# Institute of Agriculture,

SESSION 1884.



# A LECTURE

ON

# ENSILAGE:

## ITS INFLUENCE UPON BRITISH AGRICULTURE.

DELIVERED UNDER THE AUSPICES OF

## H.R.H. THE PRINCE OF WALES,

AT THE

SOUTH KENSINGTON MUSEUM,

BY

HENRY WOODS.

*ENLARGED AND REVISED, WITH APPENDICES AND TABLES OF ANALYSES.*

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# PREFACE.

THIS little work contains, in a revised and enlarged form, with appendices &c., the lecture on the practical utility of the Ensilage system and possible advantages from introducing it into British farming, which I had the great honour of delivering before His Royal Highness the Prince of Wales, a numerous and distinguished assembly of ladies, noblemen, and gentlemen, and the students of the Institute of Agriculture, at South Kensington Museum, on the evening of Monday, March 17. I trust the publication will not be thought to call for any apology. If it should, I must plead the importance of the subject, and the hope I have that the facts recorded in these pages will be of service and value to some, at least, of those for whose benefit they are chiefly intended.

HENRY WOODS.

MERTON: *March* 1884.

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# THE LECTURE.

MAY IT PLEASE YOUR ROYAL HIGHNESS, MY LORDS, LADIES, AND GENTLEMEN :—

The title of our lecture 'Ensilage—Its Influence upon British Agriculture,' pre-supposes, on the part of the distinguished assembly which I have the honour and privilege of addressing, some acquaintance with the Silo-process—that method of storage by means of which green crops are preserved and converted into the cattle food called Ensilage. Many books have been published on the system, and from time to time our agricultural journals have described at length the opening of Silos in various parts of the Kingdom, and recorded the results of Ensilage experiments, simple and elaborate.

'Never prophesy unless you know' is a maxim for which I have great respect. It was present to my mind twelve or fourteen months ago when, in closing a lecture to the Wayland Agricultural Association on the 'Origin, History, and Practice of Ensilage,' I ventured to predict that the Silo was destined to become an important factor in the practice of British agriculture—a source of relief and profit to the distressed and almost distracted farmer. Yet, whatever some persons may have thought, there was nothing rash or reckless in this forecast; founded as it was on the data of several experiments conducted at Merton, at the instance of Lord Walsingham. This evening I repeat the prediction with still stronger emphasis, and will lay before you, as concisely as possible, the evidence on which I rely in support of my conclusion.

## *ADVANCE OF SYSTEM.*

North, south, east, and west, in Ireland and Scotland, as well as in our own Kingdom, the system has gained ground, and Silos have been greatly multiplied, in the past year.

At the close of last year I issued a circular letter with a number

of questions addressed to leading agriculturists in the three Kingdoms, and the returns with which many have favoured me are exceedingly interesting and valuable. They give detailed information as to the size and character of various Silos, the different methods of storing and preserving now in use, and the results so far secured; thus affording a basis for useful comparison.

It is not more than four or five years since the Silo experiments prosecuted in America first began to attract attention in our own country. At that time Silo and Ensilage were terms almost, if not altogether, unknown to us. They were certainly not in the least understood. Notwithstanding the natural sluggishness with which we are credited, we have considerably advanced in knowledge. These terms are now as familiar to us as household words, and the ensiling of green fodder crops is no longer a tentative but an established practice amongst us.

Let me here observe that in this lecture I do not intend to use the word 'ensilage' as a verb; but will adopt *ensile* as preferable, perhaps more correct, and certainly more convenient.

## *ACTION OF THE ROYAL AGRICULTURAL SOCIETY.*

No fact in this movement is more noteworthy than the prompt manner in which much early prejudice has been overcome. Active opposition, too, is now fast disappearing.

At the outset of the controversy we naturally looked for 'light and leading' to the Royal Agricultural Society. I ventured more than twelve months ago to suggest that this was a matter in which the Council of that Society might render great public service.

It will have been observed with satisfaction that an inquiry was conducted a few months ago, on behalf of the Society, by its Secretary, Mr. H. M. Jenkins. That gentleman, in his tour of inspection, visited many Silos in different parts of the kingdom. He has probably collected a fund of useful, interesting, but, above all, I hope, *practical* information. Should this be published, some service may yet be rendered in dissipating lingering doubts and converting, perhaps, a few more or less influential sceptics.

## *IMPORTANCE TO THE FARMER.*

The national importance of introducing the Silo into the agricultural system of Great Britain cannot be too much insisted upon when we consider the conditions under which farming is, and probably will be for the future, carried on here.

It is not the least likely that the cultivation of wheat will be remunerative to the present or even to the succeeding generation of farmers.

Cast your eyes across the Atlantic, and look at America and Canada, with their vast unreclaimed territories, which only await the arrival of the husbandman and the plough to yield enormous quantities of wheat for exportation to the English market. With the tide of emigration ever beating on their shores, and with every year a larger home population to feed, these countries must, by the ordinary operation of the laws of supply and demand, be less and less able, in course of time, to send us any very important quantities of corn.

But were that yet distant contingency ever so near at hand we should still have but little reason to hope for any material relief from foreign competition. For we have also to take into consideration the almost boundless resources of our East Indian Empire, from whence, through an extended railway system, corn will soon be poured into the markets of Europe in practically unlimited quantities.

## *FRUIT, OR MILK AND MEAT?*

Our attention has been lately directed to fruit cultivation. Now, however popular the jam-pot may be with the youth of England, and high and distinguished as is the authority on which the advice has been given, I do not think that many practical farmers will be disposed to grow fruit for jam as a means of replenishing their depleted pockets. They will, I believe, much more hopefully apply themselves to the production of milk, beef, and mutton.

Milk is almost a necessary of life—to young and old. Jam is at best a dispensable luxury, the demand for which is limited; and, however much the consumption might increase, it would

probably, in the end, benefit the doctor rather than the farmer. Meat, again, except in the case of vegetarians by choice, takes a place on the table of every Englishman who has the means to buy it. The man who goes without it does so less from preference than from compulsion.

Increase our meat supply as much as you may, there is no fear of the demand being outrun and its production becoming unremunerative.

Progress in the direction of an increased growth of beef and mutton has of late years been sadly retarded by the importation at intervals of diseases from abroad. The consequent onerous and harassing restrictions laid upon the movement of our home stock have entailed ruinous losses upon breeders and graziers. Despite these drawbacks, there was a slight increase last year, and the farming interest is evidently more and more recognising that its prosperity is inseparably associated with the raising of live stock.

It is in this relation that ensilage will exert most influence upon British agriculture. Silently and gradually, yet steadily and surely, it must work a great revolution in our system of husbandry.

## *ENSILAGE SUITED TO VARIED SOILS.*

I hope to show you conclusively that by the practice of ensilage farmers may breed and graze more stock for the dairyman and the butcher. The practice is adaptable to light, heavy, and mixed soils.

Our humid climate, although it favours the development of green fodder crops, renders absolutely unavoidable a great annual loss in the process of securing them, more especially in the case of our autumn cuttings. Under the system of ensilage this loss may be entirely obviated.

Of late years many poor, cold, and damp clay lands have gone out of cultivation through the difficulty of finding tenants to take them. In these instances the land has not been sown with grass seeds, but has fallen into a condition which is the inevitable result of that kind of loose cultivation and management to which men are compelled to resort who find their capital diminishing month by month.

Common couch and other coarse grasses having naturally got the lead, it would cost a small fortune to clean these soils, and render them fit to grow corn, or to properly lay them down to grass.

But the silo will convert these coarse grasses into useful cattle fodder, and give some return, even though the cultivation is restricted to the stubbing of thistles and obnoxious weeds.

Of course, I do not for a moment suggest that ensilage of such grass will equal in value that of finer quality; but it is not too much to assert that even common and ordinarily worthless grasses become in a degree more valuable through the changes which they undergo in the silo.

In last year's lecture I reported some remarkably favourable results in the increase of milk and cream from cows fed on ensilage of common, coarse, couch-like grass, which grew under trees in an open oak wood, and had previously been considered of no use whatever as food for horses, cattle, or sheep.

This year we filled a silo with grass from the same wood and it was converted into excellent ensilage. We gave it to cows in November. They greatly relished it, and its influence on their milk was in every way satisfactory.

In support of what has just been observed as to the power of the silo to give these coarser grasses an edible value, I may refer to one of many examples included in the series of returns with which I have been so kindly furnished.

Mr. J. H. Turner, agent of the Marquis of Bristol, Ickworth Park, Suffolk, who has followed in all its essential points the Merton plan, last year ensiled some meadow grass of a rough description, and cut and carted it when very wet. The silo was closed on July 23, and re-opened on January 25 last. Writing on February 6, Mr. Turner says of the result: 'The grass I ensilaged was of the coarsest possible kind, so much so that the stock would not eat it before it was made into ensilage; now they eat it vigorously.'

A sample of this ensilage was sent to me, and was of excellent quality.

## *WHAT THE SILO WILL DO, AND WHAT IT WILL NOT DO.*

What, then, is the process by which this great and beneficial change is effected? Mr. Francis Sutton, Public Analyst for the County of Norfolk, and Analyst to the Norfolk Chamber of Agriculture, in his able and highly satisfactory report appended to the Analysis of Merton Ensilage, in 1882, pithily describes it as 'a partial digestion.'

The woody fibre of the plant being softened, its changed condition renders it more easy of assimilation. It is in fact more nutritious than when fresh. With less stimulation of the gastric juices there is less demand upon the constitution, and therefore less detraction from the benefit derived.

The green material put into a well-appointed silo continues in a fresh and wholesome state, and is subject to slower changes than occur in the field. So long as active oxygen, or, in other words, atmospheric air, is kept out, decay will not take place; and without decay there is no deterioration. By the application of sufficient pressure the air is in the first place expelled, and it is subsequently kept from permeating the mass by the slow but constant evolution of carbonic acid gas. Low temperature is, of course, of importance. If the process is to produce its full beneficial effect, it is obvious that care will be required in its management.

The want of sufficient care has doubtless led to many erroneous opinions as to the value of ensilage. Where the result has been disappointing I hold that it has been invariably due to a loose and careless, or to a faulty and perverted, method of procedure. Too much must not be expected from the silo. Though it is astonishing what it will do, it will work no miracle.

On this point a most instructive lesson is given by an experiment of Mr. Jones Parry, of Tyllwyd, Newcastle Emlyn, the particulars of which that gentleman has kindly permitted me to mention. Last year he put into a silo a lot of coarse hedge-row grass, mixed with a little clover aftermath, carried and chaffed when quite wet. The result, as stated with frank, but facetious, common-sense, reads as follows: 'The mistakes I made were using too coarse material—silos will not turn thistles into grapes; I filled too quickly, and so lost much valuable space; I used earth (contrary to your advice) instead of bran or chaff;' but yet, he adds, '*on the whole I am satisfied*; I shall experiment more largely next year.'

## *INEXPENSIVENESS OF SILOS.*

As I have said, if the silo is to do effective and remunerative work, care and skill must be shown in its management. This is so important to be recognised that I beg you to excuse the reiteration. At the same time it is unnecessary to provide expensive buildings and appliances. Farmers will be neither able nor willing to adopt a system that is costly or complicated.

For practical utility, which is the great object, an old disused barn is unsurpassed. It has the further advantage of reducing the expenditure to a minimum.

Though silos may vary in their form and character according to the circumstances of particular farms, there is no occasion to lay out large sums upon them, and on most farms, in the present prospective condition of agriculture, there is no margin for fancy buildings.

A simple oblong structure, thoroughly air-tight and water-tight, is all that Science requires for the successful storage of ensiled fodder.

## IMPROVEMENTS IN SILO-PRACTICE.

### *SUPER-SILOS—NO RE-OPENING OR RE-FILLING.*

In the conditions of the process itself, experience has suggested, and practice approved, various alterations in the nature of improvements. Some of these have so direct an influence on the ultimate value of ensilage to British agriculture that I shall offer no apology for referring to them.

One defect and drawback which attended the practice in its early application was the re-opening and filling up again of the silo, in order to make good the loss in bulk through the shrinkage that takes place in the material during the first few days after the filling.

At Merton we have overcome this difficulty by means of a simple mechanical contrivance, and at a trifling cost, more than repaid by the saving effected in labour, independent of the additional security it provides against re-admitting air into the silo.

This contrivance is what I may describe as a small super-silo—an oblong, 2-inch deal box, without bottom or lid, about 30 inches in depth ; the sides and ends, which are separate and apart, being brought together and affixed by ordinary bolts and clamps to the wooden coping and walls of the silo-proper, and the sides strengthened against lateral pressure by a few iron struts.

This simple arrangement costs so little as to be within the means of every farmer. It may be fitted in twenty minutes, and—what is also most important—during the time it is being adjusted the work of filling may proceed without interruption.

When we have filled up to the top of the super-silo with chaffed material, thoroughly well trodden down, we put on the surface a cover of cross-tied boards, in three divisions, and spread over these

a layer of bran about five inches deep—bran being the most cleanly and useful of all air excludents—and weight them in a manner to which I will presently refer.

Shrinkage, as I have said, occurs chiefly in the first few days after weighting. In less than a week from the filling the mass will have settled to a level with the coping of the silo proper. We then remove the portable super-silo.

The subsequent settling from the top of the silo itself varies according to the character of the material; but in our silos (which are 14 feet 4 inches × 6 feet 3 inches, and 10 feet 6 inches in depth) we have never found it to exceed from 20 to 25 inches.

Thus the necessity of re-opening and re-filling the silo to avoid a waste of space is entirely got rid of, and it is now a rule with us to have only one filling. The advantage of this, in enabling the work to proceed uninterruptedly, and in rendering the whole process more finished and methodical, will, I think, be obvious to all.

## *SALTING.*

Another alteration, and also an undoubted improvement, is a reduction in the allowance of salt; a matter in which I believe mistakes to have been made. After careful observation, I am not prepared to concur with those who would dispense altogether with the use of salt; but, so far as I am at present able to judge, the proportion should be about three-quarters of a pound, and in no case more than one pound to every hundredweight of the fodder. I would suggest that the exact quantity for each silo should be accurately weighed, and placed conveniently at hand, so that the men engaged in filling the silo cannot, through inadvertence or carelessness, exceed the allowance.

## *SILO-COVERING.*

The question of the best kind of covering for the contents of the silo has given rise to a good deal of controversy.

Last year I advocated the use of bran, not only on the ground that it is the most cleanly of all materials, but that, when it has served its purpose on the silo, it may be given to stock, and is thus thoroughly economical. Further experience has confirmed me in this view.

From reports I have received I am aware that in some cases it has not given satisfaction. For instance, in *The Farmer* (Jan. 28, 1884), I observe that a noted French ensiler, M. Cottu, of the Château la Touche, in the Department of the Indre et Loire, has strongly advocated the use of sawdust, because, he said, 'he considers it absurd to waste or to use bran under the impression that it can be consumed.'

The worthy Frenchman, like some of his English friends, has fallen into a great mistake. To use a homely phrase, he has been 'putting the cart before the horse.' He appears to have spread the bran next the fodder—*beneath* instead of OVER the planking. Where such a mistake is made it is not surprising there should be disappointment through the waste of bran. As M. Cottu says, it would be 'absurd' to expect stock to consume such mouldy, fusty, crusted stuff.

I have actually come across one case in which a gentleman introduced a layer of bran with each stratum of material. You may imagine the result. The temperature of the silo was greatly raised, overheating ensued, and rapid decomposition followed upon the excess of fermentation.

I, therefore, ask you particularly to observe that the bran should be laid *over* and *upon* the planking, NOT under, as has been done in some cases, which will account for the waste, of which complaint has sometimes been made.

The settling that follows the filling of the silo cannot be uniform; little 'slips' and crevices occur at the sides, and into these the bran particles run, closing them up.

Where sawdust or soil is used, you must get an admixture of dirt and grit, which certainly no animals with a regard for their stomachs would care about eating. On the other hand they will eat and enjoy the little bran that gets mixed with the ensilage.

This point, I hope, is now sufficiently clear. A layer of bran over the boards, not less than four or five inches in depth, is the best possible covering. It effectually excludes atmospheric air, and the portion that becomes mixed with the ensiled material does no harm and occasions no trouble when the ensilage is taken from the silo.

We have, therefore, made this one of the established rules of our Merton practice.

## *WEIGHTING.—MECHANICAL APPLIANCES.*

In no particular, perhaps, has practice differed more than in the weighting of the contents of the silo, both in respect to the amount of weight and the method in which it is applied. This is a point which will greatly influence the results obtained.

The weights used are comparatively unimportant, except so far as they involve much or little expense, but not so the cubical distribution of the weighting power.

There are those who advocate a very large and others an exceedingly small amount of pressure. But here, as in most matters, the mean is, perhaps, the sounder and safer rule.

Persons who favour the utmost compression seem to regard the silo too exclusively from the side of the mere preservation of the fodder ; while, on the other hand, those who hold the weighting to be a matter of secondary importance do not sufficiently take into account the mischief wrought in the silo by the presence of atmospheric air.

While we recommend the ensiled system to the favourable attention of agriculturists as a means of preserving our green crops, we ought not to overlook its more important purpose.

As we have already observed, the material, under proper conditions, undergoes certain beneficial changes in the silo, which changes may be retarded or neutralised by an injudicious or improper method of treatment.

The silo is much more than a reservoir for preserving—it is a machine for making food ; and as such it must be allowed fair play. It is in this relation that the portable super-silo of which I have spoken becomes so valuable an auxiliary.

The silo being closed and weighted once for all, the process of fermentation goes on uninterruptedly, and the ensilage contracts but one crust of slightly deteriorated material instead of the two which are found whenever the silo has been re-opened and re-filled.

On this point it seems that we should gain nothing by further experiment. Our principle at Merton is, therefore, fixed and settled. The proportion of weight we allow does not exceed 70 pounds to the square superficial foot.

We also apply the weight in a simple, cheap, and effective way. An ordinary pulley is the only kind of mechanical appliance that we employ ; manual labour being all-sufficient.

A number of boxes are filled with common gravel stones, carefully sifted, so that the underlying bran is as free of grit as possible, and not damaged for feeding.

These boxes, which have been specially designed, are made of ordinary English wood, are uniform in size, and each hold about 2 cwt. of stones; the dimensions being 24 inches by 10 inches, and the depth 18 inches. The parts are nailed together, tightened by a binding of light one-inch hoop iron. The ends, which are curved upwards, have small openings, through which is passed a moveable iron cambrel, or handle, for attaching a pulley, by means of which the boxes are easily hoisted into position. The time occupied in thus weighting one of our silos never exceeds half an hour.

Various mechanical contrivances for silo weighting, lately brought under public attention, are now in operation. But these, however excellent in principle and successful in working, are luxuries, the cost of which puts them beyond the reach of an average farmer.

One, a lever press, which has been introduced into a 90 or 100-ton silo, is said to have cost something like 40*l.* It is reported to answer its purpose admirably.

Hydraulic pressure, which is also said to answer, requires that iron tubes should be built into the walls of the silo.

Quite apart from the question of cost, however, the dead-weight principle, simple and primitive as it is, appears to me to be preferable. The chemical, as distinguished from the mechanical, work of the silo, I believe to be best promoted by the more gradual and continuous settling of the material.

Of course, there are cases where mechanical compression is indispensable, such, for instance, as where ensilage is manufactured in small concentrated quantities for conveyance off the farm; a point to which I purpose referring later on.

## *RAMMING.*

The material was at first packed by our men treading and ramming; the latter operation being performed with rather light wooden rammers. As we observed that, though lifting the 'rams' high enough, the men were by no means prodigal of their strength in bringing them down, we provided them with cast-iron, cone-shaped 'rams,' weighing about 21 lbs., with a handle four feet long. We find that these answer exceedingly well and are inexpensive. If the

foreman sees that the 'rams' are reasonably elevated, the men may be trusted to save their muscles by letting them fall quickly enough.

## *LONG ENSILAGE.*

This may be a convenient time to say a word on the subject of long ensilage. Among many samples of ensilage forwarded to me for inspection, I have found that although some which was unchaffed was decidedly good, it was not equal in quality to that which was chaffed. There was a perceptible difference in the aroma.

The odour from the long ensilage was such as you would expect to be given off by decomposing vegetable matter; and, in fact, some of the smaller and finer blades of grass were decomposed. The chaffed ensilage, on the contrary, had a wholesome vinous smell, and was fresher and greener in colour.

Some persons have complained of being unable to chaff long ensilage after it has come out of the silo. It is not surprising that in a compressed condition it clogs the cutter. We might as well try to chaff a cake of tobacco. The same comparison might not inaptly apply to the process of mastication and digestion. When green, it is, of course, easily cut into chaff without any clogging whatever.

The chaffed grass also packs much more closely in the silo than the long, so that subsequent shrinkage is greatly reduced. This fact is conclusively shown in the various reports I have received.

Without desiring to condemn the ensiling of long grass, I have seen nothing at present to induce me, on the ground of economy, convenience, or utility, to alter our plan of chaffing all material before putting it into the silo.

In this conclusion I am supported, among other authorities, by Mr. E. B. Gibson, of Saffron Walden, who ensiled 13 acres of green fodder in 1882, 57 acres in 1883, and this year proposes to put up the produce of 100 acres. He says: 'I have tried some unchaffed, but shall not do so again. Too much fermentation takes place, and much space is lost.'

## *CARTING.*

Many of my correspondents report that their carting went on in wet—sometimes very wet—weather. Now, while it is one of the chief advantages of the silo system that it enables the farmer to

gather his green crops under unfavourable conditions of the atmosphere, it does not follow that these may not ultimately affect in some degree the quality of the ensilage.

When circumstances admit, it is undoubtedly desirable for the cutting and carting to take place in weather neither too wet nor too dry. A reasonable amount of moisture will be beneficial, and therefore the crops should, as far as practicable, be cut and carted on sunless days, and in times of wet when the rain is intermitted.

## CROPS FOR ENSILAGE.

We are now in a position to consider more specifically the influence of ensilage upon the agriculture of this kingdom. If the man who causes two blades of grass to grow where one grew before is a benefactor of the human race, surely no less is he through whose efforts those blades and others hitherto wasted are converted into nutritious food for stock.

Ensilage enables the farmer to make this conversion. He may thus avoid the deplorable loss arising from wet haysels, and have in the severest winter a supply of good succulent food, little inferior in its properties to the rich growing herbage of spring and summer. He is further able to bring into useful cultivation unpromising and unproductive land.

These points I hope to establish to your satisfaction by giving an account of practical trials at Merton as to the relative value of ensiled and harvested crops.

Time and convenience require that I should not trouble you with figures more than is absolutely necessary. The few I am obliged to give have been taken from carefully worked-out tabulated details now before me, which are open to the inspection of any gentleman who desires to examine them.

### *ENSILED GRASS* v. *HAY.*

To test the relative weight and value of grass as ensilage and hay, we put into the silo an acre of heavy meadow grass. It weighed 12¾ tons and produced 12 tons of ensilage. An acre of the same made into hay weighed 2 tons 7 cwt.

Take the value of the ensilage at 1*l.* 6*s.* 8*d.* per ton, only one-third the value of hay (which I am aware is much too low an estimate, but

I have adopted it in this and the other calculations which I am about to bring under your notice, being desirous of keeping well within the mark and of allowing, beyond all question, a margin sufficient to meet any possible contentions on the part of sceptics); then deduct the incidental expenses, including an allowance of 6*l.* 12*s.* 4*d.* per cent. on the cost of building a silo, and of 35*s.* an acre for rent and tithe, together amounting to 5*l.* 4*s.* 9*d.*, and we have a balance to our credit of 10*l.* 15*s.* 3*d.* Deducting from the return of the 2 tons 7 cwt. of hay (valued at 9*l.* 8*s.*) 3*l.* 8*s.* 2*d.* for mowing, making, stacking, chaffing, and rent and tithe, we have a nett balance of 5*l.* 19*s.* 10*d.*, showing a sum of 4*l.* 15*s.* 5*d.* per acre in favour of the ensilage as against the hay.[1]

## *ENSILED 'BRANK' OR BUCKWHEAT* v. *HARVESTED BRANK.*

It is probably within your knowledge that green 'brank,' or buckwheat, when the grain is just forming, constitutes a healthy and nutritious food for horses and cattle. The plant is easy of cultivation, and will grow on dark and soft, as well as bright and sandy, soils. In an average season, where the seed has been sown thickly, it yields a somewhat bulky crop; but as a rule the quantity of grain produced is very uncertain. For the silo it should be cut when the seeds of the upper flowers are turning brown.

We have tested the value of this plant as ensilage, and compared it with its ordinary value as a seed crop. The result is as follows:—

An acre cut for the silo weighed 8½ tons, and produced 8 tons of ensilage, which, again taking the value at one-third that of hay, gives a return of 10*l.* 13*s.* 4*d.* From this sum we deduct 5*l.* 17*s.* 7*d.* on account of incidental charges, rent, and interest, leaving a balance of 4*l.* 15*s.* 9*d.*

The harvested crop, which yielded 4 qrs. of grain per acre, was sold at 32*s.* per quarter, and if we add to this 10*s.*, the value of the straw, the gross return is 6*l.* 18*s.* The incidental charges amounted to 4*l.* 10*s.* 6*d.*, giving a nett return of 2*l.* 7*s.* 6*d.*, or a balance of 2*l.* 8*s.* 3*d.* in favour of the ensilage.

It may be interesting to add that the brank came out of the silo in most excellent condition, and was greatly relished by stock.[2]

[1] Vide Appendix A. [2] Vide Appendix B.

## *ENSILED OATS v. HARVESTED OATS.*

An acre of green oats cut on July 5 last, on land formerly held by a tenant at 18*s.* an acre, rent and tithe, weighed 13 tons, and produced 12 tons of ensilage. Its value, estimated at one-third that of hay, was 16*l.* The cost of cultivating, making, &c., with an allowance for interest on the cost of building the silo, was 6*l.* 18*s.* 6*d.*; leaving a balance of 9*l.* 1*s.* 6*d.*

One acre harvested gave 7 qrs. of grain, of the value, with the straw, of 9*l.* 4*s.* The expenses on account of cultivating and harvesting, with rent, &c., were 5*l.* 2*s.* 5*d.*; thus giving a nett return of 4*l.* 1*s.* 7*d.*, and showing a balance in favour of the ensiled crop of 4*l.* 19*s.* 11*d.*

This, however, does not represent all the advantage derived from ensiling oats. Cut in a green state, the crop does not exhaust the land to the same extent as when it is left to mature, and we can at once sow common turnips, which will be available for consumption on the land during the following spring. Thus the quantity of stock-food can be increased, while the fertility of the land itself is reinstated in time to produce a crop of barley in the same year, after the turnips are fed off.[1]

## *SPURREY, AN ENSILAGE-PLANT FOR LIGHT SANDY SOILS.*

As we have seen, the ensilage system may be applied to different kinds of soils, though its results will vary with the quality of the soil, the process of cultivation, and the crops made use of. I will now ask you to consider it in one relation in which I think it would be impossible to over-estimate its advantages.

In many parts of the country there are, as we know, thousands of acres of poor, light, sandy soil, lying comparatively uncultivated or unremunerative. For these lands, if their sterility were absolute, the silos would be of no avail. But their sterility is not absolute. I believe it possible to bring them under cultivation, to the undoubted advantage of the owners, the occupiers, and the general community.

Though they will grow neither grass nor clover, I think Lord

[1] Vide Appendix C.

Walsingham has succeeded in selecting a plant suited to such soils, which makes an excellent food for the use of cowkeeper and flock-master. After consideration and inquiry, his Lordship came to the conclusion that spurrey (*Spergula arvensis*) might be profitably cultivated on light sandy soil, and the practical trials which I made, under his directions, have fully sustained that position.

Before speaking of these trials, I ought, perhaps, briefly to refer to the plant itself.

Spurrey is an annual plant of the pink and carnation family (*Caryophyllaceæ*), and is largely cultivated in different parts of the Continent of Europe. It yields a rapid crop of succulent herbage. When ripe, the capsules burst, and shed a great number of black seeds, which are said to be equal in nutritive value to rape cake. These seeds are bruised and given to horses and milch cows, and have the effect of increasing the quantity and improving the quality of the milk. Abounding on inferior light soils, the plant is greedily eaten by sheep and cattle, and is pronounced very wholesome and nutritious.

Von Thaer and other Continental agricultural authorities describe it as an eminently nutritious herbage.

Von Voght, who made some years ago many and long-continued experiments, says that, when sown on sandy soils, 'spurrey is a better pasture than red or white clover; the cows give more and better milk, and it improves the land in an extraordinary degree.' The same authority also says—'The blessing of spurrey, *the clover of sandy soils*, is incredible when it is rightly employed. I sow it on the rye and oat stubble, and I obtain a beautiful pasture and a manuring equal to four or six cart-loads of manure.'[1]

Schwartz, another authority, declares that without spurrey the Campine, a district in Dutch Brabant, instead of being 'the best cultivated soil in the world, would have been still a desert.' The plant is one 'which requires no manure for itself, and which, even when mown, by the residue it leaves, gives back more than it takes from the soil—which demands no fixed place in the rotation, but which is satisfied to come in as an after-crop, whenever the soil is at liberty—which, except for the seed, requires no preparation—which is satisfied with a soil in which nothing else but rye will grow—and which increases the quantity of milk and butter and improves their quality.'[2]

[1] *Ueber manche Vortheile der grünen Düngung*, p. 23.
[2] Schwartz, *Account of the Belgian Husbandry*, ii. p. 23.

The experimental crop which I grew by Lord Walsingham's desire was grown under such conditions as fairly tested the properties of the plant. It yielded a most excellent food for sheep and cattle, and may, therefore, be advantageously cultivated.

Speaking at the dinner of the Nottinghamshire Agricultural Society in January last, Mr. Foljambe, M.P., referring to this plant as grown at Merton, made use of the very local and provincial misnomer, 'Dodder.' The plant known in connection with English agriculture under the name of 'Dodder' is *Cuscuta Europæa*, a troublesome parasitic weed, especially injurious in clover fields, and difficult to eradicate. It belongs to the family *Convolvulaceæ*, and is, of course, totally distinct from *Spergula arvensis*.

Mr. Foljambe, although a distinguished member of the Royal Agricultural Society, has evidently overlooked an important paper on the value of Spurrey for agricultural purposes. It will be found in vol. III. pp. 418–19 of the *Journal* published by that Society.

As, however, he was good enough to express an interest in the result of our proposed analysis of ensiled spurrey, I am happy to inform him that the results have more than equalled our most sanguine expectations. So far from the animals called upon to eat the food requiring the pity which he was ready to bestow upon them, they are much more likely to be objects of envy by their less fortunate neighbours, whether in the fold or at the manger.

But to revert to our Merton trials.

Spurrey, in its cultivated form, being quite new to me, I had to consider, in the first place, how to secure genuine seed; and, secondly, how best to proceed to cultivate it.

In the absence of practical knowledge and experience on these points, I at once applied to the eminent firm of seedsmen, Messrs. Sutton and Sons of Reading. Explaining our intentions, I asked them not only to send me the necessary seed, but to oblige me with some general instructions as to the best plan to pursue in preparing the land, and sowing it.

It gives me much pleasure to state publicly that I was not disappointed in my confident expectation that they would be willing as well as able to render me valuable assistance.

The trial, as desired, was a severe one. The land selected was a piece of twenty acres of blowing sand, so poor in quality that it had seldom produced either corn or roots, and for the last two or three years had been abandoned to nature. Only here and there a spire of quickgrass (*Triticum repens*) was to be seen.

About the middle of April the plough was lightly run over the land, and the seed sown at the rate of 14 lbs. to the acre. The plant grew rapidly. In July it was from 12 to 14 inches high. It was then fit to feed off with sheep, and I told the shepherd to fold on it at night.

What a look of horror he gave! 'The sheep,' he said, 'will never eat such stuff.' And for the first three or four nights they certainly did not seem to care very much for it. They ate but little.

Then, one morning, the old shepherd came to me, with a very long face, and said: 'Lor', Sir, here's a "werry" nice job, ain't it; "jest" as I "expacted"; that stuff 's a killin' the sheep!'

One had died during the night. But a *post mortem* examination made in my presence at once proved that the unfortunate animal, instead of being brought to an untimely end through eating spurrey, died from inflammation of the lungs, the attack not one of recent standing.

With blank astonishment the shepherd received the instruction that I now gave him: 'You must continue to fold off the spurrey; we will see how many more it will kill.'

In some five or six days the sheep had taken to the food; eating it up clean every night. They seemed particularly partial to the seed-capsules. During the four or five weeks they were folded on the piece they got no other food except what little they picked up on a somewhat bare sheep-walk in the course of the day. There was no other case of sickness or mortality among them. They gained in condition, and for several days after the food was finished they manifested a desire to go back to the piece.

Even the shepherd was satisfied. He was sorry when the spurrey was done, and now looks upon it as an excellent food for sheep.

While the sheep were being folded we made a trial of the plant for purposes of ensilage. We cut a quantity for the silo. It produced $5\frac{1}{4}$ tons per acre. Considering the circumstances under which the crop was then grown for the first time, I have no reason to doubt that this weight may be largely increased. When cut into chaff we packed the material closely in the silo, which was filled and sealed on July 24, and opened on December 6.

The ensilage came out in excellent order, which those who saw the sample exhibited at Messrs. Sutton's Stand, at the Smithfield Show, can verify. The seed-capsules were apparently as perfect as on the day they were ensiled.

Sheep and cattle were fed with a mixture of this ensilage and ordinary straw chaff. It was given to three or four cows side by side with grass ensilage. They decidedly preferred it, apparently much relishing its flavour. The sheep ate it as soon as it was offered them, and were evidently very fond of it.

In fact, the results were so thoroughly satisfactory to us, as showing that spurrey may be advantageously cultivated on light lands in Norfolk, that instead of the twenty acres we grew last year we have made arrangements to seed down this year upwards of 120 acres.

The larger part of this will be ensiled; the residue fed off with sheep.

I may here observe that the advantage of growing this plant appears to be by no means confined to what is got out of one crop. A second crop may, I think, be grown in the same year.

As soon as our first crop has been cut and ensiled, we intend in future to harrow the ground with a coarse harrow and sow about 7lbs. more seed per acre. We expect this to provide a good feeding material for ewes in the autumn. Or the crop might even be ploughed in when green. In either case it must act as a useful manurial agent.

I need scarcely add that the weight of the crop would be considerably increased by the application of rape-cake, guano, or some similar manure.

## *COST OF CULTIVATING AND ENSILING SPURREY.*

You will naturally desire some information as to the cost of cultivating and ensiling Spurrey. As in the other trials, so in this, details have been framed with great care. A summary must suffice for our purpose here.

The seed cost 45*s.* per cwt., which is at the rate of 5*s.* 10*d.* per acre, and the total expenditure on account of seed, cultivating, ensiling, and all other incidental expenses, including interest on silo building, amounted to 2*l.* 8*s.* 6*d.* per acre. In its natural state the spurrey weighed $5\frac{1}{4}$ tons, and when ensiled 5 tons per acre. On the already adopted basis of one-third the value of hay at 4*l.* per ton, it realised 6*l.* 13*s.* 4*d.* per acre. Deducting the incidental expenditure, allowing for rent 3*s.*, the price at which the land, now unlet, was valued to a tenant some years ago, the nett profit amounted to 4*l.* 4*s.* 10*d.* per acre.[1]

[1] Vide Appendix D.

## *QUALITY OF THE ENSILED SPURREY.*

The results of our feeding tests and the report of the experienced Analyst, Mr. Sutton, of Norwich, jointly confirm the exceedingly great value of ensiled spurrey as a concentrated cattle food.

You will observe from the printed tables that those two most important substances, albumenoids and fat, are present in large and notable proportions.

As I have said, the ensilage was in a most excellent condition. It possessed a flavour peculiar to the plant, due to the development of essential oil. And, as showing how marked a feature this is in spurrey, I would mention that one morning a herdsman called my attention to the condition of his shirt about the shoulders, which he said felt as though it had been dipped in oil—an effect produced by his carrying ensilage to the stock.

## *ENSILED MAIZE.*

Much having been written at different times on Ensiled Maize, we last year determined to try it at Merton.

We selected a piece of land, which was valued some fifteen years ago at a rental of 28*s.* an acre, including tithe, and on which we grew a crop of mangold in 1882. In the middle of May we ploughed in some good farmyard manure—15 loads to the acre. On the 28th we drilled in common flat maize, purchased in Watton Market; at the rate of six pecks to the acre, with the rows twelve inches apart. The soil was very dry, and a fortnight passed without the least sign of germination. But no sooner had the plant made its appearance above ground than it grew with marked rapidity.

When cut for ensiling, on September 6th, it had reached the height (as you may see from the specimens exhibited here) of from seven to nine feet.

As stated in my previous lecture upon this subject, some years ago we grew a crop of maize on the Merton Home farm, which attained a height of 5 or 6 feet. Its weight was calculated at 10 tons per acre. I was told at the time that this was an under-estimated weight; and it would now really seem to have been so, as last year's crop weighed no less than 28 tons to the acre.

Much of this excess of weight may of course be attributed to the more vigorous growth of the plant, and to the greater height to which it attained.

Some of the stems were as much as five inches in circumference.

The crop was, in fact, even more remarkable than the Canadian dairy farmer's (Mr. Pierce's) described in my former lecture. That crop was 6 feet high and weighed 25 tons to the acre.

A point which required some consideration on our part was how best to cut such a bulky crop in the field and carry it to the chaffing machine. We adopted a very simple plan.

Men were employed to chop it with reap-hooks as close down to the ground as possible; and to facilitate carriage they were provided with cords about 4 feet in length, to each of which an iron ring was attached. The maize was laid across these cords in armsful, as caught in falling, and the bundles were alternately reversed. This latter plan greatly aided the operation of the chaff-cutter, as the flaggy parts and the rough stems of the plant were well intermingled, obviating the cutting all at once of the stronger material, and equalising the distribution of the finer and coarser parts within the silo. We used one of Richmond and Chandler's ordinary two-knife cutters; but removed one of the knives from the wheel, as we found the work to be much better done with a single knife.

In filling the silo we took into account the nature of the material, and employed extra treaders and rammers, so as to ensure its being compactly stored. The silo was filled and closed the same day, and covered and weighted according to our custom.

When the silo was opened the contents were found to be perfectly cool, and so far as we could judge they had been at no time subject to any great amount of heat. Along the side of the ensilage, at the top of the silo, in the form of a triangular band, was a portion which had become mouldy; but this deterioration was very slight indeed, the band being only 3 in. by 3 in.

It is also a noteworthy fact that whenever we have cut out a fresh section of the ensilage, which we have done about once a fortnight, the exposed surface has not shown the least indication of decay, and the quality of the bulk has been sound throughout.

Owing to the undoubted modification of the constituents of the maize, due to the action of the silo, the woody fibre of the stems and knots was wholly changed in character, and it was easily pressed in pieces with thumb and finger.

This I regard as an interesting fact when taken in connection with a trial in feeding cows on green maize chaff which we made at Merton some years ago. The cows at first ate this chaff very un-

willingly, and when they had become accustomed to it they suffered in a particular way, which I ascribed to 'the indigestible nature of the woody fibre forming the outer rind of the stalks.' I also suggested, as a reasonable inference from my experience of the changes effected by the silo in the case of other crops, that this objectionable feature in maize might possibly be removed by ensiling it—an opinion which is not now a matter of conjecture, but one fully corroborated by actual practice.[1]

## *ENSILED MAIZE* v. *SWEDES.*

Although I would not for a moment think of recommending the supercession of turnips, swedes, or mangold, by maize, it may nevertheless be instructive and interesting if I just mention the result of a trial we have made as to the relative value of a crop of swedes and a crop of maize, grown side by side on the same land and treated precisely alike.

After being topped and tailed ready for consumption, the swedes were weighed and gave 18 tons to the acre. We put their value at 15*s.* per ton, which would be 13*l.* 10*s.* for the acre. The cost of cultivating, manuring, and preparing for stock, with rent and tithe, was 8*l.* 19*s.* 3*d.*, which leaves us a nett balance of 4*l.* 10*s.* 9*d.*

On the other hand, an acre of the maize cut green weighed 28 tons, and produced 26 tons of ensilage, which, at one-third the value of hay, would represent a money value of 34*l.* 13*s.* 4*d.* Deducting 14*l.* 3*s.* 10*d.* on account of all incidental charges, we have a nett return of 20*l.* 9*s.* 6*d.*, thus showing the large balance of 15*l.* 18*s.* 9*d.* per acre in favour of this ensiled maize as against the swedes.[2]

## RESULTS OF ANALYSES.

Samples of these different kinds of ensilage, with the exception of the 'brank,' which was not in use at the time, have been analysed by Mr. Francis Sutton, the chemist to whom I previously alluded, and whose standing in his profession will be accepted as a guarantee that the test was efficiently and honestly conducted. The results, fully tabulated, are in your hands.

[1] Vide Appendix E. [2] Vide Appendix F.

In the report appended to these tables, Mr. Sutton says, the figures 'practically speak for themselves;' but he also observes, 'in judging of the results of analyses we must look at all the materials in a perfectly dry state. Then the comparison is clearly understood, and we see that the first most convenient set of comparisons is between fresh grass, ensilage made from the same grass, and hay made from the same grass. One would, perhaps, naturally expect to find that when the same grass is taken for all these separate articles at the same time and under the same conditions, the eventual composition would be very much the same. As a fact it is not so.

'The figures clearly show that in making grass into hay there is a distinct and notable loss of nutritive matter, not in one particular only, but practically in all; for it is found that the only two classes of really nutritious matters—namely, albumenoids, or flesh-formers; and digestible carbo-hydrates, or fat-formers—are richer by about 15 per cent. in the former case, and 7 per cent. in the latter; the useless woody fibre being increased in the hay owing to the drying process which has taken place.

'But the ensilage is even further improved by the process of the silo, for the flesh-formers show an increase of 20 per cent., and the fat-formers about 12 per cent., while the useless woody fibre is diminished even as compared with the fresh grass.'

Mr. Sutton, therefore, repeats his earlier contention that 'a ripening, or partial digestive, process goes on in the silo, and the food so produced is so much the more assimilable to the alimentary organs of the beasts fed on it, and hence they ought theoretically to do better on ensilage than on grass.'

This theoretical expectation is fully borne out by practical experience, and the superiority of such food is, indeed, 'a fact beyond dispute.'

Speaking of the ensiled spurrey and maize, Mr. Sutton points out that these substances 'differ very greatly—they differ from grass and they differ very widely from each other.' But 'there is the same leading feature' in both these plants, 'as has been noticed in the case of grass;' namely, 'a constant diminution of indigestible woody matter, and an increase of soluble matters due to the silo.' Mr. Sutton adds: 'The change is always in the same direction, and that a beneficial one.'

Spurrey, which 'contains some actual sugar, besides a very considerable proportion of oil,' he regards as 'one of the richest [materials] for conversion into ensilage.' Further, 'the amount of

soluble flesh-formers and ready-formed fat is most marked, and it cannot fail to be a food upon which any kind of ruminant animal would improve rapidly.'

Though not so rich, 'maize is most undoubtedly a good material for ensiling. It supplies bulk, and this is an important point in the case of cattle with their large stomachs.' There is 'an increase of about 10 per cent. in the total flesh and fat-formers, and a diminution in like proportion of the useless fibre, as compared with the same plant in the form of fresh chaff.'[1]

## RESULTS IN FEEDING.

It is when turning to the results which have attended the feeding of stock with ensilage that we perceive how vast an influence this new system is destined to exercise upon British agriculture. Of its benefits in this relation the evidence is overwhelming both in volume and in force.

In feeding cows, we may, I suppose, lay it down as a rule that the more plentiful the food the more plentiful the milk; the richer the food the richer the milk, the cream, and the butter. The quantity and quality of the milk produced by ensilage we, therefore, assume to be the best test of its value as a food for stock.

Taking this test, we find, in nine out of every ten practical trials, the flow of milk is stimulated and its quality enriched, by the use of ensilage.

Where results have been disappointing, the cause may invariably be traced to feeding too exclusively with ensilage.

We know what human experience in such matters is, and we conclude that it is possible to give an animal too much good food. If an alderman, for instance, were compelled to take turtle—or perhaps, I ought to say, 'conger-eel' soup—at every meal, he would very soon 'turn up his nose' at it, or possibly '*turn turtle*' himself.

Moreover, all animals will not equally thrive on the same diet: what suits one does not always agree with another, and all cows are not good milkers, however generously fed.

Time precludes me from quoting many gratifying reports with which I have been favoured on this subject.

Personal experience being so much more valued than second-hand information, I propose to invite your attention chiefly to trials

[1] Vide Appendix G.

conducted at Merton; but, before doing so, I will refer briefly to two or three reports, that I may corroborate our experience by independent testimony.

Mr. H. C. Fryer, the Lodge Park, Glandovey, speaking of an experiment, described by him as a 'splendid success,' says:—'For years I have been on the look out for some succulent food for cows in early winter which will not impart a disagreeable flavour to the milk and butter. It appears to me that ensilage exactly supplies this desideratum, and will give us the right sort of food up to the time when mangolds can be used. And if it does nothing more than fill up this gap I feel sure that all cowkeepers will bless the day that introduced ensilage to their notice. I look on it as so valuable for my milking cows that I grudge an ounce of it to any other animal.'

In carrying out the Merton practice to the letter, Lord Tollemache has attained great success, on his Peckforton estate, and, writing on January 12, his lordship says:—'I am so satisfied of the advantages of ensilage that I intend to make a larger quantity next season. I am about to consult my tenants, as to the best way of extending the system to the farms.'

Having heard that a conference of the Peckforton tenants, called by Lord Tollemache, was to be held to-day, I telegraphed his lordship to be so kind as to let me know the result of the meeting, and I have this evening received the following telegram:—'Called only a small meeting of principal tenants to encourage freedom of discussion. All passed off remarkably well. Ten of the tenants applied for two silos each, which will be supplied to them this year.'

Mr. Wm. J. Harris, of Halwill Manor, Devon, in stating his experience, writes: 'I am about to put up ensilage-room for 1000 tons. The experiment has far surpassed my expectations, and the farm manager and his men, who thought at the time that it was a mad enterprise, are now the most anxious to have more silo-room at once constructed.'

## *ENSILED MAIZE AND SWEDES.—COMPARATIVE TEST WITH COWS.*

From November 1 last we gave an allowance of wood-grass ensilage, at the rate of 35 lbs. per cow per diem, with the addition of 18 lbs. of straw chaff, 8 lbs. of maize meal, and two lbs. of bran, to all our cows except two.

These cows, named Lady Manchester and Spark 4th, we purposely reserved for a month's trial, to ascertain the relative feeding value of ensiled maize and swedes.

All the cows had previously been fed daily with 30 lbs. of mixed hay and straw chaff, 6 lbs. of maize meal, and 8 lbs. of bran. As soon as we introduced the wood-grass ensilage into their diet their yield of milk improved.

From January 10 we gave ensiled maize. Each had daily 42 lbs. of ensilage, 10 lbs. of straw chaff, 8 lbs. of maize meal, and 2 lbs. of bran. On this diet the milk supply still further increased, and the cream became richer in quality.

The month's trial to which the two reserved cows were put from January 10 shows some remarkable results.

Lady Manchester was dieted as the other ensilage-fed cows, and Spark 4th received daily down to January 31 70 lbs. of swedes, 10 lbs. of straw-chaff, 8 lbs. of maize-meal, and 2 lbs. of bran, but no ensilage. When the trial began, Lady Manchester, who weighed 48 stones, was giving daily 11½ quarts of milk, which registered 11° of cream. Spark 4th, who weighed 56 stones, was giving 11 quarts of milk, which also registered 11° of cream.

On January 12 Lady Manchester yielded 13 quarts of milk, showing 12° of cream; on the 13th, 14 quarts and 13° of cream; the next four days the same quantity of milk, with the cream raised to 14°; the following six days 14½ quarts of milk, but no alteration in the quality of the cream; on the 24th, the milk fell half a quart (to 14 quarts), but the cream rose a degree (to 15°); the eight following days the supply of milk reached 14½ quarts, and the cream fell again to 14°, except on January 26 and February 1, when it once more registered 15°; and during the remaining days of the trial the supply of milk was 14 quarts, with the quality of cream 14°.

As I have stated, we put Spark 4th on swedes from January 10 to January 30. Her daily milk supply throughout this time was generally 12 quarts, and the cream alternated between 12° and 13°. On three days only (January 21, 22, and 23) did she give as much as 13 quarts of milk.

During the last seven days, commencing January 31 and ending February 6, her food was changed. Instead of the 70 lbs. of swedes she had daily 42 lbs. of maize ensilage, with the same allowance of dry food as before. Mark the important difference in the weight of food!

An increase in her milk at once took place. On the 1st it was 14 quarts; on the 2nd, 15; and on the remaining four days, $15\frac{1}{2}$. The cream continued to register 13°.

Taking the three weeks during which swedes were given, Spark 4th averaged daily 12 1-6th quarts of milk, giving $12\frac{1}{2}$° of cream, while the average of Lady Manchester was 14 quarts of milk, and the cream $13\frac{3}{4}$°.

During the month Lady Manchester gained on her ensilage diet four stones (52 stones), and Spark 4th only two stones (58 stones) on the swedes.

A corresponding improvement in condition to that of Lady Manchester's has also been observed in the case of the other cows similarly fed, and has led to the bailiff reducing their allowance of maize meal by 2 lbs. per head per diem (to 6 lbs.).[1]

## *ENSILAGE-FED SHEEP.*

Many inquiries have been made as to the suitability of ensilage as a food for sheep.

About a year ago I published in a letter the results of a most satisfactory trial with half-a-score ewes, conducted by Mr. T. J. Gayford, of the Manor Farm, Wretham, one of the most experienced flockmasters in Norfolk. As he had no silo on his farm at that time the trial was made with Merton ensilage.

Satisfied himself as a practical flockmaster, and encouraged by his shepherd's wish that the whole flock of 800 ewes should this season be supplied with ensilage, Mr. Gayford applied to his landlord, Mr. Morris, of Wretham Hall, to build him some silos. That gentleman has liberally responded to his request and has provided him with three large barn silos.

Since January 7 the entire flock has been fed with ensiled grass from these silos. The ewes have been throughout in an eminently thriving condition, and never looked better.

The high opinion which Mr. Gayford entertains of ensilage may be inferred from his having stated that if he were about to take another sheep-farm he should stipulate for silos to be provided, and in the alternative event of the landlord not being disposed to incur the outlay, he would gladly undertake to pay interest on the capital expended in such buildings.

[1] Vide Appendix II.

## *THE MERTON EWES.*

The Merton flock, which consists of 350 ewes, has a daily allowance of ensilage. In December we began giving the ewes, which were fed on park-land all through the autumn, a mixture of grass ensilage and hay chaff.

They have done remarkably well—so well indeed that there has been no case of bad lambing, and an unwonted absence of all fatality. Never in my experience were we so successful or fortunate, in whichever way the fact may be regarded.

It is true that during the early part of the season the weather was favourable, but that is not in itself sufficient to account for a complete immunity from every kind of sickness, quite unprecedented in the flock.

I ought, perhaps, to mention that in former years it has been our practice to give a liberal daily allowance of a mixture of good hay chaff and fresh bran, at the rate of six bushels of the former to two of the latter; but this year we have dispensed with bran altogether.

It is also worthy of remark that when we did give bran the ewes picked it out as much as possible from the coarser parts of the chaff; but now they eat the chaff up perfectly clean. This is apparently owing to its being flavoured with ensilage.

The ewes are abundantly furnished with milk, and the satisfactory way in which they perform the duties of maternity is shown by the healthy and lively condition of their lambs.

Some persons might, perhaps, think that while ewes and lean sheep thus eat grass ensilage, it would not be as acceptable to animals in a higher condition, accustomed to a richer kind of food.

We are in a position to prove that any such suspicion is groundless.

Our Exhibition sheep last year were fed on ensilage mixed with other food. They not only liked it and throve upon it, but our first prize Southdown wethers at Smithfield were the heaviest pen of their age and breed ever exhibited.

I am not prepared to ascribe this increased size solely to the virtues of ensilage. I merely state it as an interesting coincidence. The sheep had an ensilage mixture, except in the summer months, from the time they were eight months old, and were throughout unexceptionally healthy.

## *HORSES.*

Of horses fed on ensilage my experience is confined to those employed on our Home Farm.

In the last two years we have given them ensilage with barley straw chaff, and dispensed with bran, while continuing the usual allowance of oats. They have been and are remarkably healthy, as the veterinary surgeon knows to his disadvantage.

An interesting piece of evidence of the value of ensilage for horse-feeding purposes is given in the following extract from the return by Mr. John A. Hardy, Heyford Hills, Weedon :—'My plough horses are very fond of the ensilage ; also my carriage nag, and a young thoroughbred horse I have, bred by Lord Spencer. They get some every day with their chaff. All do well, and I find it a great saving in bran, in spice, and brewer's grains. My farm horses do not require any bran mashes now. All the animals have soft skins. I wish I had double the quantity, and will have to be careful to make it spin out till May.'

Lord Tollemache also gives a limited quantity of ensilage to his carriage horses, and finds that it suits them well.

## *CASK-MADE ENSILAGE.*

For the sake of farmers in the low-lying Fen-lands of Norfolk, Cambridgeshire, and elsewhere, I ought not to pass over a particular set of experiments on which we entered, with the object of ascertaining if it is not possible to turn to better account than at present the rich crops of brank, Italian rye grass, and similar fodder which are grown on these lands.

What an advantage it would be to them to be able to provide the cowkeepers of London and the large towns with the means of providing grass-milk and butter during the winter season ! And there is no reason why they should not do this.

Two years ago we put a quantity of chaffed grass and other material into casks, ramming it down compactly, and weighting it and covering it with bran, as in the silo. The result was so satisfactory that last year we extended the experiment.

The casks, which were of various sizes, were filled at different

times between July and September; an operation easily, economically, and expeditiously performed.

The ensiled material consisted of maize, oats, brank, spurrey, and common grass.

When opened in the present year it was all sound and good.

Where railway facilities exist it should be possible to develop a profitable trade in such cask-made ensilage. If it pays the Great Eastern Railway Company to convey sea water in small casks at a nominal charge merely for domestic purposes, surely this and other companies would willingly carry and deliver these ensilage casks to cowkeepers at a reasonable rate.

Ensilage thus made and stored would also be an undoubted boon on board steamships carrying cows for the production of milk during a voyage.

A sixty-gallon cask, such as we used amongst others at Merton, will contain thirty-one stones of ensilage; or a quantity sufficient, with a little hay or hay chaff, and maize meal, to support a cow nine or ten days. An animal so fed would require much less water than if given only dry food—a most important consideration on board ship.

Of course care must be taken that the cask is air-tight. This may be secured by bringing a hanging-lid and clasp-fastening into use immediately after compression, whatever mechanical appliance be used in subjecting the contents to necessary pressure.

There is, therefore, no doubt that on well-conducted principles, with the aid of artificial pressure, crops may be ensiled in casks available for the use of cowkeepers, resident in large towns.

## Conclusion.

I have now endeavoured to support by facts and reasoning the proposition that Ensilage is destined to exert considerable influence on British Agriculture. It only remains to express my regret that it has been impossible for me, by further condensing the material, to reduce my demand upon your patience.

A powerful stimulus will be given to the Ensilage movement by this influential assemblage, honoured as it has been by the gracious presence of His Royal Highness the Prince of Wales.

We are deeply sensible of, and grateful for, the interest which His Royal Highness at all times manifests in the welfare of agriculture.

I am confident that within these walls, and in the country beyond them, there will be a general feeling of gratitude to His Royal Highness for having presided here this evening. He has done this, we feel, not only by reason of that public spirit, which, as Prince of Wales, he brings to bear upon every useful and deserving national enterprise, but from sympathy with a struggling yet never more important industry, and as a generous friend to the great agricultural community of this kingdom.

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## VOTES OF THANKS.

Sir TREVOR LAWRENCE, M.P.: May it please your Royal Highness, my lords, ladies, and gentlemen.—I am sure that I shall carry with me the unanimous assent of this crowded audience, when I venture to propose to the Lecturer, Mr. Woods, a very hearty vote of thanks for the lecture that he has delivered to us. It would be impossible, it appears to me, to have described in a clearer, fuller, and more interesting way, the very important subject that he has chosen to bring before us—a subject which, I venture to think, he has treated with a fulness of knowledge and a wealth of illustration which leaves nothing to be desired. So much that he has brought before us will probably be new to agriculturists who have no knowledge of ensilage that I should not venture, if even I were an agriculturist, to offer any criticism upon it; but if now, after a long period of loss and depression, there is at last opening before the farmers of this country some hope of, by new and improved methods, battling with and overcoming the obstinacy of the elements, then I think a very great debt of gratitude will be owing by the agriculturists of this country to Mr. Woods, to Lord Walsingham, and all who have taken an interest in bringing this new process before the public.

The PRINCE OF WALES: A vote of thanks has been proposed to Mr. Woods. I feel sure I need hardly put it. We shall all unanimously agree to it.

Mr. WOODS: May it please your Royal Highness, my lords, ladies, and gentlemen.—I beg to offer you my best thanks briefly, but most sincerely, for the high honour you have been pleased to confer upon me in according me this proof of your approval of my humble efforts this evening. I am especially indebted to His Royal Highness the Prince of Wales for his great condescension in conveying the vote of thanks so kindly proposed by Sir Trevor Lawrence. I can only hope that as the subject of ensilage becomes better understood, many of the difficulties by which the agriculture of the United Kingdom is now so heavily weighted may disappear, and that there may yet be in store for the British farmer brighter and better times.

The EARL OF ABERDEEN : May it please your Royal Highness, I have the pleasure to give utterance to those feelings of grateful appreciation by which your Royal Highness's presidency on this occasion is regarded not only by this large and influential audience, but, as Mr. Woods has so well said, by agriculturists at large. It is not necessary for me to allude to the immense beneficial influence of your Royal Highness, owing to the great practical interest which your Royal Highness takes in agriculture, in its widest sense, and I feel sure that the expression of our great indebtedness to your Royal Highness will be received by this meeting with grateful acclamation. I beg to propose to your Royal Highness a grateful vote of thanks for presiding on this occasion.

The vote was carried by acclamation.

The PRINCE OF WALES : My lords, ladies, and gentlemen, I wish to return my hearty and sincere thanks for the cordial reception you have been good enough to give me to-night. The duties you have conferred upon me in making me your chairman to-night have, in place of being onerous and difficult, been not only very light but have been very pleasant, for I have had the advantage of listening to the most interesting and exhaustive lecture upon ensilage which Mr. Woods has delivered. I cannot claim to have gone thoroughly into this most important and interesting subject at any depth. I have, however, some acquaintance with it, because some sixteen months ago, when on a visit to my friend Lord Walsingham, at Merton, questions in connection with this subject of ensilage were brought under my notice, and my attention was then for the first time drawn to the subject. As to the future, it is of course, impossible to foresee to what extent ensilage may be carried out, but I am convinced from what we have heard this evening from the lips of Mr. Woods, that those who are moving in this subject are dealing with one of very great importance, and I am at all events assured that we ought to be very much indebted to Mr. Woods and to Lord Walsingham for giving very careful trial to what may prove in future years the means of rendering very great and valuable services to agriculturists. Most cordially do I endorse the remarks which fell from Sir Trevor Lawrence, that even now, after the hard times which the farming interests of this country have suffered for some years, there is a prospect of the great interests which are involved in the agricultural question having a brighter future before them, and that a new gleam of light may be thrown upon their fortunes by the successful carrying out of this new experiment in agriculture—this question of ensilage. Most cordially and sincerely do I hope the experiments which have been made, and their results, may be of advantage to the agricultural community. I thank you again for your kind welcome of me to-night, and again congratulate Mr. Woods upon his most excellent and interesting lecture.

# APPENDIX A.

## *GRASS.*

VALUE OF ONE ACRE WITH COST OF MAKING INTO ENSILAGE.

### *Value of Ensiled Grass.*

| | £ | s. | d. |
|---|---|---|---|
| 1 acre of grass weighed 12¾ tons, and produced 12 tons of ensilage, value 26*s.* 8*d.* per ton, being one-third value of hay at 4*l.* per ton . . . . . | 16 | 0 | 0 |

### *Cost of Making into Ensilage.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| Cutting, 6*s.*; gathering, 1*s.* 2*d.*; pitching, 1*s.* 10*d.*; loading, 11*d.* . . . . . | 0 | 9 | 11 | | | |
| Raking, 6*d.*; driving, 1*s.* 5*d.*; horse and boy lever raking, 1*s.* 1*d.* . . . . . | 0 | 3 | 0 | | | |
| Horses for carting, 11*s.* 2*d.*; engine driver, 1*s.* 5*d.*; man feeding cutter, 1*s.* 5*d.* . . . . | 0 | 14 | 0 | | | |
| Unloading and yelming, 3*s.* 7*d.*; filling bags, 2*s.* 5*d.*; carrying to silo, 3*s.* 7*d.* . . . . | 0 | 9 | 7 | | | |
| Treading in silo, 4*s.* 10*d.*; salt, 2*s.* 6*d.*; horse and boy carting water, 2*s.* 2*d.* . . . . | 0 | 9 | 6 | | | |
| Use of engine and cutter, 12*s.*; rent and tithe, 1*l.* 15*s.* | 2 | 7 | 0 | | | |
| Coal, oil, files, &c., 3*s.* 9*d.* . . . . | 0 | 3 | 9 | | | |
| Interest on cost of barn silo at 6*l.* 12*s.* 4*d.* per cent. as charged by the Lands Improvement Company = 8*d.* per ton = 12 tons at 8*d.* per ton . . . | 0 | 8 | 0 | | | |
| | | | | 5 | 4 | 9 |
| Nett value of ensiled grass per acre . . . | | | | 10 | 15 | 3 |

## *HAY.*

VALUE OF ONE ACRE WITH COST OF MAKING.

| | £ | s. | d. |
|---|---|---|---|
| 1 acre of grass weighed 12¾ tons, and produced 2 tons 7 cwt. of hay at 4*l.* per ton . . . . . | 9 | 8 | 0 |

### *Cost of Making.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| Cutting, 6*s.*; strewing, making, and cocking, 5*s.* 6*d.* | 0 | 11 | 6 | | | |
| Throwing out and getting ready to pitch, 9*d.*; pitching, 9*d.* . . . . . | 0 | 1 | 6 | | | |
| Loading, 6*d.*; drivers, 6*d.*; raking behind pitchers, 6*d.* | 0 | 1 | 6 | | | |
| Horse and boy raking, 9*d.*; horse leader, 1*d.*; horses carting, 3*s.* 6*d.* . . . . . | 0 | 4 | 4 | | | |
| Stacking, 1*s.* 6*d.*; horse and boy for elevator, 7*d.*; use of elevator, 8*d.* . . . . . | 0 | 2 | 9 | | | |
| Thatching, 7*d.*; depreciation of straw used for thatching, 9*d.* . . . . . | 0 | 1 | 4 | | | |
| Carting water for thatching, 3*d.* . . . | 0 | 0 | 3 | | | |
| Engine driver and feeder, 10½*d.*; unloading and yelming, 1*s.* 1½*d.* . . . . . | 0 | 2 | 0 | | | |
| Filling chaff, 1*s.* 1½*d.*; horses carting chaff and water, 2*s.* . . . . . | 0 | 3 | 1½ | | | |
| Use of engine and cutter, 3*s.* 9*d.*; coal, oil, &c., 1*s.* 2*d.*; rent and tithe, 1*l.* 15*s.* . . . . | 1 | 19 | 11 | | | |
| | | | | 3 | 8 | 2 |
| Nett value of hay per acre . . . . | | | | 5 | 19 | 10 |

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## *ENSILED GRASS* v. *HAY.*

VALUE OF ONE ACRE OF GRASS MADE INTO ENSILAGE.

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| 1 acre of grass weighed 12¾ tons, and produced 12 tons of ensilage, value 26*s.* 8*d.* per ton, being one-third value of hay at 4*l.* per ton . . . . | 16 | 0 | 0 | | | |
| Deduct rent and tithe, cost of cutting, carting, chaffing, filling silo, and all other expenses, including interest on cost of barn silo . . . . . | 5 | 4 | 9 | | | |
| | | | | 10 | 15 | 3 |

### *Value of One Acre of Grass made into Hay.*

| | | | | | | |
|---|---|---|---|---|---|---|
| 1 acre of grass weighed 12¾ tons, and produced 2 tons 7 cwt. of hay at 4*l.* per ton . . . . | 9 | 8 | 0 | | | |
| Deduct rent and tithe, cost of cutting, carting, making stacking, and chaffing . . . . | 3 | 8 | 2 | | | |
| | | | | 5 | 19 | 10 |
| Balance in favour of ensilage . . . . | | | | 4 | 15 | 5 |

# APPENDIX B.

## *ENSILED BRANK.*

VALUE OF ONE ACRE WITH COST OF GROWING AND MAKING INTO ENSILAGE.

| | £ | s. | d. |
|---|---|---|---|
| 1 acre of brank cut green weighed 8½ tons, and produced 8 tons of ensilage, value 26*s.* 8*d.* per ton, being one-third value of hay at 4*l.* per ton . . . . . | 10 | 13 | 4 |

### *Cost of Growing and Making into Ensilage.*

| | £ | s. | d. |
|---|---|---|---|
| CULTIVATION : | | | |
| 1 ploughing, 7*s.* 6*d.* ; 2 harrowings, 3 horses, 1*s.* 4*d.* ; 1 harrowing, 2 horses, 6*d.* . . . . | 0 | 9 | 4 |
| 1 rolling, 6*d.* ; drilling, 1*s.* 6*d.* ; seed, 12*s.* ; 4 cwts. dissolved bones, 1*l.* 8*s.* . . . . | 2 | 2 | 0 |
| Carting and sowing dissolved bones, 10*d.* . . . | 0 | 0 | 10 |
| MAKING INTO ENSILAGE, &c. : | | | |
| Cutting, 4*s.* 6*d.* ; gathering, 6*d.* ; pitching, 1*s.* 4*d.* ; loading, 8*d.* . . . . . | 0 | 7 | 0 |
| Raking, 9*d.* ; drivers, 1*s.* ; horse and lad raking, 1*s.* 7*d.* | 0 | 3 | 4 |
| Horses carting, 8*s.* ; engine driver, 1*s.* ; man feeding cutter, 1*s.* . . . . . | 0 | 10 | 0 |
| Unloading and yelming, 2*s.* 7*d.* ; filling bags, 1*s.* 8*d.* . | 0 | 4 | 3 |
| Carrying to silo, 2*s.* 7*d.* ; treading in silo, 3*s.* 5*d.* ; salt, 1*s.* 8*d.* . . . . . | 0 | 7 | 8 |
| Horse and lad carting water, 1*s.* 7*d.* ; use of engine and cutter, 8*s.* 7*d.* . . . . . | 0 | 10 | 2 |
| Rent and tithe, 15*s.* ; coal, oil, files, &c , 2*s.* 8*d.* . | 0 | 17 | 8 |
| Interest on cost of barn silo, at 6*l.* 12*s.* 4*d.* per cent. as charged by the Lands Improvement Company = 8*d.* per ton = 8 tons at 8*d.* . . . . | 0 | 5 | 4 |
| | | 5 | 17 | 7 |
| Nett value of ensiled brank per acre . . . | | 4 | 15 | 9 |

## *HARVESTED BRANK.*

VALUE OF ONE ACRE WITH COST OF CULTIVATION, ETC.

| | £ | s. | d. |
|---|---|---|---|
| 1 acre of brank producing 4 quarters at 32*s.* per qr. 6*l.* 8*s.*; value of straw, 10*s.* . . . . . | 6 | 18 | 0 |

### *Cost of Cultivating, Harvesting, &c.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| 1 ploughing, 7*s.* 6*d.*; 2 harrowings, 3 horses, 1*s.* 4*d.*; 1 harrowing, 2 horses, 6*d.* . . . . | 0 | 9 | 4 | | | |
| 1 rolling, 6*d.*; drilling, 1*s.* 6*d.*; seed, 12*s.*; 4 cwt. dissolved bones, 1*l.* 8*s.* . . . . | 2 | 2 | 0 | | | |
| Carting and sowing dissolved bones, 10*d.* . . | 0 | 0 | 10 | | | |
| Cutting, 4*s.* 6*d.*; gathering, 6*d.*; pitching, 6*d.*; horses for carting, 2*s.* 6*d.* . . . . . | 0 | 8 | 0 | | | |
| Loading, 4*d.*; raking, 3*d.*; drivers, 3*d.*; horse and lad raking, 8*d.* . . . . . | 0 | 1 | 6 | | | |
| Stacking, 1*s.* 2*d.*; horse and boy for elevator, 4*d.*; wear of elevator, 6*d.* . . . . . | 0 | 2 | 0 | | | |
| Thatching, 1*s.*; depreciation of straw used for thatching, 10*d.* . . . . . | 0 | 1 | 10 | | | |
| Thrashing, dressing, and delivering to market, 10*s.* . | 0 | 10 | 0 | | | |
| Rent and tithe, 15*s.* . . . . . | 0 | 15 | 0 | | | |
| | | | | 4 | 10 | 6 |
| Nett value of harvested brank per acre . . | | | | 2 | 7 | 6 |

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## *ENSILED BRANK* v. *HARVESTED BRANK.*

### *Value of One Acre of Ensiled Brank.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| 1 acre of brank cut green weighed 8½ tons, and produced 8 tons of ensilage, value 26*s.* 8*d.* per ton, being one-third value of hay at 4*l.* per ton . . . | 10 | 13 | 4 | | | |
| Deduct rent and tithe, cost of cultivation, manure, seed, cutting, carting, chaffing, and all other expenses, including interest on cost of barn silo . . | 5 | 17 | 7 | | | |
| | | | | 4 | 15 | 9 |

### *Value of One Acre of Harvested Brank.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| 1 acre producing 4 quarters of brank at 32*s.* per qr., including value of straw 10*s.* . . . . | 6 | 18 | 0 | | | |
| Deduct rent and tithe, cost of cultivation, manure, seed, cutting, carting, stacking, thatching, thrashing, and delivering to market . . . . | 4 | 10 | 6 | | | |
| | | | | 2 | 7 | 6 |
| Balance in favour of ensilage . . . | | | | 2 | 8 | 3 |

# APPENDIX C.

## *ENSILED OATS.*

VALUE OF ONE ACRE WITH COST OF GROWING AND MAKING INTO ENSILAGE.

| | £ | s | d. |
|---|---|---|---|
| 1 acre of oats cut green weighed 13 tons, and produced 12 tons of ensilage, value 26*s.* 8*d.* per ton, being one-third value of hay at 4*l.* per ton . . . . . | 16 | 0 | 0 |

### *Cost of Growing and Making into Ensilage.*

| | £ | s. | d. | £ | s | d. |
|---|---|---|---|---|---|---|
| CULTIVATION : | | | | | | |
| 1 ploughing, 7*s.* 6*d.* ; 2 harrowings, 3 horses, 1*s.* 4*d.* ; 1 harrowing, 2 horses, 6*d.* . . . . | 0 | 9 | 4 | | | |
| Drilling, 1*s.* 6*d.* ; rolling, 6*d.* ; seed, 11*s.* ; 4 cwt. rape cake, 24*s.* . . . . . | 1 | 17 | 0 | | | |
| Carting and sowing cake, 10*d.* ; bird keeping, 9*d.* ; weeding, 6*d.* . . . . . | 0 | 2 | 1 | | | |
| MAKING INTO ENSILAGE, &C. : | | | | | | |
| Cutting, 4*s.* 6*d.* ; tying, 3*s.* ; pitching, 2*s.* 5*d.* ; loading, 1*s.* 9*d.* . . . . . | 0 | 11 | 8 | | | |
| Driving, 1*s.* 5*d.* ; horse and lad raking, 2*s.* 2*d.* ; horses carting, 11*s.* 2*d.* . . . . . | 0 | 14 | 9 | | | |
| Engine driver, 1*s.* 5*d.* ; man feeding cutter, 1*s.* 5*d.* . | 0 | 2 | 10 | | | |
| Unloading and yelming, 3*s.* 7*d.* ; filling bags, 2*s.* 5*d.* ; carrying to silo, 3*s.* 7*d.* . . . . | 0 | 9 | 7 | | | |
| Treading in silo, 4*s.* 10*d.* ; lad and horse carting water to engine, 2*s.* 2*d.* . . . . . | 0 | 7 | 0 | | | |
| Use of engine and chaff-cutter, 12*s.* ; salt, 2*s.* 6*d.* . | 0 | 14 | 6 | | | |
| Coal, oil, files, &c., 3*s.* 9*d.* ; rent and tithe, 18*s.* . | 1 | 1 | 9 | | | |
| Interest on cost of barn silo at 6*l.* 12*s.* 4*d.* per cent. as charged by the Lands Improvement Company = 8*d.* per ton = 12 tons at 8*d.* . . . . | 0 | 8 | 0 | | | |
| | | | | 6 | 18 | 6 |
| Nett value of ensiled green oats per acre . . | | | | 9 | 1 | 6 |

## *HARVESTED OATS.*

VALUE OF ONE ACRE WITH COST OF CULTIVATION, ETC.

| | £ | s. | d. |
|---|---|---|---|
| 1 acre, producing 7 quarters of oats at 22*s.* per quarter, 7*l.* 14*s.*; value of 1 acre oat straw, 30*s.* | 9 | 4 | 0 |

### *Cost of Cultivating, Harvesting, &c.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| 1 ploughing, 7*s.* 6*d.*; 2 harrowings, 3 horses, 1*s.* 4*d.*; 1 harrowing, 2 horses, 6*d.* | 0 | 9 | 4 | | | |
| Drilling, 1*s.* 6*d.*; rolling, 6*d.*; seed, 11*s.*; 4 cwts. rape cake, 24*s.* | 1 | 17 | 0 | | | |
| Carting and sowing cake, 10*d.*; bird-keeping, 9*d.*; weeding, 6*d.* | 0 | 2 | 1 | | | |
| Cutting, 4*s.* 9*d.*; tying, 3*s.*; horses for carting, 3*s.* 9*d.*; pitching, 9*d.* | 0 | 12 | 3 | | | |
| Loading, 6*d.*; raking, 3*d.*; drivers, 4*d.*; horse and lad raking, 8*d.* | 0 | 1 | 9 | | | |
| Stacking, 1*s.* 8*d.*; horse and boy for elevator, 6*d.*; wear of elevator, 6*d.* | 0 | 2 | 8 | | | |
| Thatching, 1*s.*; depreciation of straw used for thatching, 10*d.* | 0 | 1 | 10 | | | |
| Thrashing, dressing, and delivering to market, 17*s.* 6*d.* | 0 | 17 | 6 | | | |
| Rent and tithe, 18*s.* | 0 | 18 | 0 | | | |
| | | | | 5 | 2 | 5 |
| Nett value of harvested oats per acre | | | | 4 | 1 | 7 |

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## *ENSILED OATS* v. *HARVESTED OATS.*

VALUE OF ONE ACRE OF GREEN OATS MADE INTO ENSILAGE.

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| 1 acre of oats, cut green, weighed 13 tons, and produced 12 tons of ensilage, value 26*s.* 8*d.* per ton, being one-third value of hay at 4*l.* per ton | 16 | 0 | 0 | | | |
| Deduct rent and tithe, cost of cultivation, manure, seed, cutting, carting, chaffing, and all other expenses, including interest on cost of barn silo | 6 | 18 | 6 | | | |
| | | | | 9 | 1 | 6 |

### *Value of one Acre of Harvested Oats.*

| | £ | s. | d. | | | |
|---|---|---|---|---|---|---|
| 1 acre, producing 7 quarters of oats at 22*s.* per quarter, including value of straw, 30*s.* | 9 | 4 | 0 | | | |
| Deduct rent and tithe, cost of cultivation, manure, seed, cutting, carting, stacking, thatching, thrashing, and delivering to market | 5 | 2 | 5 | | | |
| | | | | 4 | 1 | 7 |
| Balance in favour of ensilage | | | | 4 | 19 | 11 |

# APPENDIX D.

## *SPURREY (SPERGULA ARVENSIS).*

VALUE OF ONE ACRE WITH COST OF GROWING AND MAKING INTO ENSILAGE.

| | £ | s. | d. |
|---|---|---|---|
| 1 acre of spurrey weighed $5\frac{1}{4}$ tons, and produced 5 tons of ensilage, value 26*s.* 8*d.* per ton, being one-third value of hay at 4*l.* per ton . . . . . | 6 | 13 | 4 |

### *Cost of Growing and Making into Ensilage.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| CULTIVATION: | | | | | | |
| 1 ploughing, 7*s.* 6*d.*; 2 harrowings, 2 horses, 1*s.* . | 0 | 8 | 6 | | | |
| Drilling, 1*s.*; seed, 14 lbs. at 5*d.* = 5*s.* 10*d.*; rolling, 1*s.* . . . . . | 0 | 7 | 10 | | | |
| MAKING INTO ENSILAGE, &c.: | | | | | | |
| Mowing, 3*s.*; gathering, 10*d.*; pitching, 9*d.*; loading, 4*d.* . . . . . | 0 | 4 | 11 | | | |
| Drivers, 7*d.*; horse labour for carting, 4*s.* 8*d.* . | 0 | 5 | 3 | | | |
| Engine driver, 7*d.*; man for feeding chaff cutter, 7*d.* . | 0 | 1 | 2 | | | |
| Lad and horse for carting water, 11*d.*; unloading, 6*d.* | 0 | 1 | 5 | | | |
| Yelming, 1*s.*; filling bags, 1*s.*; carrying to silo, 1*s.* 6*d.*; salt, 1*s.* . . . . . | 0 | 4 | 6 | | | |
| Treading in silo, 2*s.*; use of engine and cutter, 5*s.* . | 0 | 7 | 0 | | | |
| Coal, oil, files, &c., 1*s.* 7*d.*; rent of land, 3*s.* . . | 0 | 4 | 7 | | | |
| Interest on cost of barn silo at 6*l.* 12*s.* 4*d.* per cent., as charged by the Lands Improvement Company = 8*d.* per ton = 5 tons at 8*d.* per ton . . | 0 | 3 | 4 | | | |
| | | | | 2 | 8 | 6 |
| Nett value of ensiled spurrey per acre . . | | | | 4 | 4 | 10 |

# APPENDIX E.

## *MAIZE.*

VALUE OF ONE ACRE WITH COST OF GROWING AND MAKING INTO ENSILAGE.

### *Value of Ensiled Maize.*

| | £ | s. | d. |
|---|---|---|---|
| 1 acre of maize, cut green, weighed 28 tons, and produced 26 tons of ensilage, value 26*s.* 8*d.* per ton, being one-third value of hay at 4*l.* per ton . . . . . | 34 | 13 | 4 |

### *Cost of Growing and Making into Ensilage.*

| | £ | s. | d. |
|---|---|---|---|
| CULTIVATION : | | | |
| 2 ploughings, 16*s.* ; 3 harrowings, 3 horses, 2*s.* ; 2 rollings, 1 horse, 1*s.* . . . . . | 0 | 19 | 0 |
| 2 harrowings, 2 horses, 1*s.* ; 15 loads manure at 4*s.* per load, 60*s.* . . . . . | 3 | 1 | 0 |
| Filling, carting, and spreading manure, 19*s.* . . | 0 | 19 | 0 |
| Drilling, 1*s.* 6*d.* ; seed (6 pecks), 6*s.* 6*d.* ; hoeing, 5*s.* | 0 | 13 | 0 |
| MAKING INTO ENSILAGE, &C. : | | | |
| 5 men, reaping, tying, pitching, and loading, 15*s.* . | 0 | 15 | 0 |
| 1 lad driving, 1*s.* 6*d.* ; 4 horses carting, 20*s.* . . | 1 | 1 | 6 |
| 1 man driving engine, 3*s.* 6*d.* ; 1 man feeding cutter, 3*s.* 6*d.* . . . . . | 0 | 7 | 0 |
| 2 men yelming and unloading, 6*s.* ; 2 men filling bags, 6*s.* . . . . . | 0 | 12 | 0 |
| 3 men carrying to silo, 9*s.* ; 4 men treading in silo, 12*s.* | 1 | 1 | 0 |
| 1 lad, 1*s.* 6*d.*, and 1 horse, carting water to engine, 4*s.* | 0 | 5 | 6 |
| Salt used at the rate of 1 lb. to the cwt. of maize chaff | 0 | 5 | 0 |
| Use of engine and chaff-cutter, 30*s.* . . . | 1 | 10 | 0 |
| Coal, oil, files, &c., 9*s.* 6*d.* . . . . | 0 | 9 | 6 |
| Rent and tithe, 28*s.* . . . . . | 1 | 8 | 0 |
| Interest on cost of barn silo at 6*l.* 12*s.* 4*d.* per cent., as charged by the Lands Improvement Company = 8*d.* per ton = 26 tons at 8*d.* per ton . . | 0 | 17 | 4 |
| | | | 14 3 10 |
| Nett value of ensiled maize per acre . . . | | | 20 9 6 |

# APPENDIX F.

## *SWEDES.*

VALUE OF ONE ACRE, COST OF CULTIVATION, ETC.

| | £ | s. | d. |
|---|---|---|---|
| 1 acre of swedes, producing 18 tons, at 15*s.* per ton . . | 13 | 10 | 0 |

### *Cost of Cultivating and Preparing for Stock.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| 2 ploughings, 16*s.*; 3 harrowings, 3 horses, 2*s.* . | 0 | 18 | 0 | | | |
| 2 harrowings, 2 horses, 1*s.*; 2 rollings, 1 horse, 1*s.*; drilling, 9*d.* . . . . . | 0 | 2 | 9 | | | |
| Seed, 1*s.* 6*d.*; 15 loads manure at 4*s.* per load, 60*s.* . | 3 | 1 | 6 | | | |
| Filling, carting, and spreading manure, 19*s.* . . | 0 | 19 | 0 | | | |
| 2 horse hoeings, 2*s.*; hand hoeing, 7*s.* 6*d.* . . | 0 | 9 | 6 | | | |
| Pulling, topping, and cleaning, 5*s.* 6*d.*; loading, 3*s.* . | 0 | 8 | 6 | | | |
| Carting, 15*s.*; drivers, 3*s.*; packing, 2*s.* . . | 1 | 0 | 0 | | | |
| Grinding ready for stock, 12*s.* . . . . | 0 | 12 | 0 | | | |
| Rent and tithe, 28*s.* . . . . . | 1 | 8 | 0 | | | |
| | | | | 8 | 19 | 3 |
| Nett value of swedes per acre . . . | | | | 4 | 10 | 9 |

## *ENSILED MAIZE* v. *SWEDES.*

VALUE OF ONE ACRE OF GREEN MAIZE MADE INTO ENSILAGE.

| | £ | s. | d | £ | s. | d. |
|---|---|---|---|---|---|---|
| 1 acre of maize, cut green, weighed 28 tons, and produced 26 tons of ensilage, value 26*s.* 8*d.* per ton, being one-third value of hay at 4*l.* per ton . . | 34 | 13 | 4 | | | |
| Deduct rent and tithe, cost of cultivation, manure, seed, cutting, carting, chaffing, filling silo, and all other expenses, including interest on cost of barn silo | 14 | 3 | 10 | | | |
| | | | | 20 | 9 | 6 |

### *Value of one acre of Swedes grown in the same field by the side of the Maize.*

| | £ | s. | d. | £ | s. | d. |
|---|---|---|---|---|---|---|
| 1 acre of swedes, producing 18 tons, at 15*s.* per ton . | 13 | 10 | 0 | | | |
| Deduct rent and tithe, cost of cultivation, manure, seed, hoeing, cleaning, carting, and getting ready for stock | 8 | 19 | 3 | | | |
| | | | | 4 | 10 | 9 |
| Balance in favour of ensilage . . . | | | | 15 | 18 | 9 |

# APPENDIX G.

## *THE MERTON HOME FARM.*

ANALYSES OF ENSILED GRASSES, HAY, ETC., MADE IN THE AUTUMN OF 1883.

### GENERAL COMPOSITION.

| | NATURAL STATE. | | | | | | | DRIED AT 212° F. | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Fresh Grass | Hay from same Grass | Grass Ensilage | Swedes | Spurrey Ensilage | Green Maize Chaff | Maize Ensilage | Grass | Hay | Grass Ensilage | Swedes | Spurrey | Maize Chaff | Maize Ensilage |
| Water | 75·630 | 12·680 | 73·530 | 88·490 | 73·460 | 83·740 | 86·280 | — | — | — | — | — | — | — |
| Albumenoids (flesh-formers) | 2·158 | 6·184 | 2·805 | 1·390 | 2·392 | 1·221 | 1·149 | 8·853 | 7·072 | 10·881 | 12·085 | 9·020 | 7·509 | 8·379 |
| Carbo-hydrates (respiratory principles and fat-formers) | 9·146 | 30·736 | 11·605 | 8·364 | 11·713 | 5·421 | 5·186 | 37·020 | 35·194 | 43·530 | 72·730 | 44·126 | 33·300 | 35·697 |
| Woody fibre | 11·470 | 43·740 | 8·140 | 1·226 | 8·785 | 8·220 | 5·075 | 47·587 | 50·114 | 30·780 | 10·660 | 33·142 | 50·550 | 39·243 |
| Ash | 1·596 | 6·660 | 3·920 | 0·530 | 3·650 | 1·398 | 2·310 | 6·540 | 7·620 | 14·809 | 4·525 | 13·712 | 8·641 | 16·681 |
| | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 |

### DETAILED COMPOSITION.

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Water | 75·630 | 12·680 | 73·530 | 88·490 | 73·460 | 83·740 | 86·280 | — | — | — | — | — | — | — |
| Acetic and lactic acids | — | — | 0·520 | — | 0·940 | — | 0·540 | — | — | 1·962 | — | 3·540 | — | 3·321 |
| Soluble albumenoids | 0·501 | 1·329 | 1·795 | 1·390 | 2·291 | 0·430 | 1·020 | 2·055 | 1·522 | 7·081 | 12·085 | 8·632 | 2·644 | 7·434 |
| Insoluble do. | 1·657 | 4·855 | 1·010 | | 0·101 | 0·791 | 0·129 | 6·798 | 5·550 | 3·800 | | 0·380 | 4·860 | 0·945 |
| Soluble carbo-hydrates (sugar, gum, &c.) | 4·114 | 13·721 | 5·502 | 8·154 | 5·694 | 2·223 | 2·621 | 16·880 | 15·710 | 20·650 | 70·910 | 21·448 | 13·645 | 18·120 |
| Insoluble do. | 4·655 | 15·815 | 4·823 | | 3·619 | 2·759 | 1·585 | 18·600 | 18·110 | 18·020 | | 13·636 | 16·960 | 11·550 |
| Fatty matters | 0·377 | 1·200 | 0·760 | 0·210 | 1·460 | 0·439 | 0·440 | 1·540 | 1·374 | 2·898 | 1·820 | 5·510 | 2·700 | 2·706 |
| Woody fibre | 11·470 | 43·740 | 8·140 | 1·226 | 8·785 | 8·220 | 5·075 | 47·587 | 50·114 | 30·780 | 10·660 | 33·142 | 50·550 | 39·243 |
| Ash | 1·596 | 6·660 | 3·920 | 0·530 | 3·650 | 1·398 | 2·310 | 6·540 | 7·620 | 14·809 | 4·525 | 13·712 | 8·641 | 16·681 |
| | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 | 100·000 |

FRANCIS SUTTON, F.C.S., F.I.C.,

*County Analyst, and Analyst to the Norfolk Chamber of Agriculture.*

At the outset I think it right to say that I have entered into no speculation as to the exact chemical changes which occur in the ensiled plants—investigations are going on which may eventually throw some light on this point, especially as to the condition of the nitrogenous compounds—but, in the present imperfect state of our knowledge in this direction, I think it better to waive these questions and wait for more evidence as to the practical feeding results.

The figures of analysis speak for themselves, but in judging of the results we must look at all the materials as being in a perfectly dry state, because then the comparison is clearly understood, and we see that the first most convenient set of comparisons is between fresh grass, ensilage made from the same grass, and hay made from the same grass.

One would, perhaps, naturally expect to find, that when the same grass is taken for all these separate articles at the same time, and under the same conditions, the eventual composition would be very much the same. As a fact it is not so. The figures clearly show that in making grass into hay there is a distinct and notable loss of nutritive matter, not in one particular only, but practically in all; for it is found that the only two classes of really nutritious matters—namely, albumenoids or flesh-formers; and digestible carbo-hydrates, or fat-formers—are richer by about 15 per cent. in the first case, and 7 per cent. in the latter; the useless woody fibre being increased in the hay owing to the drying process which has taken place.

But the ensilage is even further improved by the process of the silo, for the flesh-formers show an increase of 20 per cent., and the fat-formers about 12 per cent., while the useless woody fibre is diminished even as compared with the fresh grass.

It is evident, therefore, as I said in my first examination of ensilage a year ago, that a ripening or partial digestive process goes on in the silo, and the food so produced is so much the more assimilable to the alimentary organs of the beasts fed on it; hence they ought theoretically to do better on ensilage than on grass, and this, I am told, is a fact beyond dispute.

Turning now from grass to the two other substances ensiled—namely, spurrey and maize—we find that they differ very greatly. They differ from grass, and they differ very widely from each other. Spurrey and maize may, I think, be said to be exactly at the two extremes of substances useful for ensilage—spurrey very rich, and maize comparatively poor in nutritious matters. But then, on the other hand, a very heavy crop of maize may be grown as against a moderate weight of spurrey, so that the eventual quantity of real nutrition does not differ much. But there is still the same leading feature in these substances as has been noticed in the case of grass—there is a constant diminution of indigestible woody matter, and an increase of soluble matters, due to the silo. The change is always in the same direction, and that a beneficial one. Spurrey contains some actual sugar besides a very considerable proportion of oil, and I look upon this material as being one of the

richest for conversion into ensilage. The amount of soluble flesh-formers and ready formed fat is most marked, and cannot fail to be a food upon which any kind of ruminant animal would grow rapidly. Of course, experience must prove its value in the end. At the same time, maize, which is not nearly so rich, is most undoubtedly a good material for ensiling. It supplies bulk, and this is an important point in the case of cattle with their large area of stomach; and even with this material we find the silo renders the nutriment much more soluble—there being an increase of about 10 per cent. in the total flesh and fat formers, and a diminution in like proportion of the useless fibre, as compared with the same plant in the form of fresh chaff.

## *GENERAL REPORT ON THE VARIOUS PLANTS EXAMINED.*

*Grass and Hay.*—The analysis shows that there is a distinct loss of nutritive matter, which takes place in the conversion of fresh grass into hay.

I believe the hay was made under the most favourable circumstances, because the condition was excellent, and, as the figures show, very dry.

The loss is not very great; but, if even such a loss takes place under favourable circumstances, it is certain that under unfavourable conditions it may be far more serious.

*Swedes.*—Probably this needs no remark from me, except to say that the per-centage of sugar was estimated, though not shown in the analysis —it amounted to 2·79 per cent. It will be seen that I have not separately estimated the soluble and insoluble portions. With a material containing so little woody fibre, I think this is unnecessary. There is no question that the nutritive matter of swedes is easily assimilable as compared with foods having a woody structure.

*Spurrey.*—This ensiled material is, in my opinion, exceedingly valuable as a somewhat concentrated food. The large proportions of albumenoids and fat are especially noticeable, and I need not dilate on the prominent value of these two substances in a cattle food.

The condition of the ensilage was excellent, possessing a flavour peculiar to the plant, due to the development of essential oil.

It is also worthy of mention that the watery extract contained some ready-formed sugar; probably maltose, as suggested by Mr. Woodland Toms.

I did not accurately estimate it, but it did not amount to 1 per cent.

There were also faint traces of alcohol. I am inclined to think that this plant will be found a valuable one for growth in England.

I have seen it growing on the Continent on very poor soil, and with every appearance of luxuriance, and the probability is that it may be grown on many soils which are incapable of growing clover or other rich qualities of grass.

*Maize Chaff and Ensilage.*—From a preliminary examination of these two forms of maize, I was inclined to think that the process of ensiling

was hardly remunerative, but a further insight into them has altered my opinion.

Precisely the same results have come out here as occurred in the case of the grass ensilages analysed by me last year; that is to say, there is an undoubted modification of the constituents due to the slow fermentation in the silo, and all in the direction of producing soluble and assimilable food.

It cannot be disputed that maize, as grown here, is weak in nitrogenous and saccharine constituents as compared, for instance, with rich grasses or clover; but, on the other hand, the enormous weight of the crop which may be grown acts as a compensation, and it stands to reason that the soil cannot be expected to furnish the same proportion of active constituents as would be the case with a crop of half or one-third the weight.

The maize ensilage was thoroughly sound, and has evidently been well managed in the silo.

It will not probably be thought out of place here for me to give some of my ideas on the work of the silo as gathered from these examinations. It is evident to me that in order to produce the full beneficial effect a great amount of care is required in the management of the process. The want of this no doubt has led to many erroneous opinions as to the value of ensilage.

We may look upon it as a fact that in a well-appointed silo the green material put into it goes on in a healthy living state, but with slower changes than occur while growing. The material only really dies when it decays, and decay will not take place so long as active oxygen is kept out of the mass. This oxygen, or in other words atmospheric air, is kept from permeating the substance by reason of the slow but constant evolution of carbonic acid gas, and by a sufficient pressure being put upon the material to squeeze out as much air as possible in the first instance.

It is found that beer of very weak alcoholic strength may be kept almost indefinitely by a constant pressure of carbonic acid upon its surface. Another adjunct towards the preservation of ensilage is low temperature. Experience must prove what range of temperature is most beneficial for the due perfection of result; but I feel certain that when their proper conditions are fulfilled the change which takes place in the silo is of the character mentioned by me in my previous report on grass ensilage—namely, a partial digestion. The most cursory examination of the juices of the fresh plant, and the juices of the same plant when properly ensiled, will show that a decided change has taken place—difficult to define, perhaps, but nevertheless of a healthy living character, and I believe in a much better condition for immediate assimilation by the animal economy.

I will summarise here what I consider to be the chief advantages derivable from the process of ensiling such green crops as may be safely so treated as compared with drying them in the form of hay.

It is, unfortunately, too well known that of late years especially the

nutritious qualities of the various grasses made into hay in this country have been seriously damaged.

The long periods of exposure to wet, and the increased mechanical treatment the hay has received, have resulted in the bruising of its texture, so that the vital juices have been washed out; besides which the finer portions containing the most nutriment have been detached and lost, and a further deterioration has arisen from undue fermentation in the stack, or even in the field itself.

The analysis of the specimen of hay above mentioned shows that the whole of the nutritive properties have been preserved intact; but it also shows that there exists in it a very large per-centage of useless woody matter which has to be laboriously masticated and ruminated before the valuable constituents are extracted. This all means muscular work which must necessarily consume a large proportion of the total energy of the food before a particle of permanent fat or flesh is laid on the animal. The poorer the quality of hay, the greater the amount of useless work occasioned. Experiment has proved that animals fed on inferior clover hay not only do not gain weight, but actually lose it, although they had no muscular work to do other than that which was involved in feeding.

In the case of well-made ensilage, we always find that the proportion of indigestible woody matter is reduced to the lowest point, while at the same time occurs the same beneficial change which takes place in hay—namely, the development of the aromatic constituents of the plant, which certainly renders the food palatable, and, it may be, more nutritious. But by far the most valuable feature in ensilage is the preservation of the juices of the plant in a soluble form, and apparently even in a more nutritious condition than they exist in the fresh plant. It must be conceded, I think, that if even the silo only enabled the stock-feeder to preserve the food in as good a state as when fresh, it would be an inestimable boon; but a comparison of the analytical results between fresh and ensiled grass and maize points to a still further gain in the improved condition of the material, so far as its assimilable properties are concerned.

These conclusions are somewhat theoretical on my part, but experience will prove whether they are entitled to belief.

It may be urged that hay has the advantage over ensilage in that a considerable portion of actual sugar is produced, but on the other hand it is very difficult to prove that this is a positive advantage, knowing as we do how the animal economy is able quickly to convert soluble carbohydrates into sugar or its equivalent, while we are sure that in carefully-made ensilage no practical loss of these important compounds occurs such as is constantly taking place in badly-made hay.

FRANCIS SUTTON, F.I.C., F.C.S.,
*Author of 'Handbook of Volumetric Analysis,' &c.*
*Chemist to the Norfolk Chamber of Agriculture,*
*Public Analyst for the County of Norfolk, &c., &c.*

# APPENDIX H.

## RELATIVE FEEDING VALUE OF ENSILED MAIZE AND SWEDES.

*Table showing Milk and Cream and Weight of Stock Results in a Trial with Two Cows; one fed on Ensiled Maize, the other on Swedes.*

ENSILAGE. SWEDES.

| LADY MANCHESTER. | | | | SPARK 4TH. | | | |
|---|---|---|---|---|---|---|---|
| Date 1884 | Quantity of Milk Quarts | Degrees of Cream | Quantity and description of Food given | Date 1884 | Quantity of Milk Quarts | Degrees of Cream | Quantity and description of Food given |
| Jan. 10 | 11½ | 11° | 42 lbs. Maize Ensilage, 10 lbs. Straw Chaff, 8 lbs. Maize Meal, and 2 lbs. of Bran per day | Jan. 10 | 11 | 12° | 70 lbs. Swedes 10 lbs. Straw Chaff, 8 lbs. Maize Meal, and 2 lbs. of Bran per day |
| ,, 11 | 12 | 12° | | ,, 11 | 12 | 12° | |
| ,, 12 | 13 | 12° | | ,, 12 | 12 | 13° | |
| ,, 13 | 14 | 13° | | ,, 13 | 12 | 13° | |
| ,, 14 | 14 | 14° | | ,, 14 | 12½ | 13° | |
| ,, 15 | 14 | 14° | | ,, 15 | 12 | 13° | |
| ,, 16 | 14 | 14° | | ,, 16 | 12 | 12° | |
| ,, 17 | 14 | 14° | | ,, 17 | 12 | 12° | |
| ,, 18 | 14½ | 14° | | ,, 18 | 12 | 12° | |
| ,, 19 | 14½ | 14° | | ,, 19 | 12 | 13° | |
| ,, 20 | 14½ | 14° | | ,, 20 | 12 | 13° | |
| ,, 21 | 14½ | 14° | | ,, 21 | 13 | 13° | |
| ,, 22 | 14½ | 14° | | ,, 22 | 13 | 11° | |
| ,, 23 | 14½ | 14° | | ,, 23 | 13 | 11° | |
| ,, 24 | 14 | 15° | | ,, 24 | 12 | 12° | |
| ,, 25 | 14½ | 14° | | ,, 25 | 12 | 12° | |
| ,, 26 | 14½ | 15° | | ,, 26 | 12 | 12° | |
| ,, 27 | 14½ | 14° | | ,, 27 | 12 | 13° | |
| ,, 28 | 14½ | 14° | | ,, 28 | 12 | 13° | |
| ,, 29 | 14½ | 14° | | ,, 29 | 12½ | 13° | |
| ,, 30 | 14½ | 14° | | ,, 30 | 12½ | 13° | |
| ,, 31 | 14½ | 14° | | ,, 31 | 13 | 13° | |
| Feb. 1 | 14½ | 15° | 42 lbs. Maize Ensilage, 10 lbs. Straw Chaff, 8 lbs. Maize Meal, and 2 lbs. of Bran per day | Feb. 1 | 14 | 13° | 42 lbs. Maize Ensilage, 10 lbs. Straw Chaff, 8 lbs. Maize Meal, and 2 lbs. of Bran per day |
| ,, 2 | 14½ | 14° | | ,, 2 | 15 | 13° | |
| ,, 3 | 14 | 14° | | ,, 3 | 15½ | 13° | |
| ,, 4 | 14 | 14° | | ,, 4 | 15½ | 13° | |
| ,, 5 | 14 | 14° | | ,, 5 | 15½ | 13° | |
| ,, 6 | 14 | 14° | | ,, 6 | 15½ | 13° | |

NOTE. Both cows at the time of entering upon the trial were receiving a daily allowance of 30 lbs. mixed hay and straw chaff, 6 lbs. maize meal, and 8 lbs. bran. Lady Manchester then weighed 48 stones (14 lbs.) and gave 11½ quarts of milk per day registering 11° of cream. Spark 4th weighed 56 stones (14 lbs.) and gave 11 quarts of milk, which also registered 11° of cream. On February 6 the weight of Lady Manchester was 52 stones and of Spark 4th 58 stones.

Institute of Agriculture,

SESSION 1884.

# SOUTHDOWN SHEEP:

## THEIR HISTORY, BREEDING, AND MANAGEMENT.

A LECTURE

BY

HENRY WOODS.

# PREFACE.

THE following Lecture was delivered before the Institute of Agriculture in the Lecture Theatre of South Kensington Museum, on the evening of Monday, February 25, 1884; the Right Hon. Lord Walsingham presiding. In publishing it the Author desires to record what he stated at the close of the Lecture when replying to a vote of thanks proposed by the noble Chairman and supported by Professor Tanner, that very much of the success obtained by the Merton Flock is owing to the constant sympathy and sagacious counsel which he has received from Lord Walsingham throughout his management. His Lordship's liberal and earnest efforts at all times to advance the interests of Agriculture were acknowledged in most cordial terms by Mr. Henry Webb, and Mr. Biddell, M.P., in moving the thanks of the meeting to the noble Lord for his kindness in having occupied the Chair.

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# LECTURE.

In the course of Lectures now being delivered under the authority of the Institute of Agriculture, for the promotion of agricultural education, the breeding and management of sheep naturally finds a place, and I have been invited to speak upon that part of the subject which relates to the important breed of Southdowns. It will be my endeavour to give as much information as the limited time at my disposal will allow on the following branches of the subject :—

(1) The history of Southdown sheep, with a description of their past and present peculiarities and merits.

(2) The formation of a flock of sheep, whether of Southdown or any other pure breed, and its general management.

## *ORIGIN OF BREED.*

The Southdown breed of sheep is believed to be indigenous to the Downs of Sussex. It is said by the editor of *The Farmers' Dictionary* to have existed there before the Conquest. It is, no doubt, one of the purest and most unmixed breeds in Britain. Little seems to have been known about Southdown sheep outside the comparatively limited area in which they were kept until about two hundred years ago, when (as Mr. Thomas Ellman writes) several flocks on the South Downs appear to have been nearly annihilated by an outbreak of small-pox, which was imported into this country from Holland about that time.

The sheep which the disease spared attracted rather more notice than had previously been bestowed on the breed, but it was not until the latter part of the last century that they came to be much esteemed. It was, in fact, Mr. Arthur Young, who in one of those useful essays published about 1794, which made his name famous in the agricultural world, first called public attention to Southdown sheep, speaking favourably of their hardy constitution, and of the fine quality and flavour of the mutton they produced.

About the same time they were also described by other writers as being speckle-faced, long and thin in the neck, high on the top of the shoulders, slack in the girth, high and narrow on the loin, low at the rump end with tail set on very low, sharp on the back, flat-ribbed, narrow in the forequarters, and generally, though with little space between their forelegs, showing a fairly good leg of mutton. As a rule they were looked upon as plainly-formed, if not ugly, sheep, which produced good and fine-flavoured flesh. They were small, *very small*, as compared with the Southdowns of the present day.

## *JOHN ELLMAN'S EXPERIMENTS.*

To Mr. John Ellman, of Glynde (the father of the late Mr. John Ellman, of Landport, and Mr. Thomas Ellman, late of Beddingham), will always and most deservedly belong the credit not only of bringing Southdown sheep into more general notice, but of commencing (about the year 1780) a course of valuable, well-considered, skilful, and successful experiments upon them. These experiments were conducted by him with slow and steady good effect during the long period of more than half a century. In justice to the memory of one who so earned the gratitude of sheep breeders not only in this country, but in various parts of the world, I will quote to you his well-founded and practical opinion as to what an improved Southdown sheep should be; and I would impress upon you the desirability of carefully studying those remarks, with which I thoroughly agree, except as to two particulars which I will point out to you later on.

Mr. John Ellman says,[1] 'The head should be small and hornless; the face *speckled* or grey, and neither too long nor too short; the lips thin, and the space between the nose and eyes narrow; the under jaw or chop fine and thin; the ears tolerably wide, and well covered with wool, and the forehead also, and the whole space between the ears well protected by it, as a defence against the fly; the eyes full and bright, but not prominent; the orbit of the eye (the eye-cap or bone) not too projecting, that it may not form a fatal obstacle in lambing; the neck of a medium length, thin towards the head, but enlarging towards the shoulders, where it should be broad and high, and straight in its whole course above and below; the breast should be wide, deep, and projecting forwards between the fore-legs,

[1] *Farmers' Dictionary*, vol. ii. p. 534.

indicating a good constitution and a disposition to thrive. Corresponding with this the shoulders should be on a level with the back, and not too wide above; they should bow outwards from the top to the breast, indicating a springing rib beneath and leaving room for it; the ribs coming out horizontally from the spine and extending far backward, and the last rib projecting more than the others; the back flat from the shoulders to the setting on of the tail; the loin broad and flat; the rump long and broad; and the tail set on high and nearly on a level with the spine; the hips wide; the space between them and the last rib on either side as narrow as possible, and the ribs generally presenting a circular form like a barrel; the belly as straight as the back; the legs neither too long nor too short; the forelegs straight from the breast to the foot, not bending in at the knee, and standing far apart both before and behind; the hocks having a direction rather outward; and the twist, or the meeting of the thighs behind being particularly full; the bones fine, yet having no appearance of weakness, and the legs of a dark colour; the belly well defended with wool, and the wool coming down before and behind to the knee and to the hock; the wool short, close, curled, and fine, and free from spiry projecting fibres.'

Mr. Ellman's description of the main points which constituted a symmetrical and well-bred Southdown sheep early in the present century may be accepted as the essential requirements of a good Southdown sheep at the present time, with the two following exceptions, viz.: Speckled faces and the set-on of the tail. A speckled face is very properly no longer looked upon as denoting a pure-bred Southdown sheep. The face and legs should be of a nice mouse colour, neither too dark nor too light, but of medium tint. In fact, anything in the way of a white speck on the face or legs is now considered to show a defect in the purity of the blood. The other point in Mr. Ellman's description of a well-made Southdown sheep with which I cannot agree is the set-on of the tail. Mr. Ellman says the tail should be 'set on high, and *nearly on a level with the spine.*' I am of opinion that if a sheep's tail is placed on a *level with the spine* the position is an unnatural one. I have generally found, too, that when the tail of a sheep has been placed very high, the back has been weak, and not well covered with flesh. There is a right and wrong position for the tail of a sheep, and to be right it should be neither too high nor too low.

## *ADVANCE IN PUBLIC FAVOUR.*

Notwithstanding the great improvement which Mr. Ellman effected in the breed, it was some time before Southdown sheep won their way into public favour, if we may judge of this by the prices which they made. But we must bear in mind that in those days sheep, even of the most esteemed breeds, did not realise high prices. It appears, however, from an article in the 'Agricultural Annual' of that date, that in 1836 there was a considerable increase in the value of Southdown sheep, the breed having become better known, and its merits then more fully recognised. In the year 1787 a Southdown ram fetched for the first time as much as ten guineas, Mr. Ellman selling two for 21*l.* to Lord Waldegrave, of Essex. In the previous year Mr. Arthur Young bought eighty ewes of the same gentleman at 18s. a piece. These were sent into Suffolk. In 1789 Mr. Ramsden, of Nottinghamshire, bought forty ewes from the Glynde flock at 25s. each, and Mr. Boys, of Betshanger, in East Kent, gave Mr. Ellman eight guineas for a ram. The same year Mr. Macro, of Norfolk, acquired from the same flock one hundred and seventy ewes at 23s. a head. In 1790 Mr. Crowe, also of Norfolk, bought of Mr. Ellman forty ewes at 26s. each, and a ram at twelve guineas. In 1791 Mr. Boys gave 31s. 6d. per head for sixty of the Glynde ewes.

From this year I believe we may date the increased introduction of Southdown sheep into Norfolk, under the auspices of that renowned encourager of agricultural improvement and progress, Thomas William Coke (afterwards Earl of Leicester). Mr. Ellman certainly visited Holkham in the year 1790. Having seen the Norfolk breed of sheep, which he considered more remarkable for their activity than anything else, he suggested to Mr. Coke the desirability of a trial of a few Southdown ewes to see how far they would be suited to the soil and climate of Holkham. Mr. Coke assented. As his own sheep were sold, Mr. Ellman bought 500 ewes and lambs from the best flocks in Sussex, and sent them to Holkham, with four rams from his own flock; Mr. Coke giving as much as 70 guineas for these rams. In 1793 Mr. Coke paid Mr. Ellman 35s. each for eighty ewes, and in 1794 the Earl of Egremont gave two guineas each for fifty of the Glynde ewes. After this, Francis, Duke of Bedford, the Duke of Norfolk, and other noblemen and gentlemen, visited Glynde, and

were the means of introducing Southdown sheep into different counties. The first ram that ever fetched 50 guineas was sold by Mr. Ellman in 1796 to Mr. Goodenough, of Dorsetshire. From that time, for many years, there was a steady demand for all the rams Mr. Ellman could supply at prices ranging from 20 to 100 guineas each for the season. In 1800 Mr. Ellman disposed of 200 ewes to the Duke of Bedford for 500 guineas, and in 1802–3 his Grace paid him 300 guineas for the use of a ram for the two seasons, which was the highest letting price ever made by a Glynde ram. The price at which Mr. Ellman sold his draft ewes soon rose to three guineas each, and afterwards to four guineas, at which price he contracted for the sale of the whole draft to one person (Mr. George Talbot, of Gloucestershire) for four years.

## *JONAS WEBB'S TRIALS.*

The next person who did much to improve and popularise the Southdown breed of sheep was the late Mr. Jonas Webb, of Babraham, in Cambridgeshire. This eminent sheep-breeder well deserved the respect in which he was held throughout his life. He was a true representative man, of whom his country might well be proud. His name will be remembered for ages to come, and he will be spoken of as one of England's most distinguished breeders and improvers of Southdown sheep. Great was his success as a farmer, and no wonder, for he carried out what he undertook with vigour and thoroughness. His connection with Southdown sheep commenced when he was a young man. He entered upon a series of experimental trials with several different breeds of sheep in order to find out which breed was most suited to the Cambridgeshire uplands. At that time Mr. Webb had no particular preference for any one breed, but after exhaustive trials he fully satisfied himself that Southdown sheep produced the greatest weight, and gave the best quality of mutton for the amount of food consumed, and were consequently the most profitable both to breeder and grazier.

These trials determined Mr. Webb to have nothing to do with any other breed of sheep than Southdown. He therefore purchased for the Church Farm, at Babraham, ewes and rams of the late Mr. John Ellman, of Glynde, and other breeders in Sussex. Having started it, he gave unremitting attention to his flock, and soon

witnessed a gradual but sure improvement in its character. His first letting of rams by public auction took place in 1826. These lettings were continued annually down to the year 1860.

## *THE BABRAHAM RAM LETTINGS.*

Many will remember the Babraham Ram lettings, and the annual dinner which followed, with mingled feelings of pleasure and regret: pleasure in thinking over those days, and regret that such meetings are now things of the past. Who can forget the long and gaily-decked waggon-lodge which formed a characteristic banqueting-hall filled with agriculturists, and amongst them many leading noblemen and gentlemen, who came not so much to do business as to pay honour to an old friend; who does not remember the late Earl of Hardwicke, with his burly John Bull form and manner, seated at the head of the guests delivering his short and pithy speeches, replete with humour and happy hits on current topics; who does not recall the jolly, cheerful, Sam Jonas, acting as master of the ceremonies, and his face giving off radiance enough to have lighted up the place without the aid of candles; or the lithe and active John Clayden, who was here, there, and everywhere, with a kind word for everybody; or the host himself in his seat at the bottom table, supported by his friend and opponent in Southdown breeding, William Rigden, and by the tall and spare form of Jem Turner, of Chyngton, one of the best judges of Southdown sheep that ever lived! Those were indeed meetings the like of which will never be seen again. But to resume our narrative.

## *HONOURS AND SUCCESSES.*

In 1855 a two-year old ram was let for the season for 170 guineas, and in 1860 a yearling was sold, after being used at Babraham, for 250 guineas. These were, I believe, the highest prices made by Babraham rams.

As might be expected, Mr. Webb was a most successful exhibitor of Southdown sheep at the Royal and other Agricultural Shows. His first prize was won at the Essex Show held at Saffron Walden. He was subsequently awarded prizes for his sheep at exhibitions in Ireland, Scotland, and France. He first exhibited at the Royal Agricultural Society's meeting at Cambridge, in 1840, where he

received the first prize for ewes. He continued to exhibit with marked success at most of the Royal Shows down to and including the Canterbury meeting in 1860, when he made a clean sweep of the prizes for rams.

## *DISPERSION OF THE BABRAHAM FLOCK.*

In 1861 the Babraham ewes and rams were sold by auction. They realised 10,926*l.* In the following year (1862) the shearling rams and ewes born in 1861 were also publicly disposed of, and brought 5,720*l.* Thus the entire Babraham flock fetched the large sum of 16,646*l.* Surviving but a few months the dispersion of his favourite flock, the owner passed away in November of the same year. Such is the history of the Glynde and Babraham Southdown flocks.

## *WHAT IS A PURE-BRED SOUTHDOWN?*

Here I would venture to remark that while the owners of the flocks of which I have just spoken were scrupulously careful to maintain the purity of the breed, each aimed at a different type of animal. '*Small* and good' sheep were clearly Mr. Ellman's aim; Mr. Webb's, '*large* and good.' Believing that large sheep were much the best and would be the sheep of the future, I need not say how well Mr. Webb succeeded in producing animals of larger frame and greater weight than the Southdowns of Mr. Ellman's day; while, at the same time, retaining the true type and all the essential points of a pure-bred Southdown sheep.

It is, of course, a recognised fact (or ought to be by every careful breeder of Southdown sheep) that the first and greatest point is to maintain extreme purity; to allow no cross to diminish the inestimable value of purity of blood. The direction in which improvement in Southdown sheep is desirable is uniformity of character, strength of constitution, excellence of wool, development of symmetrical form, mutton-producing properties, smallness of bone as compared with weight of meat, yet not such smallness as to prevent the carrying of an increased amount of flesh.

## *THE MERTON FLOCK.*

I may say that these are the points to which our attention has been always most especially directed in the flock of which I have now had the management for upwards of thirty-six years. It is not for me to say how far we have been successful; indeed, I must ask you to excuse me, if, in illustration of my subject, I am in some degree compelled to refer to the Merton Flock. I shall do so very briefly, and only when it enables me to trace more clearly the history of progress and improvement than could be done by reference to other flocks with which I am less intimately acquainted.

Following the subject of increase in weight I find myself obliged to mention the three Shearling Champion Prize Merton Wethers of 1870, which averaged a little over 242 lbs. each, live weight. This I believe to have been the greatest weight recorded up to that time. Some persons, indeed, at the Exhibition, thought that the great weight of those sheep suggested that there had been some cross in the breeding. I need scarcely say how utterly groundless was any such suggestion. The same imputation had been before laid to the charge of Jonas Webb. When he succeeded in producing large Southdown sheep of true type, and with as much quality as the small sheep of former times, he, too, was suspected of having had recourse to a cross with some other breed, but the suspicion was as unfounded in his case as in ours.

Since the Smithfield Show of 1870, other Merton pens of Shearling Wethers have been exhibited of nearly the average weight of the Champion sheep of that year, and no question as to the purity of their breeding was ever so much as hinted at.

At the late Smithfield Exhibition, Lord Walsingham's prize pen reached the unprecedented average for Southdown Wethers of 251 lbs. This showed an increased weight of 9 lbs. per sheep over the weight of the Champion Wethers of 1870, to which I just now referred, and of 26 lbs. as compared with the weight of the Champion Wethers in 1882.

I have no intention of trying to make it appear that with the Merton flock more has been accomplished than may be done by other flocks, or of keeping from you those particulars of management to which is due that largeness of frame and excellence of

mutton without the infusion of any blood but that of the purest Southdown, to which the Merton sheep have attained.

There are, of course, many excellent pure-bred flocks of Southdown sheep in this country whose history, peculiarities; and merits I am obliged, through stress of time, to pass over. But standing in the front rank of successful Southdown breeders at the present day we are naturally reminded of the Prince of Wales, the Duke of Richmond, the Earl of Suffolk, Lord Alington, Sir William Throckmorton, Bart., Messrs. J. J. Colman, M.P., G. and R. Emery, John Ford, Henry Fookes, G. C. Gibson, Hugh Gorringe, H. Humphrey, A. Heasman, J. Hempson, F. M. Jonas, George Jonas, and last, though by no means least, my excellent friend Henry Webb.

## *HOW TO FORM A FLOCK—PRACTICAL SUGGESTIONS.*

In the formation of a flock of Southdown, or any other breed of ewes, great care and judgment are, of course, most essential. Uniformity of character, so that the ewes look as much alike 'as peas in a peck,' should be your first object. If you desire to judge of the general character of a flock of Southdown ewes, and to see if they have, as it were, a family likeness, have them driven a short distance from where you stand, and then suddenly wheeled round so that their heads are thrown up and their faces seen at a glance. This will enable you to detect any marked want of uniformity, if there be any. In a word the ewes should be 'matching' to the eye. When drawing ewes, and separating them into lots for the rams, you must exercise great judgment in the selection, carefully noting individual *formation and peculiarities*, so that the ewes in each lot are as much alike as possible, and adapted to the style of the ram you intend to put to them.

There is no flock so perfect but some defects will be found in the ewes, which require correcting, and, therefore, care should be taken to use a ram which will be likely to improve in the offspring the faulty points observable in the ewes. It must, moreover, be a matter to which the flockmaster gives anxious attention in selecting a ram, that in correcting defects in the ewes he does not overlook any faulty points in the ram which may be transmitted through the ewe, and thereby create imperfections in the lamb which the mother did not possess.

Only by practice and carefully observing the true principles of

breeding is the flockmaster able to make a proper and judicious selection of rams and ewes, so as fitly to mate them. I therefore desire to impress upon you, agricultural students, the absolute necessity of your becoming *thoroughly* and *practically* acquainted with the good and bad points of sheep, no matter what their breed, remembering that the same care and skilful judgment requisite for the successful management of Southdowns are also required in the management of other flocks.

Each breed has its own marked peculiarities, faults, and merits, which must be well studied and carefully looked after, or a man will never become a good and successful sheep-breeder.

## *BREEDING.*

Remember that the breeding of good or bad animals is *no game of chance.* You might as well expect to breed a superior shorthorn beast by using an Alderney bull on a first-class shorthorn cow, as to breed a really good Southdown sheep by using an *inferior* ram on a good Southdown ewe.

If a man desire, and most flockmasters do desire, to breed good and shapely sheep, no matter what their breed may be, he must first endeavour to deserve success by going the right way to work to obtain it. *Leave nothing to chance.*

Many persons when they have hired a good ram try to get as much out of him as possible, and give him as many ewes as he can be got over. Now I look upon this as an unwise thing to do. Nature has its limits; and it is far more judicious to limit the number of ewes put to a ram to from fifty to seventy. The ewes will thus be seasoned at the proper time, and have strong, healthy, and vigorous lambs. If you overdo a ram and there are many ewes 'run over,' you will probably breed a number of weakly lambs; to say nothing as to the bad effect upon the ram for the following season.

I may observe that I by no means recommend what is commonly known as a '*teaser*' ram to show which ewes are in use. Nature never intended that such a course should be adopted, and I would impress upon you the necessity of following the laws of nature as closely as you can. When a ewe is taken from the *teaser* to the ram by which she is to be served, there is frequently a great deal of nervous excitement and fear produced in the ewe, and this being so

how can we wonder if there are many cases of ewes 'running over,' when they have been subjected to such unnatural treatment, which may be aggravated by the rough conduct of an irritable or bad-tempered shepherd.

## *PRACTICE AT MERTON.*

I feel that I can best explain my views and recommendations if I allow myself once more to say a few words with respect to the system of management adopted in the Merton Flock. In doing so, I desire it to be clearly understood that though I have been connected for so many years with Southdown sheep, and though I may be said to regard them with all the admiration felt for one's 'first love,' I am by no means disposed to praise them by depreciating other breeds. A long experience has taught me to recognise the fact that while Southdown sheep are well adapted to upland and dry soils, they are at the same time wholly unsuited to some other soils and conditions. And when pointing out to you the great improvement that has taken place in the breeding of Southdown sheep during the present century, I am not unmindful of the marked change effected in other breeds, such as the Cotswolds, the Lincolns, the Oxfords, the Shropshires, and the Hampshires; and were it not for the invidiousness it would involve, I should like to stray from the immediate subject of my lecture to remind you of the honour which attaches to the names of many breeders of these sheep, who have earned the thanks of both meat-producers and meat-consumers, but time will not permit this digression.

The Merton Flock comprises twelve different families, and the shepherds know, from long experience, how to select the ewes for each family, which ram to put to them, and the kind of lambs that are likely to be produced. By this careful plan of managing the several families we have produced and maintained the large size of the Merton sheep. We have always remarked that when rams have been hired for use at Merton they have only in three instances given us a first-prize animal, but that the second and third generations, after an intermingling of fresh blood with our own sheep, have been most successful.

It is a rule at Merton that when a hired ram has left a promising ram lamb the lamb is used to eight or ten ewes to see how far he

may be relied upon for use as a shearling, and thus the disappointment which might arise from his produce not being satisfactory is avoided.

## *FEEDING.*

For ten days or a fortnight before rams are put with the ewes it is advisable to change the food of the ewes to something more stimulating than that which they had been previously fed upon. This not only causes the ewes to come into use more quickly than they would otherwise do, but invariably leads to a better fall of lambs. The fresh food must be continued for at least five or six weeks, when doubtless the greater part of the ewes will be seasoned.

## *MANAGEMENT OF FLOCK.*

During pregnancy great care must be exercised not only in supplying the ewes with nutritious, health-giving food, but in keeping them from any great excitement, such, for instance, as might be produced by fright from being run by a reckless dog. I may here observe that, while fully recognising the usefulness of a well-trained sheep-dog, I cannot but protest against the way in which I have frequently seen in-lamb ewes and other sheep chased, harassed, and alarmed by a wretch of a dog, apparently under the slight control of a careless and lazy shepherd, who, to save his own legs, will unnecessarily run the dog after the sheep, heedless of the ill-effects it may produce. A good and careful man will not dream of doing such a thing. Many persons are little aware of the injury that is done by the injudicious use of dogs. If they are in-lamb ewes, there is great risk of producing abortion, and if they are fatting sheep, the effect of the alarm caused by an excitable dog upon them is to take a good deal more off in five minutes than you can put on again in five hours. In both cases the owner is a sufferer. The excitement caused by the action of the dog does away for a time with the quietude which is so desirable for fatting animals, and consequently they do not gain flesh so quickly as they would if they were kept free from unnecessary and preventible alarm.

The question, what is the best course of feeding for in-lamb ewes, s a most important one, and calls for the greatest consideration and care on the part of the flockmaster.

There exists no reasonable doubt that where ewes are kept on grass land until after they have lambed there is little fear of abortion, always presupposing that they are kept free from injury, are not jumped over ditches and water-courses, not over-driven, nor subjected to fright, &c. I have proved beyond question, with the Merton ewes, that keeping them entirely away from turnips until after they have lambed is a decided safeguard against abortion. Up to the year 1853 the Merton ewes were folded on turnips from the end of October until the spring of the following year. They were then as unhealthy as any ewes in the country. In the early part of 1854 there were something like 110 cases of abortion, and eighty ewes died. Feeling that a change in the treatment must be made, I determined that in future the ewes should not be fed on turnips (except for five or six weeks when the rams were with them) until after they had lambed. Since that time they have been folded and fed on grass land, with the supply of grass daily supplemented by a reasonable allowance of a mixture of hay chaff and fresh-made broad bran, at the rate of four bushels of chaff to one of bran. At about the fifteenth week of gestation half a bushel more bran is added to each four bushels of chaff, and this allowance of mixed food is gradually increased in proportion to the increasing demand made by the unborn lamb on the system and strength of the ewe.

## *HOW TO AVERT ABORTION.*

Since the introduction of this change in our system of feeding the in-lamb ewes at Merton, cases of abortion have been unknown, and the mortality amongst the ewes has been at a minimum.

On this point I may be permitted to call your attention to my lecture on 'Abortion and Mortality amongst Ewes,' delivered in 1877. To enable me to arrive at something like a definite idea as to the cause of the fearfully large number of ewes which aborted and died in many parts of the country in the early part of the year I have referred to, I sent out more than four hundred circular letters of inquiry, each letter containing twenty questions, to flockmasters and others throughout the United Kingdom. These letters were almost all replied to and the questions fully answered. They showed clearly and conclusively that the greater part of the abortions and deaths occurred in flocks where the ewes had been fed on a comparatively unstinted allowance of common turnips and swedes

unmixed with dry food; and that a good allowance of dry food undoubtedly does away with many of the ill effects produced by simple root diet. It was also very clearly shown that where the ewes were grass-fed there was an entire absence of any serious amount of abortion and mortality.

The particulars, with the reasons given for the conclusions at which I arrived, were fully detailed in the lecture to which I have alluded. I may, therefore, especially as our time is so limited, be excused from entering further into this subject. Let me, however, add that I have every hope, when the ensilaging of green crops comes to be fully understood and appreciated as it deserves, the system will be far more generally adopted, with as much benefit and advantage to flockmasters as to dairy farmers, cheese-makers and stock-keepers in general. I am justified in this confident statement by my recent experience of the good results which have followed the use of ensilage in the case of in-lamb ewes.

## *LAMBING.*

As the time draws near for ewes to lamb, a sheltered, well-littered yard should be provided. This should be surrounded by straw-thatched sheds, so divided as to have a nice comfortable pen for each ewe when she lambs.

These yards may be constructed for a comparatively small expenditure, and the cost will be amply compensated by the saving of life both among ewes and lambs: many that would otherwise probably be lost in severe weather being preserved by means of this timely protection.

Suitable food and dry litter should also be provided close at hand, so that the shepherd has not to run about in search of these necessaries at a time when the ewes are calling for all the attention which he can give them.

Bear in mind that the duties of a shepherd at lambing time are varied, trying, and anxious, and it is a 'penny wise' practice to stint him. To deny him a fair and reasonable amount of manual help when he requires it, will be hard upon him, and may be the cause of the death of many lambs; because, however willing he is, there is a limit to the shepherd's bodily power, besides which he cannot be in two or three places at the same time.

A careful, painstaking shepherd, of the greatest value at any

time, becomes doubly valuable at the laborious and anxious time of lambing. How considerable is the importance and worth of such a shepherd can only be fully understood and appreciated by those who, like myself, have watched his constant zeal and anxiety in endeavouring to do the best in his power for the interest of his employer.

I repeat what I said on a former occasion, that it is very desirable for the master to visit his shepherd at the lambing-fold during the night as well as during the day, as frequently as possible, and especially in coarse weather, and if he occasionally takes with him something 'warm and comforting' it will be gratefully received and fully appreciated. The more trustworthy the shepherd, the better pleased he is to find the master taking an interest in his work. If everything is going on satisfactorily, it will afford him pleasure to make it known to his employer, while, on the other hand, if he is experiencing more than ordinary anxiety and difficulty in performing his duties, he will be very thankful for the advice and assistance that his master will be able to give him—more especially in cases where the shepherd has reason to put confidence in the skill and knowledge of the master. You, therefore, see how very necessary it is for you, agricultural students, to be well *grounded* in all the practical details of sheep management if you would become successful flock-masters, or desire to have your shepherds look up to you for advice.

## *STRAINING IN EWES AFTER LAMBING.*

In a lecture on the 'Diseases of Sheep,' delivered in November 1872, I referred to most of the diseases to which sheep are liable. On this occasion I can refer to one or two only. There is that fatal disorder, 'Straining in Ewes after Lambing,' as to which I may say that in the spring of 1878 I made known the success which had followed the treatment of ewes when affected with this disease by the use of carbolised oils, by which an enormous amount of suffering and loss amongst ewes is prevented.

Not only did the Merton shepherd save every one of the ewes thus afflicted when first we adopted this treatment, but the flock in the last few years has been entirely free from the disease, which I think is wholly attributable to the free application of the carbolised oils whenever a case of difficult lambing has arisen. Since this treatment was made known by me through the agricultural papers,

it has been tried by many flockmasters, and with almost unvarying success.

One of the leading physicians of Norwich, and at the present time mayor of that city (Dr. Eade), was so struck with the success of the treatment that he tried it in two out of five severe and dangerous cases of puerperal fever in women. The two patients so treated recovered; the other three died. These cases, most interesting and important (from many points of view), will be found reported in the *British Medical Journal* of January 22, 1881, p. 116, in a paper contributed by Dr. Eade.

It would take too much time to enter into the particulars of this fatal disease and the method of its treatment. For information on these points I would refer you to some correspondence on the subject published by the proprietors of the *Norwich Mercury*, at whose office copies may be obtained. There you will find full directions for the preparation and use of these carbolised oils.

The *utmost care* must be taken in preparing the oils, which should be compounded of the *best* ingredients. Failure here may lead to failure in result. Indeed, such is the care required in the preparation, that (though, no doubt, there are others) I myself know only of one or two firms in England whose oils are perfectly satisfactory.

## *TREATMENT OF EWES IN LAMBING.*

A few brief general directions as to the management of ewes during lambing-time may be of future service to you.

In the first place, the shepherd should make it his practice to quietly walk among the ewes, carefully noting those which show symptoms of lambing within a few hours, and gently driving all such into a sheltered fold near the lambing yard, or into the yard itself, so that whether day or night he will know where chiefly to direct his attention. When the labour pains come on, and the lamb is believed to be in the right position, the shepherd should not be in a hurry, but allow nature (the best of all midwives) to do her own work.

An experienced shepherd will never attempt to help a ewe until he sees that there are signs of her (to use a shepherd's term) 'giving up.' Then assistance may be rendered with advantage.

The lamb when born should be placed near the head of the mother, who, as a rule, will perform her natural duty. When the ewe has done what is necessary by the lamb, and has somewhat

recovered from the fatigue and exhaustion of the labour, she should be sparingly fed ; at first with a mixture of good hay chaff, bran, and crushed heavy oats.

Let it ever be remembered, that the more judiciously and generously a ewe is fed after having fully recovered from the lambing, the better she will be able to nurse the lamb.

When the lambs are old enough to pick or nibble a few turnip-tops, or a little young grass, they should be allowed to run into a forward fold, where, after a little time, some finely-crushed linseed cake, mixed with crushed heavy oats and a small quantity of fresh bran, should be placed in low, covered troughs, so that they may eat a little of the mixed food at pleasure.

This kind of feeding should be continued, increasing the allowance of mixed food as the lambs grow older and stronger. Of course, experienced shepherds or flockmasters will understand that it is desirable later on to throw out a few mangolds which the lambs can pick over in the forward fold, the ewes taking what the lambs leave.

Perhaps it is unnecessary I should say that it is desirable for the mangolds to be somewhat withered by exposure to the sun and air before they are thus given to the ewes and lambs. I know of no mangold so well suited for early feeding by ewes and lambs as Sutton's 'Yellow Intermediate.' We are so satisfied with it that we now grow no other variety.

When the time arrives for weaning the lambs, which will be about July 1, preparation should be made to have a supply of cole or cabbages, or a similar kind of food, to feed them upon at night, and during the day they should be run out on clean fresh grass ; but on no account allow them to feed on grass growing upon land which may have been fouled by being heavily sheep-fed. Grass grown on such land is pernicious to lambs, and should be carefully avoided. The evil effect may not be observed until much harm has been done.

The lambs should have a daily allowance of from three to four ounces per head of mixed bruised heavy oats, linseed cake, and fresh broad bran. Where it can be conveniently given, a frequent change of pasture is most desirable, and any extra trouble or inconvenience this may cause will be amply repaid by the thriving and healthy condition that it will be sure to promote.

The ewes will require extra care and attention when the lambs are weaned from them. For a few days they should be somewhat

sparingly fed, so as to check the production of milk. Each one must also be specially watched, to ascertain the condition of its udder, and, when necessary, it should be relieved of any excess of milk by carefully drawing it off with the hand. A neglected udder is frequently followed by milk garget, which is indicated by the udder being swollen and hard. This, though not a fatal, is frequently a very troublesome disease. It arises from the milk curdling, and gives considerable pain and inconvenience to the ewe. The first thing to do is to get all the milk possible from the udder. Then use rather freely a lotion consisting of

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|---|---|
| Sugar of lead . . . . . | ½ ounce. |
| Sulphate of zinc . . . . . | ¼ ounce. |
| Vinegar . . . . . | 1 pint. |
| Water . . . . . | ½ pint. |

and give a dose of Epsom salts of from three to four ounces, dissolved with warm water.

Practical flockmasters are also well aware that great care and attention are required in the management of lambs throughout the months of July, August, and September, when so many thousands are annually lost from a low, lingering, weakening fever, which seems to feed on their very life's blood : *post-mortem* examinations showing that it leaves an emaciated body, white and bloodless. A cure is most difficult, and is rarely accomplished, if the fever remains unchecked for any length of time. Prevention in this, as in other matters, is far easier and, therefore, better than cure.

My experience convinces me that injudicious and niggardly feeding is the main cause of this lamb disease. Where lambs are given a change of food of a nutritive character, and are not allowed to feed on pastures or layers where sheep have been folded, or have laid thickly on the ground, they generally remain healthy, and are seldom attacked with the fever.

'Keep lambs in a thriving condition' is a rule which ought to be written in letters of gold. It is a rule which also applies to sheep of all ages.

Time passes so quickly that I have only a few minutes to speak of the management of young sheep when first fed with turnips. I may, however, briefly observe that great care should be taken to gradually accustom the hoggets to turnips by throwing a few at a time on to grass land where they are feeding, increasing the daily

allowance as they get accustomed to the food. After this has been accomplished put them into a fold on the turnip land at night, but in that case also the supply of roots must be limited for a time.

When feeding young sheep on turnip land it is of the first importance not to pinch them with insufficient hurdle room. An extra 10*l.* expended in hurdles may save the loss of 20*l.* worth of sheep. A good supply of hurdles enables the animals to get exercise, and to pick up any withered parts of turnips which may have been passed over during the folding. Such withered roots are enjoyed by sheep when the weather is fine, and frequently have a good effect in checking any possible evil from the fresh turnips.

It should be borne in mind that good and successful managers supplement the turnip food with a mixture of chaff (if of hay all the better), malt culms, bran, and linseed cake, and are guided in the daily allowance by the time at which they wish to have the sheep ready for sale.

When the period comes to feed with swedes, in place of white or other common turnips, care must be taken to introduce them mixed at first, and then gradually to increase the proportion of swedes until no turnips are given at all.

Do not overdo them with roots at any time, or bad results may follow.

It sometimes happens that under any circumstances a lot of sheep will begin to do badly on roots. When this is the case do not hesitate entirely to change the food for a time. It will avoid disastrous loss. I have frequently known a judicious alteration of food cause so great a change in the health of a lot of sheep as to surprise their owner and the shepherd in charge of them. A careful, observant, and practical man will frequently avoid the losses which another person, less observant and less practical, is called upon to endure.

## *VALEDICTORY ADVICE.*

Suffer me before I say good-bye to you to give you one more word of advice. This Institute affords you the opportunity of listening to many excellent lectures. From them you will learn much that will be useful to you. Whether what you hear will be of any lasting advantage or not will depend in great measure—perhaps entirely—upon yourselves. Believe me when I say that unless you think over each lecture carefully after you leave this room, you will get little permanent good.

Then, remember, that though lectures and book reading are designed to assist you, they will of themselves never make you good and successful men of business.

You must add to theoretical knowledge personal energy, care, perseverance, and economy. *Energy* in performing all your duties with a 'will.' *Care* that nothing placed under your charge suffers from want of personal attention. *Perseverance* in endeavouring to overcome all difficulties which seemingly stand between you and success. *Economy* in the management of your farms and personal expenses, so as not to spend a shilling in doing that which might with sound judgment and forethought be done equally well for sixpence.

Finally, when the time comes for you to enter upon farming, do not be tempted to hire a farm of 500 acres if your capital is only equal to one of half the size. *There is no royal road to successful farming.*

Success such as that we see to have attended those three eminent agriculturists, Jonas Webb, Sam Jonas, and John Clayden, was achieved by honest work—work with hands as well as with head. Work you as they worked, and there will be no reason why even in these adverse times your skill, care, and judgment in the management of herd, and flock, and farm, should not be rewarded with like success : a good honest return for Brain and Capital, sufficient not only for the requirements of the day but for the vicissitudes of the morrow.

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