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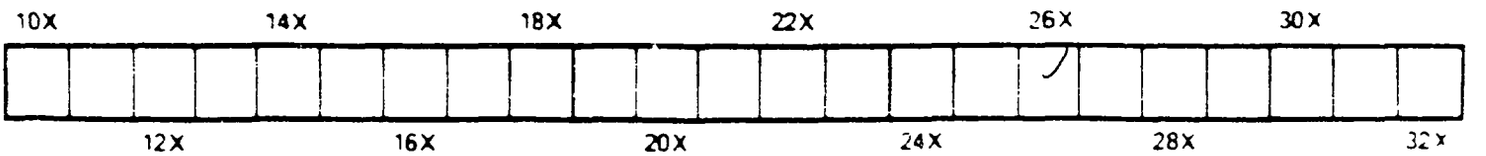

THE JOURNAL of AGRICULTURE. ILLUSTRATED

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First Steps in Farming—Young Man's Department.

LIQUID MANURE.

(Continued)

LINCOLN COLL., NOV. 20th.

In our last number we were considering the case of soils which are not benefited by the application of liquid manure, and the causes of failure. We showed that certain clay soils only require constant working in order to yield remunerative crops of wheat in succession for a number of years, and that, therefore, they contain a practically inexhaustible store of mineral elements of nutrition, and an ample supply of organic food; and further, we saw, from the analysis of one of these soils, that the amount of fertilising materials supplied by the 50,000 gallons of Mechi's tank liquid was altogether insignificant when compared with their natural provision.

It may be said: if these soils abound in *available* fertilising matters, why is farmyard manure employed upon them with advantage? The answer is this: farmyard manure is a more perfect manure than liquid manure, and being a bulky manure, it performs important mechanical functions that cannot be performed by liquid manure. Secondly, the retentive character of these soils precludes the young plants from availing themselves of the total amount of fertilising material dispersed through the whole mass of the soil; while those grown on a porous sandy soil penetrate it to a greater depth and in every direction, availing themselves of the manuring constituents uniformly distributed among a large bulk of soil by the agency of liquid manure. I do not think that much benefit would be derived from the application of solid manure to clay soils, if it were possible to incorporate it with the soil as uniformly as liquid manure, and to the same depth to which the latter penetrates them. But decided benefit results from a good dressing of common dung, because, in fact, only a small proportion of the soil is actually manured, and because, by the very bulk of the manure, the physical and chemical characters of a portion only of the soil are so altered that in reality the plants feed upon a new and artificially formed soil: compare the effects, on a heavy soil, of ten tons of manure spread broadcast with the effects of the same quantity of manure in drills.

It is not every clay soil that encloses in its embrace abundant stores of available plant-food; there are poor clays as well as poor sands, and it may be asked: Might not liquid manure produce a good effect on sterile clay land? I think not. The close texture, coldness, and want of porosity which characterise sterile clays, are opposed to the advantageous application of liquid manure, and for this reason: only a small part of such soils can be penetrated by the tender roots of plants, whilst by far the larger part of the soil enriched by the liquid manure is out of their reach; consequently, most of the liquid manure would, under these circumstances, be lost, and the small quantity left in the portion of the soil penetrated by the plant-roots cannot of course produce any striking result.

Again, we must not forget that evaporation of water produces cold: that all clay soils are generally more than sufficiently wet; that the additional quantity of water supplied in liquid manure renders them wetter still; and we shall see that the injury done to the land by the resulting cold cannot be counterbalanced by the small amount of fertilising matters supplied

Moreover, clays, whether fertile or barren, and all land that is stiff, as are the majority of Canadian soils, must be rendered closer by a heavy dose of liquid manure: an excess of water could not benefit them in their physical character. The use of liquid manure at a time when the land is more than sufficiently wet is therefore clearly objectionable. It is equally objectionable on stiff soils when they are too dry. In

summer, soils of this description crack in all directions, and the liquid manure then runs through the cracks instead of being equally diffused through the land, or it moistens the soil but very imperfectly. Much of the manure is thus lost, and injury is done by the insufficient proportion that is absorbed by a thin layer of the surface soil, for it causes at first a more rapid development of the young plants, which receive a sudden check as soon as the small quantity of moisture is all evaporated

From what has been said, we may make the following deduction: that neither the physical nor chemical characters of heavy land are favourable to the system of liquid manuring; and as by far the greater part of the cultivated soil of our province is of this description, I feel sure that liquid manure will never be generally used by our farmers.

In England, it is true, there are a few large landed proprietors who profess to have employed liquid manure on heavy land with much profit; but it must be remembered that its application has always been preceded by, or accompanied with, draining, subsoiling, clay-burning, and lining, each of which processes is well known to effect radical changes in the constitution of heavy land, so, it is very difficult to say whether the improvement visible is due to the application of liquid manure, or to the beneficial effect of one or all of the above-named processes.

On the mode of disposing of liquid manure. And now we arrive at the practical part of our subject: what are we to do with the liquid dejections of our cattle? I shall neglect, in answering the question, any reference to pipes, steam-engines, &c., feeling that such matters are quite beside our subject, and confine myself to a consideration of means that are within the power of an ordinary farmer of the province of Quebec.

On this Lincoln College Farm the matter is simple enough: the cattle stand on a slightly inclined boarded floor, the liquid and solid excrements fall together into a trough six inches deep—wide enough to admit an ordinary shovel—where they find a quantity of dry sawdust capable of absorbing all the liquid, and the whole is carried twice a day to the dung-heap. Thus managed, there is no loss at all incurred, and the mixture of the excrements of the different kinds of stock is easily carried out, the pigs being supplied with sufficient straw to soak up all their urine, and this is removed to the heap as often as seems necessary. All farmers, however, are not within two hundred yards of a sawmill, and few farmers, notably in the Townships, have sufficient straw to keep their animals properly littered—many still sell their straw. There are great difficulties looking us in the face, but I think they can, in the majority of cases, be obviated. If there are only a few hundred gallons of liquid manure produced, it clearly won't pay to lay down pipes and build an expensive tank; whereas, on the other hand, where large quantities are expected, it might pay very well. Again, unless it is known whether fattening stock, milch-cows, or young cattle are kept, or whether the farm produces much or little straw, it is difficult to solve the question: each farmer must be guided by the requirements of his own individual case. Disclaiming, therefore, the intention of laying down fixed rules for the management of liquid manure, I will point out, by way of examples three modes of disposing of the liquid excrements of animals on the general run of farms to be met with in our part of the world:

1 Where the urine of animals is completly absorbed by litter in feeding-boxes.

2. Where the urine and draining of stables, cowhouses, and pigsties are collected in a small tank close to a *covered* manure-pit.

3 Where the urine of cattle, the sewage of dwelling houses, drainage water, and every kind of animal refuse matter are collected together in a water-tight tank of larger capacity, situated, as in No. 2, close to the manure pit.

Of course, in both cases, No. 2, and No. 3, there must be a pump, by means of which the liquid from the tank can be spread over the heap of solid manure, as occasion requires.

Under no circumstances would I ever apply the liquid collected in the tank alone. Manure ought to be used entirely in a liquid form or in a solid state, and for this reason: the solid manure contains considerable proportion of soluble and insoluble phosphates, which are very deficient in liquid manure. It is decidedly a bad practice to employ separately the solid and liquid excrements of animals

On farms where no young stock is kept, and where just enough straw is produced to serve for chaff and the bedding for the animals, I believe the best plan of disposing the liquid and solid excrements is to make the manure in boxes.

The construction of feeding-boxes is simple in the extreme. I used them for many years in England, and I consider them to be the most perfect receptacle for cattle that can be conceived. They may be made eight feet square, or even less will do for the ordinary Canadian cattle. I have fatted big Shorthorns in as small a space with success. The first thing is to dig out the bottom two feet deep; the divisions may be made of rough poles, four in number and sufficiently far apart to admit the heads of the cattle with ease—I lost a fine fat beast once by his getting his head through the bars and not being able to get it back again. The manger should be movable, so that as the dung rises in the box, the manger may be raised; and a rack for straw may be placed against the wall. The boxes are best built with an alley running between the rows, and, if not thought too expensive, a small tram and a tram-cart will make the work of the feeder lighter. As an animal will never lie down in the dirt if he can find a clean place, cattle leave the boxes when fat without a speck on their coats A very small quantity of litter, used judiciously, will keep them perfectly clean; they can lick themselves and each other, so no currying with the hair-extracting comb is necessary.

Many people, who ought to know better, fancy that this system of box-feeding must be unwholesome. It is not so; the fermentation that takes place is so slow and stealthy (*eremacausis*), that no ammonia is evolved, and the only smell perceptible, even when the boxes are full, is the pleasant odour of linseed—always supposing that that indispensable food is employed.

When well managed, box-feeding prevents any waste by drainage of the most valuable portion of the manure; there is no loss by evaporation of ammonia, the manure ferments regularly and slowly, and liquid and solid excrementitious matters, which are neither of them perfect manures when applied separately, are preserved together in the most admirable manner.

But on many farms the whole of the manure cannot be made in boxes, on account of the scarcity of straw. On the majority of our English dairy-farms, where not more than 4 0/0 of the land is arable, the state of the cattle in winter is far from what it ought to be; and in the Eastern Townships of this province the case is much the same. At Compton, and all along the Coaticook valley, there is hardly any bedding given even to the fatting beasts, and the waste of manure thereby incurred is sad to see. In such places a tank and its appendages would be very useful, and the supply of sawdust from the numerous small mills in the district is, practically, unlimited, so that the absorption of the urine would be easily managed. Here, care should be taken not to admit any water from the roofs of the cattle buildings into the tank; a very small quantity of sulphuric acid—say, 10 lbs.,

a month—introduced into the tank every 8 or 10 weeks, would prevent any loss of ammonia.

As it is of much consequence to ferment manure with regularity, and as fermentation is almost altogether stopped when excrementitious matters and straw are completely immersed in water it is advisable to give the dung-pit a somewhat inclined position, so that any superfluous liquid may find its way back into the tank.

Next month I will describe the style of liquid-manure cart I prefer, and give a notion of its use in carting out the ammoniacal liquid of the gas-works, &c., as I hope to pursue it in the Spring.

ARTHUR R. JENNER FUST.

OUR ENGRAVINGS.

The engraving of "A Sheepfold" will tell its own story. The hurdles are made of white pine 4 × 4 and 1½ × 1½ inches. The rape which the sheep are feeding off (3½ acres) kept 35 sheeps for seven weeks, with the addition of a pint of oats per head per diem. The figure in the corner of the fold is intended to represent the present writer, but the features are rather blurred, owing to the necessary distance between the camera and the object. A. R. J. F.

Champion Milking Short-horn Cow Red Cherry.

We reproduce, on a somewhat smaller scale, from the London Live Stock Journal, the accompanying illustration, of the subject of which our contemporary remarks:

This wonderful cow has, two years in succession, won the champion prize for the best yield of milk at the annual show of the British Dairy Farmer's Association. She was bred by her owner, Mr Joseph Phillips, Park Meadow Farm, Peterborough, is eight years old, rich red in color, of large size, with long frame, narrow in front and very wide behind. She is not eligible for the Herd-book, but, nevertheless she partakes largely of the Short-Horn form and character. She has produced six calves, her last one having been calved on the 3d of May last. This year her day's produce of milk, in two milkings, weighed 51.75 lbs., or a little over five gallons, and the milk was found to contain 12.31 per cent. in total solids and 3.26 per cent. of butter fat. Last year she gave almost the same result.

ENSILAGE.

BY GEORGE FRY, F. L. S.

In a few short articles I propose, first, to offer a few remarks on some recent contributions to the literature of this subject; secondly, to record a few new facts and observations; and thirdly, to show that the theory which seems best to accord with all the observed phenomena attending the production of sweet ensilage is that the fermentation is not caused by independent organisms, but by the living cells of the plants put into the silo.

I.

The recently published volume (Vol. XVI.) of the transactions of the Highland and Agricultural Society of Scotland contains an article written by Dr. A. P. Aitken (the Chemist of the Society). The conclusions at which this writer arrives are directly contrary to those to which my studies and experiments have led me; and, as his opinion cannot fail to have considerable influence on a large section of the agricultural community, I take the liberty of directing attention to the fallacy on which his conclusions are based.

I may say at starting that if I could admit his facts and assumptions I should share his conclusions. It appears to me that if Dr. Aitken had carefully followed the admirable studies which M. Louis Pasteur has published in his two books, "Etudes sur le Vin" and "Etudes sur la Bière,"(1) he would see reason to modify, to a very large extent, his opinion on ferments in general, as expressed by him on pages 406 and 407 of the volume to which I refer. Passing these over, I proceed to give in Dr Aitken's own words the keystone of the arch on which the bulk of his superstructure rests:—"If deprived of air, or rather the oxygen contained in the air, or if surrounded by any gas which does not contain free oxygen, grass or other green fodder can be kept moist and fresh for a very long time. This is what is done in a silo. When green fodder is thrown into a silo, and pressed down so as to diminish as much as possible the air space within it, the amount of oxygen is very small in comparison with the mass of solid material; and if the walls of the silo are air-tight, and the surface of the heap covered over with some impervious covering, and the whole subjected to continuous pressure, the limited supply of oxygen contained in the substance and the interstices of the fodder is very soon used up by the ferments. *and when that point is attained the fermentation ceases.*"

If the statement in italics be true, then the views on ferments which have been held by the majority of scientific men for the last ten years (at least) are all wrong, and Pasteur has lived and taught in vain.

Pasteur has not only shown that ferments can exist without air or free oxygen, but he has proved, by evidence which satisfies my mind, that in the presence of free oxygen some alcoholic ferments (such as *Mycoderma vini*) produce little or no alcohol, the production of alcohol being due to the abstraction of combined oxygen from the sugar by the ferment. He has gone much further than this, for he has shown that organisms that are not alcoholic ferments, such as *Penicillium glaucum*, *Aspergillus glaucus*, and *Mucor mucedo*, also produce alcohol when grown out of contact with free oxygen.

Pasteur says:—"After the germ has received the first impulse from oxygen gas, successive generations are born indefinitely, absolutely free from the influence of atmospheric air." (Etudes sur la Bière, 1876, page 275.). He has also shown that, according to the amount of oxygen admitted to the ferment, the proportions between the weight of the yeast and of the sugar decomposed vary from 1 of yeast to 176 of sugar (where the supply of air was very small) to 1 of yeast to 23 of sugar (where the supply of air was abundant) (Idem, pages 241 and 243.)

After the most exhaustive experiments on this point, Pasteur thus expresses himself:—"The deductions from the whole of the facts which precede cannot be doubtful for any one. As to myself, I cannot prevent myself from seeing in them the foundation of the true theory of fermentation. In the experiments which I have just described, fermentation by yeast—that is to say the type of ferments properly so called—is presented to us as the direct consequence of a work of nutrition, of assimilation, of life—in one word, carried on without free oxygen gas. . . . . .

The fermentation by the yeast seems then essentially allied to the property which this little cellular plant possesses of breathing in some way (with) the combined oxygen of the sugar." (Id., page 251.)

Again he says, even more emphatically:—"The truth of the theory of fermentation, to which I have been conducting in the preceding paragraphs, is contained, for the main part,

(1) The latter I read with great interest. If our Canadian brewers would study it, and be guided by its precepts, we should not be obliged to drink such horrid potions in the summer. A. R. J. F.

in this affirmation, that the ferments properly so called constitute a class of beings having the property of living out of contact of free oxygen gas. One might express this theory in this concise form: *Fermentation is the consequence of life without air.*"

In order to silence the criticism of some other savants Pasteur shows that butyric fermentation can be carried on in a liquid containing tartrate of lime with only a trace of air at the commencement and finally that butyric fermentation can be continued in a solution of lactate of lime containing small quantities of phosphate of ammonium and potassium and sulphate of magnesium and ammonium without any trace of air at all.

Now, I say most emphatically that I believe that on this point Pasteur is right, and, unfortunately, Dr. Aitken is very wrong, and I am sure that when he has had an opportunity of considering the evidence he will change his opinion.

It will be at once evident to my readers that this point is of the greatest importance in the ensilage question; for if alcoholic, or lactic, or butyric fermentation ceased immediately there ceased to be free oxygen in the silo, I should at once recommend them to chaff, and ram, and press their fodder; but it is nothing of the sort: the fermentation, be it alcoholic, lactic, or butyric, being once set going by the first impulse of free oxygen goes on, without free oxygen, consuming and damaging the fodder until (in the sour silo) it is stopped by the concentration of its own products. It is for this very reason that I at once desired to take advantage of a kind of fermentation which, producing no disagreeable consequences, after the oxygen in the silo has been exhausted, raises the temperature to such a point as to destroy all life.

Dr. Aitken gives some analyses of ensilage showing more than 1 per cent. of acidity (reckoned as acetic acid); it is to my mind quite inconceivable (apart from other considerations) that so large a production of acid could be produced while the organisms were breathing (so to speak) in very small amount of oxygen that could have been present.

There is no room for doubt that the keystone of Dr. Aitken's argument is totally fallacious, and consequently his conclusion (which are most ably deduced from his premises) must fall to the ground

II.

The new edition (2nd edition 1884) of "Silos for British Fodder Crops," by the Sub-editor of the *Field*, is a book which all ensilors may study with advantage; it contains a good deal of information, put together in a convenient form with judgment and care (to me the tables of analyses at page 154 and 155 are worth the whole cost of the book).

At pages 148, 149 and 150 the writer criticises my system and results, and pronounces an adverse opinion thereon on the strength of the albuminoids shown in certain analyses of ensilage, which, for convenience, sake, he puts into the following form:—

Clover.	Albuminoids.		Carbohydrates.		Fat.
Vicomte de Chezelles.....	4 59	.....	9.33	.....	1.04
Mr. Gibson's (July).....	4.63	.....	14.22		
Mr. Fry's (June).....	2 61	....		12.66	
Mr. Scott's (September)	2.66			12 54	
Mr Earle's (ditto)	2.93	.....	8 42	...	1.66
Mr. Eckersley's (ditto...	3.11	.....	13.36	.....	0 78
Meadow Grass.					
Mr. Grant's (May)	3 49	.....	10 94	.	0 68
Lord Walsingham's (July)	2 75	.....	11 74		0.60
Lord Egerton's (ditto)...	2.44	.....	9 74	...	1.44
Mr. Fry's (June).....	2 50	. .		11 86	
Mr. Duncan's (Autumn).	2.57	....	11 94	..	1.28
Mr. Smith's (October).	3 30	.....	9 45	. ...	0.99

Now, in looking at this table of analyses, it must be borne in mind that the supposed amount of water is 75 per cent. in all cases, consequently there remain 25 parts of dry matter. Of these 25 parts the albuminoids are admittedly the most valuable substances, and, therefore, if the unit in each analysis represented exactly the same unit of the original substance ensiled, the respective proportions of albuminoids given in this table would be a safe guide in forming an opinion as to the systems under which the ensilage had been preserved. But, unfortunately, we have no constant factor on which to base our figures with mathematical certainty.

Had the various ensilors not added salt to their fodder (I did this last year as well as the others), the quantity of ash in the ensilage would have formed a basis on which the results could have been judged with tolerable accuracy.

As it is, however, I should have thought that the two analyses which stand at the top of the list would have made the sub-editor suspicious. Could he have thought that the original clover of the Vicomte de Chezelles and of Mr. Gibson contained so high a percentage of albuminoids as 4.59 and 4 63? On reference to the detailed analyses he would find that the ensilage of the Vicomte de Chezelles contained 1.20 of acid and 1.80 of alcohol; and that of Mr. Gibson 1 04 of acid. The loss of carbohydrates in both these cases must have been very heavy.

As I related in my last article, it is possible, in alcoholic fermentation, for one part of yeast to decompose no less than 176 parts of sugar; consequently, in all fermentations, the change in the carbohydrates may be very considerable without any apparent change in the albuminoids.

If we take a hypothetical case we shall see how great an apparent increase in the albuminoids a waste of carbohydrates may cause.

Suppose that a crop contains, besides 75 per cent. of water, 2 ash, 3 albuminoids, 13 carbohydrates and fat, 7 fibre—total 25; now suppose that in the course of fermentation there is a loss of six parts of the carbohydrates and two of fibre, we shall then have 2 ash, 3 albuminoids, 7 carbohydrates, 5 fibre—total, 17; if we now recalculate these 17 parts, so as to bring them to 25 parts, we have 2.94 ash, 4.41 albuminoids, 10.29 carbohydrates, 7.36 fibre—*total, 25; such an* analysis shows an apparent good ensilage of a crop very rich in albuminoids; but it really shows a loss of 8 parts out of 25 of an average crop.

The sub-editor says:—"Mr. Fry's sample, from grass cut in June, is also inferior to the aftermaths of Messrs. Duncan and Smith. (1)

Now, if we turn to the *Journal* of the R.A.S., page 384, we shall find this remark by Mr. Smetham, who made the analysis of Mr. Smith's ensilage: "From the low percentage of soluble carbohydrates, and the comparatively high percentage of nitrogen, it would appear that a perceptible loss had taken place." Mr. Smetham was, therefore, quite alive to this fact, which the sub-editor has entirely overlooked. The sub editor goes on to say: "Whether these results are due to poorness in quality of the fresh herbage, or to loss in Mr. Fry's process of ensilage, is a matter of uncertainty; but at present it does not promise well for the process."

The meadow from which my ensiled grass was taken has not been long my property, and its condition is certainly not first-rate; but let us see if the sub-editor has much ground for thus exposing "the hole in my coat." In his table on page 154 there are three analyses of grass 1, just before flowering; 2, Lord Egerton's; 3, Lord Walsingham's. If we take the average of these three—two good ones to one poor one—we find water, 73.7; ash, 1.93; albuminoids, 2 73; carbohydrates and fat, 12.67; fibre, 8.97. Reduced to 75

(1) Aftermath means the second crop.

per cent. of water:—Water, 75; ash, 1.8, albuminoids, 2.6, carbohydrates and fat, 12.1; fibre, 8.5. My grass ensilage, as given in the same table, was:—Water, 74.4; ash, 2.1, albuminoids, 2.6; carbohydrates, 12.2, fibre, 8.7, which, reduced to 75 per cent. of water, becomes:—Water, 75; ash, 2.05; albuminoids, 2.55, carbohydrates, 11.9; fibre, 8.5. If we remember that the ash of my ensilage was raised by the addition of salt, and then compare its analysis with that of the average of the three grass crops, I think it will be seen that there is not much room to disparage either the original crop or the ensilage On the whole, although the sub-editor's criticism is very fairly put, from his point of view, I think he is a good way off making out his case

Unless we have some means of knowing the weight of the original grass and the weight of the ensilage produced from it, or unless we have some other means of judging what the proportionate weights of these were (such as the ash may give when all ensilors cease to add salt), an analysis of a sample of ensilage does not give sufficient data to enable any one to pronounce a decided opinion either on the original crop or on the system of ensilage. The production of acid or alcohol must mean loss, and therefore a large production of these must be *prima facie* evidence against the system by which the ensilage containing them has been produced. I therefore say that the production of my sample of clover ensilage containing only 0.27 of acid is a far stronger fact in favour of my system than anything the sub editor has been able to produce against it.

The same volume contains a most interesting chapter on the chemistry of ensilage, by Mr. F. Woodland Toms. Although I do not share the opinion of this writer on many points, it is a distinct and honest attempt to advance our knowledge on the subject, and as such should be thoroughly appreciated. Among other things he calls attention to the experiments of Professor Lechartier on fruit, seeds, roots, and leaves, by which it has been proved that, when these substances are detached from the plants that bear them, life is not extinct in the cells of which they are composed. I shall have occasion to refer to these most important experiments in the course of this series of articles, and I trust I may be able to show conclusively that the facts which Messrs. Lechartier and Bellamy have discovered, as interpreted by M. Bérard and M Pasteur, form, indeed, the key to the phenomena of the silo, and establish the truth of my propositions that 1. In order to produce first-rate ensilage the temperature of the silo must rise above 50 deg C or 122 deg. Fahrenheit; 2. the proper fermentation of the silo is what I have called the "haying" fermentation.

In the meantime I recommend all my readers who have the opportunity of doing so to study a most instructive chapter on "Fermentation in saccharine fruits plunged in carbonic acid gas," which begins at page 258 of Pasteur's Etudes sur la Bière," (Paris, 1876).

British Live Stock for the Canadian Experimental Farm.

The recent visit of Professor Brown, the well known chief of the Ontario Agricultural College and Experimental Farm to Britain, will be long remembered by British pedigree stock-breeders. During his short stay on this side of the Atlantic he traversed a large breadth of country, and, being a native of Scotland, he knew well where to find good blood and pedigree combined. His important mission he accomplished with much success, as evidenced by the fact that the large collection of stock with which he left Liverpool on the 22nd ult. represented no fewer than 17 of our principal breeds of cattle and sheep—eight breeds of cattle and nine of sheep. This is the third systematic exportation of live stock from Britain to the Ontario Experimental Farm during the eight years of its existence, the previous two occurring in 1876 and 1881. The amount of money paid by the Government for the first and second exportations was $8,108 in 1876, and $6,250 in 1881, while the sum allocated for the recent extraction was $50,000. Though it was well known to Professor Brown before undertaking his important work that since 1881 pedigree stock in Britain had increased in value considerably, yet the sum laid aside for the purpose of purchasing the latest contingent indicates that it was his intention to have a greater variety of cattle and sheep than he hitherto possessed. This goes a long way in showing the success which has attended Professor Brown's well directed energies in connection with the Experimental Farm. Not only does the desire for a larger representation of British pure bred stock demonstrate the well-disposed intentions of the Government in trying to raise the character of live stock throughout Canada, but it also implies that the educational advantages derived therefrom by students are being appreciated.

With the view of making students acquainted with the best types and breeds of stock, Professor Brown's chief aim in selecting his recent collection was to obtain animals not only of good lineal descent, but also thoroughly representative of the most fashionable races in appearance The animals were thus selected with the utmost care from some of the best sources in the United Kingdom. The collection is one of the largest and most valuable that has ever left this country. It includes representatives of the Shorthorn, Hereford, Devon, Polled Aberdeen-Angus, Galloway, Ayrshire and Guernsey breeds of cattle, and Southdown, Cotswold, Hampshire, Oxford Down, Lincoln, Border Leicester, Cheviot and Black-faced breeds of sheep. With such a variety of Britain's leading breeds of live stock in use at the Guelph Agricultural College, satisfactory results may well be anticipated. It is calculated that the complete draft cost from 40,000 to 50,000 dollars, which, though within Professor Brown's original estimate, is, it is supposed, a larger sum than he expected to pay. That is to say, when he calculated upon the probable cost of the importation being $50,000, he intended to procure specimens of some other breeds besides those represented by his recent purchases. Be this as it may, there is no cause for surprise at the fact, considering that he obtained several of the choicest animals in Britain, and that he paid some of the highest prices on record. He also offered some tempting prices for other animals of note, which, however, were refused We shall refer to the stock of which the valuable collection was composed, *seriatim*:

POLLED ABERDEEN ANGUS.

This very popular breed of cattle was well represented in Professor Brown's recent selection Two of the animals were of specially high merit, viz, the two-year-old bull Strathglass (235), and the four-year-old cow Kyma (4969), purchased from Mr. Wilkin, Waterside of Forbes, Aberdeenshire, for £500 and £100 respectively; bred by Lord Tweedmouth out of the 155-guinea cow Witch of England, and sired by the 130-guinea bull Heir of Glory Strathglass, besides winning the first prize at the Royal English Society's Show at York last year, has the distinction of being a son of a member, on the female side, of the late Mr. McCombie's famous Paris group of 1878, and also a descent of that successful group through the male. He was purchased by his recent owner, Mr. Wilkin, when a calf at 103 guineas, and is now large in size, well-fleshed, specially good over the loins and back ribs, while he is deep in his carcase and possesses excellent masculine character. The dam of his sire, Pride of

Aberdeen 9th, was the highest priced animal at the memorable Tillyfour sale. In Kyma, this bull has a good companion—a good specimen of the favorite breed. She is a thick, heavily fleshed female of good quality and handsome build, and is accompanied by her fourth calf—though only four years old herself—sired by Paris 4th (2277). As a heifer with a calf at foot, Kyma won first honors at the show of the Royal Northern Agricultural Society at Aberdeen, and also in the cow class at Alford last year. Other animals included in the lot were two good useful cows, secured at Mr. Bennet's recent dispersion sale at Marypark, Inveraven, and a promising bull calf purchased from Mr. Grant, Mains of Gorie.

SHORT-HORNS.

One bull, three cows and two calves, composed the collection of Shorthorns, all of which are animals of high individual merit. The bull is the second winner at the Highland and Agricultural Society's Show at Inverness last year, in the class of aged bulls; named Rob Roy(45483). He was bred by Mr. James A. Gordon, of Arabella, Ross-shire, after the celebrated 400-guinea bull Rosario (35315), and out of Luxury, a cow which Mr. Gordon obtained from the midland counties of England. Since his achievement at Inverness last year Rob Roy has improved greatly, and was purchased from his breeder by Mr. Duthie, Collynie, Aberdeenshire, at 130 guineas, who, having a younger bull to take his place, sold him to Professor Brown at the long figure of 500 guineas. This is the highest price ever paid for a Shorthorn bull in the northern counties of Scotland. The animal, however, is the best looking that part of the country has produced for many years, and is sure to make his mark in the new country. He has a long frame, broad breast, well covered back, beautiful-filled quarters, stylish head and neck, and great wealth of flesh. Professor Brown also obtained from the same reliable source two well-bred cows, which, along with their calves, cost £350. One of these cows is Mademoiselle, a lengthy cow of good color and exceedingly fine feminine character. Her bull calf at foot, by Cayhurst, is indeed very promising and is not too dear at £80, for which we understand Mr. Ballantine, M. P., has bought him. The other cow is Princess Royal 8th, a handsome animal of great length and fine quality. She is accompanied by a promising heifer calf. The third cow is a handsome red one, purchased at the Uffington sale at the moderate price of 30 guineas.

HEREFORDS.

The Hereford contingent comprised several animals of grand quality. The highest priced animal of the breed was a two-year-old bull named Conqueror, for which Professor Brown paid £500 to Her Majesty the Queen. Conqueror is admirably formed, strong in the loin, well-covered with evenly laid on flesh, beautiful in his head and horns and handsome on his shoulders, but a trifle deficient on his hindquarters. He was bred by the late Mr. Carwardine, Stockton Bury, after the famous Lord Wilton (4740), and out of Coral, by Rodney (4907), and is own brother to the second prize bull at the Royal Show at York last year A heifer named Sunflower, and sired by Prince Waldemar (6122), was also selected from the Royal herd at Windsor. Two very good well-bred females were selected from the Felhampton herd, the property of Mr. Hill. These were the cow Bloomer, which cost £105; and the two-year-old heifer Cronkhill Duchess, which realized £67.

GALLOWAYS, AYRSHIRES, DEVONS AND JERSEYS.

From the Duke of Buccleuch three very handsome Galloways—one bull and two heifers—were obtained. The bull is Stanley 3rd, got by the famous Black Prince. He is long, level, and promising, and was not dear at £100 The two heifers, which cost £60 each, and are both very well formed are Berta and Gem 2nd. Three specimens of the Ayrshire breed were also purchased from the Duke of Buccleuch—a promising young bull at £42, a large and very handsome cow at £40, and a pretty three year-old heifer at the same figure. Two very good Ayrshire heifers were obtained very cheaply at £25 each from Mr. R. Wallace, Auchenbrin, Mauchlin, Ayrshire. The Devons, a bull and a cow, were both purchased at Windsor. The bull, Rose's Duke, by General Colley 1564, went in reality, however, from Stowey Court, where he was purchased at the sale last month by Mr. Tait for a very moderate sum. The cow, Esmeralda 4433, was got by Chancellor 1047, and cost £60, and is large and very well shaped. The bull is also very good. From Mr. L. Parsons Fowler, of Little Bushey Farm, Bushey, Herts, Professor Brown purchased one Jersey bull and three Jersey heifers for £180, and one bull and two heifers of the Guernsey breed for £120, all animals of the choicest quality and also of characteristic shapes.

SHEEP.

Of the eight breeds of sheep which we have already mentioned as being included in the consignment of live stock, there were some of the finest material to be found in the United Kingdom exported. The South-downs were selected from Lord Walsingham's celebrated flock—two rams and five ewes, costing £210. Professor Brown paid for two rams and six ewes, selected from the Oxford Down flock of Mr. Brassey, M. P., of Heythrop Park £100; and secured at good prices two very good Shropshire rams from Mr. Evans, of Uffington; and 20 ewes of the same breed from Sir Henry Allsopp's valuable flock at Hindlip Hall. Two rams and six ewes of the Hampshire breed—a choice lot—selected from Mr W. Parson's flock at West Stratton, cost £109 4s. (1)

Some very fine Cotswolds were bought from Mr. Russell Swanwick, Cirencester, and Mr. Gillett, of Kilkenny Farm, Farringdon, two rams and five ewes, costing £78. Mr. R. Wallace, Auchenbrin, Mauchlin, Ayrshire, sent seven very good Border Leicesters—one ram and six ewes—for £100. The ram, an animal of very high merit, was got by a very fine tup, for which Mr. Wallace paid 90 guineas to the Messrs. Clark. The Lincolns, very true representatives of the breed, went from Mr. Wright's famous flock at Nocton Heath, Lincoln, the price for one ram and three ewes being £60. Mr. Marshall, Morton Mains, supplied some good Cheviots, and Mr. Craig, Craigdarroch, a few good specimens of the Scotch Black-faced mountain breed.

We congratulate Professor Brown, and the Government he so ably represents, on the undoubted excellence of the large and comprehensive shipment referred to, and hope that their investment may prove as serviceable and remunerative as did their former importations to the Experimental Farm.

Edinburgh, June 12.

Broadcasting and Drilling-in Wheat.

There are two methods of sowing wheat—broadcast and in drills. By the first the seed is scattered irregularly upon the surface of the prepared soil, and covered with a harrow or cultivator. Broadcast sowing may be by hand, when the expense of a machine is saved, or by a broadcast sower, with which the work is rapidly done. Cheapness and rapidity are the principal advantages of broadcast sowing, either by hand

(1) They have come at last then! I begged Professor Brown to import some last spring, and I thank him very much for acceding to my request. A. R. J F.

or with a machine. More or less of the seed remains upon the surface of the soil after the harrow or cultivator has passed, while the covered grains are at various depths—some too deep and others too shallow for their best development. There is therefore some loss of seed, which must be allowed for in the seeding. Sowing in drills cannot be done by hand, and the cost of the machine must therefore be counted when this method is considered. The advantages of drilling, however, far outnumber those of broadcasting, so that drills are now very generally used in the wheat-growing rigions. With a drill properly adjusted, nearly every grain can be placed at the depth best for germination and growth, and well separated from all other neighbouring grains. There is much less seed required in drilling than in broadcasting, making an important saving in favour of the former method An average of two bushels per acre is used broadcast, while one-half to five-eighths of this is sufficient with the drill. (1)

Wheat that is drilled-in "winter kills" less than where it has been scattered broadcast. This winter killing is caused by the frequent freezing and thawing of the earth near the surface, which raises the roots out of the soil, and exposes them to the drying air and sun. When sown with a drill, the grain is in a slight furrow, and the freezing and thawing does not so easily lift the plant; it also tends to fill up the furrows made by the teeth of the drill, and thus adds protection to the roots which may have become exposed. Under the best conditions wheat should be sown about one inch deep.

HOW I JUDGE.

I.—IN THE SHORT-HORN CLASSES.

By a Breeder, Exhibitor, Prize-taker, Judge.

The following is a report of a conversation between Mr. Blue Blood and a Tenant Farmer, who has been acting as judge of Short-horns at the Royal Agricultural Society's Show:

Blue Blood–I hope you will excuse me, but as I am a rather young exhibitor and breeder, and somewhat inexperienced in these matters (though anxious to learn), I should feel greatly obliged if you would point out to me the grounds of your decision in this old bull class. I am the owner of this bull, for which I paid a thousand guineas, an animal of the highest breeding, and, in the opinion of every one at the sale at which I purchased him, and of many who have seen him here, as nearly perfect as possible, yet he gets no more than a commendation. What is the reason?

Judge—I see nothing to admire in your bull. I go for a rent-paying animal. If a Short-horn is not a rent-payer, I don't care how it may be bred, or what it cost; it is a worthless brute in my opinion, and the sooner Short-horn breeders realize this the better.

B. B.—Will you kindly point out what you mean by a rent-payer, and in what way this animal of mine is deficient of your standard?

J.—In the first place, your bull has the greatest of all faults, viz: that of being "thin-fleshed;" and that alone would be enough to condemn him, however symmetrical he might be.

B. B.—I don't quite understand what you mean by "thin-fleshed." Is he not as heavy as the prize-winner?

J.—In the first place, he is a year older than the prize-winner, yours being four years and the other three; and I very much question if yours is the heavier animal, though he ought to be three hundred weight more. But, assuming they were equal alive, there would be a vast difference in their dead weight. The offal from your bull would greatly exceed that from the winner.

B. B.—Really! I had no idea that there would be any material difference.

J.—The difference would be very considerable. Assuming that these animals weigh a ton each, the dead weight of the winner would probably be seventy-six scores; your bull would not be more than seventy; and the difference, at 12s. per score, is equal to £3 12s. Then the quality of the winner is so superior that I should consider it worth 1s. per score more than yours, equal to £3 6s.; making the whole difference £6 18s.

B. B.—But my bull is, perhaps, worth 700 gs. more than the other!

J.—That may be so, but only from the curiosity point of view. I have nothing to do with that in the judging ring.

B. B.—But the prize-winner has a comparatively short pedigree; and would it not be very uncertain about his breeding "true?" I am told that these short-pedigree things often breed back. I think the judges should know the breeding of the animals they are judging, and that it should influence them to a considerable extent.

J.—In the judging ring I think we can only assume that they breed true; that like begets like. That is really the only safe line for breeders and judges to follow, and so far from considering pedigree, in your bull's case, as a point in his favor, I should look upon it as quite the reverse, because (following your own argument), I should perhaps expect him to breed true, whereas the best thing that could be hoped from him would be that his stock would be as unlike him as possible.

B. B.—But my bull goes straight back to Colling's stock, and I thought everyone considered them good.

J.—No doubt they were good, but probably yours does not descend from one of the tribe into which Colling infused the Kyloe blood; otherwise they might breed more true. They bred true enough in Colling's day, and made the best prices at his sale.

B. B.—You are rather severe, and appear to be prejudiced against high-bred stock.

J.—Not at all. No one admires high-bred stock more than I do, but I don't admire them for the sake of their pedigrees, but only when they are good, as well as well bred; they must come as nearly to one's ideal as possible.

B. B—What is your ideal? Will you point out the especial merits in this first-prize bull that we have been alluding to?

J.—With pleasure. The back is always the most important point. It should be long, straight, broad, level and well covered, so as to carry a maximum of roasting beef; hips should be well marked and well covered; rump well filled up behind the hips, and thighs coming out square with the rump end (so as to almost touch the tail when hanging straight down), and going right down to the hock; ribs coming out of the back like staves out of a barrel; shoulders well sloped back and filled up behind; front of shoulder well covered, and bosom full; good neck; masculine head; broad clear muzzle; and firm rich touch, with plenty of soft hair.

B. B.—You have mentioned the most important points last, have you not? We always speak of the head and touch as the most important points.

J.—That, I think, is where you Short-horn breeders make a fatal mistake. If you looked first at the practical, and at the accessories afterwards, Short-horns would not be going down in the estimation of business men, as I fear is now the case; and such wretches as now not only pass muster, but

(1) Stuff! The drill may save one-eighth of the seed; certainly not more. Although I have grown wonderful crops with only a bushel of wheat per acre, it must be be borne in mind that the land was rich and in first-rate condition. I cannot recommend less than six pecks of fall-wheat, and eight of spring-wheat even on fairly worked soil. Broadcast demands eight pecks and ten. A. R. J. F.

A SHEEPFOLD. LINCOLN COLLEGE FARM.

are highly esteemed (solely on account of their breeding), would be improved off the face of the earth.

B. B.—But, surely, you consider head and touch very important points, do you not?

J.—I do; but I do not admire the fashionable head or the fashionable touch. I like a masculine head and strong neck on a male animal, but one that denotes docility and an even temper—not the fiery restless expression indicating everlasting rampage. I find this expression always goes with thin flesh. I like an animal that will feed under all circumstances; and, as to touch, I contend that the fashionable touch—the "sea-otter" touch—is all wrong, and indicates blubber, and not lean flesh, which is the thing we want. The flesh on rump, back and ribs should be firm, but elastic, like that of a warm india-rubber ball, though I would have the skin soft, and not too thin or tight on a breeding animal. I object altogether to the soft oily touch and thin skin that passes for "*quality*." *I observe that the best quality of beef is that* from Devons, Highlanders, Aberdeens and Galloways. There is far more lean flesh in these than in high-bred Short-horns, weight for weight; and all these are what may be termed hard handlers; hard, at all events, as compared with Short-horns. None of the sea-otter humbug about these!

B. B.—I am afraid I have been educated in a very different Short-horn school from that in which you were trained.

J.—Mine has been a practical training. I was always taught by my trainer and my own common sense that utility was the first thing to be considered, and that Short-horns should be worth as much per pound as any breed. I have seen many quite equal to Devons or Highlanders in quality, but ignorant "fashion" has put them back, and will do so still further unless practical men take up Short-horn breeding. The first absolutely essential point to go for is an abundance of good lean flesh, without which a Short-horn, or any other *pure breed, is nothing.*

B. B.—But are you not indicating a class of cattle good only for beef-producing? What about milk? Where would your ideal be when it came to be milked?

J.—I am by no means inclined to undervalue the milking part of the question, but am of opinion that Short-horns can carry flesh, and milk well too; in fact, some of the heaviest-fleshed cows I have ever seen have been excellent milkers; but this again is a matter grossly neglected by breeders. In judging, I consider the bag, its shape and indications for milk one of the most important points to be considered; and I should be very reluctant to give a prize to a cow that was evidently a bad milker, however good she might be otherwise. Still, one must not forget that the milking properties are often destroyed by the manner in which the cow has been kept, and it would be hardly fair to condemn a cow on that ground when, if she had been properly brought up, there might have been no deficiency on this score. (1)

B. B.—Is there anything especial in judging females to which your previous remarks do not apply?

J.—I would pay marked attention to the udder, and the head should be of a thoroughly feminine character. I dislike awkward horns, with black tips, and I go for nice hair and quality, and am not partial to excessively large animals. Otherwise *my former remarks apply.*

B. B.—Did you ever try judging by points?

CHAMPION MILKING SHORTHORN COW RED CHERRY.

J.—No; but I have thought a good deal about the system, and can see no good in it, but many difficulties, which, with three judges, would be insuperable. Granted that you can agree about the scale of points, there would be haggling over the value to be put upon each point in every animal that would be simply interminable. Then, supposing an animal to have, say, an utterly bad back, or any one very conspicuous fault, which would simply disqualify under the present system, as it should do, under the "point" system all you could do would be to give it nothing for this point, and, if good elsewhere, it might win, and great injustice be done. Better give up showing altogether than come to "points." (2)

B. B.—How do you judge dairy cattle? Do you not think the simple milk standard should be adopted?

J.—Certainly not. If you did so you would give the prize to a mere milking machine. Of course, quantity of milk would be the most important point; but this alone would be

(1) Just so! And because breeders dry off their cows as soon as possible in order to get fine calves, shorthorns are said to be bad milkers *naturally*. It is false: they are *trained* into bad milkers.
A R J. F.

(1) With this I entirely agree. A R J. F.

very misleading, inasmuch as the deepest milker might (and probably would) give the poorest milk, and produce no more butter than another giving one-third less milk. Then, again, she may eat half as much again as the other, and that would depend very much on the age of the cows. I think, therefore, the measuring and analyzing tests are unsatisfactory without weighing and valuing the actual amount of food consumed; that all this is too scientific to be practical, and that the safer way is to judge by appearances, combined with the actual measurement of the milk, and not to overlook the value of the cow as a grazer.

B. B.—There is one other point. Do you not consider that breeding animals should be exhibited in a natural state, and not in a state of obesity, as is almost invariably the case?

J.—Theoretically, yes; practically, no. The system of fattening breeding animals is, no doubt, highly injurious, and frequently renders them infertile; but, on the other hand, if fat animals were excluded prizes would sometimes be awarded to thin-fleshed animals (which no amount of feeding would fatten), under the impression that they are in a natural state, whereas in reality they have had as much cramming as those disqualified that are one-third heavier. Nothing could be more unfortunate than such a decision.—*London Agricultural Gazette.*

British Canadian Agriculture.

Prof. J. P. Sheldon, College of Agriculture, Downton, England, Author of "Dairy Farming" and Special Commissioner of land.

A competition that is interesting and important in a high degree is going on between the farmers of the "Old Country" and those of the "New," and it naturally involves fiscal problems which affect already and in the future will much more affect the condition of agriculture in both countries. Of the modern and more striking features of this rivalry our fathers had no conception whatever nor had we a decade and a half ago, but with the olden ones we had been familiar for some time before, though even now we do not apprehend the full scope of the influence which they will exert in the future. That the competition will become keener on the part of the new country as well as greater in volume is clearly enough seen, but we cannot foretell the lines on which it will be developed or the surprises that may be in store. In this age of steam and electricity and of multifarious inventions new and unlooked for factors are being brought into play, and these involve the adoption of various modifications in farming practices. The twin principles, progress and adaptation, are at work to-day in agriculture as they have not aforetime been, and nothing, even in agriculture, is so inevitable as the unforeseen. Of this a striking instance is seen in the transatlantic traffic in fresh meat, so recently developed, and not less so in that of live animals. I will endeavor to trace out briefly some of the tendencies which are in play just now, and to indicate the lines which will probably have to be followed in the future. In this I do not pretend to do more than approximate and suggest, which, indeed, is about all that any one would venture to do.

Confining now my remarks to Canada I will give statistics relating to exports of agricultural products:—

Fiscal years ended June 30	Butter quantity in lbs	Value in dollars	Cheese quantity in lbs	Value in dollars
1873...	15,208,633	2,808,979	19,483,211	2,280,412
1883...	8,104,467	1,705,817	58,041,387	6,451,870

These figures show a large falling off in butter, but a much larger proportionate increase in cheese, which may be in part accounted for in the superior advantages which cheese affords for transit purposes as well as in—as butter is now made and packed in Canada,—its better keeping properties. Canada, indeed, has in recent years proved herself capable of producing cheese of very superior quality and condition, her climate being, so far as the great American Continent goes, exceptionally well adapted to the pursuit of dairy husbandry (1). But the disparity I have indicated as between cheese and butter, as regards transit and preservation, is one which has no need to exist, for butter can be so made and packed as to travel safely and in good condition to the other side of the world and back again if need be. At the Centennial Fair of New Brunswick last year, I exhibited butter in hermetically sealed cans, which was over six months old and still quite fresh, though but slightly salted. This butter was made in Denmark, for the West Indian Trade, and was brought by me from England. Canada may produce such butter, and may win a large portion of this self-same trade to herself. The value of Canadian exports, consisting of animals and their produce, for the year ending June 30, 1883, was $20,284,443; and of other agricultural products, $22,818,519. The great bulk of these products was sent to England, and the demand in that country is developing in Canada the tendency to largely increase the export in animals and their produce. Canada, indeed, will owe much of her future agricultural prosperity to the export of beef and mutton and dairy products.

The Eastern and Maritime Provinces of Canada are in the incipient stages of agricultural transition, and will in time develop into stock raising and dairying countries, though the process may be long in operation. But there can hardly be a doubt that the tendency is a wise one: first, because they are better adapted to these pursuits than to grain raising, and second, because the North-West Territory is destined to become at no distant day, the chief granary of Canada, as also perhaps of England. It has for some years been patent that British farmers cannot depend on wheat as a paying crop, save once in a while and to a very small degree, and even this pittance of profit threatens to vanish very soon. These remarks do almost equally apply to Eastern Canada, as may be illustrated by figures relating to exports of that cereal, for the quantity of wheat imported into England from British North America

in 1880 was 3,893,544 cwt., and

in 1881 2,860,854 cwt.; while the total export of wheat from Canada in the year ending June 30, 1883, to all countries whither it was sent, was 5,867,458 bushels or about 3,250,000 cwt. From these returns it would appear that Canada has not in recent years been maintaining the volume of her wheat exports, though it is probable that the opening up of the north west by the Canadian Pacific railway will shortly enable her to greatly increase them, if she thinks well to do so. So far, however, as the production of wheat is concerned in British foreign possessions a new competitor, and a most powerful and therefore dangerous one, has recently entered the lists, and Canada may ere long find herself seriously handicapped by India. The exports of wheat from India to England, show a very rapid increase in volume, without causing any appreciable rise in the price of wheat in the country. It is probable indeed that the price of wheat will this year touch a lower relative point than it ever did before, and it must be admitted that the climate and soil of India are eminently suited to the growth of wheat of fair

(1) Unfortunately, the milk from the farm all goes to Lincoln College, so I can make no butter; consequently, I eat none, as what is bought to Sorel market is, generally, cheese and butter mixed.

quality. The probability now is that with the extension of the railway system of our Eastern Empire we may expect as the direct and rapid result of the competition of that vast country, where cheap labor abounds and when the cost of living is very low to the working classes, a still further reduction in the price of breadstuffs. This question is one of surpassing importance to the agricultural well being of the farmers of the Eastern Provinces of the Dominion, and I may therefore draw the attention of Canadian farmers to the urgent expedience of extending their operations in stock raising and dairy farming. It will be well in fact for them to copy the best practices of the Old Country as far as may be, viz: crop rotations made subsidiary to stock raising, stock fattening, and the production of milk. And in order to this, conservation of manure, thorough tilling of the soil, and the employment of purchased feeding-stuffs and fertilizers will occupy prominent positions in the farmer's programme It is competent for me to record, as a result of personal investigation, my opinion that the Eastern and Maritime provinces, in many parts of them, are well adapted to the growth of roots and green crops as well as of hay and straw for forage. These crops supply the foundation for successful stock-raising and dairying; and by stock-raising I do not mean cattle only, but all sorts of animals which go to the efficient equipment of mixed farms.

In the Maritime Provinces particularly a change in the habits of the farming community is pending, and must quickly come, for wooden ship building is dying out and lumbering will decline in volume. These provinces, indeed, enjoy great advantages in respect of seaboard and of a climate suitable to the kind of husbandry I have indicated. Where, indeed, on the vast continent of America, shall we find better stock land than in the noble valley of the St John river in the Sackville marshes, in the vale of Annapolis, in the Eastern Townships of Quebec, and in many other localities, while as for sheep husbandry, where have we a soil so suitable as the dry and friable loam of Prince Edward Island. Meanwhile, what is the position of farmers in Britain? and what their prospects in the future? In the ten years ending June, 1883, the area of permanent grass land in England alone has increased from 10,237,814 to 12,008,679 acres, which is more than one third of her cultivable area, and the tendency to lay down arable land to grass is still in force, for the heavy soils of the country no longer pay for cultivation. As a corollaray of this tendency, we ought to look for an increase in the number of live stock, providing it does not go too far; and failing this increase, national agricultural decadence stares us in the face in Old England. (1) Fortunately, the increase is going on for the present, the figures being as follows:

	Cattle.	Sheep.	Pigs.
1882.....	4.081,735	14.947,994	2 122.625
1883.....	4,216.625	15,594,660	2,231.195

For the United Kingdom they stand as follows:

	Cattle.	Sheep	Pigs.
1882	9,832.417	27,448.220	3.956,495
1883.....	10,097.943	28 347.560	3,936,427

In horses there is a decrease in the United Kingdom from 1,905,317 to 1,898.745, and the increase of other animals of the farm is less than it ought to be, the numbers being still below those of ten years ago.

But even though the laying down of land to grass were accompanied by a commensurate increase of live stock, the tendency that way is to be regretted, first because land under arable cultivation, in any case light and sound land, may be made to produce more food for stock and man than land in grass, and, second, because the rural population must diminish correspondingly with the increase of permanent grass land, on account of the increasing scarcity of employment. It is painfully evident that seven wet years have left British farmers poor, which means that they are badly equipped to meet the competition which swirls around them everywhere to-day; and seven good years, better than we have any reason to expect, are required to restore to them the measure of prosperitty which they enjoyed ten years ago. The wonder is that their condition is not far worse than we find it to be, for they have suffered not from wet seasons only—not alone from inferior quality of products—but from shorter yelds, and from the diminished values which were the result of sharp foreign competition.

But the rent-paying farmers of Britain to-day so far as law is concerned are placed in a position much more favourable than that of their fathers, for the money which they bury in the soil, in the way of adding to its fertility, cannot now be confiscated, as it formerly could by rapacious landlords. The position of the progressive farmer is now tolerably safe, and in this he has the encouragement without which husbandry must languish in a country where the landlord system prevails, and in the face of the competition of the globe. To place the matter in a nutshell, the British farmers must now be compensated for improvements which they leave behind them when they quit their farms. The Canadian farmer owns the land he farms, and can do with it what he likes All very well this, when ownership does not bury too large a capital; but in course of time as land increases in value, a landlord and tenant system will grow up in Canada, and it will be well that it should at the outset be defined on equitable lines. The British farmer avoids the loss which comes of a fall in the value of land, a loss from which every agricultural land owner is suffering to-day, more or less, and his capital is all available for active operations. So long as the industry of farmers is duly shielded from injustice, it is a loss rather than a gain to them to be land owners, for land owning at 2½ per cent is a luxury in which breadwinners can hardly afford to indulge Meanwhile the prospects of British farmers are brightening, and a few good seasons will revive their confidence and replenish their pockets, while a rapidly growing population will maintain the demand for food no matter what the volume of foreign competition may become. Various means are being taken to inculcate improved practices in husbandry, and sound agricultural knowledge is being imparted to the people. It is in dairy farming, probably, that the greatest need exists for improvement, specially in butter and cheese making, for the need of tuition in these departments seems so far to be perennial. Dairy schools and other means of dairy tuition have already effected great improvement in Ireland, and similar means are being adopted in England and Scotland. Canada, too, may wisely employ similar agencies, for her destiny is to develop into a great butter and cheese, as well as a beef and mutton and live stock, exporting country. She ought indeed to supply England with no inconsiderable quantity of store cattle for fattening there, and she may do this so long as by preserving a clean bill of health, and by excluding American stock from transit through her territory, she remains out of the list of countries which England has been compelled to schedule on account of diseases.

This present immunity from disease among stock is an immense advantage to the farmers of Canada.

The needs of the day in England, and probably in Canada too, in order that agriculture may flourish, are improved practice and greater economy, and the adoption of newer and more efficient ideas, along with more of personal supervision

(1) The landed proprietors will, in the long run, be the sufferers
A. R. J. F.

on the part of the farmer and his family. The rest will follow as surely as daylight follows darkness. (1)

Cattle for Dairy Purposes.

Mr. E. C. Tisdall read a paper at the recent Gloucester (England) Dairy Conference on the Selection and Breeding of Dairy Cattle, strongly in favor of the view generally taken in England that Short-Horns have no superiors in this respect. For the past five years a series of experimental analyses have been conducted under the auspices of the British Dairy Farmers' Association, at their show at Islington, by Dr. Aug. Voelcker, in order to aid a committee in determining the milk-giving and butter-producing power of the animals in the different classes entered for milking prizes. The classes were divided into Jerseys, Short-Horns, Dutch or Holstein, Ayrshire, cross-breds, and any other pure-breds. These analyses showed the weight of milk given by a number of cows of various breeds in 24 hours, and the amount of butter fat and total solids. The following is the summary of averages:

Breeds.	*No. Samples.*	*Lbs. Milk.*	*Fat*	*Total Solids.*
Short-Horns....	23	44.91	3 79	12.7
Jerseys.....	19	29.27	4.26	13.6
Guernseys	10	25.49	4.80	14.09
Dutch.....	6	46 99	2 97	11.8
Cross-bred	3	51.66	3 15	12.31

After giving these figures Mr Tisdall proceeds as follows:

OTHER TESTS.

Before applying these figures, it is desirable to compare them with those possessed by the owners of large herds to ascertain if these selected cases are supported by practical results derived from a wide area, and subject to the varied changes of food and climate. In Mr. J. C. Morton's interesting work on "Dairy Husbandry," the yearly returns from two dairy farms are presented. Mr. Wright of Chipstead, Surrey, from 50 well fed Short Horns obtained per head per annum 750 gallons, and at the second farm, 650 gallons from a similar number of cattle. Mr. Allsbrook of Notts mentions 690 gallons per head for the season of 9 months on a good Derbyshire farm. On Lord Warwick's farm 735 gallons per cow were entered on the record of 50 head, extending over ten months. This is a high yield, but that it is not more than can be obtained from Short-Horns chosen for milk and not for "beef and beauty," it is easy to show. A return was taken out to afford data for adjudicating the milk prizes at Islington, in 1880, from 60 cows of my own herds, giving 948 gallons per head, over 10¾ months. In this instance, it is fair to say a liberal diet was adopted, and the records of the best milkers were tabled as serving better the purpose in view. Probably the mean of these cited cases would be a fair basis to rely on from well-managed Short-Horns.(2)The analyses in the last two examples confirm fully the Islington data, being slightly higher in butter fat and other solids. Among Jersey stock the valuable records of Mr Burnett's, "Deerfoot Farm, Massachusett's," quoted by Dr. Sturtevant in the 36th number of the Royal Agricultural Society's Journal, are most conspicuous. The average yield of the herd over seven years, from 1873 to 1879 reaches the great figure of 605 gallons per head per annum.

This is much beyond the usual amount, which is from 450 to 550 gallons. Mr. George Simpson's herd at Wray Park, Reigate, has a reputation for milking properties, and his returns support those of Mr. Burnett as to the great capacity of the tribe for dairy produce of high qualities, 20 cows averaging 11 to 12 quarts daily, and 18 lbs. milk yielding 1 lb. butter. It will be fair to register the annual return of this race at 500 to 520 gallons at the same rate of analysis as the Dairy Show data. No return from any considerable number of Guernsey cattle has yet been made public, but from individual instances, which are numerous, it may be referred their milking powers do not range much below the race in the sister island. The Islington figures appear, therefore, to afford a correct proportion, which will be 450 gallons. No herds of Dutch cattle simply are known to be in this country, but general experience credits them with equalling or surpassing the Short-Horns in quantity, and this is supported by the Dairy Show returns. In Mr. H. M. Jenkins' much prized contributions to this subject in the Royal Agricultural Society Journal, he cites a dairy of 500 cows at Holeby, Denmark, producing 1,100 gallons daily —nearly 9 quarts per head. Another herd of 36 cows averaged 648 gallons in the year 1868 and 661 gallons in 1872, and in a third case 660 gallons each per annum is given. We shall be justified, therefore, in crediting this race with an annual yield of 650 gallons, each on the qualitative basis shown at the Dairy Shows. The Islington data from cross-breds are suggestive. The deep milking powers of the Dutch cows are sustained when a Short-Horn sire is used, and the quality of the produce improved, as examples No. 103, 73 and 82 testify. Only one instance of Hereford crossed with Short-Horn is related; but that indicates that the somewhat sluggish white-face can be developed into a good dairy cow if she keeps good company. Three cows also in my own herd, one-fourth Hereford and three-fourths Short-Horn, gave excellent results—14 1 quarts of milk daily for 9 6 months, of fair quality. Other races, such as the Kerry in Ireland and Ayrshires in Scotland, the Pembroke in Wales, and the Polled Norfolk cattle, have just claims as dairy stock in their own localities; but their suitability to the bulk of our dairy farms is too problematic to bring them within reach of this inquiry which will therefore be practically confined to gauging the merits of the Short-Horn, Jersey, Guernsey, and Dutch races and their intermediate descendants.

RELATIVE DAIRY VALUE OF VARIOUS BREEDS.

Let us now classify these figures:—Placing the average quantitive return from existing Short-Horn herds per head per annum at 700 gals., Jersey herds per head per annum at 520 gals., Guernsey herds per head per annum at 460 gals., and Dutch herds per head per annum at 650 gals., which proportions are singularly close to the actual dairy yield of the various races at the dairy shows, and taking the average analysis of each breed, already given in the "summary of averages," as our qualitative basis—a basis which is quite confirmed by the private herd records we have quoted—the commercial value of the produce of one animal of each tribe, whether disposed of as milk, butter, or cheese, will be shown in the following statement, reckoning 13 ozs. pure butter-fat equal to 1 lb. best cheese.

Table Showing Relative Value of the Produce of the Leading Dairy Tribes.

	Average annual yield of Milk. Gals.	*As butter at 1s 3d lb* £ s. d.	*As cheese at 75s cwt.* £ s. d.	*As milk at 9d. per gal.* £ s. d.
Short-Horn....	700	25 10 0	24 13 0	26 5 0
Jersey.....	520	17 7 6	17 5 0	19 10 0
Guernsey	460	19 5 0	16 7 0	17 5 0
Dutch	650	16 4 0	19 19 0	24 9 0

THE SHORT HORN FOR DAIRY PURPOSES.

The first inference from these calculations is plain and indubitable. All other things being equal, the Short-Horn is

(1) At all events, in the province of Quebec the farmer and his family cannot be accused of neglecting the supervision of the business. A. R. J. F.

(2) i. e. 753 gallons

by far the most profitable animal for general dairy purposes. Where richness of milk and butter is chiefly desired, the Channel Islands tribes seem to fulfill those requirements better and at less cost, their consumption of food being small. Where a town milk supply alone is aimed at and quantity is most in request, the Dutch race, or, better still, the Dutch crossed with Short-Horn sires, produces the desired result at the lowest outlay, but their feeding qualities are not equal to some other breeds. This is the final factor in the problem, "To what base uses may they return?" If the shambles are base they are inevitable, and offer the ultimate test of the flesh forming capacity of our stock. It may be questionable if the Jersey exceeds the Dutch in this particular, or if the Guernsey much surpasses those other two races, but it is quite unquestionable that in aptitude to fatten and lay on flesh of fine texture, rapidly the Short-Horn and its grades—as our American cousins say—by far exceed all the other dairy breeds. This valuable quality, in addition to their milking propensity, renders them superior to all others for the purposes of the dairy farmer, and all our leading dairy districts attest this fact by using Short-Horns more or less pure-bred, or native sorts repeatedly crossed with them.

Breeds of British Sheep—VI

LINCOLNS.

East Anglia has a great deal to interest every intelligent farmer who has given attention to the drainage of land, and to delight every person who rejoices to see rich blessings enjoyed by any people as a result of human effort and skill. Every one knows something how Holland has been wrested from the sea, and is preserved from its persisting attacks by perpetual vigilance. Nearly 700,000 acres of the richest land in England have been reclaimed from the same sea, and are preserved by continual watchfulness as completely as is the case in the opposite kingdom of Holland. In the counties of Lincoln, Huntingdon, Cambridge and Norfolk there are large areas below the level of the sea, from which they are protected by dykes, and into which they are drained by pumping. There are larger areas a little above the sea level, made fertile by an elaborate system of drains. Other portions reach a moderate elevation, with their highest points in the Gog Magog hills in Cambridgeshire, and the ridges in Lincolnshire called the Wolds and Cliffs. Many spots on these command very charming views. The general aspect of this Eastern England is that of a vast plain, extending as far as the eye can reach, like our most level prairies. Kingsley says it has "a beauty as of the sea, of boundless expanse and freedom." Those who have read the delightful books on this region by Walter White the accomplished secretary of the Royal Society, know something of the charms of the Fen country to the intelligent observer.

The history of the drainage of the Fens goes a long way back in the history of the country. The Romans did something in the work, and William the Conqueror much more. Charles I. accomplished a great deal when he put the Dutchman Vermuyden in charge of extended operations. Cromwell at first opposed and then encouraged his work. His system has been since greatly improved by James Rennie and other eminent engineers. The earls and dukes of Bedford have been conspicuous promoters of the vast enterprises, and have given their name to the great Bedford Level. Notwithstanding the immense cost of these drainage operations, such is the fertility of the reclaimed lands that the outlay was speedily more than repaid.

The climate of this region is mild and even, and the rainfall is as small as in any part of England. The soils vary from sandy loams on the higher portions, to peat and sand upon clay or rich vegetable loams in the lower levels. All are very fertile, and here can be seen some of the best farming in England. The wide grazing lands are famous for their excellence, and the higher lands are specially adapted for wheat and beans. The extent of the bean crop (used as food for horses) is very noticeable. Great quantities of roots are grown. No fixed system of rotation is followed. The "fourcourse shift" is very common. 1. A fallow is sown with winter tares, turnips, mangolds or mustard. 2 Barley. 3. Beans where tares were sown on the fallow, and clover where green crops were sown. 4. Wheat. A six-years course of fallow, barley, clover, wheat, beans and wheat is, however, not uncommon, especially on the best soils. The fallow is an important factor with any soil subject to such constant cropping.

This whole district is full of sheep of the Lincoln breed, or Leicester-Lincoln. Formerly the Lincolns, overgrown upon the fatness of such land, were great, flat-sided, big legged and big-footed animals, with coarse, shaggy wool that nearly swept the ground. When Bakewell brought the Leicesters to such great excellence, the Lincoln farmers obtained the improved rams, and found their flocks greatly benefited thereby. But there was strong opposition to them on the part of many, and to-day, upon the lower lands, it is thought that the admixture of much Leicester blood is disadvantageous. Doubtless the qualities that have been developed under the peculiar conditions of these lands are still essential in any animals kept upon them. As we go upon higher ground, we find a greater percentage of Leicester blood, until upon the dryest portions, where heavy crops of roots and green fodder are the chief productions, we find the sheep still Lincolns, but with strong Leicester characteristics.

This breed is said to be the largest sheep in the world. No other animal produces so much mutton and wool. Wethers under four years of age have dressed nearly 400 pounds; under three years 360 pounds, and under two years 280 pounds. I have myself seen animals that nearly, if not quite, reached these great weights. Of course such are extraordinary. Shearlings sometimes yield fleeces of 25 or 30 pounds weight, and the average of the flocks is very great. With wool at good prices, whole flocks have yielded $5 per head. The wool is coarser than the Leicester's, but well adapted to worsted goods. It is very long and lustrous, sometimes measuring as much as ten inches.

In appearance the Lincoln is very striking, because of its great size. When feeding upon the meadows they make a fine display, and they always attract attention in the show-yard. The pendent ears are a striking peculiarity. The head and legs are very white, and without wool, and are not overlarge. The neck is short for so large an animal. The shoulders and chest are deep and strong, and show the effect of the Leicester improvement. The back is very long, and of good proportions. The hams are not proportionally heavy with the carcass. The flesh is not so fine as that of smaller breeds, but still is of very fair quality. They put in a good deal of solid inside fat. They are remarkably prolific, twins being more frequent than singles: triplets are not uncommon, while fours are not very rare. Where the lambs make such large animals, hand-rearing pays better than with smaller breeds. At the great April fair in the city of Lincoln, there is a most interesting collection of 40,000, and sometimes more, offered for sale. "Hogs" (1) bring about $25 each.

I began my study of Lincolns on a very hot July day, when the mercury stood at 98° in the shade. This season has surpassed even that extreme heat. On July 3d, the mercury at many places in Eastern England stood at 103° in the shade. I was met at the old Saracen's Head Inn, in the city of Lincoln, by a Lincolnshire farmer, who rents the same lands, belonging to one of the colleges of Cambridge University, his

(1) Yearling sheep.

ancestors have occupied for more than two hundred years, and which have given the family very handsome fortunes. It is difficult for Americans to understand how a man with a capital of $250,000 can be a tenant farmer. Lincolnshire is famous for its horses. The quality of one of them was proved on that day as he drew a heavy road-cart, with two full-weighted men and a servant behind, over the heavy roads. We examined many flocks and talked with their owners. I never saw elsewhere more unquestioning confidence in any breed of animals than that they manifested; and their enthusiasm, as they discussed their favorites' good qualities over mugs (1) of home-brewed beer, almost compelled me to become a convert to the Lincolns myself. But with all their good qualities, I do not see where they yet have a place in our American system, unless, with the best of shelter and winter care, the rich lands of the States west of Ohio may make them profitable. They imperatively require high feeding, with an abundance of succulent and nutritious foods. I do not know how well the importations taken to Canada and Minnesota have succeeded. Some twenty years ago, Leonard D. Clift, in our adjoining county of Putnam, kept a flock, and was well pleased with them. Mr Clift's farm was very productive in rich pasturage.

Great numbers of Lincolns have been taken from England to Australia in the wool-growing interest.

JAMES WOOD. *Mt. Kisco, N. Y.*

(1) Come, I say, Lincolnshire farmers don t drink out of mugs, Mr Wood. They were, in my time, famous for choice port wine, and champagne was not a rare drink among them. Mugs, indeed!

A. R J F.

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