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PROBLEMS OF STOCK FEEDING

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Historical Review

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My acceptance of an invitation to provide an introduction to today's proceedings has imposed upon me a task much more difficult than I had at first anticipated. The history of nutrition is largely a history of agriculture and I propose this morning briefly to refer to a number of historic happenings in Scotland, to indicate how these had a bearing upon the science of nutrition and also to glance in passing at the conditions of husbandry in Scotland as they obtained from time to time.

Little is known of agriculture in Scotland before the 12th century but then, under the direction and guidance of the monasteries, the cultivation of the soil and the rearing of livestock, if primitive in character, were assiduously practised and there is reason to believe were being progressively developed.

All this was changed by the sudden and tragic death of King Alexander III, which occurred in 1286. The death of Alexander closed an epoch. Immediately there arose the War of Succession to be followed by the Wars of Independence, followed in turn by four centuries of strife, unrest and consequent poverty. It has been truly said that even in the south, from the Treaty of Birgham in 1290 to the Act of Union in 1707, the men of the Borders had their minds filled with forays and raids, with the theft of others' beasts and the defence of their own, rather than with efforts to improve the quality of their land and their livestock. But with the Union of 1707 came peace and a new era and, although in the first half of the 18th century, agriculture as a whole made relatively little advance, there were then made, as we shall see, numerous important individual advances that prepared the way for the great agricultural revolution which may be said to date from 1750.

Let us look at the state of affairs in the early seventeen hundreds.

The land lay completely unenclosed except round the demesnes of the nobility and gentry. Not a dyke, not a fence, not a hedge, and over extensive areas of the country not a tree as far as the eye could reach. There was some truth in Dr. Johnson's ponderous remark that "a tree in Scotland is as rare as a horse in Venice".

The food of the people consisted almost entirely of oats (the old, poor grey oat) and bere which, although a poor sort of barley, was supposed to be the only kind that would grow in the soil. There were also some pease, and green kail from the yard, for almost no other kind of vegetable was known to the common folk. Animal flesh was almost entirely

unused by the great mass of the people unless a cow or a sheep was found dead of disease or hunger. As late as 1780 there were many small towns in Scotland without a single butcher's shop.

The grey oat was cultivated on the outfield for 3 successive years after which the land lay fallow for 3, 4 or even 6 years. Manures, apart from dung, which was reserved for the infield or inbye land, were unknown. Even lime was scarcely known as a fertilizing agent before 1730. It will be understood why the third year oats were called the "wersh crop"; the yield was so miserable. The average yield of the grey oat was threefold, three seeds returned for each seed sown,

"Yin tae saw and yin tae gnaw
And yin tae pey the laird witha'".

Often the wersh crop gave only a two seed yield; a fourfold increase was considered a noble return.

The cattle were the Black Cattle, the old race indigenous to Scotland. It is said that even after attempts to fatten them they did not weigh over 10 to 12 stones (most probably Dutch stones of 22 lb.). Cows gave very little milk, just a few pints a day. It was recommended that a calf might be reared on the milk of two cows, some of the milk also being used for the household. The cows were generally too wild to milk unless their calves were beside them. The Highland sheep were the native greyfaced breed, poor, small, stunted creatures. The average carcass weights of mature animals ranged from 20 to 25 pounds; the fleece weighed no more than a pound or two. The pigs, we are told, were ugly razor backed brutes, mischievous, constantly making inroads on the homestead and yard, and who can blame them? They must have been half famished.

In summer the cattle were sent to starve on heathland; there was no sown pasture and horses had no grazing other than the grass that grew by the wayside or on the baulks or strips of waste ground. The outfield, when in fallow, acquired a natural herbage of weeds, moss and thistles on which stock was also pastured. Such hay as was made was bog hay of relatively low feeding value.

In winter the stock, including the sheep, were housed in wretched hovels; it was firmly believed that even sheep must be kept under cover if they were to live. It is said that a mere accident dispelled this delusion in the north. A Perthshire laird, who had fallen on ill times and had become an innkeeper, let his sheep run on the hill as he had no winter keep for them. When spring came, it was found, to the general amazement, that they were in better fettle than those that had been handfed in houses.

This is understandable when one considers the nature of the winter feed, which consisted mainly of straw, chaff and mashed whins, that is, whins threshed with the flail. On such food the beasts became progressively more emaciated and weaker as the winter wore on. In bad seasons in the Highlands one-third to one-half of the cattle might be expected to perish. When spring (and grass) came many of the survivors were unable to walk. This was known as the "lifting time". The farmers assisted each other in lifting and carrying the cattle out of the byres.

On top of all this, contagious disease ran uncontrolled throughout the land. The prevailing malnutrition must certainly have predisposed to worm infestation but, because of the poverty of the pastures, intensive grazing as we know it today was impossible, and it is likely that the chance of infestation was relatively low.

In the Highlands a different system was followed. The young cattle and the horses were sent to the hills from May till October where they were attended by the young people of each family. In June or July, depending on the district and the weather, the farmers with their entire families and the rest of their stock, milch cows, ewes, goats, swine and poultry, removed to the shielings, which were temporary huts and folds in grassy, sheltered spots in the upward glens and corries of the mountains; there they remained till about the end of September when they returned to the crofts to gather the harvest.

The sheep and goats were relatively few in number. They were housed each night and from the beginning of June to about the middle of September they were milked morning and evening. But the Black Cattle were the staple of the stock and the milch cows were the objects of especial care. To guard against the evil eye a charm would be said over them every morning and the cross bar of the milking shackle was made of witch elm or rowan as a precaution against witches. The people lived happily enough on their shielings, laying in stores of butter and cheese while the pastures on the straths and inbye lands round the homesteads were rested and allowed to produce winter keep.

This system was pursued beyond the Highland line till near the close of the 18th century; indeed it was continued, in some considerable way, till well into the 19th century.

As for the lowland folk, they lived lives of monotonous toil, rudely housed, ill clad. Their fare, as has been indicated, was plain enough although it cannot be said to have been unwholesome; but too often there was not enough of it, and in bad seasons famine stalked the land. In 1740 Lord Leven writes from Melville Castle, at Eskbank: "Here we have no grass at all; if we have no change of weather the people must starve. The poor creatures in the neighbourhood come here begging to pull nettles about the dykes for themselves and heather and moss for their beasts. We have daily shoals with death on their faces."

There are several references to the use of slugs and snails as human food. These were collected in the autumn and preserved in salt against the exigencies of a hard winter.

The famished cattle had another hardship imposed upon them; they were repeatedly bled and the blood mixed with meal as human food. People apparently developed a taste for this dish and we find it used even in times of comparative plenty.

According to a writer in the *Gentleman's Magazine*, 1766:

"The common people are such in outward appearance as you would not take them at first to be of human species, and in their lives they differ little from the brutes, excepting their love for spirituous liquors. They would rather suffer poverty than work. The nastiness of the lower people is really greater than can be reported; their faces are covered with smoke; their mouths are wide, and their eyes are sunk as

one pulls the face in the midst of smoke, their hair is long and almost covers the faces."

That picture may not be overdrawn but the contempt in the writing of it is without justification; it is simply a description of apathy, the apathy that comes of hopeless, grinding poverty.

But, as I have said, during this time agricultural methods were being intensively studied although, at first, only by a small handful of men; these consisted almost entirely of great landowners, but as the 18th century proceeded the study of agriculture and the diffusion of agricultural knowledge became something of a passion. The improvements were, naturally, first directed to the land but soon the breeding and feeding of farm animals began to claim attention.

Let us glance, in more or less chronological sequence, at some of the high lights that made for the remarkable improvement in agriculture and therefore in nutrition in the 18th and 19th centuries.

In 1710 James Meikle of Saltoun, East Lothian, introduced from Holland the winnowing machine. Previous to this, chaff was separated from the grain by hand-riddling it on windy days on the tops of knowes called shillinglaws. In the same year barley mills were set up in Saltoun; they were there, and nowhere else, used for 40 years. They quickly came into general use after 1750.

About 1715 began the enclosure of the land into separate fields.

The improvement of pastures by the sowing of grass seeds was begun by the Earl of Haddington as early as 1720. Cockburn of Ormiston, about 1723, set the example of sowing ryegrass and clovers. About 1723, too, Thomas Hope of Rankeillor carried out his famous demonstration of land reclamation. He took a lease of a morass known as Straightons Loch, drained it and laid it out as grass parks. This land lies just outside these windows and is known today as the Meadows.

It would appear, however, that seeding with improved grasses was intensively studied only in the last decade of the 18th and the beginning of the 19th centuries. When grass was first introduced as a seeded crop it caused great indignation and men said: "It was a shame to see beasts' meat growing where men's meat should grow".

The potato was rarely grown in Scotland, even in the kail yards of the people, before 1735. It is said to have been first grown as a field crop in Scotland at Kilsyth in 1739. Sturrock says as early as 1729 in Ayrshire, but presumably on a very limited scale. During the next 10 years the tuber was extensively cultivated in Scotland and after 1750 became the common food of the people.

The ancient and almost universal system of "run rig" consisted in the land being let for short terms to a number of tenants, each of whom farmed a "rig" or ridge of land with the help of the others. In winter the rigs became common grazing. This wasteful system, which starved all enterprise, began to disappear after the middle of the 18th century. In place of it the rigs were levelled, and small farms were formed and let to individuals on long leases of 19 years. As the result of this change it was said that "every man was late and early at his work and performed twice as much work as when the work was common".

In 1750 John Small of Dalkeith invented the iron swing plough drawn by two horses; this replaced the cumbrous wooden plough drawn by

anything from 2 to 8 oxen (maybe 2 horses and 4 oxen were used as a mixed yoke).

In 1751 the passing of the Turnpike Road Act resulted in the construction of roads suitable for wheeled vehicles and so made possible the use of farm carts; these were practically unknown south of Glasgow till 1726, and were not generally employed even in the Lowlands before 1760.

Then there came that blessed root, the turnip. Turnips had been introduced into England from Holland in 1716, but until 1739 they were only sown broadcast in little patches and never properly cultivated; naturally they often failed. They were sown in Roxburgh in 1747 by Dr. Rutherford. The people of Melrose "gathered in crowds to watch the "doctor's man" casting the queer seed in the wake of the plough, while another man behind dragged a whin bush to cover the seed with the earth". We are told that the people with silent, though devout, fervour implored the blessing of Providence on the experiment. But when the crop developed these same people in their curiosity pulled up the odd roots to examine them and this "in spite of threats by tuck of drum and of iron caltrops and iron traps".

Cockburn of Ormiston, among others, is said to have been the first to raise turnips in drill, but it is strange that the value of turnips for stock feeding was long in being appreciated. They did not become a general rotation crop in the Lothians until after 1770, and in Aberdeenshire scarcely 200 acres were grown until after the disastrous harvest of 1782; thereafter turnip cultivation rapidly became general.

The use of turnips produced spectacular results. The Reverend Mr. Ure in his *Agriculture of Roxburgh* says that 2 bullocks fed on the first crop grown in that county grew so big that the people regarded them as "monsters" and would have none of them (Ure, 1794). The turnip really revolutionized cattle feeding and breeding. By providing ample winter keep it prevented the awful starvation of the beasts throughout the long dreary winters, and permitted the breeder for the first time to select his stock animals and thus begin to build up the magnificent herds we know today.

The years 1745-46 mark another new epoch for, after the Jacobite Rising of that time had been quelled, the patriarchal system and that of heritable jurisdiction were abolished. About this time, too, it was becoming recognized that much of the hill pastures was virtually waste land and could be made much more profitable if systematically grazed by sheep. The patriarchal Highland chiefs, now turned landlords, evicted their small tenants and turned wide districts of hill land into "walks" for blackfaced sheep brought by graziers from the Southern Uplands.

This development, which effected marked changes for good and ill in the agricultural, economic and sociological life of the Highlands began about 1760 and progressed rapidly. The first sheep farmer settled in Rossshire in 1782, and we find that by 1790 quite a number were established north of the Great Glen; but the big "Highland Clearances" were chiefly made between 1810 and 1820. These dates I believe to be important for they have a very distinct bearing on the state of nutrition of Highland flocks today.

With this great change in our methods of hill sheep farming in the Highlands went the little crofting communities with their summer shielings in the hills and thereafter "there was heard nae mair liltin' at the ewe milkin'".

In 1806 Sir John Sinclair introduced the "Long Sheep" of the eastern Scottish Border into Caithness and called them for the first time the Cheviot (the Blackface was then known as the "Short Sheep").

During the years round the turn of the century Scottish agriculture advanced with remarkable rapidity. I would mention three more dates as indicative of the trend of the times. The Highland Society was founded in 1784, the chair of agriculture in the University of Edinburgh in 1790, and the Royal (Dick) Veterinary College in 1823. Indeed, it was generally recognized that Scottish agricultural knowledge now led that of England. I now quote from Orr (1931): "Instead of English farmers being brought north by noblemen to teach the Scottish farmers, Scottish grieves were taken south to introduce the new Scottish system of rotation of crops, deep ploughing, hay-making, corn-cutting with the scythe, and stall feeding of cattle."

We must, however, go to the Continent for two happenings that, in their different ways, opened another new era. In 1809 Albert von Thaer devised the first feeding standard, and in 1840 Liebig, then at the height of his fame, delivered his famous address to the British Association, afterwards published under the title "Chemistry in its Application to Agriculture and Physiology". This really founded agricultural chemistry and laid the basis of rational feeding and the use of artificial manures.

Probably as the result of the inspiration of Liebig there was formed in Edinburgh about 1842 the Agricultural Chemistry Association of Scotland followed in 1848 by the establishment of the chemical department of the Highland and Agricultural Society. At this time, we are told, every substance that might bear even a remote interest for agriculture was submitted to chemical analysis.

The feeding of farm livestock as we know it today has been evolved by the practical stockman and the chemist, or better, the physiological chemist or, in other words, by the artist and the scientist; for let us be mindful of this (we are apt to forget it) we are dealing here with not only a science, but also an *art*, the science of nutrition and the art of feeding.

In tracing, however imperfectly, the rise of Scottish agriculture my object has been to try to clarify in our minds the conditions which existed in the past, so that we may establish, roughly it must be, about when, so to speak, the modern nutritionist gets off his mark, or, to put it in another way, about when food became sufficient in quantity to permit of adequate nutrition; for it was only then that the value of this or that food substance or method of feeding could be comparatively assessed. As I have indicated that period was somewhere in the latter half of the 18th century.

The subsequent history of nutrition must be left in other and more competent hands, but, as a veterinarian, I would indicate two important matters which have a bearing upon disease.

After the Highland Clearances the sheep stock on the hills are said "to have thrived amazingly". This is not to be wondered at; the pastures were fresh ground, undepleted of minerals, uncontaminated by parasites,

but after only 40 or 50 years we find that there were complaints in respect of the carrying capacity of the grazings, and only now, after 150 years, science is awakening to a condition of affairs long recognized by practical flockmasters. The condition of semi-starvation and disease into which we have again plunged our hill flocks is only now being properly appreciated; it has even been quoted in a Government report, and we, at this late date, would seek means to rectify it.

The second matter concerns the dairy cow which has been bred to produce a truly enormous quantity of milk. The present standards of production could never have been reached by the breeder without the aid of the nutritionist. So nicely are dietaries balanced today that what might appear a slight alteration in the dairy regimen may produce a considerable reduction in milk secretion. The modern milch cow has been likened to a machine working under high pressure and consequent strain, and the same is true of the laying hen. Are we not in this matter going too far the other way? I mean, are we not here exploiting the art of feeding and the science of nutrition so fully that we are adversely affecting the stamina of the stock? I think we are.

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The Wintering of Hill Sheep

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Dr. Russell Greig has dealt with the nutrition of animals over the whole of Scotland on both good and bad land. I propose to confine my remarks to the nutrition of animals in the poorest part of Scotland, the Highlands, where there is about 10 million acres of rough grazing. As Dr. Greig mentioned, in the past there was a time when there was good grazing on the hills, but for the last 100 years the grazing in the Highlands has been such that animals kept on the hills the whole time have not been able to maintain condition. This was largely because the plants on the rough grazings were grazed by the same number of stock all the year through. Any plants that survived were those which remained green and succulent for merely a few weeks in the summer and for the rest of the year were dry, hard and woody. They were good enough for mature sheep and possibly for mature cattle, but their fibrous condition made them unsuitable for hogs during their first winter. Thus the hogs were sent to winter in the lowlands where they ran over the fields of arable grass.

This was a bad system since sometimes no such winter pasturage could be procured. When prices were good, the lowland farmer himself went in for breeding sheep. It was difficult enough, however, for him to maintain his own ewe stock and he had no room for hogs from the hills. When prices slumped, the Highland farmer had no money to pay for wintering so the sheep had to suffer. During the war years the same thing happened but for a different reason; there was not much lowland pasture for hill sheep because of the ploughing campaign, and we came to a point when the upland farmer had to look for winter keep at home.