifferent pasture, very conservatively, at 1,000 lbs. S.E. per acre. This is evidently the same as 1,600 lbs. of cereal equivalent. In 1913 we had nearly 8,500,000 acres of permanent pasture. Consequently its output of food units in terms of cereal equivalent may be estimated at just over 6,000,000 tons.

It comes to this then, that in 1913, in addition to the food units derived from our own tillage and from imported supplies, we had 6,000,000 tons from native pasture and 1,600,000 tons from native hay. When we come to the years following 1926, which are more significant for our present purpose, these totals will doubtless require some modifications, *but the order of magnitude will remain the same*, in comparison with food units derived from tillage and imports.

Referring now more particularly to the latter it will be seen from the table that "Total Available Supplies" increased from 1,845,000 cereal tons in 1926 to a maximum of 2,294,000 in round figures in 1932. During the "years which the locust (of Economic War) hath eaten" the total fell to 1,691,000 (in 1936), rose again to 2,090,000 in 1940, but fell again afterwards. The tendency to recovery was effectively checked by the circumstances resulting from the Second World War. It will be observed that imported supplies practically disappeared after 1940 and our native tillage effort, much strained by the endeavour to feed the human population, was quite unable to compensate for the deficiency in animal feed. It will also be noted that in all the years under consideration domestic production contributed the lion's share of total available supplies. Even in 1931, when imported supplies were temptingly cheap and the import of maize nearly doubled, domestic production nevertheless contributed 60 per cent. of the total in question.* The decline of tillage in 1931 was represented as proof positive of agricultural ruin but the ruin was to come later in some degree when tillage had been stimulated to display an unhealthy increase.

Among native "forage" crops, oats plus barley, potatoes and roots contribute each about a third of the total.

Quantitatively the import of animal feed is relatively unimportant, but qualitatively it is of pivotal importance. The products of native tillage do not provide a balanced ration for live stock. The cereals, potatoes and roots contribute mainly carbohydrate and are all weak in various degrees in the protein element. Grass, hay, silage and skim milk (a bye-product of grass husbandry in our case) are the only animal foods of native origin which contain an adequate proportion of protein. Consequently native tillage for the production of animal feed is and must be closely integrated with the import of those supplementary elements which native tillage cannot provide. *Only to the extent that our agriculture is based on grass, fresh or preserved, can we hope to achieve agricultural self-sufficiency with regard to animal feed.*

There is a natural affinity between skim milk and potatoes. In combination they provide an almost ideally balanced ration for pigs or poultry. Unfortunately they are so bulky that they must be supplemented by "concentrates" if optimum output is to be secured. It is still more unfortunate that skim milk is only available in the summer when the old crop potatoes have all gone bad, and potatoes are only available in quantity when skim milk is scarce. Consequently each of these valuable native raw materials is apt to be wasted when for any reason it is impossible to supplement them by concentrates of domestic or external origin. Such waste regularly happened during the Second World War.

* See table on page 97 of Majority Report on Agricultural Policy, by Post-Emergency Committee.

Finally, it may be noted that the total area under hay did not vary significantly between 1913 and 1943. The area under pasture was about 8,000,000 acres between 1929 and 1939. Owing to the necessary increase of tillage it declined to 7,142,000 acres in 1943. Consequently we may assume that in the year only 5,000,000 tons of cereal equivalent were available from that source for our live stock instead of just over 6,000,000 tons, as in 1913.

These results will have greater significance if set out in the form of a table.

TABLE III.

Cereal Equivalent (in thousands of cereal tons) available from

	1932	1936	1939	1943	1947	1948	1949
Pasture	6,000	6,000	6,000	5,000	5,100	5,200	5,600
Hay	1,700	1,570	1,480	1,510	1,600	1,600	1,600
Domestic tillage	1,580	1,321	1,443	1,666	1,457	1,780	1,430
Imports	625	218	441	Nil	81	232	294
Total	9,905	9,109	9,364	8,176	8,238	8,812	8,924

The post-1943 figures in both these tables have been calculated as far as possible in accordance with the principles on which the figures published in the official report have been calculated. (See page 29, paragraph 77, of the Majority Report on Agricultural Policy by the Committee on Post-Emergency Agricultural Policy for a description of the method.) No great accuracy is claimed for the figures themselves but the "order of magnitude" is almost certainly right. They do at least illustrate the relative magnitude of the products of domestic, tillage, as raw materials for our animal husbandry, in comparison with imports which are supplementary. The latter in their capacity as "missing components" have, nevertheless, an importance which is more than proportional to their relative quantity.

The overwhelming importance of grass and its derivatives, even in their present neglected and imperfect condition, is perhaps the chief significance of these tables.

DISCUSSION

The President in his reply reasserted his belief that 1,000 lbs. S.E. was a reasonable estimate for the annual output of average pasture land. He considered that the monthly increase of live weight of average cattle during the summer and autumn months was one possible way of measuring such output and perhaps the best way. There was no direct inference from the yield of meadows to the yield of pastures for two reasons:

- (1) Meadow grasses are in the main different from pasture grasses.

- (2) The output of a pasture depends on its being stocked with the optimum number of live stock during the whole grazing season (and rested intermittently) and therefore varies with the skill displayed in its management as well as with climatic conditions.

He did not take account of the feed value of beet tops because in the years under consideration the feed value of beet tops was only beginning to be appreciated.

In reply to Dr. Senior he expressed the view that one ton of oil cake was worth much more in feeding value than one ton of cereal, and he did not know how to express it in terms of cereal equivalent tons. He was aware of the possibilities of potato silage but aware also of the technical difficulties that must be overcome before it comes into general use.

He agreed with Mr. Eason that while doubling or trebling the output from grass was technically possible there was a human problem that must be solved before such possibilities are actualised in our grass-land farming as a whole.

In reply to Professor Shirras the President reasserted the interdependence of tillage with grass farming in Ireland. More tillage with fewer cattle would mean less animal manure, declining crop yields, and therefore less human food per acre for every acre tilled. We had that experience already during the second world war, and it was common in the Eastern European peasant countries during the 1930s.