PASTURES OLD AND NEW.

A PLEA

FOR THE

IMPROVEMENT OF OLD TURF, BETTER SYSTEMS OF GRASSING-DOWN,

AND THE

Prolonged Tenure of Alternate Husbandry Grass-Layers.

BY

JOSEPH DARBY.

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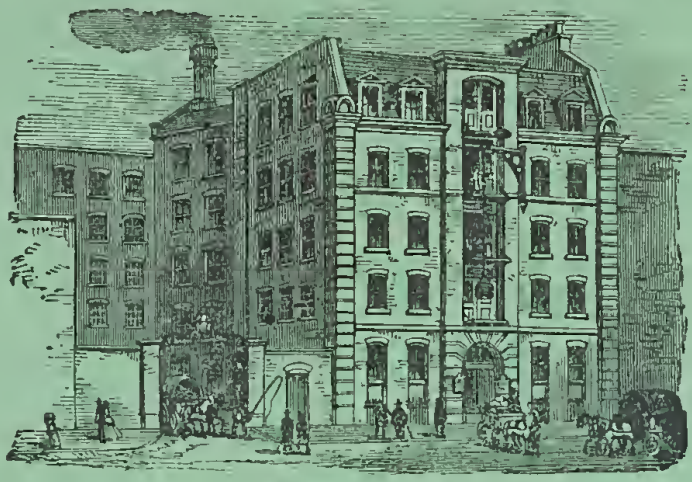

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CHAPTER I.

GRASS LANDS AS THEY ARE AND AS THEY OUGHT TO BE.

The *bête noir* of British agriculture has always been considered its grass lands, the majority of which may aptly be described as exemplifying a semi-wild condition, being little better than nurseries for weeds and the herbage indigenous to the soil in a natural unimproved state. The reason of this is that in past times the pasture part of the farm was left very much to take care of itself, being seldom manured or subjected to any management whatever, except feeding the produce by stock or cutting and harvesting it for hay. There were in the old times sheep runs, cattle runs, dairy pastures, and meadows for mowing; sometimes the latter received trifling attention, but, as a rule, even these were deplorably infested by weeds, especially rushes when in low situations, or when the fields contain many surface springs. Nor need the past tense be employed for such a description, even our best meadows being at the present day full of weeds, while second and third class ones, no less than dairy fields and pastures generally, are infested with all kinds of rubbish in the shape of vegetable life, and yield even small quantities of that in comparison with the amount of really good produce they might be made to bear if properly treated.

No one has more clearly described the cause of the impoverishment and bad quality of old pastures than Mons. H. Joulie, who, in a paper which has been translated and published in this country, points out that, while nitrogen accumulates extensively in the upper layers of pasture lands, the minerals get gradually

exhausted, and that their fallings off in produce, as well as deterioration in quality, are almost entirely attributable to the absence either of potash, the phosphates, or lime, and in many cases of two or more of these minerals. M. Joulie also points out that, "Owing to the continued accumulation of vegetable *débris*, the layer of soil in which the roots live at length becomes sour, even where the earth may originally have been calcareous, and may still be so in the underlying layers, so that the good plants tend to disappear, and give place to a vegetation which is characteristic of sour land." Unfortunately, it must be admitted that a very large proportion of pasture lands in the United Kingdom answer thoroughly to the above description, and the almost magical changes produced in them whenever applications of lime, chalk, or any other calcareous substance happen to be made, has always caused it to appear marvellous that they should not be more frequently renovated by this agency. The beneficial effect of lime on old pastures is often exemplified on sheep walks, mountains, and elevated plains no less than in low marshy or fen districts, where the soil is of a peaty character. In fact, a moment's consideration would cause it to be understood that the natural phenomena pointed out by M. Joulie is always being exemplified and having effect in pastures in all geographical positions, and whatever the nature of the soil may be. If the latter be rich in all the minerals, the evil results will be slower in manifestation, simply because they would only take place on there being actual scarcity of one or more of the minerals essential to the well-being and existence of grass plants of the highest order. There are some lands so rich in minerals that the pasture seemingly has not deteriorated either in quantity or quality for several generations, just as some deep, rich arable lands seem inexhaustible in fertility, and have been known to bear lengthy successions of grain crops without manure, and not display the slightest evidence of exhaustion.

Even the best pastures have, however, a failing in quality if not in quantity, owing to the extent they are infested with weeds. Those of the far-famed Bridgwater level have often been pointed to as among the best of the best, and the extent to which one of the most valuable of feeding grounds to be found anywhere, take the kingdom through, is at the present period infested by the wild ranunculus (usually termed buttercup), strikes the observation forcibly. This is regarded in every sense as purely a weed, unless grown to gladden the eye, inasmuch as stock always refuse

to eat it, unless driven by hunger to do so, owing to the absence of anything else. But some of the Somerset marshes—which not only bear prodigious quantities of this pest, but a great many other inferior plants only deserving to be deemed weeds—actually let at from 4*l.* to 5*l.* per acre. Horsey Slimes and some neighbouring highest-class marshes, according to the late Mr. Gabriel Poole, were accustomed to let for 6*l.* or 7*l.* per acre about ten years ago, and even now they yield high rents at annual lettings.

The character of the pasturage of low-lying marshes and meadows liable to be flooded is also materially affected by this cause. There cannot be the slightest doubt that the excessive floodings to which they were subjected during the lengthy cycle of wet years, from 1875 to 1882, had the effect of killing many of the more valuable grasses, and causing others to take their place of a more aquatic and coarser nature. This is proved not only by the statements of occupiers, but by the serious decline in value of such lands either for sale or letting, which has scarcely been exceeded by that of arable soils in the poorest districts.

The extent to which the prevention of injurious floods would benefit low-lying grass lands is not sufficiently understood, perhaps not even by those who own and occupy them; otherwise, the schemes for confining our main streams by effectual barriers would be of a grander and more comprehensive nature. As proof of this, the owners of the great Somerset level have always adopted the suicidal policy of promoting its reclamation and improvement by peddling and partially effective measures. Billingsley showed plainly that this was their failing in his day, when he wrote his report for the Board of Agriculture at the latter part of the last century. They have now an Act of Parliament which would enable them, it they chose, to confine the Parrot, with a sufficient breadth of wash lands on its brinks, within solid embankments, so as to render any floodings beyond absolutely preventible; but instead of this they are adopting a scheme which will cost a great deal of money, but can be only but very partially effective in securing the grand object of making the whole of the low-lying lands at present flooded by that main stream and its tributaries of first-class value, whereas a large proportion of them, owing to their sedgy, peaty character, are only at present of fifth or sixth-rate value, and have frequently been known to sell at auction sales for no more than 20*l.* an acre.

There are many other low-lying levels in the kingdom that have

been damaged by injurious floodings to quite the same extent as this one; and, what is more, until these floodings can be absolutely prevented, immense tracts of land at present of very little value indeed cannot be reclaimed and made good. It may confidently be asserted that thousands of acres of morass and lands full of peat bogs might be increased in value at least four-fold by the necessary steps being taken for their reclamation.

Drainage is another effectual means for the improvement of grass lands, even some that lie tolerably high. In travelling through the country how often is the eye pained by resting on numerous bad spots in grass fields, which would otherwise present to view a solid, even carpet of luxuriant green. These blemishes are chiefly caused by surface springs, and might be entirely removed by under drainage. For the want of this a considerable proportion of the produce of those fields consists of sedge grass and rushes, absolutely worthless for feeding purposes; with a still larger quantity of aquatic coarse grasses, far less nutritious than the valuable, high-class meadow grasses which might be grown instead, if the land were only thoroughly drained.

Singularly enough, most erroneous opinions have been and still are prevalent respecting the drainage of grass lands. As the owners and occupiers of flooded marshes and meadows absolutely fear to prevent the cause from operating altogether from which they suffer, lest they deprive themselves of a slight manurial operating influence, so do those who have the management of pastures of the other description fear to drain them, lest, through being of a drier character, they may yield a less quantity of produce than before. Grass is grass to them, whatever its character otherwise, and no nice distinctions are drawn as to the amount of nutriment contained in the coarse aquatic ones, supposing they are devoured, compared to that contained in foxtail, cocksfoot, the fescues, and timothy, which, by draining the land and sufficiently manuring it, they might grow instead.

Grass fields with surface springs and unsound spots bearing a different character of herbage to sound land, are nurseries for the fluke germs which give sheep liver-rot, and as a rule it will be found that flooded marshes and meadows, and grass lands requiring drainage, solely impart this baneful malady. Only by considering to what a fearful extent entire flocks were swept clean off the face of the land in 1879 and 1880, can we form any valid estimate of the immense sacrifices of wealth occasioned by wet undrained pastures. The sheep stock of the United Kingdom was

reduced several millions in those years, and has not even now fully recovered its normal enumeration.

In regard to upland pastures, and indeed to grass lands generally, the utmost ignorance prevailed up to a very recent period as to the best ways of treating them so as to impart fertility or higher producing powers, and so usual had it been for countless generations to let them alone, that even when indications of a striking nature manifested themselves by accident, or in response to some eccentric course of action, the practical teaching seldom had much effect.

A few illustrations of this may not be out of place. Not far from Romford there is a park in which one particularly bright spot could for several successive years be seen for three or four miles distant, standing out boldly from the rusty brown of the surrounding sward. Some mortar refuse spread there on an old building being pulled down, had contributed the calic chemical so much wanted. Yet, strange to state, it did not occur to the occupier of the park that it would be profitable to give the entire region a lime dressing.

On the banks of the Avon, in Hants, a similar bright oasis was produced by spreading chalk on the surface, which not only improved the quality of the herbage, but made it yield twice as much as before. Yet there are thousands of acres bordering on that and similar streams, which might be similarly benefited, yet remain bearing just so much as nature allows them and no more.

A few loads of marl were hauled and spread over an alluvial marsh, the effect of which caused white clover to spring up spontaneously very thickly without a single seed being sown, and although no one could remember having seen a single plant of that kind in the field before. A similar thing occurred in one of the poorest of upland pastures in Sussex, by Sir Curtis Lampson reserving it as lairage for sheep fed on roots and trough foods, so that they left their dung very thickly on the land. Plants made their appearance the ensuing summer never seen there before, and the produce was increased tenfold.

That old herbage, consisting of injurious plants, can be destroyed and the better grasses be made to take their place, simply by manuring alone, has been proved sufficiently by the experiments of Sir J. B. Lawes, at Rothamsted. The produce of his unmanured plots contained 16 per cent. of miscellaneous weedy herbage. These were reduced more and more, almost at the will of the experimenter, according as the plots were partially,

effectually, or highly manured; while superior grasses, such as cocksfoot, which were not found at all in the totally unmanured section, came of their own accord as the result of liberal manuring. Quaking grass, for instance, was found to the extent of 2 per cent. in the unmanured plot, but disappeared entirely in the highly manured ones; and Messrs. Lawes and Gilbert say "it is easy of expulsion by good manuring." Nearly eleven out of the sixteen parts referred to consisted of rib grass, yet "none of it was found in the produce grown by mineral manures alone;" and it is added in the report of Messrs. Lawes and Gilbert, "sheep sorrel, silene or catch-fly, ranunculus or crowsfoot, field wood-rush, germander, speedwell, and beadstraw or rennet, were also found to disappear with the application of manure."

So satisfied was Sir J. B. Lawes that the application of manure alone will kill bad herbage and bring more valuable grasses and clovers to take its place without the sowing of seeds, that some time since he suggested to landlords having impoverished foul farms thrown on their hands, that the least costly method of improving and making them valuable would be to let nature cover them with wild herbage and then feed it off by stock, well supplied with oilcake, corn, or other rich food, the high manurial agency of whose droppings would cause a gradual amelioration of the herbage until fairly good pastures would be obtained.

According to numerous facts which have been reported, a great deal of neglected arable land has been treated in this way since the present cycle of agricultural depression set in, with the invariable result indicated by Sir J. B. Lawes, to whom, however, the suggestion must not be attributed as original, the law by which the phenomenon works having been acknowledged and believed in for many generations. In South Wales there are numerous productive grass fields on the coal measures bordering on absolutely waste lands, the occupiers of which assert that the only agencies that have produced the reclamation are drainage and the application of manure.

Nearly at the top of the Aberdare mountain, near Merthyr Tydvil, about 1600ft. above the sea level, is a bright spot, which sparkles green and lustrous viewed from afar, and, on examination, is found to be three small fields which a labouring man was allowed to enclose—and merely by the application of manure, without converting them to tillage—has made to produce considerably over a ton of hay per acre at a cutting. This fact is highly important, as it shows that even the semi-barren Welsh mountains

are only unfruitful because they remain neglected and unmanured.

And it is so everywhere, go where you will, for pasture lands, mountain sheepwalks, cattle runs and downs, that are most barren, are only so for lack of more manuring. In some cases they lack the phosphates, in others potash, but almost invariably lime, which exerts a two-fold effect, one essentially and directly manurial, the other indirectly so in causing latent nitrogen to be available from the upper crust of the soil; whereby sweetening the herbage is produced.

Scientific men are perfectly agreed that pastures have a great advantage over arable land, in being able to appropriate a great deal of nitrogen from the atmosphere. There is a nitrifying effect always being produced more or less on the surfaces of all soils, but the nitrates from atmospheric sources are washed through those deficient of actual vegetable life at the surface, where there are no rootlets to take them up and appropriate them. But without minerals in sufficient quantities to make the grass plants vigorous, their powers of appropriation would probably be only limited.

Some years since the Cheshire farmers doubled, and in many instances trebled, the produce of their worn-out dairy pastures by the application of bones, after which everybody rushed erroneously to the conclusion that phosphates were solely what grass fields required to make them fruitful all the kingdom over. The error of this was soon found out, and the late Dr. Voelcker was accustomed to tell an amusing story, that when he came to Cirencester as a young man, thinking to astonish the natives, he traced the initials of his name on a grass plot overlooking the high road. To his surprise, the grass came no fresher or more luxuriant where the bone dust was placed than elsewhere. On analysing the soil he discovered the reason: it contained a superfluity of phosphates.

The conclusion may be formed that the green carpeting of our island, if only properly treated in the ways above described, might be made to appear far more fresh and luxuriant on mountains and hillsides, no less than in vales and lowland levels, and that a vast increase of their productive powers could easily be brought about.

CHAPTER II.

THE FORMATION OF NEW PASTURES.

During the ten years from 1874 to 1884 the pastures of Great Britain increased from 13,178,012 to 15,290,820 acres, or to the extent of 2,112,808 acres, the cause leading to such a result being the untoward seasons, combined to low prices, which have been experienced for corn growing, and the desire on the part of farmers to save labour and the costs of cultivation to the greatest extent possible in present times of depression.

A change in husbandry operating to this wide extent has naturally occasioned a great deal of inquiry on the best methods of converting arable to pasture; the more so as the self-same evils affecting old pastures—occasioned, as has been seen, by the exhaustion of minerals in the upper crusts of the soil—manifest themselves very early in new ones of the common order. Perhaps it is not too much to assume that three-fourths of the new pastures laid down in the four or five years previous to 1880 are already so impaired in yielding power that their owners are dissatisfied with the sacrifice of wealth they entail, and feel very inclined to return them to arable again. Owing to this, the utility of laying down land to grass, as a remedy for agricultural depression, is advocated with much less fervour at the present day than it was a few years since.

This is altogether to be deplored, inasmuch as the evil is preventible, and to be attributed to bad management. Either the land was not perfectly cleaned ere being grassed down, or the seeding itself proved to be of an indifferent character, by the seeds of annuals or weeds forming a considerable portion of the mixture sown, or the after-management of the new pastures proved inimical to their well-being. In the majority of instances two at least of these evil influences are usually to be detected on close examination.

There are three leading stages, each requiring separate considerations, in the conversion of arable to pasture: the preparatory

treatment, the nature of the seeding management, and the nourishment of the young pastures after being obtained. Without going into all the details of what is deemed most judicious preliminary husbandry, it should be observed that there are at least three pre-requisites which should, if possible, be secured: a healthy dryness of the soil whenever wet by drainage, scrupulous cleanliness by the destruction of weeds of all kinds, and bringing the land into as good a condition of fertility as possible ere being laid down. Unfortunately, land is often sown down without either requirement being carried out. The part of the farm most difficult of access, or entailing greatest strain of labour, is usually that which is first selected to be grassed down. The clayey portion is most likely to be wet and undrained, and that difficult of access to be very poor. According to the general admission of farmers themselves, the land converted to grass in the last ten years was the reverse of being in high condition, in respect to fertility, and not so cleanly as could have been desired. In respect to the other pre-requisite, the majority of farmers are not yet converted to a belief in the utility of making grass lands thoroughly dry.

"Putting the land in good heart," as it is termed, can on all medium-class soils be generally secured with the greatest ease by taking a preliminary crop of turnips, and then sowing down with rape, these two successive green crops being consumed by sheep bountifully supplied with oilcake or some other auxiliary food. The utility of taking this course would also be the more patent by the consideration that it would form the easiest and cheapest way of cleaning the land, as the tillage operations necessary to be effected for the turnip and rape crops would secure this. Thus the essential pre-requisites of cleaning the land and putting it into good heart would be gained by one and the same means, and the amount of fertility obtained will not be lightly estimated by those who know what legacies are left behind by the flock when two green crops in succession are consumed by sheep bountifully supplied with artificial food.

But a great deal of land that it is thought most desirable to sow down cannot always be managed in this way, being too heavy to bear the tramping of sheep in winter. Mr. James Howard, M.P. has experienced the old-fashioned summer fallow as the best preparatory treatment under such circumstances; and probably if clay lands, after receiving an entire, or even what is termed a "bastard" summer fallow, were allowed to have a winter one afterwards, a well-pulverised seed bed could be obtained in March or April, into

which the grass seeds might be sown with barley, oats, or rape, as may be thought most desirable.

As to the seeding itself, whatever may be the mixture chosen as being best adapted to the soil and other circumstances, it is pre-eminently desirable that all the varieties contained therein should consist of pure unadulterated seeds, which, unfortunately has not been usually the case with a considerable number of seed mixtures. Seedsmen, in their treatises, condemn the old method of saving the sweepings of haylofts for employment in seeding down to grass, as being calculated to cause the seeds of weeds and many injurious grasses to be sown along with others more valuable. This, however, according to Mr. Carruthers, scarcely operates to a greater extent that when seeds are bought from a certain class of seedsman. He has shown in some of his reports that not a few grass seed mixtures that have been submitted to inspection are most wantonly and shamefully adulterated.

The Royal Agricultural Society of England, in the year 1880, following Mr Carruthers' advice, drew out a table of standards, with reference to which they recommended their members to purchase seeds, and some few of the leading seedsmen have expressed their willingness to guarantee their seeds quite to the extent Mr. Carruthers declares that they ought to be rendered pure. To farmers it would be of course an immense boon to have this guarantee system universally established, the urgent need of which will at once be seen by comparing the subjoined analyses of two seed mixtures supplied in the spring of 1884, and which came under the observation of Mr. Carruthers.

The first was obtained from Mr. Hunter, and every variety it contained was so thoroughly unadulterated that Mr. Carruthers could only express highest approval with admiration.

The following results are transcribed from his analysis: Meadow fescue, pure, true, and clean, no rye or other grass, 98 per cent. germinated. Tall fescue, true, pure, and clean, except 5 per cent. of rye grass, with a seed or two of brome grass, 90 per cent. germinated. Hard fescue, pure, true, and clean, 83 per cent. germinated. Rough meadow grass, pure, true, and clean, a few seeds of tussock grass, but not one in 300, 88 per cent. germinated. And the same description of pure, true, and clean was applied to eight others, viz.: Catstail, of which 95 per cent. germinated; cocksfoot, the percentage of germinated being 92; dogstail, 97; foxtail, 80; perennial red clover, 90; white clover, 100; alsike, 94; and yarrow, 86.

What a contrast does the above present to the following analysis of seeds from a leading Scotch house, which Mr. Carruthers made on April 7, 1884: "Cocksfoot.—This sample consists of 62 per cent. cocksfoot, 29 per cent. small rye grass seeds, 4 per cent. Yorkshire fog, 2 per cent. hard fescue, 2 per cent. Lipedium satirium, and 1 per cent. Bromus. Rough meadow grass.—This is principally smooth meadow grass, with some seeds of rough meadow grass, fiorin, and Glyseria distans. Meadow fescue.—This consists of 73 per cent. true and 27 per cent. rye grass. Tall fescue.—This is all hard fescue, with a seed or two of Bromus. Hard fescue.—This is the same as the last. Crested dogstail.—This consists of 72 per cent. dogstail, 23 per cent. Molinia cocrulia, 3 per cent. Yorkshire fog, and 2 per cent. weeds. It is old seed or badly harvested. Golden oat grass.—This is entirely Aira fleuriosa. Foxtail.—There is 4 per cent. of Yorkshire fog. The foxtail is composed of 46 per cent. in flower, 42 per cent. in empty chaff, 6 per cent. unripe, 4 per cent. destroyed by insects, and 2 per cent. ripe. Yarrow.—Pure and true, with a little sand, about one-sixth of its weight. The seeds are well filled."

Perusal of the latter analysis will no doubt open the eyes of farmers to the enormous risks to which they are exposed, unless they purchase their seeds of leading houses, the managers of which are men of strict integrity. It is no doubt sufficient in itself to account for the rapidity with which a great many pastures fail and become filled with weeds. Probably many English seedsmen who supply bad seeds have been deceived themselves by the adulterations taking place abroad by foreign growers or merchants. But however this may be, the security of the British farmer in making his purchases can only be perfectly acquired by the establishment of the guarantee system. The high utility of this becomes still more manifest when it is considered that, if pure good seeds could be depended on, the quantity required might be so greatly lessened as to lighten the expense of seeding down very considerably. Indeed, Mr. Faunce de Laune computes that it might be curtailed almost half. Approved seed mixtures now cost from 36*s*. to 54*s*. per acre, but he feels confident that a good mixture, if thoroughly unadulterated, might be curtailed to the extent of only costing from 20*s*. to 26*s*. per acre, and yet prove perfectly efficient.

On such a material point the very fullest information possible to be obtained appears desirable, and Mr. Faunce de Laune, having been applied to, has been good enough to furnish details in the subjoined tables of the greatest and least quantities of seeds he

considers necessary to be sown on medium-class soils, the purity and high germinating power now guaranteed by some seed firms being ensured. Of course the lists would of necessity have to be slightly altered to suit other varieties of soils, and those circumstances so frequently to be met with in different districts and systems of management requiring extraordinary catering for. According to present prices the cost of these seed mixtures would amount to 23*s.* 3*d.* for the minimum, and 32*s.* 6*d.* for the maximum quantities, but several of the kinds are, owing to present scarcity, selling much higher than their average rates. For instance, in 1882 yarrow could be obtained for 3*s.* per lb., foxtail for 1*s.* 2*d.*, and cocksfoot, meadow fescue and tall fescue at 9*d.* Calculated on average price values, the total costs would be about 18*s.* for the one, and 26*s.* for the other.

	Cost at present prices per lb.		Least quantities per acre.	Greatest quantities per acre.
	s.	*d.*	lb.	lb.
Foxtail (Alopecurns pratensis)	1	6	2	4
Cocksfoot (Dactylis glomerata)	1	0	4	6
Catstail (Phlenm pratense)	0	5	4	2
Meadow Fescne (Festnca pratensis).....	1	3	2	4
Tall Fescue (Festnca elatior)	1	4	3	4
Crested Dogstail (Cynosurus cristatns)	1	4	¼	¼
Rough Meadow Grass (Poa trivialis) ...	1	9	½	½
Fiorin (Agrostis Stolonifera latifolium) (If the trne kind can be obtained.)	1	6	¼	¼
Yarrow (Achillea millefolinm)	7	0	½	½
Perennial Red Clover (Trifolium pratense perenne).....	1	0	1	1
Alsike Clover (Trifolinm hybridnm).....	1	0	1	1
White ,, (Trifolinm repens)	1	0	1	1
Golden Oat Grass (Avena flavescens) ...	2	6		½
			19½	25

The above tables were accompanied by a note fully showing why, under one particular set of circumstances, the smaller quantity of seeds might reasonably be preferred to the larger. Mr. Faunce de Laune observes: "In laying land down to grass worth only from 5*s.* to 10*s.* per acre to rent, it would be ridiculous to make an outlay of anything like 40*s.* per acre in purchasing seeds, because, by sowing small quantities of the varieties selected, and leaving the grasses to seed themselves for either one year or two years, the owner would gain more than the maximum number of plants generally considered requisite, while, in addition, the decayed vegetable matter from the unutilised stalks and foliage would be found to be the cheapest possible manure. But if, on the other hand, the land

were worth from 60*s.* to 70*s.* an acre, it might be more politic and economical to apply extra seed and manure than to allow the grass to accumulate."

This opens up a subject of vast importance which cannot be too attentively considered. In many parts of the kingdom immense acreages of poor lands have been thrown on landlords' hands, which, being unlettable, they are sorely puzzled what to do with. To restore their fertility and make them again valuable would, by regular courses of management being pursued, cost a great deal of money. They will clothe themselves with a garment of vegetation if allowed so to do, and many of them have already put one on—of the coarsest and most worthless description no doubt; but even that is better than nothing, for, as observed above, old grass, when allowed to rot on the land, adds greatly to its after fertility. Lord Portman's farm manager once came to him in great perplexity, stating that a certain poor pasture field was unusually full of grass, yet lean stock were selling so high that he was quite sure no animals could be bought to pay for consuming it. His reply was that he had always found it best, when unable to discern a proper course of action, to do nothing. This policy being allowed to rule, the manuring by the grass remaining unconsumed to rot on the land was found to confer such immense benefit that subsequent crops were much heavier than they had been previously for a long course of years.

But if impoverished lands of the character alluded to above had small quantities of good seeds sown into them previously to their produce being allowed to decay on the surface for a season or two seasons, there would most likely be far more vegetable matter produced for conversion to manure, besides a future provision for better herbage being made by the seeds which would drop from the good plants. This would, however, largely depend on the battle of the meadow—how far the good grasses could contend with and make headway against the bad ones; and the question naturally arises, how far ought vantage ground to be given to the former by cleanings of foul lands being effected previously to the minimum quantities of seed being sown?

The subjoined fact reported from Sharsted Court bears on the point strongly. Two bits of land were inclosed and planted to young fir trees, one of them at a spot where seeds of cocksfoot, foxtail, and the fescues had been sown, the other where they had not. In both cases the sward has since been left to take care of itself; there has been neither cutting nor feeding of it, and certainly no

manure applications, but the contrast was very great even the first summer; and in the ensuing spring, after a year's vegetation had rotted, the dead grass was twice as much in the inclosure where the good seeds had been sown to what it was in the other; and while in the former there were vigorous green shoots piercing through the dry mass, in the latter there appeared only slight signs of renewed vitality.

Such a conquest of the good over the bad would, however, be limited to perennial meadow grasses of deep-rooted character and robust growth. The finer ones would be entirely overcome, and likewise rye grass of every kind, which spreads its roots about on the surface like an ash tree, instead of delving right down, oak-like, as does tall fescue and cocksfoot. If any can hold their own, and supplant the wild herbage of the wilderness, it must be what are called coarse grasses, the term not at all implying any lowness in quality, as few are possessed of higher nutritive properties. What is meant by the term "coarse" is, that they have larger stalks and blades than another class termed the "finer" meadow grasses. In the opinion of Mr. Faunce de Laune, these are sufficiently robust, deep-rooted, and vigorous in development to maintain their ground in soils well adapted for them, under trying as well as favourable circumstances. For instance, should the land be chokefull of couch or wild grasses, he thinks they would push their way to the destruction of the inferior grass, instead of the others crowding them out. The bearing of this on another point will, however, be perfectly manifest; for if any of the leading perennial grasses are of this character, and have so hardy and vigorous a property, high manuring, although extremely beneficial, would not be an absolute condition to insure their vitality.

But the fact should not be overlooked that there are robust, vigorous-growing, inferior grasses likewise, and that one of them at least—Yorkshire fog or soft woolly grass—will flourish and increase either in great poverty or when the land is exceedingly rich, being well-nigh as gluttonous for nitrogen as Italian rye grass itself. The Rothamsted experiments in manuring grass-plots prove this. Although the generality of wood-pests were entirely extirpated by high manuring, the growth of this variety was increased by it.

New pastures are treated in a variety of different ways as to whether they are mown or fed, and to what extent, no less than in the different degrees of nourishment they are allowed to receive, either by direct manuring or by auxiliary food given to the stock

feeding them. So much has been advanced before as to the possibility of improving, much more maintaining, the productive yielding power of pastures, that this part of the subject scarcely requires further to be dilated on.

Still, as M. Joubert has observed, minerals have a natural tendency to sink and disappear from the upper layers of pasture fields. Indeed, chemists have been unable to detect any lime in the surface soil of sheep downs with beds of chalk only 3ft. down. Most pastures are to be benefited by potash applications as well as lime, and to many of the poorer ones a little nitrate of soda, in conjunction with the minerals required, will impart a vigorous start, at the first calculated effectually to repay the addition of the mineral element.

The requirements of new pastures are so succinctly and pithily described by Messrs. Webb and Sons, the well-known seedsmen, of Wordsley, Stourbridge, in a treatise on the grasses they circulate to their customers, that this feature may well be elucidated by a quotation of their words. They say: "The principle to be adopted in the maintenance of permanent pastures clearly is to keep up a constant supply of those elements which are required by the good grasses, or, in other words, to replace the particular elements which are carried away from the land in consuming the grass; and unless this is done the pastures are sure to deteriorate."

New pastures might be sustained in productiveness far more easily, and their improvement be promoted much more economically than in any other way if they could be irrigated. And there are numerous instances where, by making a reservoir at a hill-side and turning the contents of a ditch into it, sufficient water might be stored to keep large tracts verdant and in active growth, which would otherwise be sterile in a backward spring, or burnt up in a drought season. The waste of water available to serve this object is enormous, and the extent of pasture land very large that might be highly fertilised and raised to a vast extent in productiveness by this means alone.

CHAPTER III.

MR. FAUNCE DE LAUNE'S REFORMED SYSTEM OF SEEDING.

No literary production of an agricultural nature for many years has been more worthy of profound study than that of Mr. Faunce de Laune "on laying down land to permanent grass," which appears in vol. 18, 2nd series, of the "Royal Agricultural Society's Journal." This gentleman is the owner of a fine estate about seven miles from Sittingbourne, Kent, and at the present period farms nearly a thousand acres of his own land, a considerable portion of which appears to be a deep, friable, light loam, but it varies considerably in some places, being more mixed with flints at the surface; all no doubt resting on a bed of chalk.

That most important services are rendered by English landlords in furthering agricultural progress is well known, but they usually take the direction of pedigree stock breeding, drainage operations, the erection of buildings, or the reclamation of land. Here we find the representative of an ancient Kent family striking out into entirely new courses; but if the conclusions arrived at in the article just alluded to can be substantiated—which are the result of carefully conducted experiments lasting over a dozen years—a service will be rendered the farming no less than the landlord interest of his country well-nigh inestimable as to its real value. In the present state of the labour market, and under the influence of so many wretched seasons for corn-growing, everybody would deem it highly desirable to convert arable to permanent pasture on a large scale, but for the difficulty in securiug a good turf, and the alarming sacrifices of annual production generally considered to be involved. But, according to Mr. Faunce de Laune, these evils may be grappled with and overcome, if not with the greatest ease, at least by some slight painstaking and adopting right methods of action. The results of his experience all tend to establish the important principle that, by sowing nothing but the seeds of the best perennial grasses and clovers, those serious fallings off in pro-

duction after three or four years which are so generally complained of may be avoided, and the new pastures be made to go on increasing rather than diminishing in their annual yields of produce.

Mr. Faunce de Laune, in the article referred to, stated the mixture of grass seeds usually employed by him for all but his very thinnest soils, some of which are very close to the chalk. He sows in less quantities per acre the following kinds in similar proportions still, and recommended the mixture for all good and medium soils: Foxtail, 10lb.; cocksfoot, 7lb.; catstail, 3lb.; meadow fescue, 6lb.; tall fescue, 3lb.; crested dogstail, 2lb.; rough meadow grass, 1½lb.; hard fescue and sheep's fescue, 1lb. of each; fiorin, 1½lb.; and 1lb. each of yarrow, perennial red clover, cow grass, alsike and Dutch clover. This, it will be observed, gave as the total quantity to be employed 41lb., the cost of which was estimated to be about 2*l.* On his soils near the chalk he sowed the following: Cocksfoot, 14lb.; catstail, 3lb.; meadow fescue, 2lb.; crested dogstail, 5lb.; hard fescue, 4lb.; sheep's fescue, 4lb.; yarrow, 2lb.; and 1lb. each of golden oat grass, perennial red clover, alsike, and Dutch clover, amounting in the whole to 38lb., estimated to cost 38*s.* There is a third and different mixture, which Mr. Faunce de Laune recommended for wet soils. It had foxtail reduced to 4lb., cocksfoot increased to 10lb., the meadow fescue reduced to 2lb., the tall fescue increased to 8lb., the sheep's fescue entirely omitted, and all the others remaining very nearly the same, the quantity of seed being 40lb., at an estimated cost of 1*l.* 17*s.* 9½*d.*

While paying attention to the new teaching on this subject by Mr. Faunce de Laune, it seems desirable to compare the mixtures of grasses which he considers proper to be cultivated with those previously held in favour. A valuable publication on the subject, which is very widely known among the agricultural public, is the illustrated treatise by Mr. Martin J. Sutton, the managing partner of the great Reading seed house, enlarged and adapted to present times from the essay by his esteemed father, written by special request of the late Philip Pusey, and published in volume 22 of the Royal Agricultural Society's Journal. The varieties of grasses mentioned by Mr. Sutton as eligible for cultivation on one soil or another are 33, but the whole are not brought into use in every case. Thus, the respective numbers of varieties recommended are: On stiff clays, 19; on stiff or heavy loams, 22; on loams of medium texture, 25; on light sandy soils, 25; on sheep gravels, 25; on chalky uplands, 25; on sheep downs, 22; for

water meadows, sixteen. Mr. Faunce de Laune makes only three classifications of soils in his paper, and the largest number of varieties he would have cultivated only amounts to fifteen; so that, in the opinion of Mr. Martin J. Sutton, there are a number of valuable grasses which should be included in a mixture for permanent pasture which Mr. Faunce de Laune would prefer to dispense with.

The inquiry may possibly be helped by pointing out what these are. Fifteen varieties appear in Mr. Faunce de Laune's mixture for good or medium soils, and, comparing them with the twenty-two kinds of grasses prescribed by Mr. Sutton for heavy loams, it will be found that the following are omitted by the former, but adopted by the latter: Anthoxanthum odoratum, or sweet vernal; Festuca tenuifolia, or fine-leaved fescue; Festuca loliacea, or darnel-leaved fescue; Sutton's perennial rye grass, Pacey's perennial rye grass, Evergreen rye grass; Poa pratensis, or smooth-stalked meadow grass; Poa nemoralis, or wood meadow grass; Poa aquatica, or water meadow grass; Medicago lupulina, or yellow trefoil. These it will be seen are ten in number; but sheep fescue, golden oat grass, and milfoil or yarrow, which Mr. Faunce de Laune includes in his list, are not in Mr. Martin Sutton's for heavy loams, although two appear in his category for light loams. It should also be remarked that of the above omitted by Mr. Faunce de Laune, but adopted by Mr. Martin Sutton, Pacey's perennial rye grass is recommended to be used largely, and all the following moderately: Darnel-leaved fescue, Sutton's perennial rye grass, the evergreen rye grass.

The twenty-five varieties contained in Mr. Martin Sutton's list for medium loams contain thirteen not in Mr. Faunce de Laune's list, and these, besides the three rye grasses already mentioned, are sweet vernal, various-leaved fescue, red fescue, fine-leaved fescue, darnel-leaved fescue, smooth-stalked meadow grass, wood meadow grass, evergreen meadow grass, yellow trefoil, and yellow suckling clover. On the other hand, fiorin, yellow oat grass, and tall fescue, employed by Mr. Faunce de Laune, are not catalogued by Mr. Martin Sutton. The latter authority recommends Sutton's perennial rye grass to be used largely, and the following moderately: Pacey's rye grass, sweet vernal, various-leaved fescue, red fescue, smooth-stalked meadow grass, wood meadow grass, and yellow trefoil, none of which, it will be observed, appear in Mr. Faunce de Laune's list at all.

Of these grasses, appreciated so differently, the three rye grasses

may be for the time being dismissed from consideration, with the remark that, whereas Mr. Sutton considers them calculated to be pre-eminently productive, and to last a great many years in the land if not allowed to run to seed, Mr. Faunce de Laune considers any form of rye grass to be most objectionable. Still, leaving these, there remain a rather large number to make inquiry about, why they should in the one case be highly estimated, and in the other thrown over? Taking sweet-scented vernal first, Mr. Martin Sutton, while admitting that it is inferior in productiveness to fox-tail or cocksfoot, says: "To the presence of this grass our summer hay-fields owe so much of their fragrance, that it should be included in all mixtures for permanent meadow or hay." Mr. Faunce de Laune, on the contrary, says: "There are two other grasses which can hardly be classed as bad or good, and which are probably found in sufficient quantities amongst seed without especially sowing; these are sweet vernal and tall oat grass."

Taking the Festucas next, Mr. Faunce de Laune is silent about the merits or demerits of those he does not cultivate, but Mr. Martin Sutton affords information about one and all of them. Festuca loliacea, or darnel-leaved, he styles "a very valuable variety, especially adapted to marshy soils, irrigated meadows, and rich river flats." Of various-leaved fescue he says, "It is particularly suited to pastures on account of its large bulk of herbage, but it produces little feed the same season after mowing." Of fine-leaved fescue, "It is exceedingly useful in pastures, as it improves the quality of the herbage, and gives a fine appearance to the hay;" and red fescue is considered "specially valuable, on account of its suitability for loose, light, dry soils, and for its endurance throughout severe droughts."

Of the Poa family, Mr. Faunce de Laune chooses to have to do with but one, and that he only admits under protest, for he says: "The Poas are a numerous genus, the most valuable of which is rough meadow grass, a useful kind when mixed with others; but I consider it of second-rate quality, because, so far as my observation goes, it only grows well in years very favourable to the growth of other grasses, and when there is, consequently, an abundance of others superior to it." Mr. Martin Sutton, however, much approves of Poa pratensis, or smooth-stalked meadow grass, and says: "Although not so valuable as Poa trivialis, yet, on account of its unusual earliness and great productiveness at a period of the season when other grasses are comparatively dormant, it should be included in most permanent pasture mixtures." Poa nemoralis,

or wood meadow grass, Mr. Sutton would include in both heavy and light loam mixtures, but in the latter especially, and says, "It is a valuable variety, aud should be included in most permanent pasture mixtures, as it produces a thicker growth than either P. pratensis or P. trivialis." Poa aquatica is best adapted for water meadows, but Mr. Martin Sutton would include a small quantity in a mixture for heavy loams, and says, "it may be cut three or four times a year before the plant is in flower, and produces an immense quantity of herbage on soils which will not grow other varieties of grass." On the contrary, he would exclude Poa nemoralis sempervirens, or evergreen meadow grass, from a heavy loam, but include it in a seed mixture for a lighter loam, and remarks: "Its great recommendation is its perpetual greenness and remarkable dwarf, close-growing habit. . . . The fact of its succeeding well under the shade of trees considerably enhances its value."

The yellow trefoil and the yellow suckling clover are the only other varieties which Mr. Martin Sutton appears to appreciate but Mr. Faunce de Laune has nothing to do with. Of the former (Medicago lupulina) Mr. Sutton observes: "It is very productive, and grows with great rapidity, especially when indigenous to the soil, which it often is. It is an excellent fodder plant with other clovers, but should not be used alone." Trifolium minus, or yellow suckling clover, he considers best adapted for gravelly soils and dry rocky places. As for Avena flavescens, or golden oat grass, which Mr. Faunce de Laune considers an eligible grass for good soils, but Mr. Martin Sutton does not admit into his mixture for loams, it may be well to quote what both authorities remark in respect to it. The former observes: "Golden oat grass is found frequently in good pastures. I once sowed it largely, but I have noticed that sheep eat all the superior grasses in preference. I therefore do not now sow this grass, except on dry banks." Such being the case, it seems strange that Mr. Faunce de Laune should have included it in his mixture for the best lands. Mr. Martin Sutton observes that "this grass should form a portion of all permanent pasture mixtures on light and calcareous soils, on which it especially thrives;" also that "it affords sweet hay, comes very early, and yields a considerable bulk of fine herbage, and after the grass is cut for hay a large aftermath is produced." The conclusion is obvious; although a tolerably good grass, it is only fit for light soils.

Both authorities have prescriptions for chalk soils; but in

laying them down to pasture, Mr. Faunce de Laune would only employ eleven varieties, in the following proportions: 14lb. of cocksfoot, 5lb. of crested dogstail, 4lb. each of tall fescue and sheep's fescue, 3lb. of catstail, 2lb. each of meadow fescue and yarrow, and 1lb. each of golden oat grass and of the three perennial clovers, red, white, and alsike. Mr. Martin Sutton would sow as many as twenty-five kinds of seed.

The leading principle of Mr. Faunce de Laune's reformed method of seeding undoubtedly is, that in laying down land to grass none but the seeds of strictly perennial plants should be sown. The entire family of rye grasses, even those such as Pacey's, which claim to possess a kind of semi-perennial longevity, he considers absolutely poisonous to good land, and has almost as great an abhorrence of as the Yorkshire farmer has of fog grass, Holcus lanatus. This is of course entirely in opposition to most pre-existing notions, it having always been considered proper that a considerable proportion of either Italian, Pacey's, or some other kind of rye grass should be included in a seed mixture for permanent pasture to afford quick and abundant production in the first two or three years; while a decline in yielding power is considered only possible to be prevented by high manuring or high feeding, causing the perennials to tiller out and fill up the vacant spaces left by the annuals as the latter die out. But would it not be far better to sow all perennials at first, especially as, according to Mr. Faunce de Laune's experience, it is possible by growing the mixture of grasses he recommends, to obtain even in the earliest years quite as heavy crops as when rye grass is included?

Mr. Faunce de Laune's antipathy to the rye grass family is by no means singular. I have met with many a good man strongly impressed with the same feeling, imbibed from personal observation and experience, apparently without prejudice. Mr. Morgan Evans's paper in the Royal Agricultural Society's Journal for 1875 contains the following from Mr. John Hemsley, Shelton, Newark, describing the method of the latter in laying down a good clay loam, well drained, to grass. Mr. Hemsley says: "I drilled from 16lb. to 20lb. of lucerne, 13in. to 14in. apart in the rows, and then sowed broadcast grass seeds suited to the soil, avoiding, however, too much perennial rye grass, and leaving out entirely the Italian. In fact, white clover and cocksfoot formed a large portion of my mixture." I quote this as showing an evident bias on the part of a practical farmer to the system of curtailing varieties in the seed mixture, and dispensing to a great extent with rye grass,

before Mr. Faunce de Laune had formed the conclusions on which his papers in the Journal of the Royal Agricultural Society are based. But, on the other hand, there are quite a legion of good men that have made their mark, who have not only been accustomed to sow the rye grasses in profusion, but much more bulky and elaborate mixtures even than those recommended by Messrs. Sutton and Sons, Messrs. Webb and Sons, Messrs. Carter and Co., &c. The late Mr. Carrington, in his able paper on the subject, stated that he had seeded a six-acre field in the spring of 1874 with the following mixture: Meadow foxtail, 12lb.; cocksfoot, 18lb.; hard fescue, 6lb.; meadow fescue, 12lb.; tall fescue, 6lb.; Italian rye grass, 24lb.; Pacey's perennial rye grass, 48lb.; crested dogstail, 6lb.; Poa nemoralis, 12lb.; Poa trivialis, 9lb.; timothy, 9lb.; trefoil, 12lb.; rib grass, 6lb.; cow grass, 18lb.; white clover, 18lb.; Alsike, 12lb.; making a total of 228lb. for the six acres, or 38lb. per acre. This quantity is not widely different from that first prescribed by Mr. Faunce de Laune; and it will be observed that not many more kinds were employed, only Mr. Carrington sowed 8lb. of Pacey's rye grass and 4lb. of Italian per acre, and nothing like so much cocksfoot or foxtail. Mr. Carrington's seed mixture derives importance from his having been tolerably successful in avoiding the evil of semi-barrenness referred to above, usually suffered during a long period after the third year. But he attributed this success himself to the extensive applications he made of artificial manure to his young pastures, and a rather lavish consumption of cotton cake. He says, in the Royal Agricultural Society's Journal for 1879: "In my experience, the most economical way of making new turf productive, or of sweetening and increasing the produce of poor, coarse old pastures, is by combining the application of occasional light top dressings of nitrate of soda and superphosphate, or Peruvian guano, with the consumption on the land of feeding stuffs of high manurial value."

Even Mr. Carrington, however, was evidently under the impression that the power of arresting the evil is only limited, for in another place he says: "Even with the best plant of seeds, there is, after the first two or three years, a diminution of produce, and considerable time is required before the turf is fully established. It is only by repeated liberal applications of manure that such land" (poor and stony) "can be made into productive turf."

The rye grass family of grasses is truly the one which depends most on high manuring for vigorous development, chiefly on account of the spreading habit of the roots of its plants in keeping

near the surface rather than striking down deep. Yet, strange to say, the produce of rye grass has nothing like the nutritive properties of cocksfoot and the other meadow grasses mentioned above as being chiefly adopted at Sharsted Court. This appears to have been well known to George Sinclair when he wrote his grand work on the grasses early in the present century, as he says therein: "Let the produce and nutritive powers of rye grass be compared with those of the cocksfoot grass, and it will be found inferior in the proportion of nearly 5 to 18, and also inferior to meadow foxtail in the proportion of 5 to 12, and inferior to the meadow fescue in the proportion of 5 to 17." Bearing this in mind, and considering that the three grasses named have been as well known to advanced agriculturists as rye grass for such a great number of years, it does seem strange that the alleged perennial varieties of rye grass should be allowed to enter so prominently into seed mixtures for permanent pastures at the present day. Even Arthur Young, in his "Calendar," treating on the laying down of land to grass, recommends for a clay soil the following mixtures: Cow grass, 5lb.; trefoil, 5lb.; dogstail, 10lb.; fescue, 1 bushel; foxtail, 1 bushel. For a loam, he would substitute white clover for the cow grass, omit trefoil, preserve the same quantity of dogstail, with 3 pecks of fescue and the same quantity of foxtail, adding 1 peck of ray and 2 pecks of yarrow. His recipe for sandy soils was: white clover 7lb.; trefoil, 5lb.; burnet 6lb.; ray, 1 peck; yarrow, 1 bushel. Although cocksfoot is not mentioned in the above lists, Arthur Young introduces it in another, and states that, if the land is intended for sheep, "it is not an object of great consequence to sow only the finer grasses, as close feeding, after the first year, will make any grass fine, sweet, and productive." He adds: "I have laid down above 200 acres, chiefly for sheep, and stocked the fields so early in spring and so thickly as just to keep down the seed stems. The cocksfoot, oat grass, and Yorkshire white, with this management, have proved sweet feeding grasses, not at all rejected even in fields where the flock had a choice." Moreover, for alternate husbandry, Arthur Young's recipe was a mixture of cocksfoot, timothy, Yorkshire white, white clover, and a small quantity of trefoil.

The rye grasses in existence at the commencement of the century were probably of a much lower order than those we have at present, which will no doubt partly account both for Sinclair's low estimate of their utility and Arthur Young's making no greater mention of them. Italian rye grass had not then been introduced,

and the improved perennials, such as Paccy's, the Evergreen, and Sutton's Perennial, were wanting. There can be little doubt that the former, not having any claims to perennial character, ought carefully to be excluded from all seed mixtures for permanent pasture. The latter three are claimed by all our leading seedsmen to be true perennials, but Mr. Faunce de Laune believes that their plants rapidly die out if they chance to produce seed spikelets, and that their preservation over four or five years is entirely owing to the grass being mown or fed off by sheep in successive years before maturity has been arrived at.

Sinclair certainly had a very low opinion of rye-grass, in comparison with some of the other superior meadow grasses. He says in one part of his great work: "There has been much difference of opinion respecting the merits and comparative value of ray grass. It produces an abundance of seed, which is easily collected and readily vegetates on most kinds of soil under circumstances of different management. It soon arrives at perfection, and produces in its first years of growth a supply of early herbage, which is much liked by cattle. These merits, no doubt, have upheld it until the present day in practice, and will probably for some years to come continue it a favourite grass with many farmers; but the latter-math of ray grass is very inconsiderable, and the plant impoverishes the land in a great degree if the culms, which are invariably left untouched by cattle, are not cut before the seed advances towards perfection. When this is neglected, the field after midsummer exhibits only a brown surface of withered straws. Ray grass is but a short-lived plant, seldom continuing more than six years in possession of the soil; but is continued by its property of ripening an abundance of seed, which is but little molested by birds, and suffered to fall and vegetate."

The report of Messrs. Lawes and Gilbert in vol. 20, 1st series, of the Royal Agricultural Society's Journal, on their experiments with different manures on pasture lands, contains the following: "The general result in regard to the amount of rye grass in flowering and seeding stem, according to manure, is as follows: The proportion of it in the general produce was considerably increased by mixed mineral manures alone, by those and the smaller amounts of ammoniacal salts, and by the farmyard manure alone. On the other hand, its proportion was diminished whenever the ammoniacal salts were used in relative excess. When the ammoniacal salts were used alone, the proportion of graminaceous leaf and undeveloped stem was very high. When those salts were

used in excessive amount with the mineral manures, the proportion of other grasses and the woolly, soft grass and cocksfoot predominated over that of the rye grass, and when the ammoniacal salts were used in addition to farm-yard manure, three other plants —woolly soft grass, tall oat grass, and smooth-stalked meadow grass—seemed to gain upon the rye grass in degree of luxuriance."

Sinclair states that for the superiority of cocksfoot over rye grass, as proved by the extensive cultivation of it, the agricultural world was first indebted to Coke, Earl of Leicester, who carried on large experiments on the point at Holkham. Some of Sinclair's remarks on others of the grasses mentioned above are well worthy being quoted. For instance, in respect to foxtail, he says: "It is the principal grass in all rich natural pastures, and, therefore, in laying down permanent pastures, it should always form one-eighth of any mixture of seeds used for that purpose. Its merits demand this preference, whether with respect to early growth, produce, nutritive qualities, or permanency." He, however, remarks elsewhere respecting foxtail: "This grass, under the best management, does not attain its full perfection till it is four years from the seed, hence it is inferior to cocksfoot for the purpose of alternate cropping. The herbage, however, contains more nutritive matter than that of cocksfoot, though the weight of grass produced in one season is considerably less." Sinclair considered Poa pratensis an inferior grass, observing: "Its strong, creeping roots exhaust the soil. Its growth, after mowing, is slow, and its spring growth, though early, is inconsiderable." He relates an interesting fact, proving the inferiority of sweet-scented vernal grass. One-half of a large field was laid down with this grass and white clover, and the other half with foxtail and red clover. The sheep would not touch the former, but kept constantly on the moiety of the field which had the foxtail.

CHAPTER IV.

SUCCESS OF MR. FAUNCE DE LAUNE IN PREVENTING DETERIORATION OF NEW PASTURES.

THE assertion admits of ready proof, that there is no "example farm" of greater importance to the entire agricultural community, not only of our own country, but the world, than that of Mr. Faunce de Laune, near Sittingbourne, in Kent, for a difficulty which has puzzled well-nigh everybody has there been successfully grappled with and overcome. This is the laying down of arable land to grass and the formation of new pastures, without entailing a serious decline in production. Before Mr. Faunce de Laune made his experiments, everyone complained that it took half a lifetime to make a new pasture. Mr. Faunce de Laune proclaims that his experience is quite the reverse of this. The doctrine has commonly been held that it is an impossibility, after sowing down, to prevent the new grass lands from declining very much at the end of the third or fourth year, after which they yield only scant herbage for a considerable length of time. The new pastures at Sharstead Court and the farms attached thereto, however, appear to go on producing with an accelerated progressive power, which increases even at the critical period of the third, fourth, and fifth years; and, as some of them are still older, and yet manifest no signs of declining fertility, no other conclusion appears possible to be arrived at than that Mr. Faunce de Laune has discovered a system of forming young pastures entirely exempt from the evil above referred to.

He makes no secret of what his system is. He asserts that the evil, although so wide-spread and general, is almost entirely attributable to bad seeding. New pastures, he thinks, have hitherto been laid down on the wrong principle by a large proportion of seeds being obtained in mixtures for the purpose, which raise annual and biennial plants, instead of those of a true perennial character. He is scrupulously particular in seeding for those meadow grasses and clovers of whose perennial character

there cannot be the slightest doubt, which he considers the true reason why his grass fields go on increasing in productiveness, instead of declining during their third, fourth, fifth, and subsequent years.

Mr. Morgan Evans, in his paper published in the Royal Agricultural Society's Journal, alluding to the general loss of productiveness in new pastures, says: "Although heavy crops of grass are raised for the first two years when the operation is properly conducted, there appears to be a general agreement that in the third and fourth years there is a considerable falling off, just when the artificial grasses are giving way and dying out, and before the natural grasses indigenous to the soil have become thoroughly established. The benefit to be derived does not usually set in until the sixth or seventh year; that is, if we consider the first two years as only so much artificial grass as might be obtained in the usual way in a rotation of crops." Some of Mr. Evans's correspondents go much farther, one of them, Mr. Peter Purvis, affirming, "it will take a lifetime to make good old pasture out of arable land, and at such an expense as no tenant, even upon an ordinary lease, would entertain." Mr. James Howard, too, in a paper of his own on results at Clapham Park in laying down to grass, published in the Royal Agricultural Society's Journal for 1880, states: "My experience corresponded with that of most others who have pursued the same course. The grasses began to fail about the third or fourth year, although manure was from time to time applied, and no sheep depastured upon the field. Several years elapsed before much progress was made towards the establishment of a turf. To the best of my remembrance, it was not until about the tenth year that the grasses were well established. For at least seven years the field was not worth half the rental, the grass it produced not being sufficient to support the few young horned stock turned out upon it, cake or other extraneous food being a necessity. The conclusion I came to was, that much truth was expressed in the old Suffolk couplet:

> To break a pasture will make a man,
> To make a pasture will break a man."

Mr. Faunce de Laune's experience is as different from this as anything can possibly be. His best pastures are at Rushett Farm, about a mile from the mansion and home park, and the land there is no doubt a tolerably good loam; but anything more luxuriant than the rich, deep verdure of the carpet presented to view at the

latter part of May, 1883, I have never seen. It made me quite despise the far-famed Somerset marshes on inspecting them a few days later, the difference being simply this, that there were apparently no weeds or inferior grasses whatever, and yet a thickness of sward comparable to, and to my eye very little different from, the oldest turf. I was told on inquiry that Rushett Farm was taken in hand about five years earlier, and that the pastures I so much admired were sown in 1879. Consequently they ought, according to the general course of things so graphically described by Mr. James Howard, to have been giving out and yielding next to nothing. But, instead of this, they had improved in productiveness ever since being laid down, and looked likely enough to go on improving more and more for any number of years, so long as the high-feeding system is continued of consuming on them continually prodigious quantities of artificial food. Not until I walked over the fields contiguous to the homestead at Rushett Farm did I comprehend fully how very successful Mr. Faunce de Laune's system had been. When I inspected his pastures the previous August, notwithstanding that the fields were full of sheep, the stalks of the grasses were knee-high, but turned yellow and crowned with seed heads. Although the features of interest unfolded were then very striking, they were calculated to convey no truthful impression of the actual teeming wealth which made itself so vividly apparent in May. In respect to deep rich verdure and rapid growth, it was just like Italian rye grass gluttoning on soil which had been immersed in sewage. But, although the cocksfoot appeared as rank as anything possibly could be, there were plenty of the finer grasses in such close embrace with the stouter stalks and with one another, that the turf had a perfectly matted and thick appearance.

After visiting Sharsted Court in August, 1882, a report written by me appeared in the *Field*, from which the following is an extract: "There is a piece of land—one of the poorest on the estate—which was seeded down four years ago on the new system, and on walking over it, and admiring the thick mass of vigorous growing herbage, I was assured that it had been feeding sixteen sheep to the acre from the middle of March to within a fortnight of the present period. In fact, although 1200 Kent ewes were lambed last winter, and fully as many as five sheep to the acre have been kept to the total acreage of pasture land, it has been found impossible to keep down the grass, which is now not only thick, but high almost everywhere over the farm, and yielding an abundant crop of seed. As many as 2000 Kent ewes will be

lambed down next year. All the neighbouring practical farmers told Mr. Faunce de Laune that he had too many sheep for the extent of pasturage before; but their calculations were based on the old type of grass-growing, and even the experimentor himself could scarcely have anticipated results of such a marvellous nature to follow the adoption of the new way of doing things."

Sheep appear to be very fond of grass seeds when of the best varieties. They pick out the heads of some plants in preference to others soon after they have flowered; others they reject until the seed is thoroughly ripe, and then devour the heads; but inferior grasses never have their tops plucked off unless the animals are driven to it by sheer hunger. Hence seems the true cause why pastures not of the improved pattern so rapidly deteriorate. The worst grasses are alone permitted by the stock to shed their seeds; consequently the correct deduction appears to be that no inferior grasses whatever ought to be cultivated.

Mr. Faunce de Laune not only experiences this advantage very fully in cultivating cocksfoot, foxtail, timothy, meadow fescue, and tall fescue as his principal grasses, but finds that his sheep will readily devour in winter the dry stalks of those plants left over from the summer and autumn feedings. When I inspected the Sharsted pastures in August, 1882, almost every field was thickly burdened with dry grass, and a large number of women were employed in harvesting seed-heads from it. I naturally inferred that it would have been better had this grass been converted into hay, and told Mr. Faunce de Laune so, but he assured me that his flock would clear off the whole before spring; and so it proved, for when I paid my second visit in the subsequent May month, not a vestige of the crop of the former year was to be detected. Thus, it appears that, by cultivating chiefly the five coarse grasses enumerated above, the costs and labour of hay-making may be dispensed with. In March, 1884, I had another opportunity of going over the Sharsted pastures, and was able then better than in the previous May to become convinced that the flock may be depended on for making a complete clearance of anything left over in the shape of dry stalks if only these valuable plants are cultivated. Subjoined is an extract from what I wrote and had published in the *Field* on this occasion:

"I have made three visits to Sharsted Court and its pastures, the first in the autumn of 1882, when there was a most abundant produce of tall dry grass in almost every field, but which Mr.

Faunce de Laune assured me his flock would clear off completely during the ensuing months and throughout winter. Last year my visit was paid at the latter end of May, when I was amazed at the freshness of growth the fields presented to view, as well as at their luxuriant wealth. About a week since I paid a third visit, and found them comparatively bare of grass, there having been sheep feeding in the fields generally throughout the winter and spring. Every period of the year has its peculiar advantages for inspecting new grass fields of this nature, and the absence of crop on the latter occasion allowed a better observation as to the thickness of the herbage. As Mr. Faunce de Laune employs only small quantities of what are termed the finer grasses, it might be supposed that great thickness of sward would scarcely be a feature in his fields. But there seemed nothing to complain of in this respect, attributable perhaps to the great extent to which he incorporates meadow fescue, which fills up interstices between other grasses almost to the same extent as finer grasses of less value have the habit of doing. Mr. Faunce de Laune does, however, also employ a few of the better sorts of the finer grasses, such as crested dogstail, hard fescue, sheep's fescue, and fiorin, with yarrow, combining their seed with his mixtures in about half the quantity he considers to be required for his four leading grasses."

When Mr. Morgan Evans states that the decline in pastures after the third year is attributable to the artificial grasses dying out, and there being nothing to take their place until the indigenous grasses of the soil develop themselves sufficiently to form a thick turf, he depicts with tolerable correctness the state of things which occurs in the great majority of instances. But Mr. Faunce de Laune says truly enough that this ought not to be; that the artificial grasses of the kind alluded to ought never to be sown, but pure perennial varieties instead, that would never give out if sufficiently fed with plant food; and that, so far from the indigenous grasses of the soil being relied on to form the turf, this ought never to be permitted; but that far more valuable grasses should be so fostered that those natural to the soil would not have the slightest chance of development.

Now, all our leading seedsmen, accustomed to issue manuals of instruction on the subject, would be ready to agree with Mr. Faunce de Laune so far; for if the ultimate aim is to have a turf composed of the indigenous grasses of the soil, of what use can it be to sow the best kinds of meadow grasses? The difference between his practice and their teachings lies chiefly in his discard-

ment of certain varieties, which they consider economical and necessary for use in a seed mixture for permanent pasture, and especially certain members of the rye grass family, which they deem to be perennials, but he distinctly declares to be only of the biennial order.

There are weeds everywhere in old pastures, and Mr. Faunce de Laune's spacious park of 50 acres, surrounding his fine old mansion at Sharsted Court, although picturesque enough with its beautiful trees, is full of them, daisies infesting the ground to an extent which shows that the land thereabout is not of high natural fertility—it being well known to experienced farmers that there is no surer sign of soil poverty than an abundant crop of daisies, except it be of cowslips, which are far worse, although "the pretty cow" in our nursery rhymes was told to feed on them. The natural inference to be drawn, then, seems to be, that if Mr. Faunce de Laune can succeed in forming "good turf" on such a soil, having the two necessary conditions of thickness of sward and prime quality herbage, the accomplishment is one of which any agriculturist may well be proud. Well, very contiguous to the park lies some 50 acres of the same natural character, most of which was sown down in 1877. The grasses appear full of luxuriant growth, the finer ones showing the same disposition to intertwine their roots around those of the stouter cocksfoot plants, and push themselves up, so as to fill every interstice. One portion, consisting of from 12 to 14 acres, carried 5 sheep to the acre during the two months of March and April, 1883, which a failing pasture would scarcely do. However, there are no failing pastures on the farms surrounding Sharsted Court, which Mr. Faunce de Laune holds in his own hands, although the greater part of them have been down since 1877 and 1878, and some much longer.

The success of Mr. Faunce de Laune has been fully admitted by all who have inspected his pastures, and the evidence of Mr. R. H. Elliott, of Clifton Park, Kelso, may be specially referred to, who, in a lecture to the Border Union Agricultural Society a short time since, made special allusion to a critical examination he had made of them, and confidently asserted that the reality fully bore out Mr. Faunce de Laune's writings. The grasses were mostly in the fourth and fifth year, and showed no signs of falling off, but were keeping nine sheep and lambs per acre. The crop was so luxurious that in some fields the sheep were hidden, and the sheep appeared healthy and contented with their lot.

Mr. Elliott, who is a practical farmer, has adopted Mr. Faunce de Laune's system in its entirety, and strongly recommends it to others for good and medium class soils. He would only add to the Sharsted mixture Poa nemoralis (wood meadow grass), from its being a very early grass; and for damp situations and imperfectly-drained land Poa aquatica (reedy sweet grass).

One particular field on Mr. Faunce de Laune's farm shows the superiority of his new system in very clear lines, for all over the better portion of it the land was laid down with a certain proportion of rye grass by accident. Here there is a very perceptible falling-off in the appearance of the sward, which alters immediately on the spot being arrived at where the seeding down was according to the new pattern, the difference being so distinct that it can be seen from afar. There is also another small portion of about a couple of acres in extent where the natural herbage of the district has been allowed to predominate; but none of the sheep ever remain long on either this or the rye grass land section if they can help it. Besides which they are always remarkably healthy on the pastures of the new pattern, never being found purging, or showing signs of their food disagreeing with them. Then, again, as to high proof, old sheep and young rams, hoggets, and lambs, all alike seem very thickly coated with flesh on their portly frames.

CHAPTER V.

DROUGHT-RESISTING PLANTS ADAPTED FOR GRASSING PARTICULAR SOILS.

Some few years since most of our leading seedsmen preferred to cater for all the different soils in their grass seed mixtures, and as they founded their prescriptions on the geological character of the rocks on which the soils rested, their varieties were exceedingly profuse. But all who have given attentive consideration to the subject must be aware that a great many soils are only slightly, and some not at all, influenced by the under strata which give their denomination in the Ordnance surveys. Consequently, although it is perfectly true that the natural flora of a great many districts is very much affected by geological influences, it is not so universally, and no safe rule can be laid down for the classification of grass seed mixtures according to the geology of soils.

Far better appears to be the arrangement of having one principal mixture for the grass plants best adapted for deep fertile loams and medium class soils, and deviating therefrom in those three or four instances in which the land is very heavy or light, shaded by trees, wet, or intended for a watered meadow. The best varieties of grasses to be sought after have already been pointed out, but it would be necessary to alter their proportions somewhat when either the character of the soil itself, or its geographical circumstances, are extraordinary in character.

In the first place, it is only reasonable to conclude that a very considerable deviation ought to be made in the case of lands liable to suffer from drought. Some grasses send their roots down much deeper than others, and these it will be found are the most drought-resisting. Of this class are lucerne and sainfoin, and it appears that tall fescue (Festuca elatior) must be numbered among them. In the provinces of the Argentine Republic, bordering on the Cordilleras of the Andes, the only cultivated grass for cattle is alfalfa, or lucerne, and the country is subject to great droughts, some parts having no rain for years, and requiring all the culti-

vation to be by irrigation. Mr. J. Blamey, who resides there, in a letter to the *Field*, writes: "Last year, having to replant a vineyard which was full of this grass, I had to dig pits and clean off any alfalfa, &c., which might be in the way. We found their roots six to eight feet long, and as big round as a man's arm. In fact, we find here the drought kills vines and other trees, but never the alfalfa when it is once established firmly in the ground. In this province it does better than in our neighbouring province of Tucuman. There, owing to the soil being saturated with moisture, it does not generally endure more than a few years, whereas with us it lives as long an oak."

Facts such as the above naturally lead to the inference that lucerne ought to be included in the list of grass mixtures when seeding down lands liable to be burnt up in summer. Some have raised doubts as to its power to hold its own iu the battle of the meadow when required to produce in fellowship with other plants and grasses. But no actual testimony appears to have been afforded of this being the case; while, on the other hand, Mr. Faunce de Laune, in an experiment on a small scale bearing directly on this point, has, after three or four years' trial, found lucerne to hold its place well and produce luxuriously in conjunction with some of the coarser good grasses. Jethro Tull, it is true, maintained that by lucerne being grown in drills, with intervals wide enough to be horse-hoed, a better crop of it might be raised than in any other way, but this method has never been much adopted or sanctioned by practical men. But even although it could be proved that lucerne answers best as a tillage plant, it does not follow that it would fail to succeed in companionship with grasses in a state of permanent pasture.

Mr. Faunce de Laune, in the arid summer of 1884, which caused uplands in the southern and eastern counties very generally to be bare of grass, made a discovery of an invaluable nature respecting the drought-resisting properties of tall fescue (Festuca elatior), which, according to all seed catalogues, is recommended for wet and heavy clay soils, but up to the period stated had never been deemed well adapted for dry soils subject to drought. His new pastures on the chalk, where the land is poorest, and more of the minor grasses were sown, was very much burnt up even the latter part of July, for the abundant rains which had been falling for two or three weeks previously almost everywhere else had failed to come here, owing probably to the attractive force of the not distant English Channel in drawing off the clouds. But on the whitened

surface of these pastures there were a few green spots to be detected here and there, like oases in a desert, and, critically examined, although eaten down almost close to the ground, they displayed vigorous branchings of single plants which had stood the drought, and these Mr. Faunce de Laune pronounced one and all to be tall fescue—a few seeds of which must have been originally intermixed, as an accidental circumstance, into what had been sown, or had been brought there by birds or in some other way. There were only a very few of these green specks, but the plants producing them were all the same, unless the almost equally verdant hue of yarrow be considered worthy of note by way of exception. Mr. Faunce de Laune stated that, when he first made the discovery, he could scarcely believe his own senses, or rather correct discernment, inasmuch as tall fescue had always been considered best adapted for wet soils—the reason why he had previously left it out of his seeding on the thinnest part of his land, where the chalk is near the surface, and the herbage liable to be burnt up. However, according to this new evidence, it appears reasonable to suppose that tall fescue ought chiefly to be adopted for such soils, the reason probably being that it sends its roots deeper down than most of the other grasses, and is consequently able to stand the drought by tapping moisture from nether strata.

If the deep-rootedness of tall fescue should be considered the cause of the phenomenon, will it not be the correct thing in future to sow only the seed of those grasses and plants which similarly go far down in search of moisture and nutriment on those soils which are peculiarly liable to be burnt up in summer? If so, all our seeding prescriptions for such soils will have to undergo revision; and possibly it may be deemed best only to grow a single variety, instead of the considerable mixture hitherto deemed so necessary. Occupiers of thin chalk soils already adopt this principle in sowing down extensively to sainfoin; but, although this plant holds possession of the land, and yields a prodigious amount of keep for five or six years, and sometimes ten or a dozen, the plants are liable to be choked out ultimately by the wild grasses of the district. Possibly it may be found practicable to sow tall fescue and some other suitable meadow grasses in connection with sainfoin, that they may retain possession of the situation after sainfoin gets tired of it.

Seemingly, it would be impossible to over-estimate the value of this discovery, or what important results this increased knowledge as to the habits of so productive and highly nutritious a grass wil

be likely to lead to, Mr. Faunce de Laune himself, when pointing out the specks of verdure made by this grass, where everything else was brown and bare, said: "If the seeding here had been entirely of tall fescue, there would have been no burning up. The entire surface of the land would have remained clothed with healthy verdure, causing a large instead of a small yield of grass during the drought season."

All modern authorities have no doubt taken their ideas as to Festuca elatior being mostly adapted for heavy and wet soils from Sinclair, who conducted the Duke of Bedford's experiments at Woburn, and published subsequently his grand work, "Hortus Gramineus Woburnensis." He alludes to two varieties, the barren-seeded and the fertile, and of the former wrote as follows: "The grass at the time of flowering affords more nutritive matter than that of the latter mathe in the proportion five to four, but the grass of the latter mathe contains more nutritive matter than that at the time the seed is ripe in the proportion of four to three. A tenacious clay is therefore best fitted for the production of the grass, as, notwithstanding the plentiful supply of manure, the produce from the loam which had the advantage of it scarcely exceeds that from the clay. I know of no grass of this class adapted for clays that holds out such fair promises to repay the farmer." We find in this statement the reason why Sinclair considered the grass so well adapted to heavy soils; but the real cause of fertility on the unmanured clay was probably its deep-rootedness, and it does not appear that Sinclair made any experiment of the grass on a thin, light soil liable to burn. He further observes of this variety of tall fescue: "It is nutritive and very productive. It is true the produce may be denominated coarse when compared to the Festuca pratensis; but where is a grass to be found that produces a great weight of crop that is not in some degree coarse? It does not perfect much good seed, and can only, therefore, be propagated by parting and planting the roots." But Sinclair subsequently discovered another variety, which he termed "Fertile-seeded tall fescue," and of this he wrote: "This grass, which is nearly allied to the common Festuca elatior, perfects an abundance of seed, and is, therefore, not liable to the objection which takes so much from the value of that variety. It is equally early in the produce of foliage, and flowers earlier than the barren tall fescue by eight or ten days; the produce is equally nutritive. For damp soils that could not be conveniently made dry by drains, this would be a

most valuable plant, either to be cut for soiling or made into hay and reduced to chaff, as it might be wanted. I have never seen this plant in a wild state. It was first discovered here in the grass garden, seemingly introduced by accident." In another place he states that it was found in a moist spot, whence no doubt his impression, which everybody since has assumed to be correct, that it is best adapted for wet as well as clay soils. Probably, however, the same robust habit of not only growing three feet high, but of striking down its roots to perhaps a well-nigh equal depth, would fit it naturally for either situation, *i.e.*, where the ground is excessively wet at times, or where it is utterly devoid of moisture at the surface in a drought season. The baneful upper conditions would be penetrated through in most cases, whether the land were very wet or very dry; and this hits the bull's-eye pretty true as to the cause of the seeming mystery.

There is another plant deserving of special recognition. Yarrow or Millfoil (Achillea millefolium) was, up to a comparatively recent period, deemed a weed. Sinclair, in his well-known book on grasses, so considered it, for, in giving a list of weeds found in the richest natural pastures, he mentions the leading ones to be Ranunculus acris (buttercups), Achillea millefolium (yarrow), Plantago lanceolata (ribbed glass or plantain), and Rumex acetosa (sorrel dock); but of these, he says, the ribbed grass and buttercups were by far the most common, the yarrow and sorrel dock being confined to particular spots. "I have been," he says, "in the practice for many years of examining these pastures at various periods of the season, but I never noticed any indication of horses, cows, or sheep having touched the buttercups or the sorrel." That he was perfectly right in terming three of these plants weeds there can scarcely be the slightest doubt; but yarrow at the present day is considered worthy of being appreciated very highly as a herb or plant of which sheep are particularly fond, and it deserves a place in pastures, not only for that reason, but because it appears to possess great drought-resisting power.

Mr. Faunce de Laune, in his paper on laying down land to grass, which created so much attention when published in 1882, recommended 1lb. of yarrow seed to be included in mixtures for good medium and wet soils, and 2lb. in those for chalky and light soils; and, in his brief description of candidates for the meadow, said: "Yarrow is a herb that sheep especially like, and, however great may be the quantity in pasture, it is rare to see it in blossom where sheep are. Cattle have not such a predilection for it as sheep, but

before the autumn comes it will be found closely eaten." The drought of last summer, which proved far more severe at Sharsted Court than in many other parts even of the South of England, convinced Mr. Faunce de Laune that the plant possesses other claims for high appreciation, as he found it, like tall fescue, green and in healthy vigour even on, what he terms, his chalk banks, where the soil is thinnest and everything else was burnt up. Subsequently, in company with Mr. Carruthers, the consulting botanist of the Royal Agricultural Society, he took a tour through North and South America, and, by information he has kindly supplied, valuable observations made by them in respect to this plant are subjoined.

He says: "I hold yarrow in greater estimation, from my observations respecting it both in America and England during the last summer and present winter. Yarrow is very abundant in America, growing in sand on the shores of the Pacific, in lava 8000ft. above the level of the sea, and in the rich alluvial soils of Manitoba. In some places it forms one of the principal plants for animals to subsist on. We came to the conclusion that yarrow was the most omnipresent of all plants coming under the observation of Mr. Carruthers and myself during our travels in America," This was accompanied by the subjoined list of places where yarrow was found: "Palmer Lake, in abundance; New Salt Lake City, 8000ft. above the sea; Yellowstone Park, on lava in abundance; Montercy, growing in sand; Columbia Town, New Haven; El Pas, Yosemite Valley, it being abundant at the latter place."

The treatise on laying land down to grass, issued by Messrs. Carter, the well-known seedsmen of High Holborn, contains the following: "Hard fescue is one of the most essential grasses for a variety of purposes, not the least important being its adaptability to withstand prolonged drought. It is also exceedingly productive, and will thrive in almost any situation. It is exceedingly hardy, and consequently of great value as assisting the scant supply of winter herbage, continuing to grow long into the winter." This is high praise, but it must be admitted that hard fescue is nothing like so robust in growth or deep-rooted as tall fescue.

CHAPTER VI.

TEMPORARY PASTURES OF ALTERNATE HUSBANDRY.

When the four-course system of cropping is strictly adhered to, grass seeds are sown with barley or oats, and hold possession of the land one year only. It has been customary in certain districts, and on farms of exceptional character, to keep the grass layers down two years, and thus lengthen out the course, which obviously involves a great saving in tillage expenses, and the general advantages of adopting such a mode of procedure have so thoroughly impressed themselves on agricultural attention since corn-growing has got to be unremunerative, that it is now rapidly extending itself all over the kingdom. Mr. Clare Read recently advocated its adoption in Norfolk, employing as one argument the reflection that, after costly grass seeds had been purchased and sown, it seems an ill policy to plough up the plants they produce almost as soon as they get well rooted in the ground.

But why should farmers limit themselves to two years as the tenure to be allowed alternate grasses and clovers? Would it not be better to keep the sward free from disturbance three or four years, if the land can be kept free of weeds, and tolerably productive? There is scarcely a practical farmer in the kingdom who will not give a ready affirmative to the question; but then the majority would deem it to be difficult, if not impossible, to realise the condition of preserving perfect cleanliness. They would say that the only thing which has prevented the two years' continuity of grass layers from being universally held in favour long since, has been the liability of the young clovers, after the first year, to be choked and crowded out by native twitch; and it would probably be hinted that, to endeavour to keep the alternate grass sward undisturbed for a longer period, would only have the effect of presenting an invitation to the land to "sow itself down," just as perniciously to good farming as when a similar thing happens in thousands of so-called conversions to permanent pasture.

But are not bad seedings and indifferent management at the root of the evil just referred to? Mr. Faunce de Laune has plainly shown it to be so in the case of permanent pasture failures, and by imitating strictly his tactics of sowing none but unadulterated perennial seeds of best quality, and subsequently keeping the sward sufficiently manured, the tenure of the cultivated plants might be firmly established four years, or even much longer, without any danger of their being crowded out by twitch grass, and other weed pests. Mr. Faunce de Laune maintains that the reason so many new pastures have failed, is clearly traceable to the seeds of annual and biennial grasses having been sown; and it is only natural to suppose that, as these die out, weeds, which are nature's own provision to fill up vacancies, would take their place. Does not the self-same result frequently occur when farmers endeavour to keep down the alternate grass layer beyond one season? Of the seeds sown, one-half were probably only those of annuals, and the other moiety those of biennials; and, such being the case, what otherwise could possibly happen but a general dying out of the plants that had already fulfilled their destiny, and the occupancy of their places by weeds?

What is the usual practice in seeding for alternate husbandry? In too many districts the old time-honoured custom of depending almost entirely on "hop and ray" is still followed, because no doubt it is cheapest. In some instances a few pounds of alsike, red clover, or white Dutch clover seeds, may perhaps be added; but the reform is only a moderate one, and would not prevent the land from being extensively taken possession of by twitch as the common rye grass dies out. Most likely the seeds of weeds largely enter into the mixture sown, for few can form any adequate conception of the large extent these "hop and ray" seedings are adulterated—not wilfully or by trade chicanery, but owing to the extensive custom of farmers keeping their own grass crops for sced, and trafficking one with another for this locally-produced article many years in succession. Many samples, on being closely analysed, have been found to possess large proportions of the seeds of common couch grass, which are exceedingly difficult for the common eye to detect in an ordinary rye grass sample. Farmers go on seeding their "hop and ray" crops without noticing that couch largely infests them, and is liable to ripen its seed with the other plants; and thus the evil gains accidental but pernicious propagation.

Common rye grass ought not to be sown at all if the grass sward

is required to be kept down more than one year. At best it can only be considered a biennial. Mr. Faunce de Laune seriously questions the claims of any of the rye grass family to be deemed strictly perennial, but that vexed point need not be discussed at present. If any are of that character, they are only those actually styled perennial. Even Italian rye grass would not yield well after the first year without a heavy application of nitrogenous manure, and ought to be deemed unsuited for a three or four years' intended possession of the land. Mr. Neilson, it is true, makes a good use of it for a lengthy grass tenure, but, even in his case, the grass sward is broken after two and a half years, is mown twice in one season until the last year, and kept heavily dosed with artificial manures. There is every reason to suppose that cocksfoot would have done quite as well for Mr. Neilson as Italian rye grass; while being a true perennial, it recommends itself pre-eminently to those farmers who would like to keep down their alternate layers four years, or longer, as one sure to hold its own, with good treatment, against Yorkshire woolly grass, or even the native wild grass of the district.

Would not facts as they stand, and the general experience of practical men, justify the entire family of the rye grasses being superseded by cocksfoot in seed mixtures intended for two, three, or four years' lay? By common confession some are annual, others biennial, and only the highest priced have the slightest claim to perennial character. Why not, then, make sure by sowing nothing except that well known to raise grasses of the required longevity, especially as cocksfoot has by far the highest nutritive property?

Mr. Faunce de Laune, in his published essay, says: "Cocksfoot is by far the most valuable of all grasses, because it grows in all soils; it produces the greatest amount of keep; it is the most nutritious grass, and seems to grow faster and stronger in extremes of weather, either wet or dry, than any other grass. There is, moreover, hardly any stage of its growth in which stock do not eat it greedily, and its flower heads appear to me to be especially nutritious to all kinds of stock, young or old, in excessive wet weather."

One reason is alleged why rye grasses are preferred by farmers to cocksfoot, this being that the stalks are less coarse, and make finer, more saleable hay; but surely this feature would not decide the issue in the generality of cases. Comparatively few farmers require to make hay for the distinct object of making sale of it, and

for home use, if the fodder happened to be too coarse for utilisation, it might be chaffed before use. The higher nutritive property ought surely to determine the matter, rather than the consistency of the material. Mr. Robert Russell often makes hay of single cut cow grass, with stalks much stouter than are derivable from cocksfoot. Besides which, hay is becoming every successive year of less and less importance. Our grass and clover crops can be more profitably consumed green or converted to silage than made into hay, so that the objection, if valid, ought not to be condered to apply. The chief reason why rye grass has been so extensively adopted appears to be that the seed is far cheaper than that of other kinds of grasses. But it would in reality be a "penny-wise-pound-foolish" kind of economy which would refrain from an extra outlay of even 10*s.* an acre in the seeding when the advantages derivable are so very great in the prolonged tenure of a grass layer of highest quality—eveu half a dozen years if required—in the full maximum state of productiveness it acquired at the very first. Who would be niggardly in such a case when the additional outlay admits of being recouped in so many different ways? It may be true enough that the price of common annual rye grass is less than 2*d.* per lb., while that of cocksfoot is 1*s.*; but the latter will remain in the land growing more and more robust as long as required, while the former gives out after the very first year, causing the laud to be returned to arable, with a foulness involving tillage cleanings fully equivalent in expense to the saving in seediug.

By consulting the catalogues of the leading seedsmen it will be found that they offer seeds for oue year's lay at from 11*s.* to 14*s.* an acre, which would be 12lb. of clover seed (in some cases mixed) and about the same weight of common rye grass or Italian rye grass seed. One firm which does so advances the price and quantity of the seeds for a three or four years' rotation, the former to from 20*s.* to 21*s.* 6*d.* per acre, and the quautity to 20lb. mixed grasses and 12lb. clover. This, too, although common rye grass is substituted by Pacey's perennial cocksfoot and the fescues. But broad clover is employed, which cannot be advisable, wheu the layer is intended to remain three or four years, while the good policy of includiug Pacey's rye grass and hard fescue may be at least open to serious doubt. The subjoined seed mixture, at the stated cost, would, no doubt, be found ample for grass layers, intended to have the prolonged tenure of the soil already indicated:—

Grasses and Clovers.	Quantities per acre. lb.		per lb. *s.* *d.*		Cost per acre. *s.* *d.*
Cocksfoot	6	...	1 0	...	6 0
Timothy	6	...	0 5	...	2 6
Meadow Fescue	2	...	1 3	...	2 6
Perennial Red Clover	3	...	1 0	...	3 0
Alsike	3	...	1 0	...	3 0
White Dutch	2	...	1 3	...	2 6
Lucerne	2	...	1 0	...	2 0
	24				21 6

On chalk soils and light lands, with rubbly or porous sub-soils, sainfoin might be advantageosly substituted for perennial red clover; but for stiff clays and soils of wet character and resting on impervious clay sub-soils, neither sainfoin nor lucerne would be well suited. Trefoil in these cases should be included with larger quantities of perennial red and alsike clovers. As the average prices of cocksfoot and meadow fescue are less than the quotations in the above list, the usual costs of seeding down for a high-class alternate grass layer may fairly be put at 1*l.* per acre. It would certainly be advisable to include tall fescue and yarrow in seedings for chalk soils, and, if the first cost of the seed were not considered too great, they should form large proportions.

For light, poor, sandy soils it may be worth while bearing in mind what Arthur Young wrote about them in his calendar, published at the beginning of the century. Treating on chicory, he remarked: "On poor, barren, blowing sands, such as many districts abound with, especially in Norfolk and Suffolk, it will yield a greater quantity of sheep food than any other grass at present in cultivation. Upon such soils, when they want rest and recruiting, there is no plant that equals this, which, if sown with a portion of cocksfoot grass and burnet, will form a layer for six or seven years far exceeding those of trefoil, white clover, and ray grass, and will support so many sheep as very materially to improve the soil." Although chicory is grown in Yorkshire as a tillage plant, it is wholly for the value of its roots, which, after being dried, are sold for admixture with coffee; but, as fodder plants, chicory and burnet appear to have fallen into disuse, although Young observed of the former, "there is no plant to rival it," further remarking, "it forms a considerable proportion of many of the best meadows in the south of France and in Lombardy."

Assuming it to be reasonable, that, by applying the self-same principles of reformed seeding to alternate grass which Mr. Faunce de Laune finds so successful in forming permanent pastures, the

grass layers might be allowed to have tenure of the soil three or four years, without detracting from its productiveness or inducing foulness; the advantages to be reaped by adopting such a course of management appear to be very patent, and of vast importance. The extensive sowings down of land to grass which have been made during the past seven or eight years have been attributed to two leading causes—the unprofitableness of corn-growing, and the necessity of saving labour by lessening tillage expenses: and in all probability one object has been sought after quite as much as the other. Both are attainable by lengthening out the alternate grass course to the extent advocated, less expensively and far more conveniently than by throwing a larger proportion of the farm down to permanent pasture, and keeping the remainder in tillage after the old fashion; for, as none of what are termed the finer meadow grasses need be sown in the former case, the seeding would be less expensive, while, on the score of convenience, the farmer might employ the plough just as little or as much as the necessities and prospects of one year after another would seem to justify.

For instance, some farmers grow a great many more roots than others, and might desire to restrict corn-growing to two years out of eight—keeping the land four years to grass, and dividing the other term of similar length between roots and corn. This would afford such an immense quantity of food for stock, as to be only suitable to those possessed of large capital to the acreage occupied, as, without extensive stock rearage, dairying, and meat-making, no satisfactory returns could be realised from the immense proportion of green and forage crops. On the other hand, it would probably be much more convenient for others to keep their grass layers down three instead of four years, and grow oats, barley, beans, and peas, if not wheat, largely in the five years during which the tillage course would be kept up. Still another deviation might be deemed more desirable for some land and under certain circumstances—to keep grass in tenure the entire four years, and abbreviate the tillage period to one crop of roots and two years of corn-growing.

The leading objects of saving labour and diminishing the growth of unprofitable grain crops might be carried out to any extent thought desirable, and there would be the additional advantage of the farm obtaining a great deal more nitrogen from atmospheric sources than it does at present. Sir J. B. Lawes has very clearly shown that there is an advantage in having a green

carpet over the land when nitrification takes place, to attract and appropriate the volatile floating elements, which would get washed away and lost when falling on fallows. Nature is consequently far more favourable to such a system of prolonged tenure of the grass layers than to the four-course system; and what was meant by old farmers when they talked of "resting" the land was no doubt, in a great measure, this recuperation of fertility obtained from the atmosphere. In their management of poor soils they were extremely fond of allowing them to remain in grass a lengthy term of years, and then ploughing them up for a succession of scarifying corn crops, until they gave out in fertility, when they were allowed to sow themselves down to grass again. The system was right in one way, but wrong in another.

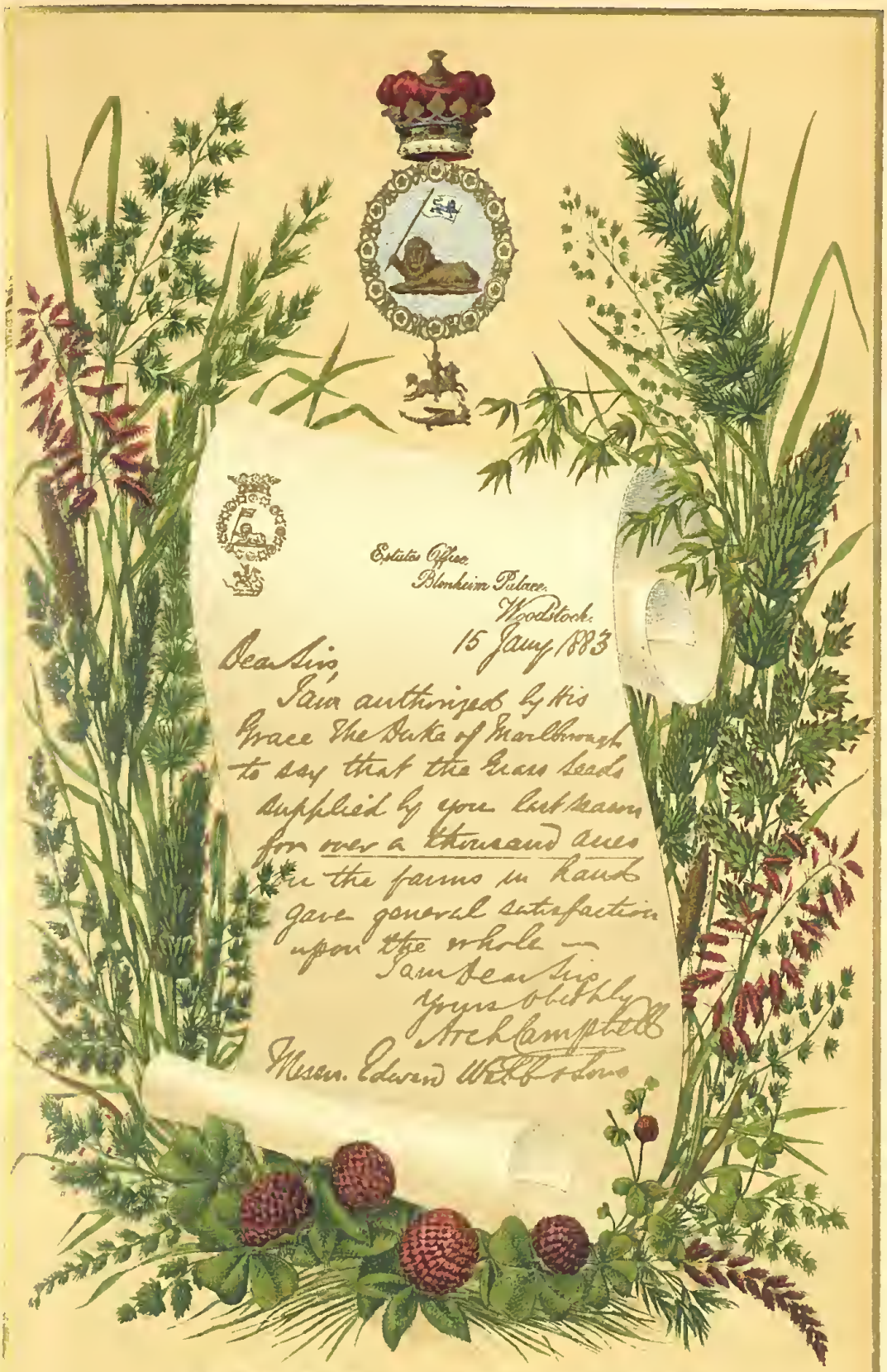
There is one branch of stock farming pre-eminently desirable to be promoted at the present day, which could be carried out with far greater efficacy, ease, and profit by prolonged grass tenure being secured—arable dairying. Farmers, when advised to adopt the latter, are prone to object to the extensive green croppings they imagine they would have to take; but with half of their land, or even three-eighths of it, always in grass, there would be no great necessity for summer green crops; and, as large portions of the grass might be mown for the silo or for hay, the winter provision of roots need not necessarily make any heavy demands on culture.

In the dairy districts of Scotland it appears to have been customary, for a great many generations, to keep seeds down two years, that the second season's grass may yield summer sustenance to dairy cows. The little Ayrshires are to be seen tethered on the alternate grass layer from spring to autumn, having the range of lengthy chains fixed to pegs driven securely into the ground. Arable dairying consequently is practised to a considerable extent in the northern kingdom, although English farmers have never had much to do with it. Further, it is pursued just on the lines advocated as being easiest and least costly. They have, perhaps, a better way in France of keeping their arable fields down to lucerne many years in succession; but, whether the plant requires a warmer climate than the British Isles, or whatever may be the cause, it has never as yet found anything like the same favour in this country as is given to it on the Continent and elsewhere.

CONCLUSION.

In balancing the respective advantages of grassing down for a temporary period of from three to six or seven years, or for a permanent pasture, the view maintained by M. Joulie must be by no means lost sight of, which is that lands kept entirely in pasture, while accumulating large stores of nitrogen, get exhausted of minerals partly through the property of the latter to sink downwards in the soil, and partly by exhaustion occasioned by successive crops when no manure is returned. On the other hand, if the plough be brought into action again after land has been in temporary pasture, a fresh supply of minerals is brought up from the under layers of the soil, and rendered available for utilisation. To quote M. Joulie, he says: "The cultivation of roots and cereals deprives the soil of nitrogen, whilst that of grass or legumiuous plants, temporary or permanent, on the contrary, causes it to accumulate in the soil. Nitrogen being the most expensive manure to buy, it is not economical to devote part of the land absolutely to arable and part to grass, for, whilst one uses up the nitrogen, the other accumulates it in excess. On the contrary, it is preferable to alternate on the same piece of land the cultivation of roots and cereals with that of grass lays, so as in a measure to repair by the second the loss of nitrogen which the first caused to the soil. By this means cultivation can be kept up indefinitely without purchased nitrogen, provided the land be maintained in a fit state of richness as regards the mineral elements."

The above view must be regarded as extremely rational, still there are numerous instances in which occupiers would prefer to apply whatever minerals were requisite to sustain the productive powers of pastures to a maximum, rather than have to break them up after being once carpetted with really good turf. Stiff clay soils would naturally be preferred to be kept permanently in pasture in the existing state of the labour market. Further, it should be borne in mind that the primary objection against permanent pasture has always been its inferior productiveness, and it appears that this, to a very great extent, can be obviated.



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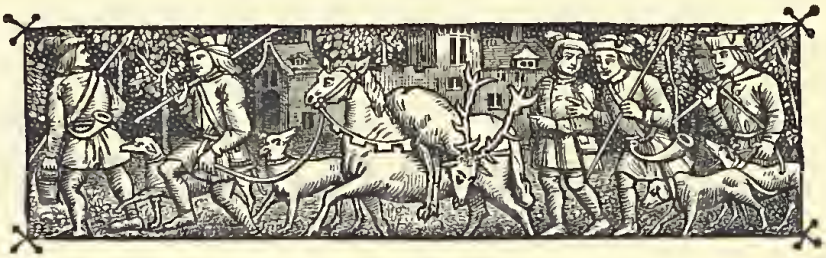

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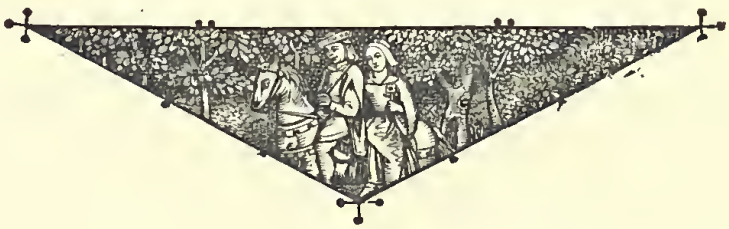

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